

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

**Spinal Cord Injury QUERI Center
2012 Strategic Plan**

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**Frances M. Weaver, PhD
Edward Hines Jr. VA Hospital
5000 S. 5th Avenue (151H)
Hines, Illinois 60141
Phone: 708-202-2414
Fax: 708-202-2316**

Frances.Weaver@va.gov

<http://www.queri.research.va.gov/sci/>

1. Executive Summary

The mission of Spinal Cord Injury (SCI) QUERI is to promote health, independence, functioning, quality of life, and productivity of Veterans with spinal cord injuries and disorders (SCI/D), through the implementation of evidence-based findings. SCI/D is a life-long condition that impacts all aspects of functioning, abilities, participation, and health. Between 236,000 and 327,000 individuals in the U.S. have some type of SCI/D that significantly affects their life activities (NSCISC 2012), and VA cares for approximately 26% of these individuals. VA provided a full range of care to more than 27,000 Veterans with SCI/D in FY2011 (SCI/D Services, ARC FY11). The average direct health care cost for a Veteran with paraplegia is \$292,740 in the first year and \$29,789 in each subsequent year; indirect costs added an additional \$64,443 per year in 2008 dollars (National Spinal Cord Injury Statistical Center (2009).

The Veterans Health Administration (VHA) SCI/D System of Care includes 24 regional SCI Centers, which provide comprehensive, coordinated lifelong care delivered by interdisciplinary teams. The SCI Centers (referred to as “hubs”) are linked with the remaining 135 VA facilities, referred to as “spoke” facilities. SCI primary care teams are located at spoke facilities, typically comprised of an SCI/D coordinator (usually a social worker), a nurse, and a physician.

SCI QUERI has identified three primary areas of focus for research and implementation based on a number of facts including costs, frequency, and impact on function and quality of life. These areas are: pressure ulcer prevention and treatment; infection prevention and management; and optimization of function.

Pressure ulcers. More than 50% of individuals with SCI/D will develop pressure ulcers during their lifetime (Goldstein, 1998). Clinical practice guidelines exist to address both prevention of pressure ulcers and treatment. However, unlike other populations (e.g., institutionalized elderly population) for which pressure ulcers are hospital or nursing home acquired, only 1.3% of the pressure ulcers for inpatients in SCI units were hospital-acquired. SCI QUERI’s work is focused on prevention and treatment of community acquired ulcers. The major goal for this area is to: reduce the number and severity of pressure ulcers in Veterans with SCI/D. Several projects are ongoing or in development. Because of the critical need for an assessment tool to monitor pressure ulcer healing in SCI, the SCI Pressure Ulcer Management Tool (SCI PUMT) was developed and validated with VA HSR&D funding. SCI QUERI worked with SCI/D Services to

implement the SCI PUMT across SCI centers using a collaborative. Investigators currently have an RRP under review to evaluate the implementation of the SCI-PUMT, as there has been low adoption in about half of the centers.

Other QUERI work is focused on prevention. QUERI investigators are developing a prevention checklist that providers can use to follow prevention guidelines. They are also testing a biophysical device to detect early skin breakdown (prior to being seen using visual assessment) through an RR&D grant. This device detects moisture and erythema in the skin and could provide a valuable tool for early detection and intervention to decrease pressure ulcer severity.

Infection prevention and management. Persons with SCI/D are at especially high risk of hospital-acquired infections (HAIs) because of frequent and prolonged hospitalizations, use of invasive devices and chronic pressure ulcers (Montgomerie, 1997; Evans et al., 2008; Evans et al in press). Rates of HAIs in patients with SCI have been reported to be between 6.7-35.5 infections per 1,000 patient days (Mylotte et al., 2000a; 2000b; Nicolle et al., 1988; Evans et al., 2008) compared to rates of 2.2-15.0 cases per 1,000 patient days reported in the general patient population (Evans et al. 2008). QUERI is working with SCI/D Services and the Multidrug Resistant Organism (MDRO) office to evaluate the implementation of the MRSA prevention bundle in SCI/D. Data indicated that patients were lacking knowledge about MRSA and prevention strategies. Investigators developed an education toolkit (SCI/D MET) to improve Veteran knowledge of MRSA and prevention. Further, they will be submitting a grant to evaluate the use of a 'safe zone' (a visually marked area) in rooms of patients on contact precautions for infection or colonization, as a means of allowing providers to enter rooms without the use of protective gear (gowns, gloves) when there is no need for physical contact with the patient, but there is a need for communication. Safe zones are being used in some VA facilities already, but empirical evidence is lacking as to its effectiveness and value. QUERI investigators are also pursuing research related to appropriate antibiotic prescribing and in understanding current practices related to urinary tract infection (UTIs) diagnosis and treatment. UTIs are one of the most common infections in persons with SCI/D.

A second area of focus is infection transmission. Influenza infections result in about 150,000 hospital admissions and 24,000 deaths each year (CDC, 2010a). The single most effective way to prevent influenza is vaccination. Influenza vaccine can prevent 70% to 90% of influenza-specific illness in healthy adults, and reduce severe illnesses and complications by up to 60%

and deaths by 80% in the elderly (WHO, 2009). Health care workers (HCWs) can spread the highly contagious influenza virus to patients in their care (Horcajada et al., 2003; Salgado et al., 2002; Harrison et al., 2002). Vaccination of HCWs can decrease the transmission of influenza to patients (Hayward et al., 2011; van den Dool et al., 2009) and may also prevent influenza-related absenteeism (LaVela et al., 2007; Poland, 2010). Requiring HCWs to be vaccinated for influenza resulted in an 88% reduction in workforce infection and a 41% reduction in influenza-related patient mortality (NPSF, 2009). However, recent QUERI findings showed that the 2009/10 influenza vaccination rate for HCWs having direct contact with individuals with SCI/D was 48% (RRP 10-046; LaVela, 2011), and rates have been at about 50% for multiple years (LaVela et al., 2007; LaVela et al., 2004a; LaVela et al., 2004b; LaVela, 2011). QUERI investigators have an RRP under review to pilot the implementation of a declination form program to increase influenza vaccination in health care providers in the SCI System of Care.

Function. QUERI is addressing two areas with respect to function: overweight/obesity and wheelchair function. Approximately 53-66% of individuals with SCI/D are classified as being overweight or obese as measured by body mass index (BMI) (Gupta 2006, Weaver 2007, Rajan 2009). Interventions for weight management are limited in SCI/D due to mobility restrictions. Our current efforts are to identify current practices in weight management in SCI/D centers and spokes through an RRP. We plan to conduct a needs assessment for Veterans with SCI/D and to pilot a lifestyle intervention to address weight management in SCI/D.

Our newest area is related to wheelchair function. The majority of individuals with SCI/D use a wheelchair for mobility (Post et al., 1997). Despite their great value in promoting independence and function in SCI/D, individuals also perceive wheelchairs as a significant factor limiting participation (Chaves et al. 2004). Nelson et al. followed a cohort of Veterans with SCI living in the community for one year and found that 31% reported at least one fall during that time and 14% had a fall with injury (Nelson et al. 2010). Building on research by colleagues in Tampa, we plan to evaluate current practices with respect to wheelchair skills assessment and retraining, and to implement and evaluate a risk-adjusted wheelchair assessment tool and training protocol.

2. Clinical Focus and Scope

The central mission of Spinal Cord Injury (SCI) QUERI is the promotion of health, independence, functioning, quality of life, and productivity of Veterans with SCI&D, through the implementation of evidence-based findings. This is primarily accomplished by: 1) enhancing patient self-management and promoting an informed, empowered patient; 2) emphasizing disease prevention and early detection of and intervention for common co-morbid conditions and impairments; 3) offering provider education, advanced training, and decision support strategies to advance a prepared, proactive healthcare team; and 4) improving access and delivery of services through new technologies and strategies. SCI/D is a life-long condition that impacts all aspects of functioning, abilities, participation, and health. To maximize the impact of our efforts, we have chosen to continue to focus much of research and implementation efforts during the next three years on pressure ulcers, a fundamental problem that impact overall health, morbidity, and quality of life in most people with SCI/D. In addition, with input from SCI/D Services and the SCI QUERI executive committee, we have expanded our focus from specific infectious disease issues (MRSA, H1N1 influenza), to a broader focus of infection prevention and management. In our last strategic plan, we had identified obesity as an area in which we wanted to devote significant effort and resources. This has been a difficult area to move forward, however, given the limited evidence-based interventions available to address obesity in the SCI&D population. Thus, we are shifting our efforts toward addressing issues that affect patient function.

Studies show that medical diagnoses alone do not predict service needs, length of hospitalization, level of care or functional outcomes. The International Classification of Functioning, Disability and Health (ICF) provides a standard language/framework that moves away from the traditional interpretation of disability (which focuses on impairments, activity limitations and participation restrictions). Function, as defined by ICF, provides a multipurpose classification of health and health-related domains to describe what a person with a given health condition can do in a standard environment (their level of capacity), as well as what they actually do in their usual environment (their level of performance). The World Health Organization (WHO) has adopted the ICF as the conceptual basis for the definition, measurement and policy formulations for health and disability.

Function involves a person's ability to perform daily activities of living and includes physical, cognitive and emotional functioning. As function is a very large area to address, we will limit our efforts to start by continuing to address issues related to weight management and obesity, as

this can negatively impact function. We also will begin to build on research by our colleagues in Tampa regarding wheelchair function and safety to facilitate our goal of improving function and participation in the community. The majority of Veterans with SCI/D use wheelchairs, yet, the extent to which wheelchair use/misuse negatively affects function (e.g., falls, injuries) has received less attention. Finally, whenever strategic, and in cases in which we can make a significant contribution, we will continue to respond to time-sensitive, field-generated issues in collaboration with our clinical partners.

Patient population. Before WWII, survival after a spinal cord injury was uncommon for more than a few weeks or months; mortality usually occurred due to uncontrollable urinary tract infections or other infectious causes. During the Balkan Wars (1912-1913), for example, 95% of the soldiers with SCI died within a few weeks. During World War I, 80% of individuals with an SCI died within a few weeks of injury and more than 95% died within one year. The 1940s – 1970s ushered in a new era of modern SCI care following momentous medical discoveries (e.g., antibiotics, blood storage and transfusions), surgical and anesthesia advances, and the development of state-of-the-art emergency medical services. SCI survival rates increased dramatically. Compared with the dismal mortality due to SCI in WWI, over 75% of soldiers with paraplegia from WWII were still living 20 years later. Over 50% of those Veterans returned to the job force thus reflecting the enormity of changes in society as well as medicine. Today, more than 90% of individuals with a new SCI/D survive and their life expectancy approaches that of individuals without SCI/D. Krause and Saunders (2010) estimated that the life expectancy of a 20 year old male with a C1-C4 (tetraplegia) injury today under favorable conditions is around 43 years. In addition, we have seen an increase in the number of older persons who sustain an SCI. DeVivo reported that those age 60 years and older at the time of injury increased from 4.6% in the 1970s to 13.2% since 2005 (DeVivo & Chen 2011).

Initially, clinical goals were focused on often fatal sequelae that follow an SCI. Over the past several decades, there has been a shift from acute medical care, to rehabilitation, to independent and vocational rehabilitation, and now to a return to community living (and aging) with a spinal cord injury. As in the general population, medical care for the SCI/D population reflects the full constellation of preventive activities and chronic disease management, although these activities are complicated by the existing underlying impairments, restrictions, and disabilities that result from SCI/D. If anything, there is a greater need for prevention, early diagnosis, and aggressive management of co-morbid conditions due to the disproportionate effects of any further impairments or functional problems in this population.

VA's SCI/D System of Care is a lifelong program, integrating medical, surgical, primary and preventive care, long term care, vocational, psychological and social services within a continuum of care and addresses changing needs throughout the Veteran's life. The vast majority of newly injured Veterans with SCI are young women and men, with a recent increase due to injuries in Iraq and Afghanistan from the Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) conflicts. However, the age distribution in this population is bimodal due to a concurrent increase in the population of older Veterans with SCI. In fact, the average age of Veterans with SCI/D is now 61 years of age and 65% of the population is 55 years of age or older.

Even with recent war-related injuries, motor vehicle crashes are the most common cause of traumatic SCIs in Veterans, followed by falls and acts of violence, recreation-related accidents, and iatrogenic causes (Berkowitz et al 1998; Go et al 1995). Regarding etiology, there are differences between the SCI/D population in VA and in the private sector. Approximately 60% of Veterans with SCI/D had traumatic injuries, in contrast to almost 100% in the Spinal Cord Injury Model Systems Centers, the largest private sector network of SCI/D care in the United States. Much less is known about non-traumatic spinal cord disorders. Some diagnostic groups are well described and followed closely (e.g., multiple sclerosis) while other groups (e.g., spinal stenosis and myelopathy) are seen in a variety of VA settings and not well tracked. A recent survey funded by the Christopher & Dana Reeve Foundation and conducted by the University of New Mexico's Center for Development and Disability, indicated that there are probably many more cases of spinal cord disorders from non-traumatic etiologies than previously thought. Recent work by QUERI investigators has determined that a significant number of Veterans with SCI/D have non-traumatic spinal cord disorders including spondylosis/spinal stenosis, tumor and syringomyelia (St. Andre et al., 2011).

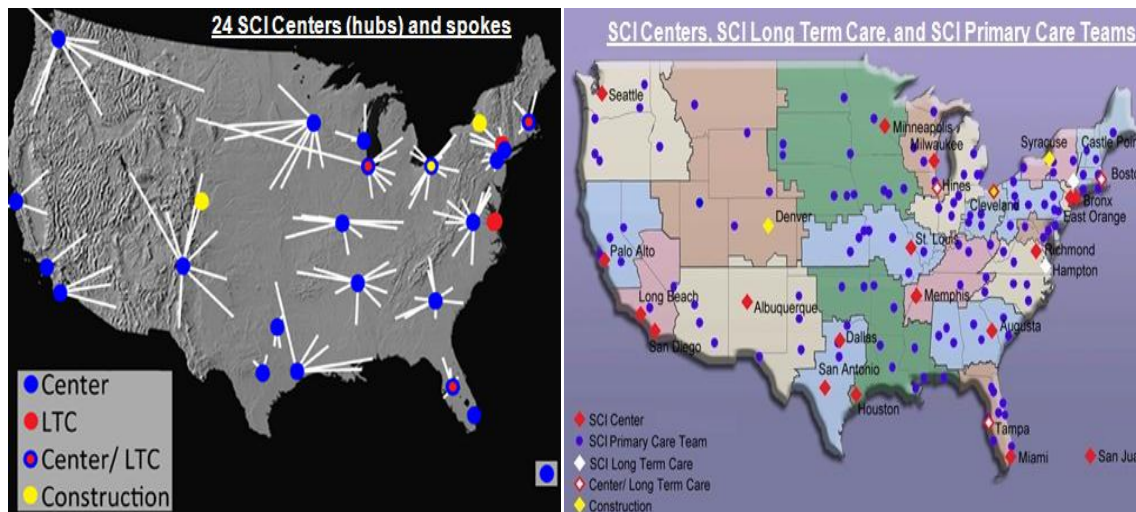
More Veterans with SCI/D have paraplegia (54%) than tetraplegia (46%). Paraplegia is defined as injury or disease below T1 so the upper limbs and hands are spared (i.e., have normal function). Typically, affected areas include the trunk, viscera (e.g., bladder, bowel), and lower limbs depending on the neurological level and completeness of injury. Tetraplegia is injury or disease with paralysis at the level of T1 or above. The upper limbs and hands are affected to varying degrees depending on the neurological level of injury. Even with complete injuries, there is often enough residual function following a neurological level at C7 and below that most people can regain independent function for mobility (e.g., using

wheelchairs, transfers) and most activities of daily life. Injuries above this level typically result in dependent care for most activities.

In VA, about 97% of Veterans with SCI/D are men. Between 42% and 48% of Veterans with SCI and SCI/D are married (St. Andre et al. 2011), an important factor because such a large proportion of this population is dependent for basic care and mobility. There is a much greater reliance on VA than has been documented for the general Veteran population. In FY08, 33.4% of all Veterans were VHA enrollees, whereas 63.7% of Veterans with SCI/D were VHA enrollees.

SCI System of Care. The Veterans Health Administration (VHA) SCI/D System of Care includes 24 regional SCI Centers, which provide comprehensive, coordinated lifelong care delivered by interdisciplinary teams. Within the 24 VA SCI Centers, there are five SCI long term care centers. The SCI Centers (referred to as “hubs”) are linked with the remaining 135 VA facilities, referred to as “spoke” facilities. Primary care teams are located at spoke facilities, typically comprised of an SCI/D coordinator (usually a social worker), a nurse, and a physician. They deliver primary care and facilitate efficient, coordinated, and appropriate delivery of care with the SCI Centers. This system is often referred to as the “hub and spokes” system of care (see Figure 1).

Figure 1: SCI/D System of Care showing referral areas on the left and sites on the right.



Through this system of care, a full range of services, including preventive, primary, specialty, emergency, sustaining, outpatient, home, long term, and end-of-life care are provided. The Office of SCI/D Services is responsible for the oversight and national leadership in VA SCI/D care. The newly appointed Chief Consultant (Barry Goldstein, MD, PhD) for the Office of SCI/D

Services has served as the Clinical Coordinator of SCI QUERI for the past 10 years. VHA Handbook 1176.01 (VHA, 2011) details the care that should be provided in the hubs and spokes. Rehabilitation is provided at the centers. Complex, SCI-specific issues such as stage III-IV pressure ulcers should be managed at an SCI center where there is significant expertise for treatment of ulcers. Alternatively, preventive efforts and non-complex problems can be addressed across hub and spoke sites and the community.

Access to care is an important issue in this population. . Many Veterans with SCI face significant geographic barriers to accessing care. Veterans with SCI/D travel an average distance of 147 miles to reach an SCI Center (LaVela et al. 2004). There are limited number of SCI/D specialists in the VA and across the United States. Most VA providers, including primary care physicians have little or no training in treating people with severe disabilities and/or conditions that are unique to SCI/D. Transportation is difficult for this population due to their mobility impairments. Transporting a person who is in a wheelchair is often not easy either; in many cases, people in power wheelchairs weigh more than 300 pounds. In addition, eligibility criteria for non-service connected Veterans with SCI/D do not include travel.

Implications for SCI QUERI. Veterans with SCI/D live with lifelong, severe restrictions and limitations that affect their health, function, activities, participation, and quality of life. Spoke sites often lack local resources for providing SCI/D specialty care. Frequently, Veterans with SCI/D receiving care at spoke sites have to contend with limited specialty care, transportation difficulties, and knowledge barriers at these facilities.

3. Significance and Consequences: Epidemiology, Morbidity/Mortality, Quality of Life and Costs

Spinal cord injuries and disorders. Between 236,000 and 327,000 individuals in the U.S. have some type of SCI/D that significantly affects their life activities (NSCISC 2012). The VA cares for approximately 26% of these individuals in the U.S., making it the single largest network of care for persons with SCI/D. In 2011, it provided a full range of care to more than 27,000 Veterans with spinal cord injuries and disorders (SCI/D Services, ARC FY11). Approximately 1-2% of these Veterans are categorized as new injuries (i.e., within 18 months of their initial injury or disease onset). More than 42% of Veterans with SCI/D were injured during their military service. A total of 631 Active Duty Service Members have been treated at a VA SCI Center since 2003. Of these, 216 sustained injury in theater (communication from the Office of SCI/D Services, October 2012).

Dating back to the mid-1990s, spinal cord injury has been recognized to be one of the most costly medical diagnoses in the United States. In VA, SCI/D is a complex condition with costs 6.5 times greater than the average VHA enrollee cost; the annual cost per VHA enrollee with SCI/D is \$44,696. There are much higher costs for new onset SCI/D, higher level injuries (especially ventilator dependent tetraplegia, and institutional long term care). For example, the average cost for a Veteran with high tetraplegia (C1-C4) is \$801,161 in the first year and \$143,507 in each subsequent year.

Figure 2: 2008 Healthcare and Living Costs for Persons with SCI/D Living in the U.S.

Severity of Injury	First Year	Each Subsequent Year
High Tetraplegia (C1-C4)	\$801,161	\$143,507
Low Tetraplegia (C5-C8)	\$517,356	\$58,783
Paraplegia	\$292,740	\$29,789
Incomplete Motor Functional at Any Level	\$236,109	\$16,547

Figures are from the National Spinal Cord Injury Statistical Center (2009) and do not include indirect costs such as losses in wages, fringe benefits, and productivity which average an additional \$64,443 per year in 2008 dollars.

The average health care cost for a Veteran with paraplegia is \$292,740 in the first year and \$29,789 in each subsequent year. (National Spinal Cord Injury Statistical Center (2009); indirect costs are not included and average an additional \$64,443 per year in 2008 dollars. Annual unadjusted healthcare costs during FY2008 for a VA cohort was similar for traumatic and non-traumatic SCI (\$49,106 v. \$45,470; St. Andre et al. 2012).

Although the number of SCI/D cases is relatively small compared to many other chronic conditions, estimated costs of care for SCI/D patients still exceed \$9 billion per year in the U.S., and over \$1.5 million per patient across their lifetime (NSCISC, 2009). In comparison with all other diagnostic groups in the U.S., the Nationwide Inpatient Sample maintained by the Agency for Healthcare Research and Quality, reported the second highest charges in the U.S. and the third longest lengths of inpatient stay for persons with spinal cord injury.

While considered a highly heterogeneous population, persons with SCI/D face common obstacles and barriers related to independent living following disability. Just less than half of the population have tetraplegia and impaired hand function. Many Veterans with SCI/D need physical assistance for activities of daily living, management of neurogenic bladder and bowel, and transfers. More than half of the population is unemployed. This statistic is particularly important because injury often occurs at a young age (almost 60% are ≤ 30 years old at onset of

SCI/D) when most individuals are in the early stages of their careers. The physical impairments associated with SCI/D represent barriers to achieving typical levels of quality of life. The average person with SCI/D reports a lower level of subjective quality of life than does the population at large across a range of dimensions, such as physical functioning, social functioning, and life satisfaction (Craig, Tran, & Middleton, 2009; Dijkers, 1997). Whereas in the general population life satisfaction tends to increase with age, there is evidence that among persons with SCI/D, satisfaction with life may diminish over time (Krause, 1997).

Complications and Clinical Conditions. Although Veterans with SCI/D share common spinal cord dysfunction and neurological deficits, there are a multitude of complications and co-morbidities that arise due to alterations in somatic function (e.g., paralysis, sensory impairments, pain, spasticity), autonomic function (e.g., impaired cough, neurogenic bladder, neurogenic bowel), and inactivity (e.g., obesity, diabetes, dyslipidemia). There are also conditions, some life-threatening, that are unique to people with SCI/D (e.g., autonomic dysreflexia, heterotopic ossification). The most common VA inpatient SCI/D diagnoses include pressure ulcers, urinary tract infections (urosepsis), nephrolithiasis, pneumonia, respiratory failure, autonomic dysreflexia, fractures, cellulitis, and deep venous thrombosis.

For some of these conditions, management is the same as in the general population. However, for many complications and co-morbidities the burden, impact, treatment, and costs are higher in SCI/D. In general, the functional limitations imposed by SCI/D often result in a narrower margin of error, a smaller range of adaptations, and fewer treatment options. Problems and conditions that are not unique to SCI/D (e.g., cardiovascular disease, obesity, and respiratory disease) are thought to occur at a younger age (LaVela et al., 2012) and require different management strategies to account for limitations in the SCI/D population (e.g., physical activity limitations in someone with tetraplegia who is trying to lose weight).

In past years, QUERI has focused on a number of high-risk, high-volume, high-cost conditions (i.e., respiratory impairments, pressure ulcers, obesity), and has addressed critical emerging issues such as prevention and treatment of health care acquired infections in SCI units, OEF/OIF service members/Veterans with SCI and natural disasters that affect Veterans with SCI/D. Taken together, these conditions cause significant morbidity and mortality in individuals with SCI/D. These areas were also selected because there were gaps between evidence-based recommendations and current clinical practices.

Our strategy for the next three years is similar, but with some modifications in our areas of focus. We will continue to focus on pressure ulcers due to high cost and prevalence, and negative impacts on function, participation and quality of life. Our efforts in two time-sensitive,

service-generated areas (Methicillin Resistant Staphylococcus aureus (MRSA) and the H1N1 influenza) have evolved to a larger focus on infection prevention and management. We are building upon our earlier work to address infection control and prevention more broadly, including addressing other healthcare acquired infections such as clostridium difficile; and addressing prevention through healthcare worker interventions. Our efforts in the area of obesity and weight management will continue, but we have broadened the area to include issues that affect function. In the next sections, we will review each of these three areas to give sufficient background and details to explain our decisions about implementation and research activities during the next three years.

Pressure Ulcers.

In the early 1990's, the Agency for Health Care Policy and Research (now AHRQ) convened two multidisciplinary panels to develop guidelines on pressure ulcer (PrU) prevention and treatment which focused primarily on hospital acquired PrUs and on provider behavior to prevent PrUs in frail elderly populations. In contrast, the overwhelming majority of Veterans with SCI are community-dwelling. They face unique challenges because they are responsible for managing or guiding their own skin care, they spend a significant amount of time sitting up in their wheelchairs and strive to remain as independent as possible in their activities of daily living. SCI-specific guidelines for PrU were published in 2000. Unfortunately, despite significant improvements in management of SCI that have led to a life expectancy for Veterans with SCI that is comparable to that of the non-SCI Veterans population, these improvements have not carried over to comparable improvements in PrU prevention and/or treatment. There has been little change in the prevalence or incidence of PrUs among individuals with SCI/D over time. High incidence and prevalence rates have been reported in acute hospital, rehabilitation, long term care, and community settings. Krouskop and colleagues found that 50% of Veterans with tetraplegia and 30% of individuals with paraplegia required hospitalization for treatment of PrUs (Krouskop, 1983).

Pressure ulcers are the most frequent and significant complication after SCI. Persons with SCI are at high risk for PrUs throughout their lifetimes due to decreased mobility, lack of sensation and other physiologic changes (Young 1981, Carlson 1992, Fuhrer 1993, Niazi 1997, Holmes 2002). PrU prevalence, morbidity, mortality, and recurrence rates are high, and most persons with SCI will have at least one serious PrU during their lifetimes. Recent work by QUERI investigators has shown that total annual VA healthcare costs are \$87,639 higher for Veterans with SCI and PrUs (\$113,579) than those without (\$25,940).

Prevention efforts, quality improvement activities, clinical interventions, and research studies in all populations are primarily directed at hospital-acquired pressure ulcers (HAPUs) in inpatient and/or long term care residential settings. VHA Handbook 1180.2 (“Assessment and Prevention of Pressure Ulcers”), released in 2006, was also directed at inpatients. VA adopted the Braden Scale to identify patients at risk of developing HAPUs. Of greatest importance, however, is that only 1.3% of the inpatients in SCI units developed a hospital-acquired pressure ulcer. As a result of these data, SCI QUERI has turned its focus for prevention efforts on the outpatient setting. Turning our attention to the community setting is no simple matter. High prevalence rates have been reported and a few studies have demonstrated that many people with SCI/D who live in the community have severe PrUs, yet the process of PrU development in the community is relatively unknown.

Little is known about the development of PrUs in the community setting other than that there are high prevalence rates. Admission from the community into the VA for PrU treatment is the most common reason that Veterans with SCI/D are hospitalized. Recurrence rates in the community are high as well. Epidemiological studies indicate that 36-50% of all persons with SCI/D who had a PrU will develop recurrent ulcers within the first year after initial healing (Niazi, 1997; Salzberg et al, 1996). Bates-Jensen, Guihan, Garber & Burns (2009) studied Veterans with SCI/D discharged to the community with a healed PrU and found that recurrence was common, severe (stage III/IV), and recurred soon after initial healing (4 months on average).

More than 50% of individuals with SCI/D will develop PrUs during their lifetime (Goldstein, 1998). Treatments to heal full thickness ulcers often requires long term hospitalizations, specialty care (including plastic surgery), expensive wound care products, and specialty equipment necessitated by pressure ulcers account for more than \$6.5 billion spent each year in the U.S. (CDC, 1990; NIDRR, 1997). Veterans with SCI/D who had PrUs had higher total healthcare costs (\$100,935) than those without an ulcer (\$27,914), with most of the costs attributed to inpatient days (Stroupe et al., 2011).

Infection Prevention and Management.

Prevention of infections is critical because of their impact on patient morbidity and quality of life, mortality, and healthcare costs. Infections are a common cause of morbidity and mortality in persons with SCI (Montgomerie, 1997; Darouiche, 2003). The most common infections in this population include urinary tract infections (UTIs), respiratory tract infections, PrU infections, and blood stream infections (BSIs) secondary to these infections. Due to frequent contact with the healthcare system and use of invasive devices, a significant portion of infections in persons with SCI are healthcare-related. Veterans with SCI/D and the health care workers who provide their

care have a higher chance of transmission for many infections. In the U.S., an estimated 1.7 million healthcare-associated infections (HAIs) lead to over 98,000 deaths each year (Klevens et al., 2007). Infection with multidrug-resistant organisms (MDROs) such as Methicillin-resistant *Staphylococcus aureus* (MRSA) complicates management and prevention efforts for HAIs due to increased resistance to first-line antibiotics and their increasing spread across healthcare facilities and community settings. In addition, patients may have negative perceptions about being infected with certain microorganisms like MRSA because of being placed in contact isolation. It has been shown that patients who have negative perceptions about their illness often have increased future disability and slower recovery independent of the initial medical severity (Petrie, 2006). Due to the ongoing efforts of VA SCI/D Services and MDRO Program Office for MRSA and MDRO prevention and in improving healthcare worker vaccinations to prevent influenza and its complications in Veterans, we have focused our work on advancing health care practice and management to prevent infection and improve outcomes in the SCI/D population. Below, we briefly describe the epidemiology of HAIs in SCI, MRSA and influenza.

HAIs. Individuals with SCI/D have an especially high risk of HAIs because of frequent and prolonged hospitalizations, use of invasive devices and chronic pressure ulcers (Montgomerie, 1997; Evans et al., 2008; Evans et al in press). Rates of HAIs in patients with SCI have been reported to be between 6.7-35.5 infections per 1,000 patient days (Mylotte et al., 2000a; 2000b; Nicolle et al., 1988; Evans et al., 2008) compared to the significantly lower rates of 2.2-15.0 cases per 1,000 patient days reported in the general patient population (Evans et al. 2008). Specifically, UTIs followed by BSIs, appear to be the most frequent causes of HAIs in persons with SCI. In one study we found the incidence rate of UTI to be 8.9 per 1,000 patients days and BSI to be 6.0 per 1,000 patient days (Evans et al., 2008), which are unacceptably high. Many of these infections are caused by antimicrobial resistant organisms such as MRSA or multidrug-resistant gram negative bacteria (Evans et al., 2008; Evans et al., 2009a). Other epidemiologically relevant organisms causing infection in SCI include *Clostridium difficile* infection (CDI). CDI is a diarrheal infection, where the most common risk factor for development is antibiotic use. There is a paucity of literature on the epidemiology of CDI in the SCI/D population, and on its impact on morbidity and mortality. However, one article found that in acute rehabilitation patients (SCI, stroke, TBI), CDI was the third most common nosocomial infection (15% of all infections; Mylotte et al., 2000). Marciniak et al (2006) reported that *C. difficile* colonization was present in 16.4% of all patients admitted to an acute rehabilitation unit and was 18% in the SCI patients. It is important to note that only new injuries are typically admitted to rehabilitation units in the private sector. Therefore, colonization and infection rates

would be much lower in these private sector facilities than in SCI units in the VA because of the differences in the patient groups; VA includes a more chronically injured patient population. Therefore, the rates of infection in the veteran SCI/D population are likely to be much higher.

MRSA. MRSA is a frequent cause of infection in the U.S. Although recent estimates have demonstrated that colonization with *S. aureus* is decreasing (32.4% of the U.S. population in 2001-2002 to 28.6% in 2003-2004, $p < 0.01$), the number and percentage of MRSA colonization has increased over the same time period (0.8% to 1.5% of the population) (Kuehnert, 2006; Gorwitz, 2008). Kuehnert et al estimated that 292,000 hospitalizations with a diagnosis of *S. aureus* infection occurred annually in U.S. hospitals in 1999-2000, of which 43% were related to MRSA (Kuehnert, 2005). In 2005, there were over 350,000 hospital stays for infections with MRSA (Elixhauser, 2007). Invasive MRSA infections occur in approximately 94,000 persons each year, causing about 19,000 deaths, and most of these infections are thought to be healthcare-associated with onset in the community (58.4%), followed by nosocomial or hospital-onset infections (26.6%) and community-associated infections (13.7%) (Klebens, 2007). On average, hospital stays for MRSA infections cost \$14,000 compared to \$7,600 for all other stays, and the length of hospitalization is more than double, 10.0 days for MRSA infections versus 4.6 days for all other stays (Elixhauser, 2007). MRSA in the Veteran population has increased with over 400 MRSA positive patients isolated per 100,000 served in 2006 (VA 2007).

MRSA is especially relevant to persons with SCI/D. This population is at high risk for MRSA colonization and infection because of prolonged hospitalization (LaVela, 2004; Evans, 2008), frequent contact with body fluids (e.g., most people with SCI/D have a neurogenic bowel and bladder and urinate via a catheter), frequent development of chronic wounds such as pressure ulcers (Guihan, 2008; Smith, 2008), and extensive antibiotic use due to frequent infections (e.g., urinary tract infections and pneumonia) (Evans, 2008; Montgomerie, 1997; Evans et al, in press). There are few published articles on the incidence and prevalence of MRSA infection or colonization in persons with SCI/D. The early literature suggests that MRSA colonization/infection ranges from as low as 7.7% to nearly 30% of patients. Maeder et al (1993) found 11% of SCI/D patients in a rehabilitation facility were colonized with MRSA, with prevalence greatest among those SCI/D patients in the pressure ulcer management service (27%) than in the those patients in the SCI rehabilitation unit (5%) (Maeder, 1993). Surveillance cultures conducted at admission to another rehabilitation unit showed that the most prevalent antibiotic resistant micro-organism was MRSA (30.2% of patients) (Mylotte, 2000). In all, 7.7% of patients colonized with MRSA at admission or during their stay, eventually developed

nosocomial (MRSA) infection during their stay on the unit (Mylotte, 2000). A recent study of community-dwelling persons with SCI/D found that 10% of patients recruited carried MRSA on their perineal skin, with most also being colonized in the nares (Roghmann, 2007).

Staphylococcus aureus (14.7% of all isolates) with 92.2% being MRSA was the most prevalent causative organism in a study of hospital-acquired infection in one SCI/D unit (Evans, 2008).

Recent evidence from the VA MRSA Initiative indicates that while MRSA prevalence at admission is high (38.6% ± 19.1%) in SCI units, MRSA HAI rates are declining (Evans Martin et al., in press). MRSA HAI rates declined 81% between October 2007 through June 2011 from 1.217/1,000 patient-days to 0.237/1,000 patient-days (P<0.001, for trend). Bloodstream infections declined by 100% (P=0.002), skin and soft-tissue infections by 60% (P=0.007), and urinary tract infections by 33% (P=0.07). However transmission rates have not declined. These data are promising and suggest that additional efforts can push the SCI Centers down to zero MRSA infections occurring in the hospital, reduce transmissions, and impact other MDROs.

Influenza. Influenza is a significant disease that is associated with high rates of morbidity and mortality. Up to 15% of the US population is affected by the virus annually (WHO, 2009). Influenza infections result in about 150,000 hospital admissions and 24,000 deaths each year (CDC, 2010a). Annual influenza epidemics account for an estimated 610,660 life-years lost, 3.1 million days of hospitalization and 31.4 million outpatient visits (Molinari et al., 2007). Due to impaired respiratory function, individuals with spinal cord injuries and disorders (SCI/D) are at extremely high risk from respiratory complications that occur as a result of contracting influenza-like illnesses (DeVivo et al., 1993).

Health care workers (HCWs) can spread the highly contagious influenza virus to patients in their care (Horcajada et al., 2003; Salgado et al., 2002; Harrison et al., 2002). In fact, unvaccinated workers can be a key cause of outbreaks in health care settings. Transmission of influenza in hospital and long-term care settings such as nursing homes has been documented (CDC, 2006) and HCWs have been implicated in the transmission of influenza among patients and providers (Horcajada et al., 2003; CDC, 2006; Pachucki et al., 1989; Nichol et al., 1997; Carman et al., 2000; Bridges et al., 2003; Walker et al., 2006). This is particularly alarming for individuals with SCI/D who are at high risk for influenza-related complications, hospitalization, and death (CDC, 2007).

The single most effective way to prevent influenza or severe consequences from the illness is vaccination. Safe and effective vaccines have been available and used for over 60 years. Influenza vaccine can prevent 70% to 90% of influenza-specific illness in healthy adults. In the elderly, the vaccine reduces severe illnesses and complications by up to 60% and deaths

by 80% (WHO, 2009). Influenza vaccination uptake is important for the protection of both of the HCW against influenza and to reduce the likelihood that the patient may be exposed to an influenza-infected health-care worker. HCW vaccination can decrease the transmission of influenza to patients (Hayward et al., 2011; van den Dool et al., 2009) and may also prevent influenza-related absenteeism (LaVela et al., 2007; Poland, 2010).

Function in SCI/D.

In the field of rehabilitation, patients and providers are particularly concerned about patient function. Functional assessment involves the objective measurement a person's ability to perform activities of daily living (e.g., walking, bathing, toileting, eating), including relevant psychosocial aspects (Granger et al. 2012). Following a significant and life-altering event such as SCI, patient function is affected. Daily function requires sensory, motor and cognitive skills. A number of assessment tools are available to address function such as ambulation and gait, communication, memory, psychological and social activities (Ullrich et al. 2012).

According to the International Classification of Functioning (ICF) model developed by the World Health Organization (WHO) and endorsed by all major disability groups, disability is best understood as a function of biological, psychological, and social factors including health condition, function, and contextual factors (environmental and personal). Three levels of human functioning are classified by ICF: (1) body function and structures (e.g., pain, weight), (2) activity (e.g., propelling a wheelchair) and (3) participation (e.g., engagement with family, work, and community). Assistive technologies are viewed as environmental factors that are used by persons with disabilities to improve function. Thus, persons with SCI/D experience impaired function (e.g. cannot walk), but can navigate their environments with the proper assistive technologies (e.g. wheelchairs), thus reducing overall disability. The goal of rehabilitation is to optimize function in all three levels, ultimately improving quality of life. Over time, however, a number of personal or health factors can further impair function including medical complications, chronic illnesses, injuries, weight gain, joint and extremity pain, and sleep problems. Furthermore, in individuals with SCI/D, the environment (social, physical, and adaptive) can impact the level of functioning and influence an individual's ability to live independently (Gray, 2003).

The Functional Independence Measure (FIM) is often used in the rehabilitation field (including SCI) to track functional outcomes; the FIM measures individual's level of independence across several areas, including self-care, mobility, locomotion, communication and social cognition (Jackson 2000). Recent literature has shown that, in the SCI cohort, function tends to decrease over time (for individuals who were originally of higher function;

Pershouse 2012) and with age (Furian 2009). Additionally, decreased severity of injury is shown to predict increased functional independence, while being of older age has been shown to predict decreased functional outcomes in the SCI population (Wilson 2012).

Recent literature has shown that in a SCI cohort increased function (as measured by the FIM) is associated with increased likelihood of being employed and living in the community and, as well as decreased likelihood for hospitalization and institutionalization, and fewer hours of caregiving needed (both formal and informal). These increased odds of independence and decreased healthcare utilization suggest that greater functional outcomes lead to lessened economic burden in the SCI population (Cohen 2012). As such, projected health care associated savings in conjunction with a five-point improvement of the FIM motor score would be between \$430-\$580/year per person for institutionalization costs, \$400/year per person for hospitalization costs, and approximately \$2,200/year per person in formal caregiving costs (Cohen 2012).

Overweight/obesity.

An estimated 53-66% of individuals with SCI/D are classified as being overweight or obese as measured by body mass index (BMI) (Gupta 2006, Weaver 2007, Rajan 2009). In addition, elevated waist circumference levels, a surrogate measure of intra-abdominal fat, were found in 35% of adult males with SCI/D (Tomey 2005). Limitations in physical activity, changes in body composition such as reduced muscle mass, and lowered metabolic rate, which follow SCI/D, likely contribute to overweight and obesity in this cohort.

Consequences of Overweight/Obesity. Just as in the general population, being overweight or obese puts individuals with SCI/D at increased risk for negative health consequences. In the general population, overweight/obesity is a major contributor to morbidity and mortality (NIH 1998). It is a well-established risk factor for comorbidities such as diabetes, hypertension, and dyslipidemia, conditions which are also highly prevalent among individuals with SCI/D (NIH 1998, Bauman 2008). In cross-sectional studies of persons with SCI/D, elevated BMI was associated with hypertension, cardiovascular disease, and diabetes (Weaver 2007, Rajan 2009).

Literature also suggests that overweight/obesity in persons with SCI/D contributes to impairments in performing critical activities such as transfers, wheelchair pushing, and ambulation, resulting in poorer overall functional outcomes. While data for SCI/D cohorts is lacking, research in able-bodied cohorts has shown that obesity impairs QOL and places a large burden on the healthcare system (Yancy 2002, Ford 2001, Colditz 1999, Finkelstein 2003).

Prevalence of dysfunctional sleep SCI/D. There is a significant relationship between being obese and sleep disorders (NHLBI 2012). Jensen et al. (2009) found that individuals with

SCI/D had significantly worse overall sleep problems than both the general population and a chronically ill population; including more sleep disturbances, poorer sleep quantity (e.g., fewer hours of sleep), poorer sleep adequacy, more snoring, and greater daytime somnolence. Sleep disordered breathing, especially sleep apnea, is common following SCI/D (Leduc 2007, Biering-Sorensen 2009). Studies have reported that the degree of sleep disturbances, including daytime sleepiness, is directly associated with the frequency of sleep arousals of all types, not just respiratory-related arousals alone (Piper 2008).

In a recently completed study by the investigators (LaVela, Weaver) of over 1200 Veterans with SCI/D, 52% indicated regularly having insomnia during the prior year, and of those, 64% were overweight or obese. Additionally, those who were overweight/obese had significantly more excessive daytime sleepiness, snoring, and sleep apnea than those who were not; they also reported decreased energy and excessive fatigue.

Consequences of sleep problems. Numerous epidemiologic studies have demonstrated that sleep problems are associated with increased risk of mortality and comorbidities such as diabetes, obesity, and hypertension (Knutson 2010). Sleep disturbances are known to poorly affect QOL in patients with a variety of chronic conditions including lung cancer, Parkinson's disease, renal disease, endocrine diseases, multiple sclerosis, cardiovascular diseases, depression, anxiety disorder, and mental health conditions (Verster 2008). Individuals with chronic illnesses, including heart disease, diabetes, asthma, or depression, who have sleep problems have been found to have significantly worse QOL compared with chronically ill patients without sleep problems (Manocchia 2001).

Literature suggests that the presence of dysfunctional sleep may contribute to poor health outcomes in individuals with SCI/D beyond the effects of the SCI itself (Jensen 2009). Similar to the general population, dysfunctional sleep leads to increased risk of anxiety and depression in persons with SCI/D (Norrbrink 2005). Lack of physical activity and increased pain have been reported in persons with SCI/D reporting excessive daytime sleepiness (Hammel 2009).

Overweight/obesity focus on function. Obesity has been associated with poor physical function in the general adult population (Myint 2006). Since individuals with SCI already have difficulties with physical function above and beyond the general population, it is important to take weight into consideration with the SCI population as well. In fact, recent literature has reported that, in an SCI cohort, obese individuals displayed significantly lower gains in both self-care and mobility FIM scores (on average) than their overweight or normal weight counterparts (Stenson 2011).

Lower FIM scores in individuals with SCI who are obese have been shown to increase likelihood for the development of other conditions, such as pressure ulcers (Verschuereen 2011), and foster a need for greater overall minutes of caregiving time needed per day to help with activities relating to function compared with individuals with SCI of normal weight (Stenson 2011).

Wheelchair function. The majority of individuals with SCI/D use a wheelchair for mobility in the community (Post et al., 1997). Despite their great value in promoting independence and function in SCI/D, individuals also perceive wheelchairs as the most significant factor limiting participation, beyond the impact of their neurological impairment (Chaves et al. 2004). Wheelchair-related falls and tips account for the majority of fatal wheelchair accidents and non-fatal injuries requiring visits to the emergency room in the population of persons who use wheelchairs (Unmat & Kirby 1994). Noninstitutionalized manual wheelchair users in general who were surveyed reported that 57% had experienced a fall or tip over and 47.1% had reported an injury as a result of the fall (Kirby et al. 1994). While most were minor, almost 16% were considered serious (e.g., head injury, fracture). A survey of persons with incomplete SCI found that 75% reported falling in the past year (Brotherton et al. 2007). Nelson et al. followed a cohort of Veterans with SCI living in the community for one year and found that 31% reported at least one fall during that time and 14% had a fall with injury (Nelson et al. 2010). Clearly, wheelchair falls with injury are a concern in general and in the SCI/D population. In addition to falls and fractures, people who use manual wheelchairs are at risk for repetitive stress injuries of the upper extremities, thus interfering with the ability propel and limiting activities and participation. Recognizing the link between shoulder dysfunction and ability to use a wheelchair, the Consortium for Spinal Cord Medicine developed a clinical practice guideline on 'Preserving Upper Limb Function Following SCI' (CSCM, 2005). The CPG consists of 35 recommendations in six categories: Initial Assessment of Acute SCI; Ergonomics; Equipment Selection, Training, and Environmental Adaptations; Exercise; Management of Acute and Subacute Upper Limb Injuries and Pain; and Treatment of Chronic Musculoskeletal Pain to Maintain Function. QUERI investigators conducted focus groups with SCI providers and Veterans regarding the CPG. One recommendation was that there was a need to "develop a research agenda to develop a convincing evidence-base for recommendations in the areas of health promotion, wellness and exercise." (Powell-Cope et al., under review).

4. Treatment Evidence Base

In several specific areas, evidence-based clinical practice guidelines (CPGs) specific to SCI/D have been developed for common complications and co-morbid conditions. These include a CPG for pressure ulcer prevention and management (Pressure Ulcer Prevention and Management Following Spinal Cord Injury published in August; Garber 2000). The CPGs were developed by the Consortium for Spinal Cord Medicine Consortium (CSCM) and supported by the Paralyzed Veterans of America (PVA). The Consortium is made up of 21 health professional and payer organizations representing physicians, therapists, nurses, psychologists, social workers, consumers, insurance case managers, policy makers from VA representing public and private healthcare sectors. The Consortium develops, produces, and disseminates evidence-based CPGs designed for providers and companion consumer guides for patients. The SCI pressure ulcer CPG developed by the Consortium guides much of our work, as will be discussed below.

In general, there is no single specific guideline for SCI/D as there is for many conditions such as diabetes mellitus, congestive heart failure, and depression. The clinical practice guidelines mentioned above focus on specific, common complications that follow SCI/D. The reasons for not developing a comprehensive evidence-based guideline for SCI/D may not be obvious. There is simply too much heterogeneity and complexity in SCI/D. There are more differences than similarities in comparing for example: a 20 year old with high tetraplegia with a 60 year old with paraplegia; someone with a traumatic myelopathy from spinal stenosis with a traumatic spinal cord injury; or a stable neurologic condition such as transverse myelitis with the progressive neurologic changes that accompany a malignant spinal cord tumor.

There are two CPGs that focus more generally on traumatic SCI (Outcomes Following Traumatic Spinal Cord Injury and Early Acute Management in Adults with Spinal Cord Injury). Both of these focus on the acute rehabilitation phase of treatment immediately following a traumatic spinal cord injury. Since the vast majority of Veterans have chronic SCI, these guidelines have less relevance to QUERI activities.

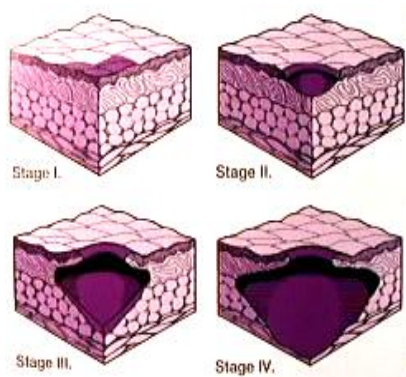
In general, SCI QUERI has helped promote the clinical practice guidelines that have been published. Clinical practice guidelines have guided our previous work (e.g., Respiratory Management Following Spinal Cord Injury, Depression Following SCI). We continue to work with the Paralyzed Veterans of America to disseminate the CPG consumer guides and have made them available to Veterans through the VA's My HealthVet portal as part of the SCI Healthy Living Center.

The following discussion reviews the treatment, management, and prevention evidence base for each of our focus areas: PrUs, infection prevention and management, and function.

Pressure Ulcers.

Pressure ulcers are lesions caused by unrelieved pressure, resulting in damage to underlying tissues (Bates-Jensen 2006). They commonly occur over bony prominences and are classified in six stages by level of tissue involvement; stage I PrUs are areas of persistent erythema on intact skin and stage IV PrUs are full-thickness lesions involving deeper structures (e.g., bone, joint, tendon; see Figure 3 below). The staging system used is the National Pressure Ulcer Advisory Panel's (NPUAP) 2007 classifications:

Figure 3



- **Stage I:** Intact skin with non-blanchable redness of a localized area usually over a bony prominence. Darkly pigmented skin may not have visible blanching; its color may differ from the surrounding area.
- **Stage II:** Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough. May also present as intact or open/ruptured serum-filled blister.
- **Stage III:** Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling.
- **Stage IV:** Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present on some parts of the wound bed. Often include undermining and tunneling.
- **Unstageable:** Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed.
- **Suspected Deep Tissue Injury:** Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue.

Visual assessment remains the accepted standard for detecting early stage I PrUs. No empirical evidence consistently supports alternative methods of detecting stage I PrUs. It's worth noting that there is considerable confusion about the issue of healing and staging. While a PrU can deteriorate and thus, reach a worse stage, the same is not true for healing (e.g., a full thickness stage IV ulcer cannot 'heal' to a partial thickness stage II wound). Wounds cannot be back-staged. Although it is important to stage a wound initially, there is limited value to repeatedly stage a wound during treatment unless the ulcer is deteriorating.

Published guidelines for PrU prevention and treatment in all populations emphasize the following elements: 1) comprehensive assessment including a complete history, review of systems, and review of past medical history that evaluates factors commonly associated with PrU development; 2) an organized approach to risk assessment that utilizes a standardized tool; 3) a complete physical examination that includes an assessment of skin and other systems that may be associated with pressure ulcer development (e.g., hypotension, diabetes, peripheral vascular disease, and/or infections of skin); 4) an assessment of equipment (e.g., commode, wheelchair), interfaces (e.g., mattress, cushion), and activities. In other words, the assessment is a complete history and physical examination that reviews all possible intrinsic and extrinsic factors that may lead to development of a pressure ulcer. Research, expert opinion and CPGs stress that there are numerous factors and prevention techniques that are important to prevent PrUs. There is no simple, single cause or intervention that will ameliorate this problem. To prevent PrUs, multiple factors and interventions are recommended such as patient education, pressure reduction and off-loading the site (e.g, individualized repositioning, use of support surfaces in bed and in wheelchairs), improved hygiene (e.g., management of incontinence and dry skin), adequate nutrition, environmental protection, and psychosocial support. We are committed to using the CSCM CPG, and evidence from other populations, as the basis of our implementation efforts in this area. As new evidence becomes available, we will also incorporate it into our implementation efforts.

Pressure Ulcer Healing and Medical Treatment of Pressure Ulcers. With thorough and comprehensive medical management, many PrUs may successfully heal. Unfortunately, as yet, there is no reliable way to predict if an ulcer will or will not heal during an initial assessment. Treatment of a PrU can involve medical management and/or surgery. A common strategy is to begin by treating the ulcer with medical management.

Successful medical management of PrUs includes factors such as maintenance of a clean wound (e.g., adequate debridement of non-viable tissue, wound cleansing, identification and control of infection), nutritional assessment and supplementation if indicated, and topical wound care to maintain a moist healing environment. Typically, patients with large full thickness PrUs are maintained in a physical position such that minimal pressure is being exerted over the wound (e.g., bedrest on a specialty mattress for most sacral and ischial wounds).

A system to regularly re-assess the wound must be in place to determine if healing is taking place over time. This often includes serial measurements, detailed descriptions of the wound, and documentation of treatments received. In all U.S. health care settings, PrUs are classified according to the system developed by the NPUAP; visually observing the level of tissue

involved in the wound where a stage I PrU indicates redness over a bony prominence but no break in the skin, stage II indicates a partial thickness wound, and stage III, IV, and unstageable ulcers indicate full thickness loss of tissue with or without non-viable necrotic tissue.

There is less empirical evidence about whether and when individuals with SCI are considered for surgical repair of an ulcer. In an earlier intervention study to prevent PrUs, we found that some SCI centers did not have reliable access to plastic surgery. Consultation for appropriateness of plastic surgery at the time of admission for treatment of a severe pressure ulcer was routine at some sites and not at others. About 59% of patients receiving surgical treatment for severe ulcers in our study, however, the range of patients receiving surgical treatment of their ulcers ranged from 12.5% to 89.7% at 6 of the largest VA SCI Centers (SCI QUERI, unpublished data).

SCI QUERI has carefully evaluated guidelines and literature on wound healing. There are literally hundreds of reputedly effective treatments including ointments, dressing materials, electrical stimulation, negative pressure wound therapy, heat modalities, hyperbaric oxygen, antibiotics, noncontact normothermic wound therapy, electromagnetic stimulation, collagen, and growth factors. A variety of parameters and measures are used to study wound care processes and intermediate outcomes to assess treatment effectiveness. Definitive healing, or wound closure, is almost never used as an outcome measure because time to closure is typically months or longer for Stage III and IV PrUs.

There is no universally accepted validated measurement tool to follow PrU healing over time in SCI/D and this has been a barrier to evaluating PrU treatment effectiveness in SCI. The fundamental principle of all evidence-based wound healing recommendations requires a frequent reassessment to determine if healing has occurred since the previous assessment. Although outwardly simple, evaluating pressure ulcers for healing is complex. VHA Handbook 1180.2 (Assessment and Prevention of Pressure Ulcers) lists 17 wound characteristics that should be documented. Of note, there are no studies that validate the use of the wound characteristics to assess healing in the Handbook. Instruments that are currently available have not been validated in the SCI/D population. During the SCI/D Pressure Ulcer Collaborative (2006) in which nurses and physicians from each SCI Center participated, considerable resistance was encountered to using existing instruments because they did not capture essential information used to make day-to-day clinical decisions or the perceived burden was too great. For example, the NPUAP's Pressure Ulcer Scale for Healing (PUSH) tool is a simple instrument to use but it does not include important factors like undermining and tracking. The assessment tool most widely used in clinical settings, the Bates-Jensen Wound Assessment

Tool (BWAT), includes 13 indices but was felt to be too time-consuming for practical usage. The nurses who are wound care specialists in the SCI Centers have sometimes developed their own tools due to skepticism about existing instruments. There was considerable resistance to abandon these tools until something sensitive to the changes that they felt were important for clinical care was developed.

Dr. Audrey Nelson and colleagues completed a VA HSR&D study that developed a pressure ulcer monitoring tool (SCI-PUMT) in which the validity, sensitivity, and reliability were examined in the VA SCI/D population. SCI-PUMT was developed in response to SCI QUERI and the Office of SCI/D Services needs. Since a universally accepted and used instrument will allow intra-patient and inter-patient comparisons, SCI QUERI has been working closely with SCI/D Services office on full implementation of the SCI-PUMT in all SCI/D centers.

In May 2011, QUERI investigators participated in a “train-the-trainer” Collaborative to implement the SCI-PUMT in all 23 SCI/D centers that was sponsored by the VA SCI&D Services Office. Monthly/bimonthly facilitation conference calls were held with clinical champions from the SCI/D centers to promote implementation of the SCI-PUMT. SCI/D center clinical champions were surveyed on how the SCI-PUMT implementation was progressing. This informal survey found that while 18 of the 23 centers were using SCI-PUMT, use was uneven. Only 7 centers reporting use at 76-100% of the time, while 11 centers reporting using it less than 25% of the time. We also conducted a small locally initiated project (LIP) to examine SCI-PUMT implementation as a single site. At the beginning of PUMT implementation the SCI center were tracking PUMT information by hand and not reporting it in the medical record. Now, staff are scanning PUMT scores into the medical record. Given this variability, we identified a need to assess overall SCI-PUMT implementation. An RRP by Drs. Guihan, Bates-Jensen and Powell-Cope is currently under review with the following goals: 1) characterize the variability in SCI-PUMT implementation across the 23 SCI centers, 2) identify barriers and facilitators to and best practices for SCI-PUMT implementation through an in-depth evaluation comparing high and low adopters of the SCI-PUMT and 3) to examine the influence of wound care team characteristics (e.g., structure, teamwork, patient-centeredness, culture, etc.) on SCI-PUMT implementation. We plan to use information gathered to work with low adopting centers to improve their uptake of the tool. We plan to follow up the evaluation of the SCI-PUMT implementation with another RRP (and a future SDP) to test additional implementation strategies to promote adoption in underperforming centers and to examine sustainability of SCI-PUMT implementation and its impact on care outcomes. We believe that use of a single tool across multiple settings (inpatient,

outpatient, home care) to assess PrU healing in SCI will improve both clinical care and the quality of research studies.

To support implementation of the SCI-PUMT, additional work related to assessment of wound healing is also underway. Drs. Guihan and Bates-Jensen received RRP funding to use data from VA CSP#535 (the largest randomized controlled trial of Veterans with SCI/D and pressure ulcers) to study factors associated with non-healing PrUs in Veterans with SCI/D. The objective of this RRP is to use the CSP data to develop evidence-based parameters to assess risk for impaired healing in pressure ulcers. In addition to the rich data included in the CSP trial, we will be able to retroactively calculate SCI-PUMT scores from the CSP data. This will enable us to examine the SCI-PUMT as a predictor of healing/non-healing. We will examine other factors associated with impaired healing of pressure ulcers using the CSP data and examine the relationship between SCI-PUMT scores and healing status.

Prevention of Pressure Ulcers. All published guidelines and evidence-based recommendations agree that there are many risk factors that potentially contribute to the development of a PrU. Some of these risks are not preventable such as genetics, age, and the prominence of bony protuberances. For people with SCI/D, other immutable factors include level and completeness of spinal cord injury.

Pressure ulcer prevention programs focus on modifiable factors. Unfortunately, the list of these risk factors is long and there is no conclusive empirical or experimental evidence that demonstrates which factors are most important. Numerous factors have been identified that must be addressed to avoid the development of PrUs. These typically include mechanical forces (i.e., pressure, shear, and friction), behaviors (e.g., pressure releases in which the person with SCI/D does weight shifts repeatedly while sitting in a wheelchair or repositioning activities while in bed), support surfaces (such as the cushion used while in a wheelchair or on a commode and the mattress used in bed), equipment, posture and weight-bearing (i.e., assessing the weight distribution and applied pressures while in the wheelchair using pressure mapping technology), moisture and incontinence, nutrition, and co-morbid conditions such as diabetes mellitus.

While there is evidence that use of a standardized risk assessment tool such as the Braden Scale for Predicting Pressure Sores can identify persons at increased risk for PrU development in institutionalized and hospitalized populations, the instrument is problematic when applied to persons with SCI as nearly all are rated as 'at risk' with the tool. The ability to reliably identify which individuals are at the highest within an "at risk" population in the community is essential for prevention efforts targeted at the home environment.

Data for people with SCI/D living in the community have consistently demonstrated high prevalence rates of PrUs (point prevalence rates have been shown to be up to one-third). VA data also demonstrated very high prevalence rates of pressure ulcers in Veterans with SCI/D who were admitted to the hospital. We are committed to addressing prevention of PrUs among Veterans with SCI/D in the community setting where they develop. We have two major efforts planned in this area. First, we are working to develop and test standardized risk assessment tools specific to Veterans with SCI/D. Dr. Stephen Luther (Tampa COE) has been funded to study to modifiable PrU risk factors using cutting edge healthcare informatics and patient safety risk modeling methods in persons with SCI. We anticipate validating and testing his instrument following development of the tool. Looking at this same problem using a different approach, we are working with Dr. Matt Peterson (Tampa COE) on his RR&D CDA proposal re-submission (December 2012), which is focused on use of pressure mapping technology as a method of refining and individualizing risk assessment of persons with SCI/D.

Another prevention approach we are pursuing involves a novel method of risk assessment and detection of early pressure damage. This approach uses biophysical methods for early detection and prediction of PrUs in Veterans with SCI at home. Using surface electrical capacitance to detect sub-epidermal moisture (SEM, a measure of edema in the skin and tissues) as a reflection of inflammatory response due to tissue damage) measured with a handheld dermal phase meter, Drs. Guihan and Bates-Jensen are evaluating SEM as a method of detecting and possibly predicting early pressure damage. This RR&D funded study builds on Dr. Bates-Jensen's previous work in other populations and on a previous QUERI RRP. Surface electrical capacitance has been used to quantify wound healing in burn patients and to examine the relationship between SEM and prevalence of erythema and Stage I PrUs in elder nursing home residents. We are currently in the final stages of data collection for this study and we are enthusiastic about the potential ability of the device in providing more objective measures of potential pressure damage and the opportunity for early preventive interventions.

Infection Prevention and Management.

MRSA. Due to the rising impact of MRSA infection in the U.S. and in Veterans, the VHA released (VHA Directive 2007-002: Methicillin-Resistant Staphylococcus Aureus, MRSA Initiative) a new policy in January 2007, describing infection control strategies to prevent the spread of MRSA in VA facilities. The goal of the MRSA initiative is to interrupt the transmission of MRSA and thereby decrease the number of patients who are at risk for infection. There are four components to the standardized program (also known as "the bundle") currently being implemented in VA: 1) Active surveillance/screening cultures (ASCs); 2) Use of contact

precautions (CP) by healthcare providers (i.e., gloves, gowns) if patients are found to be MRSA positive; 3) Appropriate hand hygiene (HH) (i.e., hand washing and/or use of alcohol-based gels); and 4) Culture change (i.e., staff and leadership engagement). This national policy was rolled out in early 2007 in general acute care units and due to the unique aspects of risk and infection control in the SCI unit, VA MDRO Program Office (formerly known as the MRSA Program Office) and the SCI/D Services released 'Guidelines for Implementation of MRSA Prevention Initiative in the Spinal Cord Injury Centers' (July 24, 2008), which are intended to support VHA Directive 2007-002.

The individual components of the bundle have been supported in the literature although some controversies still exist around the effectiveness of ASCs and CP (Robicsek 2008; Editorial 2008; Harbarth 2008) The evidence regarding the efficacy of active surveillance, isolation, and contact precautions for patients with MRSA are key components of the VHA policy, has come from hospital outbreaks (Saiman, 2003; Nicolle, 1999; Khoury, 2005) as well as from control of MRSA in other circumstances outside of outbreaks (Harbarth, 2000; Huang, 2006; Ridenour, 2006; Snadri, 2006). Most of this evidence is based on high-risk units (such as ICUs), or high risk hospital patients such as long term care facility residents or immunocompromised patients (Weber, 2007). Published guidelines from the Society for Healthcare Epidemiology of America (SHEA) (Muto, 2003) and the Centers for Disease Control and Prevention (CDC) (Siegel, 2006) recommend ASCs for identifying the reservoir for spread of MRSA based on moderate evidence with at least 1 RCT included, and controlling spread using contact precautions based on good evidence with at least 1 RCT included. In addition, strategies to prevent transmission of MRSA in acute care settings are presented in a recent joint SHEA/Infectious Disease Society of America (IDSA) practice recommendation (Calfée et al., 2008). Hand hygiene (handwashing and/or use of alcohol based hand gels) by healthcare professionals is one of the most important strategies for controlling transmission of multidrug resistant organisms (MDRO) (Muto, 2003). Despite hand washing being recommended after all patient contacts as part of standard precautions in 1996, compliance rates remain low and vary by HCW type. None of this evidence has been demonstrated in persons with SCI/D, although the strategies should be directly translatable to this population. However, those with SCI/D have unique issues that need to be addressed; these complicate control of MRSA spread in hospital settings. These issues include the use of common areas for rehabilitation and exercise (e.g., physical therapy gym), shared equipment, and the difficulty associated with hand hygiene for people with impaired hand function secondary to tetraplegia.

Influenza. Key organizations recommend that all HCWs be vaccinated annually for influenza and that health-care facilities should actively vaccinate HCWs as a part of a comprehensive influenza infection control program. The CDC recommends influenza vaccination of HCWs and it is the gold standard of care (CDC, 2011) – though not yet required – among all health care institutions.

Several leading medical and infectious diseases organizations endorse mandatory influenza vaccination and declination form programs for HCWs. The American Hospital Association (2011), National Foundation of Infectious Diseases (2010), American Public Health Association (2011), American Academy of Family Physicians (2011), and American College of Physicians (2010) support mandatory influenza vaccination of HCWs, with varying policies on declination exceptions (religious reasons) and alternative actions (reassignment, wearing a mask) (IAC, 2012). The Association for Professionals in Infection Control and Epidemiology recommends that health care facilities that employ HCWs require annual influenza immunization as a condition of employment unless there are compelling medical contraindications (Greene et al., 2011). The Infectious Diseases Society of America supports mandatory HCW influenza vaccination of HCWs, which should be a condition of employment and “professional privileges,” and does not endorse declination for religious reasons (IDSA, 2010). The National Patient Safety Foundation supports mandatory influenza vaccination of HCWs and, if medical contraindications make vaccination not possible, that all available alternatives to avoid influenza transmission must be used, e.g., masks and adjusting job responsibilities (NPSF, 2009). The Society for Healthcare Epidemiology of America views HCW influenza vaccination as a core patient and HCW safety practice with which noncompliance should not be tolerated and recommends exemptions only due to medical contraindications (Talbot et al., 2010). Likewise, the Department of Defense (DoD) instituted a policy for mandatory annual influenza vaccination of HCWs who provide patient care in DoD Military Treatment Facilities (Assistant Secretary of Defense, 2011). Data show that institutions requiring mandatory HCW influenza vaccination show an 88% reduction in workforce infection and a 41% reduction in influenza-related patient mortality (NPSF, 2009). The 2011-2012 VA goal is to increase the seasonal influenza vaccination rate of employees to at least 85 percent (DVA, 2011).

Function in SCI/D.

Wheelchair function. Nelson et al (2010) identified risk factors related to wheelchair falls in Veterans with SCI. Pain in the last two months, alcohol abuse, greater motor function, history of a previous fall, fewer years with an SCI and shorter length of wheelchair explained 85% of the variance in falls. Factors related to injury as a result of a wheelchair fall included pain in the last

2 months, greater motor function, history of falls, and inaccessible entrance to home. Although falls and injuries were more common for those using manual wheelchairs, those who use their wheelchair more hours/day and who have better scores on the Wheelchair Skills Test (Kirby et al. 2004), were not predictive in these models.

Mountain et al. 2010 propose that even in long-standing wheelchair users, that wheelchair skills should be routinely assessed as part of a regular assessment of function, and that training should be offered when there are limits identified. A recent paper by Hosseini et al. 2012 demonstrated that the ability to perform manual wheelchair skills was associated with higher community participation and life satisfaction in group of persons with SCI from six Model System SCI centers who use manual wheelchairs. Wheelchair skills success was less than 75% on 8 of the 31 items on the Wheelchair Skills Test in this cohort.

Current fall risk assessment tools are not specific to SCI/D. Most were developed for populations like the elderly or for settings such as hospitals (Gates et al. 2008; Perell et al., 2001). Tampa investigators have developed and tested an SCI-specific wheelchair falls risk-assessment tool (Groer et al. in development). The tool, tested on a group of Veterans with SCI/D, focuses on factors that are modifiable including duration of SCI, amount of alcohol one drinks in a day, falling within the past year, number of transfers completed per day, and pain intensity. It has yet to be tested as to determine if it is useful in reducing fall incidence.

5. Current Practices and Quality/Outcome Gaps

Pressure ulcers.

There are two major private sector initiatives to reduce PrUs in healthcare settings; one effort through Medicare and the other through the Institute for Healthcare Improvement (IHI). Medicare data suggests that wounds are becoming increasingly common in hospitalized patients in the United States. Recent Medicare data suggest that PrU incidence rates vary considerably by clinical setting, ranging from 0.4% to 38% in acute care, from 2.2% to 23.9% in long term care, and from 0% to 17% in home care (van Rijswijk 2008). Center for Medicare Services indicated that as of October 2008, it would discontinue reimbursement for hospital acquired PrUs (Lyder 2003). The practical implication of this policy is that if there is no documentation of a PrUs upon admission or if a patient acquires a PrU while in the hospital, hospitals will lose thousands of dollars because they will not receive reimbursement.

The need to educate providers about identify PrUs was emphasized by a pilot study of physicians in which 67% were able to identify a stage I PrU. The study concluded that: "[providers] need to improve their knowledge and confidence with regard to PrU care to become

competent as clinicians and educators for this condition."(Odierna 2003) Programs and hospitals typically target physicians and nurses to help educate them about the importance of recognizing, assessing and documenting pressure ulcers on admission. These programs include standard information designed to educate providers about PrUs, ulcer staging, and routine prevention strategies that they can implement at their facility. In response to the new CMS policy, most states have also developed PrU initiatives with a focus on reducing ulcers in acute care and/or nursing facilities.

A second effort at reducing PrUs in hospitals and LTC settings is the 5 Million Lives Campaign, led by IHI. It is designed to protect patients from incidents of medical harm in United States hospitals focused on 12 preventable conditions, including PrUs. IHI's approach to reduce PrUs in healthcare facilities used the Breakthrough Series (BTS) Collaborative model to help providers achieve its goal of zero pressure ulcers. The BTS Collaborative approach is a focused short term (12-15 months) quality improvement effort that utilizes highly interactive education and training approaches to bring about change in clinical settings. While these are important efforts, they have less relevance for PrUs in SCI as we have shifted QUERI's PrU prevention efforts to the outpatient population. There are some important factors to consider. First, SCI/D patients are, at least to some degree, usually in charge of their own self-care. This is very different from the hospitalized and long term care populations where the etiology of ulcers is frequently linked to lapses in provider behavior. Second, despite studies dating back more than 40 years to improve use of skin-protective behaviors, the majority of them focus on the inpatient setting. Andberg et al. (1983) was the first to recognize patient-healthcare provider relationship factors. Their results suggest that a relationship that promoted active patient participation was associated with greater compliance and success in treatment. Krouskop and colleagues (1983) demonstrated that a formal PrU clinic that provided a multi-faceted intervention consisting of individualized education plus greater attention to treatment factors including equipment prescription was successful in decreasing PrU recurrence. Third, little is known about the use of CPG-recommended interventions in the community setting. Most quality improvement, clinical, and research studies have focused on the hospital and long term care settings.

We have begun to consider PrUs as a complex chronic illness, not unlike diabetes, hypertension or heart disease. This literature has helped to move our prevention efforts in the direction of trying to learn more about how to adapt existing materials to increase self-efficacy and improve skin care behaviors in persons with SCI/D. The role of self-efficacy in the management of other chronic conditions is well established and is often critical to long term

outcomes. This is also consistent with long-held approaches used in rehabilitation medicine for the past 50 years, to teach people with SCI/D about self-management and/or how to direct care if physically dependent. Thus, using best available clinical practices and evidence from other populations, our current study on self-management was designed to address patient behaviors that may influence individual and health system factors. The target population for the work is community dwelling high risk individuals who already have had at least one severe ulcer. We have posited that like those with other complex chronic illnesses (e.g., diabetes or heart disease), preventing and managing PrUs requires substantial and sustained changes in patient behavior and improvements in self-management. As mentioned previously, our efforts have used the Pressure Ulcer Prevention and Treatment Following Spinal Cord Injury Clinical Practice Guideline to identify specific patient behaviors that providers believe are important to change to prevent ulcers.

We are also working to better understand outcomes of care for PrUs. Drs. Guihan, Bates-Jensen, Sohn and Gould (Tampa COE) are currently preparing an IIR submission (December 2012) to evaluate the short and long term outcomes of surgical procedures for PrUs in SCI. This study will describe outcomes (and the factors related to those outcomes) of PrU surgery in Veterans with SCI/D using the VA National Surgical Quality Improvement Program database. We will examine surgical outcomes including postoperative length of stay, 30-day morbidity rates, 1-year surgery-related readmission rates, and mortality. We plan to use an expert panel of SCI/D clinicians including SIC chiefs, plastic surgeons, wound experts to identify surgery-related adverse outcomes. We will also conduct a chart review for a randomly selected set of patients who underwent surgery to examine 3, 6, 9 and 12 month outcomes of surgery. This study will provide needed information on one significant aspect of PrU treatment.

SCI QUERI has carefully evaluated what is known about gaps and implementation related to the prevention of PrUs for Veterans with SCI/D who live in the community. We have found that there are three significant problems that warrant careful study. First, from provider to provider and SCI/D Center to SCI/D Center, there is no uniform approach to prevention. For example, during the Pressure Ulcer Collaborative (2006), we found that some SCI Centers routinely used pressure mapping (a pressure monitoring device that produces a computer-generated color graphic of pressure distribution) while others did not. We found that there was no uniformity for the provision of specialty mattresses given to at-risk individuals to use in the home. And there were differences in what was recommended for diet and nutritional health and in barriers to improving nutritional health. Second, we found that interventions to promote PrU healing are complex since they are typically interdisciplinary (involving the physical therapist,

occupational therapist, nurse, physician, and psychologist) and involve many types of educational and clinical interventions. Third, we found that most outpatient encounters are complex, involving the assessment and treatment of acute complications such as urinary tract infections, preventive care recommendations (e.g., vaccinations, smoking cessation), functional issues, and complex system-level issues. Even during the outpatient annual evaluation in which pre-planned processes are in place, there are numerous assessments by several members of the team.

Since we submitted our previous strategic plan, we know considerably more about the population of Veterans with SCI receiving treatment for PrUs. QUERI investigators (Guihan, Bates-Jensen, Goldstein) have conducted 2 large scale multi-center randomized trials to improve patient skin protective behavior. Our first study built on the results of a small RR&D funded pilot study conducted on patients with surgically healed ulcers (n=42). The intervention consisted of individualized PrU education and a monthly reminder call to patients to discuss skin management. This study was very successful in preventing recurrence. The intervention group had a significantly longer average time to ulcer recurrence at 18 months than controls groups (19.6 vs. 10.2 months, $p=.002$) and had a significantly lower rate of recurrence (33% vs. 75%, $p=.007$).

While the effect of the intervention was strong, it was a single site study and the sample size was small. We recruited 6 of the largest VA SCI centers to participate in a randomized trial. The study provided up to 3 hours of PrU education to all study patients just prior to discharge to the community after their ulcer was healed. Intervention group patients received sustained, proactive support via scheduled telephone calls to assist patients in making improvements in their skin care behaviors. The sample was stratified on the number of previous ulcers (0 vs. 1+). The primary outcomes for the study were rate of and time to recurrence. We encountered numerous issues in conducting the study, the biggest of which was patient recruitment.

All PrUs in the pilot study were surgically healed. Because the availability of surgery was scarce at some of our study sites, we decided that it was necessary to include patients with medically and surgically healed ulcers. It soon became apparent that PrU management had changed dramatically during the time between the two studies. Subject recruitment for our study did not meet expectations. In the pilot study, the mean LOS for patients with severe PrUs was 278 days (with all subjects' wounds fully healing), whereas the LOS in our study ranged from 110 - 245 days (with almost 50% of those who enrolled in the study leaving the hospital with open skin). The median time to recurrence in this study was 4 months and about 69% of the

sample at least one readmission during the study period. Among intervention group patients, 25% of readmissions were skin-related (vs. 40% of controls, $p=ns$).

Checklists and clinical protocols have demonstrated improvements in addressing significant gaps and improvements in clinical management once organized reminders, procedures and protocols were in place. SCI QUERI has long debated how best to study prevention practices, implement CPG recommendations, and improve carry-over to the home setting. We are making this area a priority for our prevention focus for next three years. We believe that simplifying and routinizing this complex process will allow careful study, improve clinical care, and lead to improvements outcomes in the near future.

Infection Prevention and Management.

MRSA. All VA facilities are mandated to follow the VA MRSA Initiative guidelines for prevention of MRSA and have recommended guidelines specifically developed for SCI Centers. We conducted a national survey of SCI Centers along with interviews of key stakeholders to assess current practices being utilized by the SCI staff (Project Label: MRSA Current Practice). We found that SCI center staff had made significant efforts at implementing the MRSA Prevention guidelines. We also identified variability and gaps in practice and barriers to best in practice for several areas including appropriate use of contact precautions, educating patients and their family/caregivers about MRSA prevention, and providers' perceptions about evidence for supporting these practices.

Seventy-four percent of SCI/D staff reported 'always' wearing a gown before entering a MRSA positive patient's room (range of 42% to 100%) and only 66.1% (range of 29% to 100%) reported 'always' encouraging other HCWs to wear a gown and gloves when entering the room of a patient who is MRSA positive. Barriers identified with gowning and gloving included concerns such as unit layout/multi-bed rooms, competing demands, high rate of patient/provider interactions due to patient disability; and issues with shortages in gowns and gloves, overflow of trash, and being unaware the patient was on CP. These respondents also reported spending about 65% of their time in direct patient care, suggesting frequent patient-provider interactions per day. The World Health Organization (WHO) guidelines on hand hygiene and health care have identified that one of the risk factors for poor hand hygiene adherence is the high number of opportunities for hand hygiene per hour of patient care. Therefore, this may be a considerable barrier to use of appropriate contact precautions in SCI Centers. Our plans to develop a 'safe zone' intervention may alleviate some of these barriers.

One of the recommendations in the SCI MRSA care guidelines is to promote education of patients about MRSA. VA's MRSA Prevention Initiative has developed and disseminated

educational materials for the general VA population. However, from our recently completed work (Project Label: MRSA education), where we conducted focus groups with patients and providers and convened an expert panel, we found that these materials did not address the unique challenges that face Veterans with SCI/D and their caregivers. Patients with SCI/D often have the major risk factors for acquisition of MRSA (i.e. prolonged hospitalization, pressure ulcers, frequent UTIs) and they need to be adequately educated about what MRSA is, how it is transmitted, and what they and their caregivers can do to prevent MRSA spread or infection. We also found that an interactive strategy was desired by providers, rather than just using a brochure (Hill et al., in press). The MRSA current practice study enforced these findings, where respondents reported inconsistent education of SCI patients and visitors/family members providing direct patient care about MRSA and hand hygiene and only half perceived the education they provided to these stakeholders as 'good' or 'excellent'. In addition, 18% and 24% reported using return demonstration of skill/teach-back methods for MRSA education or hand hygiene demonstration, respectively. Finally, respondents felt the evidence was strong/very strong for handwashing to prevent resistant organisms like MRSA in healthcare workers (87%), but less so for SCI patients in general (65%) or SCI patients with poor hand function (58%). The results indicate that there is a clear gap in both receipt of patient education about MRSA and hand hygiene in the actual content of materials and strategies used to educate SCI/D patients. We plan to build on our pilot work from our RRP 09-125(Project Label: MRSA education) to address this gap and implement the SCI/D MET, our SCI-specific MRSA educational toolkit for patients (SDP in revision).

Influenza. National influenza vaccination rates for HCWs have increased slowly over the past decade. Centers for Disease Control and Prevention (CDC) national figures indicate that during the 2010/11 influenza season, coverage for influenza vaccination among HCWs was 64% (CDC, 2011) and during 2009/10 the HCW vaccination rate was 62% (CDC, 2010b). Documented VHA HCW influenza vaccination rates were 54% during 2010/11 and 77% during 2009/10 (DVA, 2011). However, our recent findings showed that the 2009/10 influenza vaccination rate for HCWs having direct contact with individuals with SCI/D was 48% (RRP 10-046; LaVela, 2011). Although national rates are slowly increasing, SCI HCW rates have been at about 50% for multiple years (LaVela et al., 2007; LaVela et al., 2004a; LaVela et al., 2004b; LaVela, 2011) and were even lower during a pandemic season when HCWs were prioritized for vaccine receipt (LaVela et al, 2012; Locatelli et al., 2012).

Furthermore, to provide baseline vaccination rates and preliminary data, we conducted a survey with HCWs in SCI facilities to determine their attitudes, beliefs, and willingness to

engage in a declination form program (2012 QUERI supplement). Across 35 VA SCI Hub and Spoke facilities, 375 HCWs participated in the survey to date; findings indicated that:

- 67% agreed/strongly agreed that HCWs have an obligation to receive an influenza vaccine.
- 57% of HCWs thought that use of a declination form by their facility would have “some” or “a lot” of influence on their decision to be vaccinated.
- 67% indicated that they would support a policy at their facility, where HCWs not receiving the influenza vaccine would be required to sign a declination form documenting vaccine non-receipt and the reason that they declined.
- 52% reported that they would support a policy where all HCWs at their facility were required to get a mandatory influenza vaccine each year, unless medically contraindicated.

As such, we have submitted an RRP (‘Use of Declination Forms to Improve Influenza Vaccination in Health Care Workers’) that will pilot the implementation of a declination form program to increase influenza vaccination in health care providers in the SCI System of Care. The aim is to pilot the program at 2 SCI facilities along with a formative evaluation to understand the implementation processes and to examine costs. We intend to examine influenza vaccination pre/post outcomes in HCWs at the 2 pilot sites compared with 2 control sites comprised of comparable sites (randomly matched based on staffing numbers and patient load) receiving ‘usual influenza infection control strategies.’

Function in SCI/D.

People with SCI/D are surviving longer, as such, a better understanding of the factors that may serve as barriers to functioning in this cohort is needed. With aging, attainment and maintenance of independence and functional ability may require additional support beyond the medical model of care. This point of view goes beyond what is ‘medically necessary’ and allows exploration into factors related to the environment in which one operates.

Weight management and obesity.

Our current RRP (LaVela 12-213) to look at weight management concerns and practices in Veterans with SCI/D across the SCI System of care identified some issues related to function. Excess weight was identified as one of the major influences on function and mobility in focus groups:

“Spinal cord patients tend to gain weight after their injuries, and it tends to make their function worse because you [have] more weight to sling around. It’s actually probably more important for them to stay on weight than it is for an average person in a lot of ways. They can lose the ability to move.” (Participant from SCI Spoke)

However, due to functional limitations, Veterans with SCI/D are limited in their options for weight loss. Traditional exercise approaches are often not possible for Veterans with SCI/D, and exercise and physical activities in which Veterans with SCI/D can engage are often not optimal for weight loss.

As a participant from an SCI center noted:

“Facilities where these people can exercise, the type of exercises they can do, and the people who... have the expertise to train them, to teach them, are limited. So whereas you or I can... go on a whole multitude of different machines and, and work with a multitude of different trainers, these people are... there are body parts that don't work. It's much, much harder to get onto a fitness program and when you are, you don't have the appropriate equipment, and just in general it's harder to burn calories if you can't pedal, move your legs.”

Furthermore, recent evidence has been provided suggesting that rehabilitation delivered through telemedicine (in addition to regular home care) may be an effective means of improving functional outcomes in an SCI cohort post-hospital discharge (Dallolio 2008). QUERI will be examining how to deliver weight management for Veterans with SCI/D.

Wheelchair function. The rate of wheelchair falls resulting in injury has increased in general (Xiang et al. 2006). Rates for persons with SCI/D are similar or higher than the general wheelchair population. We do not have good data on the extent to which wheelchair skills are assessed and retraining provided when deficits are identified. As part of their initial rehabilitation, persons are taught how to use their wheelchairs. VHA SCI/D Handbook 1176.01 emphasizes that rehabilitation is provided to achieve maximal potential and to promote outcomes that minimize or prevent impairment and reduce restrictions in activity. As part of the annual comprehensive preventive health examination, providers are expected to review fall prevention factors such as cognitive impairment (intrinsic) and wheelchair repairs needed (extrinsic). Providers are also expected to review and correct unsafe practices such as poor transfer skills.

We expect that there is variability in how these recommendations are implemented across SCI centers (where annual evaluations are usually provided) as the guidelines are not specific as to how skills and function should be evaluated and addressed. Recent data from studies of wheelchair skills and lower extremity fractures suggests that there is room for improvement. Our initial efforts will be to describe this variability.

Next, we will develop a plan to implement a wheelchair assessment for those patients who are at high risk based on the Nelson work (e.g., pain in past 2 months, prior fall), as well as for anyone who may be at greater risk as a result of a change in health status (e.g., extended hospitalization, change in equipment). We will identify champions at several SCI centers (e.g., therapists, providers) who will utilize a risk-based wheelchair skills evaluation protocol during annual evaluations.

6. Significant Influences on Current Practices and Outcomes

We noted previously that care for persons with SCI/D is different from care for other persons with medical illnesses, and furthermore that care in the VA for people with SCI/D is fundamentally different than that which occurs outside the VA. And yet systematic research to understand the unique needs of Veterans with SCI/D is often limited. This context is important towards understanding how VHA programs and policies are organized to influence current practices and outcomes, and how SCI QUERI has developed its goals and strategies. In brief, because the world of SCI/D care and research is relatively small, it is critical that effective partnerships and ongoing communication be maintained in order to facilitate best practices.

In this section we will describe the most important VHA and non-VHA programs, policies, and entities that have influence on current practices in the SCI/D System of Care, and where appropriate we will briefly note where SCI QUERI goals intersect with the goals of major programs and entities.

The Office of SCI/D Services is the national program office that sets program and policy guidance for SCI/D services provided throughout VHA. As described previously, SCI/D Services is an important stakeholder as well as a partner with SCI QUERI. Significant influence on current practice by the Office of SCI/D Services is a result of frequent and regular communication with the field, site visits, policy development, and publication of VHA Handbook 1176.1 (Spinal Cord Injury and Disorders System of Care Procedures; VHA 2011).

Measurement is a critical part of quality improvement, testing and implementing change in clinical practice. During the past 10 years, there have been remarkable improvements as a result of SCI/D specific performance measures (e.g., respiratory vaccinations, diabetes care). In addition to dissemination of the results from OQP, the Office of SCI/D Services has a longstanding practice of giving feedback to SCI Centers and spoke facilities. This feedback consists of regular reports on national, facility-level, and comparative performance. Low performers are contacted to discuss problems, barriers and facilitators of improvement. In

keeping with this practice, SCI QUERI has also provided feedback to sites on performance in areas such as staff vaccination rates.

As already noted, Veterans with SCI/D have highly specialized care needs, which translates into the challenge of delivering necessary specialty training to SCI/D providers. SCI QUERI, the Office of SCI/D Services, and EES have been involved in many targeted training efforts through the years for Veterans and SCI/D providers. These have consisted of letters, posters, formal courses, LiveMeetings, and brief communications such as e-mail messages. There are a number of listserv groups including SCI/D Chiefs, SCI/D physicians, SCI/D nurse managers, SCI/D nurses, SCI/D Management and Information Outcomes Coordinators, SCI/D psychologists, SCI/D therapists, and SCI/D dietitians. Information is also distributed through an intranet, internet, and SharePoint site. Extensive educational activities have been part of SCI QUERI projects such as the vaccination efforts targeting both Veterans and SCI/D providers. These included reminders, fact sheets, posters, and feedback regarding performance. Articles regarding respiratory vaccinations were included in the quarterly newsletter and facilitators and barriers were discussed during monthly calls. Although generally ineffective in isolation, dissemination of materials and didactic educational sessions are used in combination with other interventions. Several QUERI-developed tools are posted on the SCI/D Services website.

The use of clinical information systems and clinical reminders has been part of previous SCI QUERI interventions and is a current design feature of the new Spinal Cord Injury and Outcomes (SCIDO) application. Clinicians from all 24 SCI Centers and 135 SCI/D primary care teams have greeted the reminders in SCIDO with great enthusiasm. In using many of the instruments embedded in SCIDO, the clinician is prompted with specific instructions when there are critical changes (e.g., if there is neurologic change from the previous exam, if there is an indication that the Veteran may be depressed, or if there is a functional change).

Standing orders and other changes in the system of care have been used by SCI QUERI in past studies. Standing orders were used by many facilities to increase respiratory vaccinations. Standing orders have also been used to routinize clinical practice for a number of conditions in SCI Centers including treatment of autonomic dysreflexia and treatment of neurogenic bowel.

One important barrier to improved practice in the VHA SCI/D System of Care is the limited body of empirical research to guide clinical care. As such, organizations comprised of clinical experts, local clinician opinion leaders, and peer experts, are especially influential. Clinical practice guidelines (CPGs) have been mentioned previously in this strategic plan. There are many SCI-specific CPGs developed by the Consortium of Spinal Cord Medicine (CSCM) to

address a number of co-morbid conditions specific to SCI/D including neurogenic bowel, bladder management, prevention and treatment of PrUs, preservation of upper limb function, expected outcomes, depression, acute management of autonomic dysreflexia, and prevention of thromboembolism. SCI QUERI investigators and others have shown the importance of a targeted implementation strategy to promote change in clinical practice that follows clinical practice guidelines. CPGs representing state-of-the-art, evidence-informed expert consensus are critical given challenges to effective care stemming the unique needs of Veterans with SCI/D and limited empirical research to inform practice.

Mentoring, use of clinical champions, and local opinion leaders are used extensively throughout the SCI/D System of Care and have been used by SCI QUERI. There is a formal and informal mentoring system in many of the SCI Centers and between most of the SCI Centers and their respective spoke facilities. The VA SCI/D System of Care is relatively small and the overall organizational structure is well-defined which facilitates the use of well-respected peer and clinical leaders.

Other influences include Veteran service organizations which are strong partners of SCI QUERI and the Office of SCI/D Services. The Paralyzed Veterans of America (PVA) has supported many SCI QUERI activities, serves on our Executive Committee, assists with research and implementation projects, and trainee activities. The PVA has also given administrative and financial support for the development of the clinical practice guidelines. PVA also hosts an annual scientific meeting, and QUERI continues to have a significant presence at these meetings. Other major meetings that QUERI participates in regularly include the Academy of Spinal Cord Injury Professionals (ASCIP) and American Spinal Injury Association (ASIA).

The Model Spinal Cord Injury System program, sponsored by the National Institute on Disability and Rehabilitation Research (NIDRR), Office of Special Education and Rehabilitation Services, U.S. Department of Education, provides support to improve care, maintain a national database, participate in independent and collaborative research and provide continuing education relating to spinal cord injury. Historically, their findings served as the basis for benchmarking, rehabilitation outcomes, and SCI research. SCI QUERI has utilized their work and findings to address issues in VA, expanding and modifying information as it is relevant to the Veteran population. Reciprocal input continues between VA and NIDRR. Dr. Arthur Sherwood, former Science and Technology Advisor at NIDRR, is a member of our Executive Committee. We collaborate with colleagues at the Northwest Regional Spinal Cord Injury System in projects relating to pressure ulcers, obesity, behavior change, and motivational

interviewing. The Model SCI Systems continue to have a strong influence on SCI/D providers as a leading source of empirical evidence in the field.

Despite all the positive influences on current practice and patient outcomes, there also are barriers to improving practice. Clinical care and research studies often have to rely on tools that were not designed or validated for use in the SCI/D population.

In some cases, SCI QUERI and partners have developed tools that were needed in fundamental areas. The SCI-PUMT and SCI/D-MET are two such examples. This basic but important work has slowed our progress in past years; however, we are now able to reap benefits from these developmental efforts. As we discussed in previous sections, the SCI-PUMT is an important clinical advancement since all guideline-based care of wounds recommends that ineffective treatment be discontinued and another treatment be instituted. Full implementation of the SCI-PUMT will also be a major advancement for research studies because there will now be a reliable way to monitor healing and compare treatment interventions in SCI/D. Tools that are sensitive, reliable, and valid in the SCI/D population will be an important clinical and research advancement. Since the beginning of SCI QUERI, there has always been tension between developing such tools and basic evidence opposed to moving directly to implementation work. SCI QUERI has been more deliberative in taking advantage of partnerships and collaborations with researchers in the field as a method of moving the field forward (as we did with Dr. Nelson and colleagues in developing the SCI-PUMT implementation).

Another barrier to improving practice has been the limited number of investigators working in the area of SCI/D. We have begun to address this through formation of a pressure ulcer workgroup that includes researchers, SCI providers, and surgeons to set the agenda and plan projects to address pressure ulcer prevention and treatment. In addition, SCI QUERI has always included mentoring as part of its mission. We have focused on mentoring young investigators through formal mentoring opportunities (post-doctoral fellowships and career development awardees) and through more informal mechanisms such as serving as consultants and advisors on grant proposals. We have been successful in mentoring several investigators who have stayed in the field and are now independent investigators.

Access to care is a barrier for Veterans with SCI/D. Efforts by the Office of SCI/D Services and SCI QUERI to improve access for Veterans with SCI/D include an SCI-specific telehealth initiative and the development of an SCI/D healthy living center in My HealthVet. The telehealth initiative involved purchasing equipment for station-to-station telemonitoring in FY2008-2009 and implementation of the technology in FY2010. The Office of SCI/D Services and SCI QUERI have worked together with the My HealthVet program office to develop an

SCI/D healthy living center. The recent introduction of secure messaging should further enhance access and communication between Veterans and their providers.

7. SCI QUERI Center Goals

Pressure Ulcers

SCI QUERI is committed to reducing the number of full thickness Stage III, IV and unstageable PrUs in Veterans with SCI/D. Our intermediate goal is to develop, test and implement standardized tools for wound healing and risk assessment that will then lead to our long term goals of improved outcomes and reduced incidence of full thickness stage III, IV, and unstageable PrUs.

Major goal: Reduce the number and severity of pressure ulcers in Veterans with SCI/D.

- a. This goal relates to prevention of pressure ulcers and improved treatment to prevent recurrence of pressure ulcers.

Objectives: Our short term objectives are related to improving standardization of prevention and treatment of pressure ulcers.

1. Standardize monitoring of wound healing, using the SCI-PUMT Veterans with SCI/D and pressure ulcers within the SCI/D system of care.
2. Standardize patient assessment and prevention interventions based on CPG recommendations within the SCI system of care.

Plan for achieving goal

We have several activities directed at these objectives as follows:

1. Evaluate the SCI-PUMT implementation and identify areas for improvement.
2. Improve usability of SCI-PUMT data for clinicians and researchers.
3. Develop a pressure ulcer non-healing index based on critical time points for treatment decisions, and evaluate SCI-PUMT scores in relationship to the non-healing index
4. Develop, validate, and test a PrU risk assessment tool specific to Veterans with SCI/D.
5. Test feasibility of using a biophysical measure to detect and predict PrU in the community as a means for early intervention.
6. Develop and implement a clinical checklist to ensure clinical practice guidelines regarding PrU prevention are being followed during patient encounters.

Anticipated key impacts

Use of a standardized measure to monitor pressure ulcer healing will allow for comparative effectiveness studies of PrU interventions. It is also anticipated that by conducting standardized and routine monitoring of PrU will result in greater adherence to PrU treatment guidelines and better outcomes (e.g., improved healing rates, reduced recurrences).

Primary Partners

Our partners for our PrU goals include SCI&D Services and the Tampa HSR&D/RR&D Center of Excellence.

Implementation Science Contribution

Our work in PrUs builds upon prior, current and planned projects. Using the PARIHs framework and a mixed models approach, we will develop an SDP to test implementation of a standardized PrU prevention checklist into the annual evaluation and will evaluate strategies used for successful implementation. We will also be evaluating the implementation of the PUMT in the SCI centers as we move to examine sustainability of new practices and ability to serve as a decision aid to increase use of CPG for PrU treatment.

Cross-QUERI contribution

PrU assessment, prevention and treatment has relevance to other high risk groups, particularly in Veterans with neuromuscular and mobility problems (e.g., polytrauma, DM in the setting of polyneuropathy, geriatrics). The approaches employed in the SCI QUERI studies are likely to be useful in these other populations.

Disparities

Our work on SEM (described above) has the potential to address disparities. The current “gold-standard” for identifying early skin breakdown and stage I PrUs is visual assessment. Garber et al. found that when skin problems are first detected in persons with SCI, early reporting followed by immediate and appropriate action can, in some cases, prevent development of a more severe ulcer. Identifying early skin breakdown in people with darkly pigmented skin using visual assessment is difficult. Previous research has shown that even experienced health care professionals may experience difficulty in detecting erythema and stage I PrUs in people with darkly pigmented skin. By the time any skin breakdown can be seen in those with darkly pigmented skin, the damage may already be much greater than for those with lighter skin. We are enthusiastic about the ability of the SEM device to pick up early damage in persons with darkly pigmented skin.

Data development, implementation, evaluation

It remains difficult to obtain detailed information about PrUs that is necessary for clinical decisions, implementation studies, and/or research studies (e.g., number, etiology, severity,

size, location, history of previous ulcers/PrU surgeries, etc.) from existing VA administrative data. Our studies have shown that it is difficult to collect this information using chart review data as well because documentation is often incomplete and/or not standardized. To address the need for more standardized data on pressure ulcers, there are two VA initiatives currently underway. VHA's Nursing Outcomes Database (VANOD) and data collected by OQP include items to identify and describe PrU care but are currently limited to the inpatient population. The VANOD record is a discharge record – that is, the final record is complete at the time of discharge. VANOD data focus on processes of preventive care and the development of hospital-acquired pressure ulcers. VANOD data identified very few Stage II-IV hospital-acquired PrUs, suggesting that in the SCI/D population, most ulcers develop in the community. The Spinal Cord Injury and Disorders Outcomes (SCIDO) application also holds great promise for enabling clinicians, researchers and policy-makers to obtain more detailed information about PrUs in the SCI/D population. On the 'Medical Complications' tab in the SCIDO application, there is a pressure ulcer section that allows primary data entry for 1) pressure ulcer risk instrument used; 2) pressure ulcer risk score; 3) PUSH instrument; 4) time to achieve healing; 5) sitting time; 6) is ulcer closed at finish; and other parameters. There are also displays for pressure ulcer risk history and a history that includes date and characteristics of past pressure ulcers. There is also a "Pressure Ulcer Treatment Report" that includes pharmacy supplies, prosthetic device codes, radiology results, complete blood count, history of surgical procedures, and surgical complications. However, the timeline for the full roll-out of SCIDO is not available.

Examining questions related to PrUs has typically required that SCI QUERI supplement VA administrative databases with primary data collection. Primary data collection has been used to obtain more detailed information including the number and severity of ulcer(s), location, and other ulcer characteristics. Many of these variables and other factors that will be important for clinical decision-making will be able to be tracked in the SCIDO and/or VANOD databases when they are fully operational, however, for our immediate future, primary data collection will be required for our implementation projects. We are also committed to using additional databases to provide data on treatment of PrUs for Veterans with SCI. As examples, we are currently funded to examine the CSP 535 data for indices of non-healing in pressure ulcers, we are preparing a proposal to evaluate outcomes using the NSQIP database and we are collaborating on a project to examine data related to persons with SCI/D in the Minimum Data Set Assessment data for Veterans cared for in community long term care facilities.

At present and for the foreseeable future, we will continue to require primary data collection as has been done in all past studies. Information about healing is not yet available so

developing and implementing the SCI-PUMT is a necessary in order to document pressure ulcer severity and compare interventions to improve healing. Our plan is to incorporate the SCI-PUMT tool into CPRS using a template in the future.

Health Information Technology (HIT) development, implementation, evaluation

Not applicable.

Infection Prevention and Management

Since our last strategic plan, we have made significant progress in the areas of MRSA and influenza (H1N1 and seasonal). For both of these areas, we have met our previous intermediate goals and made advances in our long-term goals. The results of our research and implementation efforts in these two time sensitive focus areas have been expanded to a goal that focuses on infection prevention and management.

Major goal: Advance health care practice and management to prevent infection and improve outcomes.

Plan for achieving goal

We plan to achieve this goal through several center activities and projects over the next 5 years. For our work on MRSA prevention, we have already developed an educational toolkit (SCI/D MET) to be used by SCI providers to educate patients and their caregivers about MRSA prevention and hand hygiene. Through the SDP mechanism we intend to implement this toolkit at several SCI Centers where we will continue to learn about the effectiveness of the toolkit in improving patient knowledge, behavior, and activation as well as implementation barriers and facilitators at the facility and provider level (Project Label: SCI/D MET). The SCI/D MET is an enhanced educational intervention including a patient brochure, an educational flip chart to facilitate interactive discussion, and a return demonstration of handwashing between the nurse educator and patient and an aptitude test to evaluate patient comprehension. Also included in the toolkit are the SCI/D MRSA Care guidelines, patient knowledge and attitudes questionnaires, provider evaluation of the intervention, and toolkit instructions. The toolkit is currently available on the VA SCI/D Services intranet website.

From our completed study on MRSA current practice, we identified barriers in practice for use of contact precautions (CP) in SCI patients, particularly with the use of personal protective equipment (PPE) (i.e. gowns and gloves) and appropriate hand hygiene. Our project activity focused on developing and testing the effectiveness of a 'red tape or safe zone' in SCI centers will focus on addressing these barriers. The 'red tape zone' is an area demarcated by

red tape on the floor in the patient's room which identifies areas that are safe to stand in without using PPE. If the HCW goes beyond the red tape, they must use appropriate CP procedures by donning gowns and gloves in addition to using appropriate hand hygiene. The 'safe or red tape zone' is a best practice being used by several VA and non-VA facilities as part of their 'bundled' interventions by: 1) providing a visual cue to remind HCWs which patients are in CP, thereby improving compliance with gowning, gloving, and hand hygiene; 2) reducing the need for gowning and gloving when there isn't an contact (e.g., provider entering only to communicate with the patient). This could reduce provider time spent gowning and gloving, reduce costs for gowns and gloves, and potentially increase frequency and satisfaction with patient/provider communication. The VA's pilot program of the MRSA Prevention Initiative with the Pittsburgh VA used the 'red tape zone' as a visual cue part of their bundled intervention to reduce MRSA transmission and infections.

Our efforts in MRSA prevention will be directly applicable to the prevention of CDI since similar strategies are needed to control spread of these organisms. Our ongoing IIR on CDI epidemiology and management strategies will be utilized to assist the VA MDRO program office in the roll-out of the new VA CDI bundle to prevent CDI in Veterans. As this roll-out occurs, we will continue to collaborate with them in evaluating the implementation of the CDI bundle.

Further, we will be expanding on our earlier research related to antibiotic prescribing and will be submitting a grant to assess patient, provider, and system level factors associated with antibiotic prescribing for several infections (PI: Evans), and we are working with a urologist from Palo Alto, Dr. John Lavelle on characterizing urinary tract infection (UTI) diagnosis and treatment practices of providers in both SCI Centers and spoke facilities.

Influenza. We plan to address influenza infection and transmission during the upcoming influenza season. Our plans involve progression along the QUERI six step model, while adopting principles of the PARIHS framework, to achieve our goals of successfully implementing evidence-based influenza infection control practices.

Several completed projects have provided us with findings on gaps, barriers, and current practices with regard to infection control for seasonal influenza in SCI/D settings (QUERI step 3). We have conducted significant research to understand attitudes/knowledge regarding influenza, to increase influenza vaccination rates in Veterans with SCI/D and their healthcare workers, and to understand attendance practices and prescribing patterns of SCI/D providers. Our efforts allowed us to complete a project (project label: "*Staff education*") to develop and implement quality improvement strategies to address gaps in influenza infection control (QUERI steps 4A-C). This completed project allowed us to evaluate the impact of our implementation

efforts on provider/facility outcomes (QUERI step 5). Recent research efforts by Dr. LaVela and colleagues examining influenza infection prevention practices include '2009 H1N1 Pandemic and Seasonal Influenza in SCI/D: Infection Control Strategies' (RRP-10-046) and 'Assessment of Health Care Worker Influenza Vaccination and Position on Declination Programs' (2012 QUERI Supplement).

To achieve our current influenza goals toward implement strategies to increase the use of evidence-based practices, we developed an RRP under review (Use of Declination Forms to Improve Influenza Vaccination in Health Care Workers) to pilot test a declination form program intended to improve influenza vaccination uptake in HCWs providing care to Veterans with SCI/D. Collectively, our completed efforts have identified areas that will be addressed in planned activities which include tailored quality improvement strategies to resolve gaps and to build upon prior efforts to make a valuable contribution to SCI QUERI focus area work to improve influenza infection control and prevention in SCI facilities. Because successful implementation of infection control practices is facilitated through buy-in of scientific evidence, we will use the PARIHS framework to guide our assessments of perceptions of evidence among healthcare providers with regard to influenza vaccination and declination, along with the Diffusion of Innovations Model (DIM) which deals with how innovations, defined as new ideas or practices, are spread (Rogers, 2003). The DIM will be used to understand the adoption of HCW vaccination and to decipher which declination program components will require additional efforts diffusion is to occur.

This RRP will serve as the baseline for future implementation efforts. The purpose of the pilot is to understand what is needed to implement the declination form program in SCI facilities (formative evaluation of the implementation process and needs) and the barriers and facilitators to implementation(QUERI step 3). This pilot will provide our research team with preliminary data for the next step, a SDP, to roll-out the implementation efforts on a wider scale.

Anticipated key impacts

We expect several significant impacts from our activities. Our efforts will impact the SCI QUERI center's priority areas directly by improving infection control and prevention practices in SCI facilities. Achieving our study aims will provide information on ways to improve the quality of clinical practice within the VA and the health and safety of Veterans with SCI/D and their HCWs.

The SCI/D MET will be used to improve patient knowledge about MRSA prevention practices, behavior, and engagement with providers through patient activation. We anticipate that the success of the implementation of the toolkit will increase use of it in the SCI Centers and prepare us for a larger national roll-out. Through the use of the 'safe zone' we expect to

improve appropriate use of gowns and gloves and hand hygiene in SCI Centers. The development of the evidence base for the safe zone will make a stronger case for implementation at SCI Centers. The impacts of the 'safe zone' may include reduced provider time spent gowning and gloving, reduce costs for gowns and gloves, and increased frequency and satisfaction with patient/provider communication.

Our current CDI study will provide baseline data on the epidemiology of CDI in Veterans with SCI/D and also what treatment and management strategies are being used for this with CDI. Very few published studies exist on the burden of the CDI in SCI/D. This study will not only add to the evidence base on the topic, but also provide the MDRO program office with additional data on CDI rates and risk factors.

Our work on antibiotic prescribing practices and UTI diagnosis and treatment is still evolving. However, with the research we develop and conduct, we ultimately want to improve provider knowledge of appropriate diagnosis and treatment of UTIs.

Our work on influenza infection control will have an impact by identifying facilitators and barriers to implementing a declination form program in VA SCI care facilities and by providing information about what strategies are successful to facilitate a national roll-out. Successful implementation of a declination form program is expected to increase influenza vaccination rates in HCWs providing care to Veterans with SCI/D, resulting in decreased transmission of influenza between health care workers, patients, and other workers.

Primary Partners

SCI QUERI and our clinical partner, the Office of SCI/D Services have worked together closely to address the area of infection prevention and management. Our MRSA and CDI efforts have involved a strong collaboration with the Office of SCI/D Services, the VA MDRO Program Office, and the Infectious Disease Program Office. Experts from these three offices have been directly involved in recently completed MRSA projects including serving as expert panel members.

The influenza work builds on an ongoing partnership between the SCI QUERI and VHA SCI/D Services (Dr. Barry Goldstein, SCI Chief Consultant is a member of this RRP research team), in efforts to control transmission of influenza in the SCI/D System of Care. We have an ongoing relationship with the VHA Office of Public Health, specifically Rick Martinello, MD, Chief Consultant for Clinical Public Health, who will collaborate with us and provide insight on national level policy related VA HCW vaccination initiatives as applicable to our efforts. Our VHA partners will participate in program design, implementation, and evaluation efforts.

Implementation Science Contribution

We have utilized both the PARIHS framework and ORCA measures for several of the studies in infection prevention and management. Both of these tools were used to design the provider survey and interview questions from the 'MRSA Current Practice' study as well as the data collection tools for the H1N1 influenza pandemic study. We found that perception of the evidence was significantly associated with provider practice related to educating patients about MRSA and hand hygiene. Similarly for the pandemic work, the use of ORCA and PARIHS showed that health care workers were significantly more likely to adopt influenza infection control practices when they believed that clinical expert opinions in their facility were supportive of influenza infection control practices.

For our planned work, we will utilize the PARIHS framework to implement the SCI/D MET Toolkit. The influenza declination form program work will be guided by the Diffusion of Innovations Model and the PARIHS framework.

The decision to adopt and implement an infection prevention practice is influenced by practice characteristics (e.g., cost, evidence, usability), the organization (e.g., leadership, personnel, resources), and the environmental context (e.g., public reporting, pay-for-performance) (Saint et al., 2010a; Saint et al., 2010b; Damschroder et al., 2009). According to Krein et al. (2006), only by effectively implementing evidence-based infection prevention practices can we reduce healthcare-associated infection. We will use the Diffusion of Innovations Model to explore how the influenza infection control practice of formal declination is spread. Furthermore the evidence subscale of the Organizational Readiness to Change (ORCA) tool will be used to assess HCWs perceptions of evidence related to declination forms and influenza vaccination. The ORCA tool will be used to develop our provider assessment tools to understand barriers and facilitators related to the PARIHS elements of evidence, context, and facilitation (Kitson et al., 1998; Kitson et al., 2008; Rycroft-Malone et al., 2002; Rycroft-Malone et al., 2004; Helfrich et al., 2009).

Cross-QUERI contribution

Not applicable.

Disparities

The H1N1 influenza pandemic allowed facilities to test their preparedness plans in an actual pandemic situation and provided valuable lessons about responses to and communication during emergent events throughout the VA SCI/D System of Care (including 18 hub facilities and 16 spoke facilities). Our findings allowed us to identify and document differences in influenza infection control practices conducted at SCI Centers compared with SCI spoke

facilities and potential associated disparities. This will allow us to tailor additional influenza implementation efforts to reduce potential disparities by health care setting.

Data development, implementation, evaluation

Our MRSA current practice study data was utilized in combination with the infection data from the MDRO Program office to evaluate the implementation of the MRSA Prevention Initiative. Dr. Evans and Dr. Goldstein (as the SCI/D Services representative) collaborated with Dr. Martin Evans from the VA MDRO (formerly MRSA) Program office to develop a manuscript on the impact of the MRSA Prevention Initiative on MRSA transmission and infection in the SCI Centers (Evans et al., in press).

Health Information Technology (HIT) development, implementation, evaluation

Not applicable.

Function in SCI/D.

Major goal: To optimize function in persons with SCI/D.

Within this area we will focus on two areas: obesity/overweight and on wheelchair function.

Plans for achieving goal

Obesity/overweight and function. Life expectancy of persons with SCI/D has considerably improved over the past decade. Many individuals with chronic SCI/D experience problems with weight gain and have an increasingly inactive lifestyle (associated with deconditioning and secondary health conditions, e.g. upper-extremity pain, diabetes, cardiovascular disease) that may lead to reduced functioning.

Objective 1: To conduct a functional needs assessment in overweight /obese Veterans with SCI/D.

Objective 2: To do a pilot implementation of a lifestyle intervention (building off of ongoing weight management practices study and planned functional needs assessment).

Objective 3: Implementation project with the goal of preserving functioning in chronic SCI/D (via wheelchair findings and lifestyle pilot findings).

Wheelchair function. As this is a new and emerging focus for SCI QUERI, we will begin by assembling a workgroup to develop our research agenda. We will also develop an RRP to examine current practices related to wheelchair assessment and intervention. We will then

develop an SDP to implement the work conducted in Tampa on assessing wheelchair skills and providing training for deficits. Last, we will explore extending this work to the home setting.

Objective 1: Assemble a workgroup that will develop the SCI QUERI agenda around wheelchair function including safety, skills assessment, training, prevention (e.g., treatment of osteoporosis). This group will develop a plan that included planned projects, timelines, and milestones to be achieved.

Objective 2: Evaluate current practices for regular assessment of wheelchair use and skills. Through the QUERI RRP mechanism and QUERI core support, we will conduct an assessment of current practices with respect to wheelchair use assessment, safety and prevention strategies at SCI centers and large SCI spoke clinics where annual examinations are conducted. This will include interviews with key stakeholders and review of medical records.

Objective 3: Implement a risk-based wheelchair skills assessment and training program. Building on the work by our colleagues in Tampa, we will develop an implementation plan to increase use of wheelchair skills assessment and retraining for patients who are at risk of falls and/or injuries due to wheelchair-related use. This work could be extended to assessment of and retraining for transfer skills as well.

Objective 4: Extend work in wheelchair use, safety and injury/fall prevention to the home setting. The majority of Veterans with SCI/D live in the community in their own homes. Although some of these Veterans receive home health care services, most do not. We do not have good information about wheelchair use and safe patient handling/injury prevention in the home. Recent data indicates that the vast majority of PrUs occur in the community. We suspect that falls and injuries most commonly occur in the community.

Anticipated key impacts

Improving evidence-based components of a lifestyle program, including reducing weight and increasing activity, will preserve functioning in persons with chronic SCI/D. Improving/maintaining good wheelchair skills will result in optimized mobility which will lead to greater participation and better quality of life. It will also lead to fewer falls and injuries such as fractures.

Primary Partners

For the obesity work, we have an ongoing partnership with VA Operations groups, including VA National Center for Health Promotion and Disease Prevention (personal communication Leila Kahwati, August 2011) and the VA National Program for Weight Management (personal

communication with Ken Jones, Director of MOVE!, August 2011) , and continue our ongoing partnership with the Office of SCI/D Services (Goldstein).

We will work with SCI/D Services and with colleagues at the Tampa VA RR&D/HSR&D center of excellence and the Tampa Patient Safety Center to address issues around wheelchair function. We have had an ongoing relationship with colleagues in Tampa for many years. We will reach out to the RR&D COE in Pittsburgh which is focused on wheelchairs and other assistive technologies in SCI and other disabilities. As we move into the area of function around use of wheelchairs, we will work closely with these investigators to implement the evidence that they have developed related to prevention of impairment in SCI/D.

Implementation Science Contribution

We will begin our implementation work at the SCI centers and clinics and draw upon the experiences in implementation from our prior work utilizing PARIHS and CFIR models. As we extend our implementation efforts to the community, we will document our lessons learned.

Cross-QUERI contribution

Although our focus is on wheelchair use in SCI/D, there are many other cohorts of patients who use wheelchairs for mobility. Ensuring safe and appropriate use of wheelchairs to prevent injury and further impairment has relevance for these other populations as well. For example, a significant number of persons who have had a stroke use a wheelchair for mobility in the community. Our work may have relevance for the Stroke QUERI.

Disparities

Optimizing function through addressing excess weight and/or wheelchair performance will help address disparities due to mobility impairments in Veterans with SCI/D.

Data development, implementation, evaluation

Data on wheelchair function is not collected in a systematic way to our knowledge. It may be appropriate to develop a template to collect information on wheelchair use and skills that could be included in the medical record and/or through the SCI/D Outcomes database (SCIDO). Measures of function and participation are already part of the SCIDO (i.e., Functional Independence Measure (FIM), CHART and SWLS). We would be able to link our wheelchair data to patient function and outcome measures.

Health Information Technology (HIT) development, implementation, evaluation

Use of emerging health technology may be beneficial to optimize function and participation opportunities in this population of Veterans with SCI/D. We will look for opportunities to integrate our research and implementation activities with technologies such as telehealth and mobile applications.

8. Metrics (Pressure Ulcers)

				Timeline
Goal 1: Reduce the number and severity pressure ulcers in Veterans with SCI/D				FY 2011-2016
Objectives	Scope	Project	Metric Data Source	
A. Develop, test and implement standardized tools for wound healing and risk assessment.	SCI centers and spokes			
Center Activities/Project Outcomes				
1. Implement and evaluate PUMT	SCI centers	RRP Submitted	Primary data collection	FY 2013-14
2. Recruit a pressure ulcer clinical expert to co-lead the pressure ulcer focus area	National	QUERI core	Completed – Dr. Barbara Bates-Jensen has joined SCI QUERI team	2012-2016
3. Develop and test a pressure ulcer risk assessment tool (PURT)	National	Planned IIR	Secondary data mining	FY 2013-15
4. Develop and implement a checklist and interdisciplinary team process to ensure clinical practice guidelines regarding pressure ulcer prevention are being followed	Multiple SCI centers	LIP	Primary data collection	FY2012
5. PU evaluation and treatment using PUMT	Single Center	LIP	Primary data collection	FY2012
6. Develop a pressure ulcer non-healing index	National	RRP	CSP trial data	FY2013
Clinical Process Outcomes				
1. Training manual for PUMT	SCI centers	QUERI core pilot work	Primary data collection	Completed
2. Use of PUMT by SCI/D providers – ultimately incorporate PUMT into electronic data capture	6 SCI centers	Planned SDP	Primary data collection; % of providers who use PUMT	FY 2012-16
3. Application of PUMT to patients and pressure ulcers	SCI centers and spokes	Planned SDP	Number of Veterans with SCI/D and number of pressure ulcers for which PUMT is used	FY 2012-16
4. Use of pressure ulcer checklist by SCI/D providers during annual evaluations and hospital discharges	SCI centers and spokes	Planned SDP	Primary data collection	FY2013-16

5. Test feasibility of using a biophysical measure to detect early skin breakdown (as a means of early intervention)	SCI centers	RR&D	Primary data collection	FY2011-2013
Clinical Outcomes				
1. A. Increase PUMT use by 20% in the 23 VA SCI/D centers B. Have 10% of the SCI/D centers implement the PUMT at least one spoke site	23 SCI centers	Existing PUMT collaborative monthly conference calls and Planned SDP to evaluate sustainability	Primary data collection; A. % of centers using PUMT. 2010 data: 13 of 23 centers (57%); target 80%. B. % of SCI/D centers who have implemented the PUMT who are implementing use of PUMT at SCI/D spoke sites. 2010 data: 0%; target 10% of centers (n=2; 10% of the 19 centers which is the target goal (80%) for SCI centers implementing the PUMT)	FY 2012
2. 1% decrease in hospitalizations for severe pressure ulcers	SCI centers	Planned SDP	VA Administrative data	FY 2013-2016

Metrics (Infection Prevention and Management)

				Timeline
Goal 2: Advance health care practice and management to prevent infection and improve outcomes				FY 2011-2016
Objectives	Scope	Project	Metric Data Source	
Center Activities/Project Outcomes				
1. Develop a ‘safe zone’ in patient care rooms in SCI Centers	2 SCI Centers	Planned IIR	Primary data collection	FY 2014-16
2. Assess patient, provider, and system level factors associated with antibiotic prescribing	SCI Centers	Planned IIR	Primary data collection, Administrative data	FY2014-16
3. Implement MRSA toolkit and educational materials at SCI Centers	3 SCI Centers	SDP in revision	Primary data collection	FY2014-16
4. Describe the epidemiology of <i>C. difficile</i> infection and effectiveness of treatment	National	IIR 10-148	VA IDPO Emerging Pathogens Initiative Database, Administrative data, Primary data collection	FY2011-13
5. Conduct annual survey to health care worker seasonal influenza vaccination, work absence, and beliefs about declination form programs	National	QUERI 2012 Supplement	Primary data collection	FY2012
6. Implement pilot influenza declination form program	2 SCI Centers	RRP under review	Primary data collection; Occupational Health Record System (OHRS) database	FY2013-14
7. Implement large-scale influenza declination form program	SCI Centers	Planned SDP	Primary data collection; OHRS database	FY2014-16

8. Characterize diagnosis and treatment of UTIs in SCI centers and spokes	1-2 SCI Centers and spoke sites	RRP in development	Administrative and clinical data	FY2013-14
9. Field a provider current practices survey for UTI management	National sample	RRP planned	Primary data collection	FY2013-14
Clinical Process Outcomes				
1. Improve appropriate use of gowns and gloves and hand hygiene in SCI Centers	2 SCI Centers	Planned IIR 2014	Primary data collection	FY 2014-16
2. Increase knowledge about MRSA prevention practices in patients	SCI Centers	SDP under review	Primary data collection	FY 2014-16
3. Improve use of MRSA toolkit in SCI Centers	3 SCI Centers	SDP under review	Primary data collection	FY 2012-16
4. Improve uptake of influenza vaccination by health care workers working in the SCI/D System of Care	SCI Centers and spokes	SDP planned	Primary data collection; OHRS database	FY2014-16
5. Document use of declination form program in SCI/D System of Care	4 SCI centers	RRP under review	Primary data collection	FY2013-14
6. Develop strategies to educate SCI providers on diagnosis and appropriate treatment of infection prevention strategies	1 SCI center, 1 spoke	Planned RRP	Primary data collection	FY15
Clinical Outcomes (Secondary outcomes)				
1. Decrease rates of MRSA transmission in SCI/D centers (Status: MRSA transmission rates fell 15% from 1.217/1,000 patient-days in October 2007 to 1.031/1,000 patients days in March 2011)	SCI Centers	MDRO Program Office/MRSA Prevention Initiative	MDRO Program Office/MRSA Prevention Initiative	FY 2012-16
2. Decrease rates of hospital-acquired MRSA infection in SCI/D centers (Status: MRSA HAI rates declined 91% from 1.217/1,000 patient days in October 2007 to 0.108/1,000 patients days in March 2011)	SCI Centers	MDRO Program Office/MRSA Prevention Initiative	MDRO Program Office/MRSA Prevention Initiative	FY 2012-16
3. Increase provider knowledge of appropriate diagnosis and treatment of UTIs	SCI spokes	Planned RRP	Primary data collection	FY15-16

Metrics (Function)

				Timeline
Goal 3: Optimize function in Veterans with SCI/D				FY 2011-2016
Objectives	Scope	Project	Metric Data Source	
<ul style="list-style-type: none"> A. Ensure that screening is performed and counseling/treatment for obesity is offered to Veterans with SCI/D. B. Implement an evidence-based weight loss/management program for Veterans with SCI/D C. Improve wheelchair function and safety. 	SCI centers and spokes			
Center Activities/Project Outcomes				
1. Conduct a systematic assessment of current weight management treatment and prevention practices, barriers, and facilitators across the VA SCI/D System of Care.	SCI centers and spokes	RRP	Primary data collection	FY2012-13
2. Finalize data analyses to examine the relationship between commonly used anthropometric tools and cardiovascular risk in individuals with SCI/D during FY2012.	1 SCI center	F4309I	Primary data collection	Completed
3. Submit project (SDP 1 in FY2013) to implement strategies to obtain BMI (by addressing weight ^a and height ^b measurement issues) for Veterans with SCI/D in all settings (across hubs and spokes). ^a Currently almost no Veterans with SCI/D are weighed outside of SCI Centers. ^b May be modal height of all height values recorded over 5 years or historical height when necessary.	SCI centers and spokes	Planned SDP1	Primary data collection, CPRS	FY2013
4. Submit project (SDP 2 in FY2015) to implement a SCI/D-appropriate weight management program and measure its effect on overweight and obesity prevalence and cardiovascular risk.	SCI centers and spokes	Planned SDP2	Primary data collection, CPRS, OQP performance data, VSSC MOVE! data	FY2015
5. Conduct a functional needs assessment in overweight /obese Veterans with SCI/D.	SCI centers and spokes	Planned RRP	Primary data collection, SCIDO	FY2013
6. To do a pilot implementation of a lifestyle intervention (building off of ongoing weight mgmt practices study and planned functional needs assessment).	SCI centers	Planned RRP	Primary data collection, CPRS	FY2014

7. Implementation project with the goal of preserving functioning in chronic SCI/D (via wheelchair findings and lifestyle pilot findings).	SCI centers and spokes	Planned SDP	Primary data collection, CPRS, SCIDO	FY2015-16
8. Establish a workgroup to develop an agenda for wheelchair function, safety and injury prevention	National	Workgroup	n/a	FY2013-15
9. Evaluate current practices regarding wheelchair skills assessment and training.	SCI Centers and large Spokes	Planned RRP	Primary data collection	FY2013
Clinical Process Outcomes				
1. Increase the percentage of Veterans with SCI/D who are screened for obesity and offered weight management counseling if 'at risk.' (baseline will be determined)	SCI centers and spokes	Planned SDP1	OQP performance measure, CPRS	FY2013
2. Increase the number of Veterans with SCI/D who are enrolled in a weight management program, such as SCI adapted MOVE! from 0.03% to 1.5% (est. 2,850 Veterans) by the end of the 4-5 year SDP 2.	SCI centers and spokes	Planned SDP2	CPRS, VSSC MOVE! cube and study logs	FY 2015
3. Increase the # of providers in two SCI/D centers who use motivational interviewing for weight management.	2 SCI centers	RRP 09-143	SCI providers	Completed
4. Increase the % of Veterans at risk for wheelchair fall/injury who are evaluated on wheelchair skills by 10%.	SCI Centers and Spoke sites that conduct annual evaluations	Planned SDP	Primary data collection	FY2014-16
5. Provide wheelchair skills training for individuals who demonstrate limits in wheelchair function, who have a significant change in health status, and/or who receive a new wheelchair	SCI Centers and Spoke sites that conduct annual evaluations	Planned SDP	Primary data collection, SCIDO	FY2014-16
Clinical Outcomes				
1. Increase calculable BMI in Veterans with SCI/D (current proportion to target proportion, once determined)	SCI centers and spokes	Planned SDP1	OQP performance data, VSSC MOVE! data	FY2013

<p>2. Improve cardiovascular parameters among Veterans with SCI/D after six months to one year weight program participation.*Target values based on general Veteran MOVE participant 6 month aggregate change values. Source: VHA-NCP Facility-Level Patient Outcomes Evaluation Report, 09/2010.</p>	<p>SCI centers and spokes</p>	<p>Planned SDP2</p>	<p>Annual evaluation</p>	<p>FY2014</p>
<p>2a. Improve fasting glucose (of those with diabetes) after 6-12 months of weight program participation. *HbA1c: Mean change of -0.3</p>				
<p>2b. Improve blood pressure (of those with hypertension) after 6-12 months of weight program participation. *Systolic Blood Pressure: Mean change of -2.5. *Diastolic Blood Pressure: Mean change of -1.6</p>				
<p>2c. Improve fasting lipid levels (of those with high cholesterol diagnosis) after 6-12 months of weight program participation. * Total Cholesterol: Mean change of -4.1 *LDL: Mean change of -0.8.</p>				
<p>3. Improve BMI and weight change outcomes in Veterans with SCI/D who participate in an appropriate weight management program, such as SCI adapted MOVE!, over 6-12 months. *Average absolute BMI change of -0.5 and/or weight change of -3.6.</p>	<p>SCI centers and spokes</p>	<p>Planned SDP2</p>	<p>CPRS, VSSC MOVE! cube and study logs</p>	<p>FY 2014</p>
<p>4. Reduce the % of wheelchair-related falls that result in injury by 25% (current rate 14%, target 10%)</p>				

9. Management Plan

The SCI QUERI Research Coordinating Center is located at the Hines VA Hospital under the leadership of Frances M. Weaver, PhD. All QUERI investigators based at Hines also have appointments in the HSR&D Center of Excellence located at Hines which Dr. Weaver also leads. These investigators leverage funds between QUERI and HSR&D funding, when appropriate. QUERI investigators include Marylou Guihan, PhD, assistant director of SCI QUERI; Bridget Smith, PhD; Charlesnika Evans, PhD; Sherri LaVela, PhD; and Ben Gerber, MD. Support staff includes a computer programmer/analyst, a master's prepared biostatistician, three project managers, and a Center administrative coordinator (Dolores Ippolito, MPH).

Our Clinical Coordinating Center is based in Seattle. The SCI/D Services office also is located in Seattle. Barry Goldstein, M.D., Ph.D. is the Chief Consultant is SCI/D Services and also serves as the Clinical Coordinator for SCI QUERI. Dr. Goldstein is active in the Northwest Regional Model Spinal Cord Injury System. One of our investigators (Suparna Rajan, PhD), who also functions as our clinical Center coordinator, is also located at the Seattle center.

We have two additional investigators who are based at the Sepulveda VA. Dr. Barbara Bates-Jensen is an internationally known researcher in pressure ulcer research. She joined QUERI in 2011 to lead our efforts in the area of pressure ulcer prevention and treatment, serving as the SCI QUERI Associate Director for pressure ulcer research and implementation. This year we also added Dr. Henry Anaya to the team. Dr. Anaya serves as our senior implementation science coordinator, spending 50% of his time on SCI QUERI activities. Dr. Anaya is a successful implementation researcher with the HIV/Hep C QUERI who has had funding for two SDPs of his own. He also is mentoring Jennifer Hill, MA, who is our assistant IRC. Jennifer has served as project manager on several SCI QUERI projects already. Together they devote 1 FTEE to implementation for SCI QUERI.

Experts lead each of the SCI QUERI focus areas. Drs. Bates-Jensen and Guihan are leading efforts in pressure ulcer research and implementation. Charlesnika Evans, PhD and Sherri Lavela, PhD lead our work in infection prevention and management. Fran Weaver, PhD and Sherri LaVela, PhD are leading efforts in our emerging area of function in SCI/D. Dr. Bridget Smith, a health economist, oversees the cost analyses for all SCI QUERI projects.

Funding of projects is based on science development through HSR&D and RR&D merit support, QUERI RRP support for pre-implementation work, and SDP for implementation activities.

We continue to seek funding from other sources, as appropriate. In the past, we have received funding through the Christopher Reeve Paralysis Foundation, the American Paraplegia, the Seattle VA Epidemiologic Research and Information Center (ERIC) small grants program, the PVA Research Foundation, VA Center for Occupational Health and Infection (COHIC), and the Research Foundation for Prevention of Complications Associated with Healthcare.

We reconstituted our Executive Committee this year. Members of the committee are listed in the roster. Membership includes two SCI Center Chiefs (Burns, Sabharwahl), VISN leadership (Anderson), implementation expertise (Van Duesen Lukas), a Veteran with SCI/D (Cowell), representation from PVA (Cowell and Carswell), and SCI research expertise (Powell-Cope). We hold bimonthly telephone calls to review plans and progress and meet in person once a year (capitalizing on other SCI meetings in which members would already be in attendance).

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