

**Department of Veterans Affairs
Quality Enhancement Research Initiative (QUERI)**



Polytrauma/Blast-Related Injuries

*Improving Care for Veterans with
Polytrauma and Blast-Related Injuries*

**Strategic Plan
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Strategic Plan Executive Summary

I. Center Mission, Scope and Goals

The mission of the Polytrauma and Blast-Related Injuries (PT/BRI) QUERI is to promote the successful rehabilitation, psychological adjustment and community re-integration of individuals who have polytrauma and blast-related injuries. Consistent with the VHA definition of polytrauma,¹ PT/BRI QUERI defines polytrauma as two or more injuries to physical regions or organ systems, one of which may be life threatening, resulting in physical, cognitive, psychological, or psychosocial impairments and functional disability.

The scope of the PT/BRI QUERI includes the full range of health problems, health care system and psychosocial factors represented in this mission. However, PT/BRI QUERI focuses on filling gaps and implementing research to improve health outcomes for two high priority and prevalent blast-related injuries that occur in the context of other combat injuries: Traumatic Brain Injury (TBI) and traumatic amputation.

Our efforts are focused primarily on enhancing the new and rapidly evolving Polytrauma System of Care which has targeted individuals whose combat injuries frequently include TBI. As amputation care becomes more integrated into the Polytrauma System of Care, PT/BRI will sharpen its focus on traumatic amputations.

PT/BRI QUERI's goals are listed below. Goals to improve practice are listed by time frame. The first six goals will be our primary focus during this next fiscal year. However, we will also undertake activities to advance goal 7 this next year. Implementation science goals are not time dependent. We see these goals as integral to all our activities and undertake activities to advance these goals on an ongoing basis.

Immediate Short-Term Goals to Improve Practice

1. Develop efficient, sustainable and valid data systems for identifying patients, their medical problems, service needs and outcomes.
2. Optimize care coordination and transitions across care systems and settings for patients with polytrauma and blast-related injuries.
3. Ensure that blast-exposed veterans receive screenings for high frequency "invisible" problems, including TBI, hearing loss, vision loss, pain, and mental health problems.
4. Optimize caregivers'/family members' ability to provide supportive assistance to veterans with impairments resultant from polytrauma and blast-related injuries.
5. Promote identification and evaluation of potentially best practices for polytrauma rehabilitation.
6. Promote and conduct research to identify community reintegration problems and facilitate community reintegration among veterans with PT/BRI.

Medium- to Long-Term Goals to Improve Practice

7. Improve treatment and outcomes for blast-related amputation.
8. Identify and test potentially fruitful strategies to improve self-management, including tele-rehabilitation, cognitive aids, augmentative communication and environmental controls.
9. Expand the evidence-base for treatment of mental health problems, including PTSD and substance use disorders, among individuals who have polytraumatic injuries.

Implementation Science Goals

- a. Develop and/or adapt and evaluate implementation and quality improvement strategies to clinical problems for which the evidence-base is not well developed.
- b. Promote the development of a community of evidence-based practice for polytrauma and blast-related injuries.
- c. Identify or develop strategies for evaluating the implementation readiness of new research evidence.

To fulfill its mission and achieve its goals, PT/BRI QUERI is developing and coordinating a broad network of: (a) investigators from the VA (including HSR&D and RR&D Centers of Excellence), DoD and academic institutions, (b) consumers (patients and their caregivers), (c) clinician experts, and (d) managers and VHA leaders. In addition, PT/BRI QUERI is adapting the QUERI 6-step process to reflect the fact that the system of care is not static, standard literature reviews will need to be supplemented with consensus processes to identify potentially best practices, and potentially better practices may need to be adapted and tested in local contexts rather than through RCTs. That is, PT/BRI QUERI is modifying the QUERI process to include a focus on the contextual and evolving nature of evidence for best practice in polytrauma rehabilitation.

I.1 Scope and Clinical Focus

The scope of the PT/BRI QUERI includes the full range of health problems, health care system and psychosocial factors represented in this mission. The PT/BRI QUERI, therefore, is not limited to one medical problem. Instead, this QUERI focuses on the complex pattern of co-morbidities and related functional problems and health care needs among the combat-injured.

Despite the breadth of this scope, we have identified two **priority clinical foci**: traumatic brain injury (TBI) with polytrauma and traumatic amputation with polytrauma. That is, our clinical priorities are TBI and traumatic amputation in the context of injuries to other body structures and organs. Both TBI and traumatic amputation are priority areas for VHA and of increased prevalence due to the Global War on Terror (GWoT).²⁻⁴ The cohort that is the primary target of our activities is Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) VA patients, many of whom remain on active duty during their initial course of treatment in the VA. However, QUERI activities will benefit all patients with polytraumatic injuries, regardless of service era and context of injury (e.g., war zone), particularly those who have injuries caused by explosions.

Because the health care system that is the target of our activities is the VHA Polytrauma System of Care, PT/BRI QUERI has partnered closely with the newly designated Polytrauma Rehabilitation Centers (PRCs) which are charged with setting the standards for polytrauma care throughout the VA. Over time, our focus will include the full range of health care settings that serve individuals with polytrauma and blast-related injuries and the full spectrum of injury severity. This expansion of our focus from PRC inpatient rehabilitation for the severely injured to outpatient and home based facilities for those with milder injuries parallels the roll out of the Polytrauma System of Care.

Other QUERI Overlap: Other QUERIs also focus on improving health outcomes for OIF/OEF veterans, including OIF/OEF with post-deployment health problems. Coordination of research efforts involving new veterans is crucial, particularly for PT/BRI QUERI given the relatively small size of the target population. PT/BRI QUERI is exploring with other QUERI Centers, including the Spinal Cord Injury and Mental Health QUERIs, the possibility of collaborating on cross-

cutting projects. The PT/BRI QUERI Implementation Research Coordinator is responsible for initiating communication with other QUERI Centers to ensure adequate coordination of research that cuts across QUERI conditions and involves new veterans.

I.2 Significance and Consequence: Epidemiology, Morbidity/Mortality, Quality of Life and Costs.

During the GWOt, America's Armed forces are sustaining new and complex patterns of blast-related injuries.³⁻⁵ As of October 22, 2007, 29,958 service members have sustained non mortal injuries during OIF and OEF(in and around Afghanistan), 13,695 of whom did not returned to duty within 72 hours, presumably because of the severity of their injuries.⁶ In this era of modern warfare, the majority of combat injuries are blast-related.⁷⁻⁹ In combat, sources of blast injury include artillery, rocket and mortar shells, mines, booby traps, aerial bombs, improvised explosive devices and rocket propelled grenades. The severity and pattern of blast injuries depends on the explosive composition and amount of material involved, surrounding environment, delivery method, distance between the victim and the blast, and presence of intervening protective barriers or environmental hazards.¹⁰ Due to improvements in body armor, as well as in battle site and acute trauma care, more individuals are surviving beyond the acute phase of blast injuries.^{4,11} Consequently, the military and VA are providing medical care to individuals with blast injuries who may have died in previous wars.

The four basic mechanisms of blast injury are termed as primary, secondary, tertiary, and quaternary.⁵ Primary injuries are due to high-order explosive over-pressurization shock wave moving through the body from solid and liquid sections to gas-filled organs, such as the lungs, gastro-intestinal tract and middle ear. These injuries are not necessarily obvious. Secondary injuries are due to bomb fragments and other objects propelled by the explosion. Tertiary injuries result from the blast wind (not the over-pressurization shock wave) throwing the victim and can include bone fractures and traumatic amputation. Quaternary injuries are those not included in the first three classes, such as burns, crushing injuries and respiratory injuries.

Given the possible effects of explosions on the human body, it is not surprising that blast injuries are often "polytraumatic". Injured body systems and structures include: (1) auditory/vestibular, (2) eye, orbit, face, (3) respiratory, (4) digestive, (5) circulatory, (6) central nervous system, (7) renal/urinary tract, (8) extremity, (9) soft tissue, (10) mental health, and (11) pain.¹² Particularly common is traumatic brain injury (TBI). It has been estimated that over 60% of blast-injuries result in Traumatic Brain Injury^{3,13} and TBI has been labeled the "signature injury" in the GWOt.¹⁴ Consequently, best practice for blast-related polytrauma requires a focus on TBI in the context of other injuries.

PT/BRI QUERI conducted a study of PRC patients to identify high priority problems among combat injured VA polytrauma patients (the Patient Characteristics and Outcomes Study). During the first four years of the GWOt, the PRCs treated 566 active duty service members, 188 of whom were injured in OIF/OEF. Most war-injured patients had traumatic brain injury, injuries to several other body systems and organs and associated pain. Blasts impacted more body systems and/or organs than other mechanisms of injury; with the median and modal number of injuries associated with blasts being five (range 1 to 9). Soft tissue, eye, oral and maxillofacial, otologic, penetrating brain injuries, post-traumatic stress syndrome symptoms, and auditory impairments were more common in blast-injured patients than in those with war injuries of other etiologies.¹⁵

The severity of polytraumatic combat injuries and the circumstances in which they occur cause not only significant impairments, but also psychological stress to injured soldiers and their families. New systems of care are needed to meet the rehabilitation needs and optimize functional outcomes in this new patient group. Recognizing this, Congress passed Public Laws 108-422 (section 302) and 108-447 and the Secretary of Veterans Affairs designated four Polytrauma Rehabilitation Centers (PRCs; Minneapolis, MN, Palo Alto, CA, Richmond VA, Tampa, FL) to provide specialized rehabilitation treatment and expand clinical expertise in polytrauma throughout the VA.^{16,17} The VA is in the process of establishing a fifth PRC in San Antonio, Texas, with construction starting in 2008.

I.3 Treatment/Management Evidence Base

There is not a strong evidence base for best practice for rehabilitation of TBI with polytrauma, particularly blast-related polytrauma. The PT/BRI QUERI priorities, therefore, stem from research on best practices for TBI rehabilitation, chronic disease management, and stakeholder needs. We selected the empirically-supported Chronic Care Model (CCM)¹⁸⁻²⁰ as a clinical conceptual framework because the effects of blasts and other battlefield injuries are likely to be life-long. Furthermore, given the chronicity of the conditions for which individuals seek rehabilitation care, it is not surprising that there is considerable conceptual overlap between rehabilitation best practice and the CCM. Both, for example, seeking to optimize care coordination, treatment planning, environmental support, including support for family members/caregivers, and support for patient self-sufficiency/self-management in order to help patients achieve the highest possible level of functioning and quality of life.¹⁹⁻²³ The relevance of the CCM to individuals with polytraumatic injuries is further demonstrated by the fact that about half of patients with a chronic condition suffer from multiple chronic conditions.¹⁸ That is, the CCM addresses the needs of patients with multiple morbidities.

Data System Development. There is strong evidence that reliable and valid data systems for tracking and monitoring patients are necessary for effective management of complex and chronic medical conditions. Evidence indicates that effective chronic illness care depends on information systems that assure ready access to data on individual patients as well as populations of patients.^{24,25} Data systems are needed to provide timely reminders for providers and patients, identify relevant subpopulations for proactive care, facilitate treatment planning, share information with patients and providers to coordinate care, and monitor performance of teams and care systems. Because of the fundamental role data systems play in disease management, development of data systems for tracking and monitoring outcomes among patients with polytrauma and blast-related combat injuries is the PT/BRI QUERI's highest priority.

Care Transitions and Coordination. Patients with complex care needs often require care in multiple settings. They are also particularly vulnerable to care transition failures.²⁶ Indeed, breakdowns in communication and care coordination as patients transition across care systems; settings and providers interfere with effective, efficient and safe service delivery and result in inadequate patient and caregiver preparation for receiving care at the next setting.^{18,26-29} It is, therefore, not surprising that care coordination plays an important role in the CCM model and rehabilitation best practice.^{28,30} There is also consensus that care coordination over the life span is essential for management of TBI with polytrauma³¹ and VHA has established specific care structures to facilitate care coordination to injured veterans, regardless of where they live, including a polytrauma case management system and a telehealth network.³² Identification of optimal approaches to care coordination is limited by the fact that there is no consensus as to what constitutes coordinated care and what outcomes should be measured.³³ There is also a lack of measures to assess the quality of care transitions. However, there is a growing

understanding of what effective care transitions involve. At the general level, effective care transitions involve: (a) communications between the sending and receiving care teams, (b) preparation of the patient and the caregiver for what to expect at the next level of care, (c) medication reconciliation, (d) a follow-up plan, and (e) education about warning symptoms to monitor.²⁶ Data systems and information support technologies can serve an important role in facilitating the timely transfer of essential information as patients traverse care systems and settings.^{18, 26}

Screening. Failure to identify and treat TBI exacerbates the disability and burden on society associated with TBI related symptoms.²¹ Furthermore, the social, emotional, and behavioral problems that frequently result from TBI are often misdiagnosed and untreated. Thus, proper identification of TBI is a critical step in determining and providing appropriate treatment for those in need. Furthermore class II evidence suggests that earlier treatment may be associated with better outcomes.³⁴ To ensure that veterans returning from Iraq and Afghanistan with combat-related TBI receive appropriate healthcare, the VA instituted nationwide screening for all OIF/OEF VA users in April, 2007.³⁵ The VA screening tool is based on the brief screening tool developed by the Defense and Veterans Brain Injury Center (DVBIC) and tested in active duty.³⁶ A priority for the PT/BRI QUERI is to promote research supporting the implementation of this screening tool. Furthermore, as discussed above, individuals with blast-related TBI often have impairments in other areas. The work of QUERI investigators indicates that pain and visual dysfunction is particularly common among polytrauma patients with TBI.³⁷

Caregiver Burden. A significant number of caregivers, spouses and family members of persons with TBI report stress, depression, anxiety and decreased time and energy for recreational activities.³⁴ The depression is often enduring.³⁸ Emotional and behavioral changes in the individuals with TBI are associated with caregiver distress and poor family functioning.³⁴ In one relatively large study, injury severity was also associated with caregiver burden.³⁹ Inferring from available data, one would expect for caregivers of patients with polytraumatic combat injuries to be at risk for adverse effects. There is some data to suggest that caregiver distress has a negative impact on the caregiving.⁴⁰⁻⁴² In a recent report, the Office of the Inspector General emphasized the need for VA to address the needs of the family members of patients who have TBI with polytrauma: "To adequately meet the needs of its TBI patients, VHA needs to provide additional help for the family members and other caregivers so vital to the well-being of these patients in the long-term."^{31(p.i)} While the need is great, research on interventions to meet the support and information needs of family members of TBI patients is limited.³⁴

1.4 Current Practices and Quality/Outcome Gaps.

The Polytrauma System of Care is new and rapidly evolving. There are no clinical practice guidelines for polytrauma rehabilitation. The first performance measure specific to injured OIF/OEF service members and veterans was issued October 19, 2006, to ensure prompt access to VA health services.⁴³ It requires that 90% of new veterans with combat injuries wait no longer than 30 days for specialty care services and that 95% of severely injured OIF/OEF service members/veterans are contacted by their VA case managers within 7 days of notification of transfer to VA. Three quality monitors related to VHA Directive 2007-013, "Screening and Evaluation of Possible Traumatic Brain Injury in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) Veterans" have been developed and are now included in the OQP 2008 Technical Manual. There are two performance measures that evaluate compliance with the requirements of: (a) screening all OIF/OEF who present to VA for care, and (b) timely completion of the comprehensive TBI evaluation. There is also a Supporting Indicator that addresses timely contact for those who screen positive to schedule a

comprehensive evaluation. The External Peer Review Program (EPRP) data extraction is in progress and facility reports will be available in FY 2008.

To identify practices and quality/outcomes gaps, the PT/BRI QUERI conducted a PRC Needs Assessment in FY 2006 based on 56 semi-structured face to face interviews with PRC providers and consultants from services (pain, PTSD, blind rehabilitation, infectious disease) that work closely with the PRCs.⁴⁴ Findings are summarized below:

Changes in Current Practice in Response to a New Cohort of Patients

Findings from the PRC Needs Assessment indicate that VA polytrauma inpatients are demographically and clinically distinct from other VA rehabilitation inpatients and that rehabilitation providers and the system of care are adapting to meet the needs of this new group of patients and their families (see Table 1). Demographic Differences: According to providers, polytrauma patients are younger than other VA rehabilitation patients and hence face different developmental issues in adapting to their injuries. They also have strong military identities that impact their rehabilitation needs and reactions to being injured in combat. The public and media's interest in war injured patients impacts rehabilitation care. Clinical Differences: Polytrauma patients have unique constellations of visible and invisible injuries. Due to their clinical complexity, providers have adjusted their treatment strategies and involve services outside of rehabilitation (e.g., psychiatry, neurology) in treatment. Family members of polytrauma patients are more intensely involved in rehabilitation and have service needs that may surpass those of families of rehabilitation patients without polytrauma. PRC providers are developing new services and new approaches to meet the needs of family caregivers.

Knowledge and Quality Gaps

Needs expressed by PRC providers can be grouped into the following content areas: (1) database development, (2) care coordination, (3) screening promotion, (4) provider education and (5) best or better practices for polytrauma rehabilitation, particularly for rehabilitation for minimally responsive TBI patients and for optimizing caregiver outcomes, and (6) provider stress. Provider-identified needs are presented in Table 2. Needs 1 and 2 are consistent with those reported by the Office of the Inspector General.³¹ Needs 3 and 4 are consistent with a recent VHA initiative to promote TBI education⁴⁵ and an Under Secretary for Health Information Letter to promote TBI screening.⁴⁶ Since collection of these data VHA has instituted national screening for TBI.³⁵

Table 1: Current Practice In Relation to Differences in OIF/OEF PRC Patients

Domain	Differences between Patients with PT/BRI and other VA Rehabilitation Patients	Practice Change
Cohort Differences	Younger; different life-span and family issues; different skills and interests; military identities very important.	PRC units modified in structure, appearance and availability of cohort appropriate resources (e.g., internet); providers incorporating patients' skills and interests into treatment.
Medical Differences	New and complex patterns of injuries. Brain injury may be more severe. Different types of injuries than previously treated within VA (e.g., burns, multiple amputations).	Providers acquiring skills in and adapting standard rehabilitation for TBI to take into account impairments such as low vision or amputations. Using co-treatment more frequently; consulting with services outside of rehabilitation more frequently; Length of stay longer. New staff hired.
Evidence-Base for Practice	Evidence base less well developed than for rehabilitation for single injuries.	Work groups to identify potentially best practices; create protocols, templates and other tools.
Discharge Challenges	Patients may live far away from the PRC; variation in resources across the US and in expertise in TBI and polytrauma within VA. OIF/OEF service members who require long-term care do not fit the demographic of long-term care facilities or nursing homes.	Proactive case management system; PRC staff involved in education of providers across the system of care; implementation of Polytrauma Network Sites; Use of tele-rehab.
Active Duty Status	Most patients are active duty or recently separated, necessitating coordination across the two care systems and involvement of VBA.	DoD Military Liaison on unit; VHA social worker at MTF; access to military records for some providers; Video-conferences with DoD; New responsibilities of case managers.
Family Involvement and Needs	More intense and different in quality. Family members may travel great distances to support the recovery of injured service member and have their own sets of instrumental, information and psychological needs.	Providers integrating family members into the therapies; developing programming and interventions for family members to help them adjust to the changes in their loved one. New staff hired.
Public Involvement	Patients receive more and different types of attention from officials, community members and the media because of the fact that they sustained their injuries in the GWoT.	Hospital administrators and public affairs more involved in units; patients considered "hospital patients"; providers and managers have more reporting responsibilities.

GWoT= Global War on Terror; MTF = Military Treatment Facility; PRC = Polytrauma Rehabilitation Center; VBA = Veterans Benefits Administration.

Table 2: PRC Provider Identified Needs

Need 1	<p>Database Development</p> <p>Providers expressed a need for descriptive information about polytrauma patients within and across sites, as well as information on outcomes over time. They also noted the need for a reliable and valid tracking system to facilitate reporting of data to managers and stakeholders.</p>
Need 2	<p>Tools and strategies to facilitate Care Coordination.</p> <p>Rehabilitation for the war injured presents unprecedented challenges to care coordination. This is because within a brief amount of time, combat injured polytrauma patients traverse countries and care systems. PRC providers expressed the need for continued improvement in communication and transfer of clinical information across care systems. They also emphasized the challenges to transfer of care from the PRC to the patient's home facility. Because the extension of the polytrauma system of care into the outpatient arena is new, the structures and processes needed to coordinate care from the PRC to community based care are in development.</p>
Need 3	<p>Screening for TBI and other injuries in new veterans at risk for blast exposure.</p> <p>PRC providers discussed challenges to full evaluation of comorbidities in PRC patients with moderate to severe brain injuries, including of pain and PTSD, the diagnosis of which depends on self-report. Even more pronounced was their concern that OIF/OEF veterans who are not treated within a PRC may have undetected TBI and other blast injuries that interfere with adjustment to civilian life. Some of these patients are being referred to outpatient rehabilitation providers after failed employment experiences and/or relationships. Providers expressed the belief that earlier intervention would have prevented these adverse outcomes and that many others with mild blast-related injuries are not getting any treatment at all.</p>
Need 4	<p>Education of VHA Providers</p> <p>Because this is a new patient population with unique characteristics and needs (see Table 1 above) there is a strong need for provider education. Provider education is also essential for appropriate screening and effective transfer of care.</p>
Need 5	<p>Identification or development of best practices for rehabilitation of TBI with polytrauma.</p> <p>There is no well-established evidence base for rehabilitation for polytrauma and most VA rehabilitation specialists have not had training or experience treating combat-related blast injuries. PRC providers most consistently and emphatically described a need for best practices for: (a) patients at low levels of cognitive functioning who are not able to engage in standard acute rehabilitation therapies, and (b) caregivers/family members who have their own psychological and the information needs. Because the families of lower level patients often have greater needs themselves, Need 5a and Need 5b are related.</p>
Need 6	<p>Structures and processes to reduce PRC provider stress</p> <p>Rehabilitating the war injured is particularly stressful because of the severity of the patients' injuries, the needs of family members, the level of public involvement (e.g., media), and the new responsibilities providers have for identification of best practices, program development and training of other providers.</p>

1.5 Significant Influences on Current Practice. The following VA and DoD Offices, Programs and Initiatives influence the VA polytrauma care and hence are PT/BRI QUERI partners.

VHA Programs, Offices and Initiatives

Polytrauma System of Care: The polytrauma system of care operates under the leadership of the VACO Rehabilitation Office. It consists of four Commission on Accreditation of Rehabilitation Facilities (CARF) accredited PRCs which are linked to 21 Polytrauma Network Sites (PNS), one in each VISN. In 2008, the VA will add one more PRC in San Antonio, TX. The PNSs became operative in December of 2005 and are charged with providing inpatient rehabilitation and outpatient care to former PRC patients and OIF and OEF veterans who present with milder war-related injuries and rehabilitation needs, as well as for coordinating care with patient's local facilities. This system of care will also include Polytrauma Support Clinic Teams (PSCT) that follow stable sequelae at facilities closer to the veteran's home, and a Polytrauma Point of Contact (PPOC) at every facility. In addition, workgroups from the Physical Medicine and Rehabilitation (PM&R) Program Office and the Prosthetics and Sensory Aids Service are developing strategic plans to more closely link amputation care with the Polytrauma System of Care.

Telehealth Initiative: The Care Coordination Office designed and provides technical assistance in the operation of a polytrauma telehealth network to improve patient access to PRC specialists and facilitate the transfer of PRC expertise in TBI and other impairments associated with polytrauma between the PRCs and PNSs. Expansion of this system to the PSCTs and facilities with specialized expertise in amputation care is under consideration.

Employee Education System (EES): EES is responsible for designing, developing, and implementing state-of-the-art health care training programs for VHA medical care personnel. EES sponsored the Veteran Health Initiative (VHI) independent study course on TBI, a specialized education program for the PRCs and PNSs in August of 2006, and several satellite broadcasts for polytrauma providers.

VA National Polytrauma Pain Subcommittee: This subgroup of the VHA National Pain Research Working Group focuses on identifying best practices for pain assessment and management in polytrauma and research priorities within this area.

OIF/OEF Data Mart: The VISN Support Service Center (VSSC) is building an OIF/OEF data mart which will allow users to identify cause and effect patterns, outcome trends, and outlier patterns among OIF/OEF veterans who use VA services.

Corporate Data Warehouse: The Office of Information (OI) is building a Corporate Data Warehouse that will integrate key enterprise-wide clinical, administrative and financial data.

Amputation Practice Guidelines: VHA Clinical Practice Guidelines for amputation care should be released by winter, 2007.

Seamless Transition Office: The Seamless Transition Office (STO) coordinates all VA activities related to the provision of benefits and health care for service members transitioning directly from Military Treatment Facilities (MTFs) to VA facilities. The STO also provides coordination within VA for all other initiatives of the DoD and States to provide outreach services to OIF and OEF veterans. The STO recently rolled out a database of service members transferred from MTFs to VAMCs that may be of use to the PT/BRI QUERI.

DoD Research, Education and Clinical Programs

Defense and Veterans Brain Injury Center (DVBIC). Coordinated at Walter Reed Army Medical

Center, DVBIC is a multi-site medical care, clinical research and education center funded through the DoD. The 8 DVBIC sites include the four VA PRCs, 3 MTFs and a civilian partner.

Amputation Patient Care Program. The Amputee Patient Care Program, located at Walter Reed Army Medical Center, was developed to meet the comprehensive medical, rehabilitative, and social needs of amputees injured in the current global war on terrorism, with the goal of maximizing subsequent patient outcomes utilizing a sports medicine approach.

1.6 QUERI Center Goals. Goal areas and objectives within each goal area were identified through literature reviews, the PRC Needs Assessment, the Patient Characteristic and Outcomes Study, as well as surveys and meetings with the PT/BRI QUERI Executive Committee, which consists of experts in areas relevant to the QUERI mission.

In the tables that follow we list the PT/BRI QUERI clinical and implementation goals. For the Goals to Improve Practice, we also list the time frame for achieving each objective: short-term = 1-2 years; medium-term = 3-5 years; long-term = greater than 5 years. The Implementation Science Goals are time independent, meaning that we work toward accomplishing these goals on an ongoing basis.

Goals to Improve Practice are listed in order of priority. Improving the Polytrauma System of Care is the overarching goal of these specific QUERI goals and objectives. TBI with polytrauma is the primary clinical problem that system is designed to address. As amputation care becomes more closely linked to the polytrauma system of care, PT/BRI QUERI will expand its focus to include the promotion of evidence-based practice for traumatic amputation.

Clinical Goals 1 through 5 are those that address the most immediate needs in the field as identified through the PRC Needs Assessment, by VHA leadership and external stakeholder groups, including Congress. Short-term objectives within these goal areas will be our primary focus during FY 2007, although we will also engage in foundation building activities to advance later goals. Because the evidence-base for best practice is in an early stage of development, a PT/BRI QUERI goal is to promote the identification and evaluation of best practices in local contexts.

The Implementation Science Goals are influenced by the fact that the system of care is new and the evidence-base for best practice is not well established. To achieve our mission, PT/BRI QUERI needs to develop and adapt implementation strategies to this more ambiguous context. In this way, PT/BRI QUERI's clinical and implementation science goals are closely linked.

Table 3: Goals to Improve Practice, Objectives, Time Frame, and Expected Products	
Goal 1: Develop efficient, sustainable and valid data systems for identifying patients, their medical problems, service needs and outcomes.	
1a: Collaborate with PM&R on enhancement of Functional Status Outcomes Database (FSOD) so that it allows for reporting of injuries and impairments in the war injured and tracking of their outcomes over time.	Short-Term
1b: Collaborate with OIF/OEF Special Interest Work Group to ensure that the OIF/OEF data mart allows for identification of subgroups of combat injured service members.	Short-Term
1c: Collaborate with PM&R on development of a TBI evaluation template that will generate a national TBI database for administrative and research purposes.	Short-Term
1d: Collaborate with PM&R on development of an empirically supported algorithm for identifying polytrauma patients that will be used to generate a polytrauma patient marker in CPRS.	Short-Term
1e: Use the OIF/OEF data mart and other VA databases to characterize the patient population, their medical problems and patterns of service use.	Short to, Long-Term
Product 1: Enhanced FSOD for tracking injuries and impairments in war-injured rehabilitation patients across the continuum of care. Product 2: Template for evaluating patients who screen positive for TBI through Clinical Reminder system. Product 3: Database containing results of TBI Screening (positive and negative screens) and evaluation (positive screens only). Product 4: Polytrauma marker in CPRS to help clinicians identify this vulnerable population. Product 5: Reports describing subgroups of polytrauma patients and their patterns of service use.	
Goal 2: Optimize care coordination and transitions across care systems and settings for patients with polytrauma and blast-related injuries.	
2a: Collaborate with PM&R and EES to develop fact sheets for providers that includes findings from PT/BRI QUERI Patient Characteristics and Outcomes (PC&O) study.	Short-Term
2b: Dissemination of product 2a so that providers across VHA can access this information when needed (at time of encounter).	Short-Term
2c: Identify and implement methods of dissemination to providers outside the VA.	Medium-Term
2d: Develop and test tools to facilitate care transitions among PRC patients	Short-Term
Product 6: Fact sheets to educate providers about impairments in patients with polytrauma. Product 7: Efficient and effective care coordination tools.	
Goal 3: Ensure that blast-exposed veterans receive screenings for high frequency “invisible” problems, including TBI, hearing loss, vision loss, pain, and mental health problems.	
3a. Collaborate with VA HSR&D to promote and conduct research supporting implementation of the VA TBI screening tool.	Short-Term
3b. Identify and implement informatics to promote screening of other high frequency impairments.	Short-Long Term
Product 8: Tools and informatics to support screening for TBI and other blast-related impairments in OIF/OEF veterans.	

Table 3: Goals to Improve Practice, Objectives, Time Frame, and Expected Products (continued)	
Goal 4: Optimize caregivers'/family members' ability to provide supportive assistance to veterans with impairments resultant from polytrauma and blast-related injuries.	
4a: Informal caregiver needs assessment to characterize information needs of caregivers.	Short-Term
4b: Implement a Family Care Advisory Group to characterize usual care and potentially best practices for caregivers of patients with combat related polytrauma	Short-Term
4c: Develop/modify and test educational materials adapted to findings in 4a.	Short to Medium-Term
4d: Test interventions to reduce caregiver burden and promote shared decision making.	Long-Term
Product 9: Educational materials for caregivers. Product 10: Standardization of family care across the PRCs. Product 11: Interventions to improve family care.	
Goal 5: Promote identification and evaluation of potentially best practices for polytrauma rehabilitation.	
5a: Promote the research of investigators conducting clinical research on TBI, polytrauma and blast-related injuries.	Short to Long-Term
Goal 6: Promote and conduct research to identify community reintegration problems and facilitate community reintegration among veterans with PT/BRI	
6a: Identify, develop or modify tools to measure community reintegration among OIF/OEF.	Short-Term
6b: Identify community reintegration problems and treatment preferences among OIF/OEF.	Short-Term
6c: Develop/modify and test interventions to facilitate community reintegration among OIF/OEF with PT/BRI	Medium to Long-Term
Product 12: Reliable and valid measure of community reintegration	
Goal 7: Improve treatment for traumatic amputation within the polytrauma system of care	
7a: Evaluate the new Clinical Practice Guidelines for Amputation Care to determine role of PT/BRI QUERI in promoting guideline adherence.	Short-Term
7b: Obtain leadership input and direction on the QUERI role in the traumatic amputation system of care.	Short-Term
7c: Identify high priority gaps and needs in the VA system of care for patients with traumatic amputations.	Medium to Long-Term
7d: Identify and implement interventions to improve outcomes for OIF/OEF with combat-related amputations.	Long-Term
7e: Identify and test strategies for matching prosthetic devices to the needs and impairments of amputees.	Long-Term
Product 13: Tools for evaluating appropriateness of prosthetic devices for amputees who also have TBI.	
Goal 8: Identify and test potentially fruitful strategies to improve self-management, including tele-rehabilitation, cognitive aids, augmentative communication and environmental controls.	Medium to Long-Term
Goal 9: Expand the evidence-base for treatment of mental health problems, including PTSD and substance use disorders, among individuals who have polytraumatic injuries.	Medium to Long-Term

Note. Short-term = 1-2 years; Medium Term = 3-5 years; Long-term = 5+ years.

Table 3: Implementation Science Goals (continued)
Implementation Goal A: Develop and/or adapt and evaluate implementation and quality improvement strategies to clinical problems for which the evidence-base is not well developed.
Implementation Goal B: Promote the development of a community of evidence-based practice for polytrauma and blast-related injuries.
Implementation Goal C: Identify or develop strategies for evaluating the implementation readiness of research evidence.

Note. Implementation Science Goals are not time dependent.

1.7 Plans for Achieving QUERI Center Goals.

Here we describe the over-arching approaches we are using to fulfill our mission and achieve our goals.

QUERI Implementation Process: PT/BRI QUERI is using the QUERI six-step process to guide its research activities. However, we have adapted this process to take into account the nature of the evidence-base for polytrauma rehabilitation. That is, we have modified the QUERI process to reflect the fact that: (a) the system of care is new, (b) literature reviews will not be the primary source of information on best practices for polytrauma, (c) potentially better practices may need to be adapted and tested in local contexts rather than through RCTs. Below we list the PT/BRI QUERI version of the QUERI six-step process:

- 1) Identify high priority clinical problems and outcomes for patients with polytrauma and blast injuries.
 - a. Develop data systems to facilitate QUERI step 1.
- 2) Identify or develop potentially best or better practices for polytrauma rehabilitation
 - a. Develop tools and structures that facilitate best practice.
 - b. Promote and conduct research that builds the evidence base for best practice.
- 3) Promote and conduct research to identify gaps and needs in the polytrauma system of care.
- 4) Implement interventions to promote the adoption, evaluation and modification of potentially best practices.
- 5) Demonstrate a link between practice changes and improved patient and caregiver outcomes.
- 6) Demonstrate that these interventions improve quality of life, physical and mental health, and community reintegration for injured service members.

The most obvious change to the QUERI six-step process is our explicit emphasis on the contextual nature of the evidence needed to improve practice in steps 2 and 4, our inclusion of foundation building activities as integral to adapted QUERI step 1 and 2. Another adaptation which is not related to the nature of the evidence but rather to the scope of our QUERI's work is the inclusion of caregivers as an intervention target in step 5. Our plan is to refine these modifications to the QUERI implementation model through evaluation of our practice improvement efforts and ongoing assessment of the needs in the field.

Implementation Model: The literature relating to organizational change is extensive and many models to facilitate implementation have been proposed. While intuitively reasonable, the evidence-base supporting most of these approaches is limited. One notable exception is the Organizational Change Manager (OCM) model developed by Gustafson and colleagues at the University of Wisconsin's Center for Health Systems Research and Analysis (UWCHSRA) using Bayesian statistics.^{47,48} This model and the associated survey tool (also referred to as the

OCM), was developed through evaluation of the organizational attributes that led to successful and unsuccessful change efforts across 221 healthcare improvement projects in the United States, Canada, and the Netherlands.⁴⁷ Subsequently, has been used to predict implementation success because of its relatively strong evidence base, PT/BRI QUERI has decided to use the OCM model to guide its implementation efforts.⁴⁸ The OCM model has identified 18-factors as predictive of implementation outcome: (1) Mandate/Project Launch, (2) Leader Goals, Involvement, and Support, (3) Supporters and Opponents, (4) Middle Manager Goals, Involvement, and Support, (5) Tension for Change, (6) Staff Needs Assessment, Involvement, and Support, (7) Exploration of Problem and Understanding Customer Needs, (8) Change Agent Prestige and Commitment, (9) Source of Ideas, (10) Funding, (11) Relative Advantages, (12) Radicalness of Design, (13) Flexibility of Design, (14) Evidence of Effectiveness, (15) Complexity of Implementation Plan, (16) Work Environment, (17) Staff Changes Required, and (18) Monitoring and Feedback. The associated survey was designed to measure levels of each factor. It is completed by staff (including opinion leaders, providers and program leadership) implementing a change initiative. Scores indicate likelihood of successful adoption and identify areas of potential concern that warrant attention. For example, the survey might indicate that staff have not been adequately involved nor adequately trained to sustain a given practice improvement.

The practical value of administering the OCM survey during the early phases of an implementation effort is that it allows change facilitators (such as QUERIs) and clinical teams to identify potential barriers to implementation of a practice change initiative so that corrective actions can be taken. It may also help educate those seeking to implement a change about factors that influence adoption. Repeat administration of the OCM may also predict the likelihood of sustained change, although the evidence supporting the use of the OCM model to predict sustainability is less well developed.⁴⁸ PT/BRI QUERI will use the OCM survey in conjunction with other methods of formative evaluation (such as qualitative methods and measures of satisfaction) to optimize the likelihood of success of our change initiatives. In addition, PT/BRI QUERI is in contact with the UWCHSRA researchers who designed the OCM and will collaborate with this group to evaluate the utility of the OCM model and survey tool to polytrauma rehabilitation and to the prediction of sustained organizational change.

The OCM model provides a framework for measuring barriers and facilitators of change at the external environment, organizational environment, and change microcosms levels. It neglects consideration and measurement of the role of the change facilitator, however. Facilitation has been identified as a potentially important component of successful implementation and is one of three key components in the Promoting Action on Research Implementation in Health Service (PARIHS) framework.⁴⁹ Our plan is to augment and improve upon the OCM model through systematic consideration of the role and types of facilitation necessary for adoption and sustained use of a practice change.

Consultation with Implementation Experts: PT/BRI QUERI welcomes innovative approaches to implementation and quality improvement. This has led us to seek consultation with experts in implementation and quality improvement who can help us to apply “lessons learned” through their work implementing practice improvement initiatives in other health care systems.

To build our knowledge and skills in implementation strategies that may be appropriate to polytrauma rehabilitation, PT/BRI QUERI regularly consults with an outside expert in health care organization and implementation of best practice for chronic illness whom we have designated our Implementation and Management Advisor (Jon Christianson, PhD, Director of the Center for the Study of Healthcare Management and Chair of the Department of Health Care Management

in the Carlson School of Management at the University of Minnesota). This helps ensure that we employ state of the art implementation strategies as we move forward.

Ongoing Needs Assessment: Because the care structures and processes for polytrauma care are rapidly evolving, PT/BRI QUERI needs to take an active and ongoing approach toward needs assessment. That is, QUERI steps 1-3 are ongoing. We accomplish this through: (a) research, (b) collaborative relationships with the opinion leaders, VHA Offices, programs, work groups and leaders that influence the system of care, (c) integration into our Core Team of a PRC key informant and opinion leader whom we have designated as our Field Liaison (Rose Collins, PhD), and (d) literature reviews.

Partnerships with VHA Data System Initiatives and Experts: Data system development is our highest priority goal. We are leveraging ongoing data system and data collection initiatives, including those lead by the VISN Support Service Center (VSSC), the Office of Information and PM&R. These initiatives are of high priority to VHA and are sufficiently staffed and resourced to achieve their goals in a timely fashion. These ongoing initiatives do not require any additional staff time, an important consideration given the level of stress among PRC clinicians.

PT/BRI QUERI works closely with the Statistics and Data Management Team within the Center for Chronic Disease Outcomes Research at the Minneapolis VAMC. This team is well-versed in: VA and Medicare data systems; statistics; database design and development; administrative data extraction; data management; storage and security; design, development and implementation of custom applications and websites; project management; monitoring and validation of data collection. Their involvement in the Colorectal Cancer QUERI's C4 project was crucial to its success. They have already played an important role in the PT/BRI QUERI Patient Characteristics and Outcomes Study and are crucial to the success of projects involving data system development and extractions.

PT/BRI Network: PT/BRI QUERI is developing and coordinating a broad network of: (a) investigators from the VA (including HSR&D and RR&D Centers of Excellence), DoD, and academic institutions, (b) consumers (patients and caregivers), (c) clinician experts, and (d) managers and VHA leaders. We have developed a database to track our affiliates, monitor their research activities, and facilitate networking among them. PT/BRI QUERI investigators are regularly linked with clinician experts to ensure that projects are appropriate to the field and do not overburden clinicians, patients and caregivers.

PT/BRI QUERI has created a website that is useful for researchers, consumers and clinicians and fosters a PT/BRI community of practice and research. It contains links to resources identified as important by PRC clinicians, educators, and managers.

Work Groups: We have formed a Family Care Advisory Group which consists of representatives from each of the PRCs, the National Director of PM&R, and PT/BRI QUERI. The PT/BRI QUERI Implementation Research Coordinator, Carmen Hall, PhD, is the Family Care Advisory Group facilitator. In the winter of 2008, we will form a TBI Clinical Reminder Research Work Group to design and implement health services research in support of the TBI Clinical Reminder to be lead by Nina Sayer, PhD.

PT/BRI QUERI Core Team: The research and clinical arms of the PT/BRI QUERI are fully integrated and therefore PT/BRI QUERI sees itself as being one Center. The Core Team is comprised of the PT/BRI QUERI Coordinators and our Field Liaison. It is committed to

identifying goals and using methods that meet the needs of patients, caregivers, providers, VHA and external stakeholders.

II. Management Plan

II.1 Administrative Structure.

PT/BRI's administrative structure consists of a **Core Team**, an **Executive Committee** and **Specialty Work Groups**.

Core Team

Through the PT/BRI QUERI Core Team, research and clinical coordination efforts are integrated. Purposeful integration of research and practice is crucial for the success of this QUERI because the evidence for best practice is coming from the field and because the field is highly responsive to VHA leadership, external stakeholders (e.g., Congress) and consumers. We prefer the term Core Team to Coordinating Center because team members are located in different facilities and "Coordinating Center" connotes one physical location. Nina Sayer, PhD (Research Coordinator), Barbara Sigford, MD, PhD (Clinical Co-Coordinator), Carmen Hall, RN, PhD (Implementation Research Coordinator), Rose Collins, PhD (Field Liaison), and the Administrative Coordinator (To Be Named) are based at the Minneapolis VAMC; Steven Scott, DO (Clinical Co-Coordinator) is based at the Tampa VAMC. Dr. Scott solicits and brings to the Core Team the input and feedback of other Tampa VAMC experts in areas relevant to polytrauma rehabilitation, making the Tampa VAMC rehabilitation team integral to the PT/BRI QUERI Core Team. The Core Team is responsible for the PT/BRI QUERI research portfolio and day to day activities. Conference calls among the Research, Clinical and Implementation Coordinators occur weekly or every other week and QUERI affiliates are invited to join those calls as needed.

Executive Committee

PT/BRI Executive Committee (EC) is comprised of investigators, managers and leaders with expertise and job responsibilities relevant to the PT/BRI QUERI mission. DoD clinical managers and experts serve on our EC to ensure that PT/BRI QUERI activities meet the needs of patients with polytraumatic combat injuries, many of whom are active duty at the time of their VA inpatient stays. Drs. Sayer, Sigford and Scott are members of the EC. The EC serves advisory and evaluative functions for the QUERI. It helps shape our strategic plan by prioritizing the identified needs in system of care that form the focus of our goals and objectives, assisting in networking and coordination efforts, linking us with resources that may advance our goals, contributing to QUERI research in various capacities, and helping us to monitor and evaluate our own progress.

PT/BRI QUERI's goals to improve practice are established annually but adjusted as necessary through needs assessments, review of the literature, PM&R and PRC leadership, and EC member input and feedback. EC members complete an annual survey prior to our face to face meeting to ensure full assessment of the needs, gaps and priorities in the field of polytrauma rehabilitation and to promote identification of resources, initiatives and programs that will help us advance our mission and achieve our goals. In other words, PT/BRI QUERI uses its EC as a source of information in conducting QUERI steps 1 to 3. PT/BRI QUERI summarizes responses to the EC survey and integrates survey responses with data derived from formal and informal needs assessments. The resultant summary of identified needs is then presented during the annual EC meeting for the purpose of prioritization. Prioritization is crucial to ensuring that our goals and the associated objectives address the most important gaps in the field. PT/BRI QUERI Core Team updates the EC committee on QUERI activities formally every six months during a conference call or face to face meeting, depending on funding and feasibility considerations. However, PT/BRI QUERI has more regular contact with EC members who have roles in specific PT/BRI QUERI projects or initiatives. We expect to

need more frequent contact with EC members when EC members are more directly involved in executing QUERI projects.

Advisory and Work Groups

In order to achieve our goals within the area of Family Care, we formed a Family Care Advisory Group, led by Dr. Carmen Hall, the PT/BRI QUERI Implementation Research Coordinator. This group meets weekly to discuss family care within the polytrauma system of care, including usual care, evidence for usual care, and potential better practices. It is also responsible for the development of the Family Care Map project which will help optimize family care within the PRCs.

Dr. Sayer will lead a TBI Screening Research Work Group beginning in the winter, 2008 to develop a plan for research to support implementation of the TBI screening tool.

Conference calls and email are the primary mode of communication among Advisory and Work Group members. External consultants with expertise in methods or content relevant to the work group's agenda are invited to join these calls as needed. The Advisory and Work Groups update the Core Team and seek input from VHA and Physical Medicine and Rehabilitation (PM&R) leadership.

II.2 Roles of PT/BRI QUERI Coordinators.

Along with our Field Liaison, the PT/BRI QUERI Coordinators form the QUERI Core Team. The Core Team works closely with the EC and VHA leadership.

Nina A. Sayer, PhD is the Research Coordinator and Chair of the PT/BRI QUERI EC. Her responsibilities include policy setting, developing and executing the QUERI Strategic Plan, promoting research consistent with the QUERI mission, and establishing the PT/BRI Network. She works very closely with the Clinical Coordinators.

Barbara Sigford, MD, PhD and **Steven Scott, DO**, are the Clinical Coordinators. They ensure that PT/BRI QUERI's agenda and activities are consistent with national and local needs, synergistic with other programs and initiatives being implemented through VA Central Office, and informed by DoD practice and policy. They also facilitate PT/BRI QUERI's close relationship with the PRCs and evolving relationship with the Polytrauma Network Sites.

Carmen Hall, RN, PhD, replaces Greta Friedemann-Sanchez as the QUERI Implementation Research Coordinator (IRC). Her responsibilities include leading and participating in the design, implementation and evaluation of PT/BRI QUERI projects, disseminating PT/BRI QUERI products and research findings, and serving as liaison and resource for affiliates within the PT/BRI network, as well as performing literature reviews and researching implementation strategies appropriate to PT/BRI QUERI goals and objectives. Dr. Hall is also responsible for communicating with other QUERI IRCs about projects that may overlap with their goals and impact their activities.

Administrative Coordinator. The Administrative Coordinator (To Be Named) is responsible for all administrative activities, including tracking the progress of ongoing and planned projects, managing the QUERI budget, scheduling, organizing the QUERI EC meeting, disseminating publicity and reports to QUERI affiliates, disseminating surveys to EC members, writing and disseminating meeting minutes, and for monitoring and updating the PT/BRI QUERI website.

II.3 Key Administrative Collaborations.

PT/BRI QUERI coordinates its work with PM&R and the Rehabilitation Office. The Core Team has regular contact with EC member and Chief Consultant to the Rehabilitation Office, Lucille Beck, PhD. The Clinical Coordinators are leaders within the Polytrauma System of Care and

local PIs for the DBVIC. PT/BRI QUERI participates in various national initiatives, including the PM&R FSOD Enhancement Project and TBI Evaluation Template/Database Project, the Office of Information and PM&R Polytrauma Marker Project, the VSSC OIF/OEF Data Mart Special Interest Focus Group, the VA National Polytrauma Pain Subcommittee, the VHA Tele-rehabilitation Field Work Group and the DoD-VA Family Transition Task Force. Other administrative collaborators include the Mental Health Strategic Healthcare Group, the Office of Information, and the Employee Education system.

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