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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.



## 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 Unites 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 iSHIFTup (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 . iSHIFTup

iSHIFTup 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

iSHIFTup 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 iSHIFTup. 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 iSHIFTup 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 iSHIFTup content objectives. Objectives refer to what users are expected to know, do, think and feel as a result of using iSHIFTup. The panel identified a set of objectives that apply to all adults with SCI. These are the "Core" objectives of iSHIFTup. 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 iSHIFTup. 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 . iSHIFTup program

iSHIFTup 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 iSHIFTup, 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 iSHIFTup, 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 iSHIFTup 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.