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Neuropsychological Sequale of Mild Traumatic Brain Injury

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Abstract: Studies have proven that mild traumatic brain injuries (MTBI), commonly known as concussions, can result in cognitive and functional impairment. This impairment is often a result of misdiagnosing and/or the unavailability of resources to properly evaluate a mild traumatic brain injury. In clinical and hospital settings nurses are often faced with patients who have incurred a MTBI; however, they may not be aware of the evaluation tools available to them in order to accurately assess their patient. The first part of this paper will review the criteria that define a MTBI, signs and symptoms associated with a MTBI, and symptoms that patients can experience following this injury. The second part of this article will present, compare, and contrast various tools used to assess and diagnose patients. The goal of this paper is to provide nurses with the necessary tools and knowledge that is required to properly assess, treat, and teach a patient who has sustained a MTBI.

Introduction

The Center for Disease Control and Prevention recently described traumatic brain injury as a silent epidemic in the United States. Of those total injuries, mild traumatic brain injuries (MTBI) account for seventy-five percent (National Center for Injury Prevention and Control, 2003). MTBI is a significant neurological health problem in the U.S. with an estimated 300,000 new cases reported each year (Duff, Proctor, &Haley, 2002). The reason behind this silent epidemic is that symptoms of MTBI are often minor or undetectable. In turn, patients sustaining a MTBI do not report their injury or can be misdiagnosed by health care personnel not familiar with MTBI (Mateo, 2003). An additional compounding cause of misdiagnosed MTBI cases is that patients are seen hours, days, or weeks post-injury; therefore, missing a critical diagnostic time period (Ruff, 2005). A majority of MTBI cases are seen in Emergency Room departments or outpatient health clinics where there is no standardized assessment or surveillance system in place to "determine the prevalence of individuals with MTBI-related functional and cognitive impairments" (National Center for Injury Prevention and Control, 2003). There is a considerable need for standardized assessment tools available to health care personnel, in particular nurses that are evaluating these individuals. The purpose of this paper is to provide appropriate tools to aid nurses in the proper assessment, treatment, and teaching involved with patients sustaining a MTBI.

Mild Traumatic Brain Injury

Criteria

Several definitions of Mild Traumatic Brain injury exist throughout literature with a varying degree of emphasis placed on particular diagnostic symptoms. The majority of articles reviewed for this paper placed importance on loss of consciousness, post-traumatic amnesia, and Glasgow Coma Scale scores (Duff, Proctor, & Haley, 2002; Mateo, 2003; Ruff, 2005). For this paper the WHO definition of MTBI will be followed. As defined by the WHO task force, a mild traumatic brain injury is an acute brain injury resulting from mechanical energy to the head from external physical forces (Holm, Cassidy, Carroll, & Borg, 2005). Criteria to classify a MTBI would include the following:

- Confusion or disorientation, loss of consciousness for 30 minutes or less
- Post-traumatic amnesia (PTA) for less than 24 hours or transient neurological abnormalities such as focal signs, seizure, and intracranial lesion not requiring surgery
- Glasgow Coma Scale (GCS) score of 13-15 after 30 minutes post-injury or upon presentation to health care setting

Contraindications to these criteria would be psychological disorders, alcohol and/or drug impairment, or pre-existing medical conditions (Holm, Cassidy, Carroll, & Borg, 2005). Several studies have also utilized neuro-imaging, such as computed tomography (CT) and magnetic resonance imaging (MRI), for additional diagnostic criteria (Holm, Cassidy, Carroll, & Borg, 2005; Kell, Hiltbrunner, Dill, & Kesselring, 2000; Mateo, Glod, Hennen, Price & Merrill, 2005; Rees, 2005; Stalnacke, Bjornstig, Karlsson, & Sojka, 2005).

Signs and Symptoms

As a silent epidemic in the United States the signs and symptoms of MTBI can often be missed. Depending on when a patient seeks medical care symptoms can diminish over time. For example, the McCrae et al. (2003) study was limited due to athletes not verbalizing symptoms and health care personnel that were not able to conduct an evaluation immediately post-injury. Symptoms can be mistaken for other environmental factors as well; such as, stress, work, and/or family. The signs and symptoms can be placed into physical and cognitive categories. Physical symptoms can include:

- headaches
- nausea
- dizziness
- fatigue
- irritability, and
- sleep disturbance.

Cognitive symptoms can include:

- affective lability
- attention disturbances
- impaired memory and planning functions
- information processing deficits, and
- psychiatric disorders

(Keller, Hiltbrunner, Dill, & Kesselring; Mateo, 2003; Rose, 2005).

The recognition of these symptoms is imperative for nurses working in areas such as emergency rooms and outpatient clinics. The need to recognize and correlate the symptoms with a mild traumatic brain injury can help with the identification and early treatment of such an injury. Nurses are often times the first health care personnel to interact with patients and even a basic understanding of the symptoms associated with MTBI can help a nurse in planning interventions aimed at preventing further problems.

Post-injury Difficulties
A majority of patients recover and resume normal daily activities of living within weeks after MTBI. However, in some cases it has been seen that patients have suffered from neuropsychological deficits, emotional disturbances, and long-term cognitive impairment (Keller, Hiltbrunner, Dill, & Kesselring, 2000; Mateo, Glod, Hennen, Price, & Merrill, 2005). Persistent headaches, dizziness, and visual disturbances have been reported by persons sustaining MTBI. Along with physical impairments, MTBI has been linked to depression, anxiety, and problems with learning new tasks (Keller, Hiltbrunner, Dill, & Kesselring, 2000; Kraus et al, 2005; Tiersky et al., 2005; Walker, 2002). Patients have also complained of difficulties with returning to work and maintaining activities of daily living (Stalnacke, Bjornstig, Karlsson, Sojka, 2005; Walker, 2002). Mateo, Glod, Hennen, Price, and Merrill (2005) compared psychiatric inpatients with and without MTBI to the length of hospital stay (LOS) and the number of psychiatric admissions. It was noted that there was a significant increase in both the LOS and number of admissions with psychiatric inpatients with a history of MTBI compared to inpatients without a history of MTBI.

MTBI can cause considerable problems and disabilities if it not properly treated. Early detection, education, and proper management have been effective in reducing symptoms (Kraus et al., 2005, Tiersky et al., 2005). The difficulties and problems linked to MTBI can be devastating to a person. The lack of a standardized assessment tool between hospitals and outpatient clinics has left patients without knowledge or resources that can aid them during the recovery stage. Nurses need to be aware of the criteria that defines MTBI, the signs and symptoms, and evaluation tools in order to help those patients who may experience significant chronic disabilities. The subsequent sections will present, compare, and contrast the tools that are currently available to nurses and health care personnel that may encounter MTBI.

Evaluation Tools

This study will focus on three main tools that can be used to effectively assess a person that has sustained or is suspected to have sustained a mild traumatic brain injury. The first two tools are the Glasgow Coma Scale (GCS) and the Standardized Assessment of Concussion Scale (SAC). The third tool is used post-injury to assess self-awareness and adaptation (Mateo, 2003). All of these scales can be very useful in determining the extent of injury from a MTBI. They provide easy and safe assessments that nurses can use in any setting, whether it be in a hospital or outpatient clinic.

Glasgow Coma Scale
When first developed the Glasgow Coma Scale (GCS) was originally intended to classify severe brain injuries; however, the scale did classify injuries that fell within a specific range as “minor head injuries” (Ruff, 2005). Due to the scale’s convenience and simple evaluation method it is the most widely used and recognized scaling system that is used to diagnose mild traumatic brain injury **(cited in** Mateo, 2003). Currently, the GCS is included in the diagnostic criteria for MTBI set by the WHO task force in 2003. The simplicity of GCS lies within the 15 point scoring system. There are three sections: eye opening response, verbal response, and motor response. Various points are allotted according to a patient’s response in each section. The scores are

conversely related; a higher score represents a higher response, whereas, a lower score represents a lower response. A patient is then placed into either a severe, moderate, or mild category or brain injury. A score of 3-8 with a loss of consciousness (LOC) greater than 8 hours is classified as severe. A score of 9-12 with a LOC of up to 6 hours is classified as moderate. A score of 13-15 with 0 to 15 minutes LOC is considered mild (Mateo, 2003). A model of the scale can be found in Table 1.

Table 1.

Eye Opening Response	Points	**Verbal Response**	Points	**Motor Response**	Points
Spontaneous, opens with blinking at baseline	*4*	Oriented	*5*	Obeys commands for movement	*6*
To verbal stimuli, command, and speech	*3*	Confused conversation, but able to answer questions	*4*	Purposeful movement to painful stimulus	*5*
To pain only (not applied to face)	*2*	Inappropriate words	*3*	Withdraws in response to pain	*4*
No response	*1*	Incomprehensible speech	*2*	Flexion in response to pain (decorticate posturing)	*3*
		No response	*1*	Extension in response to pain (decerebrate posturing)	*2*
				No response	*1*
				Total Points	
Information obtained from www.cdc.gov					

Standardized Assessment of Concussion Scale

The Standardized Assessment of Concussion Scale (SAC) was developed for use during sporting event or recreational activities. It can be used by medical and non-medical personnel as an effective tool in assessing MTBI. The SAC measures scores regarding cognitive functions (e.g. orientation, memory, and concentration), neurological screening (e.g. sensation and motor response), and if “pre- or posttraumatic amnesia” is present (Mateo, 2003). McCrae et al. (1998) studied the effectiveness of the SAC for athletes experiencing a concussion and found that there was a significant reduction in scores of players sustaining concussions compared to players without concussions.

Community Integration Questionnaire

The Community Integration Questionnaire (CIQ) was developed "to provide a measurement of community integration after traumatic brain injury." This scale can be conducted in-person or through a telephone interview. The CIQ is aimed at how a person performs daily activities of living, such as household chores and social events. There are three sections of the CIQ: home integration, social integration, and productivity. Examples of each section can be found in Table 2, respectively. The CIQ is scored out of a total of 29 points and similar to the Glasgow Coma Scale scoring, the higher the score the higher the integration.

Table 2.

Home Integration *Who usually does shopping for groceries or other necessities in your household?* • Yourself alone *(2 points)* • Yourself and someone else *(1 point)* • Someone Else *(0 points)*
Social Integration *Who usually looks after your personal finances, such as banking or paying bills?* • Yourself alone *(2 points)* • Yourself and someone else *(1 point)* • Someone else *(0 points)*
Productivity** *How often do you travel outside of the home?* • Almost every day *(2 points)* • Almost every week *(1 point)* • Seldom/never, less than once a week *(0 points)*

Information obtained from www.tbims.org/combi

**Productivity scores also involve a Job-school variable that influences the score

Comparison and Contrast of Tools

The three tools presented each have specific areas that they look for when dealing with MTBI. Nonetheless, all of the tools are aimed at aiding in the assessment and evaluation of persons with mild traumatic brain injuries. The Glasgow Coma Scale is widely recognized, used, and easily accessible. Yet, the GCS has been criticized because it "cannot be administered retrospectively" (Ruff, 2005). Many nurses do not see a person immediately after an injury and could have a hard time obtaining accurate scores with this scale. The Standardized Assessment of Concussion Scale (SAC) can be highly useful in outpatient settings and sporting events where access to emergency care may not be within close distance. The CIQ can be very helpful to nurses working in outpatient clinics providing follow-up calls. The ability to conduct an interview over the phone can allow a nurse to quickly assess any changes and/or prevent further complications of MTBI in their patients. However, due to "certain shortcomings of the CIQ, a research project

is ongoing to develop a new version, designated CIQ-2" (http://tbims.org/combi/ciq/index.html). Before using this scale it is important to check for any new versions. It is also suggested to obtain a small amount of training before implementing the scale in a health care setting.

Conclusion

Mild traumatic brain injuries are a significant health problem in the United States, approximately 75 percent of brain injuries are considered mild traumatic brain injuries. An estimated 300,000 new cases are recorded each year as well. The misdiagnosing, mistreatment, and mismanagement can have adverse neurological, cognitive, and functional effects on persons. In addition, it is estimated that $17 billion a year is spent treating MTBI (National Center for Injury Prevention and Control, 2003). There needs to be a multi-disciplinary approach to the diagnosis, treatment, and management of these persons sustaining MTBI and nurses have the power to influence this cause.

Nurses are often on the front-lines of communication, prevention, and assessment in hospitals and outpatient settings. It is crucial that nurses understand this "silent epidemic" that is occurring across the United States in order to aid in decreasing the incidence and prevalence of this injury.

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