Increasing specialty care access through use of an innovative home telehealth-based spinal cord injury disease management protocol (SCI DMP)

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Background: A spinal cord injury disease management protocol (SCI DMP) was developed to address the unique medical, physical, functional, and psychosocial needs of those living with spinal cord injuries and disorders (SCI/D). The SCI DMP was piloted to evaluate DMP clinical content and to identify issues for broader implementation across the Veterans Affairs (VA) SCI System of Care.

Methods: Thirty-three patients with SCI/D from four VA SCI centers participated in a 6-month pilot. Patients received customized SCI DMP questions through a data messaging device (DMD). Nurse home telehealth care coordinators (HTCC) monitored responses and addressed clinical alerts daily. One site administered the Duke Severity of Illness (DUSOI) Checklist and Short Form-8 (SF-8™) to evaluate the changes in comorbidity severity and health-related quality of life while on the SCI DMP.

Results: Patients remained enrolled an average of 116 days, with a mean response rate of 56%. The average distance between patient's home and their VA SCI center was 59 miles. Feedback on SCI DMP content and the DMD included requests for additional clinical topics, changes in administration frequency, and adapting the DMD for functional impairments. Improvement in clinical outcomes was seen in a subset of patients enrolled on the SCI DMP.

Conclusion: SCI HTCCs and patients reported that the program was most beneficial for newly injured patients recently discharged from acute rehabilitation that live far from specialty SCI care facilities. SCI DMP content changes and broader implementation strategies are currently being evaluated based on lessons learned from the pilot.

Keywords: Home telehealth, Spinal cord injury, Nursing

Introduction

The Veterans Health Administration (VHA) is an international leader in the use of nurse-led care coordination home telehealth (HT) programs. Disease management protocols (DMPs) used with data messaging devices

(DMDs) provide HT patients with educational, behavioral, and symptom management content. The goals for patient enrollment in VHA HT programs include increased access to specialty care and the reduction of complications that could result in poor outcomes, inpatient admissions, or unnecessary emergency room visits. Over 75 000 veterans are currently enrolled in VHA HT programs managed by nurse HT care coordinators

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(HTCCs) on a variety of DMPs. The majority of veterans enrolled in these HT programs are enrolled for diabetes mellitus, congestive heart failure, hypertension, post-traumatic stress disorder, chronic obstructive pulmonary disease, and depression DMP management.¹ The effectiveness of case management using other DMPs is well reported, including improved patient self-management skills, decrease in hospital admissions, decrease in emergency room visits, and improved patient and provider satisfaction.^{2–4} VHA telehealth initiatives have included expanding the use of HT DMPs in patient populations such as spinal cord injury (SCI), where care is specialized and access to care is challenging.

Of the 8.76 million veterans who receive care in Veterans Affairs (VA) medical centers and primary care clinics throughout the USA (2012), more than 22 000 veterans received SCI specialty care.^{5,6} VA has the largest single network of care in the nation, providing a full range of primary and specialty care to veterans with spinal cord injuries and disorders (SCI/D). VA services are delivered through a hub and spokes system of care model. There are 25 regional SCI centers that provide primary and specialty care by interdisciplinary clinical teams. Newly injured veterans and active duty service members receive rehabilitation at the SCI centers. In the 128 VA facilities that do not have an SCI center, primary care teams (i.e. spoke sites), consisting of a physician, nurse, and social worker, all of whom receive specialty training, provide care for veterans that do not require care in the SCI center. SCI spoke site providers at VA SCI spoke medical centers facilitate referrals for specialty care provided at the SCI centers.⁷

Although a comprehensive network has been established for veterans with SCI, healthcare delivery is complicated by severe mobility problems and physical disabilities. The use of an SCI DMP with DMDs allows for patients to have more frequent contact and communications with providers, especially when large geographic distances limit access to specialty care. To our knowledge, there are no DMPs available to address the unique medical, physical, functional, and psychosocial care needs of patients living with an SCI. In 2008, a group of interdisciplinary VA SCI clinical experts collaborated with the VHA Office of Telehealth Services to develop an SCI DMP. SCI DMP content items were developed to be consistent with SCI clinical practice guidelines, SCI consumer guides, the SCI self-care guide “Yes, You Can! A Guide to Self-Care for Persons with Spinal Cord Injury” book, and SCI provider expert opinions. Common with other DMPs, the goal for enrollment in the SCI DMP program is to promote the adoption and behavior change that will lead to a

healthy lifestyle and minimize health complications and caregiver stress. The SCI DMP differs from other DMPs in that it is comprehensive and addresses the unique medical symptoms that cover multiple organ systems, functional abilities, preventive practices, psychosocial and caregiver issues.

This paper is a descriptive report of a pilot quality improvement program developed to assess and improve the newly developed SCI DMP. The goals of the pilot program were to evaluate SCI DMP content, obtain nurse HTCC and patient feedback regarding care management practices, clinical flow processes, and to identify issues that need to be addressed prior to broader SCI DMP implementation across the VA SCI System of Care.

Materials and methods

SCI DMP

The SCI DMP is a recurring 168-day program with ~400 content items that assess a broad range of symptoms, educational needs, and self-management behavior recommendations for patients with SCI. The DMP content can be customized for each patient for use with the DMD (Fig. 1). In this pilot program, DMD can also be referred to as the Health Buddy™ device. Clinical content areas within the SCI DMP include wheelchair management, general medical, general psychosocial, bowel and bladder management, pressure ulcer prevention, pressure ulcer treatment, shoulder management, pain, fall risk, activities of daily living (ADLs), instrumental ADL, sexuality, caregiver assessment, safety issues, and overall compliance with preventative health practices. During the pilot, content related to diabetes management was also available as a part of the SCI DMP.

Each patient who is a candidate for HT program enrollment is referred by an SCI physician, or identified, assessed, and screened by a nurse HTCC. The nurse HTCC contacts the patient's SCI physician for concurrence to enroll the patient into the HT program. A care plan is initially developed by the nurse HTCC based on clinical needs identified during the screening process and then reviewed by the SCI physician for concurrence prior to HT program enrollment. Development of a patient-specific care plan is a part of the HT care coordination/case management process. A care plan is a part of the overall treatment plan, which includes goals, as identified by the HTCC provider, as well as input from patients regarding what they would like to achieve. It is an opportunity to identify patient needs for education and reinforcement of self-management skills. Throughout the time that a patient is enrolled in the HT program, implementation of the care plan involves monitoring patient outcomes and progress

SCI DMP Clinical Content	Sub-Content Areas	No. of Questions	Content Example(s) *
General Medical	Quality of Life, Medications, Blood Pressure	10	In the last 2 weeks, have you missed or stopped taking prescribed medicine(s)?
General Psychosocial	Activity level, Caregiver Support, Depression	8	In the past week, have you had problems communicating with your caregiver(s)?
Safety	Equipment use, Falls, Autonomic Dysreflexia symptoms, Transfers	8	In the last week, have you fallen from a toilet/commode chair?
Pressure Ulcer Prevention & Treatment	Preventive practices-Skin care, Nutrition, Equipment, Monitoring treatment	54	When your skin was checked today, were there any new red areas or skin changes? Do you or your caregiver change your position by turning side to side and on your back when you are lying in bed?
Bladder Management	Practice, Urinary Tract Infection, Fluid Intake, Catheterization	27	How often do you experience bladder accidents or leak urine?
Bowel Management	Practice, Hygiene, Accidents, Symptoms	32	In the last 2 weeks, have you had no stool results for 3-4 days in a row?
Activities & Instrumental Activities of Daily Living (ADLs and IADLs)	Feeding, Grooming, Bathing, Dressing, Toileting, Mobility, Community Living, Safety, Communication, Home/Financial/Health Management	64	Are you able to transfer in and out of the shower independently? In the last month, have you ever burned yourself when cooking or transporting hot food or liquid?
Wheelchair Management	Manual and Power Wheelchairs, Cushions, Tires, Maintenance, Safety	35	How often do you check the condition of your cushion?
Shoulder Management	Practice, Symptoms, Wheelchair use, Pain symptoms	48	Do you experience shoulder pain when propelling a manual wheelchair?
Sexuality	Knowledge, Belief, Practice, Fertility	75	Are you comfortable talking to your partner and/or healthcare provider about SCI and sexuality?
Pain Management	Types of pain, symptoms, medication, activities, sleep	14	How often does pain interfere with your ability to sleep? Of the listed non-medical treatments, which has the greatest impact on decreasing pain in persons with SCI/D?
VA Clinical Reminders & Performance Measures	Annual physical exams, immunizations, tobacco usage	6	Have you had an annual physical evaluation within the last year? A flu shot is needed every year because (list of response choices).
Diabetes	Controlling blood sugar, foot and eye examinations, comorbidities.	13	What does the HbA1c test measure? Is your blood sugar under control (normal range of 70 to 120 mg/dl before meals and under 140 mg/dl at 2 hours after eating)?

*Clinical content categories, questions and statements condensed

Figure 1 SCI DMP clinical program variables that can be customized for the patient.

towards established treatment goals. The patient is periodically assessed and adjustments to the care plan are made as needed. Depending on local HT program policy, the HT treatment/goal re-assessment period can range from every 90–180 days of HT program enrollment. During HT DMP enrollment, other interdisciplinary team members may also be consulted to assist patients in meeting care plan goals or to address newly acquired clinical concerns. In addition to developing a clinically appropriate patient-centric nursing care plan, the nurse HTCC provides training for the patient on DMD technology use as well as VHA HT DMP response expectations.

When considering DMD use, a patient's home setting needs to support remote HT care. The HTCC ensures

that the patient/caregiver consents to DMD technology use in the home and is able to demonstrate competence in setting up, troubleshooting, using, and maintaining the equipment. Safe installation of equipment and access to connectivity is addressed. Connectivity to receive SCI DMP content and transmit responses to and from the DMD can be made through landline, internet, or satellite connectivity. The DMD device assumes that the patient has the manual dexterity to push a button to indicate that a response choice has been selected. Adaptive DMDs can be designed and provided to patients with upper limb and hand impairments, but it is not a standard option on the DMD. When functional adaptations are made for the patient to be able to use the DMD independently, training is provided.

Assuming that all SCI DMP clinical content categories are selected, patients enrolled on the HT SCI DMP pilot program would have responded on an average to eight questions, with a range from 5 to 14 questions, per daily session. The remaining approximate 300 questions were asked over 3 or 6 months. The time that it took for patients to complete a daily SCI DMP session during the pilot program period ranged from 5 to 15 minutes.

Patients who enroll in VHA HT programs are expected to respond to DMP content daily. This is a VHA requirement intended to support the nurse HTCC case management process, which includes education provided to optimize patient self-management skills. For patient non-responders or partial responders, nurse HTCCs are expected to develop a plan to address and resolve issues related to the non-compliance in responding to daily DMP content. Patients who do not respond at least 70% of the time over a 3-month period are expected to be dis-enrolled from the HT program. VHA guidance for HTCCs explains daily expectations for patients to submit responses to all DMP questions and enter vital sign data. The recommendation is based on the premise that inadequate or incomplete data leads to limited abilities for the HTCC to provide appropriate intervention and may also reinforce lack of adherence in patient behavioral practices as it relates to their overall health.⁸

Daily DMP content contains questions pertaining to patient knowledge, behavior, and symptoms related to their SCI/D. Patient responses are recorded and transmitted to secure databases that VA nurse HTCCs can review daily to monitor and care for their patients. Patient DMP responses are viewed on a web-based portal with pre-assigned color-coded risk level ratings of low, medium, and high, which correspond to the degree of clinical intervention needed (Fig. 2). Further reproductions are strictly prohibited. For example, one skin-related DMP question is “When was the last time you or a caregiver inspected your skin?” The four response choices and the levels of risk are “today” (no risk), “last night” (low risk/green), “yesterday” (medium risk/yellow), and “over 3 days” (high risk/red).

When a patient’s response raises concerns, the nurse HTCC makes decisions regarding intervention, which may include consultation with interdisciplinary clinical team members and/or follow-up patient education as appropriate. DMPs promote patient self-management, support individuals with chronic conditions, and keep them in daily contact with their HTCCs. Patients using DMPs receive support for their self-care behaviors (e.g. medication compliance, diet, and exercise), education,

and intervention recommendations that are tailored to their unique conditions and individualized HT care plan.

Program evaluation

Evaluation of the SCI DMP involved administering a semi-structured qualitative survey to the nurse HTCCs at the end of the pilot period. Nurse HTCCs were also asked to report their experiences and make recommendations that would improve the clinical management process. Report of the patient’s perspective is based on voluntary patient report to their HTCC, including their opinions on the SCI DMP clinical categories and content. All four nurse HTCCs completed and returned the program evaluation survey form. Qualitative descriptive feedback was recorded and reviewed independently by two evaluators who collaborated to identify recurring and emerging themes of relevance.

At one SCI center, the standard practice is to incorporate clinical outcome measures as a part of the local program evaluation process. Although a clinical outcome measurement was neither required nor a component of the SCI DMP pilot evaluation, this SCI center chose to utilize two standardized clinical instruments, the Duke Severity of Illness Checklist (DUSOI) and the Short Form-8 (SF-8™) Health Survey to evaluate the clinical outcomes of patients enrolled in the SCI DMP pilot. The DUSOI was used to evaluate the severity of comorbid conditions during SCI DMP enrollment. The DUSOI is a tool used to measure the overall severity of illness, but can also be used as a comorbidity measure. The four parameters that are used to rate severity with the DUSOI tool are symptoms, complications, prognosis without treatment, and treatment potential.⁹ In this pilot, the nurse HTCC identified at baseline, the patient’s three most severe conditions based on clinical judgment to be rated for severity of illness scores, which were then summarized across the four severity domains. An overall comorbidity score was obtained, as well as a severity score for each diagnosis. Overall DUSOI scores and DUSOI condition-specific scores were calculated at the beginning of SCI DMP enrollment (baseline) and 6 months after enrollment.

The SF-8™ Health Survey was used to measure changes in patients’ health-related quality of life (HRQoL). The SF-8™ summarizes the SF-36™ into eight items representing eight domains of HRQoL: (1) physical functioning, (2) role physical, (3) role emotional, (4) bodily pain, (5) vitality, (6) mental health, (7) social functioning, and (8) general health. These items are summarized into a physical component and a mental component summary score.¹⁰ The SF-8

Responses on Thursday, March 14, 2013[Add a new worklist](#)

				Summary Risks	Vital Signs	Uncertain
Patient	Response Time	Home Phone	Symptoms	Behavior	Knowledge	General Readings
07:23 PM EDT			None	High	Low
	04:26 PM EDT		Medium		None	Low
	09:06 PM EDT		None	None	None	Low
	01:09 PM EDT		None			Low
	07:32 AM EDT		None	None		Low
	11:45 AM EDT		None	None	None	Low

[Back to top](#)

Results Date: 01/22/2013 (mm/dd/yyyy) Results:

Legend					
Result of Session 118 of Spinal Cord Injury 168 day SG from VHA - Spinal Cord Injury 093011					
Response date: Tuesday, Jan 22, 2013 08:00 AM EST					
Risk	Question	Response	Category	Aspect	Report Code
low	Welcome back, BERNARD! Thank you for using the Health Buddy. Begin whenever you are ready.	Okay	General	None	
high	Do you have ever have symptoms of heavy sweating, jitters or pounding headache during your bowel care session?	Yes	Symptoms	None	
	You must discuss this serious problem promptly with your care coordinator.	continue	Symptoms	None	

Figure 2 HTCC daily work list view of patient clinical alerts. (Reproduced with permission from the copyright owner; © 2013 by Robert Bosch Healthcare Systems, Inc.)

summary scores were also completed at SCI DMP enrollment and repeated at 6 months post-enrollment.

Results and outcomes

Patient characteristics

A total of 33 male patients from four SCI centers participated in the SCI DMP pilot. For 85% of patients, their SCI specialty care provider was also their designated primary care provider. Of the 33 patients enrolled in the SCI DMP, 40% were referred by an outpatient SCI provider, 33% were referred by their own SCI provider, 15% were referred by an inpatient SCI provider, and 12% were already enrolled in another HT program. The average age was 57 years with a

range from 36 to 84 years of age. The average time since SCI diagnosis was 17 years, with a range from less than 1 year to 51 years.

Patients responded an average of 56% of the total number of days that they were enrolled in the program with the total response rate ranging from 10 to 93%. All patients in the pilot either lived in their own home or apartment. On average, patients lived 59 miles from their closest VAMC SCI center, with distances from the closest SCI center ranging from 3 to 378 miles.

Qualitative evaluation (nurse HTCC feedback)

All four nurse HTCCs completed the program evaluation survey. Overall they felt that SCI DMP content

was most helpful for new injuries, but could also be a refresher for those with older injuries, especially patients with recurring clinical management needs common to those living with an SCI (e.g. frequent re-admissions related to skin breakdown), as well as patients who experience a recent change in their medical, functional, and/or psychosocial status or physical home setting. Nurses expressed the preference for the SCI DMP to be combined with other comorbid DMPs such as diabetes, HTN, or depression so that they can manage the patient's multiple comorbidities. Although there was some diabetes content included in the SCI DMP, the nurse HTCCs reported that it was insufficient for daily care management of patients with diabetes. Additional nurse feedback included requests to add respiratory content, to lower the frequency of repetitive content items, such as urinary-related and autonomic dysreflexia symptoms, and to decrease the length of educational content that is provided to the patient.

Nurse HTCCs' clinical background in SCI/D care management and collateral duties were reported as issues that could impact broader SCI DMP implementation. They recommended the need for nurses with positions solely dedicated to HT patient case management. All four nurses reported that HTCC with SCI specialty training was preferred for care management of patients enrolled on the SCI DMP. Reasons provided include the ability to manage complex SCI-specific clinical issues, being more likely to recognize patients at risk for SCI-specific conditions (e.g. autonomic dysreflexia) earlier on, and having the knowledge to intervene early on when the problem can be resolved more easily. SCI-related training would also facilitate better care coordination among interdisciplinary providers across the VA SCI System of Care to resolve patient-generated clinical alerts. Collaboration with the interdisciplinary SCI clinical team can include physicians, physician assistants, nurse practitioners, nurses therapists,

social workers, psychologists, and dieticians, all of whom provide unique expertise to help the patient achieve self-care management goals. The nurses reported that communications between the SCI center interdisciplinary team and local physicians can be challenging for patients who live in remote areas and receive their care outside of the specialty SCI centers.

Qualitative evaluation (patient feedback)

Patients suggested ways to improve the SCI DMP, including additional content development on QoL issues, physical activity, dietary management, and aging with SCI. Positive feedback from patients included reports of satisfaction with timely nurse communications. Specifically, nurse HTCCs contacted patients to follow-up on clinical alerts and in the process, the problems were identified and resolved promptly. The SCI DMP content was described as educational with suggestions to increase the frequency of patient self-management practice content.

With respect to VA HT program enrollment expectations for daily response to DMP content, patients reported "it was easy to miss a day". Reasons for not responding to DMP content on a daily basis range from not having assistance with using the DMD device to the questions being asked too often and educational follow-up information being too long and repetitive. Patients reported that the device was relatively easy to use, but those who needed caregiver assistance to use the DMD to respond to DMP content items wanted options to respond privately and communicate confidentially with the nurse HTCC.

Patient outcomes

For the subset of nine patients who participated in the SCI DMP pilot program at one SCI center, the overall DUSOI score for patients at this SCI center decreased by nearly 20% from initial enrollment on SCI DMP to the 6-month follow-up, indicating a decrease in the severity of comorbid conditions under nurse HTCC management (Fig. 3). A decrease in the severity of urinary tract infections, neurogenic bladder, diabetes, HTN, and SCI-related pain was noted, with the greatest reductions seen in bladder-related conditions and pain. Of all the comorbid conditions, chronic pain had the highest prevalence (72%) and demonstrated a decrease in severity by 30% over the course of HT enrollment. The severity of neurogenic bowel increased over the pilot period (Fig. 4).

Improvements were also seen for both the patient perceived physical and mental HRQoL after 6 months of SCI DMP management (Fig. 5). The physical health summary scores increased more than the mental health

Figure 3 Overall DUSOI scores.

Figure 4 DUSOI score by SCI-related comorbidity.

summary scores, consistent with the trend observed with the DUSOI findings.

Discussion

VA HT programs are staffed with dedicated care coordinators, most of whom are nurses or social workers. In response to a growing need to care for and manage specific patient populations, specialties HTCCs are becoming more common. In the case of a management role, the HTCC identifies a physician, who is typically

the patient's designated primary care provider, to consult and co-manage the clinical issues that arise during patient enrollment on a specific DMP. Some patients may have SCI specialty providers who also serve as their primary care providers, while others may have multiple providers to meet their SCI and primary care needs.

The geographic distance between where a patient with SCI resides in relation to the nearest SCI center varies widely. For many patients with SCI, access to specialty

Figure 5 SF-8 summary scores.

care is challenging and limits a patient's ability to obtain specialty care services. HT SCI DMP enrollment may be one pathway towards overcoming barriers to specialty care access. Although feedback from both nurse HTCC and patients suggest that the SCI DMP can be used and improved for the larger SCI patient population, it was also consistently reported to be most useful for HT enrollment of new injuries. Perhaps, it is this latter group that the SCI DMP content should be further developed, given that daily response expectations of HT DMP enrollment coincides with the likelihood for greatest benefit to the patient when intense daily communication and education is provided soon after a new injury.

The clinical outcomes reported by one SCI center showed that the actual and perceived health improved in the subset of patients enrolled on the SCI DMP, and the severity of comorbid conditions decreased overall, including conditions that were addressed within the SCI DMP content. These preliminary outcomes may infer that the SCI DMP has a positive impact on the health outcomes of patients with SCI. However, these improvements must be interpreted cautiously, and the overall generalization to the SCI population cannot be done without further investigation. Although these health outcomes were measured in 27% of the total pilot group, the absolute number in this population was small ($n = 9$). Due to the lack of scientific rigor and standardization, there may have been unidentified biases or confounding factors, especially since outcomes were limited to one site. There is also a lack of normative and population-specific data available to benchmark for comparison. At a minimum, the positive trends seen in this subsample should stimulate a discussion on the potential long-term impact the SCI DMP may have on this population. Moreover, the findings highlight the need for an ongoing discussion and the identification of relevant telehealth-related outcomes for patients with SCI.

A key element of the SCI HT program is for nurse HTCC to collaborate with interdisciplinary team providers to develop and maintain a plan, which includes frequent communications with patients to promote health maintenance practices that could minimize medical complications. The nurse HTCC serves as the patient's advocate, providing guidance and assistance to navigate across the VA healthcare system to receive the specialty care that they need. In this pilot, the nurse HTCCs reported that having an understanding of the VA SCI System of Care enabled them to serve as a liaison between multiple providers to optimize care for their patients with SCI/D. Without an understanding of the

VA SCI hub and spokes system infrastructure, there is the potential for missed care management opportunities and delayed delivery of specialty care services.

Reasons for the great variation in SCI DMP response rates is likely multifaceted. Current knowledge is limited regarding the determinants of HT compliance. Wade, Cartwright, and Shaw (2012) found that telehealth acceptance was positively correlated with user compliance. Although unknown, it is possible that there was variation in the degree of telehealth acceptance among patients who enrolled in this SCI DMP pilot program. Some patients with SCI/D have hand impairments leading to limitations of hand function and finger dexterity. This may have contributed to a negative pre-conceived view regarding ease of equipment use and subsequent lower DMP response rates. Other reasons for lower response rates may be related to patient-reported lengthy and frequently administered SCI DMP content items. The need for caregiver assistance to respond to questions on the DMD may impact confidentiality and the comfort to provide an honest response, or lead to non-responses with caregiver-related questions. An argument can be made that any level of response and communication with the nurse HTCC could benefit the patient; however, VA program expectations for daily response without regard to individual factors can place patients at risk for HT program dis-enrollment, in which case, the patient would lose the positive benefits of frequent education and intervention. From a VHA systems implementation perspective, perhaps alternative HT care coordination/case management models and expectations for DMP rates of response need to be explored for patients with SCI/D enrolled in the HT programs using DMPs.

Patients enrolled on the SCI DMP pilot were limited to a DMD device that allowed for the selection of specific clinical SCI DMP content, but did not have options for integration of SCI DMP content with comprehensive DMP content that address other chronic conditions. In other words, the SCI DMP is currently unavailable as a comorbid DMP. During this pilot evaluation of the SCI DMP, there was limited content related to diabetes management. The content that was available was determined to be insufficient for comprehensive daily diabetes management and subsequently removed from the SCI DMP program post-pilot. Other DMD options that would allow SCI nurse HTCCs to better manage patients with comorbidities include the option to use peripheral devices to collect vital and other measurement readings (e.g. blood pressure, blood glucose), as well as the option to integrate DMD use with video technologies. Depending

on the VA vendor contracts for DMD technologies, the options for DMP content development, connectivity, and peripheral device integration vary. In practice, the degree of flexibility that care coordinators should have to adapt to the clinical content to meet patients' needs depends on the capabilities of a vendor's DMD device, a vendor's information technology, and the DMP programming platform, as well as the complexity of the DMP. If available, patients with SCI who also have complex, comorbid conditions may benefit from home video visits, and/or daily vital sign readings that could occur in tandem with SCI DMP DMD enrollment.

Further SCI DMP content development, integration of multiple telehealth technologies, and more options to communicate and document care coordination plans between providers across SCI hub and spoke VA medical centers would benefit the SCI patient population enrolled in HT programs. To reach more patients, new clinical practice models and information technology infrastructures need to be explored to coordinate care between specialty and primary care providers.

Conclusions

The SCI DMP is potentially an excellent self-management, early education, and home-based intervention tool for newly injured SCI patients. A recognized benefit of DMP enrollment is the increased access to specialty care. Continuing to make changes by tailoring SCI DMP content to better support patient self-management needs, as well as further exploration to understand factors associated with HT DMP compliance, would allow for more frequent contact with the SCI healthcare team. Information received via the DMDs can be used to provide targeted interventions at the first indication of symptoms or gaps in behavior or knowledge that if not addressed, could lead to the worsening of symptoms or poor outcomes. This frequent, recurring promotion of behavioral change and need to maintain healthy lifestyle practices, as well as consistent contact with a dedicated nurse HTCC is a very strong intervention that can have positive benefits on health practices that are not directly addressed in DMP content.

Introducing the SCI DMP in VHA provides a means to monitor the unique medical, physical, functional, and psychosocial issues that veterans and their caregivers face in the home setting. With an established SCI network in VHA, there are many opportunities to learn more about how the SCI DMP can be most useful clinically and determine the best communication methods to provide care coordination to veterans living in remote areas. This pilot has provided valuable

information that is currently being used to modify the existing SCI DMP and guide broader implementation in the VA SCI System of Care. SCI nurse HTCCs managing patients on the current SCI DMP need to take into consideration that although comorbid DMP content is not yet available, extra clinical attention needs to be taken to provide comprehensive patient care management. Furthermore, given the complexity and comprehensive nature of the SCI DMP, more experience with clinical management is needed before standardized protocols can be developed for clinical management across the larger VA SCI hub and spokes specialty system of care network.

Ongoing SCI DMP content evaluation and clinical outcomes reporting is anticipated as a means to keep the content clinically relevant as the clinical practice recommendations evolve. Efforts are also underway to develop SCI DMP implementation guidance throughout the VA SCI System of Care to ensure patient safety, optimal care coordination, and communication between SCI specialty and primary care providers.

Acknowledgments

This material is the result of work supported with resources and the use of facilities at the Louis Stokes (Cleveland) VA Medical Center, James A. Haley (Tampa) VA Medical Center, Clement J. Zablocki (Milwaukee) VA Medical Center, and VA New Jersey (East Orange) Healthcare System.

Disclaimer

The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the United States government.

References

- 1 CCHT Vendor Data Cube. VHA Support Service Center Proclarity Database [Intranet]. [Cited 2013 Mar 18]. Available from: <http://vaww.vssc.med.va.gov>.
- 2 LaFramboise LM, Todero CM, Zimmerman L, Agrawal S. Comparison of health buddy™ with traditional approaches to heart failure management. *Fam Community Health* 2003;26(4): 275–88.
- 3 Jia H, Chuang H, Wu SS, Wang X, Chumbler NR. Long-term effect of home telehealth services on preventable hospitalization use. *J Rehabil Res Dev* 2009;46(5):557–66.
- 4 Darkins A, Ryan P, Kobb R, Foster L, Edmonson E, Wakefield B, *et al.* Care coordination/home telehealth: the systematic implementation of health informatics, home telehealth and disease management to support the care of veteran patients with chronic conditions. *Telemed J E Health* 2008;14(10):1118–26.
- 5 National Center for Veterans Analysis and Statistics [Internet]. Department of Veterans Affairs. [Cited 2013 Mar 26.] Available from: <http://www.va.gov/vetdata>
- 6 Medical SAS Datasets-SCI specialty inpatient and/or outpatient care [Intranet]. Department of Veterans Affairs: Austin Information Technology Center (AITC). [Cited 2013 Feb 1.]

- 7 VHA Handbook 1176.01-SCI&D System of Care [Intranet]. Department of Veterans Affairs; c2011 February 8. [Cited 2013 Mar 26]. Available from: <http://vaww.sci.va.gov>
- 8 VHA Office of Telehealth Services. Guidance Document: Guidance to Maximize the Care Delivery and Cost-Effectiveness of VHA Home Telehealth (HT) Programs through Active Encouragement of Veteran Patient Participation using HT Technology. Revised 2011 Dec 19.
- 9 Parkerson GR, Broadhead WE, Tse CK. The duke severity of illness checklist (DUSOI) for measurement of severity and comorbidity. *J Clin Epidemiol* 1993;46(4):379–93.
- 10 McHorney CA, Ware JE, Jr, Raczek AE. The MOS 36-item short-form health survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. *Med Care* 1993;31(3):247–63.