Implementation of the Agitated Behavior Scale in the Electronic Health Record

By

Helen John Wilson

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Abstract

Background: Traumatic brain injury (TBI) is a major cause of morbidity and mortality worldwide and can result in various consequences including behavioral disturbances such as agitation. The occurrence of agitation during the recovery of brain injury can interfere with the achievement of rehabilitation goals. It is thus important to identify agitation early with a valid assessment tool and provide timely interventions to reduce it.

Purpose: The purpose of this study was to implement an Agitated Behavior Scale (ABS) through an electronic health record and to evaluate the usability of the ABS in a traumatic brain injury unit at a rehabilitation hospital in the Mid-Atlantic region of the United States.

Methods: A quality improvement project was conducted in the brain injury rehabilitation unit in three phases that included an in-service education, implementation of the ABS in electronic health record and administration of survey questionnaire. It consisted of 755 electronic ABS chart reviews and a sample of 23 registered nurses of the brain injury unit.

Results: Results showed that there was good compliance in the use of the ABS in the electronic health record and in the implementation of interventions for agitation among the TBI patients. The survey questionnaire findings confirmed that the electronic ABS was found to be utilizable and practical.

Conclusion: Utilization of the ABS through the electronic health record on a daily basis will allow for an early identification of agitation in TBI inpatients in the hospital and enable prompt interventions to manage agitation thus promoting positive outcomes for the patient

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Capstone Committee Chair:

Dr. Kathleen Michael, PhD, CRRN

Capstone Committee Members:

Dr. Kritis Dasgupta, MD, MBA

Dr. Elizabeth Galik, PhD, CRNP

Dr. Regina Donovan Twigg, DNP, RN

Faculty members:

Dr. Kathleen Buckley, PhD, IBCLC, RN

Dr. Lynn Chen, PhD

Table of Contents

Abstract 2

Acknowledgements 3

Chapter

I Overview

Background and Significance of the Problem 5

Problem Statement 6

Purpose and Significance of the Project 7

Theoretical Framework 8

II Review of Literature

Traumatic Brain Injury 10

Agitation after Traumatic Brain Injury 11

Assessment of Agitation 14

Agitated Behavior Scale 14

Use of Electronic Health Records for Clinical Documentation 20

III Methodology

Design, Sample and Setting 24

Procedures and Measures 25

Human Subjects Protection and Approval Process 28

IV Results

Data Collection 29

Data Analysis 30

Results 31

V Discussion 33

References 38

Tables & Figures 44

Appendices

Appendix A 49

Appendix B 51

Appendix C 55

Appendix D 57

Implementation of the Agitated Behavior Scale in the Electronic Health Record

Overview

Background and Significance of the Problem

Traumatic brain injury (TBI) is a major cause of morbidity and mortality worldwide and is a serious problem in the United States. It has been estimated that around 10 million TBI's occur worldwide resulting in hospitalization, disability or death (Whitfield, Thomas, Summers, Whyte, & Hutchinson, 2009). In the United States of America, an average of 1.7 million TBI's occur each year with 52,000 deaths and 275,000 hospitalizations (CDC, 2012). TBI can be a cause of disability and 3.1 million people live with lifelong disability after TBI and need rehabilitation (Brain Injury Association of America, 2012).

Kim (2002) maintains that traumatic brain injuries are most often complicated by changes in personality, cognition, and impulse control that may lead to behavioral disturbances. The neurobehavioral consequences of brain injury include irritability, nervousness, disinhibition, poor impulse control and agitation (Levy et al., 2005). Although there are many behavioral consequences of TBI, agitation and aggression are common and can hinder the recovery of patients (Nott, Chapparo & Baguley, 2006).

During the recovery phase of brain injury, up to 70% of patients exhibit agitation (Nott et al., 2006). Agitation can be defined as, "a state of aggression during posttraumatic amnesia in the absence of other physical, medical, or psychiatric causes" (Lombard & Zafonte, 2005. p.798). Aggressive behavior, manifested as physical violence and/or verbal anger that threaten harm to one's self or to others, also falls within the continuum of agitation after brain injury (Eisenburg, Im, Swift & Flanagan, 2009). The other characteristics of agitation include a variety of inappropriate behavior including repetitive acts, behaviors that deviate from social norms and

aggressive behaviors that are directed toward oneself or others (Cohen-Mansfield, Libin & Marx, 2007).

It is thought that cognitive impairments are partially responsible for agitation (Eisenburg et al., 2009). In patients with a traumatic brain injury and a damaged hippocampus, recall and recognition are impaired (Manns, Hopkins, Reed, Kitchener, & Squire, 2003). Therefore they may not remember their health care providers and the environment they are in, and feel alienated from them, which may jointly increase agitation (Park, 2010).

The occurrence of agitation during the recovery of brain injury and rehabilitation may not only place the patient at risk for harm but can also interfere with the achievement of rehabilitation goals and outcomes (Bogner, Corrigan, Fugate, Mysiw, & Clinchot, 2001). Patients with agitation may also resist direct care, be disruptive on the unit, or even pose a physical risk to themselves, family, or staff (Lombard & Zafonte, 2005). Lequerica et al. (2007) found that agitation following brain injury limits engagement in rehabilitation therapies and in turn, diminishes clinical outcomes. Bogner et al. (2001) were able to demonstrate that the presence of agitation is predictive of a longer length of hospital stay. It is thus important to accurately identify the signs and level of agitation and provide timely interventions to reduce it.

According to Amato, Resan and Mion (2012), a standardized assessment tool is necessary to provide an objective measurement of the type and severity of the agitated behavior. This would help in guiding the implementation, as well as evaluating the effectiveness of various intervention strategies to decrease agitation.

Statement of the Problem

The nurses need to have a way to accurately identify and assess agitation in their patients, so that they can choose appropriate interventions and evaluate the effectiveness of those

interventions. Although an assessment tool has been found to be helpful in identifying agitation early and intervening appropriately, not all rehabilitation units are using one consistently. The current practice in my setting is that there is no objective assessment tool available to evaluate agitation on a routine basis. Including an assessment tool as part of an electronic medical record can greatly facilitate its consistent and serial measurements of agitation.

The Agitated Behavior Scale (ABS) is found to be a reliable and valid assessment tool, used for patients with TBI to determine the nature and level of agitation during the recovery phase of acquired brain injury (Lombard & Zafonte, 2005). There are various studies in which the investigators have utilized the ABS scale to study the level and pattern of agitation. Using the ABS in my setting as part of a routine assessment will enable early identification of agitation and help the nurse to intervene appropriately according to the level of agitation. This will facilitate participation in rehabilitation therapies and improve patient outcomes.

Purpose of the Capstone Project

The purpose of this capstone project is to implement the Agitated Behavior Scale (ABS) through an electronic health record and to evaluate the usability of the ABS in a traumatic brain injury unit at a rehabilitation hospital.

Significance of the Capstone Project and Anticipated outcomes

This capstone project addresses the need for an objective assessment of agitation in TBI patients and outlines the author's plan to implement the ABS to evaluate agitation in TBI patients. The ABS will be implemented in the electronic health record that is used for documentation in the rehabilitation setting. According to Gurley (2004), the electronic health record (EHR) provides the opportunity for healthcare organizations to improve the quality of care and patient safety. Young (2000) discusses that the EHR is accessible from different sites to

many people at the same time and retrieval of the information is almost immediate. The record is constantly updated and is available concurrently for use everywhere. Information can be immediately accessible at any unit workstation whenever it is needed (Gurley, 2004).

During the implementation of the project, the ABS documentation that indicates the presence or absence of agitation in a patient will be entered into the electronic health record and can be retrieved by the members of the rehabilitation team at any time. This makes it possible for the health care provider to plan their therapy or intervention accordingly.

This capstone project thus will facilitate the use of the ABS in early identification of agitation in traumatic brain injury inpatients in a rehabilitation hospital and will enable prompt interventions to manage agitation, prevent escalation of agitation, and thus improve participation and engagement of TBI patients in rehabilitation therapies.

Theoretical Framework

Lewin's change theory will serve as the framework for the capstone project (Figure 1). Lewin's theory has been dynamically used in nursing practice to implement a change (Lee, 2006). Lewin theorized a three-stage model of change that is known as the "unfreezing-change-refreeze model" to bring about a planned change (Schein, 1996).

The unfreezing stage of Lewin's theory is about getting to a point of understanding that change is necessary and determining the steps necessary to make the change. It is finding a problem that needs to be solved and determining what resistance there is, and to create a change that will resolve the problem. It involves creating initial motivation to change by convincing people that current state is undesirable (Ritchie, 2006).

The second stage involves a process of change in feeling, behavior, thought, or all three that is more productive in some way. It is developing new values and behaviors through process

changes or organizational structure changes and developmental techniques. Resources are gathered and the plan is made for the new behaviors to be adopted (Ritchie, 2006).

The refreezing stage involves establishing the change so that it becomes the standard. Refreezing seeks to stabilize the group in order to ensure that the new behaviors are relatively safe from regression. New behavior is to be reinforced through proper communication structures and an evaluation is made to ensure if it has been accepted by the staff (Schein, 1996).

As identified in the statement of the problem, the registered nurses in the setting are not using a valid and reliable assessment tool to measure agitation in traumatic brain injury patients. Amato et al. (2012) recommends the use of ABS on a daily basis to evaluate agitation in TBI patients. Nott et al. (2010) concluded that the reporting of daily ABS scores on a shift-by-shift basis was very helpful in identifying individual behavioral inconsistencies in the brain injured patient.

It is thus recognized that change among the nursing staff is necessary to meet best practices. Evidence appraisal and review will be the basis for the recommendations that are formulated for this practice change. This change process of introducing an assessment tool for early identification of agitation would be discussed with the stakeholders. After the approval from the regulatory bodies, the ABS would be introduced into the electronic health record. This process of the practice change will include the staff being educated on the importance of assessment of agitation and on the use of ABS in the electronic health record to evaluate agitation in TBI patients. Thereafter, the nurses would use the validated ABS scale to document their assessment findings of agitation in traumatic brain injury patients. The usability of the ABS in the electronic health record would then be evaluated by a reliable and validated survey questionnaire.

Review of Literature

The literature review sets the background for a capstone project in which the investigator will evaluate the use of the ABS assessment scale for agitation among TBI patients on a rehabilitation unit. It begins with a discussion of the definition, causes, and effects of Traumatic Brain Injury (TBI). This is followed by a description of agitation in traumatic brain injury patients, including the antecedents and consequences of that agitation. This literature review ends with an analysis of descriptive and non-experimental studies on the assessment of agitation, the use of the Agitated Behavior Scale to evaluate agitation and the utilization of electronic health record in clinical documentation.

Traumatic Brain Injury (TBI)

Definition and causes.

Traumatic brain injury is "considered an insult or trauma to the brain from an external mechanical force, possibly leading to temporary or permanent impairments of physical, cognitive and psychosocial functions with an associated diminished or altered state of consciousness" (Whitfield et al., 2009. p.1). TBI is a contributing factor to a third (30.5%) of all injury-related deaths in the United States (Centers for Disease Control and Prevention, 2010). According to the Centers for Disease Control and Prevention (2010), direct medical costs and indirect costs of TBI such as lost productivity totaled an estimated $60 billion in 2000.

The primary injury is typically from blunt force (i.e., motor vehicle crashes or falls) or from a penetrating wound, (i.e., gunshot or knife wounds) (Roth & Farls, 2000). Falls are the leading cause of TBI and motor vehicle–traffic injury is the leading cause of TBI-related death (CDC, 2010). Other causes of TBI are falls, violence, firearm-related accidents, and sports-related activities (Duff & Wells, 1997). Traumatic brain injury does not include ischemic

damage, such as damage from a stroke, or non-mechanical brain damage caused by brain tumors or seizures.

Effect of TBI analyzed by age and by sex.

Traumatic brain injury (TBI) is a leading cause of death and disability among children and young adults in the United States (CDC, 2009). The CDC reported in 2012 that in "every age group, TBI rates are higher for males than for females" (CDC, 2012, para. 5). In elderly patients, TBI is more likely to involve cognitive complications, such as depression, apathy, and dementia (Ikonomovic et al., 2004). The occurrence of major head injury increases the risk of cognitive decline among older adults; in addition, cognitive decline resulting from prior causes is increased by head injury (Luukinen, Viramo, Koski, Laippala, & Kivela, 1999).

Agitation after Traumatic Brain Injury

Agitation is frequently found during recovery from severe brain injury. Brain-injured patients with severe injuries have been shown to have a higher percentage of agitation (30%) compared to 19% in mildly brain-injured patients (Angelino, Miglioretti, & Zotti, 2002). According to Sandel & Mysiw (1996), one third of TBI patients exhibit agitation in the subacute stage of rehabilitation.

Agitation may include inappropriate vocalizing, intolerance of medical management or equipment, and directed or diffuse aggressive behaviors (Lombard & Zafonte, 2005). In patients with a traumatic brain injury and a damaged hippocampus, recall and recognition are impaired (Manns et al., 2003). Therefore, when patients have hippocampal damage, they may not remember their health care providers and feel alienated from them. They also may not understand the environment they are in, which may jointly increase agitation (Park, 2010).

Antecedents.

There are many antecedents to agitation that have been identified:

1. Cognitive Impairment – It was found that low scores on the cognitive portion of the Functional Independence Measure (FIM) were prognostic of the severity of agitation in a patient (Bogner et al., 2001). It is thought that cognitive impairments are partially responsible for agitation and may also negatively affect rehabilitation outcomes (Eisenburg et al., 2009).
2. Amnesia or memory deficits - Agitation is often the first symptom exhibited at the posttraumatic amnesia (PTA) phase during subacute rehabilitation (Park, 2010). In patients with a traumatic brain injury and a damaged hippocampus, recall and recognition are impaired (Manns et al., 2003). This may lead to their inability to remember their health care providers and understand the environment they are in, causing agitation (Park, 2010).
3. External Stimulation – The hospital can be a distractible environment for a brain injured patient, with its noise, light and audio-visual devices, and result in external stimulation which can be a cause for agitation. It has been found that noxious stimuli in environments exist before the agitation begins (Eckhardt & Deffenbacher, 1995). Simple environmental alterations may reduce unwanted behaviors such as agitation (Lombard & Zafonte, 2005).
4. Altered Emotion - Patients exhibit various emotions and appeared distressed, anxious, scared, angry, and desperate prior to becoming agitated (Pryor, 2005). This loss of emotional control may be caused by brain damage, particularly the frontal lobe,

amygdala and hippocampus, and reduces the ability to respond to fear or threat involving agitated behavior (Dolan, 2002).

Consequences.

The following are the consequences or outcomes that have been identified as a result of agitation in brain injured patients:

1. Disruption in rehabilitation process – Agitation following brain injury has been reported to limit engagement in rehabilitation therapies and, in turn, diminish patient progress in rehabilitation and clinical outcomes (Lequerica et al., 2007).
2. Threat to safety of patient or health care provider - Agitated patients may refuse to accept direct care, be disruptive on a unit, or even pose a physical threat to themselves or staff (Lombard & Zafonte, 2005). Aggressive behavior, manifesting as physical violence and/or verbal anger that threatens harm to one's self or to others, also falls within the continuum of agitation after brain injury (Eisenburg et al., 2009).
3. Increased length of hospital stay – According to Eisenburg et al. (2009), agitation is problematic in the brain-injured patient because it has been shown to be associated with longer lengths of stay in rehabilitation hospitals. Bogner et al. (2001) conducted a longitudinal study and was able to demonstrate that the presence of agitation is predictive of a longer length of stay.
4. Decreased cognitive and motor functioning at discharge - In a rehabilitation process, it is necessary that patients take an active role in their own recovery. And therefore when the patient exhibits agitation which causes disruption in the rehabilitation process, it has been found to be associated with poorer cognitive and motor functioning at discharge (Lequerica et al., 2007). Bogner et al. (2001) also

demonstrated in the longitudinal study that the presence of agitation was predictive of decreased functional independence in the cognitive realm at discharge.

It is recognized that agitation in TBI patients can have many negative outcomes during rehabilitation and hence agitation needs to be identified early in order to help in implementing the management of agitation.

Assessment of Agitation

Evidence based standardized assessment tools that provide objective measurements of agitation are essential for guiding the implementation as well as evaluation of various intervention strategies (Amato et al., 2012). Although there are scales, such as the Cognitive Functioning scale, the Richmond Agitation-Sedation scale, and the Consciousness/Agitation Assessment Tool, they are not specific to assessing the different characteristics of agitation in TBI patients. The Agitated Behavior Scale (ABS) (see Appendix A) is a tool used to determine the nature and level of agitation during the recovery phase of acquired brain injury (Bogner, 2000). The ABS has been found to be a reliable and valid scale to be used for inpatients with TBI (Corrigan, 1989).

Agitated Behavior Scale (ABS)

Development of ABS.

Corrigan (1989) developed the Agitated Behavior Scale (ABS), which has become a commonly used, validated tool in the rehabilitation environment. The ABS uses a rating of severity from 1 (absent) to 4 (present to an extreme degree) to measure agitation. It includes 14 different behaviors and can be completed in 10 minutes of observation. The total scores may range from 14 to 56, and the range of scores is correlated with the degree of agitation: no agitation (< 21), mild agitation (21–28), moderate agitation (29–35), and severe agitation (≥ 36)

(Zun & Downey, 2008). A patient with a score of 21 and above is considered to be agitated. These scores provide definite indications to assist health care professionals in classifying the different degrees of agitation in clients and to intervene appropriately (Corrigan, 1989).

According to Baker (2001), the ABS scores were classified by four different components of agitation: physical, cognitive, behavioral, and verbal.

1. Physical: These ABS components measure the severity of unnecessary physical movements indicative of agitation. These include pulling at restraints or tubes, rocking, rubbing and self-stimulating behavior, wandering and pacing, restlessness and excessive movements, and repetitive behavior.
2. Cognitive: These ABS components measure the levels of cognition that reflect agitation. These comprise impulsivity, impatience, intolerance, and poor concentration and attention.
3. Behavioral: These ABS components measure the levels of abnormal behavior. Behavioral signs of agitation comprise sudden changes in mood, incidences of threats of violence, unpredictable anger, uncooperative behavior, easily initiated or excessive crying/laughing, and incidences of self-abuse.
4. Verbal: This ABS component of agitation measures the incidence or severity of rapid, loud or excessive talking.

Measurement of Psychometric Properties of ABS.

Many researchers have discussed agitation in brain injured inpatients in rehabilitation and the role of ABS in evaluating agitation. Corrigan (1989) first described the development and initial validation of a scale designed to objectively assess agitation in a TBI population. An initial 39-item pool was reduced to a 14-item, called the Agitated Behavior Scale that was later tested

on an independent sample of 35 TBI patients admitted for inpatient rehabilitation. Measures of the reliability of the ABS tool indicated that Cronbach's alpha was greater than 0.8 and significant. The correlations between ABS and measures of concurrent validity were consistently high with significant correlation coefficient at a level of $p<.0001$. The ABS thus demonstrated significant internal consistency, a high level of reliability and also indicated relatively strong and consistent concurrent validity. It was concluded that although it measured content and concurrent validity, additional investigation was required for establishing the construct validity of this measure.

Another study was conducted by Corrigan and Bogner (1994) which focused on the factor structure of the ABS. While the earlier study supported the reliability, internal consistency, and concurrent validity of the ABS, this study investigated its underlying factor structure and examined the variability of levels of agitation on 212 TBI patients throughout a 24-hr day in an acute rehabilitation setting. In order to cross-validate factor analysis results, three samples of observations were created by randomly selecting three rating scales from each of the 212 patients. Confirmatory factor analysis was used to determine which of four theoretical models best fit the underlying structure of the ABS. On analysis, the results revealed that agitation was best represented by model 3 with three underlying factors: Aggression, Disinhibition and Lability. The factors of model 3 were highly intercorrelated, and the results of the MANOVA indicated that the F values were significant ($p<.01$) in all three samples and concluded that agitation was lowest during the night shift.

Bogner, Corrigan, Stange and Rabold (1999) later did a comparative study on the reliability of the Agitated Behavior Scale. They investigated the interrater reliability of the scale on 45 patients with TBI and 23 patients with progressive dementia. It was found that the ABS is

a reliable instrument for measuring agitation in persons with TBI, as well as with long term care facility residents experiencing dementia. Pearson product moment correlation coefficients were calculated for the ratings of the sample. The ratings yielded a correlation coefficient for the total score of .920 and .906 for TBI and for the residents of the long-term care facility respectively. Cronbach's alpha, a measure of internal consistency, was calculated for the total score based on the ratings. The total score as well as two of the factor scores (Disinhibition and Aggression) had high interrater reliability. The third factor, Lability had a lower reliability coefficient with ratings of behaviors following TBI.

Two other studies were conducted to evaluate the measurement properties of the ABS and to determine its feasibility, reliability and clinical utility (Amato et al., 2012; Bogner, Corrigan, Bode & Heinemann, 2000;). Bogner et al. (2000) compared observations of 100 individuals with TBI, 102 individuals with dementia, and 6 individuals with anorexia using the ABS. The ABS appeared to be a reliable and valid measure of agitation across three diagnostic groups. Separation reliability was used for the analysis and it was found that for the TBI sample, the person separation value was 2.09, with a significant separation reliability value of .81. They also found that agitation as measured by the ABS is best represented as a unitary construct. In regard to the construct of agitation it was established that among the 14 behavior items of ABS, three items do not appear to fit as well with the construct of agitation as measured by the ABS: wandering (Item 8), excessive crying/laughing (Item 13) and self-abuse (Item 14).

A prospective, descriptive study conducted by Amato et al. (2012) on a brain injury rehabilitation unit on 51 TBI patients was designed to determine the feasibility, reliability and clinical utility of the agitated behavior scale. The feasibility of the tool was examined and it was found that it was completed 78% of the time without reminders. The interrater reliability was

concluded by 71% of the ratings showing an exact agreement and 23% being within 2 points. In regard to its clinical utility, the ABS identified agitation in the sample with more than half of the patients exhibiting agitated behaviors during rehabilitation. The most prevalent behaviors that were identified were impulsivity (23%), distractibility (19%), restlessness (14%) and uncooperativeness (11%). The ABS was found to demonstrate the ability to reflect intensity of behavior, guide the nurses in the initiation of interventions and evaluate the effectiveness of various care strategies. The researchers recommended the use of the ABS on a daily basis to evaluate agitation in TBI patients, though the study was limited by a small sample size, and this study was conducted on only one unit.

Use of ABS to Measure Patient Outcomes.

The studies that were discussed thus far have established that ABS is a reliable and valid scale to evaluate agitation in TBI patients in a rehabilitation setting. There are other descriptive studies in which the investigators utilized the ABS to study the patterns of agitated behavior in relation to outcomes among TBI patients.

Bogner et al. (2001) conducted a longitudinal study to determine the role of agitation in the prediction of traumatic brain injury rehabilitation outcomes. The study was conducted on 340 consecutive patients admitted to an acute traumatic brain injury rehabilitation unit with a 1- year follow up after discharge. The outcomes under study were rehabilitation length of stay, discharge destination, functional independence at discharge, productivity and life satisfaction at 1-year follow up. The presence of agitation was identified using ABS and it was found to be associated with a lengthier rehabilitation stay and decreased likelihood that the individual would be discharged to a private residence ($p<0.001$ for both). The univariate analyses indicated that the duration of agitation was a significant predictor of length of rehabilitation stay ($p<0.001$). The

sample in this study was adequate and appropriate and the study was able to demonstrate the relation between agitation and rehabilitation outcomes.

The Agitated Behavior Scale was used to identify and measure the level of agitation in yet another study conducted by Lequerica et al. (2007). The study used a cross-sectional, correlational design to examine the nature of agitation in patients with brain injury and quantify the relation between agitation and patient progress in rehabilitation. The sample consisted of 69 patients with acquired brain injury admitted to an acute rehabilitation hospital. A 2-step hierarchical multiple regression was performed with engagement in therapy as the outcome variable. The final model accounted for 37.6% of the variance in engagement, $R^2 = 0.38$, $F(2, 66) = 19.9$, $p < .001$. It concluded that agitation predicts engagement in rehabilitation therapy over and above injury severity. This study thus stresses the disruptive nature of agitation for patients' ability to engage in rehabilitation therapies.

The ABS has not only been utilized to identify the presence and level of agitation but has also been used to monitor agitated behavior changes during different times of the day. A prospective, descriptive study was completed by Nott et al. (2010), to monitor daily shift-by-shift changes in agitated behavior, using ABS during adult brain injury rehabilitation. This study included 407 recordings with the ABS on eight participants who were monitored daily for up to 28 days. It was found that the mean ABS scores were highest during the afternoon shift, which could be attributed to low levels of structured activities available at that time, higher levels of environmental stimuli during visiting times, and increased cognitive fatigue. Agitated behavior was lowest in patients with improved cognition and also at night, while persisted agitated behavior was associated with low levels of cognition. The results of this study contribute to a clearer understanding of the individual patterns of agitated behavior in TBI patients during their

recovery. The results also verify that the reporting of daily ABS scores on a shift-by-shift basis is very helpful in identifying individual behavioral inconsistencies in the brain injured patient. The major limitation of this study was that the sample size was small, and thus the observations cannot be over-generalized.

Use of Electronic Health Records for Clinical Documentation

Nursing documentation is an important aspect of the patient's clinical picture and is an essential factor in communication among health care team members regarding patient care. The Institute of Medicine (2001) strongly recommends the use of electronic solutions to improve the quality of care provided to hospitalized patients. According to the Agency for Healthcare Research and Quality (2007), widespread adoption of an electronic medical record has shown to be an efficient method to improve quality, safety, and efficiency of care in health care agencies if correctly implemented.

For this reason, it is the intention of the investigator to implement the ABS as an assessment clinical tool in an electronic health record (EHR) and evaluate its usability. The following section will include research studies on the efficiency of EHRs and their use for clinical documentation. A review of this literature should assist in a fuller understanding of the strengths and limitations of EHRs as well as factors associated with nurses' attitudes toward and perceptions of documentation through EHRs.

Impact of EHRs on Efficiency.

A systematic review of the literature was performed by Poissant, Pereira, Tamblyn, and Kawasumi (2005) to examine the impact of electronic health records (EHRs) on documentation time of physicians and nurses, and to identify factors that may explain efficiency differences across studies. In total, 23 papers with studies that were conducted during 1990 to 2004 were

included. The use of bedside terminals and central station desktops saved nurses, respectively 24.5% and 23.5% of their overall time spent documenting during a shift. Among the 11 studies which examined the impact of EHRs on time efficiencies of nurses, six of them reported a reduction in documentation time when using a computer. Among those, the relative time differences ranged from −2.1% to −45.1% and each of these studies assessed the time efficiency of computerized systems that were accessible through either bedside terminals or central station desktops.

Nursing Attitudes and Perceptions towards the usability of EHRs.

As technology continues to increase in daily nursing practice, the need to evaluate nurses' perceptions of effects of technology on patient care is identified. Understanding how nurses view the documentation process affects development of computer technology and educational programs. A variety of studies have been completed to assess nurses' perceptions including satisfaction, efficiency, confidence, and acceptance in use of computerized documentation systems.

A qualitative study was conducted by Carrington and Effken (2011) to compare nurses' perceptions of the strengths and limitations of the electronic health record, while documenting and retrieving patient information regarding a clinical event. A descriptive design was used in which open-ended, semistructured interviews were conducted with 37 registered nurses from medical, surgical, and telemetry units of two urban Arizona hospitals. These nurses had an experience of using the electronic nursing documentation system for at least 3 months. The results indicated that lack of EHR efficiency was reported by 50% of the nurses at each site. The data suggested that nurses perceive retrievability as one of the strengths or characteristics of the EHR that enhances communication. Barriers such as lack of efficiency in the use of EHR and

lack of relevance of documentation were perceived as limitations of the EHR impeding communication. Nurses suggested that they be involved in electronic health record decisions and that hospitals try to reduce the identified barriers to electronic health record use.

Smith, Smith, Krugman, and Oman (2005) conducted a related study to evaluate a nursing staff's attitude toward computerization, time needed for documentation, and comprehensiveness of charting entries. A convenience sample of 46 registered nurses (RNs) employed on a 26-bed orthopedic and neuroscience unit and an 18-bed pulmonary unit participated in the study. Data from the staff surveys, observations, and chart audits conducted pre- and post–computer project implementation demonstrated that: (a) the staff attitudes toward computers were less positive with a significant decrease post computerization ($p=0.004$), (b) the time required for charting was unchanged, and (c) there were significant improvements ($p<.05$) in how completely the nurses documented charting elements, such as pain assessment, safety surveillance, teaching, skin surveillance, neurological assessment, and discharge planning.

Moody, Slocumb, Berg, and Jackson (2004) conducted a similar study of 100 nursing personnel at a large Magnet hospital with a descriptive study design to assess the needs, preferences, and perceptions of nurses associated with EHR documentation methods. Nurses' attitudes about the use of EHRs and their perceived effects on patient care were assessed. A five-item, Likert-type attitude scale explained 54% of the variance in attitude scores and demonstrated sound construct validity and internal consistency ($r = 0.77$). More than one third, 36%, perceived that EHRs had resulted in a decreased workload. The majority (64%) of the nurses preferred bedside documentation but reported that environmental and system barriers often prevent EHR charting at the bedside. Overall, 75% of the nurses thought EHRs had improved the quality of documentation and 76% believed electronic charting would lead to

improved safety and patient care. Nurses with expertise in computer use (80%) had a more favorable attitude toward EHRs than those with less expertise.

It is thus evident through these studies that clinical documentation through electronic health record has positive outcomes and some barriers. It is therefore important to assess the implementation of the ABS in an electronic health record and evaluate its usability

Summary

The investigator examined evidence about the use of an agitation scale to evaluate agitation among TBI patients on a rehabilitation unit. An analysis of descriptive and non-experimental studies on the assessment of agitation, the use of the Agitation Behavioral Scale to evaluate agitation, and the utilization of electronic health record in clinical documentation was done. It is clear from the synthesis that the evidence provides appropriate and relevant studies and information available in dealing with implementation of the Agitation Behavior Scale to evaluate agitation in TBI patients. There are valuable insights provided about the reliability and validity of the ABS and also demonstration of its utilization in identifying agitation. It was also clear from the literature review about the advantages of clinical documentation in an electronic health record. These findings will thus facilitate early identification of agitation in traumatic brain injury inpatients in a rehabilitation hospital and will enable prompt interventions to manage agitation, prevent escalation of agitation, and thus improve participation and engagement of TBI patients in rehabilitation.

Methodology

An objective assessment of agitation in Traumatic Brain Injury (TBI) patients is necessary for early identification of agitation to enable prompt intervention and prevent escalation of agitation. The Agitated Behavior Scale (ABS) is a reliable and valid scale used for patients with TBI to determine the nature and level of agitation during the recovery phase of acquired brain injury (Lombard & Zafonte, 2005). The purpose of this capstone project is to implement the Agitated Behavior Scale (ABS) through an electronic health record and to evaluate the usability of the ABS in a traumatic brain injury unit at a rehabilitation hospital. In the following section, the design, sample and setting of the project, measurement methods, data collection and analysis and human subjects' protection plan will be discussed.

Design

The capstone project is a quality improvement project of implementing an Agitated Behavior Scale (ABS) in an electronic health record and utilizing a survey technique to evaluate the usability of the ABS, which is used to determine the presence and level of agitation via a convenient sampling design.

Sample and Setting

The sample for this study will come from a population of registered nurses who work on a Traumatic Brain Injury unit in a large rehabilitation hospital in the Mid-Atlantic region of the United States. The unit consists of 34 registered nurses and this project will appropriately engage all RNs who evaluate and document patient assessments. Convenient sampling will be used as it allows the investigator to obtain basic data and trends without the complications of using a random sample.

Procedures and Measures

This study which includes implementation of the ABS and evaluation of the usability of the ABS consists of three phases. In Phase 1, the nurses will receive a 30 minute in-service education on the importance of assessment of agitation and the use of the ABS to evaluate and score levels of agitation in TBI patients. The training will also include case studies of patients with agitation to allow the nurses an opportunity to use the scale. The in-service training will be conducted twice for all three shifts in a two week period to provide an opportunity for education to all the registered nurses of the unit. This education will enhance the nurses' knowledge about the importance of assessment of agitation and ABS documentation in the electronic health record to evaluate agitation in TBI patients. This approach will facilitate a practice change in the assessment of agitation and the documentation behavior of the nurses.

Phase 2 consists of implementation of the ABS in MediLinks, a trademark of Mediserve, which is a part of the EHR used in the rehabilitation industry. The ABS (see Appendix A) is a reliable and valid scale used for inpatients with TBI (Corrigan, 1989). The scale uses a rating of severity from 1 (absent) to 4 (present to an extreme degree) on 14 different behaviors. A patient with a score of 21 and above is considered to be agitated (Corrigan, 1989). Scores from the ABS scale can be classified into four levels of agitation: none (< 21), mild (21–28), moderate (29–35), and severe (≥ 36) (Zun & Downey, 2008). The ABS used to assess agitation will be documented through an EHR for a period of 6 weeks. The registered nurses will complete the electronic ABS documentation in MediLinks on a routine basis, once a shift for their TBI patients. When their assessment findings are entered into the electronic ABS, they will automate a total score that indicates the level of agitation. The nurse will also be instructed to indicate in the EHR, if interventions were implemented for their patients in response to their evaluation of

agitation (see Appendix A). During Phase 2, periodic positive reinforcements of the nurses to use the scale will be carried out by the investigator in the form of informative posters and laminated index ABS cards to enhance the use of the assessment tool.

Phase 3 of the study will include evaluating the usability of the tool through a nursing survey. It is expected that about 80% of the nurses will participate in the study with an estimated sample size of 27. The survey questionnaire will be administered during all the three shifts for a period of 2 weeks. This validated survey questionnaire based on the System Usability Scale (SUS) will be used for the project (Brooke, 1996). The SUS measures the subject's perceived assessment of the usability of a product by asking users to rate the effectiveness, efficiency and satisfaction with that product. The SUS consists of ten statements that are rated on a 1 to 5 point Likert Scale, generating a combined score ranging from 0–100 (see Appendix B). The total score of the SUS reflects a participant's view of a product's usability and provides a point estimate measure of usability and customer satisfaction (Bangor, Kortum, and Miller, 2008). Analysis showed a high reliability with a Cronbach's alpha of 0.91.

For this capstone project, the SUS will be slightly modified with permission to make it specific for the implementation of ABS. The modified survey will include replacement of the term "system" with "scale" referring to the ABS, as stated in the initial instructions. The SUS will be distributed with a demographic data collection form which includes age, years of RN experience, ethnicity and highest nursing degree achieved. This information is collected to find the correlations between the demographic variables and the usability of the assessment tool. The results of the survey will provide feedback on the usability of the tool and consequently point out if there needs to be a change made in the use of the ABS in the electronic health record.

Data Analysis

The two sources of the data for analysis are ABS in the MediLinks section of the Electronic Health Record and the Survey Questionnaire. The electronic health records of the TBI patients that include the ABS documentation during the six-week period of implementation will be audited. These records of the TBI patients will be de-identified through the use of statistical methods proven to render information not individually identifiable. A chart review of the electronic ABS reports produced from the data mining of the EHR will provide data that will reflect the completeness of the ABS documentation, identification of the levels of agitation and if interventions were implemented or not. The total score will automatically populate once the document is complete indicating the completeness of the tool. The ABS will also indicate the level of agitation that was identified as no agitation (< 21), mild agitation (21–28), moderate agitation (29–35), and severe agitation (≥ 36).

After six weeks of implementation of the ABS in the electronic health record, the survey questionnaire will be administered to the nurses. Data collected from the survey questionnaire will facilitate evaluation of the usability of the ABS. SUS yields a single number representing a composite measure of the overall usability of the system being studied. SUS scores have a range of 0 to 100. To calculate the SUS score, the score contributions from each item have to be summed. Each item's score contribution will range from 0 to 4. For the items 1,3,5,7 and 9, the score contribution is the scale position minus 1. For items 2,4,6,8 and 10, the contribution is 5 minus the scale position. The sums of the scores have to be multiplied by 2.5 to obtain the overall value of SU (Brooke, 1996).

This data from the EHR and the survey questionnaire will be entered into an excel sheet and then exported to Statistical Package for Social Sciences (SPSS) for further analysis. The data

will be analyzed using descriptive statistics. Measures of central tendency would be used for the interval data and frequency distribution and the percentages will be used for nominal data. This would allow the data to be summarized in a meaningful way and be interpreted about the completeness of the ABS documentation, identification of the levels of agitation and whether interventions were implemented or not in response to the identification of agitation. The demographic data will describe the sample characteristics and determine the generalizability of the project. Correlation statistics will be used to study the relationship between the demographic variables and the usability of the assessment tool.

Human Subjects protection and approval processes

This capstone project will be submitted to the University of Maryland School of Nursing for approval and then to the Institutional Review Boards (IRB) of the University of Maryland and the institution in which the project will be carried out. This project does not require invasive procedures, monitoring or interventions, and therefore there is minimal risk and an exemption or expedited review will be requested. The data will be de-identified, thus protecting patient information. The data will also be stored securely in a password protected environment with restricted access to the investigator. The access to the information collected will be limited to the Capstone committee. This project will be carried out according to a set timeline (Table 7).

Results

The investigator completed training required by the University of Maryland, Baltimore including the Collaborative Institutional Training Initiative (CITI) modules and Health Insurance Portability and Accountability Act (HIPAA) training. Institutional Review Board (IRB) approval was obtained from both the University Of Maryland School Of Nursing and the Human Research Protection Office (Appendix C) and the Medstar Health Research Institute (Appendix D).

Data collection

After the approval from the IRB, the study began in the Brain Injury unit of the National Rehabilitation Hospital. This study included implementation of the ABS in the electronic health record and the evaluation of the usability of the ABS in three phases. In Phase 1, the nurses received a 30 - 45 minute in-service education on the importance of assessment of agitation and the use of the ABS in the electronic health record in TBI patients. The nurses learnt how to assess and identify the level of agitation-using electronic ABS in the MediLinks and to indicate if interventions were implemented in response to the presence of agitation. The education also included case studies to allow the nurses to practice scoring ABS. The in-service training was conducted twice for all three shifts in a two-week period (between November 25 to December 8, 2012) to offer an opportunity for education to all the registered nurses of the unit.

Phase 2 consisted of implementation of the ABS in MediLinks. The registered nurses used the electronic ABS documentation in MediLinks on a routine basis, once a shift for their TBI patients for six weeks from December 9, 2012 to January 19, 2013. During this period, there was periodic positive reinforcement of the nurses carried out by the investigator in the form of informative posters and laminated index ABS cards to enhance the use of the assessment tool.

At the end of six weeks, data was collected about the documentation of the Agitated Behavior Note using an electronic chart review.

Initially, the list of the TBI in-patients of the brain injury unit during the period of December 9, 2012 to January 19, 2013 was collected from the admissions department of the hospital. These records of the TBI patients were de-identified and each chart had an identification number given to it. The investigator did not know the individual identities of the patient after the identification number was specified and no research data was linked to individual patients.

Phase 3 of the study included evaluating the usability of the tool through a validated survey questionnaire based on the System Usability Scale (SUS) during the period of January 23, 2013 to February 5, 2013. Although the expectation was that about 80% of the 34 nurses would participate in the study with an estimated sample size of 27, it was found that 2 of them were on vacation during that period of time and 3 part-time nurses worked few shifts (1-2) during the same period. Therefore, the participation rate was 71.9 % with a sample size of 23 for a population of 32 nurses. The survey questionnaire was administered during all the three shifts for a period of 2 weeks and the data was collected from the survey questionnaires at the end of two weeks. The data was stored securely in a password protected computer with restricted access to the investigator. The identity of the providers or staff involved in the documentation was not collected or recorded.

Data Analysis

The data from the EHR and the survey questionnaire were entered into an excel sheet and then imported to Statistical Package for Social Sciences (SPSS-21.00) for further analysis. Descriptive statistics were conducted for all variables, measures of central tendency for interval

data and frequency distribution and the percentages for nominal data. This allowed the observations to reflect the completeness of the ABS documentation, identification of the levels of agitation, whether interventions were implemented or not in response to the identification of agitation and the usability of the ABS. A parametric t-test was also used to examine the impact of the demographic characteristics of the nursing staff sample on the total score of the system usability scale in the survey questionnaire.

Results

The chart review of the ABS in MediLinks explored the use of the Agitated Behavior Scale in the identification of agitation including the completeness of documentation, levels of agitation and interventions implemented for 29 TBI inpatients. There was 92.2% compliance in the documentation of the ABS in the electronic health record, as there were 755 electronic ABS documentations out of a possible 819. Among the 755 charts that were reviewed, 99.9% had completeness of documentation of Agitated Behavior Scale. Most of the assessments (83.8%) indicated no agitation, while 12.8% had mild agitation, 2.3% had moderate agitation and 1.1%, a small proportion had severe agitation. Interventions were implemented for most of those (80.3%) who were identified to have agitation, while 18.9% of the cases did not have interventions implemented as per the documentation (Table 1).

The survey questionnaire consisted of a sample of 23 Registered Nurses, among which nearly half of the sample's age ranged between 26-40 years (52.5%). Almost two-thirds of the participants (65.2%) had bachelors' education, while 26.1% had an associate degree. The participants with less than five years of nursing experience (60.8%) were more than those who had more than 5 years of experience (39%) (Table 2). The mean of the total score of the system

usability scale in the survey questionnaire was 76.09 with a range of 45-100 (SD - 17.85) (Table 3).

This study also examined the impact of the age of the nurse sample on the total score of the system usability scale in the survey questionnaire using an independent sample t-test. The participants were divided into two groups according to their age (Group 1: <40, Group 2: >40). This test compared the total scores of the system usability scale for two age groups (<40 years & > 40 years) and was found to have no significant difference in the total scores for age<40 years (M = 80.71, *SD* = 17.11) and age>40 years (M = 68.89, SD = 17.46; t(21) = 1.61, P = .12, two-tailed). The magnitude of the difference in the means (mean difference = 11.82, 95% Cl: -3.49 to 27.15) was small (eta squared =.05)(Table 4).

There was also no significant difference in total scores of the system usability scale for Diploma/Associate degree in Nursing (M = 80.36, *SD* = 16.61) and Bachelors/ Masters (M = 74.22, SD = 18.57; t (21) = .75, P = .46, two-tailed). The magnitude of the difference in the means (mean difference = 6.14, 95% Cl: -10.85 to 23.13) was small (eta squared =.04) (Table 5).

The total scores of the system usability scale for two groups related to levels of experience in nursing (<5 years & > 5 years) was also compared. It indicated that there was no significant difference in the total scores for experience < 5years in nursing (M = 76.43, *SD* = 17.00) and experience > 5years in nursing (M = 75.56, SD = 20.15; t (21) = .11, P = .91, two-tailed). The magnitude of the difference in the means (mean difference = .87, 95% Cl: -15.36 to 17.10) was small (eta squared =.05) (Table 6).

Discussion

According to Amato, Resan and Mion (2012), agitated behaviors in post traumatic brain injury patients can range from mild to severe, during the recovery phase. A standardized assessment tool is necessary to provide an objective measurement of the type and severity of the agitated behavior. This would help in guiding the implementation, as well as evaluating the effectiveness of various intervention strategies to decrease agitation.

In this study, the investigator introduced the ABS in the electronic health record and examined the usability of the ABS. During the in-service education phase of the project, many of the nurses expressed interest in learning more about agitation in traumatic brain injury patients and in knowing the importance of assessment and management of agitation. This started an awareness of a practice change that was to come in the assessment of agitation and the documentation behavior of the nurses.

This project was able to demonstrate that this practice change of implementing an agitation assessment tool had 92.2 % provider compliance in the use of ABS in the brain injury unit. Although there was a high compliance with the documentation of ABS, it was found that only 16.2% of the documentations indicated presence of agitation, which was mostly mild agitation (12.8%). According to Angelino, Miglioretti, & Zotti (2002), brain-injured patients with severe injuries have been shown to have a higher percentage of agitation (30%) compared to 19% in mildly brain-injured patients. As 16.2 % is a lower percentage than what previous studies have indicated, there needs to be a follow up study to assess the inter- rater reliability of ABS among the nurses in the scoring of ABS.

It is heartening to note that among those who were identified to have agitation, 80.3% received interventions. The 18.9% who did not receive interventions had only mild agitation.

One possible explanation for the small percentage of nurses that did not intervene is that they felt the agitation was at a mild level and did not feel the need to intervene. One of the study's objectives in using the ABS is to enable early identification of agitation and help the nurse intervene appropriately to avoid escalation of agitation. It is therefore important that reinforcements be given to nurses during continuing education about intervening promptly.

The results of the usability of the ABS from the survey questionnaire indicated that the mean of the total score of the system usability scale (SUS) in the survey questionnaire was 76.09 with a range of 45-100. According to Bangor, Kortum, and Miller (2009), a score above 70 in the system usability scale meant that it was an acceptable score indicating usability. Thus, we can infer that the nurses felt that this scale was usable in the assessment of agitation on TBI patients in the electronic health record.

The findings are similar to studies that have established the utility of ABS, although this was a unique study involving ABS in the electronic health record. To my knowledge after a literature review, this is the first evaluation of ABS introduced in the electronic health record. The findings of this project support the adaptation of this new assessment tool, which is a practice change in the unit.

Testing the impact of the demographic characteristics on the total score of the system usability scale in the survey questionnaire concluded that the sample's demographic characteristics did not significantly influence the results of the score. This could be because of the small sample size, as the study was conducted in the only brain injury unit of the hospital and did not include other rehabilitation hospitals. Replication of the study with a larger sample would help in identifying the correlation between the demographic characteristics and the results of the survey questionnaire.

The success of this study is indicated by a practice change in the unit. The nurses are presently using the ABS for assessment of agitation on a regular basis in the unit once a shift. This quality improvement project was valuable as it integrated evidence-based practice to bring about a change in provider practice. It has facilitated the use of the ABS in early identification of agitation in traumatic brain injury inpatients in the hospital and enabled prompt interventions to manage agitation and prevent escalation of agitation. This study also established the tool's usability in the electronic health record making it easy for adaptation.

The study has some limitations such as the sample being small with no randomization and no baseline data for comparison thus limiting the generalizability. The sample was from a single rehabilitation center and there was no representation from nurses of different rehabilitation hospitals. The change that is to be made while redesigning the study is to conduct a higher level of research study with a larger sample.

Another limitation in the data collection process is the manual process of the electronic medical record review. A manual medical record review is time intensive and less efficient than a automated data collection. In regard to the results of the survey questionnaire, testing effects may contribute to bias and be an internal validity threat as the mere act of doing the project may influence outcome (Polit & Beck, 2004).

Translation Plan and Implications for practice

Evidence based practice (EBP) supports team based, interprofessional care and training. EBP can determine standards of care and provide a clear and transparent process that guides the health care professional, patient or community in making informed, evidence-based clinical decisions (Satterfield et al., 2009).

The translation theory I used to implement this evidence-based practice and will use in the future is the Iowa model. The Iowa model is a practice model that can be used in guiding practitioners including physicians, nurses and allied health professionals, to apply evidence and improve the healthcare outcomes (Titler, 2010). This model allows us to focus on knowledge and problem-focused triggers, leading to questions on current nursing practices and whether it can be improved through the use of current research findings (Titler, 2006).

As my project involved a team approach in managing the problem, and included a clinical education component, the Iowa model best fit my project. The Iowa Model of Evidence-Based Practice to Promote Quality Care identifies a problem-focused or knowledge focused trigger. It then validates whether the trigger is a priority for the organization. If it does, then a team is formed and an evidence search results. When a sufficient research base is identified, a pilot project is conducted to implement the practice change. If the change is appropriate for adoption, then the practice is instituted, monitored & disseminated (Tilter, 2010).

Translating knowledge about identifying and managing agitation through effective practices required careful planning and consideration of the factors involved in implementation of the practice change. Future studies may include quality improvement projects, testing ABS assessments done pre and post intervention, to identify the effectiveness of intervention in the reduction of agitation. These studies can also measure improvements in the patient outcomes such as reduced hospital stay and increased rehabilitation outcomes. Chart reviews using larger population can identify the magnitude of agitation in TBI patients and compare the levels of agitation in different shifts.

The American Association of Colleges of Nursing (AACN) specifies the Doctor of Nursing Practice's (DNPs) foundational competencies in The Essentials of Doctoral Education

for Advanced Nursing Practice (AACN, 2006). In Essential III: Clinical Scholarship & Analytical Methods for Evidence-Based Practice, the DNP is required to develop competencies to be able to synthesize and translate evidence-based findings into practice and be involved in the dissemination and integration of new knowledge.

The DNP should be able to design and evaluate methodologies that improve quality in an effort to promote safe and effective patient-centered care, analyze and critically evaluate existing literature to determine best practice and develop practice guidelines (AACN, 2006). This project facilitated the critical evaluation of the literature for best practice in identifying agitation in TBI patients, and translation of that knowledge into practice.

The dissemination of findings from this project includes an oral presentation in the brain injury unit and Quality Improvement committee at NRH, manuscript publication in a peer-reviewed journal (Journal of Neuroscience Nursing/ Rehabilitation Nursing) and poster or oral presentations at conferences and other Neurorehabilitation facilities.

Conclusion

In summary, the Agitated Behavior Scale, a reliable and valid measure of agitation in patients with TBI, was implemented in the electronic health record, the results of which showed that there was good compliance in the use of ABS in the assessment of agitation. This scale was also evaluated for its usability in the electronic health record and was found to be utilizable. Utilization of the tool on a daily basis will allow for an early identification of agitation in TBI inpatients in the hospital and enable prompt interventions to manage agitation thus promoting positive outcomes for the patient.

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Tables & Figures

Table 1

Variables of the Agitated Behavior Scale documentation in the electronic health record

	n (755)	%
Completeness of documentation		
Complete	754	99.9
Incomplete	1	.1
Levels of Agitation		
No Agitation	633	83.8
Mild Agitation	97	12.8
Moderate Agitation	17	2.3
Severe Agitation	8	1.1
Interventions		
Implemented	98	80.3
Not implemented	23	18.9
Missing	1	.8

Table 2

Baseline characteristics of the registered nurses sample from survey

	N	%
Age		
< 25	2	8.7
26-40	12	52.2
41-55	6	26.1
>56	3	13.0
Education		
Diploma	1	4.3
Associate	6	26.1
Bachelors	15	65.2
Masters	1	4.3
Years of Experience		
<2	9	39.1
3-5	5	21.7
6-10	3	13.0
11-20	3	13.0
21-30	3	13.0

Table 3

Total score on the system usability scale (SUS) from the survey

	N	%	Range	Mean (SD)
Total score on the SUS	23		45-100	76.09 (17.85)

Table 4

Key outcomes of a t-test comparing the means of the age groups to the total score on SUS

		Age<40 years N= 14		Age >40 years N= 9		*t*	*df*	*p*	*d*[b]
	N	Mean	SD	Mean	SD				
Total scores on SUS	23	80.71	17.11	68.89	17.46	1.61	21	.12	.70

Table 5

Key outcomes of a t-test comparing the means of the education groups to the total score on SUS

		Education Associate/Diploma N=7		Education Bachelors/Masters N=16		*t*	*df*	*p*	*d*[b]
	N	Mean	SD	Mean	SD				
Total scores on SUS	23	80.36	16.61	74.22	18.57	.75	21	.46	.35

Table 6

Key outcomes of a t-test comparing the means of the experience groups to the total score on SUS

		Experience<5 years N=14		Experience>5 years N=9		*t*	*df*	*p*	*d*[b]
	N	Mean	SD	Mean	SD				
Total scores on SUS	23	76.43	17.00	75.56	20.15	.11	21	.91	.05

Table 7

Timeline for Capstone project

Task / Goal	Due Date
Select and Finalize Capstone Members	3/12-3/12
Finalize Capstone Proposal	5/12
Present Capstone proposal	8/12
Secure Committee Approval	8/12
IRB UMB & NRH Approval	9/12 – 11/12
Conduct the Study	12/12 - 1/13
Analysis, Synthesis, Evaluation of Findings	2/13 -3/13
Prepare Capstone Project	3/13 - 4/13
Present Capstone Project	4/13
Prepare Final Capstone Written Report	4/13

Theoretical Framework

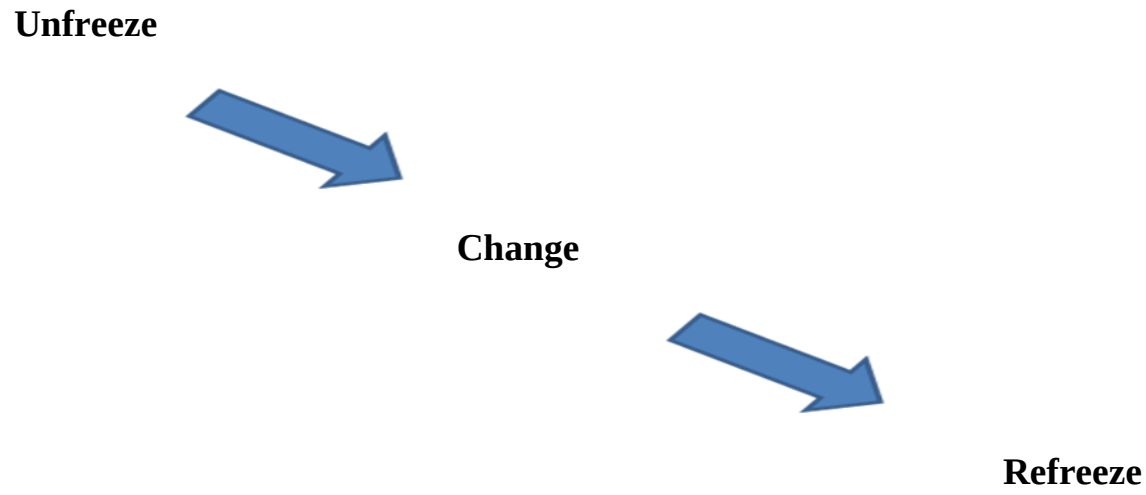

Figure 1: Lewin's Change Theory

Adapted from Lewin's Change Theory. Ritchie, B. (2006). Lewin's Change Management Model: Understanding the three stages of change. Retrieved from http://www.consultpivotal.com/lewin's.htm

Appendix A: Section 1 of the Agitated Behavior Note

Agitated Behavior Scale

At the end of the observation period indicate whether the behavior described in each item was present and, if so, to what degree: slight, moderate or extreme. Use the following numerical values and criteria for your ratings.

1 = absent: the behavior is not present.

2 = present to a slight degree: the behavior is present but does not prevent the conduct of other, contextually appropriate behavior. (The individual may redirect spontaneously, or the continuation of the agitated behavior does not disrupt appropriate behavior).

3 = present to a moderate degree: the individual needs to be redirected from an agitated to an appropriate behavior, but benefits from such cueing.

4 = present to an extreme degree: the individual is not able to engage in appropriate behavior due to the interference of the agitated behavior, even when external cueing or redirection is provided.

DO NOT LEAVE BLANKS.

1. Short attention span, easy distractibility, inability to concentrate.	
2. Impulsive, impatient, low tolerance for pain or frustration.	
3. Uncooperative, resistant to care, demanding.	
4. Violent and or threatening violence toward people or property.	
5. Explosive and/or unpredictable anger.	
6. Rocking, rubbing, moaning or other self-stimulating behavior.	
7. Pulling at tubes, restraints, etc.	
8. Wandering from treatment areas.	
9. Restlessness, pacing, excessive movement.	
10. Repetitive behaviors, motor and/or verbal.	
11. Rapid, loud or excessive talking.	
12. Sudden changes of mood.	
13. Easily initiated or excessive crying and/or laughter.	
14. Self-abusiveness, physical and/or verbal.	
Total Score	

Levels of Agitation

No Agitation - (< 21)

Mild Agitation (21–28)

Moderate Agitation (29–35)

Severe agitation (≥ 36)

Adapted Agitated Behavior Scale. Bogner, J. (2000). The Agitated Behavior Scale. The Center for Outcome Measurement in Brain Injury. Retrieved from http://www.tbims.org/combi/abs/absrat.html

Section 2 of the Agitated Behavior Note

Nursing Interventions for Agitated Behavior

Select the interventions implemented for an ABS score greater than 21**:**

- Decreased stimuli in the environment
- Communicated in non threatening tones
- Reoriented the patient to time, place, person and situation
- Used simple directions to follow
- Provided a protective environment
- Placed the patient in a quiet room
- Provided aroma therapy
- Provided music therapy
- Provided hand massage
- Administered medication
- Other: _____

  _____

Appendix B: Survey Questionnaire

To The Registered Nurses of 3 East

You are invited to complete a survey to evaluate the usability of the agitated behavior scale in the electronic health record

Dear Registered Nurses,

Welcome and thank you for your interest in the survey. The purpose of this survey questionnaire is to evaluate the usability of the agitated behavior scale in the electronic health record. The completion of the survey is voluntary. If you choose to complete the survey, please place the completed survey in the provided envelope and insert the envelope in the box located at the 3 east nursing station.

Please know that by answering the questions below, you are giving your consent to participate in this survey. Remember to take a minute to respond to the demographic questions after completing the survey questionnaire. If you have any questions in regard to the survey, please don't hesitate to contact me.
Thank you!

Helen Wilson, RN, MSN, DNPc

Phone: 240-688-1586.

Email: helenswilson@umaryland.edu

Instructions for completing the System Usability Scale (SUS):

1. *Select the answer that best corresponds to your level of disagreement or agreement with each item ranging from 1- Strongly Disagree to 5- Strongly Agree.*
2. *In the statements below, "ABS" refers to the "Agitated Behavior Scale" in MediLinks*
3. *Record your immediate response to each item, rather than thinking about items for a long time.*
4. *All items should be checked. If you feel that you cannot respond to a particular item, then you should mark the center point of the scale.*

Adapted scale based on System Usability Scale. Brooke, J. (1996). SUS: A 'quick and dirty' usability scale. In P. W. Jordan, B. Thomas, B. A. Weerdmeester, & A. L. McClelland. Usability Evaluation in Industry. London: Taylor and Francis. Retrieved from http://www.usabilitynet.org/trump/documents/Suschapt.doc

System Usability Scale

	Strongly Disagree				Strongly Agree
1. I think that I would like to use the ABS frequently	1	2	3	4	5
2. I found the ABS unnecessarily complex	1	2	3	4	5
3. I thought the ABS was easy to use	1	2	3	4	5
4. I think that I would need the support of a technical person to be able to use the ABS	1	2	3	4	5
5. I found that the various functions in the ABS were well integrated	1	2	3	4	5
6. I thought there was too much inconsistency in the ABS	1	2	3	4	5
7. I would imagine that most people would learn to use the ABS very quickly	1	2	3	4	5
8. I found the ABS very cumbersome to use	1	2	3	4	5
9. I felt very confident using the ABS	1	2	3	4	5
10. I needed to learn a lot of things before I could get going with the ABS	1	2	3	4	5

Demographic Data

(This information will help in the analysis of the survey results. Please check the appropriate circle to indicate your answer.)

What is your age?

- O 25 or under
- O 26 – 40
- O 41 – 55
- O 56 or older

What is your highest level of education in nursing?

- O Diploma in nursing
- O Associate degree in nursing
- O Bachelor in nursing
- O Master in nursing & above

What are your years of experience as a registered nurse?

- O 2 years and below
- O 3-5 years
- O 6-10 years
- O 11-20 years
- O 21-30 years
- O Above 31 years

THANK YOU FOR COMPLETING THE SURVEY!

Appendix C: UMB Approval of Research Notification

University of Maryland, Baltimore
Institutional Review Board (IRB)
Phone: (410) 706-5037
Fax: (410) 706-4189
Email: hrpo@som.umaryland.edu

APPROVAL OF RESEARCH NOTIFICATION

Date: October 15, 2012

To: Kathleen Michael
RE: HP-00053525
Type of Submission: Initial Review
Type of IRB Review: Expedited

Approval for this project is valid from 10/14/2012 to 10/13/2013

This is to certify that the University of Maryland, Baltimore (UMB) Institutional Review Board (IRB) approved the above referenced protocol entitled, "*Implementation of the Agitated Behavior Scale in the Electronic Health Record to Evaluate Agitation in Traumatic Brain Injury Patients*".

The IRB has determined that this protocol qualifies for expedited review pursuant to Federal regulations 45 CFR 46.110, 21 CFR 56.110, & 38 CRF 16.110 category(ies):
(5) Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for nonresearch purposes (such as medical treatment or diagnosis). (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(4). This listing refers only to research that is not exempt.)

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(2) and (b)(3). This listing refers only to research that is not exempt.)

The IRB made the following determinations regarding this submission:
- A waiver of consent has been approved per 45 CFR 46.116(d).

Below is a list of the documents attached to your application that have been approved:
Eligibility Checklist for HP-00053525 v8-13-2012-1344886808263
Study Schedule
Agitated Behavior Scale
Survey

In conducting this research you are required to follow the requirements listed in the INVESTIGATOR MANUAL. Investigators are reminded that the IRB must be notified of any changes in the study. In addition, the PI is responsible for ensuring prompt reporting to the IRB of proposed changes in a research activity, and for ensuring

that such changes in approved research, during the period for which IRB approval has already been given, may not be initiated without IRB review and approval except when necessary to eliminate apparent immediate hazards to the subject (45 CFR 46.103(4)(iii)). The PI must also inform the IRB of any new and significant information that may impact a research participants' safety or willingness to continue in the study and any unanticipated problems involving risks to participants or others.

DHHS regulations at 45 CFR 46.109 (e) require that **continuing review** of research be conducted by the IRB at intervals appropriate to the degree of risk and **not less than once per year.** The regulations make **no provision for any grace period extending the conduct of the research beyond 10/13/2013.** You will receive continuing review email reminder notices prior to this date; however, it is your responsibility to submit your continuing review report in a timely manner to allow adequate time for substantive and meaningful IRB review and assure that this study is not conducted beyond **10/13/2013**. Investigators should submit continuing review reports in the electronic system at least six weeks prior to this date.

Research activity in which the VA Maryland Healthcare System (VAMHCS) is a recruitment site or in which VA resources (i.e., space, equipment, personnel, funding, data) are otherwise involved, must also be approved by the VAMHCS Research and Development Committee prior to initiation at the VAMHCS. Contact the VA Research Office at 410-605-7000 ext. 6568 for assistance.

The UMB IRB is organized and operated according to guidelines of the International Council on Harmonization, the United States Office for Human Research Protections and the United States Code of Federal Regulations and operates under Federal Wide Assurance No. FWA00007145.

If you have any questions about this review or questions, concerns, and/or suggestions regarding the Human Research Protection Program (HRPP), please do not hesitate to contact the Human Research Protections Office (HRPO) at (410) 706-5037 or HRPO@som.umaryland.edu.

Appendix D: NRH Approval Notice

MedStar Health
Research Institute

6525 Belcrest Road
Suite 700
Hyattsville, MD 20782
301-560-7300 PHONE
301-560-7373 FAX
medstarresearch.org

Approval Notice
Response to Stipulations - (Initial Review)

19-Nov-2012

14805 Athey Road
Burtonsville, MD 20866

Protocol Number: **2012-380**
PI Name: **Helen John Wilson RN, MSN, DNPc**
Protocol Title: **Implementation of the Agitated Behavior Scale in the Electronic Health Record**

Dear Helen John Wilson RN, MSN, DNPc,

The **Response to Stipulations - *(Initial Review)*** submission was reviewed by **IRB # 1 Washington** in accordance with expedited review procedures on **16-Nov-2012**.

The IRB has approved the submission. You can begin research activities. **The approval is valid from *16-Nov-2012* through *15-Nov-2013***. Any modifications to the IRB-approved protocol and other supporting documents must be reviewed and approved by the IRB prior to implementation.

If the study will continue beyond *15-Nov-2013*, please submit a continuation request form forty-five (45) days prior to *15-Nov-2013* to allow the IRB sufficient time to review and approve the request.

Please refer to the Office of Research Integrity website to review the **Principal Investigator's Responsibilities** as a MedStar researcher on http://www. medstarresearch.org/Body.cfm?id=243.

If you have any questions, please contact me at 301-560-7339.

Thank you,

Jacqueline Steenbakker
Office of Research Integrity

Enclosure: Stamped HIPAA Waiver
Stamped Survey Questionnaire
Stamped Behavior Scale

Knowledge and Compassion
Focused on You