

Health practices of veterans with unilateral lower-limb loss: Identifying correlates

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Abstract—Persons with a nontraumatic lower-limb amputation are at high risk of losing their contralateral limb in the years postamputation. In this study, veterans with a unilateral lower-limb amputation participated in a survey about health beliefs and health practices known to affect risk of amputation (foot care and smoking). Most participants reported good foot-care practices (93% checked the top of their foot, 73% checked the bottom of their foot, 75% checked between their toes, and 72% washed their foot daily); however, a small percentage engaged in important foot-care practices less than once a week (2% checked the top of their foot, 7% checked the bottom of their foot, and 7% checked between their toes less than once a week). In addition, nearly a third still smoked. The belief in one's ability to engage in good foot care and the belief that good foot care reduces the risk of future foot problems were significantly correlated with foot-care practices. In addition, psychological well-being (life satisfaction) was significantly related to foot care and smoking status. Longitudinal research is needed to identify determinants of health behaviors to better direct intervention efforts.

Key words: amputees, foot-care practices, health behavior, health beliefs, psychological adjustment.

INTRODUCTION

More than 70,000 lower-limb amputations were performed at Veterans Health Administration (VHA) hospitals between fiscal years 1989 and 1998 [1]. Amputation rates for veterans treated at VHA facilities were higher than rates for males in other U.S. hospitals during this same period, with rates almost three times greater for

veterans 45 to 65 years of age and nearly double for veterans 65 to 74 years of age compared to the same aged U.S. male population. These data revealed that the incidence of amputation increases with age [1]. Among those veterans receiving amputations at VHA facilities between 1989 and 1998, the average age at amputation was 64 years. The two most frequently documented indications for amputation obtained from VHA hospital discharge diagnosis codes were diabetes and atherosclerotic peripheral vascular disease.

In a review of the literature on older lower-limb amputees, it was noted that, despite recent improvements in medical care, the survival of dysvascular amputees and the risk of contralateral amputation has not changed much [2]. The review cites a 20 to 50 percent risk of losing

Abbreviations: BHADP = Barriers to Health Activities Among Disabled Persons Scale, DHBS = Diabetes Health Belief Scale, GDS = Geriatric Depression Scale, HBM = Health Belief Model, IRB = institutional review board, SD = standard deviation, VA = Department of Veterans Affairs, VHA = Veterans Health Administration.

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the contralateral leg to vascular disease over the 4 years following initial limb loss. In a recent study of diabetic amputations in the Department of Veterans Affairs (VA), more than half the veterans receiving a lower-limb amputation had had a prior amputation [3]. Some have suggested that the lack of improvement in outcomes indicates that the prevention of amputation has not received adequate attention [4].

The importance of health prevention and health promotion practices for patients at risk for lower-limb amputation is well established. Smoking is known to impact the risk of lower-limb loss. In a review of the peripheral vascular consequences of smoking, Krupski noted that "cigarette smoking is associated with increased risk and extent of advanced atherosclerotic vascular disease in peripheral as well as coronary arteries" [5]. He further noted that smokers are more likely than nonsmokers to experience amputations, as well as a long list of other vascular-related health problems. Boulton stated that foot ulceration and amputation are the most preventable of all long-term complications of diabetes. He reported that screening and education in preventive self-care has been shown to reduce the incidence of amputation among patients with diabetes by 50 percent [6]. Similarly, among VA patients receiving a lower-limb amputation, two of the most frequently reported events believed to have led to the ulceration were "shoe-related" events and errors in self-care [3].

Both of these behaviors—preventive foot care and smoking—must be addressed among those at risk for lower-limb amputation. It is especially important that these behaviors be addressed among nontraumatic, unilateral lower-limb amputees, a group known to be at very high risk for additional amputation. We need to better understand the health practices of this at-risk population, and we also need to better understand what predicts those health practices. Understanding the determinants of patients' health behavior may allow us to design more effective interventions that minimize health risks, promote healthier living, and ultimately reduce future limb loss and even premature death.

Several models have been suggested to predict health practices. One model that has been broadly applied and has gained wide acceptance is the Health Belief Model (HBM) [7]. The HBM was originally developed to explain the preventive behaviors that healthy individuals engage in with the intention of avoiding specific illnesses, diseases, or medical conditions. The model proposes that individuals with minimal levels of health motivation and knowledge

will engage in preventive health behavior if they (1) view themselves as being potentially vulnerable (susceptibility), (2) view the disease or medical condition as severe (severity), (3) believe the preventive health behavior is effective (benefits), and (4) perceive few barriers to engaging in the preventive behavior (barriers). The model's author also noted that some "cue to action," whether internal (e.g., symptom) or external (e.g., physician's recommendation), is needed to trigger the individual to contemplate action.

Many researchers also have found it valuable to incorporate Bandura's self-efficacy concept in their prediction of health behavior [8]. Bandura suggested that behavior is not only a function of one's belief that the behavior will lead to a particular outcome (outcome expectation) but also a function of one's belief that he or she is capable of performing the behavior in question (efficacy expectation).

Depression and psychological distress have also been associated with health behaviors [9–11]. These associations are typically suggested to be reciprocal in nature. For instance, depression can lead to inactivity; alternatively, increases in physical activity level can improve mood. The scant literature available on the psychological well-being of lower-limb amputees has suggested that distress and depression are more common among lower-limb amputees than in the general public [12–14]; therefore, it is particularly important to consider the relationship between psychological well-being and health behaviors among persons with a lower-limb amputation.

To what extent psychological distress affects self-care among persons with a lower-limb amputation is unknown, and only one study has attempted to apply the HBM to individuals with a lower-limb amputation [15]. Pham et al. assessed the health beliefs of persons with diabetes who had lost a lower limb and related those beliefs to adherence to several components of a diabetes care regimen. Although the authors concluded that health beliefs influence diabetic self-care practices, individual components of the HBM exhibited fairly weak correlations with self-reported adherence. Measurement issues, such as the incongruity between the level of specificity of the beliefs and the behaviors assessed, may have contributed to the relatively weak correlations. In addition, Pham et al.'s sample consisted of French-speaking Canadians with diabetes, 37 percent of whom had received only a toe amputation. Thus, their results may not be applicable to veterans with major unilateral lower-limb amputation. An examination of the critical health behaviors and

correlates of those behaviors among a sample of veterans with unilateral lower-limb amputation who are served by the VHA would be useful.

In this study, we sought to (1) describe the extent to which veterans with a nontraumatic, unilateral lower-limb amputation engage in two health behaviors (one positive behavior, foot care; one negative behavior, smoking); (2) determine the extent to which health beliefs (susceptibility, severity, benefits, barriers, self-efficacy) correlate with foot-care practices; and (3) examine the extent to which psychological well-being (life satisfaction, depression) is related to foot-care and smoking behavior.

METHOD

Participants

Forty-four veterans with a unilateral lower-limb amputation (transtibial or transfemoral) whose surgery was performed at the Houston VA Medical Center participated in a 20-min telephone survey. The survey included questions about their mobility status, foot-care practices, current smoking practices, and psychological well-being. To be included in the study, veterans had to have had a nontraumatic, unilateral lower-limb amputation between 6 months and 3 years prior to participation, reside in the community, be responsible for their own basic self-care, and be capable of completing a telephone interview. Study procedures were reviewed and approved by the institutional review board (IRB), and all data were collected in compliance with the IRB's standards.

Veterans who could not be reached by phone after repeated attempts were sent a letter asking them to contact the investigators. Of those who appeared to meet criteria, 14 refused to participate, 28 were unreachable, and 4 were excluded because of current foot ulcers. The sample of veterans completing the survey consisted of 44 veterans, 29 with a transtibial amputation and 15 with a transfemoral amputation. Participants were, on average, 20.67 months (standard deviation [SD] = 10.86) postamputation. The vast majority (43 of 44) was male. The average age of the sample was 61.45 (SD = 9.75) years. Approximately half (47.7%) were African American; 38.6 percent were Caucasian; 11.4 percent were Hispanic; and 2.3 percent were of some other ethnicity.

Measures

Health Practices

Daily foot-care practices were assessed by asking participants how often they or a care assistant examined their intact foot (top, bottom, and between the toes), washed their foot, felt their foot for dry skin, changed their socks, and checked their socks and shoes for objects or seams that might injure their foot. The items used to assess daily foot-care practices were derived from the literature on foot care for persons with peripheral vascular disease and/or diabetes. Items were also adapted from the Patient Foot Care Survey [16], a measure designed for persons with diabetes without lower-limb loss. Content experts were consulted to assure that items were appropriate and applicable to persons with unilateral lower-limb amputation. A daily foot-care practices score was created by adding responses to these items. One item (checking shoes) was not included in the summary score because some participants were not ambulatory and therefore did not regularly wear shoes. The Cronbach's coefficient alpha (a measure of the consistency of responses to all items of the measure) for the remaining seven items was 0.74.

Current tobacco use was assessed by asking participants whether they currently used cigarettes, cigars, pipes, or chew. Tobacco users then reported the average amount of tobacco used per week. All tobacco users smoked cigarettes, and none reported using other forms of tobacco; therefore, the data reported refer only to the number of cigarettes smoked per week.

Foot-Care Beliefs

Susceptibility. Perceived susceptibility was measured with two items modeled after the Diabetes Health Belief Scale (DHBS) [17]: "How likely do you believe you are to develop foot sores/ulcers?" and "How likely do you believe you are to have an additional lower-limb amputation?" Participants responded to the items using a four-point Likert scale ranging from 1 (not at all) to 4 (very much). The two items were averaged to create the Susceptibility Scale, with a range of 1 to 4. The internal consistency (Cronbach's coefficient alpha) of the two-item scale was 0.61.

Severity. Using the same four-point response format, veterans rated the extent to which they thought (1) a future foot sore/ulcer would interfere with their activities of daily living, and (2) a future foot sore/ulcer would be difficult to treat. The scores on these two items were averaged,

resulting in a score that ranged from 1 to 4. The internal consistency of this two-item severity scale was 0.63.

Benefits. With items modeled after the DHBS [17], patients were asked to what extent they believed that good foot care could help keep them from (1) getting a future foot sore/ulcer and (2) having a future limb amputation. The same four-point response scale (1 = not at all to 4 = very much) was used, and the scores on the two items were averaged to create the perceived benefits of foot-care scale, which had a Cronbach's coefficient alpha of 0.83.

Barriers. Barriers to engaging in good foot care were assessed with an adaptation of the Barriers to Health Activities Among Disabled Persons Scale (BHADP) [18]. The BHADP, which was developed specifically for disabled adults, assesses the extent to which each of 18 potential problems prevents individuals from engaging in a wide range of health promotion activities. For this study, a panel of healthcare professionals reduced the list of barriers to those deemed relevant to foot care. They also suggested additional items specific to foot care (e.g., "I cannot see my foot"). This resulted in a checklist of 14 potential barriers. Participants were also given the opportunity to list up to two additional barriers not included on our list. Using a four-point response format, participants were asked to indicate the extent to which each of the barriers kept them from regularly engaging in good foot care (0 = never, 1 = sometimes, 2 = occasionally, 3 = routinely). Items were summed to create a barriers scale (possible range from 0 to 48), which was used in analyses predicting foot-care practices.

Self-efficacy. Participants were asked to indicate the extent to which they believed they were capable of regularly engaging in good foot care. A 4-point response format was again used (1 = not at all to 4 = very much), resulting in a single-item measure of foot-care self-efficacy.

Psychological Well-Being

Life Satisfaction. Life satisfaction was measured with the Satisfaction with Life Scale [19], a five-item scale that assesses individuals' global life satisfaction. This measure has been found to correlate highly with the longer and extensively used Life Satisfaction Index. A ($r = 0.81$) and has been reported to have an internal consistency coefficient of 0.83 [20]. In this sample, the internal consistency was 0.88.

Depression. Depression was measured with the short form of the Geriatric Depression Scale (GDS) [21]. This 15-item scale uses a yes/no response format and has demonstrated sensitivity and specificity similar to that of the full 30-item GDS [22]. Internal consistency in this sample of veterans with lower-limb amputation was 0.84.

RESULTS

Health Behaviors

Foot Care

Most participants reported that they engaging in foot-care behaviors daily, ranging from 65.9 percent who checked their shoes daily to 93.2 percent who checked the top of their foot and checked their socks daily (see **Table 1**). Some participants did not engage in important foot-care practices even once a week: checking one's shoes (15.9%), checking the top of one's foot (2.3%), checking the bottom of one's foot (6.8%), checking between one's toes (6.8%), and feeling one's foot for dry skin (6.8%). The lower compliance rate for checking one's shoes reflects the fact that some participants were nonambulatory and did not need to routinely check their shoes for possible hazards.

Table 1.
Percentage of unilateral lower-limb amputees engaging in foot-care practices.

Foot-Care Item	Daily	3-4 Times per Week	1-2 Times per Week	Less than Weekly
Check Shoes	65.9	2.3	15.9	15.9
Check Socks	93.2	2.3	4.5	0.0
Change Socks	70.4	18.2	11.4	0.0
Wash Foot	70.4	18.2	11.4	0.0
Check Foot—Top	93.2	0.0	4.5	2.3
Check Foot—Bottom	72.7	15.9	4.5	6.8
Check Foot—Between Toes	75.0	13.6	4.5	6.8
Check for Dry Skin	77.3	9.1	6.8	6.8

Smoking

Nearly 80 percent of the participants reported having regularly smoked at some time in their lives. Approximately a third (31.8%) were regular smokers at the time of the interview. They reported smoking an average of 9.03 (SD = 10.94) packs of cigarettes per week and reported having smoked for 31.64 (SD = 13.79) years, on average.

Health Beliefs

Mean scores on the foot-care belief measures are presented in **Table 2**. Participants, on average, rated their susceptibility to foot problems and additional amputation as relatively low (2.02 on a 1 to 4 point scale, with 31.7% scoring a 1). Their perception of the severity of acquiring a foot ulcer or infection was 2.96 on the same 1 to 4 scale (with 28.2% scoring the maximum of 4), indicating that they generally acknowledged the seriousness of such an event. There was broad acceptance of the benefits of good foot care, with a mean score of 3.64. Participants also generally believed themselves to be capable of regularly engaging in good foot care, with a mean self-efficacy score of 3.50.

Participants on average endorsed 2.46 barriers to practicing good foot care, with a range of 0 to 9 barriers reported. The percentage of participants endorsing each barrier is presented in **Table 3**. Barriers most frequently noted included transportation problems (34.1%) and unavailability of someone to help them (24.9%). In addition, several participants noted that additional information and assistance from healthcare providers was needed, with 20.4 percent reporting a lack of information, 27.3 percent reporting they felt they could not do things correctly, and 24.9 percent indicating a lack of help from healthcare professionals. The average total barriers score (which reflects the number of barriers endorsed, as well as the extent to which each barrier interfered with foot care) was 4.36 (SD = 4.84). **Table 3** lists the average interference score for each individual barrier (range 1 to 3) based on those who endorsed the barrier as being problematic. The barriers rated as interfering the most with foot-care practices were lack of support from family and friends, concern about alerting healthcare professionals to a potential problem, inability to see their foot, and inability to reach their foot.

Psychological Well-Being

The mean score on the Satisfaction with Life Scale was 19.30 (SD = 9.25). When examined by level of

Table 2.

Mean and standard deviation on health belief and psychological well-being measures ($N = 44$).

Variable	Mean	Standard Deviation
Health Beliefs		
Susceptibility Scale	2.02	1.01
Severity Scale	2.96	1.03
Benefits Scale	3.64	0.73
Barriers Scale	4.36	4.84
Self-Efficacy Scale	3.50	0.82
Psychological Well-Being		
Life Satisfaction	19.30	9.25
Depression	4.04	3.48

Table 3.

Percentage of veterans endorsing barriers to good foot care.

Item	Percentage of Sample Endorsing the Item*	Interference	
		Mean	SD [†]
Feeling what I do does not help	13.7	1.50	0.89
Lack of transportation (to see the doctor)	34.1	1.60	0.74
No one to help me	24.9	1.73	0.90
Not interested	9.1	1.75	0.96
Lack of information about what to do	20.4	1.67	1.00
Lack of support from family/friends	9.1	2.75	0.50
Lack of time	4.5	1.00	0.00
Feel I cannot do things correctly	27.3	1.42	0.67
Lack of help from healthcare professionals	24.9	1.73	0.90
Concern I may alert healthcare professionals to a problem requiring hospitalization or amputation	15.8	2.14	0.90
My foot does not hurt	18.2	1.50	0.76
I cannot see my foot	4.6	2.00	1.41
I cannot reach my foot	15.8	2.14	0.90
I have trouble remembering	13.7	1.50	0.84

*Reflects the percentage of participants who rated item as having (1) sometimes, (2) often, or (3) routinely kept them from practicing good foot care.

[†]Reflects average score based only on those indicating that item at least sometimes interfered with practicing good foot care. Possible score range is 1 to 3. SD = standard deviation

amputation, life satisfaction was lower among veterans with a transfemoral amputation (15.47, SD = 9.49) than those with a transtibial amputation (21.36, SD = 8.60). Despite the small sample size, the difference in mean life satisfaction scores was statistically significant ($t = 2.06$, $p < 0.05$).

Mean score on the short GDS for the entire sample was 4.04 (SD = 3.48). Again, veterans with a transtibial amputation had lower depression scores, on average, (3.45, SD = 3.25) than did those with a transfemoral amputation (5.20, SD = 3.73), although the difference was not statistically significant ($t = -1.61$, $p = 0.11$). When the recommended cutoff of 6 was used to determine those who might be experiencing clinically significant symptomatology, 11 of the 44 participants (25.0%) exceeded the cutoff. Again, differences emerged according to level of amputation, with 17.2 percent of those with a transtibial compared to 40.0 percent of those with a transfemoral amputation scoring in the range indicative of clinically significant depressive symptomatology.

Relationship Between Health Behaviors and Health Beliefs/Psychological Well-Being

Examining the correlations between health beliefs and daily foot-care behaviors, perceived benefits ($r = 0.36$, $p < 0.05$) and self-efficacy ($r = 0.37$, $p < 0.05$) were significantly correlated with foot-care practices, such that those who perceived greater benefits of good foot care and those who believed themselves capable of practicing good foot care engaged in better daily foot-care practices. Perceived severity, susceptibility, and barriers were not significantly related to foot care ($r = 0.14$, 0.06 , and 0.02 , respectively).

With regard to psychological well-being, life satisfaction ($r = 0.45$, $p < 0.01$) was significantly correlated with daily foot care. A hierarchical multiple regression analysis was conducted to determine whether life satisfaction accounted for a significant amount of variance in foot care above and beyond that accounted for by level of amputation. Life satisfaction was found to contribute significant variance even after level of amputation was statistically controlled, F change (1, 40) = 6.53, $p < 0.05$. Life satisfaction was also related to smoking status. Those who smoked were significantly less satisfied with their lives (14.78, SD = 10.16) than nonsmokers (21.48, SD = 8.09; $t = -2.34$, $p < 0.05$). Depression was not significantly related to daily foot-care practices or smoking status, although a trend in the expected direction was observed with respect to both behaviors (foot-care

practices, $r = -0.24$, $p = 0.11$; smoking status, $t = 1.65$, $p = 0.11$).

DISCUSSION

Although most veterans in the study with a nontraumatic, unilateral lower-limb amputation reported having already quit smoking and described good daily foot-care practices, nearly a third still smoked and a small percentage washed and checked their remaining foot once a week or less. Although these results are generally encouraging, it is important to note that this sample represents those veterans who survived up to 3 years postamputation and did so without experiencing an amputation of their contralateral limb. These and other exclusion criteria likely resulted in a somewhat selective sample. Thus, these results likely reflect the healthiest individuals with the best self-care practices. The self-reported data from this sample likely indicate the best-case scenario with respect to the health behaviors of this population.

Despite the somewhat restricted subject pool, a belief in the benefits of good foot care and a belief in one's ability to engage in good foot care were moderately correlated with foot-care practices. Other components of the HBM (i.e., severity, susceptibility, barriers) were not significantly correlated with foot-care practices. Although the barriers scale used in this study was not significantly related to daily foot-care practices, it is worth noting that approximately one-fourth of all participants indicated a need for more information and/or assistance from health-care professionals with regard to their foot care.

Veterans with a major lower-limb amputation had lower life satisfaction scores ($M = 19.30$) than previously reported among undergraduate students ($M = 23.50$ [19]) and also older adults recruited through community agencies and groups ($M = 25.8$ [19], $M = 24.4$ [20]). In our sample, life satisfaction was significantly lower among those with transfemoral amputations compared to those with transtibial amputations. A similar pattern was found with regard to depression scores, with 40 percent of those with a transfemoral amputation exceeding the cutoff for clinically significant depressive symptomatology compared to 17 percent of those with a transtibial amputation. This adds important information to a literature that has been criticized for the limited attention given to psychological adjustment of persons with limb amputations [13,23].

Life satisfaction appears to be an important correlate of health behaviors among unilateral lower-limb amputees. Life satisfaction was significantly correlated with daily foot-care practices, such that veterans who reported higher life satisfaction were more likely to practice better daily foot care. Life satisfaction accounted for significant variance in foot-care practices above and beyond that accounted for by level of amputation; thus, this relationship is not simply a function of less impaired patients (i.e., those with a transtibial rather than a transfemoral amputation) being better able to provide their own self-care. Life satisfaction was also related to smoking status, with nonsmokers reporting higher life satisfaction than smokers. Depression was not significantly related to foot-care practices or smoking status, but a trend was observed with both behaviors. The failure to obtain statistically significant results with our depression measure is likely related to our relatively small sample size.

It is impossible to determine causality in studies that examine health practices and psychological well-being at a single point in time. For example, do people who are more satisfied with life exercise more (because they want to extend their life) or does regular exercise lead to greater satisfaction with life (because exercise causes people to feel better and stay healthier)? The obvious reciprocal nature of these relationships makes it difficult to attribute causality. While smoking and psychological well-being are very likely to be reciprocally related, there is less reason to suspect a bidirectional relationship between psychological well-being and foot care. Although causality cannot be attributed in a cross-sectional study, it seems more likely that psychological well-being would influence daily foot-care practices than the reverse. The fact that life satisfaction was related to foot care is particularly striking given that foot-care behaviors are quick and relatively easy to perform. We hypothesize that psychological well-being might exert a stronger influence on more demanding aspects of self-care, such as exercise or diet, than behaviors that are simple to perform. Of course, longitudinal research is needed in order to answer such questions.

Greater attention needs to be given to the health behaviors, health beliefs, and psychological well-being of persons with lower-limb amputation, both in research and in clinical practice. Helping unilateral lower-limb amputees avoid subsequent bilateral amputation is an important objective. Although unilateral lower-limb amputation impairs functioning, bilateral lower-limb amputation has

an even greater impact on functioning. For example, in one study, 100 percent of participants with a transtibial amputation and 92 percent with a transfemoral amputation were able to use stairs with varying levels of assistance. In contrast, one-fourth of participants with a bilateral lower-limb amputation were unable to use the stairs at all, even with assistance [24]. Clearly, it is important that efforts be made to help veterans with a unilateral lower-limb amputation retain their intact limb.

Recommendations from physicians and healthcare providers can affect patients' efforts to initiate behavior change. Using smoking as an example, even brief interventions requiring only 3 min of physicians' time during routine office visits have been shown to increase quitting rates among smokers [25]. However, healthcare providers often fail to take advantage of opportunities to encourage patients to change their behaviors. A recent study on physicians' smoking cessation advice to patients revealed that less than 50 percent of patients received advice to quit smoking [26]. These authors argue that physicians continue to miss opportunities to provide potentially life-saving advice to patients. Physicians and rehabilitation team members similarly have the opportunity to affect important health behaviors among lower-limb amputees. Additional research, particularly longitudinal research is needed to better identify the important determinants of health practices among those with a lower-limb amputation. These studies can then be used to guide rehabilitation team members' efforts to improve the self-care practices of this population. We believe that rehabilitation team members have the potential to improve self-care practices and ultimately improve long-term health outcomes among veterans with lower-limb amputation.

CONCLUSION

Although most veterans with a nontraumatic, unilateral lower-limb amputation did not smoke and reported that they practiced good daily foot care, a third continued to smoke cigarettes and a small percentage reported inadequate foot care. Health beliefs, particularly perceived benefits and self-efficacy, and psychological well-being were related to these two important behaviors. Additional research is needed to better understand the health practices of this at-risk population and better identify the determinants of those health practices. Such information may then be used to promote better health,

improve quality of life, and ultimately reduce additional disabilities in this population.

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