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Development and perceived utility and impact of a skin care Internet intervention



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ABSTRACT

Pressure ulcers (PrUs) in people with spinal cord injury (SCI) are a common, mostly preventable, skin complication with serious health consequences. This paper presents the development, theoretical bases, and perceived usefulness and effectiveness data for iSHIFTup.org, a skin care Internet intervention to prevent pressure ulcers in adults with SCI. Participants ($n = 7$) were, on average, 36 years old ($SD = 10.09$), tetraplegic (71%), paraplegic (29%), and caucasian (86%), with an average time since injury of 10.43 years ($SD = 9.64$ years). During the six weeks of program access, participants' usage of the program was tracked and analyzed. Participants subsequently completed measures focused on usability, likeability, and usefulness (the Internet Evaluation and Utility Questionnaire; IEUQ), and on their perceptions of the impact of the program on targeted behaviors (using the Internet Impact and Effectiveness Questionnaire; IIEQ). Participants generally reported positive experiences using iSHIFTup, indicating it to be useful, effective, easy to use, and understandable. All participants reported that iSHIFTup helped them to manage their skin care, improved their skin care routine, and supported healthy skin care activities. A majority of users indicated that they were able to implement program recommendations, and all users believed the Internet was a good method for delivering pressure ulcer prevention programs. This is the first paper to focus on a skin care Internet intervention for adults with SCI.

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1. Introduction

Traumatic spinal cord injury (SCI) produces immediate functional changes that usually result in mild to severe paralysis and loss of sensation below the level of injury (Krause et al., 2008). Pressure ulcers (PrUs) are a common secondary complication following traumatic SCI (Garber et al., 2002), and every individual with SCI is at life-long risk for developing PrUs post injury (Krause and Broderick, 2004). The National Pressure Ulcer Advisory Panel (NPUAP) defines a pressure ulcer as an area of unrelieved pressure over a defined area, usually over a bony prominence, resulting in ischemia, cell death, and tissue necrosis. Twenty to thirty percent of individuals with SCI will have at least one PrU within the first five years after injury (Chen et al., 2005; Krause and Broderick, 2004; Krause et al., 2008), and more than 50% of adults

with SCI incur at least one severe PrU (stage 3 or stage 4) in their lifetime (Fuhrer et al., 1993; Garber et al., 2000; Jackson et al., 2010).

PrUs negatively impact both quality of life for individuals with SCI, and their ability to live independently and to contribute to society (Krause and Broderick, 2004). Adults with SCI who develop PrUs have higher rates of medical complications and mortality than those without PrUs (Krause et al., 2008). Having a PrU also puts one at higher risk for future PrUs (Garber et al., 2000). PrUs and their associated complications may prolong length of stay in health care facilities and negatively impact rehabilitation progress (Zanca et al., 2005). When PrUs develop, they may require months or years to heal (Consortium for Spinal Cord Medicine, 2000), and are expensive to treat, with estimated annual costs amounting to \$1.4 billion in the United States attributed to PrU treatment after SCI (Gelis et al., 2009).

Structured, face-to-face prevention education programs delivered to adults with SCI by health care providers have been shown to be effective in increasing knowledge of PrUs and how to prevent them as well as in reducing PrU occurrence or recurrence (Consortium for Spinal Cord

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Medicine, 2002; Garber et al., 2002; Krouskop et al., 1983; Rintala et al., 2008). While preventing PrUs through routine health maintenance is widely encouraged, many people with SCI lack access to PrU prevention and management strategies and practices (Regan et al., 2009).

Using the Internet to deliver a PrU prevention intervention may help overcome some of the barriers associated with traditional face-to-face PrU prevention programs, including making it more readily available. The Internet has been found to be an accessible method for delivering information to adults with SCI (Goodman et al., 2008). As reported in one trial by Goodman et al. (2008) 69% of participants with SCI use a computer and 94% of these individuals access the Internet. The majority of these Internet users (68%) went online 5 to 7 days a week.

Given the high rate of utilization of the Internet by individuals with SCI, the Internet appears to hold considerable potential as a means for delivering Internet-based prevention and intervention programs. Internet interventions are structured, self-guided programs delivered over the Internet using proven behavioral strategies to promote behavior change (Ritterband et al., 2003). Internet interventions have been found to be efficacious in changing behaviors for a variety of behaviorally-based problems (Barak et al., 2009; Ritterband et al., 2009; Wantland et al., 2004). This paper describes the development of iSHIFUp (Internet Skin Health Intervention for Targeted Ulcer Prevention), a skin care Internet intervention for adults with SCI to promote preventive skin care behaviors and prevent pressure ulcers. Findings related to participants' perceived impact and utility of the intervention are summarized.

2. iSHIFUp

iSHIFUp was developed at the University of Virginia Behavioral Health and Technology Laboratory in collaboration with Woodrow Wilson Rehabilitation Center with funding from the Virginia Commonwealth Neurotrauma Initiative (2009–2012).

2.1 . Development process

iSHIFUp development followed a process shown to be valuable in the creation of other Internet interventions (Hilgart et al., 2012; Ritterband et al., 2009). Content development utilized a comprehensive set of theory-driven instructional strategies recommended for health education (Kinzie et al., 2002). A condensed version of Gagne's events of instruction (Gagne et al., 1985) was used as a starting point, or framework, on which the health belief model, social cognitive theory, and diffusion theory were drawn as key health behavior change theories to inform instructional strategy development (Bandura, 1986; Hilgart et al., 2012; Kinzie et al., 2002; Rosenstock et al., 1994). The Model of Internet Interventions was used as a guide for ensuring appropriate components were included, resulting in a testable program (Ritterband et al., 2009).

An advisory panel of eight community member adults with SCI, three caregivers, an occupational and physical therapist who work with adults with SCI, a rehabilitation physician, a wound specialist nurse, a clinical health psychologist, and an instructional designer was established to provide input and feedback on the development of iSHIFUp. This group met three times in the first year of the project to review findings from previously published sources on PrU prevention education (including the *Consortium for Spinal Cord Medicine*, 2000, 2002; Cuddigan et al., 2009; Schubart et al., 2008). This process was implemented to identify gaps in existing recommendations and to reach consensus on a set of goals for iSHIFUp that aligned with published PrU prevention literature. During advisory panel meetings, the research team presented materials in a semi-structured format and elicited feedback to guide content and design. All feedback and ideas were recorded, transcribed, and later distributed to panel members via email. From the complete list, items were rank ordered by panel members with top-ranking items then used to inform further design. Using this method, program goals were evaluated and confirmed with the advisory panel.

The result was identification of a set of ten connected PrU prevention behaviors. These behaviors aligned with previously published guidelines for PrU prevention (see Fig. 1).

Advisory panel members also contributed to crafting iSHIFUp content objectives. Objectives refer to what users are expected to know, do, think and feel as a result of using iSHIFUp. The panel identified a set of objectives that apply to all adults with SCI. These are the "Core" objectives of iSHIFUp. Additionally, a number of objectives were identified related to skin care and pressure ulcer prevention that apply to a subset of adults with SCI. These adjunct objectives are the "Module" objectives of iSHIFUp. Initially, design and learning activities were evaluated by members using paper prototypes via email. Six cycles of paper-based review of Core and Module learning activities were completed between 2010 and 2012. The final program specifications resulted in three Core units, and sixteen adjunct Modules focused on specific issues surrounding skin care that are recommended on a tailored basis (see Fig. 2).

Formative evaluation (ongoing review and revision of the program materials and activities) was conducted throughout the development period in which identified items were prioritized, and those most easily implemented were made prior to the study. These included updating elements of navigation design; adding additional graphics and instructions to the program tutorial; changing link colors; and updating audio files. Items not feasibly implemented prior to study launch remain part of an optimization plan to be implemented in future program revisions. For example, a revision that remains on the optimization plan is adding a feature to the Cores and Modules allowing users to make notes that can be printed or accessed later.

2.2 . iSHIFUp program

iSHIFUp incorporates a media rich format of text, audio, graphics, animation, and video, providing an interactive and engaging experience for users. When users log in to iSHIFUp, they begin on the Home screen. Information on the Home screen changes based on the user's status, providing instruction on what to do and where to navigate within the program. The bulk of the program content is embedded in three Cores, sixteen Modules, and three Follow-Ups, which are to be completed over a four week period (see Fig. 3). Users also complete daily diaries in order to prospectively track skin care behaviors.

2.2.1 . Cores, modules, and follow-ups

When users first begin iSHIFUp, they are instructed to complete the program Cores. Core units are completed sequentially, during the first week of use, with each Core estimated to take a typical user about an hour. The three iSHIFUp Cores include: Core 1, which makes a rationale

1.	Pressure reliefs while sitting (3x/hr 3 min ea).
2.	Turn/reposition while lying down.
3.	Check skin morning and evening.
4.	Remove all pressure when problem is found.
5.	Limit sitting time to own tolerance to pressure.
6.	Sit and lie on pressure reducing surfaces.
7.	Keep skin clean and dry.
8.	Manage nutrition (adequate protein and hydration).
9.	Test and check clothes and shoes for good fit.
10.	Track changes that impact skin.

Fig. 1. Ten behaviors to prevent pressure ulcers.

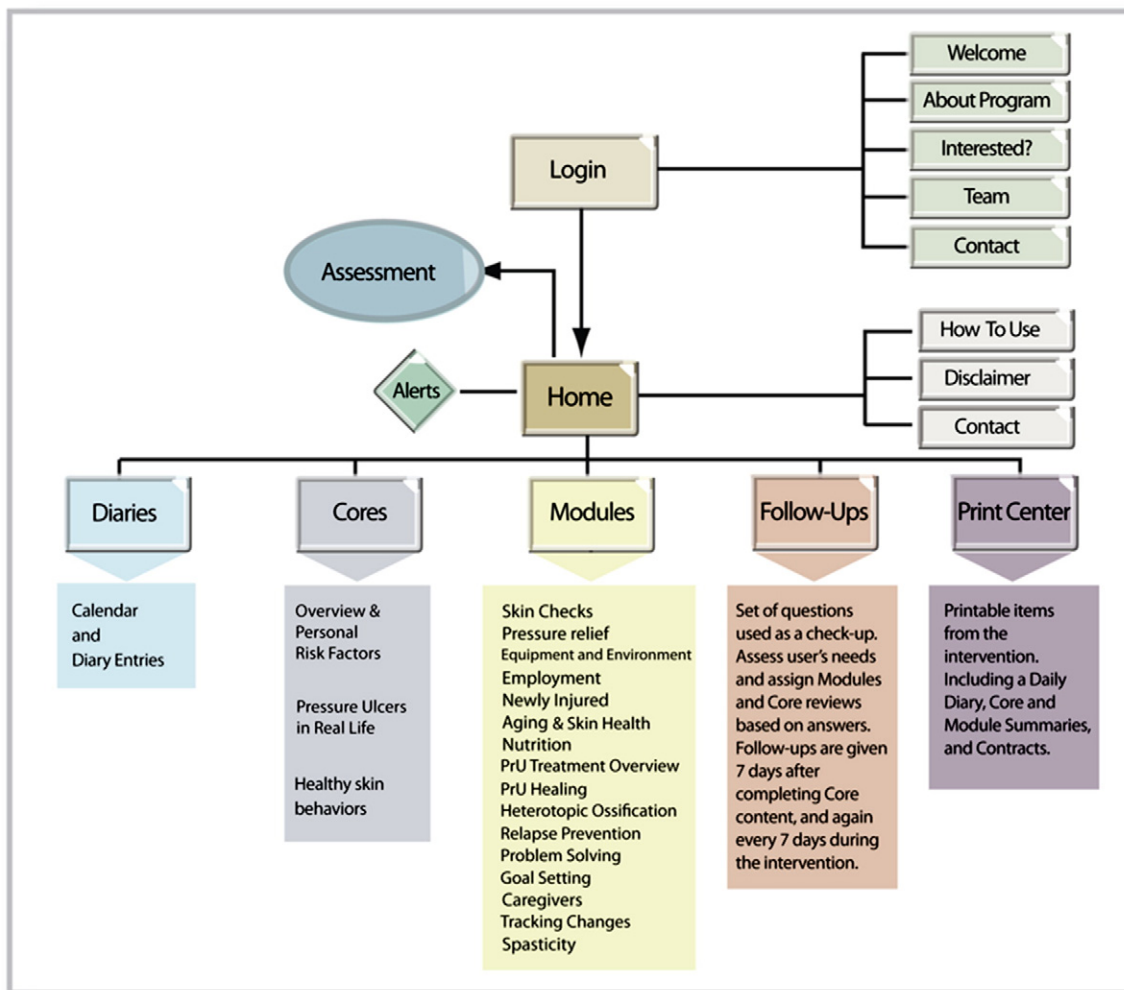


Fig. 2. iSHIFTup program.

for awareness of life-long PrU risk, encourages taking responsibility of skin care, and gives an overview of the program; Core 2, which focuses on the knowledge portion of PrU prevention and identifies a set of connected behaviors to best prevent PrUs; and Core 3, which is the behavioral component of the program and supports engagement in the identified set of preventive behaviors. Each Core (and Module) begins by clearly informing users what they should be able to do after completing that unit of the program. Users are given the opportunity to self-assess and are provided feedback on their performance of key skills and behaviors. iSHIFTup uses interactions to simulate “hands on” practice of behaviors and skills, and provides feedback in the form of audio and visual content based on user input. For example, in Core 2: Pressure Ulcers in Real Life, users perform a “virtual” skin check which provides the opportunity to select the places on the body PrUs are most likely to occur. Feedback is given based on the choices users make. Additionally, in Core 3, Healthy Skin Behaviors, users are given opportunities to select and view/listen to others modeling “best-practice” skin checks in stories and expert videos. Users also select stories of people who describe or demonstrate an inability to perform skin checks or who perform them incorrectly, and thus see the consequences of these negative examples. The models (actors used in stories) represent people of different age, ethnicity, and gender, as well as level and completeness of SCI and time since onset. Models also differed in their level of competence in performing behaviors, or their attitudes in taking charge of their skin care, thereby allowing users to select the

types of models they find most helpful. Fig. 4 provides a listing of Core content and the primary instructional strategies used.

iSHIFTup recommends Modules based on a Follow-Up set of 20 questions users answer one week after completing the three Cores. These Follow-Up questions help determine how well the user is implementing program recommendations (e.g., “Have you performed pressure relief while sitting?”, “Have you checked your skin 2× per day?”). And, based on the user's responses, specific Modules are assigned to address identified issues, providing a tailored experience. Users are prompted to complete these recommended Modules during the next 7 days. This cycle of completing a Follow-Up and receiving recommended Modules is repeated three times; users, however, may continue to use the program after these are completed.

2.2.2. Diaries

Diaries allow users to track their skin care behaviors while using iSHIFTup. The Daily Diary consists of ten questions on user behaviors that make up a skin care routine. Tracking behaviors helps users see cause and effect relationships among behaviors and outcomes. For example, a user who typically sits 8 h each day in a wheelchair and then finds a skin problem after sitting 10 h, may more easily connect the problem to the additional sitting time when behaviors are being tracked. Diary items include number of hours sitting in wheelchair, number of hours in bed or lying down, number of pressure reliefs each hour, number of skin checks, whether problem areas were found,

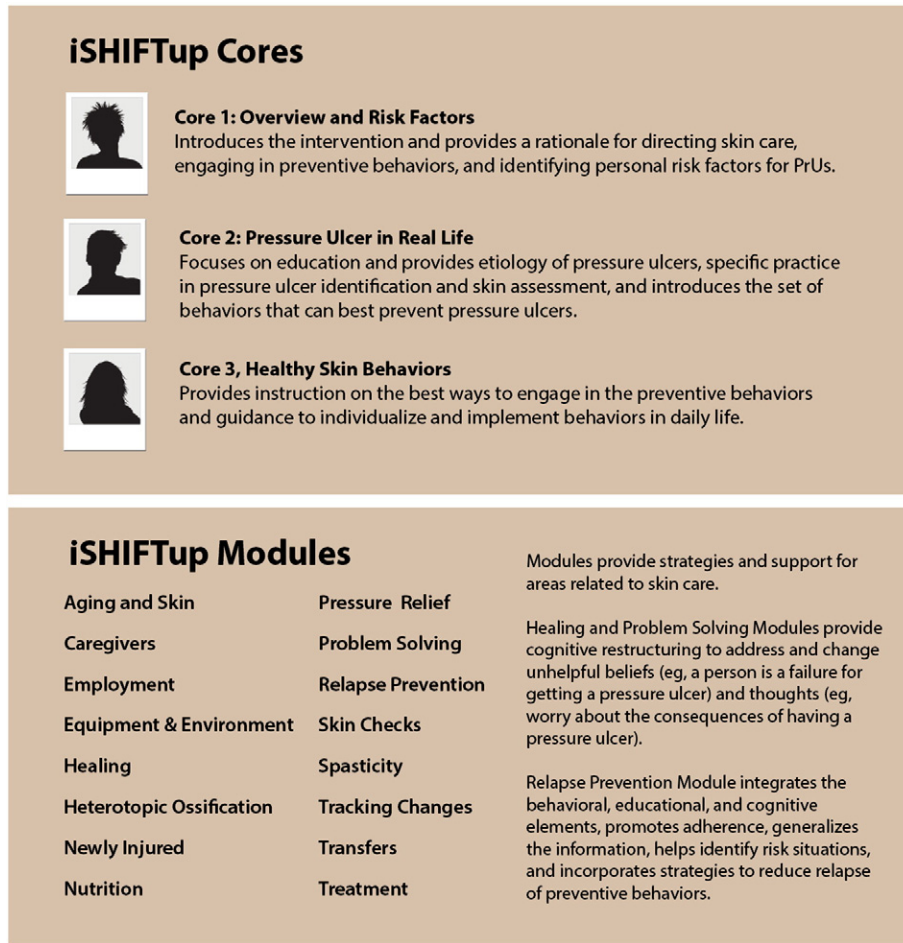


Fig. 3. iSHIFTup Cores and Modules.

and if so, what was found and where on the body. Users also answer questions about changes in equipment and environment and are provided a notes area to enter detailed information on changes that occurred and additional items they wish to track.

Once diaries have been entered, users can view this information using the Diary Charts feature in iSHIFTup (Fig. 5). The diary charts graphically display the key behaviors over time, thus allowing participants to better understand patterns in their skin care behaviors. For




Core Content	Theory/Construct	Instructional Strategy
 <p>Core 1: Overview and Risk Factors Introduces the intervention and provides a rationale for directing skin care, engaging in preventive behaviors, and identifying personal risk factors for PrUs.</p>	<p>Social Cognitive Theory Self-Efficacy Mastery, Competence Self-management Story based learning Motivational Interviewing</p>	<p>Multimedia: cueing Active learning Video, vignettes Modeling, examples Reflection Practice with specific feedback Goal setting</p>
 <p>Core 2: Pressure Ulcer in Real Life Focuses on education and provides etiology of pressure ulcers, specific practice in pressure ulcer identification and skin assessment, and introduces the set of behaviors that can best prevent pressure ulcers.</p>	<p>Social Cognitive Theory Self-Efficacy Mastery, Competence Self-management Health Belief Diffusion Theory Motivational Interviewing</p>	<p>Multimedia: cueing Active Learning Video, vignettes Modeling, examples Practice with specific feedback Simulation Authentic assessment</p>
 <p>Core 3, Healthy Skin Behaviors Provides instruction on the best ways to engage in the preventive behaviors and guidance to individualize and implement behaviors in daily life.</p>	<p>Social Cognitive Theory Self-Efficacy Mastery, Competence Self-management Health Belief Diffusion Theory</p>	<p>Multimedia: video, vignettes Modeling, examples Reflection Practice with specific feedback Problem solving Visualization</p>

Fig. 4. Core content and primary instructional strategies.

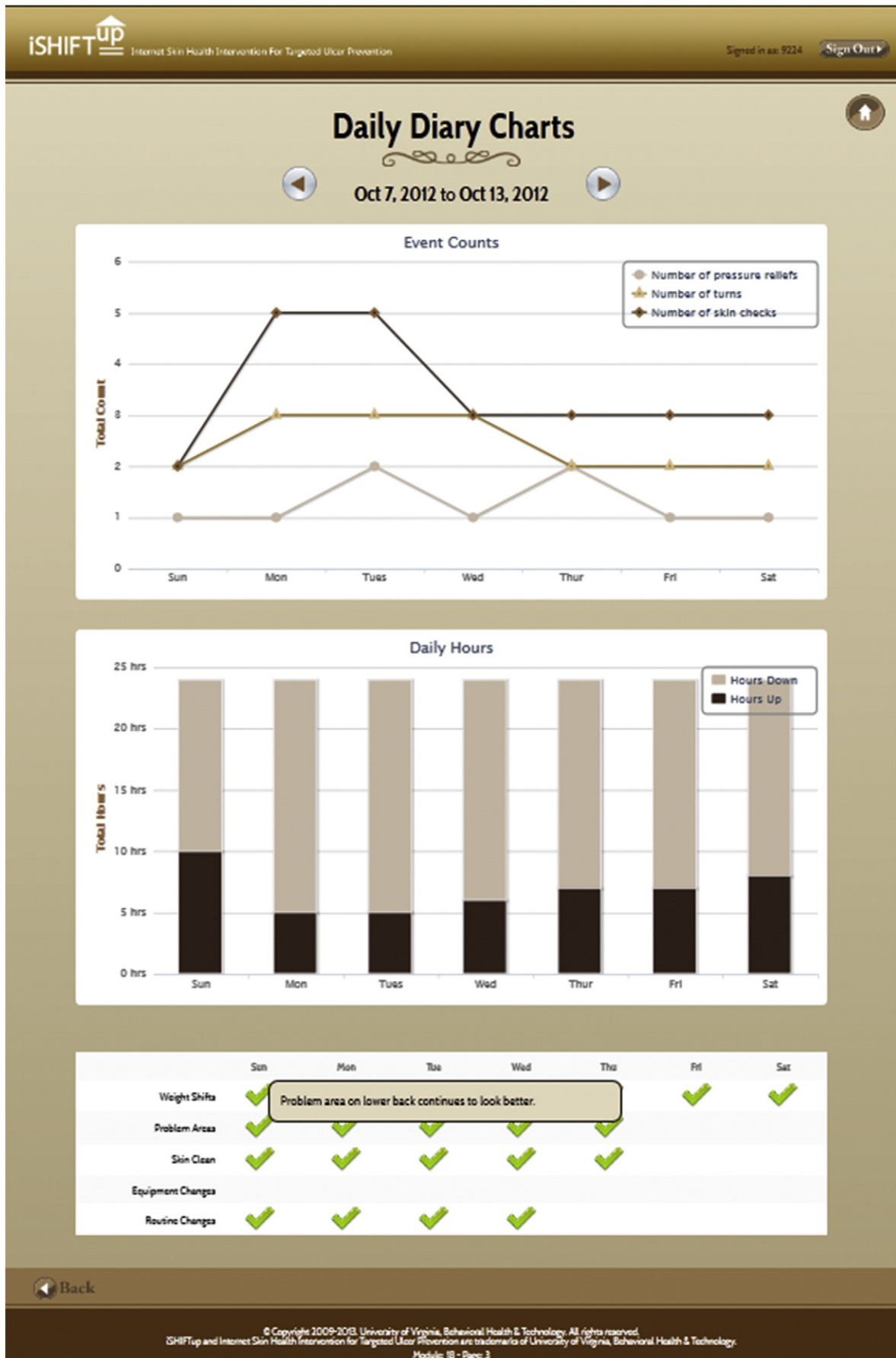


Fig. 5. Diary charts.

example, users can view how their sitting time, frequency of pressure reliefs, and number of skin checks varied over a given period.

2.2.3 . Other strategies and techniques

iSHIFTup includes a number of strategies and techniques shown to be beneficial in engaging individuals when using Internet interventions and encouraging the prescribed behaviors (Ritterband et al., 2008; Ritterband et al., 2009, 2012). In addition to detailed guidance on how to perform specific behaviors and daily diaries to track behaviors over time, iSHIFTup makes considerable use of tailoring, automated prompts, goal setting and behavioral contracting.

Basic tailoring has already been mentioned with respect to the Follow-Ups and assigned Modules. iSHIFTup also offers tailored content to users based on their PrU history, self-assessed prior knowledge of PrUs, and their baseline skin care regimen. In each case, users are asked to make selections from multiple choices (e.g. “I have never had a pressure ulcer,” “I get a pressure ulcer every year”) and based on their selections, specific content, relevant to that choice is provided. In addition, content specific to the user’s own selected risk factors for pressure ulcers is provided. Tailored messages are also sent to users based on predefined triggers and time periods, such as when users complete, or fail to complete, assigned activities. Automated prompts in the form of emails are sent throughout use of the program to encourage the user to return to the program, highlight upcoming events, and generally increase engagement.

A motivational interviewing approach was used to encourage users to establish when and what they are willing to do to care for their skin and prevent pressure ulcers, in a non-judgmental context (Rollnick et al., 2010). Behavioral contracts and goal setting have been implemented giving users the opportunity to set goals. A subset of users, however, may find they are not ready to set goals when provided the opportunity. Users answering “yes” to the question, “Are you ready to set goals?” progress to the goal setting screen, whereas those answering “no” are asked questions to identify reasons they are not ready to set goals and receive content based on the answer choices they make. Users are then provided additional content based on their explicit needs and preferences.

3 . Methods

3.1 . Participants

Eight participants were recruited between July and October, 2012 through the Woodrow Wilson Rehabilitation Center (WWRC), in Fishersville, Virginia, as part of a larger RCT of iSHIFTup. To participate in the study, adults aged 18 years and older had to meet traumatic SCI criteria (medical diagnosis of traumatic spinal cord lesion, paraplegia or tetraplegia, irrespective of the level or completeness of injury), have regular Internet access, and have an identified healthcare provider following their care. Participants were ineligible if they had paralysis from other causes (e.g., progressive medical conditions; multiple sclerosis, TB) or previously developed severe PrUs (stage 3 or 4). Participants were first screened by phone, and those meeting initial eligibility were interviewed in-person, where eligibility was confirmed, informed consent was obtained, and participants were enrolled in the study. This study was approved by the internal review board at the University of Virginia Health System. Informed consent was obtained from all individuals who participated. Participants were compensated \$100 following their involvement in the study for completing the assessment batteries.

3.2 . Measures

3.2.1 . Program usage

Usage was tracked via five primary metrics: Login and completion of Cores, Diaries, Follow-Ups, and Modules. Intervention users were

instructed to complete three Cores during the initial week and then three Follow-Ups, one for each of the subsequent three weeks. Based on responses to the Follow-Ups, users were encouraged to complete recommended Modules.

3.2.2 . Internet evaluation and utility questionnaire (IEUQ)

The IEUQ measures participants’ experiences and perceptions of an Internet intervention. It has 15 items and 3 open-ended response items. The constructs measured by items one through eight include: ease of use; convenience; engagement; enjoyment; layout; privacy; satisfaction; and acceptability. Items nine through fifteen assess perceptions of the Internet program in terms of: usefulness, comprehension, trustworthiness, credibility, likelihood of returning, mode of delivery, and helpfulness. Participants respond to questions on a 5-point Likert scale from 0 (“not at all”) to 4 (“very”). The three open-ended items focus on what the participant found to be *most helpful parts of the program*, *least helpful parts of the program*, and to provide *suggestions to make the program better*. In an earlier and shorter version of this measure (Ritterband et al., 2008), good internal reliability was found ($\alpha = .69$). Detailed results of its use with insomnia samples have also been published (Thorndike et al., 2008; Ritterband et al., 2012).

3.2.3 . Internet impact and effectiveness questionnaire (IIEQ) for iSHIFTup

The IIEQ measures participants’ perceptions of an Internet intervention in terms of the program’s perceived effectiveness in resolving or preventing their targeted health condition. The measure used in this study consists of 23 items; 13 generic items that apply to all prevention interventions, and 10 items that are specific to the behaviors targeted in iSHIFTup. Perceived impact is measured in terms of helpfulness, knowledge gains, treatment/prevention effectiveness for self, effectiveness for others, and long-term effectiveness. It also measures impact on preventive behavior implementation, goal-orientation, ability and confidence to manage the health condition, preparedness, behavioral support and tracking, and likelihood of recommending to others. Participants respond to questions on a 5-point Likert scale from 0 (“not at all”) to 4 (“very”). The 10 iSHIFTup intervention-specific questions were tailored to the protective skin care behaviors supported in this intervention; helpfulness in performing pressure relief (frequency and duration), helpfulness performing skin checks (frequency, where to check, what to look for), ability to find and respond to problem areas, and ability to prevent pressure ulcers. In an earlier version of this measure (Ritterband et al., 2008), good internal reliability was found on the subscales of the questionnaire, including physical symptoms ($\alpha = .88$), comfort ($\alpha = .80$), and worry/mood ($\alpha = .65$). Detailed results of its use with a primary insomnia sample are also published (Thorndike et al., 2008).

4 . Results

Of the 8 participants, 7 completed the online post-assessment measures after having six weeks of access to iSHIFTup. This sample was primarily female (71%, $n = 5$), caucasian (86%, $n = 6$), and tetraplegic (71%, $n = 5$). Participants were on average 36.14 years old ($SD = 10.09$), and their average time since injury onset was 10.43 years ($SD = 9.64$ years). All participants reported using the Internet and checking email regularly (at least once per week) during the duration of the study (see Table 1).

4.1 . Program usage

All 7 participants logged into the program during the 6-week intervention period, ranging from 7 to 38 times ($\bar{x} = 14.86$, $SD \pm 10.75$). To meet minimum study requirements, users had to log in a minimum of three times, and the logins had to be at least 5 min apart to be considered a unique login. iSHIFTup participants were encouraged, but not required, to enter skin care diaries during the intervention period. All

Table 1
iShiftup participants.

Characteristic	iSHIFTup participants (n = 7)
Age, mean (SD)	36.14 [10.09]
Race	
African American	1
Caucasian	6
Asian	0
Sex, No.	
Women	5
Men	2
Marital status, No.	
Single (never married)	3
Married	1
Separated/divorced	1
Other	2
Education, mean (SD), y	13.29 [2.21]
SCI group, No.	
Tetraplegia	5
Paraplegia	2
Time since onset (years)	10.43 [9.64]
Check email daily	6
Use Internet daily	5

participants entered diaries, ranging from 5 to 42 diaries completed (\bar{x} = 19.57, SD ± 13.21). Completing 42 diaries during the intervention period represents a user who completed a diary entry for each day of the study. All seven participants completed at least one Module, ranging from 1 to 15 (\bar{x} = 6.86, SD ± 4.45).

Of the 7 iSHIFTup participants, all completed all three Cores, at least one intervention Follow-Up, and at least one Module. Four (57%) completed three or more Follow-Ups (range: 1–5 Follow-Ups completed). For all 7 participants who completed the first Follow-Up, between 5 and 15 Modules were assigned (M = 9). Among those who completed at least one Follow-Up, 6 (86%) completed 4 or more. Among those who completed at least one Module, the median number completed was 7 (range 1–15).

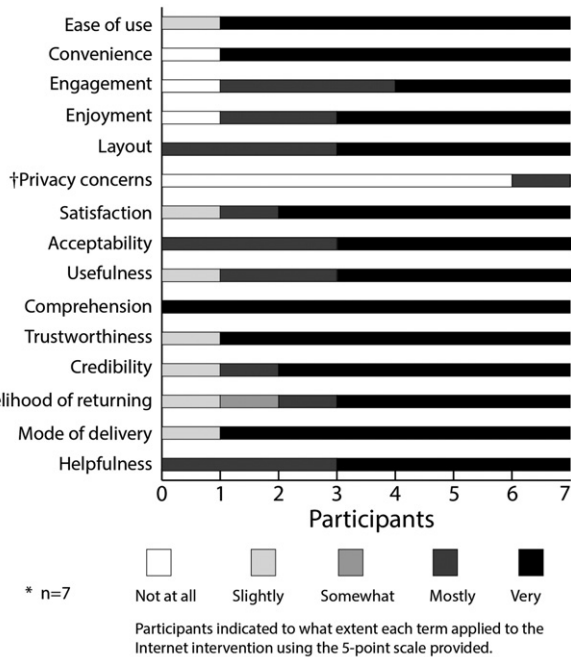


Fig. 6. Internet Evaluation and Utility Questionnaire.

4.2 . Internet evaluation and utility questionnaire

All participants (100%) reported that iSHIFTup was mostly or very helpful and acceptable, very easy to comprehend, and that they mostly or very much liked iSHIFTup's layout (see Fig. 6 for the participant utility ratings). Six participants (86%) reported that iSHIFTup was very easy and convenient to use, and was mostly or very engaging. Six participants (86%) identified iSHIFTup as mostly or very useful, credible, and indicated they were mostly or very satisfied with and enjoyed using iSHIFTup. Six participants (86%) rated the material as very trustworthy, indicated no concerns about privacy, and rated the internet as a very good mode of delivery. All indicated they would likely return to the program.

The responses to the open-ended questions were generally positive (see Table 2, for participant responses). There were a range of responses for what users found "most helpful, and "least helpful". Three participants did not identify an aspect of the program that was least helpful, but instead indicated that it was generally helpful. Four participants provided suggestions for improvements.

4.3 . Internet impact and effectiveness questionnaire

All participants who used iSHIFTup found the program helpful in improving skin care routines and reported knowledge gains in skin care and pressure ulcer prevention. Six participants (86%) stated that iSHIFTup was very helpful in providing behavioral support for skin care activities. Five participants (71%) indicated iSHIFTup was mostly or very effective for themselves and six (86%) rated iSHIFTup as being very effective for others, and somewhat or very effective for long-term use. Six participants (86%) stated they were mostly or very able to follow through with program recommendations and were able to reach the goals they had initially set. Five (71%) rated iSHIFTup's diaries as mostly or very helpful in tracking daily skin care activities.

Six participants (86%) rated iSHIFTup as somewhat, mostly, or very helpful in being confident to take charge of skin care. All participants said they would be likely to recommend iSHIFTup to others.

All participants rated iSHIFTup helpful in preparedness to prevent pressure ulcers and care for skin. Five participants (71%) rated iSHIFTup as mostly or very helpful in performing regular pressure relief, and somewhat, mostly, or very helpful in increasing frequency of pressure relief. All participants indicated iSHIFTup helpful in increasing the duration of pressure relief. Five participants (71%) perceived iSHIFTup as somewhat, mostly, or very helpful in performing skin checks and increasing the frequency of skin checks. All participants found iSHIFTup helpful in where on their body to check and what to look for when checking skin. Six participants (86%) indicated that iSHIFTup was mostly or very helpful in managing their skin care. Five participants (71%) indicated that iSHIFTup was mostly or very helpful in their ability to find and respond to skin problems. All participants rated iSHIFTup as helpful in preventing pressure ulcers in the future. (see Fig. 7 for the participant impact ratings)

5 . Discussion

iSHIFTup is the first skin care Internet intervention for adults with SCI. Overall, users generally liked the program and found it to be useful, easy to use, and effective. A majority of users felt able to implement program recommendations. These are encouraging feasibility findings for an Internet-based prevention program focused on PrUs and skin complications, particularly given how significant a public health problem they can be for people with SCI. And, while face-to-face PrU prevention programs may be useful, they are not available to many individuals who need them. Therefore, demonstrating that iSHIFTup was found to be acceptable and usable is promising, noting that most users believed the internet was a good method for delivering PrU prevention programs.

Table 2
IEUQ open-ended responses.

Participant	Most helpful	Least helpful	Suggestions for improvement
1	ulcer information	audio examples	no suggestions
2	It's easy accessibility.	The commitment of time to the program.	Put more realistic expectations for pressure reliefs. It's very hard to lean from side to side or forward for 3 minutes, 3 times an hour.
3	It was very easy to understand and did not have all the confusing medical words or definitions in it.	I don't believe any part of iSHIFTup has a least helpful part in it. Especially for someone who just had a spinal cord injury. I wish I had this when I was first injured.	I believe that this program is a very good educational tool for people who suffer with spinal cord injury's. iSHIFTup has down a fantastic job putting together this SCI Skin Healthy and Prevent Pressure Ulcers video. The only things I would do and you may be doing them (I don't know). Every new injured spinal cord pateit needs this and every spinal cord rehab center should have a copy or Internet course like this one we just took. There is nothing I can think of at this time.
4	The whole program was helpful. It helped to refresh me in proper skin care.	There was nothing that was not helpful.	
5	the modules	diary	more videos
6	Learning the different spots you can get ulcers and how it effects you emotionally as well as physically.	Really didn't find anything unhelpful	Be a little shorter

Note: This table contains responses as entered by participants.

Participants believed that iSHIFTup improved their ability to manage their skin care, helped improve their skin care routine, and helped support healthy skin care activities. Participants also reported that the information in iSHIFTup was trustworthy and consistent with clinician recommendations. Most participants indicated that iSHIFTup would work well as a long-term solution to supporting healthy skin care behaviors, and that iSHIFTup would work well for others with SCI. These perceived improvements are important and positive; however, identifying more quantitative metrics to address actual improvements are also needed.

While most participants provided positive responses and feedback, one participant reported a more negative experience, as can be seen by many of the “not at all” responses in Figs. 6 and 7 (see Rozentel et al., 2014, regarding the recommendation for better reporting of negative effects of Internet interventions). Interestingly, the participant who responded in this way was the youngest user. The feedback provided by this participant will help shape future iterations of iSHIFTup by providing useful input as to how younger individuals with SCI might best be served by this approach. For example, optimizing for a mobile device

(particularly a tablet) may increase the convenience and enjoyment for younger users.

Other limitations of the findings presented here include a small and homogenous sample in terms of race/ethnicity (95% Caucasian), geography (all in Virginia, US) and tetraplegia (83%).

In designing and developing iSHIFTup, a number of strategies were successfully implemented that can inform designs of future Internet interventions. A systematic process was followed that allowed input from advisory panel stakeholders (Hilgart et al., 2012). Adhering to this process required commitment to a development period that allowed sufficient time to gather, prioritize, organize, and member-check specifications. Performing ongoing cycles of formative evaluation also required a commitment to time and process. It is critical to appreciate as well as plan for and accurately gauge the length of time it takes to operationalize a face-to-face program for Internet delivery. Unfortunately, this can be very challenging to do, but understanding that it is typically a time consuming and costly endeavor to undertake can be useful and can help set expectations more appropriately.

Regarding engagement in user-centered design, it was evident that a purposeful selection and inclusion of design-informants with SCI (advisory panel members) representing differing ages, time since onset, and level of function, was critical to creating a relevant program. The Advisory Panel for iSHIFTup represented different constituencies within the SCI population on age and gender. It was, however, weighted toward those with tetraplegia, greater levels of independence (i.e. high functioning tetras), and greater time since onset. This is representative of the participants generally served by WWRC, and by those enrolled in the study (71% tetraplegia, 29% paraplegia). This indicates a good fit between iSHIFTup's design and the population on which it is being tested. The implications of this potential bias in design, however, should be recognized. Future revisions to iSHIFTup should include design partners that represent the full trajectory of time since onset of SCI with regard to skin care.

Another strategy that is important but often challenging in the user-centered approach is finding the right balance between practice recommendations of advisory panel members with SCI (e.g., real-world solutions to skin issues) versus the best-practice recommendations from content experts. This point is evident in the open-ended response items by a participant who suggested iSHIFTup be improved by “having more realistic expectations for pressure reliefs”. iSHIFTup presents recently updated, best-practice, pressure relief recommendations calling for more frequent pressure relief, maintained for longer durations. However, what is considered ‘best-practice’ may not necessary be ‘realistic’ for some. Exploring methods for supporting differing levels

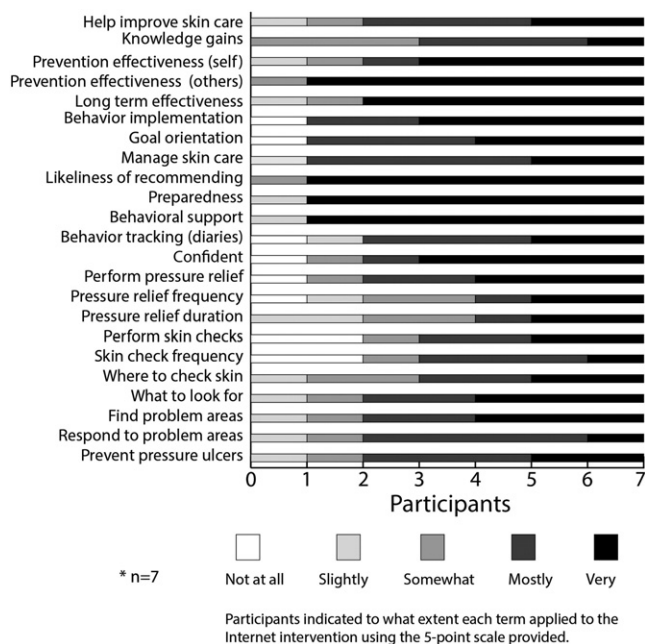


Fig. 7. Internet Impact and Effectiveness Questionnaire.

of adherence to behaviors may be one way to support those users who find ideal recommendations unrealistic, and, at least initially, unattainable.

6. Conclusion

iSHIFTup is the first program of its kind to be tested and perceived as useful and effective by adults with SCI. Despite consensus among experts that most PrUs are preventable, and recognizing the role of preventive behaviors in the prevention of serious PrUs, many people with SCI do not have access to effective prevention interventions during the trajectory of their injury. Decades of shortening duration in rehabilitation post injury has resulted in fewer opportunities to engage people with SCI in face-to-face interventions and to provide ongoing behavioral support for integrating preventive behaviors into daily routines.

For people with SCI in whom PrUs do occur, there is greater risk for development of additional PrUs. Currently there are few mechanisms in place for people with SCI following treatment of a PrU to find support to establish and continue preventive behaviors once an ulcer is healed. Follow-up programs are notoriously absent. For rehabilitation centers and hospitals that follow patients with SCI, programs like iSHIFTup may have considerable potential, both for assisting individuals with SCI and their caregivers to learn how to implement and maintain skin health before a PrU develops, and for those who have already experienced a PrU, to prevent recurrence or new ulcers.

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