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14. ABSTRACT The telerehabilitation for OEF/OIF returnees with mild or moderate combat related Traumatic Brain Injury (TBI) has as its objectives 1) care coordination for wounded veterans using distance technology via the internet and 2) monitoring of physical and mental health outcomes using a variety of instruments. To date we have enrolled 72 veterans and are actively following 61 in the study We have collected baseline and six month health status data on most veterans. Data collection one year after enrollment is in progress. Our initial findings indicate that 1) Functional capabilities measured by locomotion and mobility appear to have stabilized among our cohort of veterans while deficiencies in cognition (memory, problem solving), psychosocial adjustment (anger, emotional status) and problems in integrating into society pose challenges 2) Those with comorbid PTSD appear to linger in employability and ultimate integration into society as compared to those without the diagnosis 3) Individualized treatment pathways are needed for rehabilitation and ultimate integration into society and 3) Veterans have expressed appreciation for the program.					
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Telerehabilitation for OIF/OEF Returnees with Combat-Related Traumatic Brain Injury.

Introduction

Goals: This is one project in a planned program of research to improve care for injured Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) veterans. We propose with this study to test a telerehabilitation program for veterans with combat related traumatic brain injury (TBI) with or without comorbid post traumatic stress disorders (PTSD) by monitoring functional, cognitive and mental health outcomes together with their integration into society using a variety of instruments. Coordinating medical care at a distance and thereby reducing their utilization of the VA health system is another important goal of this telerehabilitation intervention.

The *long term* goal of this program of research is to optimally define telerehabilitation services for all veterans with polytrauma, including accurate and efficient screening instruments, educational material for patients and families, family support, and family counseling to enhance care coordination and to maximize functional outcomes and quality of life.

The Telerehabilitation intervention: Veterans who meet the inclusionary criteria of a clinical diagnosis of combat incurred mild or moderate TBI in Iraq and Afghanistan and who utilize the James A. Haley (JAH) Veterans Hospital in Tampa, FL as their primary source of care and who in the opinion of care providers in the Polytrauma Clinic at JAH will possibly benefit from the program are eligible to be consented for participation. They are provided Dell® laptop computers to communicate at least once weekly on a secured VA server with the care coordinator (Ms. Susan Brock, ARNP) who also meets them at their scheduled outpatient visits at the JAH. The RN helps in a variety of care coordination efforts including scheduling appointments with specialists, medication management, counseling and monitoring outcomes. The RN coordinates care for Post Traumatic Stress Disorders (PTSD) with a clinical psychologist at the JAH.

Challenges in care delivery: Our challenge has been establishing a “secure virtual highway” to conduct the telerehab intervention. The VA has no national program for providing individualized care coordination for veterans via telemedicine. It does have an e-health portal where veterans may submit and track vital signs such as BP readings and cholesterol levels but one that does not provide for individualized care.

The Veterans Integrated Service Network 8 (VISN 8) which includes the JAH currently uses the Health Hero patient management system and uses store and forward technology using the Health Buddy and web based solutions as part of its program to support patients with chronic conditions such as Congestive Heart Failure, diabetes, hypertension, COPD and mental illness. However, this technology does not allow for the posting of individualized questions for tracking health conditions and care coordination a key component of our proposed telerehabilitation intervention.

Home visit to assess functional status and home environment: The Physical Medicine and Rehabilitation Service at the JAH provides a service wherein visits to the homes of combat injured veterans are made by qualified Occupational Therapists who add functional aids such as hand rails and ramps for wheel chairs in the homes to aid in ambulatory function. Other assistive devices include modifications to the kitchen to accommodate the needs of the veterans. The cost to the VA is limited to \$2,000 per veteran.

Monitoring health outcomes; Veterans are required to connect (via the internet) to a secured commercial website (SurveyMonkey.com™) to provide responses to a variety of instruments to monitor their health outcomes over time including the Functional Independence and Functional Assessment Measure™ (FIM/FAM), the Craig Handicap Assessment and Reporting Technique (CHART), the PTSD Checklist Military Form, Modified PTSD Symptom Scale, Self-Report Alcohol Use Disorders Identification Test (AUDIT), Self Report Beck Depression Inventory and the Medical Outcomes Social Support Survey.

Research team: The telerehabilitation care coordination team is organized under a primary care physician, namely, Steve G. Scott, DO, Chief Physical Medicine and Rehabilitation Services VA. Andrea M. Spehar, DVM, MPH, JD is the Program Manager and a Co-Investigator. Two full time polytrauma nurses,

Susan Brock, ARNP and Maria Morales, RN, aid in recruiting veterans to the study, as well as providing care coordination. Assisting them is William A. Lapcevic, MSST, MPH an expert in information technology and data management. We have added Paula Chapman, PhD and Rebecca Kayo, PhD (clinical psychologist) to our team of researchers to identify and follow our cohort of enrolled veterans with combat-related TBI with co-morbid PTSD.

Body

The following tasks have been completed with additional details below.

- Task 1.* Administrative tasks, Months 1-3: **Completed**
- a. Obtain Institutional Review Board and conduct literature review.
 - b. Recruit LAMP coordinator care coordination RN.
 - c. Recruit technical personnel (LAMP technician) and software analyst.
 - d. Order computers, load software programs/dialogues and set up web site on VA servers.
- Task 2.* Patient recruitment and programming, Months 3-32: **Completed**
1. Finalize list of all OEF/OIF returnees discharged from the Tampa PT/BRI Center with a primary or secondary diagnosis of TBI.
 2. Contact (phone/internet/mail) patients who meet inclusion criterion and agree to participate and have informed consents signed.
- Task 3.* Initial home visits to assess functional status and home environment, Months 3-32: **Completed.**
1. Conduct initial home visit to assess functional status and home environment
 2. Make recommendations for assistive devices and environmental interventions
 3. Purchase assistive technology through appropriate VA providers and provide training.
 4. Set up the dialogues.
- Task 4.* Data Collection: Months 5-32: **Ongoing**
1. Abstract from the Veterans' health Information Systems & Technology Architecture (VistA) medical record abstracts pertaining to health care utilization and treatments of TBI patients.
 2. Abstract from the VA Decision Support System (DSS) cost estimates of VA Health Care Utilization.
 3. Download responses to patient inputs to aforementioned survey instruments.
 4. Conduct patient/caregiver satisfaction surveys and perceptions on facilitators and barriers to telerehabilitation.
- Task 5.* Data Analysis: Months 32-36: **Ongoing**
1. Conduct statistical analysis to determine:
 - a. Changes in functional status and community integration
 - b. Satisfaction with assistive devices and technology
 - c. Changes in patterns of healthcare utilization and associated costs
 - d. Satisfaction with TBI LAMP
 2. Conduct interviews to synthesize facilitators and barriers to providing telerehabilitation for TBI.
- Task 6.* Final Analyses and Report Writing: Months 36-40: **To Be Addressed**
- a. Prepare final report and initial manuscripts.

Patient characteristics

Demographics: We are actively following 61 veterans of a total of 72 who have consented to the telerehabilitation study. Some of the injured were transferred from Walter Reed Army Medical Hospital to the Physical Medicine and Rehabilitation Service at the JAH and were subsequently discharged but still utilize the outpatient services at the JAH. Others were discharged from other military or VA facilities and chose to reside in the Tampa area partly due to the availability of health care at the JAH. One of our enrollees is a female who sustained TBI due to indirect fire. Reasons for discontinuation of rehabilitation to five individuals include mortality (1), moving away from the area (2), incarceration (1) and non compliance (6). The patients range in age from 21 to 55 years with a mean age of 33 years. Table 1 provides for a breakdown of race and ethnicity among enrollees.

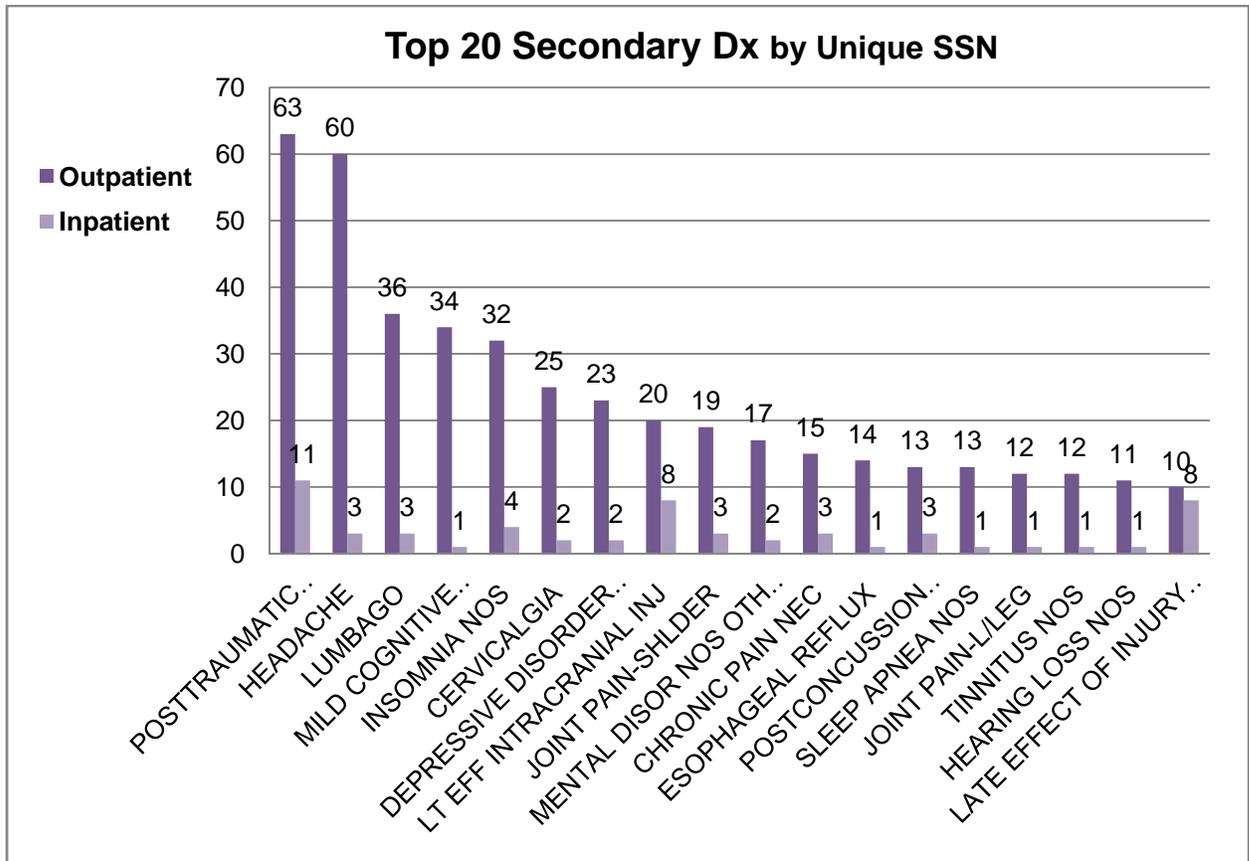
Table 1: Racial Characteristics (n=61)

	Frequency	Percent
<i>WHITE</i>	37	60.66
<i>HISPANIC</i>	17	27.87
<i>UNANSWERED</i>	3	4.92
<i>BLACK</i>	2	3.28
<i>AMERICAN INDIAN</i>	1	1.64
<i>NATIVE HAWAIIAN</i>	1	1.64

Health Status

As per the inclusionary criteria for participation in telerehabilitation all veterans have a primary clinical diagnosis of Traumatic Brain Injury incurred in combat theatres in Iraq and Afghanistan. Though the mechanism of injury is not always identified in their medical charts in the VA, conversations with wounded warriors has revealed that the majority suffer from the effects of blast related injuries resulting from improvised explosive devices and mortar attacks. Many of the wounded suffer from the many adverse side effects of TBI. The counts of secondary diagnosis illustrated in Figure 1 are for unique veterans but are mutually inclusive in that the same diagnosis may be recorded twice for the same veteran at outpatient visits or at inpatient admissions.

Figure 1: Secondary diagnosis among veterans recorded during inpatient (n=11) and outpatient (n=63) visits.



As can be observed, Post Traumatic headaches and the adverse effects of TBI manifested as musculoskeletal disorders and cognitive impairment were common ailments of our study cohort. This is clearly indicated in the care coordination provided to veterans with the issues pertaining to cognition and psychosocial complications requiring urgency and providing challenges in providing care. Substance abuse, involving prescribed medications, alcohol and street drugs also complicates treatment.

Baseline Surveys

We have started collecting data as required by our protocol on a variety of functional, cognition, social integration and mental health outcomes to evaluate the efficacy of the telerehab intervention. As may be noticed many of the instruments have overlapping questions in the areas of function, cognition and psychosocial adjustments. Yet each instrument has its own peculiarity in assessing veterans' health status and has independently been shown to provide for reliability and validity in measurement. We therefore have maintained the integrity of each instrument and have not altered any of the questions posed. Repeated measures will be conducted over time and appropriate statistical analysis will reveal changes over time as indicated in the initial protocol and statement of work.

The aim of gathering information is twofold: 1) To characterize rehabilitation trajectories over time in the areas of function, cognition, psychosocial adjustment, integration into society and mental health disorders

over time and 2) To individualize treatment patterns customized to each veterans needs so as to maximize the effect of telerehabilitation. Unlike traditional telemedicine that deals with disease specific monitoring or intervention (diabetes, CHF, dementia etc), our cohort exhibits a very diverse population in terms of disease affliction, complexity and propensity to receive care.

Post Traumatic Stress Disorders

In September 2008 DOD extended our study to separately follow and treat a total of 15 veterans with TBI and PTSD using a variety of measures and instruments. In January 2009 we started enrolling veterans who meet this inclusionary criterion. We have enrolled a total of 14 veterans who meet the inclusionary criteria and have collected baseline and six month data and present the veteran’s responses to the Beck Depression Inventory and the modified PTSD symptom scale. Both instruments appear to indicate an improvement over six months after enrollment especially in the decline in suicidal tendencies. More troubling was the relative lack of improvement in the areas of concentration and loss of interest. Flashbacks and emotional reminders of traumatic experiences worsened over the six month interval indication the need for intensive counseling to address the same though none of the changes were statistically significant due to the small sample size. Table 2 denotes change in depression levels over the period of observation.

Table 2: Beck Depression Inventory

Label	N	Baseline			n	6 Months		
		Mean	Med	Std		Mean	Med	Std
Beck Depression Inventory Composite	14	1.58	1.48	0.65	9	1.42	1.57	0.60
Sadness	14	1.21	1.00	0.97	9	1.11	1.00	1.05
Pessimism	14	1.50	1.00	0.76	9	1.44	1.00	1.13
Past Failure	14	1.07	1.00	1.00	9	0.89	1.00	0.93
Loss of Pleasure	14	1.93	2.00	0.73	9	2.00	2.00	1.12
Guilty Feelings	14	1.50	1.00	1.16	9	1.22	1.00	1.09
Punishment Feelings	14	1.64	2.00	1.39	9	0.56	0.00	0.73
Self Dislike	14	1.21	1.00	1.05	9	1.11	1.00	1.05
Self-Criticalness	14	1.50	1.00	1.02	9	1.22	1.00	0.44
Suicidal Thoughts or Wishes	14	0.93	1.00	0.92	9	0.33	0.00	0.50
Crying	14	1.43	1.00	1.22	9	1.44	1.00	1.33
Agitation	14	1.79	2.00	0.80	9	1.56	1.00	0.88
Loss of Interest	14	1.79	2.00	0.97	9	1.89	2.00	0.78
Indecisiveness	14	1.93	2.00	0.73	9	1.89	2.00	0.78
Worthlessness	14	1.29	1.50	1.14	9	1.22	1.00	1.09
Loss of Energy	14	1.57	1.50	0.65	9	1.78	2.00	0.83
Changes in Sleeping Patterns	14	2.00	2.00	0.39	9	1.89	2.00	0.93
Irritability	14	1.79	2.00	0.80	9	1.67	2.00	1.00
Changes in Appetite	14	1.50	2.00	1.02	9	1.56	2.00	0.53
Concentration Difficulty	14	1.93	2.00	0.73	9	1.89	2.00	0.78
Tiredness or Fatigue	14	1.86	2.00	1.03	9	1.44	1.00	0.73
Loss of Interest in Sex	14	1.79	2.00	0.89	9	1.67	2.00	0.71

Table 3 highlights changes in markers for a diagnosis of Post Traumatic Stress Disorders among 14 war wounded with combat related TBI and PTSD.

Table 3: Modified PTSD Symptom Scale

Label	Baseline				6 Months			
	n	Mean	Med	Std	n	Mean	Med	Std
Modified PTSD Symptom Scale: Self-Report - Frequency Composite	14	3.19	3.21	0.50	9	2.96	3.00	0.66
Have you had recurrent or intrusive distressing thoughts or recollections about the experience?	14	3.29	3.00	0.73	9	2.89	3.00	0.78
Have you been having recurrent bad dreams or nightmares about the experience?	14	3.00	3.00	0.68	9	2.56	2.00	1.01
Have you had the experience of suddenly reliving the experience flashbacks, acting or feeling as if it were re-occurring?	14	2.57	2.50	0.85	9	2.67	3.00	0.71
Have you been intensely EMOTIONALLY upset when reminded of the experience (includes anniversary reactions)?	14	2.71	2.50	0.83	9	3.00	3.00	1.00
Have you been having intense physical reactions (e.g., sweaty, heart palpitations) when reminded of the experience?	14	2.79	3.00	1.05	9	2.78	2.00	0.97
Have you persistently been making efforts to avoid thoughts or feelings associated with the experience?	14	3.07	3.00	1.00	9	3.00	3.00	0.87
Have you persistently been making efforts to avoid activities, situations, or places that remind you of your experience?	14	3.21	3.50	1.05	9	2.44	2.00	1.33
Are there any important aspects about your experience that you cannot recall?	14	2.64	3.00	1.01	9	2.22	2.00	0.83
Have you markedly lost interest in free time activities?	14	3.43	3.50	0.65	9	3.00	3.00	1.00
Have you felt detached or cut off from others around you?	14	3.57	4.00	0.94	9	3.44	4.00	0.73

Have you felt that your ability to experience the whole range of emotions is impaired (e.g., unable to have loving feelings)?	14	3.43	4.00	0.76	9	3.67	4.00	0.71
Have you felt that any future plans or hopes have changed because of your experience (e.g., no career, marriage, children, or long life)	14	3.21	3.00	0.80	9	2.56	2.00	1.24
Have you been having persistent difficulty falling or staying asleep?	14	3.57	4.00	0.51	9	3.67	4.00	0.50
Have you been continuously irritable or having outbursts of anger?	14	3.21	3.50	0.89	9	2.89	3.00	0.93
Have you been having persistent difficulty concentrating?	14	3.50	4.00	0.65	9	3.44	4.00	0.73
Are you overly alert (e.g., always check to see who is around you, etc.)?	14	3.71	4.00	0.61	9	3.22	3.00	0.67
Have you been jumpier, more easily startled?	14	3.29	3.00	0.73	9	2.89	3.00	1.05

Functional Independence Measure™ (FIM) and Functional Assessment Measure (FAM): The (FIM™)^{1,2} is a widely accepted functional assessment measure in use in the rehabilitation community. The FIM measures independent performance in motor and cognitive skills in addition to the ADLs pertaining to the self care categories of feeding, grooming, bathing, dressing upper body, dressing lower body and toileting. The FIM is proprietary. We have therefore captured all elements of the FIM in an expanded version of the same which includes elements in Functional Assessment as well.

Because disturbances in communication, cognition, and behavior are prominent characteristics after brain injury, additional items considering those issues were added to the FIM, resulting in a functional assessment measure, FIM+FAM.³ The FIM+FAM has been increasingly adopted as an outcome measure in brain injury rehabilitation.^{4,5}

Findings: Table 4 provides for the N, means, medians, and standard deviation of self scoring by veterans at baseline, six month and twelve months after enrollment. The range of scoring for each item is 1-7 with a response of 1 denoting a near total assistance (able to complete less than 25% of task) and 7 implying complete independence. The range of 1-7 imposes ceiling effects on responses. The cohort in general performed well in self care items such as grooming, feeding, bathing and dressing as well as toileting. Except for one veteran confined to a wheelchair, as a group they indicated good mobility and locomotion as expressed by transfers to chairs, cars, climbing stairs and using the tub or shower. Communication skills as contained in reading and verbalizing were adequate. As clearly evident psychosocial adjustment and cognitive function are the main areas of concern in coordinating care. Depression, anger, substance abuse, inability to integrate into society and post traumatic stress disorders of varying magnitude and complexity afflict many returnees with wounds incurred in war. Emotional outbursts are fairly frequent among this population.

Our care coordination therefore has been mostly directed towards facilitating psychological counseling and psychiatric care. Due to the shortage of mental health experts in the VA compared to the large number of veterans who require this service our efforts at obtaining the needed care for our cohort has been challenging.

Table 4: Functional Independence Measure™ and Functional Assessment Measure

Variable	Baseline				6 Months				12 Months			
	n	Mean	Med	STD	n	Mean	Med	STD	n	Mean	Med	STD
FIMFAM COMPOSITE	64	6.01	6.31	0.97	52	5.97	6.10	0.93	20	6.08	6.14	0.70
SELF CARE ITEMS (Totals)	64	6.51	6.93	0.91	52	6.46	6.86	0.86	20	6.71	7.00	0.38
Feeding	64	6.55	7.00	1.05	52	6.44	7.00	1.13	20	6.70	7.00	0.57
Grooming	64	6.52	7.00	0.93	52	6.29	7.00	1.24	20	6.55	7.00	0.60
Bathing	64	6.33	7.00	1.29	52	6.37	7.00	1.09	20	6.60	7.00	0.50
Dressing Upper Body	64	6.45	7.00	1.22	52	6.48	7.00	0.96	20	6.80	7.00	0.41
Dressing Lower Body	64	6.34	7.00	1.20	52	6.31	7.00	0.96	20	6.60	7.00	0.75
Toileting	64	6.61	7.00	1.11	52	6.62	7.00	0.84	20	6.80	7.00	0.41
Swallowing	64	6.80	7.00	0.74	52	6.73	7.00	0.84	20	6.95	7.00	0.22
SPHINCTER CONTROL	63	6.63	7.00	0.84	52	6.63	7.00	0.88	20	6.70	7.00	0.44
Bladder Management	63	6.70	7.00	0.80	52	6.65	7.00	0.84	20	6.70	7.00	0.47
Bowel Management	63	6.57	7.00	0.98	52	6.60	7.00	1.00	20	6.70	7.00	0.47
MOBILITY ITEMS	63	6.56	7.00	1.04	52	6.61	6.83	0.66	20	6.64	7.00	0.51
Bed	52	6.56	7.00	1.02	52	6.40	7.00	0.98	20	6.30	7.00	1.08
Chair	63	6.56	7.00	1.10	52	6.67	7.00	0.68	20	6.55	7.00	1.00
Wheelchair	41	6.68	7.00	0.99	50	6.76	7.00	0.82	20	7.00	7.00	0.00
Toilet	63	6.60	7.00	1.16	52	6.73	7.00	0.66	20	6.75	7.00	0.44
Tub or Shower	63	6.43	7.00	1.25	52	6.48	7.00	0.83	20	6.65	7.00	0.49
Car Transfer	62	6.61	7.00	0.96	52	6.60	7.00	0.77	20	6.60	7.00	0.75
LOCOMOTION	63	6.29	6.50	1.07	52	6.23	6.50	1.03	20	6.43	7.00	0.84
Walking	62	6.23	6.50	1.11	52	6.10	6.00	1.19	20	6.05	7.00	1.57
Wheelchair	41	6.66	7.00	0.99	50	6.80	7.00	0.73	20	7.00	7.00	0.00
Stairs	63	6.00	6.00	1.37	52	6.04	6.00	1.33	20	6.10	7.00	1.62
Community Access	63	6.29	7.00	1.50	52	6.04	7.00	1.62	20	6.55	7.00	0.69
COMMUNICATION ITEMS	63	5.98	6.29	1.11	52	5.93	6.21	1.01	20	6.07	6.21	0.92
Comprehension-Audio	60	5.65	6.00	1.52	52	5.63	6.00	1.39	20	5.90	6.00	0.97
Comprehensive-Visual	58	5.90	6.00	1.35	52	6.12	6.00	1.13	20	6.20	6.00	0.89
Expression-Verbal	63	6.22	7.00	1.24	52	5.96	6.00	1.25	20	6.15	7.00	1.27
Expression-Non-Verbal	53	6.36	7.00	1.11	52	6.27	7.00	1.09	20	6.25	7.00	1.12
Reading	63	5.86	6.00	1.47	52	5.58	6.00	1.50	20	5.70	6.00	1.38
Writing	63	5.83	6.00	1.41	52	5.85	6.00	1.53	20	6.10	6.00	1.33
Speech Intelligibility	62	6.10	6.50	1.33	52	6.08	6.50	1.36	20	6.20	6.00	1.06
PSYCHOSOCIAL ADJUSTMENT	62	5.05	5.75	1.77	52	4.95	5.50	1.86	20	4.81	4.63	1.64
Social Interaction	62	5.23	6.00	1.99	52	5.15	6.00	1.90	20	4.85	5.00	1.93
Emotional Status	62	5.02	6.00	1.91	52	4.85	6.00	1.99	20	4.45	4.00	1.88
Adjustment to Limitations	61	5.31	6.00	1.82	52	5.19	6.00	1.78	20	5.25	5.00	1.48
Employability	61	4.66	6.00	2.38	52	4.60	6.00	2.43	20	4.70	6.00	2.52
COGNITIVE FUNCTION	63	4.95	5.40	1.57	52	4.99	5.40	1.47	19	5.17	5.20	1.23
Problem Solving	63	5.11	6.00	1.81	52	5.38	6.00	1.73	19	5.42	6.00	1.50
Memory	63	3.90	4.00	1.73	52	3.77	3.00	1.82	19	4.32	4.00	1.77
Orientation	63	5.35	6.00	1.83	52	5.44	6.00	1.70	19	5.37	6.00	1.54
Attention	63	4.75	5.00	1.75	52	4.58	5.00	1.85	19	4.89	6.00	1.66
Safety Judgment	63	5.62	7.00	1.90	52	5.77	6.50	1.63	19	5.84	6.00	1.38

Patient Competency Rating: The Patient Competency Rating provides for a rating of basic competencies in performing everyday chores with responses on a 1-5 scale with 1 denoting the most difficulty in addressing a problem and a score of 5 implying ability to handle the problem with total ease.

Findings: Findings of the completed questionnaires are contained in Table 5 and are similar to those of FIM/FAM with psychosocial adjustment (problem controlling temper, keeping from being depressed, adjusting to changes) and cognition (remembering, scheduling and participating) posing challenges to the veterans and care providers. As may be noticed the range of most responses is 1-5 though the means tend towards the higher numbers. This is due to the binary nature of our cohort where the majority of individuals display good health and a small minority are of poor health status.

Table 5: Patient Competency Rating

Variable	Baseline				6 Months				12 Months			
	n	Mean	Med	Std	n	Mean	Med	Std	n	Mean	Med	Std
Preparing meals	65	3.77	4.00	0.90	52	3.81	4.00	0.97	19	3.89	4.00	0.94
Dressing myself	65	4.11	4.00	0.92	52	4.12	4.00	0.92	19	4.26	4.00	0.81
Personal hygiene	65	4.09	4.00	0.98	52	4.17	4.00	0.81	19	4.21	4.00	0.85
Washing dishes	65	3.78	4.00	1.04	52	3.90	4.00	1.12	19	4.11	4.00	0.99
Doing laundry	65	3.68	4.00	1.05	52	3.75	4.00	1.10	19	4.11	4.00	0.94
Taking care of finances	65	2.91	3.00	1.14	52	3.08	3.00	1.25	19	3.21	3.00	1.13
Keeping appointments	65	2.68	3.00	0.85	52	2.83	3.00	1.02	19	2.95	3.00	0.91
Starting conversations	65	2.71	2.00	0.98	52	2.71	2.50	1.09	19	2.63	2.00	1.07
Staying involved work	65	2.40	2.00	0.72	52	2.31	2.00	0.90	19	2.42	2.00	0.90
Remembering dinner last night	65	2.78	3.00	0.87	52	2.65	2.50	0.86	19	2.84	3.00	1.17
Remembering names	65	2.63	2.00	0.91	52	2.77	3.00	0.94	19	2.84	3.00	0.96
Remembering daily schedule	65	2.60	3.00	0.79	52	2.69	3.00	0.96	19	3.00	3.00	1.25
Remembering important things	65	2.48	3.00	0.75	52	2.38	2.00	0.75	19	2.74	2.00	0.99
Driving car	65	3.88	4.00	1.07	52	3.90	4.00	1.19	19	4.32	5.00	0.95
Getting help confused	65	3.08	3.00	0.92	52	3.19	3.00	1.07	19	3.42	3.00	0.77
Adjusting to changes	65	2.74	3.00	0.83	52	2.85	3.00	1.02	19	3.00	3.00	1.00
Handling arguments	65	2.43	2.00	0.97	52	2.52	2.00	1.04	19	3.00	3.00	1.00
Accepting criticism	65	2.80	3.00	1.05	52	2.88	3.00	1.20	19	2.89	3.00	1.24
Control crying	65	3.42	3.00	1.06	52	3.63	4.00	1.16	19	3.53	3.00	1.35
Acting appropriately	65	3.60	4.00	0.97	51	3.57	4.00	1.01	19	3.89	4.00	0.88
Showing affection	65	2.63	2.00	1.02	51	2.47	2.00	1.08	19	2.58	2.00	1.02
Participating in groups	65	2.75	3.00	0.87	51	2.55	2.00	0.99	19	3.05	3.00	1.08
Recognizing upsetting others	65	2.91	3.00	0.93	51	2.73	3.00	0.98	19	2.79	3.00	1.13
Scheduling daily activities	65	2.72	3.00	0.88	51	2.86	3.00	1.08	19	2.95	3.00	0.91
Understanding instructions	65	3.12	3.00	0.84	51	3.04	3.00	0.98	19	3.16	3.00	0.96
Meeting daily responsibilities	65	3.14	3.00	0.81	51	2.92	3.00	0.98	19	3.16	3.00	1.12
Controlling temper	65	2.35	2.00	0.82	51	2.29	2.00	0.97	19	2.32	2.00	1.06
Keeping from being depressed	65	2.54	2.00	0.99	51	2.47	2.00	1.03	19	2.47	2.00	0.84
Keeping emotions from affecting abilities	65	2.80	3.00	0.89	51	2.57	2.00	0.96	19	2.79	3.00	1.03
Control laughter	65	3.77	4.00	0.90	51	4.16	4.00	0.95	19	4.11	4.00	1.05
Totals	65	3.04	3.03	0.54	52	3.07	2.98	0.69	19	3.22	3.13	0.69

Craig Handicap Assessment and Reporting Technique: The CHART provides for assessing assistance levels, time spent (and with whom) and financial resources. The standard deviations indicate great variability among veterans in each of the categories listed substantiating our prior finding that our cohort is binary in nature on care needs especially in the areas of cognition and integration into society.

Table 6: Craig Handicap Assessment and Reporting Technique

Variables		Baseline				6 Months				12 Months			
		n	Mean	Med	Std	n	Mean	Med	Std	n	Mean	Med	Std
Physical assistance for Personal care activities	Hrs paid	65	0.11	0.00	0.87	52	0.19	0.00	0.91	19	0.00	0.00	0.00
	Hrs unpaid	65	3.29	0.00	8.43	52	2.37	0.00	5.77	19	3.79	0.00	7.98
Time someone is with you in your home	Hrs assisting	65	4.12	5.00	1.83	52	3.46	3.50	2.00	19	3.95	4.00	2.01
	Hrs help remembering	65	3.15	3.00	0.78	52	3.19	3.00	0.79	19	3.26	3.00	0.73
Typical day	Hrs out of bed	65	14.80	16.00	4.89	52	14.13	16.00	4.92	19	15.37	17.00	3.53
	Hrs out of house	65	4.02	4.00	2.07	52	4.13	5.00	2.08	19	3.58	3.00	2.06
Nights spent away from your home	In previous year	65	2.63	3.00	1.34	52	2.77	3.00	1.32	19	2.74	3.00	1.24
Hours/ week working in a job	Hrs	65	14.92	0.00	18.89	52	16.31	0.00	20.24	19	22.00	26.00	19.85
Employment status	Yes=1; no=0	54	0.48	0.00	0.50	52	0.48	0.00	0.50	19	0.63	1.00	0.50
Hours/ week in school working toward a degree	Hrs	65	3.77	0.00	8.36	52	6.04	0.00	11.15	19	3.84	0.00	5.62
Homemaking including parenting	Hrs wk	65	19.49	10.00	28.15	52	16.92	8.00	23.20	19	15.21	10.00	16.14
Maintenance	Hrs wk	65	4.09	2.00	5.36	52	4.52	2.00	6.99	19	5.89	3.00	6.40
Recreational activities	Hrs wk	65	4.51	2.00	5.93	52	5.06	2.50	6.98	19	5.37	2.00	8.25
People living with	Number	65	2.71	2.00	3.77	52	2.31	2.00	1.57	19	2.11	2.00	1.66
Any significant other	Significant others	59	0.76	1.00	0.43	47	0.83	1.00	0.38	16	1.00	1.00	0.00
Relatives living with	Number	65	1.77	2.00	1.65	52	1.73	1.00	1.89	19	1.68	1.00	1.73
Business /associates visited monthly	Number	65	2.75	0.00	8.41	52	3.98	0.00	14.56	19	3.16	0.00	9.23
Friends visited, phoned, at least once a month	Number	64	3.36	3.00	3.28	50	2.74	2.00	4.10	17	1.65	2.00	1.27
Strangers initiated a conversation with	Number	65	1.31	1.00	1.04	52	1.06	1.00	1.00	19	0.89	1.00	1.05

Combined annual yearly income	Nominal scale <20k to >80k	64	4.53	4.00	2.15	51	4.51	4.00	2.19	18	5.44	5.50	2.50
Yearly medical care expenses	Nominal scale <1k to >15k	65	2.31	2.00	1.54	52	2.37	2.00	1.67	19	2.89	3.00	2.02

Patient satisfaction surveys

The first of our patient satisfaction surveys revealed the enrollees were highly appreciative of the care provided as indicated in Table 7 with the scoring mechanism on a Likert scale with 5 denoting strongly agreeing and 1 equal to a strong disagreement to the question posed. Veterans rated the interventionist (Ms. Sue Brock, ARNP) a perfect 5 for her effort and overwhelmingly rated the telerehabilitation intervention as superior to traditional VA care obtained at the Tampa VA.

Table 7: Patient satisfaction survey

	Question	N	Mean	Median	Std Dev
Q1	The telerehab website was easy for me to use.	25	4.60	5.00	0.5774
Q2	I found the telerehab communications convenient.	25	4.84	5.00	0.3742
Q3	I found the amount of time the telerehab communications take to be about right.	25	4.60	5.00	0.5774
Q4	I found the time between telerehab communications about right.	25	4.48	5.00	0.5859
Q5	The RN (Sue Brock) returned my messages in a timely manner.	26	5.00	5.00	0.0000
Q6	The RN was able to provide the services requested.	26	4.96	5.00	0.1961
Q7	The overall care and services provided by the RN met my needs.	26	4.81	5.00	0.4915
Q8	When I had questions about care coordination the answers provided were helpful to me.	26	4.88	5.00	0.3258
Q9	I had no concerns about whether the privacy of personal medical information was protected.	26	4.65	5.00	0.8918
Q10	The telerehab care coordination was more convenient than arranging through the James A Haley Veteran's Hospital.	26	4.81	5.00	0.4915
Q11	The telerehab communications can substitute for some visits to the James A Haley Veteran's Hospital.	26	4.19	4.50	0.8953
Q12	Overall, I am satisfied with the telerehab service I am enrolled in.	26	4.85	5.00	0.3679

Key Research Accomplishments: None so far.

Reportable Outcomes: We have presented our initial findings at the Military Health Forum in Kansas City in September 2009. Findings will be published in peer-reviewed medical journals such as the VA Journal of Rehabilitation Research and Development and the US Army Medical Journal and presented at national meetings, such as VA HSR&D and appropriate conferences organized by the DOD. The results of this research will be presented at the annual PT/BRI conference sponsored jointly and hosted annually by the Tampa VA, the Defense and Veterans Brain Injury Center and the University of South Florida. In addition to the usual methods of dissemination, the main audience for research findings is clinical staff at the four PT/BRI Centers. We are presently preparing the first of manuscripts for publication in peer reviewed journals highlighting our findings.

Presentations:

1. K Siddharthan, S Scott, AM Spehar, SM Brock, WA Lapcevic. *Telerehabilitation for combat wounded with Traumatic Brain Injury (TBI) and Post Traumatic Stress Disorders (PTSD)*. James A. Haley Veterans Hospital Research Day (April 29, 2010).
2. K Siddharthan, S Scott, AM Spehar, SM Brock, WA Lapcevic. *Effect of comorbid PTSD on psychosocial adjustment among combat wounded veterans*. VA Mental Health Conference, Little Rock, AK, April 2010

Conclusion.

The major findings our research so far indicates:

1. Functional capabilities measured by locomotion and mobility appear to have stabilized among our cohort of veterans while deficiencies in cognition (memory, problem solving), psychosocial adjustment (anger, emotional status) and problems in integrating into society pose challenges.
2. Headaches, depression and other Post Traumatic Stress disorders appear to afflict a majority of patients.
3. Individualized treatment pathways are needed for rehabilitation and ultimate integration into society.
4. Veterans have expressed appreciation for the program.

We would like to enhance the robustness of our telerehab study by proposing to expand our present research into a randomized control study (RCT) by following as a control group up to 30 veterans who receive traditional care at the Tampa VA and are not subject to our intervention. Such an RCT would greatly enhance the power of our study and enable investigation into the cost effectiveness of telerehabilitation and the time trajectories of various health outcomes while adjusting for confounders, characteristics that our present study lacks. We are working closely with DOD to try and redefine our statement of work to address this undertaking.

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