Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE) Webinar Series

Progressive Return to Activity Following Acute Concussion/Mild Traumatic Brain Injury: Guidance for the Primary Care Manager and Rehabilitation Provider

March 13, 2014, 1-2:30 p.m. (EDT)

Welcome and thank you for standing by. At this time all participants are in a listen-only mode. Today's conference is being recorded. If you have any objections you may disconnect at this time. Now I would like to turn the meeting over to Major Tisha Bridge.

Good afternoon and thank you for joining us today for the DCoE Traumatic Brain Injury March webinar. My name is Major Tisha Bridge. I am the chief of the office of Education Outreach for the Defense and Veterans Brain Injury Center. I will be your moderator for today's webinar. Today's webinar is "Progressive Return to Activities Following Acute Concussion, Mild Traumatic Injury: Guidance for the Primary Care Manager and Rehabilitation Provider."

Before we begin, let us review some webinar details. Live closed caption is available through the Federal Relay Conference Captioning. Please see the pod beneath the presentation slides. Adobe Connect and Defense Connect Online are the technical platforms hosting today's webinar. Should you experience technical difficulties, please visit dcoe.mil/webinars to access troubleshooting tips. If you cannot connect via Adobe Connect or Defense Connect Online, please continue to listen via the phone and go to dvbic.dcoe.mil/online-education to download the slides. There may be an audio delay as we advance the slides in this presentation. Please be patient as the connection catches up with the presenter's comments.

During the webinar, please submit technical or content-related questions via the question box. The question box is monitored, and questions are forwarded to the moderator for response during the question-and-answer session during the last half hour of the webinar. Our presenters will field as many questions as time permits. Please feel free to identify yourself to other attendees via the chat box, but refrain from marketing your organization or products.

Today's presentation and resource list are available for download from the files box below and will be archived in the online education section of the DVBIC website. DCoE's awarding of continuing education CE credit is limited in scope to health-care providers who actively provide psychological health and traumatic brain injury care to active duty U.S. service members, reservist, National Guardsmen, military veterans, and/or their families. All who registered prior to the deadline on Thursday, March 13th, 2014, at 11:00 a.m. EDT are available to receive a certificate of attendance of CE credit. If you meet the eligibility requirements and preregistered on or before Thursdays, March 13th, 2014, at 11:00 a.m., visit

http://continuingeducation.dcri.duke.edu/ to complete the online CE evaluation and post test, and down load your CE certificate or certificate of attendance.

We'll now move on to today's webinar topic, progressive return to activity following acute concussion, mild traumatic injury, guidance for the primary care manager and rehabilitation provider. Consensus panels have increasingly recommended a gradual return to normal activity using a graded protocol after a concussion. In January of 2014 the Defense and Veterans Brain Injury Center released two companion recommendations to facilitate a standardized stage return to unrestricted activity for service members who have sustained concussion in deployed and non-deployed settings; the progressive return to activity following acute concussions from mild traumatic brain injury guidance for the primary care manager and the rehabilitation provider in deployed and non-deployed settings.

Resource Suite was developed in collaboration with military clinical and academic subject matter experts. It addresses the six stages of progression, from rest to pre-injury activity. Definition of rest, use of the neural behavioral symptom inventory to track symptoms, a two-tiered complementary approach based upon symptoms and provider judgment, physical, cognitive, and vestibular balance activities recommended for participation in activities to avoid at each stage, and guidelines for progression, regression, and referral. This webinar will introduce these key stages delineated by the clinical recommendations.

At the conclusion of this webinar, participants will be able to discuss the evolution towards evidence-based approaches to graded return activity after concussion; describe the standardized stage approach for increasing physical and cognitive activities to optimize recovery; identify progressive return to activity, clinical recommendations, clinical support tools, and patient education dissemination plan in the primary care or rehabilitation setting; evaluate the concussed patient's progression through the stages of recovery, and when the patient should be referred for further evaluation.

I would now like to introduce or first presenter, Dr. Michael McCrea. Dr. McCrea is a professor of neurosurgery and neurology and director of Brain Injury Research at the Medical College of Wisconsin, as well as a neuroscientist at the Clement Zablocki VA Medical Center in Milwaukee, Wisconsin. He is an American Board of Clinical Neuropsychology -- certified in clinical neuropsychology and is the immediate past president of the American Academy of Clinical Neuropsychology.

Dr. McCrea has authored numerous scientific publications, book chapters, and national and international lectures on the topic of TBI, including the text "Mild Traumatic Brain Injury and Postconcussion Syndrome," the new evidence base for diagnosis and treatment, published by Oxford University Press. Thank you for your participation and welcome, Dr. McCrea.

Thank you. It's an honor for me to be part of this webinar, as well as having been invited to be part of the working group and consensus panel that first tackled this issue a year ago, or more. What I hope to do this afternoon is to briefly share with you some background on the history and evolution of rest and graded exertion in a sports concussions setting, how the science has evolved over the past decade or more and ultimately delivered a more evidence-based approach to concussion management and return to play, and then pointing out some of the lessons learned from that work over the past ten years or more, and how it helped inform a similar standardized approach to graded activity in the management of concussion in a military operational medical setting.

I have no relevant conflicts or other disclosures to make as part of this presentation today. Where I'd like to begin this conversation is with just a bit of historical backdrop, and that being that concussion and contact in collision sports is not certainly new to the horizons. It's arguably been around as long as these sports have existed, perhaps the most notorious concussion in NFL history, for instance, actually occurred in October of 1960, when here, on the ground, you see Frank Gifford who was rendered unconscious by Chuck Bednarik from the Philadelphia Eagles. Mr. Gifford was certainly one of the highest profile players in the game at the time, and he was forced out play for several months after this injury. But, still, in those days, this was not front-page material.

It was really at some point really in the mid 1990s, when several high profile athletes came forward expressing their concerns about the potential long-term consequences or their lingering symptoms associated with repetitive concussion, including some commentary from those athletes that perhaps they were returning to play too soon, in retrospect, return to play too soon after their injury.

The point I hope to leave you with today is that the real game changers on this landscape has been better science. Many large-scale prospective studies over the past 20 years have taken most of the guess work out of sports concussion management in terms of its diagnoses, evaluation, management, and the topic that we're here to talk about today, return to activity. Now, certainly I'm not making the claim that returning an athlete to play, for instance, in a high school football setting is equivalent to what we encounter in a military operational setting. The stakes are clearly higher in the latter, where someone's life might by be on the line. But the exercise is very much the same; and that is, there is a need for a rapid diagnoses, a standardized form of evaluation, and evidence-based approaches to injury management and ultimately determining when an athlete or a soldier is fit to return to activity, and how we go about that.

Fortunately, as I mentioned, the science has evolved quite significantly of late, and we now have several consensus guideline statements in the literature, including those from Zurich Consensus Conference in 2012, a summary of the evidence from Dr. Giza and Colleagues at the American Academy of Neurology. There are a numbers of sporting organizations, the National Athletic Trainers Association, Team physicians, and so forth who have put our similar statements, with a great deal of consistency about how we go about many managing those these injuries.

What I hope to share with you today is how it's really science that is driving best practice in the 2014. To address the return to activity question, and the benefit of graded exertion, really, let's also do is a brief review of the literature on what we now understand to the be true natural history of this injury. And that really divides into two parallel discussions; first, what have we learned from prospective studies about how long it typically takes for an individual to make a complete clinical recovery in terms of signs, symptoms, performance on cognitive testing, et cetera. And there's really been an enormous amount of data on that issue that I'll share with you in summary today.

But perhaps the most exciting frontier on the horizon right now is determining, with the utility of advanced neuro-imaging techniques and the other tools available to us, how long does it take for recovery to occur at physiological levels? And the implication here is if these two time frames are completely overlapping, then how we go about things in injury management today is perfectly fine. But if, for instance, the window of vulnerability or the time course of physiological recovery after concussion extends beyond the time point of clinical recovery, ideally we would

want to know the totality of that time course and make decisions based on a complete recovery, both clinically and physiologically, to drive evidence-based approaches to return to play.

When we look at our studies and replications by several groups around the country, we find something very interesting in athletes, and that is about 20% of them report a complete recovery in the order of 24 hours or less, and 85% of athletes report a complete recovery within the first seven days. Now the obvious criticism or weakness of these datas is that they're based on self reports. And I often say that if I had a dime for every Thursday morning miracle recovery in high school football I'd be a very wealthy man, obviously the athlete being motivated to make a complete recovery in order to return to the game the following Friday.

But, overall, it turns out that less than 3% of our athletes, in a very large sample here of nearly 800, have any elevation in their self-reported symptoms, relative to their own pre-injury baseline, beyond one month post injury. The bottom line is that self-report alone is not satisfactory to rely on in terms of determining an athlete's level of recovery, and it underscores the importance for performance-based measures of recovery.

I'm going to pause there for a second. I am noticing that some individuals may be having difficulty with the audio. Am I coming through okay, sound wise?

Yes, sir. This is Major Bridge. We can hear you.

Okay. Terrific.

This is the operator, and you're coming through just fine.

Okay. Thank you very much.

You're welcome.

When we look at performance-based recovery however, something very similar appears, in that, when we look at, in addition to symptom recovery in our athletes, in our large prospective studies, we employ multiple variants of cognitive test batteries, as well as balance and postural stability testing, and something very similar emerges, in that even beyond symptom recovery, 80 to 90% of athletes achieve a complete recovery, even on performance-based measures, in the order of seven to ten days post injury.

Now what's most concerning in terms of injury management and return to activity is that that seven-to-ten-day window also happens to be the period of time during which the athlete is at great risk of repeat injury. You can see here that somewhere between 75 and 90% of our same-season repeat concussions occur within the first seven to ten day of initial injury, which begs the question as to whether or not there's this period of vulnerability during which the individual who has sustained a concussion is at risk of secondary injury. And then ultimately, in term of return to play, or in this case, return of activity, how long is long enough?

And as I mentioned, the newest frontier on the horizon is our ability to look at this in real time in humans from a physiological standpoint, using advanced neural imaging techniques, EEG testing, and other, quote, biomarkers of injury effects and recovery, and something very interesting very interesting is starting to emerge in the literature. What our group refers to as our working model of an integrated theory of recovery, and that is, if we assume that an individual has a normal state of brain function prior to their injury exposure, there's a concussive event

that occurs, and we know from a number of studies that there is this initial period during which that individual will exhibit severely elevated symptoms of headache, dizziness, and otherwise, while also demonstrating quite prominent and large effect sizes on cognitive testing, balance testing, and other functional capacities, while also on neuro-imaging studies, DTI, resting state imaging, et cetera, having clear evidence of underlying path of physiology and disruption of normal brain structure and function.

It's then during this intermediate period that the individual, in this case an athlete or a soldier, comes forward, reporting a complete symptom recovery. They perform normal or better than their baseline on cognitive testing, balance testing, and other functional measures, but emerging datas to suggest that there is this extended tail of physiological recovery that might extend beyond the time point of clinical recovery, and it's at some point later that the individual achieves complete clinical and physiological recovery.

Now, as I mentioned earlier, the main implication here is ideally we would like to know the totality of that period of vulnerability, both the clinical and physiologically, in order to determine how long is long enough before individuals return to activity after concussion. This is an issue that we did undertake at the Zurich meeting in 2012. In addition to the consensus statement from Zurich, there was also theories of individual manuscripts, reviews of the evidence in the literature. This is a paper authored by Kathryn Schneider and colleagues on the benefit of rest. And you can see here that an there conclusion was that an initial period of rest may be of benefit, but long-term rest was not considered as beneficial, and, clearly, a need for more research, looking at the ultimate efficacy of rest and created exertion.

At this point, in 2014, from the sport cornerstones of the world, clearly, rest and rated exertion are the corner stones of concussion management. And here you see the proposed graded return to play protocol in the Zurich guideline, which is very similar to other consensus statements in the sports medicine literature, in which it marks a stark contrast from how we used to do things, where, in the old days, an athlete would have a complete recovery or maybe not even be recovered yet and sent back to, for instance, football practice or other intense activities immediately.

Now there's a ramping up philosophy, in which when the athlete is approached or is nearly approaching a point of being completely symptom free, we start them on light activity for a short duration of time, and as they're able to tolerate, we ramp up both the intensity and the duration of their activity until they reach a point where they can tolerate quite high intensity long duration activity without any recurrent symptoms, and then eventually return them to their normal participation in football or other sports, for instance. Here is a terrific paper by Dr. West and Dr. Marion comparing the recommended guidelines across various consensus statements in the sports literature. I don't intend to go into this in detail, but it is a very good shelf reference if you're wanting to do a head-to-head comparison of those various statements in the literature.

And as it relates to the benefits of rest after concussion, here is another paper by Silverberg and Iverson, and their ultimate conclusion, after reviewing the literature on benefits of rest and graded activity. The best available evidence suggests that complete rest exceeding three days is probably not helpful, but gradual resumption of pre-injury activity should begin as soon as tolerated, and supervised exercise may benefit patients with persistent symptoms.

I think the punch line is this, the time course of the graded activity protocol has a nice coincidence with what we now understand to the be the true natural history of clinical and physiological recovery, such that if we begin athletes into this graded exertion protocol we're

also not only then providing them with an active program of rehabilitation but also extending their recovery time or their non-participation time such that they are in a much safer state after reaching a complete recovery before returning to their normal activities, whether that be in a sports setting or, in this case, a military setting. And I'm hopeful, and I think it was the case that the science and the lessons learned from the sports concussion world were of great benefit in the ability to put together a standardized protocol like this for the military medical operation setting.

You can see a number of references here that I have included in my presentation, and I'm going to now hand it over to Therese West, who is going to talk more about her leadership and the activity of the consensus panel and the new protocol.

Thank you for your presentation, Dr. McCrea. If you have any questions for Dr. McCrea, please submit them now via the question box located on the screen. I would now like to introduce our second presenter, Dr. Therese West: Dr. West provides contract support and is a subject matter expert, SME, in the division of Clinical Practice and Clinical Recommendations in the Office of Clinical affairs at the Defense and Veterans Brain Injury Center, DVBIC.

In addition to holding a doctorate degree in nursing practice, DNP, Dr. West is nationally certified as a family nurse practitioner, FNP, as well as certified pediatric nurse, CPN. As the project officer for the DVBIC working group, Dr. West led the team to develop progressive prerogative return to activity following acute concussion, mild traumatic injury, guidance for the primary care manager, and rehabilitation provider.

You may find it helpful to download the support tools for boast the primary care manager and the rehabilitation provider in order to follow along and refer to during Dr. West's presentation. These tools are located in the bottom left corner of your screen. Thank you for your participation and welcome, Dr. West.

Thank you Major Bridge. First of all, this it's just my disclaimer that the views expressed in this presentation are my own and do not reflect official policy of the U.S. Army, Department of Defense, or the U.S. Government. I have no relevant financial relationships to disclose, and I do not intend to discuss any off-label or investigative unapproved use of medical products or devices. Next slide, please.

The learning objectives here have already been outlined by Captain Bridge early on in the presentation, so if you could all just -- and as she mentioned, I would recommend that you download or pull up on the split screen the clinical support tools for both of the clinical recommendations that can be found in the left bottom of your screen to refer to as we go along. Next slide, please.

So concussion, as Dr. McCrea so nicely summarized everything earlier, we have found in the military that with more than 294,000 traumatic brain injuries have been reported in the Department of Defense that have occurred between the year of 2000 and through the year of 2013. It's a major concern, of course, and as it is to the general population, and it can impact a service member's health, the unit readiness, and mission accomplishment. The majority of these documented brain injuries are 82.5%, are known as mild TBIs or concussion, and 85% of all concussions are reported as occurring in the non-deployed or non-combat theater setting. Next slide, please.

So as Dr. McCrea also mentioned, the approach is something that, for progressive return to activity, has been slowly but surely becoming evidence based, and concussion care centers in Afghanistan reported three different progressive return to activity protocols. So in February of 2012, the occupational therapists and physical therapists in Afghanistan identified that although they had three regions of care, they were utilizing an evidence-based approach in all three, meaning a step-wise approach following concussion, their efforts were not standardized, and they had several questions that remained and unanswered as to exactly how they should progress someone and when not to.

The need for standardization was brought to Defense Center of Excellence, as well as DVBIC, and the question became how do we address this, and could we please help them to develop a standardized approach that could take place in both the deployed and the non-deployed setting for progressive return to activity to their pre-injury levels following an acute concussion. The clinical practice guidelines were reviewed, as well as literature, and so we then identified that there was not on only a need, but there was also a gap that was available to everyone. Next slide, please.

So just to review, although the information is consistent, as Dr. McCrea mentioned, and it was all evidence-based recommendations for rest and a graded gradual return to activity following concussion, not any one source offered specific recommendations; meaning, what is the description of rest, what activities are recommended at specific timeframes following injury, what activities should be avoided at specific timeframes following injury, and how do we determine when an individual is ready to progress. So we had also questions about when the primary care provider should refer an individual to someone else, to a rehab provider or a higher level of care, and how exactly do we identify all of that. So we needed this information, and those were the questions that the working group addressed. Next slide, please.

The working group was established, and in this working group, we had representation from all the services, meaning the Army, Air Force, Marines, Navy, and Veterans Affairs, as well as civilian experts in the field of neurology, family medicine, sports medicine, occupational therapy, physical therapy, concussion and sports, neuropsychology, physiology, concussion rehabilitation, and athletic training. So we had a very well rounded group of multidisciplinary individuals.

We combined the evidence and the working group also discussed and we started with a framework for the graded approach using the Zurich consensus stages that Dr. McCrea discussed, and we also included the neurobehavioral symptom inventory, which we will talk about later, to track and identify symptoms. The Borg's Rate of Perceived of Exertion Scale, which is a well known scale to occupational physical therapists, that to translate measurable gradual increase in an individual's rate of exertion during the activities, and the Metabolic Equivalent Scale, or the MET scale, to determine what military-specific physical activities would translate into each stage and correlate with an individual's RPE for that stage. Additionally, the body's physiological response to exercise tolerance, as Dr. McCrea discussed, was addressed through the application of resting heart rate and resting blood pressure.

The recommendations were then developed, reviewed by all representatives in the working group, and all of the military services representatives as well. The documents were then cross-walked with Department of Defense Policy, as well as service-specific policies and the existing deployed and Garrison Concussion Management Guidance for Congruency. Next slide, please.

And the result was two different clinical recommendations, Guidelines for Concussion Management based upon state of the science today, and calls for a gradual step-wise approach to return to activities following a period of rest. These do address in both the deployed and the non-deployed setting, as I said, following acute concussion. They offer guidance for primary care managers and rehab providers in both settings. This a progressive approach from rest to return to pre-injury activity. It combines patient feedback and provider assessment to gradually progress the patient from a limited activity back to a full range of daily activity. The staged approach emphasizes the need to rest and how gradually to increase this physical, cognitive, and balance activities.

So the two clinical recommendations suites include -- each have a primary care -- each have a clinical recommendation, which is a narrative format, a clinical support tool, or pocket-sized reference cards containing the algorithms and a brief summary of guidance, as well as superscripted detailed information; provider education training slides that include detailed information and case study examples, and patient education materials that we'll discuss later in more detail in the presentation. Next slide, please.

So the general principles of the clinical recommendations are that, first of all, they do interface with the theater and in Garrison concussion management algorithm. They're more of a how-to manual for daily activity during concussion recovery. Each patient is unique, so we look at it from that perspective, by tracking the individual symptoms on the neurobehavioral symptom inventory. We increase activities slowly, based upon how the service member feels, and can help reduce the setbacks to help improve overall recovery. We monitor and report symptoms that help the provider better guide recovery, and after an educational intervention for all patients, those with few and mild symptoms are managed by a primary care provider and follow a self guided staged approach, which we'll review. Most individuals who are diagnosed with a concussion can be managed by their primary care provider, and with education and guidance for when to follow up. Next slide, please.

Additionally, a list of key activities for participation and activities to avoid at each stage are noted. The staged approach, as we said, includes and gradually increases physical, cognitive, and balance activities. As Dr. McCrea also mentioned, both inactivity and too much activity can be detrimental, so it's a fine balance that everyone must find with each patient. As we said, each unique individual patient will make progress at different rates.

Research has shown that many non-concussed individuals are rarely symptom free. For an example, a headache of any given person on this call or in this webinar or in this room today may be at a moderate level or a two, several times weekly perhaps. This recommendation indicates, for our purposes of the clinical recommendation, that asymptomatic is defined as symptoms reported as zero, rarely, or as one mild on the NSI. So that's how we define asymptomatic in this clinical recommendation.

Additionally, the recommendations consider the use of over-the-counter medication such as Acetaminophen for headache, and pre-injury prescribed medications, as not interfering with an individual's ability to progress. We ran forth at increasing activities slowly, based upon how the service member feels, can help reduce setbacks and help improve overall recovery. These guidelines are designed to assist our service members and veterans who have sustained a mild TBI to gradually return as safely and quickly as possible.

Service members who sustain a concussion are recommended to be referred only to a rehab provider for daily monitor activity if the primary care manager determines that they are not

progressing as expected, there is no progression in seven days, or symptoms are worsening, and they are symptomatic after the full progression or after exertional testing or if this is their second concussion in 12 months and symptoms are reported as moderate after resting, an we will review this further.

What the clinical recommendations do not do, they do not replace the existing concussion management algorithms in the deployed setting or in the Garrison setting, as I mentioned earlier. The recommendations provide guidance that interfaces with the deployed concussion management algorithm on the initial provider card under PCM management superscript I, and the Army Garrison algorithms provider algorithm superscript F. So they interface there, they don't replace anything. They also do not provide guidelines for specific symptom management. Next slide, please.

This slide depicts the stages of progression that include stage one, rest; stage two, routine activity, and progress through to stage six, which is returning to your pre-injury activity. Next slide, please.

Okay, so a quick comparison of the two clinical recommendations; meaning the primary care management of clinical recommendation and the rehab provider clinical recommendation. So as mentioned with the two, they are separate. They do interface with each other. The primary care manager is on uncomplicated concussion complex, not the complex made on TBI, which is more with the rehab, patient education is the main focus of intervention for the primary care clinical manager for clinical recommendation, whereas, the rehab provider progression is guided more by the rehab specialist, and only first or second concussion in 12 months with a mild NSI report can report to the primary care provider, where, with the rehab care provider clinical recommendation, it relies on defined physiological parameters of resting heart rate and resting BP to determine exercise tolerance and guide safely through progression. Next slide, please.

Additionally, the primary care manager, CR, talks about the 24-hour and 48-hour reassessment, with possible exertional testing if the symptoms remain zero to one, or mild, on the NSI. There is a minimum of four additional days to progress through the stages, three, four, and five, if symptoms have not reached mild during the first 48 hours. If this is the second concussion in 12 months and symptoms are reported as two or higher, they are recommend referral to the rehab provider. And the rehab provider clinical recommendation remains that moderate layers -- for a service member who remains moderately or severely symptomatic -- I'm sorry -- after first or second concussion and describes their symptoms as greater than a two, a two or greater. Symptomatic after stage five, intensive activity exertional testing, and/or is referred by the primary care providers through their clinical judgment at any time, if they don't feel that their individual is progressing as expected. Next slide.

This is just a quick slide that depicts the neurobehavioral symptom inventory, which is a 22-item inventory of non-specific but common mild TBI symptoms. The rating scale is a zero to four, with zero be none and four being very severe. We recommend that the NSI becomes part of the medical record each time the patient fills out so the next provider that comes along can then prepare the two documents. Next slide, please.

So what is the role of the primary care manager? Well once the concussion has been diagnosed and confirmed, we provide mandatory recovery, 24 hours for the first or second concussion within 12 months. That's just a given across the board. Also, we have bullet number two is for three or four more concussions within 12 months, you refer to a higher level of care after you do symptom management and give follow-up guidance. You refer to a higher level of care for a

recurrent concussion evaluation. The acute concussion educational brochure should be provided to all patients who are diagnosed with concussion at that time of diagnosis. This is a general informational brochure and does not contain specific information about progressing through activity.

Upon reassessment in 24 hours, if the service member remains symptomatic, the return to activity education brochure is to be provided to the service member and is advised to follow the guidance for stage-one rest for an additional 24 hours, and return for reassessment. The progressive return to activity process or referred to a rehabilitation provider for daily monitor progressive activity at the providers discretion. And just a little note at the bottom that all concussions should be evaluated in accordance with the Department of Defense, DODI 6490.11, and treated through the VA DOD practice guidelines. Next slide, please.

This slide then depicts what the clinical support tool front page looks like. It has the top box, where we have -- this is the full algorithm that illustrates primary care management care for progressive return to activity that was discussed on the slide previously. As you see in the red outlined box, we have the concussion is diagnosed, you refer, you review concessional educational brochure with the patient, and then you request that the patient do a mandatory 24-hour recovery. Next slide, please.

So for everyone, just to review and to bring this point home, everyone, whether it be your first, second, or third concussion, whether it be the symptomatic or asymptomatic, should be given the acute concussion education brochure. We know from the literature that education is the single-most important intervention following a concussion. The acute concussion education brochure should be given to all service members once they're diagnosed. Superscript B on the algorithm refers to the recommended parameters for recovery in stage one rest. The activities that are permitted and are recommended are on the left side of the graph -- of the table, and the things to avoid or what is not recommended is a no on the right side of the box.

The parameters for rest are included and are recommended and what to avoid, please reinforce this to our patients as a way to keep them into the appropriate parameters of rest. All these activities consider the physical cognitive, and balance vestibular activities. Next slide, please.

So additionally, with first concussion, if the service member is asymptomatic after that 24-hour mandatory recovery period, which many individuals may be, they will follow the left side of the algorithm, and following guidance includes informing that the patient should contact their primary care provider if symptoms return, and for symptoms increase in the number of severity or if they are unable to increase or progress their activities. So many patients -- the majority of concussions is the person's first concussion, and so they will follow this left side of the algorithm. If they're asymptomatic, if there's no symptoms present, they can be exertionally tested, and if there's still no symptoms present, as we mentioned, then they would be given follow-up guidance and allowed to return to their pre-injury activities. Next slide, please.

So I mentioned exertional testing, which is one of the things that you would do to get the individual to see if they were able to be symptom free and then maybe progress on to their pre-injury activities. So this is consistent with the Theater Garrison algorithms as well. Exertional testing is indicated by a superscript D. It discusses how to exert someone to 65 and 85% of their target heart rate using pushups and sit-ups, et cetera, maintain the level of exertion for two minutes, assess for symptoms such as headache and all the other symptoms that are contained on the neurobehavioral symptom inventory. And if symptoms or red flags exist with exertional testing, it is recommended that you stop testing and consult the provider. So if it is the provider

doing the exertional testing, they are recommended to stop the exertional testing and give the individual a second 24 hours of rest, and then to reassess again.

So just to review and just to bring into proportion with our stages how this exertional testing is, is that the exertional testing, it's a 65% of a target heart rate, actually will fall into place with our stage-three or light occupation oriented activity that calls for a 65% of your target maximum heart rate. So that's why we don't want individuals to get to that stage until they're really ready to do so. Next slide, please.

The left side of the PCM algorithm, as I said, illustrated the recommended pathway for the first concussion and the first 48 hours, not just the first 24. The first 24 is all the way to the left. The second 24, there's a second area there, that is defined by the rectangle, shows the review. If somebody is symptomatic after the first 24 hours and/or after exertional testing, you will review the Return to Activity Educational Brochure with the service member and initiate the stage one, which is rest. Next slide, please.

So the first concussion, once the individual, after 24 hours, the second 24-hour period, then returns for reassessment. If they still are not symptomatic at that point, then they can go through the exertional testing and perhaps exit the process. However, if they are symptomatic, that's when we recommend that you initiate the full progressive return to activity process. If, after 24-hour period and 48-hour period, any symptoms are reported as greater than a mile, such as too moderate, you provide the service member with this return to activity educational brochure, review the information contained in the brochure, as its very important to guide the service member and reinforce the parameters of rest, and when they should return for a reassessment, and when they should also return -- what types of things are red flags, and they should return immediately. This individual would still be considered in the acute phase of concussion. Next slide, please.

This slide shows a Return to Activity Educational Brochure is a tri-fold brochure that is recommended to be printed on legal-size paper and is available for download on PDF at dvbic.dcoe.mil website. This information that is contained on this brochure includes what a concussion is, when to contact their PCM immediately for red flag, a sample neural behavior symptom inventory with rating explanation that we'll show on the next slide, as well as guidance for activities that are recommended and what they should avoid during each stage, as well as when to return to their provider. Next slide, please.

This is what the inside of the Return to Activity Educational Brochure looks like. As I said, it tells the red flags, and things to avoid as well. On the left bottom you will see the "Rating your symptoms" scale. It goes through, it clearly defines for the service member what a zero and one a one and et cetera mean. There is also rest, what we do in stage-one rest. It is a sample of what is recommended and what you do not do.

So each of the stages, the format, are defined exactly the same way. There's a list of things that are recommended that can be done. There is also telling them do not do or should avoid certain activities, and then it tells them to -- and you see the little red box that's outlined in red at the bottom right says "After this stage, see your primary care manager and discuss symptoms and determine your next steps." So we're telling them that at that point, they're still not able to make the decision for themselves whether they should progress or not, and we're recommended that they be reassessed by their provider.

There's also a little note there, and you can see in patient language at the bottom. If your heart starts to race immediately, stop what you are doing and resting. This was not intended to be something for the provider. It's not language that a provider is using, but it would be language that a patient might understand, and may be more inclined to follow and understand that if they're doing an activity that's increasing their heart rate, which is one of the physiological parameters of exercise intolerance, then you want them to stop that activity. Next slide, please.

So during the first concussion, the service member, you see the primary care manager after stage one rest, and if the symptoms are rated a zero to one, as I mentioned, then the service member may undergo the exertional testing. If the service member has new symptoms or symptoms rated greater than one, then they are required to stay in another 24 hours of rest. The center of the primary care algorithm covers the initiation of progressive activity, which would occur following that if the individual remains symptomatic. Next slide, please.

So to initiate the process, how can an individual then go on to the progression? So it can continue the progressive activity process and they should complete the NSI every day, after spending at least 24 hours in any given stage. In order to progress to the next stage, the service member has to have been in current stage for at least 24 hours, have no new symptoms, have no new increase in severity of symptoms, and if their NSI continues to be reported as a zero to one or mild. Next slide, please.

So when do we refer this patient and how would we know if they were ready to be referred or if they continue to stay under the primary care. So we recommend that the person be referred to the rehab provider on their first concussion for the more monitored progressive return to activity process, if they are not progressing as anticipated, if there's no progression in seven days, if the symptoms are worsening, if the service member reports symptoms following exertional testing after stage five, which is intensive activity, or per provider judgment. It's very important, this topic, to know.

The second concussion: Side bar A, which is after 24 hours of rest, if the service member has a second concussion, side bar A, this is within a 12 month period, primary care is recommended to follow side bar A, which is located on the flip side of the clinical support tool. Research has identified that individuals with subsequent concussions may require additional time to recover. Side bar A defines a more conservative approach to the progressive return to activity that also is in alignment with the requirements of the DODI 6490.11, as we discussed. Next slide, please.

Initiate progressive activity process after a mandatory -- for a second concussion after the mandatory 24 hour and begin stage one rest, just as we discussed with the primary care model. Next slide, please.

Refer to the returned rehab provider for the daily monitored return to activity process, as I said, if the person is not progressing as anticipated or no progression at all in seven days. That's an important thing. If somebody is not progressing, if they're going back and forth between stages, unable to progress, then there is an identified symptom or exercise activity and tolerance, and they should be monitored on a regular basis. Next slide, please.

Third concussion: Third concussion is outlines at the box all the way to the right on the return to return to activity algorithm. We recommend that you provide symptom management, provide guidance for follow-up care, and refer to a higher level of care for recurrent concussion evaluation. This, again, is all in alignment with the DODI 6490.11 in the concussion care management algorithms for both Garrison and in Theater. Next slide, please.

So just to review the progression through activity, the following conditions apply at all stages and should be met for the service member to progress. Each stage is a minimum of 24 hours and specifies each activity that is permitted. The NSI is completed daily, every morning. The service member may move to the next stage only if symptoms are reported greater than one, and there are no new symptoms on the NSI. And if the service member reports an increase in the number or severity of symptoms during an activity, the current activity must be stopped and the service member remains at that stage and with resting for 24 hours, and then can repeat and try the activities at that stage the following day.

If an activity at any stage causes an increase in number of severity of symptoms, we recommend that the service member stop that activity and rest, as I said, for the remainder of the day. If the following morning they are asymptomatic, as depicted by zero to one on the NSI, then they may resume the activities from that previous day, with the advisement to do decreased efforts of those activities that produced symptoms. If symptoms return at a two or higher, they should contact their primary care manager and be evaluated and return to the last tolerated stage of activity. Next slide, please.

It is also recommended that all service members see the primary care manager after they have completed stage five, which is intensive activity, so that they can then undergo exertional testing with observation, to resume before they are released to stage six unrestricted activity. You can refer the service member to a rehab provider or higher level of care, as we said, for all those parameters at provider judgment or if after that exertional testing after stage five they become symptomatic again. Next slide, please.

So the rehab provider guidance is very similar, it's a little more detailed, and it also gets into more specifics concerning the physiological parameters around concussion recovery. The rehab provider guidance is a continuation of the progressive return to activity acute concussion guidance for the primary care manager, and the distinction for patients between both recommendations include guidance that the primary care manager is more self-guidance approach, whereas the guidance for the rehab provider is more clinician directed. It's a bit more complex and much more guided. Next slide, please.

So progression across the stages for the rehab provider, as I said, is more detailed. It uses the following tools to assess both self reported, which are subjective, and objective measures of progression across each stage. So the self-reported measures are the NSI and the Borg Rating of Perceived Exertion Scale, which is probably familiar to many of you occupational and physical therapists out there that are listening, and the objective measures that we have defined are theoretical maximum heart rate during activity, a resting heart rate, and a resting blood pressure. Next slide, please.

This slide shows an example of what the Borg's Rating Perceived Exertion Scale looks like. It starts at six, with no exertion at all, and goes up to maximum exertion of 20. So it measures the intensity of a physical activity based upon the physical response that a person experiences during this exercise. It's reported on a scale of zero, no exertion at all, to 20, for maximum exertion. The theoretical maximum heart rate is calculated using 220 minus the age of an individual. A resting BP parameter maximum is given at 140/90 for a maximum heart rate at rest -- I'm sorry, blood pressure at rest, and the resting heart rate of a maximum 100 beats per minute is recommended. So the Borg's RPE scale was built into the rehab provider guidance on the clinical support tool at each stage, listed under the physical progression column. Next slide, please.

The following criteria apply at all stages and should be met for the service members to progress, the same as the primary care provider model; meaning that you have no new symptoms, no symptoms rated above a one, mild on the NSI, the resting blood pressure should not exceed 140/90, and resting heart rate should not exceed 100 beats per minute. Activity to rest intervals are also defined in the provider clinical support tool and are noted under each column, as well as the rest period, so it will say a ratio period of how many minutes of exercise for both physical cognitive exercise, and how much rest should follow. We recommend that these rest and activity ratios are followed highly for consistency and recovery for the patient. For example, on stage three we have light occupational oriented activity, a maximum of 60 minutes physical activity period followed by four hours of rest at a one to four ratio is recommended. Next slide, please.

So for both of the clinical recommendations, if the criteria of progression are met then you can advance to the next stage, but if they are not met, you return to the prior stage for 24 hours, and that's what's recommended in the rehab provider clinical recommendation. If the service member reports symptoms during any activity, again, please have them stop activity and rest. Next stage.

So this page is or this slide pretty much looks a lot like our patient education sheets. The patient education sheets for the rehab provider are very detailed. They do define what the heart rate. We recommend that the provider circle the heart rate for the individual and let them know what their target heart rate at rest should be, and it also gives very clearly what activities are to be done, including these little icons and stages, and as well as physical, cognitive, and vestibular balance activities that are recommended. Next slide, please.

So stage one rest, so the objective in stage one rest is very similar to as Dr. McCrea showed with the Zurich consensus stages. It's extremely light physical, cognitive, and vestibular balance activity, with the goal of symptom resolution. The activities and rest guidelines include primarily rest, with extremely light cognitive activity. Basic daily activities and basic things, such as brushing your teeth, extremely light leisure activity, extremely light vestibular balance activity is permitted, which may include walking on a level surface and limited head movement so that you don't evoke or elicit symptoms in the individual, but definitely no work, like as Dr. McCrea said, no return to play same day. No work, no exercise, no video game, no studying, or driving is recommended.

The service member may return to pre-injury activity and follow-u[guidance if no symptoms are present following an exertional testing after this stage. So in the clinical support tool for the provider, the RPE or the rate of perceived exertion is set at six to eight, which is extremely light activity for rest, and the heart rate should not exceed 40% of the target maximum heart rate during any activity that the servicemen is doing. It's very important that when they're in the rehab provider model they've already had symptoms, they've already been identified as having more prolonged symptoms than other individuals, therefore, at a higher level, therefore, it is very important that these parameters are explained to the patient and followed through by the rehab provider. Next slide, please.

So stage two is a very similar setup, with the light routine activity and RPE on the provider clinical support tool shows a 7 to 11 as being the RPE stage of light activity. The heart rate at that stage should not exceed 55% of the target maximum heart rate during any activity, and no video games, no driving, no resistance training, no repetitive lifting, no sit-ups or pushups or pull-ups are recommended to be carried out by that individual. So the bending task for vestibular, we those listed here. They're also listed, these activities, on the patient education

sheets for each stage, and we do have what you can do outdoor/indoor, stationary cycling at low pace with low resistance, cognitive activity it is such as computer use, and reading, but they have timeframe parameters around them, and vestibular and balance activities such as climbing stairs, putting on your boots and bending tasks, those are important not to elicit, as I said, any type of vestibular balance issues that the service member who is symptomatic may then incur.

And in stage two we have a parameter ratio of maximum cognitive activities of 30 minutes of light cognitive activity followed by minimum of 60 minutes rest following that cognitive activity period. Next slide, please.

Stage three, as I mentioned on a previous slide, we have an RPE of 10 to 12. We can increase the intensity and complexity of the exercise and cognitive activity, and we're telling people not to lift and carry objects -- to only lift and carry objects that are less than 20 pounds. They can use an elliptical or stair-climber machine or military tasks, such as cleaning your equipment, et cetera. But cognitive activities at stage three are now maximum of 30 minutes of cognitive activity, followed by a minimum of 60 minutes rest in between. Physical activities can be done, as we said, but just making sure that there's rest in between, and "novel salva" or collision sports, no video games, and no driving still at this phase. Next slide, please.

Stage four, increase the intensity and RPE is now 12 to 16, and follows the same parameters with cognitive and physical activities. The target maximum heart rate at stage four is now 70 to 85%.

In stage five, next slide, please. The objective in stage five is intensive activity. So this is when we're going to mimic the service's member's typical activities they would do on a regular day. So the duration and intensity of activity parallels the service member's typical role, function, and tempo. In addition to any stage activities, we resume usual physical exercise routine. Cognitive activities may include driving now as appropriate, weapon simulator, or target practice may be conducted. Vestibular balance activities may include running, patrol duty, jumping, landing, et cetera, and physical activity duration should not exceed 50 minutes, followed by rest.

The RPE at this stage, or the rate of perceived exertion, is maximum exertion or 16-plus, and a service member can go 85 to 100% of their target maximum heart rate. However, it's very important to note that no combatives or collision sports are still recommended at this stage, not until the person successfully completes this stage without symptoms and then does the exertional testing following successful completion of this stage, as defined by no increase in number of symptom or severity of symptoms. The service member is recommended to see the primary care manager after stage five for exertional testing and before release to stage six of unrestricted activity. Next slide, please.

So stage six really is not a stage that we have full parameters around. It's just identifies that the person has returned to their unrestricted activity or their pre-injury activity levels. We recommend that you still provide follow-up guidance for when and if they should return to their provider, and then they need to go back to their pre-injury activity levels. Next slide, please.

So just a few slides of key points to remember, the first concussion, the service member may return to pre-injury activity if they remain asymptomatic and report symptoms of a zero to one on a mild on exertional testing. Once exertional testing is performed, if the service member is asymptomatic after a 24-hour mandatory recovery, that can be when exertional testing is performed. If the service member has no new symptoms or has an NSI score of zero to one

mild at rest, and after successful completion of stage five, intensive activities, those are the timeframes when exertional testing can be performed.

Exertional testing is to be completed after stage five, as I said. If a person experiences a second concussion, they do not continue through the process. They stay at stage one or two, which is light activity, for an additional five days, as recommended by the DODI 6490.11 for additional five days of symptom for a total of seven days of symptom resolution prior to them carrying out the full stages three to five return to activity process. Next slide, please.

The progressive return to activity process is recommended for those concussed service members who remain symptomatic after mandatory recovery period and an additional 24 hours in stage one rest, or those who become symptomatic after exertional testing. If the service member fails to progress for more than seven days, they should be referred today the rehab provider for concussion care specialist, and if they do not need to do all of the activities on the handout, which is an important thing for them to find out. Next slide please.

The service member is recommended to stay at each stage for a minimum of one day, and patients entering the process are not recommended to skip any stages. If symptoms on the NSI are above a mild, then they should stay at the rest and stay at that stage, and return to the prior stage if necessary. Appropriate rest between activities should also be considered important and reminded to the patient. The NSI results for each stage should be entered into the permanent health record.

We have a few polling questions that we wanted to ask as well, just to see if we were clear with our message that we sent through here to concerning progressive activity. So the question one, rested progressive return to activity process, which of the following activities is permitted in stage one rest? Everybody's answering here. I didn't speak to fast for everybody. We'll see if everybody picked up on it. Okay, so we have an answer of -- let's see all the answers, we've only got four answers, A, B, C, and D. So we know that -- is everybody through? Okay.

So we have everybody answered the majority of the individuals -- and there's four more though -- okay. So the majority of individuals said treadmills, walking at a low speed. So that's true, and that would definitely be the item -- would be the correct answer. But we also have -- oh, what? We also have the second answer, which is television with rest breaks each hour.

Okay, go to the next question, please. Which of the following would prevent a service member with concussion from progressing to the next stage of the return to active process? Oh, wow, all of the above already won that through. So that's good. That's great. And then this last question is, is it permissible to skip a stage if a service remains asymptomatic? Okay, excellent. Excellent answer. Everybody got -- 88% of you were listening or I was clear with my message, one or the other. It's permissible to skip a stage -- not permissible to skip a stage if the service remains asymptomatic. Once they've entered into the full progression, meaning that they start with stage two through five, then they cannot skip. Next slide, please.

So in conclusion, the role of these clinical recommendations is to provide the primary care manager and the rehab provider with guidance for progressive activity following acute concussion. The progression to return to activity is recommended for those service members who remain symptomatic upon completion of the mandatory recovery period. Progression should be measured in three domains using physical, cognitive, and vestibular balance activities to slowly progress the individual. And progression is dependent upon the number and intensity of symptoms, activity and tolerance, and provider assessment. The required measure to

progression includes the NSI. No new symptoms is rated higher than a one or mild, resting heart rate of less than 100 beats per minute, and resting BP of less than 140/9 0. You should increase demands systematically and progressively to observe changes, and modify the intensity and duration of activity based upon the individual's symptoms.

I would like to thank everyone for this webinar, for listening to this important guidance. Thank you.

Thank you, Dr. West, for your presentation. If you have any questions for Dr. West, please submit them now via the question box located on the screen. It is now time to answer questions from the audience. We are monitoring the question box and will forward questions to our presenters for a response. If you have not already done so, you may submit questions now via the question box located on the screen. We will respond to as many questions as time permits.

Our first question is for Dr. McCrea. "What is the evidence that DTI or other sophisticated imaging or physiologic abnormalities that may persist long after clinical recovery leaves the athlete at risk for a second concussion, or worse, neurologic outcome with a second concussion?"

Excellent question. So just to clarify, the existing evidence suggests that there are lingering signal abnormalities on, for instance, resting state FMRI or DTI, and, for that matter, QEEG that extend beyond the time point of clinical recovery. And that includes our own work and that of others. So, for instance, in athletes who were initially symptomatic and had impairments on neurocognitive testing, for instance, and abnormalities on imaging or QEEG, we have found that those abnormalities or those, quote, markers of injury, are still present beyond the time course of clinical recovery when the athlete is symptom free and back to normal performance on cognitive testing.

I'm not aware, however, of any literature to suggest that there's a direct correlation between the finding of those abnormalities or the lingering signal on those technologies and increased risk. There has been a small amount of literature indicating that athletes are, indeed, at heightened risk of re-injury, as I pointed out from our work and others, during that window of recovery. But I think two issues here; those lingering findings on imaging that have been reported, how meaningful are they, do they truly represent lingering abnormality in brain structure and function? In other words, how specific are they, and we're going to require more controlled studies to determine that, and then also, do they convert to risk. The athlete is otherwise functionally normal, and, therefore, is there any association between those imaging findings and truly increased risk of re-injury. There's an intuitive, I think, conclusion that individuals are at heightened risk if they haven't reached a complete clinical and physiological recovery, but I'm not aware of that in the literature.

Thank you for your insight into that great question, Dr. McCrea. The next question is forwarded to Dr. West. "Dr. West, if someone has more than one concussion in a season, do they really need to have more conservative management?" That's a great question, there Major Bridge. Currently, the guidelines call for a concussion, it's not a calendar year, it's within a 12-month period of time. So the guidelines that the military uses is one concussion is counted, and then if your second concussion is within a 12-month period of time, then they are recommended to be treated as such.

Okay, thank you. There's a follow-up question to that. "Dr. McCrea, If a player has a sports-related concussion towards the end of the season, such as in the month of November, and their

next concussion occurring in August of September of the following year, do they still need more conservative management?"

Well those decisions are made on an individual case basis. But purely, as it's described there in the question, I would say not. It depends on how many prior concussions. I mean I think in most clinical settings we tend to be increasingly more conservative based on higher number of prior concussions sustained by the athlete. But, no, for instance, if there was one injury in November and another one in the following August, I would say we would tend to be mildly more conservative, but not unilaterally.

And that's just -- I think that that's an excellent point, Dr. McCrea. I do think in the military it's a little bit different. As I said, we are recommending that within -- if they have a related -- I'm sorry, a military related concussion toward the end of the season and their next occurs in August, as we said, which is before the following November, that that would be -- it would be within a 12-month period of time, not a calendar year, so that's what we would recommend, that it's treated as a second concussion, a little bit more conservatively.

Okay, thank you, both of you.

Yeah, I think I was saying that, in most clinical settings, we would tend to be a bit more conservative in that case. I thought the question was whether or not that athlete should be disqualified for the remainder of that season starting in August. But that would not be the case.

Okay, thank you, Dr. McCrea. The next question is directed to Dr. West. "Dr. West, is the presence of MRI abnormality such as external injury, affect the exertional testing recommendation?"

First, let me just point out that an MRI is not typically recommended for an individual in the acute concussion stage, and this recommendation does follow the -- is recommendation for acute conditions following acute concussion. And just as our clinical recommendation on neural imaging states, MRI is not usually indicated until someone is still remaining symptomatic or has the clinical parameters requiring an MRI in the sub-acute stage. So I would say that that wouldn't even apply to this clinical recommendation.

Okay, Dr. West, thank you for your insight on imaging following a concussion.

Dr. McCrea, can you explain how the 24-hour recovery period was chosen, why not 12 or 48 hours? Or perhaps Dr. West.

I think that's probably directed to Dr. West.

The 24-hour recovery -- well I think, Dr. McCrea, I know we discussed this during the working group, and as well as in all the literature, that they recommend that it's done in -- that the resting periods are done in increments of days or 24-hour periods. So with the 24-hour resting period that's initial mandatory rest, that was taken from the existing guidance that was in the Department of Defense, DODI, that I mentioned, the 64.9011, which was a mandatory recovery period. That was to eliminate anyone going right back to play, or in this case, right back to military duty the same day that they were injured. So I think it's the same type of thing as not returning to play, but that probably what we should call it in the sports world. Is that correct, Dr. McCrea?

Yeah. The 24-hour period for each rehabilitative stage is consistent with the protocols in the sports world.

Okay, thank you. And the next question, Dr. McCrea, has a sports-related component to. "Can you comment on the fundamental differences between sports-related concussion and concussion occurring in different venues or by different mechanisms, if there is any.

Sure. I think there's a, you know, there's very limited data that would allow a direct -- forgive the pun -- head-to-head comparison of concussion in athletes, civilian, and military service members. But if you conduct a comparative investigation of the literature across the three populations at risk, you'll find far more overlap than discrepancy in terms of the acute injury characteristics, the true natural history of recovery, and the risk factors associated with prolonged symptoms or atypical recovery.

Okay, thank you, Dr. McCrea, for your insight on that question. The next question is directed to Dr. West. "How are the data points, such as the rate of perceived exertion, percentage of maximum heart rate in cognitive tests identified at each stage, or were they just arbitrary to provide guidelines?"

Very good question. We were prepared for that question, and the working group was very diligent in researching this, and as I mentioned, the rate of perceived exertion is a very subjective measure, and activities, however, can be found for each of the perceived exertion levels and then they were then cross-walked, as I said, with military specific tasks and duties that were on a metabolic equivalent scale or the MET scale, which tells how much exertion a body is to determine what military specific physical activities would translate into each stage and correlate with the individual's perceived exertion rate. So there was a lot of thought and effort, as well as evidence and validated information that went behind making these recommendations.

We also, as I mentioned, had a multidisciplinary team of experts in our working group who were available, Dr. McCrea being one of them, that were very, very helpful and available to discuss and to provide us with additional literature and research, and through their experience to help us to define these parameters. And we still made certain that we were doing this at a conservative approach, being fully aware that this is a new and innovative product and that there is nothing else currently to compare it to, so we wanted to make sure that we approached this in a more conservative manner. But it was not arbitrary. I hope that answers the question.

Yes, Dr. West, I think that provides some excellent clarification on how the parameters were defined for this product.

Dr. McCrea, the next question is directed to you. "What is your opinion of the DOD progressive returned activity clinical recommendation? Do you think that these recommendations accurately reflect the intent of the various consensus statements and guidelines for concussion management?"

Well I think there's a great deal of consistency, you know, and Therese can speak to this. But I don't know that there was an absolute necessity that what works in a military operational medical setting has to match perfectly with how we do things in the sports world. And I hope that wasn't the takeaway message here that some heard. I think rather than starting from scratch in the development of a graded activity protocol for the military, again, as I mentioned earlier, the exercise was what lessons have we learned, good, bad, and otherwise in the sports world that

could be borrowed and help information this protocol. And I think to that extent, Dr. West and her team have a done a terrific job.

There will be nuances, major nuances to the military setting that are unique and not overlapping with the sports world. That said, our approach to things in the sports world is certainly not perfect either and has evolved over a period of 20 years, even with regard to just the issue of graded activity, and is continually being perfected. If you go back even three years, there was, in a community-based setting, there was kind of a prevailing attitude toward very extended rests, and we would see athletes in our clinic who had not been to school for three or four month, where the notion of rest had been taken way too far, and that pendulum has come back to the middle now, where, really, the name of the game in 2014 has become short-term rest and active rehabilitation, and I think that's reflected in the military protocol as well.

Yeah, and I'd just like to thank you, Dr. McCrea, if I could add onto that as well. Like Dr. McCrea said, we did use the current consensus guidelines, as well as some of our information from the working group, but with such a great exchange of up-to-date literature and experts that got together to discuss as a working group, and our working group actually met prior to the Zurich consensus working group, and I know that some of the members of that working group panel did take our information back, as well as another clinical guideline that we did not discuss that was the Ontario Neuro Trauma guideline. There was also working group members that didn't take information that was discussed between us, so we also helped to inform some of those other clinical recommendations that took place and were developed subsequently, following our working group.

And, additionally, it wasn't, as we said, the physiological parameters of resting heart rate and resting blood pressure, all these things are not military specific. They can be modified. You know, these clinical recommendations and guidelines may be modified to be able to be utilized in different settings.

Yes, ma'am, thank you, Dr. West and Dr. McCrea, for your dialogue on that question. The next question is for Dr. McCrea. "Sir, how do you see the civilian sports environments using the military's recently released progressive return to activity with adaptation?"

I think, if this follows the same pathway that other subtopics related to concussion have, I think over time you'll continue to see both evolve along their own track but in parallel, and each sector, borrowing the lessons learned from the other. Dr. Marion is on the phone, I think -- or on the webinar, I think, and I think he's familiar with another example like this, in which assessment tools that have been developed, for instance in the NFL and in the military, there's been an effort to take the best of both worlds and meld them into a better model that is beneficial to both. So I think what we continue to learn in sports about graded activity and active rehab, and what the military continues to learn in their application of the same in their setting, I would hope there would continue to be information exchange and that we borrow the best of both worlds and benefit both sides.

And if I may just add on to that, Dr. McCrea. We are planning to DVBIC to do some evaluation on the effectiveness of these products through some research at our clinical sites, so we're hoping to be able to inform what may have to be modified or adjusted or adapted, and we welcome feedback from you folks out in the field that may implement these products, and as providers, so thank you.

Okay, Dr. West, Dr. McCrea, that concludes the question-and-answer session of today's web. We appreciate all of the excellent questions that were submitted by the audience for Dr. McCrea and Dr. West.

Thank you. I'm grateful that I could participate.

Yes, Dr. McCrea, we're very fortunate to have you and Dr. West participate today. Thank you again to our presenters. To help us improve future webinars, we encourage you to complete the feedback survey that has been opened in a separate browser on your computer. To access the presentation and resource list for this webinar, you may download them from the files box below, or at the DVBIC's website, Dvbic.dcoe.mil/online-education. An audio recording and edited transcript of the closed captioning will be posted to that link in approximately one week.

The next DCoE psychological health webinar topic, "Mild TBI in Co-occurring Psychological Health Disorders" is scheduled for March 27th, 2014, from 1:00 to 2:30 EDT. The next DCoE traumatic brain injury webinar topic, "Family Functioning and TBI," is scheduled from April 10th, 2014, from 1:00 to 2:30 p.m. EDT. Thank you for attending. Have a great day.

Thank you. And as this concludes our conference, we ask that all participants please disconnect your lines at this time.