

12-11-2009

A Head Injury Teaching Module For Pre-Hospital Assessment: Using The FOUR Score

Chris A. Wolf
Augsburg College

Follow this and additional works at: <https://idun.augsburg.edu/etd>



Part of the [Nursing Commons](#)

Recommended Citation

Wolf, Chris A., "A Head Injury Teaching Module For Pre-Hospital Assessment: Using The FOUR Score" (2009). *Theses and Graduate Projects*. 476.

<https://idun.augsburg.edu/etd/476>

This Open Access Thesis is brought to you for free and open access by Idun. It has been accepted for inclusion in Theses and Graduate Projects by an authorized administrator of Idun. For more information, please contact bloomber@augsbu.edu.

A Head Injury Teaching Module For Pre-Hospital Assessment: Using The FOUR Score

CHRIS A. WOLF

AUGSBURG COLLEGE

**Augsburg College
Lindell Library
Minneapolis, MN 55454**

Submitted in partial fulfillment of the
requirement for the degree of
Master of Arts in Nursing

AUGSBURG COLLEGE
MINNEAPOLIS, MINNESOTA

2009

**Augsburg College
Department of Nursing
Master of Arts in Nursing Program
Thesis or Graduate Project Approval Form**

This is to certify that **Chris Wolf** has successfully defended her Graduate Project entitled
**“A Head Injury Teaching Module for Pre-Hospital Assessment: Using the Four
Score”** and fulfilled the requirements for the Master of Arts in Nursing degree.

Date of Oral defense December 11, 2009.

Committee member signatures:

Advisor: Dr Susan K Nash Date 12-11-09

Reader 1: Joan Brandt Date 12-11-09

Reader 2: Barbara Johnson Date 12-11-09

The function and duty of a quality human being is the sincere and honest development of one's potential.

- *Bruce Lee*

Dedication

I would like to dedicate this work to my family. These individuals have been my inspiration, my source of support, and my source of strength. They have sacrificed to make all of this possible.

Acknowledgements

I wish to thank Augsburg College faculty, staff, and fellow students for their support and efforts on my behalf. I would like to acknowledge the extra efforts of my thesis advisor, Dr. Susan Nash, and readers, and thank them for their support and guidance. I would like to acknowledge the members of the 109th Aeromedical Evacuation Squadron, Minnesota Air National Guard, who graciously participated in this project. Finally, I would like to acknowledge the work of Dr. E.F.M. Wijdicks and his development of the FOUR Score.

Abstract

A Head Injury Teaching Module For Pre-Hospital Assessment: Using the FOUR Score

CHRIS A. WOLF

Field Project

The purpose of this project is to create a teaching module and evaluation tool for a United States Air Force Aeromedical Evacuation Squadron for the pre-hospital assessment of patients with head injuries using the FOUR Score assessment scale. Specifically, this project integrates theory, relevant literature, and reflection on service to and caring for others. Information from published literature supports the development and implementation of a new assessment tool, such as the FOUR Score, to assess patients who have suffered a head injury. Ultimately, a teaching module is presented, described, and evaluated, along with potential questions to be addressed in the future.

Table of Contents

Acknowledgements	iv
Abstract	v
CHAPTER 1 (Introduction)	1
Background	1
Purpose/Significance	3
Theoretical Perspective	5
CHAPTER 2 (Literature Review)	7
Background	7
Review of the ‘Gold Standard’	8
A New Head Injury Scale	10
A Teaching Module for Pre-hospital Providers	11
Theoretical Perspectives	13
CHAPTER 3 (Methodology)	18
Description	18
Implementation	19
CHAPTER 4 (Evaluation)	28
Description of Evaluation Procedures	28
Analysis	29
Reflection	30
CHAPTER 5 (Discussion)	34
REFERENCES	39

HEAD INJURY TEACHING MODULE

APPENDICES

A	45
B	46
C	47
D	48
E	49
F	50
G	52

TABLES

1 Educational Module Slide Presentation	50
2 Likert Survey Questionnaire Data	29

Chapter One: Introduction

Background

The Glasgow Coma Scale (GCS) was developed by Teasdale and Jennett; neurosurgery professors at the University of Glasgow who wanted the tool to be used to help determine level of consciousness in patients with head injuries (www.brainandspinalcord.org). Over the past 30 years, the GCS has become the gold standard in predicting outcome following nontraumatic and traumatic head injury largely because of its simplicity (Grmec & Gasparovic, 2001). The GCS has been the most commonly used and widely accepted coma rating scale and since its inception in 1974 no meaningful modification has occurred. Other scales have been introduced, but over time have proven to be difficult for use in practice (Teasdale & Jennett, 1974). These scales were too complicated (Rowley & Fielding, 1991) or found too much variation between observers (Starmark, Stallhammar, Holmgren & Rosander, 1988). The GCS is used in nations throughout the world (Aarabi, 1990; Boots, 2006; Briones Claudett, 2008; Levi et al., 1990) and in many different situations (Antia, 2005; Holcomb, 2005; Xia, 2005).

In spite of limitations, the GCS has become the gold standard and most widely used method of assessment of patients with brain injuries (www.ssgfx.com). It is used primarily because it is simple, has a relatively high degree of inter-rater reliability, and because it correlates relatively well with patient outcomes.

While the GCS has been proven to be a useful tool and it has also been proven to have shortcomings (Drake, McDonald, Magnus, Gray & Gottshall, 2006). First, the verbal component is often not assessable as many head injured patients are intubated. Second, the GCS ignores brainstem reflexes that are a key component of examination of head injured patients. Third, the reliability of the GCS may be dependent on the training of personnel using the scale (Riechers et

al., 2005). Because of the shortcomings of the GCS, there have been many attempts to develop new scales to replace it.

A major deficit of the GCS is its inability to assist in evaluation of those patients who are intubated. In these patients, the verbal component of the GCS cannot be assessed. In contrast, a recently introduced scale, the Full Outline of UnResponsiveness Score, commonly referred to as the FOUR Score, (Wijdicks, Bamlet, Maramattom, Manno & McClelland, 2005) has been developed. It has been tested and validated in hospital settings located within a major medical center and teaching hospital, including a Neuroscience Intensive Care Unit (ICU) (Wolf, Wijdicks, Bamlet & McClelland, 2007) and a Medical ICU (Iyer et al., 2009). This scale is more comprehensive but maintains as much simplicity as the GCS to be useful in practice. The FOUR Score has excellent validity and predicts outcome. This scale adds new components and ignores the verbal response of the GCS (Appendices A & B).

All branches of the United States military use the GCS as part of patient assessments, including the US Air Force (AFI 41-307). One recent article noted that the GCS is the primary means by which combat casualties are triaged (Riechers et al., 2005). Interestingly, the authors determined that level of knowledge of the GCS among military physicians is poor, even in a population of individuals with specific training in use of the scale. The article concluded that methods for improving accurate quantization of level of consciousness need to be explored. Exploration of new methods to better triage and treat patients within a system as large as the United States military is one challenge for this project. The U.S. military is a top-down hierarchy and many decisions would need to be made in order for a new head injury scale to be implemented. Using this project as an example, it may be necessary to have this project completed and published in a reputable journal to gain acknowledgment. The findings may need

to be validated by peers. Next, a senior level decision-maker within the military would need to have knowledge of the project. Finally, that person would need to give orders to have the new method implemented. This is a simplified scenario; in reality this may take years to happen if it happens at all.

Purpose

The purpose of this project is to create a teaching module and evaluation tool for a US Air Force Aeromedical Evacuation Squadron (AES) on the pre-hospital assessment of patients with head injuries using the FOUR Score scale. Finding a better tool to use to evaluate patients with head injuries is not only a major undertaking, but also a critical need. According to Butler (2001), most (31%) of the combat troops killed in action (KIA) are killed by penetrating head trauma. Some of the KIA may be saved if a better tool was used to evaluate and triage these patients. In addition, a Centers for Disease Control and Prevention analysis estimated that approximately 1.4 million people present to hospitals each year for medical care related to traumatic brain injury (TBI) (Summers, Ivins & Schwab, 2009). Summers also noted that TBI is a common injury and that outcomes after TBI vary greatly (2009). Using a tool, such as the FOUR Score, may help reduce the variability of outcomes.

The FOUR Score has several major advantages to the GCS. These advantages were first reported in the initial study of the FOUR Score (Wijdicks et al., 2005). The advantages include:

1. It adds assessment of breathing and brainstem reflexes and expands upon the eye and motor responses.
2. It detects locked in syndrome and pseudo coma. It also validates the presence or absence of a vegetative state in which the eyes can be spontaneously open.

3. The introduction of brainstem reflexes aids the examiner to assess all components of the brainstem and the respiratory drive. Presence or absence of these exam components is likely essential in outcome determination and need for brain death evaluation.
4. The motor response ignores the difference between decorticate and withdrawal response, which has always been hard to grade, but adds an additional level of alertness.
5. The total score (16) is close to the GCS (15). However, all individual components have four points each for easy recall. In addition, the lowest possible score for each component is zero, which makes for more intuitive sense than a minimum GCS score of three. For family members, it is easier to convey a poor prognosis with a score of zero in contrast to a GCS score of three. A zero score also alerts examiners to potential need for brain death evaluation. (Wijdicks et al., 2005, p. 592)

Over the past century there has been tremendous transformation in the understanding of head injuries (Wijdicks, 2008). Different categories of injuries – coma, locked in syndrome, brain death – have emerged. These terms and conditions will be discussed in greater detail in Chapter Two.

Examiners may find it difficult to examine a patient with a head injury, but because the techniques of examination have evolved greatly the exam of the patient with a head injury should not be seen as difficult. Examination of patients with head injuries is a fundamental skill. Scales such as the FOUR Score can be useful to help care providers better understand the degree of head injury (Wijdicks, 2006). The FOUR Score, and tools like it, would complement a thorough patient history and knowledge of events which led to the injury.

The author completed an Ovid Medline search to determine when branches of the US military began using the GCS in patient assessments. No articles were found during the search,

using 1975 – 1985 as a time frame and keywords Glasgow Coma Scale and military. When used separately during the same time period, Glasgow Coma Scale had 4923 hits and military had 454 hits. For purposes of this project, the author assumed that the GCS began to be used by branches of the US military during the late 1970's, or approximately 30 years ago. It should be noted that neither the US Air Force, nor members of the US Air Force, have officially endorsed or supported use of the FOUR Score. For purposes of evaluating head injuries, brain injuries, coma, etc the GCS is the assessment tool officially used (AFI 41-307). This does not mean however, that a new assessment tool could not be an improvement.

Theoretical Perspective

Nurse theorist Jean Watson's Philosophy and Science of Caring (2008), Caring Science, or *Caritas Processes* (CP) guide this project and provide the groundwork for the process of creating an educational tool used to teach aeromedical health care providers a new method of evaluating patients with head injuries. Watson's *Caritas Processes* support the need to promote increased communication, provide additional education, and foster a stronger knowledge base for optimizing nursing care. Applying CPs could assist in promoting safer bedside practice, enhance survival and recovery, and minimize the potential for untoward effects.

Nurses play a central role in survival and recovery of patients with head injuries. They assume responsibility to provide effective care, deliver patient and family education, evaluate pain and adverse effects, collaborate with physicians and other health care providers, and monitor responses to therapies to ensure patient safety. The significance of addressing the care of patients with head injuries is increasingly more complex and similar in scope to addressing the care of wounded warriors requiring amputations. It is a necessity to provide updated, and

Chapter Two: Literature Review

A review of the literature was completed to determine background information regarding head injury assessment tools and methods used to introduce those tools. Several literature reviews were completed. Topics of the reviews included: GCS, FOUR Score, learning theory, and theoretical perspectives of Watson and Greenleaf. These topics are discussed in this literature review section.

Background

Initial interest in the FOUR Score led to the completion of the first FOUR Score validation study, published in 2007 (Wolf et al.). Since that time, the author of that study wanted to determine how the FOUR Score compared to the GCS in pre-hospital settings. By speaking directly to more than one dozen leaders of pre-hospital care providers throughout Minnesota and Wisconsin, it was determined that the level of interest in the completion of a validation study was low and therefore no pre-hospital study was initiated. In spite of that low interest, a literature review was completed using Ovid Medline and 2005 – 2009 as reference years along with keywords such as FOUR Score, pre-hospital, education tool, and education module. This literature review did turn up over 1000 articles related to coma or brain injury. There was no specific tool used to teach the FOUR Score to care providers either in or out of the hospital.

The 109th Aeromedical Evacuation Squadron (AES) is part of the Minnesota Air National Guard and has approximately 100 members who are primarily Flight Nurses and Medical Technicians. This squadron is also part of the United States Air Force. One major task of this squadron is to move patients, often from battle zones or places of humanitarian need, to locations with higher levels of patient care. The squadron operates in teams of five primarily on cargo aircraft specifically designed to carry patients. Leaders of the 109th AES determined it was

appropriate to present an educational module specifically designed to teach members of the 109th AES a new method of evaluating patients with head injuries.

The U.S. military is currently re-examining the training of medics. According to McCarthy, this re-examination is long overdue (2003). Military personnel are often deployed in increasingly remote locations at a great distance from sophisticated professional medical care (Cloonen, 2003). A review of the Glasgow Coma Scale is needed as part of the overall review of the training of medics.

Review of the ‘Gold Standard’

The GCS is an internationally recognized tool used to assess patients with suspected or confirmed brain injuries (Huntley, 2008). Since its inception in 1974 the GCS has gained widespread acceptance around the world as a means of assessing the level of consciousness of patients with head injuries (Rowley & Fielding, 1991). “Dr Teasdale, co-developer of the GCS, once stated ‘The GCS was developed to fill the need for a practical method to assess impairment of consciousness in all types of patients with acute brain insult, in all settings, by all kinds of staff, at all times, often minute by minute’ ” (Sullivan, 2005, p. 1). “Dr Marion also stated ‘It’s important to remember that Dr Teasdale devised the GCS for nurse use. They were concerned that nurses would be able to accurately report to the next shift and to physicians the status of the patient. It’s important that we don’t forget this’ ” (Sullivan, 2005, p. 13). Yet because of many of the problems with use of the GCS, as stated in Chapter One, there are those who may feel that the GCS has an unwarranted position as the gold standard. In Rowley’s *Lancet* article, the GCS was found to be used accurately by experienced and highly trained users, but inexperienced users made consistent errors (1991). “The assertion that the GCS is usable by personnel of all grades of experience has never been supported by evidence of accuracy, and our results do not support

it” (Rowley & Fielding, 1991, p. 537). Prior attempts at modifying the GCS or developing entirely new scales “have not come to fruition, largely because the GCS is an example of admirable simplicity” (Wijdicks, 2008, p. 71).

There are conflicting views of the GCS and its use in pre-hospital environments. Holcomb stated that “the ability to accurately triage trauma patients can be difficult in the prehospital environment...scoring systems have been developed with a goal of determining which patients should be transported immediately to a trauma center, thus benefiting from life saving interventions” (2005, p. 7). Yet despite poor GCS scores, patients may make a full recovery (Hanna, 2004). In another article Convertino stated that “most prehospital medical interventions during civilian and military trauma casualty transport fail to utilize advanced decision-support systems for treatment and delivery of medical interventions” (2008, p. S342). One study, using patients who sustained head wounds during the Iran-Iraq war, yielded results showing that the two best predictors of mortality were a low GCS and infection (Aarabi, 1990). Additionally, a study by Menegazzi et al. sought to determine the reliability of the GCS when used by emergency room physicians and paramedics (1993). Menegazzi found that the GCS was significantly reliable and demonstrated a significant level of intra-rater reliability between the emergency physician group and the paramedic group. According to Riechers et al., overall physician performance of the GCS was “marginal” (2005). Riechers stated that many physicians “were able to identify what ‘GCS’ stands for, but far fewer were able to identify the titles of the specific categories, let alone identify the specific scoring of each category...to optimize outcome from combat related head injury, methods for improving accurate quantization of neurologic state need to be explored.” (p. 1327). The conflicting findings of many GCS-related studies

speak directly to the purpose of this project; to begin to look at a new method of evaluating head injuries.

For purposes of this project, head injury is considered any trauma to the head (www.emedicinehealth.com). In contrast, coma is defined as a condition in which the patient is unarousable, unresponsive, and lies with the eyes closed (Plum & Posner, 1980); brain death is defined as irreversible cessation of all brain functions of the entire brain (Wijdicks, 2002); and Locked-in Syndrome is defined as a neurological condition in which the patient is alert but is unable to communicate except for blinking and vertical eye movements. All voluntary motor activity below the level of the third nerve nuclei is lost (Wijdicks, 2008, p. 65). This project will not include injuries related to blasts or explosions causing concussions or mild traumatic brain injuries without a direct blow to the head.

A New Head Injury Scale

The FOUR Score was introduced by Dr. EFM Wijdicks in 2005. The purpose of this new coma scale was to address shortcomings of the GCS, while maintaining simplicity (Wijdicks et al., 2005). This new scale has been validated, is more comprehensive, and predicts patient outcomes better than the GCS (Wijdicks et al., 2005). Advantages of the FOUR Score include: adding assessment of brainstem reflexes and breathing; expanding upon the eye and motor responses; aiding the examiner in assessing respiratory drive. All components have four points for easy recall. In addition, this new assessment tool was validated using experienced and inexperienced nursing staff in a clinical setting during 2006 (Wolf et al., 2007). This validation study clearly showed that the FOUR Score was equally easy to use, had slightly better inter-rater reliability, and was much better at providing insight to patient outcomes.

A Teaching Module for Pre-hospital Providers

A literature search was conducted using Ovid Medline and the years 2003 – 2009. Using keywords education model, over 1800 articles were retrieved. By adding the keyword pre-hospital, the search was narrowed to less than 30 articles. One article discussed the incorporation of a five-step tool to improve clinical teaching skills of nursing preceptors (Kertis, 2007). This five-step tool has been used successfully in residency programs and has only recently been introduced to nursing preceptors. An article by Hamer presented a capacity-building model designed to allow inexperienced nursing staff to develop their knowledge, skill, and experience in several different areas while flowing through assessment and planning, through implementation and monitoring, and to evaluation and feedback (2008). A final article was aimed at evaluating programs already in place (Menix, 2007). Several articles related to teaching topics within the military. An article by Barillo et al. was found to be useful for teaching the fundamentals of burn care during the first 24 hours of care, but several add-on modules were necessary to meet specific needs of military audiences (2005). Many of these models may have been adapted and used for this project but were deemed inappropriate for various reasons including different audiences and different intent. In addition, these articles offered very little information relating to learning theory.

Another Ovid search was completed using 2000-2009 and additional terms such as military, medicine, and training. Results of this search yielded 1885 articles. After abstracts were read, approximately 65 articles were deemed relevant. One article, by Butler, discussed tactical training programs for special operations forces and how these small groups teach and provide trauma care (2001). The rationale for the trauma care training program lies in data indicating that

31% of troops killed in ground combat die due to head trauma. Another 25% die as a result of torso trauma. An actual educational model was not presented by Butler however.

An article submitted by a Turkish Naval Officer was determined to be appropriate and adaptable (Yaren, Kir, Ucar, Gocgeldi & Hasde, 2004). This article introduced a training model used to teach enlisted military men about sexually transmitted diseases. The training model introduced by Yaren was original and innovative; it was developed to address a need within the Turkish Armed Forces (TAF). A literature search indicates that no one has tested the model to independently validate its effectiveness. The Yaren model consists of two segments. The first segment involved training the trainers who would be providing health education. The second segment, which this project is based upon, involved training the men serving in the TAF. The breakdown in the training of these men included a lesson plan as follows: adult training and health training; overview of STDs (history, prevalence, significance); specific STDs and their background; and characteristics, advantages, and rules of condom use. In addition, pre and post tests were administered to determine knowledge levels of course participants. This article also offered no learning theory as a basis. Participants in the Yaren article were adults, so it is surmised that the study was grounded in adult learning theory.

In education, one definition of learning is a process which brings together cognitive, emotional, and environmental influences to allow changes in a person's knowledge (Illeris, 2001). This is an open definition, covering all processes that lead to relatively lasting changes. Yet learning is also a complex process involving biological and societal elements working together in a complex interaction. The Illeris model of learning involves interactions between an individual, the environment, and a psychological acquisition process. This model also adds cognitive, psychodynamic, and social dimensions used to build up the abilities, identities, and

participation of learners (para. 11). In a similar way, incorporating the individual, psychodynamic, and social dimensions, the FOUR Score will be introduced, taught, and practiced in scenarios by an instructor with knowledge of the new assessment tool to care providers with no knowledge of the new tool.

Based on this literature review, a one hour educational module for pre-hospital care providers with little or no previous experience with the FOUR Score was designed. This module was to take place within a formal learning environment; a student – teacher relationship would be established in a small classroom or auditorium. As noted earlier, examination of existing curricula revealed that no present course exactly fit these needs.

Theoretical Perspectives

This educational module is grounded in theoretical frameworks developed by Robert Greenleaf and Jean Watson and operationalized within the context of the military code of conduct. Greenleaf's Servant Leadership Theory, and how it relates to both the military and the introduction of a new head injury scale, will be addressed, and Watson's Theory of Human Caring will be applied to this project to provide guidance.

In his work, titled 'Servant Leadership', Robert Greenleaf (2002) explains that in order to be a leader, a person must make a conscious choice to aspire to lead and he explains his thesis as such: "caring for persons, the more able and the less able serving each other, is the rock upon which a good society is built" (p. 62). Yet to be a servant-leader, one must begin with a feeling that one wants to serve first. Mr. Greenleaf's legacy and teachings related to servant-leadership continue on through an educational website, www.greenleaf.org. According to this organization there are many benefits of servant-leadership which include: a long-term approach to life and work with the potential to create positive change throughout society; collaboration; a focus on

service to followers. Greenleaf (2002) stated “if one is a servant...one is always searching, listening, expecting that a better wheel for these times is in the making” (p. 23). Servant-leadership is not a quick-fix approach and may not be quickly instilled in an institution. This form of leadership may also be perceived as soft due to perceived indecisiveness.

Members of the U.S. Air Force are expected to adhere to a Code of Conduct and are inspired by Core Values (Appendix C) (<http://www.airforce.com>, October 1, 2009). The second Core Value, Service Before Self, involves placing professional duties before personal desires. This value follows closely with what Greenleaf speaks to; serve others with a respect acknowledging their worth as human beings. People outside of hospitals deserve, and may need, the best care available, just as patients in hospitals should be receiving the best care available. All care providers, regardless of location, should be providing the best care possible while respecting the individual that is being cared for.

With this project in mind, advocates of Servant Leadership have a responsibility. Advocates must show others that it is possible to transfer caring from individuals to groups. Just as it is possible to serve one, it is possible to serve 100. One major task of the author is to introduce the new assessment tool to an audience that has no knowledge of the new tool. Part of this task will include: discussing the rationale for needing the new tool; discussing the validation of the new tool; showing advantages and disadvantages of the new tool; demonstrating how the new tool is applied; allowing the audience to practice scenarios using the new tool; and allowing time for discussion or questions about the new tool. There is a perceived difficulty because there may be less personal attachment to large groups or organizations. Yet large organizations deserve service, caring, and respect just as much as the individual. Leaders have the responsibility to

demonstrate integrity in their actions with these large organizations, such as an air force, just as with individuals.

Although terminology is different, many of Mr. Greenleaf's underlying themes such as service, collaboration, and positive change seem to be relatively similar to Watson's theoretical approach. In her work, Watson (2008) places a high value on caring, societal missions, and assisting with basic human needs. Watson's Theory of Human Caring (THC) was developed in the late 1970's and since that time has evolved into ten Caritas Processes (Appendix D) which serve as a guide for nursing practice models and research.

This project is guided in part by this exact sense of caring. The project started from a "calling": wanting to determine if a new head injury assessment tool is appropriate in a pre-hospital environment; wanting to create an educational module to teach a new head injury scale; and wanting to create change in an organization not necessarily known for change. By following this calling, and the Core Values of the U.S. Air Force, the author is able to express caring (for individuals and organizations) and be of service to the nation and mankind.

Some of Watson's Caritas Processes (CPs) seem to relate strongly to this project. For example CP Six (2008, p. 107) is a process involving the creative use of self and all ways of knowing as part of the creative process. Watson states (2008, p. 111) that it is "critical to have evidence and empirical knowledge for professional practice, yet 'evidence' can take many different forms." In addition, CP Seven addresses engaging in genuine teaching-learning experiences which attend to unity of being and subjective meaning (2008, p. 125). Watson adds (p. 125) that this requires meaningful relationships as well as timing and sensitivity to the teaching moment. All of this entails creativity, planning, and action. It is within this CP that

Watson explains *caritas coaching* (2008, p. 127); embracing transpersonal and unity views of teaching, but involving greater depth in working within another's frame of reference.

For this project *caritas coaching* is used on a personal level. This project is based on inner goals: developing a teaching module; introducing a new assessment tool; creating foundations for change; serving others. Through the completion of this project, support systems may be recognized and new ways of thinking may be realized. In other words, new problems may not be solved by using old solutions; creative solutions may have to be used. Through this process a personal maturation may be realized

CP Eight discusses creating a healing environment at all levels. Watson includes comfort, safety, privacy, human dignity, and clean aesthetic surroundings within this CP (2008, p. 129). Finally, CP Nine involves administering sacred nursing acts of caring-healing by tending to basic human needs (2008, p. 170). Watson states "everyone has a longing to engage in life with a sense of accomplishment and expressive achievement that contributes to the greater good, beyond self" (2008, p. 176).

Linking Watson's CPs with this project is relatively easy. CP Six and CP Seven provide guidance and influence when in connection with creatively using the Yaren (2004) teaching model and using the FOUR Score in a pre-hospital environment. CP Eight and CP Nine factor into this project with regards to providing a better tool with which to treat and care for patients. Creatively caring and providing dignity is important, not just for patients, but for the people providing the care as well. In addition, there is an eye toward sacred acts, not just in providing care to patients, but also when providing an educational experience to aeromedical nurses and medics, and even connecting a sense of contribution to a greater good from the author. The use of the FOUR Score is about more than contributing caring and dignity; it is also about striving to

achieve the development of a new tool in order to provide safe, comprehensive care to individuals who may need that care in a prehospital setting.

Throughout the 2008 text, Watson acknowledges caring as essential to nursing. Service and caring are moral ideals, preserving human dignity and shaping practice. This project addresses more than just teaching modules and assessment tools. This project examines a new method to better care for patients in a pre-hospital environment in order to maximize their dignity through better patient care. This project is also reflected in Air Force Core Values; displaying Excellence through a passion to continually improve our service and ourselves.

Chapter Three: Methodology

The focus of this project addresses two important topics: introducing the FOUR Score in a pre-hospital setting; finding a better tool to more appropriately triage patients with head injuries. The focus of this chapter is to provide an outline of how the project was implemented. A description of the project and discussion of how the project was implemented, including an outline of the educational module are included.

Description

The author used Ovid on January 21, 2009 to find a teaching model or tool to use to introduce the FOUR Score to the 109th AES. The 109th AES is an Aeromedical Evacuation Squadron in the Minnesota Air National Guard and consists of approximately 100 personnel (Flight Nurses and Medical Technicians). Using 1995 – 2009 and terms teaching model and nursing, 1693 articles were found. The author scanned abstracts within this group for the keyword military, in order to find articles where nursing teaching models may have been used within a military setting. Less than one dozen articles were found. Many of these articles were brief and editorial in nature (Barker, 2003; McCarthy, 2003). One article did provide an in-depth look at the preparation of a training model in the Turkish Navy (Yaren et al., 2004). Dr. Yaren separated this training model into smaller lessons involving an overview, history, prevalence, characteristics, advantages, and adult training.

In the group of abstracts without the keyword military, the author found several different training models. The method used to introduce the FOUR Score to the 109th AES will be patterned after the training model used by Yaren (2004). Yaren used a several step process to set up the training model: (1) determine the knowledge level of the students; (2) prepare training programs and materials according to the knowledge level; (3) train the trainers; (4) measure the

effectiveness of the training provided to the trainers; (5) training of the students by the trainers; (6) measure the effectiveness of the training provided to the students.

Yaren broke down the actual training as follows: (1) adult training; (2) overview, history, and significance of the subject matter; (3) general characteristics of the subject matter; (4) specific characteristics of the subject matter. This project will follow the basic outline as presented by Yaren. This training model was selected primarily due to ease of use and adaptability to different subject matter. The FOUR Score has not been introduced to members of the US military, so members of the 109th AES will have no prior knowledge of the subject matter. All members of the 109th AES are adults; subject matter will be prepared accordingly and materials or knowledge will be presented by PowerPoint, lecture, and paper handout. No trainers will need to be trained for this project; education and training will be provided by the author.

In addition, the material will be taught in a progression consisting of: (1) overview, history, and significance of scales used to evaluate brain injuries; (2) general characteristics of the GCS, including advantages and disadvantages; (3) overview of the FOUR Score, including advantages and disadvantages; (4) demonstrations and scenarios using the FOUR Score; and (5) evaluation of the training model by the participants.

Implementation

The teaching module will be completed during a training duty weekend of the 109th Aeromedical Evacuation Squadron. The 109th AES is stationed at the Minneapolis – St. Paul, MN Air Force Reserve Station under the command of the 133rd Airlift Wing, Minnesota Air National Guard. Participants include approximately 100 members of the 109th AES, which include Flight Nurses and Medical Technicians. In keeping with the teachings of Greenleaf, the

author will be serving other Air Force Airmen by helping those Airmen learn more about caring for patients with head injuries.

In spite of limitations, the GCS has become the gold standard and most widely used method of assessment of patients with brain injuries (www.ssgfx.com). It is used primarily because it is simple, has a relatively high degree of inter-rater reliability, and because it correlates relatively well with patient outcomes.

There is a minimal amount of education directed at teaching new methods of evaluation of head injuries in a pre-hospital setting. With this in mind, a review of the literature yielded an article that studied student perceptions of the use of PowerPoint during educational sessions (Frey & Birnbaum, 2002). This study involved 160 university students who completed a 12 item Likert scale survey and two open-ended questions regarding the use of PowerPoint. Results of this study found that students agreed that PowerPoint had a positive effect on lecture and were preferred over traditional lectures. Reasons cited included better organized lectures, easier to take notes, and more helpful with studying for exams. Frey and Birnbaum also concluded that lectures enhanced with presentation software are a relatively passive tool, used to organize and enhance lectures, while holding the students attention (2002, p. 8). Results from another study showed that PowerPoint presentations should not be viewed as a replacement for traditional lecture, but instead as an enhancement for the lecture (Szabo & Hastings, 2000). This study also found that PowerPoint did appear to benefit learner recall. Results of a United Kingdom study with 130 students found that students attending lecture with PowerPoint scored higher on exams than did students attending lecture without PowerPoint (Lowry, 1999). Harknett and Cobane (1997) surveyed students and found that 80 percent of those students felt that PowerPoint lectures

benefitted learning. Some of those students also felt that the visual emphasis of PowerPoint during lectures helped them recall lecture material.

With this in mind, this project will be based around a PowerPoint presentation to hold the students' attention and organize the lecture in a visual manner. Lecture will also be used to deliver the information for students who are auditory learners. Finally, practical scenarios will be used to address the learning needs of students who learn best by doing, or actively participating. An important point to consider is that the willingness to serve others can be an acknowledgment that educators may also need to leave their comfort zones (Greenleaf, 2002). Educators may need to tailor their service to fit the needs of audience members, even if there are a variety of needs which have to be met. People learn differently, and this module is set up to meet the needs of different types of learners. *Caritas coaching* is an important concept during this timeframe (Watson, 2008). It will be important to operate from others' frame of reference. It will also be vital to role model and invite learning from each other. This is an important concept; a helping, trusting relationship is vital not just for the presenter teaching the audience, but also for members of the audience who are relying on the expertise of the educator to help them achieve their goals. It will be important to acknowledge the service to others; helping the audience to grow and in turn help them to better serve others. This is a key element of Greenleaf's (2002) Servant Leadership and a foundation of the Core Values of the United States Air Force (www.airforce.com).

This project is set up being mindful that the students are adult learners, as well as care providers. Adult learners learn differently from younger learners, according to Malcolm Knowles (www.infed.org, October 22, 2009, para. 15). In addition to learning differently, there is different interplay between the cognitive and psychodynamic functions (Illeris, para. 21). How situations

are experienced, the emotions and motivations involved, and the mental energy involved all play roles in adult learning. This relates directly to CP Six (Watson, 2008) and being open to new ways of knowing and using evidence from rational, emotional, and spiritual intelligences.

Knowles (www.infed.org) found several characteristics unique to adult learners: adults are self-directed; personal experiences are a resource for learning; readiness to learn becomes oriented to social roles; motivation to learn is more internal; and new knowledge is applied quickly. One phrase to describe this may be ‘authentically present’ (Watson, 2008); both the educator and adult learners may find themselves more present due to increased readiness to learn, increased motivation, and increased self-direction. Within the U.S. Air Force, Airmen are typically taught in classrooms using lecture, followed by time for questions or comments. Depending upon what is being taught, there may be a segment for active participation. Most Air Force speakers or educators now use lecture along with PowerPoint. Other federal organizations use similar methods to educate students. Training methods include: lecture (to control time and keep the group together); role play (to aid retention and practice new skills); group discussion (to maintain interest and share resources); case study (to get students involved); and demonstration (to aid understanding and retention) (www.usdoj.gov, October 22, 2009, p. 7). The following section provides an outline of the PowerPoint presentation:

- I. Title
- II. Display of model outlines
- III. Disclaimer
- IV. Objectives
- V. History & Background

- early descriptions

- late 20th century descriptions

VI. The “Gold Standard”

- background

- advantages

- disadvantages

- study findings

VII. A New Method

- background

- advantages

- disadvantages

VIII. Display of head injury scales

IX. A New Method visual aid

X. Applying the scales; scenario examples

XI. Conclusion

In addition, there are several points worth mentioning about the PowerPoint presentation, which is shown in Table One (Appendix F) and Appendix G. First, the title slide coincides with an introduction explaining that the presentation is a part of a larger project, which involves grounding and guiding the presentation through theories based upon adult learning, caring, and service. The next slide displays the educational model which this module is adapted from. The intent of this second slide is to display both the model and the module next to each other to allow the audience to visualize the similarities and differences. Moving along through the presentation,

there are additional slides which are used to introduce the audience to the history and background of assessment tools used to evaluate patients with head injuries. This section details early knowledge and case studies from the 16th century through the 20th century. It is important to note in this section that an explosion of new knowledge occurred in the mid to late 20th century. Several assessment tools were developed, but none were as universally accepted as the GCS, which was introduced in 1974. An example of the lecture, from Slide # 5, is included:

Descriptions of patients with head or brain injuries have been found in documents dating back to the 16th century. Although seemingly rudimentary now, at the time, this new base of knowledge was considered innovative. This new knowledge led to further advances and documentation into the 18th and 19th centuries. In particular, during the 19th century, a large volume of written material focused on case studies relating head injuries with various types of organ failure. Again, this led to more knowledge in the 20th century, where we see an explosion of new data, medical advances, and texts dedicated to knowledge of the brain.

During the presentation, it is important to acknowledge the audience and convey a sense of caring. One method used to convey this caring is to use appropriate eye contact. This would also be important to convey a sense of knowledge of the subject material and a sense of professionalism. This is particularly true in Air Force presentations where presenters may be graded upon the knowledge and professionalism conveyed.

The next section details the introduction and acceptance of the GCS. It is important to stress that studies have shown the GCS to be very useful and studies have shown the GCS to have faults. It is worth mentioning that often authors who find fault with the GCS also recognize that it is an admirable and simple tool for evaluation of patients with head injuries.

The section which follows the GCS section introduces the new assessment tool; the FOUR Score. This section makes note that this new tool was developed specifically to address the shortcomings of the GCS. It has been validated in hospital settings, but no studies have tested the FOUR Score in other settings. Several advantages of the new scale are discussed in the following slides, as well as disadvantages. The primary disadvantages at this time pertain to the necessity to learn another assessment scale, and the usefulness of the new scale outside of a clinical setting. An example of the lecture, from Slide #15, follows:

By completing validation studies, and through use of the new scale, some disadvantages have been found. One disadvantage is that this is yet another scale to assess head injury. It is interesting to note how many different assessment scales or tools can be uncovered with a basic literature review. Another disadvantage may be scoring all components of the FOUR Score individually. The widespread use of the GCS and of totaling the component scores may be a difficult habit for care providers to break. Finally, this new tool has not been validated in pre-hospital settings. This is an important point, since many care providers outside of a hospital may be First Responders, Medical Technicians, Paramedics, or other non-Nursing or non-Physician providers. The level of education and training among these people may be significantly different.

During this portion of the presentation it is still important to remember caring (Watson, 2008) and professionalism. Yet it is also important to remember that at this point, the audience is being led; they are receiving new knowledge which will help them care for others in a better way. The audience is being served (Greenleaf, 2002) and in return, can then go and serve others.

The concluding section wraps up the presentation by displaying the GCS and FOUR Score tools together in one slide. This is used to allow the audience the visualization of the differences

in how the tools address patient assessment. Another slide displays diagrams which display how an assessment may look. Finally, patient scenarios are used to allow the audience to put into practice the use of both the GCS and the FOUR Score. The scenarios are used so that the audience can practice applying both scales for comparison.

This educational module, featuring PowerPoint, will be instrumental in introducing a new method of evaluation of head injuries to prehospital providers. In addition, the FOUR Score may provide a new method of providing better care to patients with head injuries. The module is designed to fit into a 60 minute time window, with approximately 30-35 minutes used for PowerPoint and lecture, 10 minutes for questions and answers, and 10 minutes for evaluation of the session. The extra time allowed for scenarios, questions, and answers is part of the module to allow learners to internalize the new knowledge and apply that knowledge in a real-world context. This promotes knowledge exploration in a structured framework and also provides a rich and deep educational module. This also brings in Watson's CP Six & CP Seven (2008). It is important for educators to allow the learners to find their own motivation and achieve their own goals. By allowing the learners to do this, the educator is serving those in the audience (Greenleaf, 2002); providing leadership and guidance in new ways of caring (Watson, 2008). This allows learners to learn from each other by asking questions and being open to new ideas. The evaluation tool (Appendix E) contains six questions and is adapted from Wijdicks (2005). This would meet the needs of one hour of continuing education for credit towards nursing licensure. This time limit is also important to military personnel. Most Air Force presentations and educational sessions are designed to be brief and succinct. There is strict adherence to time limits and often briefings last minutes rather than hours. It would also provide flexibility for both

the lecturer and the audience. Printed handouts, including the PowerPoint slides, would be provided. The slides, as outlined above, are included in Appendices F and G.

Chapter Four: Evaluation

Description of evaluation procedures

After completing the teaching module, a post-module evaluation tool was used (Wijdicks, 2005) to determine if students agreed that the FOUR Score was a better tool than the GCS. Receiving feedback can be an impressive tool used to provide better service (Greenleaf, 2002) and more appropriate teaching to future participants. It is also instrumental in learning how a new method of evaluating head injuries may need to be tailored to fit the needs of pre-hospital care providers. This evaluation tool was set up as a Likert tool and is shown in Appendix E. Twenty evaluations were handed out to students; fourteen were returned completed. Results are listed in the following chart. However, it should also be noted that there is more to this project than just the evaluation of the content of the educational module. In addition, there is also the evaluation of the process of project development and how the module was presented. This latter evaluation occurs later in Chapters Four and Five.

Table 2*Likert survey questionnaire data*

Question # (See Appendix E)	Range (1 – 5)	Mean	Mode
1) The FOUR Score is relevant and easy to use.	2 - 5	4.1	5
2) The FOUR Score is obtained quickly.	2 - 5	3.6	4
3) The FOUR Score is obtained more rapidly than the GCS.	1 - 4	2.6	2
4) The FOUR Score is a good alternative to the GCS.	1 - 5	3.3	3
5) The FOUR Score is a better score than the GCS when looking at patient status.	2 - 5	3.8	4
6) The FOUR Score is a tool I would use if it becomes generally accepted.	2 - 5	4.0	4

Analysis

The Likert scale evaluation tool was used in this project because it is a commonly used method to determine if a person agrees or disagrees with a question. It is also the evaluation tool used in the original FOUR Score validation study (Wijdicks, 2005). For each question in the

survey, the range of scores is listed. The average (mean) score for each question is also listed.

Finally, the most common score (mode) for each question is listed. Approximately 74% of participants agreed that the FOUR Score was relevant and easy to use (question #1).

Approximately 60% of participants agreed that the FOUR Score was obtained quickly (question #2). Most participants (approximately 63%) disagreed that the FOUR Score was obtained more rapidly than the GCS (question #3). 55% of participants were neutral or undecided as to whether the FOUR Score was a good alternative to the GCS (question #4). Most participants (63%) agreed that the FOUR Score was a better method to determine patient status than the GCS (question #5). Approximately 70% of participants agreed that the FOUR Score is a tool that they would use if it became generally accepted (question #6).

Reflection

Using a Likert scale allowed the author to gather information relating to initial attitudes from pre-hospital care providers about the FOUR Score, when compared to the GCS. This information is useful because it provides information about what users like and do not like about the FOUR Score. It reveals key information relating to the comparison of the two scales and where future studies or projects need to go in addressing new methods of head injury assessment. It is important to note that contrary to previous validation studies of the FOUR Score, the participants who completed this Likert scale survey did not agree that the FOUR Score was obtained as quickly as the GCS. This may be one area to address in the future when considering pre-hospital use of the FOUR Score.

What is the takeaway from all of this work? What was learned after all of the literature review and development of the module? It initially appears that there is some promise of acceptance of the FOUR Score as a viable pre-hospital alternative to the GCS. Respondents to

the Likert survey seemed to indicate that the FOUR Score may be useful, despite initially taking more time to obtain the actual patient scores. One next step may be to complete a pilot study validating the FOUR Score outside of a hospital or clinical setting. There is at least some potential to further examine the use of the FOUR Score in this setting.

In addition, the development of the module seemed appropriate to the author. Reflecting upon the experience, initial goals seemed to be met. The session concluded in 57 minutes, allowing participants to obtain one unit of continuing education (CEU). This is important and meaningful to health care providers because CEU's are needed to maintain licensure. The author is empathetic to care providers who need to maintain licensure; the author is also a Registered Nurse who needs to maintain licensure. Additionally, PowerPoint slides were used as an outline, only supplementing the lecture. Visual learners had something to look at, while auditory learners could listen to the lecture. Patient scenarios were also used to allow others to learn by doing. At the end of the presentation, questions were asked by participants and the answers were provided by both the presenter and by other participants. This allowed participants to assist each other with learning the new material. This module initially appears to be both appropriate and very useful for the introduction of a new head injury assessment tool. As an interesting note, addressing all ways of learning and providing time at the end for discussion seemed to really resonate *caritas* (Watson, 2007). The participants genuinely seemed to be open and connect with one another in their closing discussion. It is conceivable that this format could be used in a variety of situations and environments, ranging from the introduction of the new tool to refresher training at a later date. It could also conceivably be used for a variety of care providers such as First Responders, Paramedics, and Nurses who work in a variety of settings.

This may be an important beginning for the Air Force, other branches of the military and other care providers who work outside of hospital or clinical settings. Initial indications appear to lead to the conclusion that the FOUR Score may be a viable alternative to the GCS. This would mean training a large group of individuals in a new method of head injury evaluation. After over thirty years of using the GCS, this would mean a huge culture shift.

This project is the culmination of hard work, a large time commitment, and a lot of creative energy. For the author, this is where Watson's CP Six is important. This project displays a creative use of self. This also validates what the author believed may be true: the FOUR Score is a viable alternative to the GCS in the specified setting. This has potential to be the beginning of a journey to attempt to get the GCS replaced by the FOUR Score. The acceptance of the FOUR Score would culminate in a fulfillment of Watson's CP Nine by the author. In essence, the author would be giving to a greater good, something bigger than self, so that others may benefit.

Implications of the acceptance of the FOUR Score would be far reaching. In practice, the FOUR Score would slowly, eventually replace the GCS. This change would impact how patients with head injuries are assessed. It may also affect how patients in a pre-hospital setting are triaged for more appropriate care. In other ways, this change could affect things such as accreditation, APACHE scoring, etc. Research may be affected greatly. Initially, there may need to be significant studies completed to validate the FOUR Score in a broader variety of settings. Studies would also need to address best practices for teaching and training users of the new scale. Studies may also need to be completed to address deficiencies of the new scale, such as participants not agreeing that the FOUR Score is obtained as quickly as the GCS. Broad based research would address all of this and more if the FOUR Score is going to replace the GCS. Nursing education would be greatly affected by these changes. Nursing students would face

changes to curricula, while nurses in practice would need to be trained and re-trained in the use of this new assessment tool. It would be important to remember that not all change is bad; sometimes change can be a positive thing. Stressing the importance of providing better care for patients would be paramount, as would be sharing the energy that the author feels with the development of this module, which relates to CP Seven. This change would be addressing health inequities by incorporating an improved way to care for all patients with head injuries, in all settings, by all care providers.

Chapter Five: Discussion

According to Riechers “appropriate triage is critical to optimizing outcome from battle related injuries. The GCS is the primary means by which combat casualties, who have suffered head injury, are triaged. For the GCS to be reliable in this critical role, it must be applied accurately.” (p.1327). How critical is this task? If this task is not accomplished, is there a high probability of death or increased morbidity? How critical is it for a patient with a head injury to have this particular new assessment tool used for evaluation purposes? As Greenleaf (www.greenleaf.org) may say; “are we serving others to the best of our ability?” Are there more carative ways that we could be taking care of patients? Are providers helping others care for their mind, body, and spirit? After having looked at all of these factors, it is still necessary to consider that the relative value of a new assessment tool increases when the incidence of head injury increases. It should also be noted that there may be intangible factors that influence decision making processes.

Arguments against using the new tool

- Without a validation study or studies, there is no clear evidence that using this new assessment tool will change outcomes in pre-hospital settings.
- It should also be taken into consideration that pre-hospital care providers may preferentially use the GCS.
- Training time is consumed providing initial and follow-up training in the use of the new tool. This time could otherwise be spent on other subjects or tools which have already been proven to favorably impact outcomes.

Arguments in favor of using the new tool

- There is evidence that using the new tool in clinical settings will improve outcomes.

- The majority of ground combat injuries are head injuries.
- As reported earlier in this project, studies have found flaws in the GCS and in the use of the GCS.

As Reichers stated “for the military there are two possible solutions. The first is regular GCS refresher training...The second is to develop a clinical tool that is easier to learn and retain.” (2005, p. 1333).

There are two paths a leader may choose to take here. Either choice would provide service and caring to others, but which choice would provide the *best* service and caring? How could we be giving the best of ourselves? It would seem that the first path may be to serve others by advocating for regular, frequent training in the use of the GCS. The second path, and the one chosen by the author, would be to follow through with development and advocacy of a new method. By engaging others in their frame of reference, it may be possible to engage them in genuine teaching relationships. It may be possible to work together to determine the most appropriate way to adapt the FOUR Score for pre-hospital use. All involved would be coaching each other and learning from each other, culminating in better care for injured individuals.

Knowing all of this, where do we go from here and what may be done differently? Strong arguments can be made to train or not to train pre-hospital care providers in the use of the new assessment tool. At the very least, there is a clear necessity to assess, in an evidence-based manner, the efficacy of this new skill in the hands of those providing care. What may need to be undertaken by recognized experts is a systematic cost/benefit analysis of teaching this skill to care providers, using the general teaching approach outlined in this project.

One outcome may be that the GCS, despite flaws, is considered acceptable for use. Resources would not need to be used to train users of a new assessment scale. It may be necessary to re-think training of the GCS however. To provide more consistent use and reliability, it may be deemed necessary to provide more frequent training in the use of the GCS.

Another outcome may be acceptance and implementation of the FOUR Score scale. This would require training for all care providers and frequent updating of skills to retain the new knowledge.

A final outcome may be to develop an entirely new scale. Over the past several years this has been attempted on several occasions by many different people, with little success. One possible solution may be adapting a new scale from a slightly revised, previously developed scale. One example could be a rapid version of the FOUR Score, possibly titled “the EMBR Scale”. This “EMBR Scale” is a mnemonic taken from the components of the FOUR Score; Eyes, Motor, Brainstem, and Respiration. The intent of this new scale would be to ensure that the intent of the original FOUR Score remains, but strip down the scale for faster learning, retention, and application. It could be used in pre-hospital settings merely as a simple tool to rapidly assess patients and, depending upon the score, alert care providers at a medical facility that a further exam is needed; quite possibly using the original FOUR Score. The EMBR Scale may appear as follows:

The EMBR Scale

Eye Response

- ▶ E4 = eyelids open, tracking or blinking to command
- ▶ E2 = irregular eyelid opening
- ▶ E0 = eyelids remain closed to pain stimuli

Motor Response

- ▶ M4 = thumbs up, fist, or peace sign
- ▶ M2 = irregular comprehension of commands
- ▶ M0 = no response to pain

Brainstem Reflexes

- ▶ B4 = pupil and corneal reflexes present
- ▶ B2 = irregular pupil and/or corneal reflexes
- ▶ B0 = absent pupil, corneal, or cough reflex

Respiration

- ▶ R4 = regular breathing pattern
- ▶ R2 = irregular breathing pattern; close to needing intubation
- ▶ R0 = apnea or breathes at ventilator rate

One goal should be to quickly move patients to higher care levels, as appropriate. A second goal would be to lower morbidity and mortality, and assist patients with returning to meaningful, productive lives. Based solely upon validation studies of the FOUR Score in clinical settings, it is conceivable that the EMBR Scale may be a viable alternative to the GCS in pre-hospital settings. Some initial thoughts to consider include:

- The need to test the EMBR Scale in a pre-hospital setting.
- The need to introduce and train care providers to accomplish the testing.
- The eventual need to complete a pilot study and validate the EMBR Scale.
- The introduction of the EMBR Scale.
- Development of methods to educate care providers on the use of the EMBR Scale.

After completion of the development of this educational module to introduce the FOUR Score to pre-hospital care providers, it would seem as though the development and introduction

of the EMBR Scale would be a formidable challenge. One possible solution may be to complete a pilot project comparing the GCS and the EMBR Scale with actual patients in a pre-hospital setting. It may be possible to complete this small scale project during a future military deployment, utilizing members of the 109th AES. This would have the potential of validating the new EMBR Scale in real world scenarios. This small project would allow for evaluation of the new scale by a small group of care providers. A challenge would be getting valid feedback since the number of people using the EMBR Scale would initially be small. However, knowing that there is a need for new methods to assess and treat head injuries would seem to make this a challenge worth taking.

References

- Aarabi, B. (1990). Surgical outcome in 435 patients who sustained missile head wounds during the Iran-Iraq war. *Neurosurgery*, 27(5), 692-5.
- Adult Learning Styles and Training Methods. Retrieved from <http://www.usdoj.gov/adr/workplace/pdf/learstyl.pdf>
- AFI 41-307. Aeromedical Evacuation Patient Considerations and Standards of Care. 10 August, 2007.
- Antia, S.X., Sholevar, E.H., & Baron, D.A. (2005). Overdoses and ingestions of second-generation antipsychotics in children and adolescents. *J of Child and Adolescent Psychopharmacology*, 15(6), 970-85.
- Barillo, D.J., Cancio, L.C., Hutton, B.G., Mittelsteadt, P.J., Gueller, G.E., & Holcomb, J.B. (2005). Combat burn life support: A military burn-education program. *J of Burn Care & Rehabilitation*, 26(2), 162-165.
- Barker, P. (2003). Trauma training and the military. *Injury*, 34, 1-2.
- Boots, R.J., Joyce, C., Mullany, D.V., Anstey, C., Blackwell, N., Garrett, P.M., Gillis, S., & Alexander N. (2006). Near-hanging as presenting to hospitals in Queensland: Recommendations for practice. *Anaesthesia and intensive care*. 34(6), 736-45.
- Briones Claudett, K.H., Briones Claudett, M.H., Chung Sang Wong, M.A., Andrade, M.G., Cruz, C.X., Esquinas, A., & Diaz, G.G. (2008). Noninvasive mechanical ventilation in patients with chronic obstructive pulmonary disease and severe hypercapnic neurological deterioration in the emergency room. *European Journal of Emergency Medicine*, 15(3), 127-33.

Butler, F.K. (2001). Tactical medicine training for SEAL mission commanders.

Military Medicine, 166(7), 625-31.

Cloonen, C.C. (2003). “Don’t just do something, stand there!”: To teach or not to teach, that is the question – intravenous fluid resuscitation training for lifesavers. *J of Trauma*, 54, S20-S25.

Convertino, V.A., Ryan, K.L., Rickards, C.A., Salinas, J., McManus, J.G., Cooke, W.H., &

Holcomb, J.B. (2008). Physiological and medical monitoring for en route care of combat

casualties. *J of Trauma-Injury Infection & Critical Care*, 64(4 Suppl), S342-353.

doi:10:1097/TA.0b013e31816c82f4

Drake, A.I., McDonald, E.C., Magnus, N.E., Gray, N., & Gottshall, K. (2006). Utility

of Glasgow Coma Scale-Extended in symptom prediction following mild traumatic

brain injury. *Brain Injury*, 20(5), 469-75.

Frey, B.A., & Birnbaum, D.J. (2002). Learner’s perceptions on the value of PowerPoint in

lectures. United States Department of Education. Office of Educational Research &

Improvement. University of Pittsburgh.

Glasgow Coma Scale. Retrieved from

[http://www.brainandspinalcord.org/recovery-traumatic-brain-injury/
glasgow-coma-scale.html](http://www.brainandspinalcord.org/recovery-traumatic-brain-injury/glasgow-coma-scale.html)

Glasgow Coma Scale. Retrieved from

<http://www.ssgfx.com/CP2020/medtech/glossary/glasgow.htm>

Greenleaf, R. *Servant Leadership*. Retrieved from <http://www.greenleaf.org>

Greenleaf, R. (2002). *Servant leadership: A journey into the nature of legitimate power and greatness* (25th anniversary ed.). New York: Paulist Press.

- Grmec, S., & Gasparovic, V. (2001). Comparison of APACHE II, MEES, and Glasgow Coma Scale in patients with nontraumatic coma for prediction of mortality. *Acute Physiology and Chronic Health Evaluation. Mainz Emergency Evaluation System. Critical Care Medicine, 5*, 19-23.
- Hamer, B. (2008). A capacity-building model for implementing a nursing best practice. *J for Nurses in Staff Development, 24*(1), 36-42.
- Hanna, S.J. (2004). A study of 13 cases of near-hanging presenting to an accident and emergency department. *Injury, 35*(3), 253-56.
- Head Injury*. Retrieved from http://www.emedicinehealth.com/head_injury/article_em.htm
- Harknett, R.J., & Cobane, C.T. (1997). Introducing instructional technology to international relations. *Political Science & Politics, 30*, 496-500.
- Holcomb, J.B., Niles, S.E., Miller, C.C., Hinds, D, Duke, J.H., & Moore, F.A. (2005). Prehospital physiologic data and lifesaving interventions in trauma patients. *Military Medicine, 170*(1), 7-13.
- Huntley, A. (2008). Documenting level of consciousness. *Nursing2008, 38*(8), 63-64.
- Iyer, V.N., Mandrekar, J.N., Danielson, R.D., Zubkov, A.Y., Elmer, J.L., & Wijidicks, E.F.M. (2009). Validity of the FOUR score scale in the medical intensive care unit. *Mayo Clinic Proceedings, 84*(8), 694-701; doi:10.4065/84.8.694.
- Illeris, K. (2001). *The Three Dimensions of Learning: Keynote at NFPF/NERA:s 29th Congress*. Stockholm, Sweden, March 15-18, 2001.
- Kertis, M. (2007). The one-minute preceptor: A five-step tool to improve clinical teaching skills. *J for Nurses in Staff Development, 23*(5), 238-242.

- Learn About The Air Force: Core Values of the United States Air Force. Retrieved from <http://www.airforce.com/learn-about/our-values/>
- Levi, L., Borovich, J.N.B., Guilburd, I., Grushkeiwicz, A., Lemberger, S., Linn, I., Schachter, M., Zaaroor, J., & Feinsod, M. (1990). Wartime neurosurgical experience in Lebanon, 1982-1985. I: Penetrating craniocerebral injuries. *Israel Journal of Medical Sciences*, 26(10), 548-54.
- Lowry, R.B. (1999). Electronic presentation of lectures – effect upon student performance. *University Chemistry Education*, 3(1), 18-21.
- Malcolm Knowles, informal adult education, self-direction and andragogy. Retrieved from <http://www.infed.org/thinkers/et-knowl.htm>
- McCarthy, M. (2003). US military revamps combat medic training and care. *Lancet*, 361, 494-95.
- Menegazzi, J.J., Davis, E.A., Sucov, A.N. & Paris, P.M. (1993). Reliability of the Glasgow Coma Scale when used by emergency physicians and paramedics. *J Trauma*, 34(1), 46-8.
- Menix, K.D. (2007). Evaluation of learning and program effectiveness. *J of Continuing Education in Nursing*, 38(5), 201-208.
- Plum, F. & Posner, J.B. (1980). *The diagnosis of stupor and coma*. New York: Oxford
- Riechers, R.G 2nd, Ramage, A., Brown, W., Kalehua, A., Rhee, P., Ecklund, J.M. & Ling, G.S. (2005). Physician knowledge of the Glasgow Coma Scale. *J Neurotrauma* 22(11), 1327-1334.
- Rowley, G., & Fielding, K. (1991). Reliability and accuracy of the Glasgow Coma Scale with experienced and inexperienced users. *Lancet*, 337, 535-8.

- Starmark, J.E., Stalhammar, D., Holmgren, E. & Rosander, B. (1988). A comparison of the Glasgow Coma Scale and the Reaction Level Scale (RLS85). *J Neurosurgery*, 69(5), 699-706.
- Sullivan, M.G. (2005). FOUR score takes on Glasgow scale. *Clinical Neurology News*, 1(11). doi:10:1016/S1553-3212(05)71320-0
- Summers, C.R., Ivins, B., & Schwab, K.A. (2009). Traumatic brain injury in the United States: An epidemiologic overview. *Mount Sinai Journal of Medicine*, 76,105-110.
- Szabo, A., & Hastings, N. (2000). Using IT in the undergraduate classroom: should we replace the blackboard with PowerPoint? *Computers & Education*, 35, 175-187.
- Teasdale, G., & Jennett, B. (1974) Assessment of coma and impaired consciousness: A practical scale. *Lancet*, 13(2), 81-4.
- Watson, J. (2007). Caring theory defined. In *University of Colorado Denver College of Nursing*. Retrieved from http://www.nursing.ucdenver.edu/faculty/theory_caring.htm
- Watson, J. (2008). *Nursing: The philosophy and science of caring*. Boulder: University Press of Colorado.
- Wijdicks, E.F.M. (2008). *The comatose patient*. New York: Oxford.
- Wijdicks, E.F.M. (2006). The Glasgow Coma Scale in historical context and the new FOUR Score. *Rev Neurol Dis*, 3,109-17.
- Wijdicks, E.F.M. (2002). Brain death worldwide: accepted fact but no global consensus in diagnostic criteria. *Neurology*, 58, 20-25.

Wijdicks, E.F.M., Bamlet, W.R., Maramattom, B.V., Manno, E.M., & McClelland, R.L. (2005).

Validation of a new coma scale: The FOUR score. *Ann Neurology*, 58(4), 585-93.

Wolf, C.A., Wijdicks, E.F.M., Bamlet, W.R., & McClelland, R.L. (2007). Further validation of

the FOUR score by intensive care nursing staff. *Mayo Clinic Proceedings*, 82, 435-38.

Xia, Y.Q., Yan, L.L., Xu, R.X., & Wang, Q.H. (2005). Evaluation of improvement of

subhypothermia in cerebral vasospasm after severe craniocerebral injury.

Chinese Journal of Clinical Rehabilitation, 9(41), 138-41.

Yaren, H., Kir, T., Ucar, M., Gocgeldi, E., & Hasde, M. (2004). Training enlisted men on

sexually transmitted diseases and preparation of a training model. *Military Medicine*,

169(12), 980-84.

Appendix A

Glasgow Coma Scale (Wijdicks, 2008, p. 72)

Eye Response

- 4 = eyes open spontaneously
- 3 = eye opening to verbal command
- 2 = eye opening to pain
- 1 = no eye opening

Motor Response

- 6 = obeys command
- 5 = localizing pain
- 4 = withdrawal from pain
- 3 = flexion response to pain
- 2 = extension response to pain
- 1 = no motor response

Verbal Response

- 5 = oriented
- 4 = confused
- 3 = inappropriate words
- 2 = incomprehensible sounds
- 1 = no verbal response

Appendix B*The FOUR Score* (Wijdicks, 2008, p. 73)

Eye Response

E4 = eyelids open, tracking or blinking to command

E3 = eyelids open but not tracking

E2 = eyelids closed but open to loud voice

E1 = eyelids closed but open to pain

E0 = eyelids remain closed to pain stimuli

Motor Response

M4 = thumbs up, fist, or peace sign

M3 = localizing to pain

M2 = flexion response to pain

M1 = extension response

M0 = no response to pain

Brainstem Reflexes

B4 = pupil and corneal reflexes present

B3 = one pupil wide and fixed

B2 = pupil or corneal reflexes absent

B1 = pupil and corneal reflexes absent

B0 = absent pupil, corneal, or cough reflex

Respiration

R4 = regular breathing pattern

R3 = Cheyne-Stokes breathing pattern

R2 = irregular breathing

R1 = triggers ventilator or breathes above ventilator rate

R0 = apnea or breathes at ventilator rate

Appendix C

United States Air Force Core Values (<http://www.airforce.com>)

- I. Integrity First
- II. Service Before Self
- III. Excellence In All We Do

Appendix D*Jean Watson's Caritas Processes (CP) (Watson, 2008)*

- CP 1** Cultivating the practice of loving-kindness and equanimity toward self and other as foundational to *Caritas Consciousness*
- CP 2** Being authentically present: enabling, sustaining, and honoring the faith, hope, and deep belief system and the inner-subjective life world of self/other
- CP 3** Cultivation of one's own spiritual practices and transpersonal self, going beyond ego-self
- CP 4** Developing and sustaining a helping-trusting caring relationship
- CP 5** Being present to, and supportive of, the expression of positive and negative feelings
- CP 6** Creative use of self and all ways of knowing as part of the caring process; engage in the artistry of *Caritas* nursing
- CP 7** Engage in genuine teaching-learning experience that attends to unity of being and subjective meaning – attempting to stay within the other's frame of reference
- CP 8** Creating a healing environment at all levels
- CP 9** Administering sacred nursing acts of caring-healing by tending to basic human needs
- CP 10** Opening and attending to spiritual/mysterious and existential unknowns of life-death

Appendix E

Revised Questionnaire (adopted from Wijdicks, 2005)

1. The FOUR Score is relevant and easy to use.
2. The FOUR Score is obtained quickly.
3. The FOUR Score is obtained more rapidly than the GCS.
4. The FOUR Score is a good alternative to the GCS.
5. The FOUR Score is a better score than the GCS when looking at patient status.
6. The FOUR Score is a tool I would use if it becomes generally accepted.

for each question above, select a corresponding answer from the choices below

1	2	3	4	5
Disagree Strongly	Disagree Somewhat	Neutral	Agree Somewhat	Agree Strongly

Appendix F

Table 1

Educational module slide presentation outline

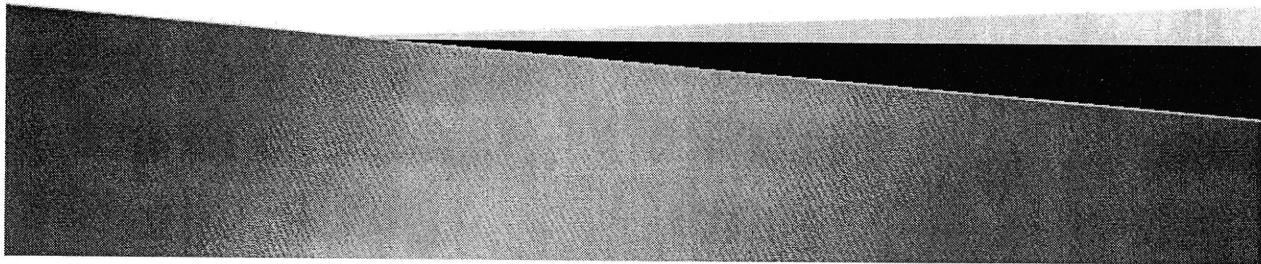
Slide #	Contents	Rationale/Discussion	Purpose
1	Title slide		Introduction
2	Display of educational models	Show Yaren model & Wolf module side by side	Display original model and adapted module together
3	Contents not approved by US Air Force	The FOUR Score has not been studied or approved by the US Air Force	Disclaimer that new model and assessment scale are not approved by US Air Force
4	Objectives	State what attendees should be able to take away from the educational module	Provide take-away points from module
5	History & background of assessment scales	History of early head injury knowledge	Provide basis of how head injury assessment started
6	History & background	History of late 20 th century assessment scales	Provide background of early assessment scales
7	History & background of GCS	Background of GCS	Provide basic knowledge of why GCS was developed
8	Advantages of GCS	Discuss positive aspects of GCS	Highlight positive aspects of the GCS
9	Disadvantages of GCS	Discuss negative aspects of GCS	Highlight flaws; explain where improvements are needed
10	GCS research findings		Discuss what other authors have learned about GCS
11	GCS research findings		Discuss what other authors have learned about GCS
12	FOUR Score introduction	Introduce new assessment scale	Introduction of new scale
13	FOUR Score background	Discuss background & why scale was developed	Highlight why new scale was developed

14	FOUR Score advantages	Positive aspects of new scale	Discuss how new scale is better than GCS
15	FOUR Score disadvantages	Negative aspects of new scale	Discuss what may prevent new scale from widespread use
16	Assessment scales	Show GCS & FOUR Score side by side	Show both scales next to each other for comparison
17	FOUR Score visual aid	Show visual aid for FOUR Score demonstration	Visual aid to help new users understand new scale and its components
18	Applying the scales in scenarios	Apply both scales to case scenarios	Show how both scales are used in scenarios
19	Conclusion	Summary	Summarize the presentation

Appendix G

Evaluation of Head Injuries:
Review of Old Methods; Introduction of a New Method

Chris Wolf
Augsburg College, 2009



Provide title & name

Provide audience a description of this part of Masters project

Describe how this project evolved from previous validation studies

Is the new method appropriate in a pre-hospital setting?

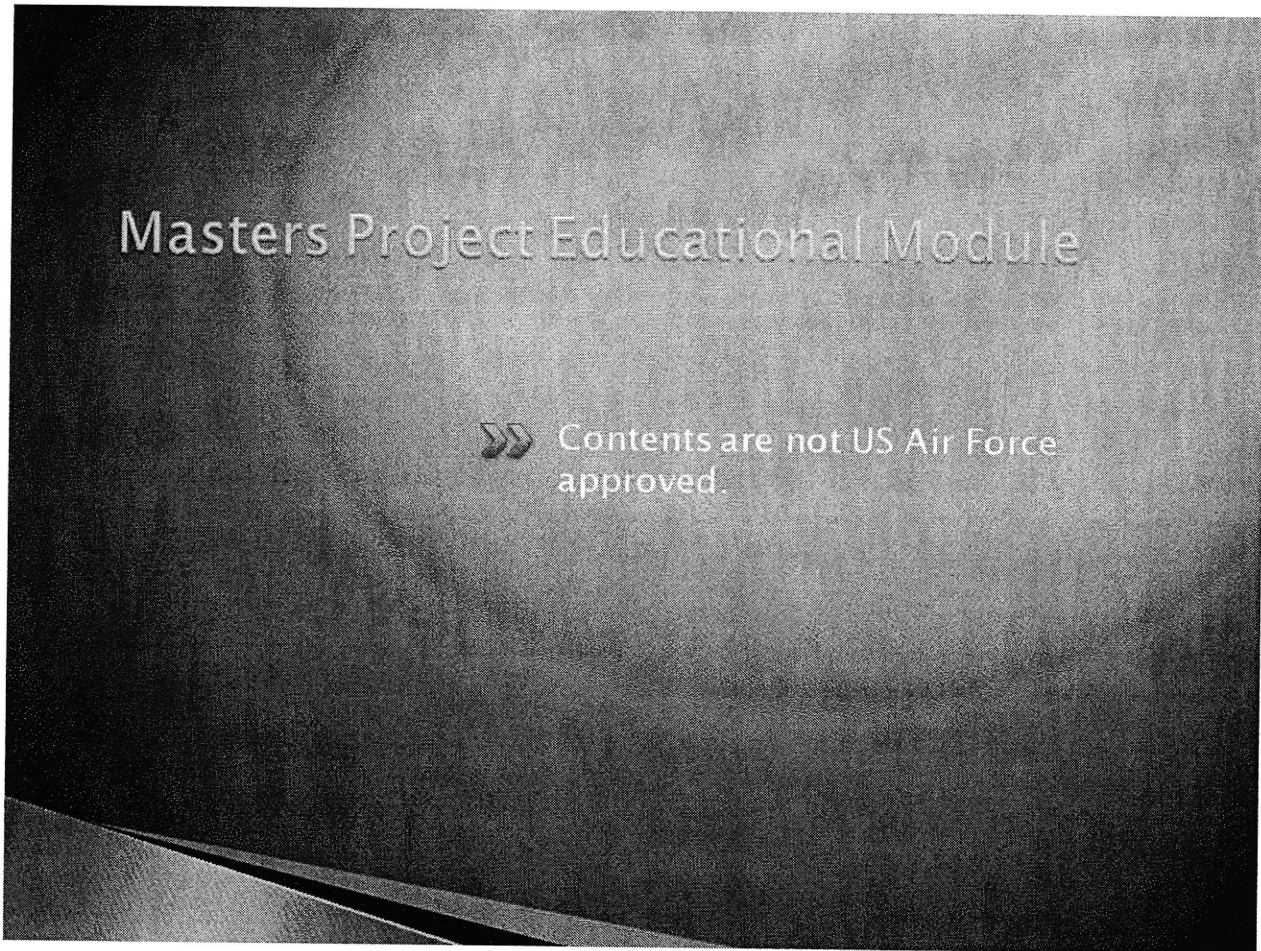
Masters Project Educational Models

- ▶ Pre-test
- ▶ Adult health training
- ▶ Overview of STD's
- ▶ History
- ▶ Prevalence
- ▶ Characteristics
- ▶ Advantages of avoidance
- ▶ Post-test
- ▶ Overview of coma scales
- ▶ History & prevalence of GCS
- ▶ Advantages/Disadvantages
- ▶ Introduction of FOUR
- ▶ Advantages/Disadvantages
- ▶ Addendum

- Yaren H et al. (2004). Training enlisted men on sexually transmitted diseases and preparation of a training model. *Military Medicine*. 169(12) 980-94.

Describe how the teaching module is adapted from a previous model

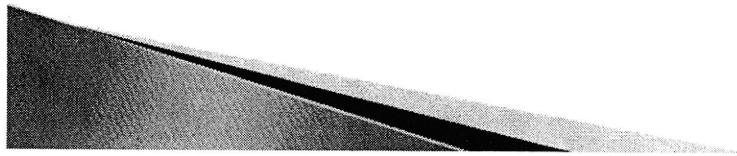
Discuss model & module side by side



Tell audience that the new method is not approved by USAF

Objectives

- ▶ Review history & significance of scales
- ▶ Introduce a new scale
- ▶ Discuss practical application of the new head injury assessment scale

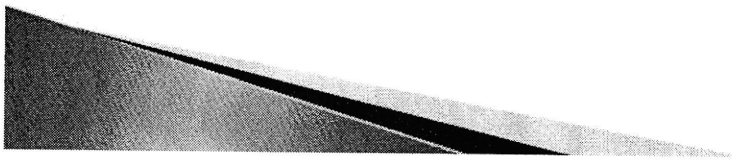


Discuss objectives of teaching module with audience

History & Background

- ▶ Descriptions dated as early as 16th century
- ▶ 18th & 19th centuries – more publications
- ▶ 19th century – focus on relation with organ failure
- ▶ 20th – most productive period
 - advances & dedicated texts (Plum, Posner, Fischer)

Wijdicks EFM. (2008). *The comatose patient*. New York: Oxford.



History / Background of early head injury assessment scales / tools

Rudimentary descriptions in 16th century

18th / 19th centuries began to see publications

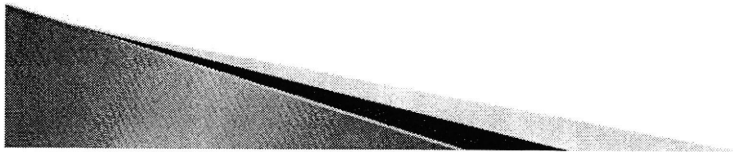
19th century publications began to focus on organ involvement

20th century most productive so far – advances & dedicated texts

History & Background

- ▶ 1950's – value in stimuli, brainstem reflexes, managing hyperthermia, airway management, risk in skin breakdown, ICP
- ▶ 1950's & 1960's – early work eventually led to new scales
 - Ommaya
 - Ranchos Los Amigos (RLAS)
 - AVPU
- ▶ 1970's – introduction of Glasgow Coma Scale

Wijdicks EFM. (2008). *The comatose patient*. New York: Oxford.



20th century progressed

1950's began to find value in different concepts related to assessments

1950's – 1970's new scales developed (OMMAYA, RLAS, AVPU, Innsbruck)

1974 GCS was introduced

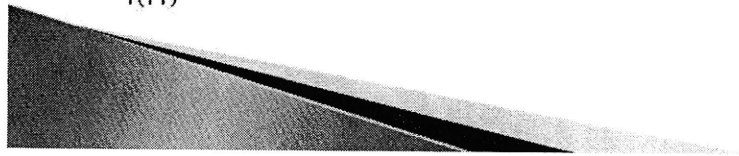
The “Gold Standard”

▶ 1974 – Teasdale & Jennett

Teasdale G, Jennett B. (1974) Assessment of coma and impaired consciousness. A practical scale. *Lancet*. 13;2:81–4.

- ▶ most commonly used & widely accepted
- ▶ no meaningful modification
- ▶ determine level of consciousness in patients with brain injuries
- ▶ nurses would be able to accurately report the status of the patient

Sullivan MG. (2005). FOUR score takes on glasgow scale. *Clinical Neurology News*. 1(11)



Developed by Teasdale & Jennett

Has become common / accepted / incorporated into many things

No meaningful modification

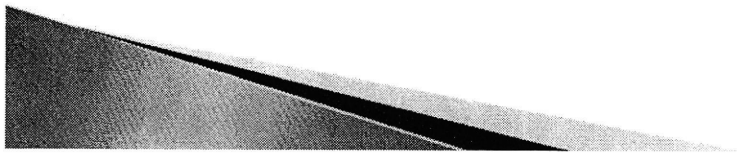
Useable by all staff

|

The “Gold Standard” (Advantages)

- ▶ Simple
- ▶ Relatively high degree of inter-rater reliability
- ▶ Correlates relatively well with outcomes
- ▶ All types of brain insult, in all settings, by all staff

Sullivan MG. (2005). FOUR score takes on glasgow scale. *Clinical Neurology News*. 1(11)



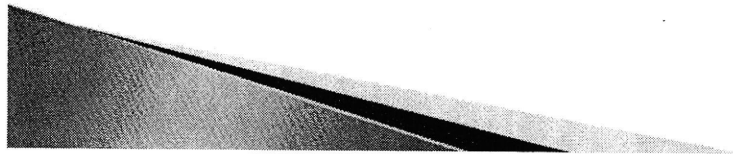
Follow slide text here



The “Gold Standard” (Disadvantages)

- ▶ Verbal component often not assessable in intubated patients
- ▶ Ignores brainstem reflex
- ▶ Reliability may be dependent on training of personnel using the scale

Riechers RG 2nd, et al. (2005). Physician knowledge of the Glasgow Coma Scale.
J Neurotrauma. 22(11):1327-34.



Follow slide text here

Emphasize that reliability may be dependent upon training

The “Gold Standard”

- ▶ primary means by which combat casualties are triaged

Riechers RG 2nd, et al. (2005). Physician knowledge of the Glasgow Coma Scale.
J Neurotrauma. 22(11):1327-34.

- ▶ most (31%) of the combat troops killed in action (KIA) are killed by penetrating head trauma. Some of KIA may be saved if a better tool was used to evaluate and triage these patients

Butler FK. (2001). Tactical medicine training for SEAL mission commanders.
Military Medicine. 166(7):625-31.

- ▶ the assertion that the GCS is usable by personnel of all grades of experience has never been supported by evidence of accuracy

Rowley G, Fielding K. (1991). Reliability and accuracy of the Glasgow Coma Scale with experienced and inexperienced users. *Lancet*. 337:535-8.



Discuss quotes

Note how different studies both support & refute the GCS

|

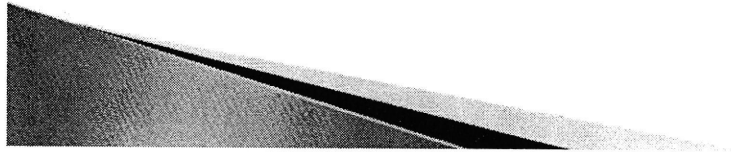
The “Gold Standard”

- ▶ the GCS is an example of admirable simplicity

Wijdicks EFM. (2008). *The comatose patient*. New York: Oxford.

- ▶ methods for improving accurate quantitation of level of consciousness need to be explored

Riechers RG 2nd, et al. (2005). Physician knowledge of the Glasgow Coma Scale. *J Neurotrauma*. 22(11):1327-34.



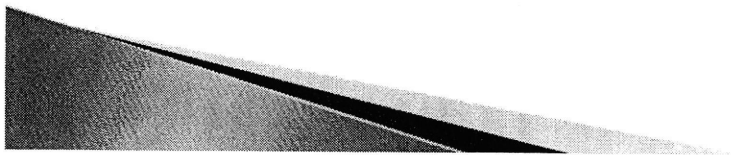
Discuss quotes

Again note the support for GCS & calls to find a better tool

A New Method

- ▶ The FOUR (Full Outline of UnResponsiveness) Score
- ▶ Introduced in 2005

Wijdicks EFM, et al. (2005). Validation of a new coma scale: The FOUR score.
Ann Neurology. 58:585-93.



Introduce the FOUR Score

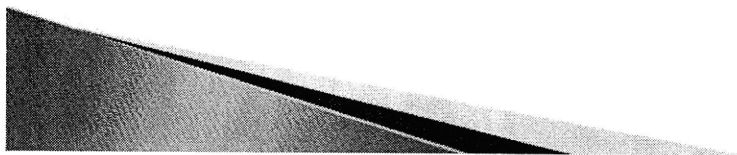
Discuss how Wijdicks initially validated the tool

|

A New Method

- ▶ More comprehensive
- ▶ Maintain simplicity
- ▶ Address the evaluation of intubated patients

- ▶ Has been validated in hospital settings



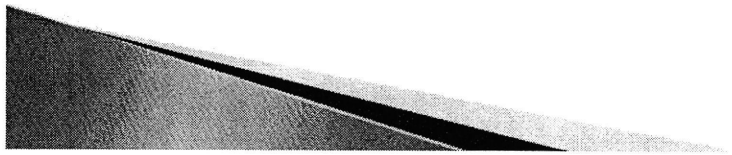
Discuss validation of new scale in hospital settings

Discuss how the new scale is superior to GCS

|

A New Method (Advantages)

- ▶ Assesses breathing and brainstem reflexes
- ▶ Expands on eye and motor responses
- ▶ Similar total scoring (16) to GCS (15)
- ▶ Each component is 0 – 4 points for easy recall
- ▶ Predicts patient outcomes better than GCS



Discuss additional advantages of FOUR

Highlight scoring differences

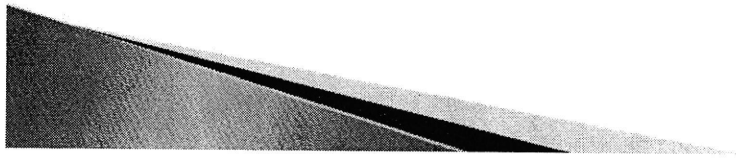
GCS – 3 categories – eyes, motor, verbal; 3-15 points; often totaled

FOUR – 4 categories – eyes, motor, brainstem, respiration

0-16 points, score each category individually

A New Method (Disadvantages)

- ▶ Yet another new scale
- ▶ Component scores are not totaled (E,M,B,R)
- ▶ Has not been validated in pre-hospital settings



Discuss potential problems with FOUR

Can it really catch on without use all types of settings?

|

GCS vs FOUR

Table 1 *Glasgow Coma Scale* (Wijdicks, 2008, p. 72)

Eye Response

- › 4 = eyes open spontaneously
- › 3 = eye opening to verbal command
- › 2 = eye opening to pain
- › 1 = no eye opening

Motor Response

- › 6 = obeys command
- › 5 = localizing pain
- › 4 = withdrawal from pain
- › 3 = flexion response to pain
- › 2 = extension response to pain
- › 1 = no motor response

Verbal Response

- › 5 = oriented
- › 4 = confused
- › 3 = inappropriate words
- › 2 = incomprehensible sounds
- › 1 = no verbal response

Table 2 *The FOUR Score* (Wijdicks, 2008, p. 73)

Eye Response

- › E4 = eyelids open, tracking or blinking to command
- › E3 = eyelids open but not tracking
- › E2 = eyelids closed but open to loud voice
- › E1 = eyelids closed but open to pain
- › E0 = eyelids remain closed to pain stimuli

Motor Response

- › M4 = thumbs up, fist, or peace sign
- › M3 = localizing to pain
- › M2 = flexion response to pain
- › M1 = extension response
- › M0 = no response to pain

Brainstem Reflexes

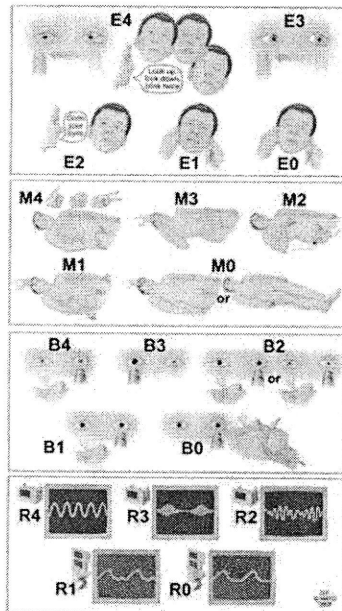
- › B4 = pupil and corneal reflexes present
- › B3 = one pupil wide and fixed
- › B2 = pupil or corneal reflexes absent
- › B1 = pupil and corneal reflexes absent
- › B0 = absent pupil, corneal, or cough reflex

Respiration

- › R4 = regular breathing pattern
- › R3 = Cheyne-Stokes breathing pattern
- › R2 = irregular breathing
- › R1 = triggers ventilator or breathes above ventilator rate
- › R0 = apnea or breathes at ventilator rate

Discuss scales side by side for audience visualization

A New Method



Iyer V. N. et.al. Mayo Clin Proc.;2009;84:694-701

Visual aid to allow audience to see how an exam may appear

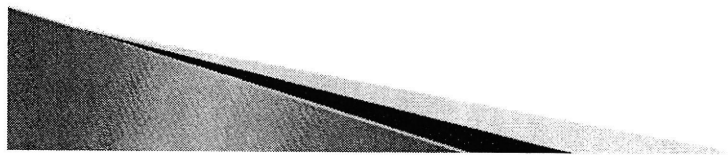
Applying the scales

- ▶ Scenario #1

- patient

- ▶ Scenario #2

- patient



Develop two brief pt scenarios to allow audience to put knowledge into practice

Use GCS & FOUR in each to allow comparison

|

This concludes the briefing.

Questions?

Conclusion; allow time for questions & discussion

I long to accomplish a great and noble task, but it is my chief duty to accomplish small tasks as if they were great and noble.

- Helen Keller