Progressive Return to Activity Following Acute Concussion/Mild Traumatic Brain Injury: Guidance for the Primary Care Manager in Deployed and Non-deployed Settings

Introduction

More than 287,000 service members have sustained a traumatic brain injury (TBI) between 2000 and the third quarter of 2013.[1] The majority of these (83.3 percent), were classified as mild TBI (mTBI), also known as concussion.[1,2] The identification and treatment of mTBI is most beneficial during the acute injury phase and is reported to decrease disability.[3] Current literature including the widely accepted consensus guidelines and the "Veterans Affairs/ Department of Defense Clinical Practice Guideline for Management of Concussion/Mild Traumatic Brain Injury" recommends that patients with mTBI gradually return to normal activity as soon as safely possible using a progressive activity protocol.[3,4]

However, clear guidance on a progressive return to activity following mTBI after the mandatory recovery period is not well described. This clinical recommendation (CR), "Progressive Return to Activity Following Acute Concussion/mTBI: Guidance for the Primary Care Manager in Deployed and Non-deployed Settings" and clinical support tool (CST) offer guidance for Military Health System (MHS) primary care managers (PCM) and offer a standard approach following mTBI. A companion CR and CST "Progressive Return to Activity Following Acute Concussion/Mild TBI: Guidance for Rehabilitation Providers in Deployed and Non-deployed Settings" is also available at dvbic.dcoe.mil. These clinical recommendations for the progressive return to pre-injury activity promote standardization of care following mTBI in the Military and Veterans Health Systems. Each service may mandate service-specific requirements for activity following mTBI.

Background

The guidance contained in this CR represents a review of currently published literature and expert contributions obtained by the Defense Health Agency (DHA) in collaboration with clinical subject matter experts representing the services, VA, as well as academic, research and civilian sectors. The Traumatic Brain Injury Committee (TAC), an inter-agency, multi-service collaborative effort of TBI subject matter experts, which includes representatives from the Army, Navy, Marine Corps, Air Force, Defense and Veterans Brain Injury Center (DVBIC), National Intrepid Center of Excellence, U.S. Central Command, Readiness Division of the Defense Health Agency, the United States Coast Guard and the VA has reviewed this recommendation.

Current literature indicate that the diagnosis and evaluation of acute concussion involves the assessment of a range of clinical signs and symptoms in physical, cognitive, behavioral and emotion domains.[3,6,7,8] The progressive activity process is organized by stages, from Stage 1 – Rest through Stage 6 – Unrestricted Activity (Table 1, page 2).

Physical, cognitive and vestibular/balance areas are incorporated into the activities in each stage to determine the readiness of the individual to move from one stage to the next. Additionally, the stages describe guidelines for adequate rest and progressive activity.[9,10] The Neurobehavioral Symptom Inventory (NSI) is used as a subjective measure for symptom reporting.[11,12,13,14,15,16] The NSI is a 22-item symptom inventory of non-specific but common mTBI symptoms and is used in this clinical recommendation as a tracking and evaluation tool for post concussive symptoms.[13] The tracking is completed using a self-rating scale of 0-4 with 0 being described as "rarely or never present," 1 being described as "mild" and 4 being described as "very severe". A sample NSI and additional guidance such as parameters for exertional testing are included as part of the CST. The CST provides pocket cards for quick reference to the algorithms for progressive return to activity following acute concussion/mTBI. Most individuals recover from mTBI within hours to days following the injury.[4,17] It is important to send a service member back to pre-injury activity as quickly and safely as possible following mTBI. The service member's history of concussion, the provider's clinical expertise and judgment, as well as operational requirements, may supersede any recommendation for an individual.

Summary

The progressive return to activity process is based upon the service member's history of concussion in the past 12 months and symptom report. If this is the **first concussion in the past 12 months**, all guidance is contained in the algorithm (Figure 1.0) on the first page of the CST. The algorithm begins following concussion diagnosis and the review of the "What You Should Know About Concussions Educational Brochure" with the service member. If the service member is asymptomatic after the 24 hour mandatory recovery, exertional testing can be performed. However, if the service member is symptomatic after 24 hours or after exertional testing, then the PCM provides additional education using the "Return to Activity Educational Brochure" and the service member enters Stage 1 - Rest. If after the additional 24 hours in Stage 1 the service member is asymptomatic, exertional testing can be performed. The entire progressive return to activity process (Stages 1-6, see Table 1.0) is recommended for those concussed service members who remain symptomatic after this additional 24 hours in Stage 1 - Rest or those who become symptomatic after exertional testing. Accordingly, some service members who sustain their first concussion in 12 months will be able to move through exertional testing and return to pre-injury activity in 24 hours. Others will require an additional 24 hours to become asymptomatic before and after exertional testing. Still others will require the completion of Stages 1-6 of the progressive activity process.

A service member who sustains a **second concussion in the past 12 months** receives the same education using the "What You Should Know About Concussions Educational Brochure" and the mandatory 24 hour recovery period. On the next day, the PCM provides additional education using the "Return to Activity Educational Brochure" and the service member enters Stage 1 - Rest. See Sidebar A (Figure 2.0) on the second page of the CST. A service member must have seven consecutive days of symptom resolution at Stage 1 and Stage 2 before completing the remainder of the progressive return to activity stages.

Whether the first or second concussion in the past 12 months, exertional testing is recommended after Stage 5 and before returning to pre-injury activity. The PCM should refer the service member to a rehabilitation provider or higher level of care if they are symptomatic following exertional testing after Stage 5, if recovery is not progressing as anticipated, if there is no progression in seven days or if symptoms are worsening. Those service members who have three or more concussions in 12 months require referral to a higher level of care.

The service member should expect to see their PCM at least twice after a concussion. **Education is the single most effective intervention following acute mTBI showing the greatest decrease in the number and duration of symptoms**.[10] It is important that the provider review the educational brochure with the service member during their encounter. The progressive return to activity process is guided by the PCM. Throughout the progressive return to activity process, PCM symptom management and clinical judgment is recommended. A standardized approach to the progressive return to activity following acute mTBI is required to optimize recovery.[5,6,18]

Table 1

Stages of the Progressive Return to Activity Process

Stages	Description	Objective
1.	Rest	Symptom resolution
2.	Light Routine Activity	Introduce and promote limited effort
3.	Light Occupation-oriented Activity	Increase light activities that require a combined use of physical, cognitive and/or balance skills
4.	Moderate Activity	Increase the intensity and complexity of physical, cognitive and balance activities
5.	Intensive Activity	Introduce activity of duration and intensity that parallels the service member's typical role, function and tempo
6.	Unrestricted Activity	Return to pre-injury activities

Figure 1.0

Guidance for the Primary Care Manager in Deployed and Non-deployed Settings

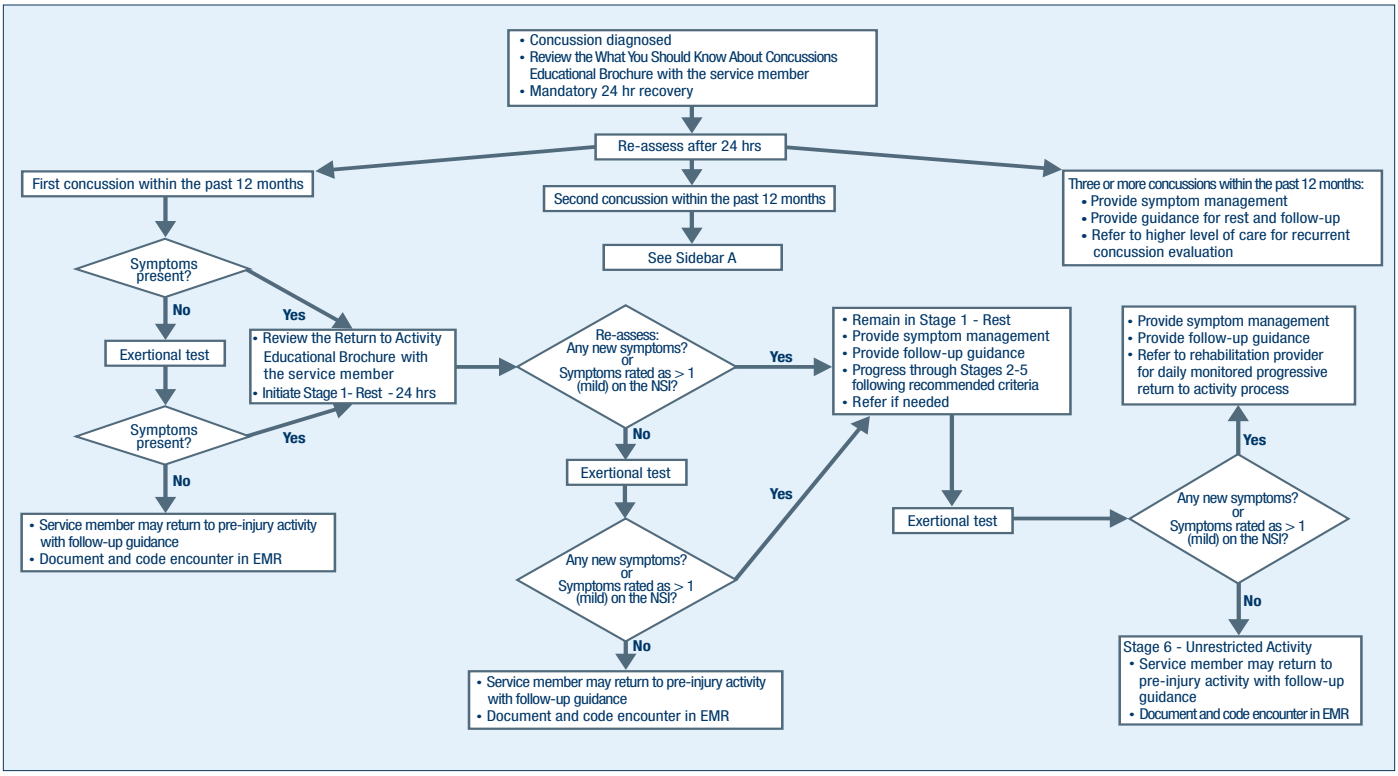
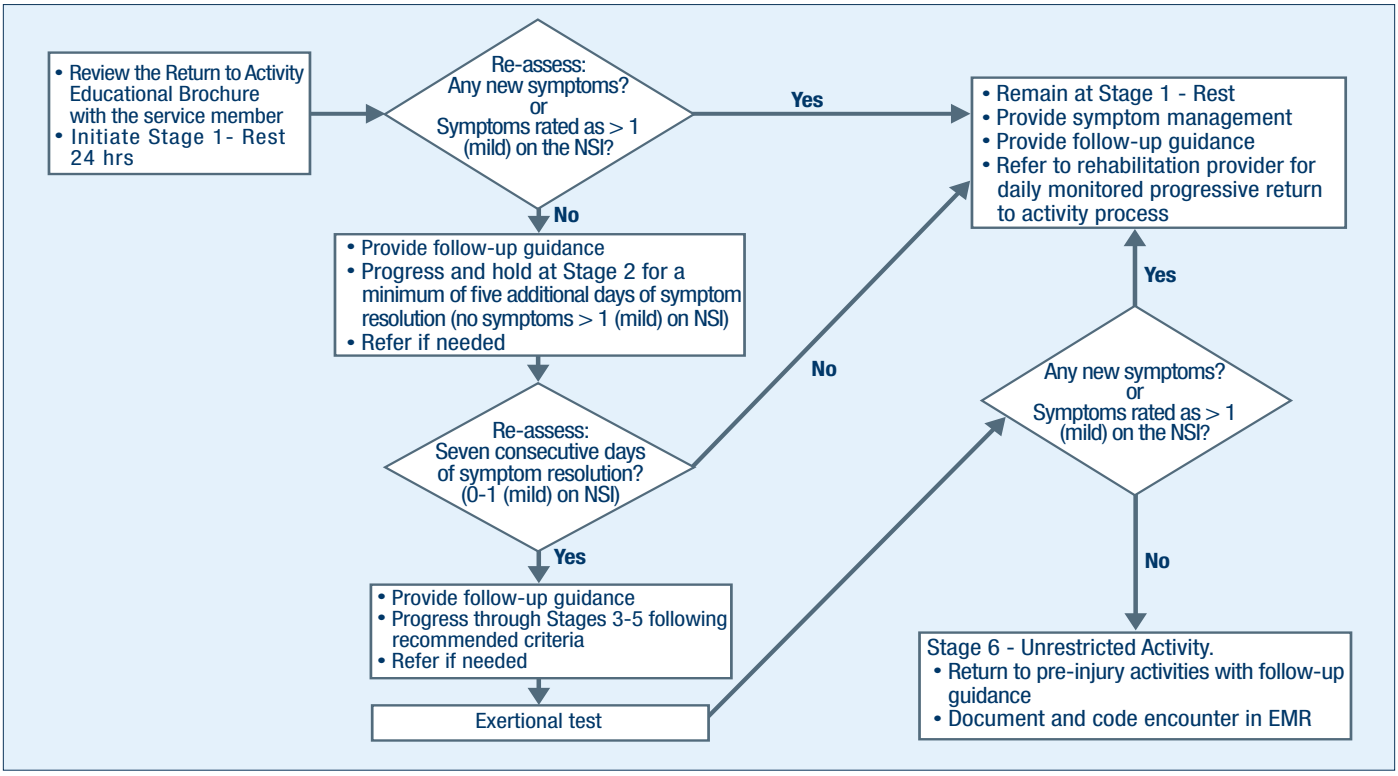


Figure 2.0

Sidebar A

Second concussion within the past 12 months



Recommendation

The process of progressive return to activity is divided into two algorithms according to the prior concussion history (Figure 1.0 and Figure 2.0). The algorithms are available for provider convenience as pocket-sized reference cards in the CST which is available at dvbic.dcoe.mil.

Initiation of Progressive Return to Activity Process

First Concussion

In accordance with DoDI 6490.11, after a concussion is diagnosed service members require a mandatory 24 hour recovery period.[5,6] Following the mandatory 24 hour recovery period, if symptoms are absent, exertional testing is performed. It is recommended that the service member enter into the progressive activity process if symptoms are reported upon completion of the mandatory recovery period or upon completion of the exertional test. The service member follows the parameters for stage 1 - Rest for 24 hours and returns to the PCM the following day for further guidance. If the service member becomes asymptomatic after 24 hours of defined rest in Stage 1, exertional testing may be completed. If the service member is asymptomatic (no symptoms reported greater than pre-injury levels or new symptoms greater than 1 (mild) on the NSI) after exertional testing, they are given follow up guidance and may return to pre-injury activity. If symptoms greater than 1 (mild) on the NSI are provoked by exertional testing, the service member should continue with the remaining stages of progressive activity. In summary, exertional testing may be conducted 24-48 hours post-concussion if the service member is asymptomatic. The service member should remain at Stage 1 for another day before completing the entire progressive return to activity process (Stages 1-6, see Table 1.0) if they have any new symptoms or symptoms greater than 1 (mild) on the NSI after a day at Stage 1.

Second or Third Concussion

If the current concussion is the second concussion within 12 months, the mandatory 24 hour recovery period is followed by additional days at Stage 1 or Stage 2 for a total of seven consecutive days of symptom resolution before finishing the remaining progressive activity stages.[5,6] If the current concussion is the third concussion in a 12-month period a recurrent concussion evaluation by a higher level of care is required.[5,6]

Service Member Educational Intervention

Early intervention, including written information, significantly impacts patient outcomes following mTBI.[10] The "What You Should Know About Concussions Educational Brochure" is the initial patient education source and should be given to and reviewed with all service members at the time that they are diagnosed with a concussion. The PCM should provide the critical educational intervention using this brochure during the initial 24 hour mandatory recovery period to establish the expectation for recovery. If the patient remains symptomatic after 24 hours, is symptomatic after exertional testing, or if this is the second concussion within the past 12 months, the PCM should review the "Return to Activity Educational Brochure." The "Return to Activity Educational Brochure" gives the service member instruction for the allowable level of activity for each stage, the criteria for progression, and when to return to the PCM. The expectation for recovery through a staged progressive activity process should be explained. Patient education following mTBI should include prohibition of alcohol and avoidance of caffeine and nicotine. Use of these substances may increase or mask symptoms, delay recovery as well as affect blood pressure (BP) and heart rate (HR).4,19,20,21 Service members should be educated on the daily progression of activity as well as what symptoms to expect and when to seek medical care. The "What You Should Know About Concussions Educational Brochure" and the "Return to Activity Educational Brochure" are available at dvbic.dcoe.mil.

Symptoms and Objective Measures

Post-mTBI recovery varies based on an individual's physiologic response.[10] Symptoms are often a manifestation of altered physiology and are utilized within this CR to guide the provider and patient through the stepwise progression of activity.[10] Symptoms such as fatigue or headache are rarely completely absent, especially following exertion even in the non-concussed individual.[22] Symptom tracking is implemented by use of a symptom checklist, the NSI, to establish an individual's ability to progress and their activity tolerance.[3,10] The patient should complete the NSI daily each morning. [3,23,24] The NSI is used to track post-concussive symptoms and not as a diagnostic measure.[12] The NSI is located on the "Return to Activity Educational Brochure" for service member reference.[13] The physiological changes used to evaluate activity tolerance are resting HR and resting BP. These objective measures may be influenced by pre-existing or undiagnosed conditions. Prescribed or over-the-counter medications may also affect these physiological parameters. Providers may also consider a resting HR no greater than 100 beats per minute and a resting BP not to exceed 140/90 mm Hg as parameters of progression.[25] The objective measures of resting BP and resting HR are recommended as baseline during the initial evaluation for comparison if the patient returns with an increase in number or severity of symptoms. The initial structured, well-defined Stage 1 — Rest is imperative to both physical and cognitive recovery as well as for symptom management.[9] During the first two stages of progressive activity, service members are not to participate in activities that cause tachycardia described as "activities that make your heart race" on the "Return to Activity Educational Brochure." When headache, sleep difficulties or vestibular or balance difficulties are present, providers are advised to utilize educational resources for both provider and patient available at dvbic.dcoe.mil.

Progression through Activity

The following conditions apply at all stages and should be met for the service member to progress:

1. Each stage lasts a minimum of 24 hours and specifies the activities permitted.
2. The NSI is completed daily in the morning.
3. During the progression, the service member may move on to the next stage only if symptoms are reported as not greater than mild (1) and there are no new symptoms on the NSI.
4. If the service member reports an increase in the number or severity of symptoms during or after an activity, the current activity must be stopped and the service member advised to rest for the remainder of the day.
    a. If the daily morning NSI reveals no new symptoms and all symptoms are not greater than mild (1), the service member completes the stage from the day before. If the service member reports new symptoms or reports symptoms greater than mild (1), the service member remains at the previously tolerated completed stage and contacts their PCM for follow up.
    b. It is recommended that the service member be re-evaluated by the PCM prior to resuming the activity progression. The service member may stay at the previously tolerated stage for another day or be referred to a rehabilitation provider.
5. It is recommended that all service members see the PCM after Stage 5 for exertional testing and before release to Stage 6 – Unrestricted Activity.

Example: The service member has progressed to Stage 3 of activity and has an increase in number or severity of symptoms; they should stop the activity and rest the remainder of the day. If on the following day the increase in number or severity of symptoms remains, they are recommended to follow up with PCM for an evaluation. If upon evaluation the PCM notes increased HR, increased BP or increased symptom number or severity, it is recommended that the individual return to Stage 2 for another day or be referred to a rehabilitation provider.

Referral to Rehabilitation Provider or Higher Level of Care

Referral of the service member to a rehabilitation provider or higher level care is recommended per PCM judgment or if recovery is not progressing as anticipated, no progression is made in seven days, symptoms are worsening or if symptomatic following exertional testing after Stage 5.

Stages

Stage 1: Rest

Stage 1 provides guidance following the 24-hour mandatory recovery period. During this stage extremely light physical, cognitive and vestibular-balance activity is permitted with the goal of symptom resolution. The focus is primarily on rest with basic activities of daily living, as tolerated. A quiet environment with low lighting is recommended. The optional use of sunglasses is further recommended if the service member complains of sensitivity to light. Cognitive activity should be limited and a normal sleep routine is encouraged with naps as needed. For patient guidance, see "Healthy Sleep" fact sheet available at dvbic.dcoe.mil. To limit vestibular/balance symptoms, the PCM should advise the service member to move his/her head and body slowly and through a limited range of motion. Limited bending with head below the heart and sitting while dressing or putting on shoes are recommended. Additionally, PCMs are recommended to advise the service member not to work, exercise, play video games, study or drive.[26]

Stage 2: Light Routine Activity

The goal of Stage 2 is to introduce and promote limited effort. Physical exercises in this stage include light activity, such as stretching, walking on level surfaces and stationary cycling at a conversational pace with low resistance. Cognitive activities such as computer use, leisure reading, and simple board games are introduced. Vestibular and balance activities such as climbing stairs, putting on boots, and bending tasks are recommended. Both physical and cognitive activity should be limited to 30 minutes or less and followed by four hours of rest. It is recommended that the service member avoid crowded environments.[3] The PCM is recommended to advise the service member to not engage in sit-ups, pull-ups or push-ups, playing video games, repetitive lifting, resistance training, driving, combatives or contact and collision sports.

Stage 3: Light Occupation-oriented Activity

The goal of Stage 3 is to increase light activities that require a combined use of physical, cognitive or vestibular/balance skills that are occupation specific. Recommended physical activities include lifting and carrying objects less than 20 pounds, use of elliptical or stair climbing machines and light military tasks such as cleaning equipment. Occupation-oriented cognitive activities may include performing a maintenance check on a vehicle, following simple instructions to complete a task such as shopping for one item. Vestibular/balance activities in Stage 3 are walking on uneven terrain, swimming (avoiding flip turns) or standing on one foot. Additional examples of exercises and activities can be found in the "Return to Activity Educational Brochure" and on the companion CR "Progressive Return to Activity Following Acute Concussion/mTBI: Guidance for the Rehabilitation Provider in the Deployed and Non-Deployed Settings" (all products are available at dvbic.dcoe.mil). The physical activity intervals in Stage 3 are for a maximum of 60 minutes followed by four hours of rest. Rest must follow the activity to allow for adequate recovery time.[27,28] Cognitive activity periods are limited to 30 minutes of recommended activity followed by a minimum of 60 minutes of rest. The PCM should advise the service member to avoid video games, driving, combatives and contact or collision sports.

Stage 4: Moderate Activity

The goal of Stage 4 is to increase the intensity and complexity of physical, cognitive and balance activities. Physical activity examples include hiking, jogging to running as tolerated, light resistance training and non-contact sports. Cognitive activities recommended in this stage include video games, land navigation, driving simulator, weapons simulator and target practice. Vestibular balance activities can include foosball, golf putting, jump rope and swimming with flip turns. Supplementary examples of these exercises and activities can be found on the "Return to Activity Educational Brochure" and on the rehabilitation providers CST. Physical activity is limited to 90 minute intervals followed by a minimum six hours of rest. Cognitive activity in this stage is recommended for a minimum of 20 minutes but not to exceed 40 minutes. Additionally, the service member should maintain a 1:2 cognitive activity to rest interval ratio. For example, 30 minutes of cognitive activity is followed by 60 minutes of rest. The PCM should advise the service member not to drive, participate in combatives, contact or collision activities.

Stage 5: Intensive Activity

The goal of this stage is to increase the duration and intensity of activity to parallel the service member's typical role, function and tempo. Stage 5 prepares the service member for duty by testing physical, cognitive and vestibular/ balance skills at full exertion. Resistance training is maximized in this stage. Cognitive activity should be sustained for a maximum of 50 minutes and include an environment of exertion and/or distraction. Driving is included in this stage as appropriate. Vestibular/balance activities may now include navigating uneven terrain, jump landings and simulations that include virtual reality to establish vestibular/balance symptom resolution. The PCM should advise the service member not to participate in combatives, contact or collision activities.

Stage 6: Unrestricted Activity

Stage 6 — Unrestricted Activity — can be initiated the day after Stage 5 providing all criteria of progression are met. Specifically, if the service member has no new symptoms and no NSI symptoms rated greater than 1 (mild) the morning after Stage 5, they should report to the PCM for exertional testing. If there are no new symptoms and no symptoms rated as greater than 1 (mild) during and after exertional testing, then the service member is progressed to Stage 6. The service member should be advised to return to provider if symptoms return or increase in number or severity.

Conclusion

This recommendation is consistent with current policies and medical literature. The recommended standardized approach for progressive activity following mTBI is intended to serve as a guide for PCMs and service members as they work together for recovery to safely rest, remediate residual post-concussive symptoms and return to pre-injury activity. All products are available at dvbic.dcoe.mil.

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