Weight Loss Intention, Dietary Behaviors, And Barriers To Dietary Change In Veterans With Lower Extremity Amputations

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Abstract

Obesity is thought to be highly prevalent in persons with lower extremity amputations (LEAs) and can impair physical and social functioning. The aim of this study was to determine the prevalence of weight loss intention, weight loss strategies, dietary patterns, and barriers to making dietary changes, and their associations with body mass index (BMI, kg/m2), amputation characteristics, health status, and socioeconomic factors. We conducted a cross-sectional study (n = 150) using data from a self-administered questionnaire. 43% of participants were obese and 48% were trying to lose weight; 83% of those trying to lose weight reported trying to “eat differently”, but only 7% were following a comprehensive weight loss program involving dietary changes, physical activity, and behavioral counseling. 21% of participants reported ≥6 barriers to changing their eating habits (e.g., habit, too little money, stress/depression). Obesity was associated with younger age, lower physical health scores, hypertension, arthritis, and diabetes. Compared to those not trying to lose weight, a greater proportion of those trying to lose weight had a BMI ≥35 kg/m2, age <55 years, higher physical and mental health scores, and more frequent consumption of vegetables, beans, chicken, and fish.

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Abstract

Background

Obesity is thought to be highly prevalent in persons with lower extremity amputations (LEAs) and can impair physical and social functioning.

Objective

The aim of this study was to determine the prevalence of weight loss intention, weight loss strategies, dietary patterns, and barriers to making dietary changes, and their associations with body mass index (BMI, kg/m^2), amputation characteristics, health status, and socioeconomic factors.

Methods

We conducted a cross-sectional study (n = 150) using data from a self-administered questionnaire.

Results

43% of participants were obese and 48% were trying to lose weight; 83% of those trying to lose weight reported trying to “eat differently”, but only 7% were following a comprehensive weight loss program involving dietary changes, physical activity, and behavioral counseling. 21% of participants reported ≥6 barriers to changing their eating habits (e.g., habit, too little money, stress/depression). Obesity was associated with younger age, lower physical health scores, hypertension, arthritis, and diabetes. Compared to those not trying to lose weight, a greater proportion of those trying to lose weight had a BMI ≥35 kg/m^2, age <55 years, higher physical and mental health scores, and more frequent consumption of vegetables, beans, chicken, and fish.

Conclusions

Though over half of overweight and obese individuals with LEA were trying to lose weight, few reported following a comprehensive program to lose weight, which may indicate an unmet need for services for this group. To be effective, these programs will need to address the complex physical and mental health challenges that many of these individuals face.

Keywords:
Lower extremity amputation, Obesity, Diet, Weight loss, Veterans

Abbreviations:
LEA (lower extremity amputation), ICD (International classification of disease), BMI (Body mass index), VA (Department of Veterans Affairs)

Lower extremity amputations (LEAs) are frequently an unfortunate complication of type 2 diabetes and peripheral vascular disease. In 2006, over 1 million people in the U.S. had a LEA[1]; this number is predicted to double by 2050.[2] Studies of LEA and obesity have varied in methodology and time period. Some,[3, 4, 5] but not all[6] studies have found that obesity is more prevalent in persons with LEA than in the general population.[7] Obesity may adversely impact mobility, prosthesis fit and function,[8, 9] and quality of life, and exacerbate secondary conditions that are common among people with LEA, such as musculoskeletal pain, osteoarthritis, falls, and injuries.[10, 11, 12] In the general population, obesity can lead to reduced activity levels and a cascade of events such as increased wheelchair use, a more sedentary lifestyle, greater health care utilization and costs, reduced ability to live and function independently and increased burden on formal and informal caregivers.[13, 14]

In the general population, evidence-based guidelines for obesity treatment recommend comprehensive weight management programs (e.g., dietary modification, physical activity and behavioral counseling). However, weight control may be especially challenging for people with LEA because of additional barriers to performing physical activity[15, 16, 17, 18, 19]; consequently, it is likely that diet modification and behavioral counseling take on even greater prominence.[20]

The overarching goals of this study were to better understand the current dietary patterns, barriers to healthy eating habits, and weight loss strategies in this population in order to design and implement effective weight loss interventions for people with LEA. To accomplish these goals, we conducted a cross-sectional study of a population-based sample of veterans to determine the prevalence of weight loss intention, weight loss strategies, dietary patterns, and barriers to making dietary changes, and their associations with body mass index (BMI, kg/m^2), amputation characteristics, health status, and socioeconomic factors.

Methods

Study sample

The sampling frame included veterans who had a LEA at least 6 months prior to completing the questionnaire and at least one primary care visit in the previous 18 months (to increase the likelihood of a correct current address) at a Veteran Health Administration (VHA) facility in the Veterans Integrated Service Network (VISN) 20, which includes facilities in Washington, Oregon, Idaho, and Alaska. Potentially eligible individuals were identified using the VISN 20 Data Warehouse based on: 1) ICD-9 procedure codes (84.10–84.17), 2) prescription for a lower limb prosthesis or repair (L5000–L5341, L5999, L7500–7600, L8400–8410, L8417–8430, L8440–8460, L8470–8480, L8499), and/or 3) diagnosis of lower limb amputation (ICD-9 895.1, 896.0–896.3, 897.0–897.7 and V49.71–V49.76). The VA Puget Sound Institutional Review Board approved all study procedures. We randomly selected 400 individuals of the 2436 identified, with the aim of obtaining at least 150 completed questionnaires between June and November 2011. Individuals were mailed a pre-notification letter informing them about the study and allowing them to opt-out. Those who did not opt-out were mailed the survey. For non-responders, we mailed a reminder postcard, another copy of the survey and/or followed up by telephone.

The 28-page survey included questions on their amputation, physical activity, diet, weight and weight management, general health, and demographic characteristics.

General health

We assessed physical and mental health using the global health question items from the Patient Reported Outcomes Measurement Information System (PROMIS), with items scored on a 5-point scale (5 = excellent to 1 = poor)[21, 22] The 4-item physical health score assessed overall physical health, physical function, pain and fatigue. The 4-item mental health score assessed quality of life, mental health, satisfaction with social activities, and emotional problems. Raw scores were converted to T-scores, standardized to the U.S. population (mean of 50, standard deviation of 10) based on the methods described elsewhere.[23]

Lower extremity amputation (LEA) characteristics

We inquired about respondents' level of amputation on each leg, the reason for the amputation and the time since their initial amputation. The type of LEA was classified hierarchically into four categories based on the most proximal level of amputation: toe, partial foot/feet, transtibial, and transfemoral. Reason for amputation was dichotomized into trauma vs. not (all other causes).

Body mass index

Participants were asked to report their weight to the nearest pound and their height in feet and inches. We calculated a limb loss-adjusted body mass index (LLA-BMI, kg/m^2) as a proxy for body fat employing previously published methods that attempt to account for the weight difference due to the limb loss.[9, 24, 25] Briefly, this method assumes that limb weight is proportional to total body weight, and assigns a standard percentage of body weight loss for a given amputation level (e.g., 5% for a unilateral transtibial

amputation). This weight is then added to the self-reported weight. For participants who reported their body weight including their prosthesis, we first subtracted the average weight (based on prosthetists' expert opinion) of a transtibial (6 pounds) or transfemoral (12 pounds) prosthesis as appropriate, from their reported body weight.[9, 24, 25] We then used standard BMI cut-points to define normal weight (18.5–24.9 kg/m^2), overweight (25.0–29.9 kg/m^2), obese class I (30.0–34.9 kg/m^2) and class II+ (≥35.0 kg/m^2). Since a major focus of this study is evaluating dietary behaviors in relation to weight management, we excluded participants who were underweight based on an LLA-BMI <18.5 kg/m^2 (*n* = 5).

Indicators of dietary behaviors

Data on dietary behaviors were collected using an 8-item measure, "Starting The Conversation", which was developed to be a short dietary screener.[26] The 8 items are: frequency per day or week of consuming: 1) fast food meals or snacks; 2) fruit; 3) vegetables; 4) regular sodas or sweet tea; 5) beans, chicken or fish; 6) regular snack chips or crackers; 7) desserts and other sweets that are not low fat; and 8) use of margarine, butter, or meat fat to season vegetables or put on potatoes, bread, or corn.

Current weight management behaviors

Monitoring of weight was assessed by asking participants how frequently they weighed themselves or got weighed with 6 categories from "at least 1 time per day" to "one time per year or less frequently".[27] Participants were also asked if they were trying to lose weight now. For those who said "yes", they were asked to indicate which of the following their current weight loss plan included: 1) some form of dieting, 2) avoiding particular foods or food groups, 3) doing physical exercise, 4) using pre-packaged meals, 5) using meal replacements, 6) engaging in a comprehensive weight loss program with dietary changes, physical activity, and behavioral counseling, 7) keeping a log or journal for eating and exercise, 8) having a surgical weight loss procedure, 9) taking a prescription medication to lose weight, 10) taking an over the counter medication such as vitamins, minerals, or nutrient supplement, herbal supplement, naturopathic or alternative medicine preparation or supplement to lose weight, and "other, please specify".[28, 29, 30]

Barriers to changing eating habits

Participants indicated on a scale from 1 to 5 (1 being "not at all a barrier" and 5 being "very much a barrier") the degree to which the following factors got in the way of changing their eating habits: 1) eating food from restaurants, fast food places, convenience stores, or vending machines; 2) person who prepares my food is uncooperative; 3) too much high calorie food available at home or work; 4) too little time to prepare and eat healthy foods; 5) too little money to buy healthy foods; 6) access to healthy foods (for example, no transportation to a store that sells healthy foods); 7) feeling hungry much of the time; 8) habit – I'm used to eating a certain way; 9) difficulties such as stress or depression; 10) being with others who overeat; and 11) don't know how to start. Responses were dichotomized as reporting that the factor was a barrier (rating of 3–5) vs. not (ratings of 1–2). To determine overall barrier "burden", for each person, we counted the number of barriers he/she reported, and dichotomized number of barriers as ≥6 or <6. Six was chosen as a cut-point as it represented endorsement of approximately one standard deviation (2.9) above the mean (3.4) of the total number of barriers.

However, because the selection of a cut-point was not determined *a priori*, we conducted a sensitivity analysis utilizing 5 as the cut-point to assess the robustness of our findings.

Statistical analyses

Descriptive statistics including frequencies and proportions were compared across LLA-BMI categories and current weight loss intention. Continuous variables were summarized using medians and ranges. To assess associations between characteristics and trying to lose weight and reporting a high burden of barriers, we used relative risk (RR) regression, specifying a log-link, Poisson family, and robust standard error estimates.[31] We used RR regression because it allows direct calculation of RRs rather than odds ratios, which can differ substantially from RRs when the outcome (trying to lose weight) is common (conventionally described as >10%).[31] The Poisson family was chosen because estimating equations for Poisson regression are unbiased when the outcome variable is dichotomous.[31] We hypothesized *a priori* that age and LLA-BMI would be strongly associated with weight loss intention and potentially associated with the factors considered, e.g., hypertension, arthritis, physical health scores, and dietary behaviors. Similarly, we hypothesized that age, LLA-BMI and weight loss intention would be strongly associated with barriers to healthy eating and potentially associated with the demographic and health factors considered. Thus, to examine, for example, associations between physical health and weight loss intention, independent of age and LLA-BMI, analyses were adjusted for covariates. For ordered categorical variables (e.g., frequency of consuming fruit), we tested for trend across levels. As there was only a small amount of missing data, individuals with missing responses to questions were dropped from those analyses. Stata 13 (College Station, TX) was used to perform statistical analyses.

Results

Of the 400 individuals mailed a study invitation, 60 were determined to be ineligible (7 were deceased and 53 self-reported not having a LEA, presumably due to coding errors in the medical record). Of the 340 apparently eligible individuals, 161 individuals completed the survey. Of the remainder (n = 179), 11 were unable to be contacted because the letters were returned to sender with no forwarding address and no phone number, 85 actively declined participation and 83 did not respond after repeated contacts (47.4% response among presumed eligible). Of those who completed the survey, 11 were excluded from analyses (5 were underweight [LLA-BMI <18.5 kg/m^2], 3 had their amputation <6 months prior, and 3 did not provide weight and height information), leaving 150 for analyses.

Mean age of respondents was 66 years, 98% were male, 85% were White and 59% were married or were living with a spouse/partner (Table 1). Twenty-three percent of participants were normal weight, a third were overweight, 26% and 17% were obese class I and II or greater, respectively. In line with the descriptive aims of this study, here we highlight differences that were of a meaningful magnitude. Compared to normal weight individuals, a greater proportion of those classified as obese class II or greater were younger (age <65 years), had hypertension, arthritis, and diabetes. The pattern for heart disease was less straightforward, with the highest prevalences for those who were normal weight (43%) and obese class II or greater (46%) and lower self-reports among those who were overweight (32%) and obese class I (33%). Median physical health scores were somewhat lower in obese class II or greater individuals, but mental health scores were similar. There were no clear associations between level of

amputation or time since amputation and BMI category though a greater proportion of those who were normal weight had their amputation <2 years prior (29% vs. 18% or less in the other BMI groups). Of those who were obese class II or greater, 38% had their amputation 2–5 years prior, compared to 14%, 20%, and 8% among those who were normal weight, overweight, or obese class I.

Table 1Demographic, health, and amputation-related characteristics of people with lower extremity amputations, stratified by body mass index[a] category

Characteristics	Normal weight *N* = 35	Overweight *N* = 50	Obese, class I *N* = 39	Obese, class II+ *N* = 26
Body mass index[a,b] (kg/m^2)	22.7 (19.4, 24.8)	28.0 (25.1, 29.8)	32.1 (30.1, 34.3)	39.0 (35.2, 49.6)
Age				
<55	8.6%	10.2%	13.2%	20.0%
55–64	31.4%	36.7%	52.6%	44.0%
65–74	34.3%	34.7%	18.4%	20.0%
≥75	25.7%	18.4%	15.8%	16.0%
Race/ethnicity				
White	82.9%	86.0%	84.6%	84.6%
Other/missing[c]	17.1%	14.0%	15.4%	15.4%
Currently married or living with partner	60.0%	66.0%	55.3%	50.0%
Level of amputation				
Toe(s)	37.1%	14.0%	30.8%	30.8%
Partial foot	11.4%	10.0%	5.1%	7.7%
Transtibial	25.7%	50.0%	35.9%	38.5%
Through knee or transfemoral	25.7%	26.0%	28.2%	23.1%
Amputation due to trauma[d]	22.9%	46.0%	41.0%	30.8%
Years since amputation				
0.5 to <2	28.6%	2.0%	18.0%	3.9%
2 to <5	14.3%	20.0%	7.7%	38.5%
5–19	22.9%	28.0%	33.3%	34.6%
≥20	17.1%	36.0%	25.6%	15.4%
Missing	17.1%	14.0%	15.4%	7.7%
Median (range)	3.6 (0.5, 46)	12.4 (0.6, 47)	8.7 (0.7, 56)	5.7 (1.6, 41)
Health conditions and status				
Hypertension	60.0%	64.0%	64.0%	76.9%
Arthritis	51.4%	58.0%	53.9%	69.2%
Diabetes	57.1%	40.0%	59.0%	73.1%

High blood cholesterol	34.3%	46.0%	43.6%	38.5%
Heart disease	42.9%	32.0%	33.3%	46.2%
Physical health score[b]	34.9 (16, 45)	32.4 (16, 45)	34.9 (20, 45)	31.0 (16, 40)
Mental health score[b]	43.5 (28, 68)	45.8 (25, 59)	43.5 (21, 68)	45.8 (25, 63)

Normal weight: LLA-BMI = 18.5–24.9, Overweight: LLA-BMI = 25.0–29.9, Obese, Class I: LLA-BMI 30.0–34.9; Obese, Class II: LLA-BMI ≥35.0.

Age: 3 people missing (1 overweight, 2 obese).

Percentages are presented unless otherwise indicated.

aBody mass index adjusted for limb loss; see Methods for details.
bValues presented are median (range).
c2 people were missing for race.
dNon-traumatic includes vascular disease, infection, cancer and other.

Table 2 presents demographic, health, and amputation-related characteristics among those not trying (*n* = 78, 52.3%) and trying to lose weight (*n* = 71, 47.7%), excluding one person who did not answer this question. LLA-BMI was strongly associated with trying to lose weight. Of the 35 veterans with normal weight, only 4 (11%) were trying to lose weight, while 20 (80%) of the 25 with LLA-BMI ≥ 35, were trying to lose weight. Additionally, age <55 (vs. 55–64) and higher physical and mental health scores were positively associated with trying to lose weight, as shown in Table 2.

Table 2Demographic, health, and amputation-related characteristics of people with lower extremity amputations, stratified by weight loss intention

	Trying to lose weight currently?				**Age- and BMI[a]-adjusted associations with trying to lose weight**	
	No (*N* = 78, 52.3%)		**Yes (*N* = 71, 47.7%)**			
	N	**%**	***N***	**%**	**RR**	**95% CI**
Body mass index[a] (kg/m^2)						
18.5 to <25	31	39.7	4	5.6	1.0	Ref
25–29.9	26	33.3	24	33.8	4.2	1.6, 11**
30–34.9	16	20.5	23	32.4	5.4	2.1, 14***
≥35	5	6.4	20	28.2	6.7	2.6, 17***
Age (years)						
<55	4	5.3	14	20.0	1.7	1.2, 2.4**
55–64	34	44.7	26	37.1	1.0	Ref
65–74	20	26.3	21	30.0	1.4	0.97, 2.0

≥75	18	23.7	8	12.9	0.93	0.54, 1.6
Race/ethnicity						
White	69	88.5	57	80.3	1.0	Ref
Other/missing	9	11.5	14	19.7	1.3	0.91, 1.8
Currently married or living with partner						
No	30	39.0	30	42.3	1.0	Ref
Yes	47	61.0	41	57.8	1.1	0.78, 1.4
Level of amputation						
Toe(s)	22	28.2	17	23.9	1.0	Ref
Partial foot	8	10.3	5	7.0	0.91	0.44, 1.9
Transtibial	28	35.9	30	42.3	1.1	0.73, 1.7
Transfemoral	20	25.6	19	26.8	1.2	0.80, 1.8
Amputation due to trauma						
No[b]	51	65.4	43	60.6	1.0	Ref
Yes	27	34.6	28	39.4	1.0	0.73, 1.4
Years since amputation						
0.5 to <2	11	14.1	8	11.3	1.0	0.63, 1.7
2 to <5	11	14.1	16	22.5	0.87	0.54, 1.7
5–19	25	32.1	19	26.8	0.68	0.44, 1.0
≥20	18	23.1	20	28.2	1.0	Ref
Missing	13	16.7	8	28.2	0.81	0.44, 1.5
Hypertension						
No	29	37.2	23	32.4	1.0	Ref
Yes	49	62.8	48	67.6	1.0	0.72, 1.4
Arthritis						
No	39	50.0	25	35.2	1.0	Ref
Yes	39	50.0	46	64.8	1.3	0.93, 1.8
Diabetes						
No	33	42.3	35	49.3	1.0	Ref
Yes	45	57.7	36	50.7	0.81	0.60, 1.1
High blood cholesterol						
No	44	56.4	43	60.6	1.0	Ref
Yes	34	43.6	28	39.4	0.85	0.62, 1.2
Heart disease						
No	44	56.4	49	69.0	1.0	Ref
Yes	34	43.6	22	31.0	0.75	0.53, 1.0
Physical health score[c]	32.4	16, 45	34.9	16, 45	1.37	1.1, 1.7**
Mental health score[c]	43.5	28, 68	45.8	21, 68	1.20	1.0, 1.4*

Note: 1 person did not answer the question on current weight loss intention. Total number included in analyses is a maximum of 149; 3 people were missing for age and 3 different people were missing for mental health score; Row percentages are presented.

Values presented are *N* (%) or are medians (ranges) where specified.

*$p < 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$.

aBody mass index adjusted for limb loss; see methods for details. BMI adjusted for age only and age adjusted only for BMI.
bReference category includes amputations due to vascular disease, infection, cancer and other.
cValues presented are medians (ranges). In regression analyses, centered means were used and the RR represents a 10-point (= 1 standard deviation) change. Higher scores indicate better health.

Table 3 presents dietary and weight monitoring behaviors stratified by weight loss intention. Individuals who were trying to lose weight reported more frequently consuming vegetables and beans, chicken, or fish compared to individuals not trying to lose weight. Among those trying to lose weight, less than half were weighing themselves at least weekly and a third were weighing themselves less than once per month.

Table 3Associations between dietary behaviors[a], weight monitoring, and trying to lose weight

Characteristics	Trying to lose weight currently?				Age- and BMI[b]-adjusted associations with trying to lose weight	
	No (*N* = 78)		Yes (*N* = 71)			
	N	%	*N*	%	RR	95% CI
Fast foods meals/snacks per week					*p-trend*	*0.65*
<1	36	46.8	29	41.4	1.4	0.71, 2.7
1–3	34	44.2	37	52.9	1.4	0.73, 2.8
≥4	7	9.1	4	5.7	1.0	Ref
Servings per day of fruit					*p-trend*	*0.55*
≥5	5	6.4	6	8.6	1.4	0.84, 2.4
3–4	25	32.1	17	24.3	0.95	0.65, 1.4
≤2	48	61.5	47	67.1	1.0	Ref
Servings per day of vegetables					*p-trend*	*0.011**
≥5	11	14.1	11	15.7	1.7	1.1, 2.6*
3–4	33.3	45.6	31	44.3	1.3	0.96, 1.9
≤2	41	52.6	28	40.0	1.0	Ref
Servings per day of regular sodas/sweet tea					*p-trend*	*0.51*

<1	46	59.0	52	74.3	1.0	0.63, 1.6
1–2	20	25.6	10	14.3	0.71	0.37, 1.4
≥3	12	15.4	8	11.4	1.0	Ref
Servings per week of bean, chicken or fish					*p-trend*	*<0.001***
≥3	28	35.9	35	50.0	3.1	1.5, 6.5**
1–2	32	41.0	30	42.9	1.6	1.0, 5.0*
<1	18	23.1	5	7.1	1.0	Ref
Times per week consumed regular snack chips or crackers					*p-trend*	*0.71*
≤1	43	55.1	40	57.1	1.3	0.45, 3.6
2–3	29	37.2	27	38.6	1.6	0.54, 4.5
≥4	6	7.7	3	4.3	1.0	Ref
Times per week consumed desserts or other sweets (not the low-fat kind)					*p-trend*	*0.64*
≤1	41	52.6	33	47.1	1.0	0.68, 1.5
2–3	26	33.3	23	32.9	0.80	0.50, 1.3
≥4	11	14.1	14	20.0	1.0	Ref
Amount of margarine, butter or meat fat used to season vegetables or put on potatoes, bread, or corn					*p-trend*	*0.68*
Very little	27	34.6	32	45.7	1.0	0.65, 1.6
Some	43	55.1	28	40.0	0.86	0.52, 1.4
A lot	8	10.3	10	1	1.0	Ref
Frequency of weighing					*p-trend*	*0.18*
≥1 time/week	23	29.5	32	45.1	1.4	0.72, 2.7
1 times/week-1/month	20	25.6	14	19.7	1.1	0.53, 2.1
2–10 times per year	24	30.8	18	25.4	1.1	0.56, 2.1
≤1 time per year	11	14.1	7	9.9	1.0	Ref

*$p < 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$.

a"Starting the conversation" is the source for the questions on dietary consumption.[26]
bBody mass index adjusted for limb loss; see Methods for details. BMI adjusted for age only and age adjusted only for BMI.

The most commonly reported weight loss strategies were eating differently (83%), avoiding particular foods or food groups (78%), and physical exercise (54%, Table 4). Less than 10% of individuals reported using meal replacements, pre-packaged meals, a comprehensive weight loss program, or keeping a log of their eating and exercise. No individuals reported taking

prescription weight loss medication or having bariatric surgery. When considering variation by BMI category, we found that a smaller proportion of individuals with obesity class II or greater (35%) reported exercising than those in the other BMI groups (50%, 58%, and 65% among those who were normal weight, overweight, or obese class I, respectively), but obesity class II+ individuals more frequently used meal replacements and a comprehensive weight loss program compared to other groups.

Table 4Weight loss strategies for those trying to lose weight currently (*n* = 71) by LLA-BMI[a] category

Current weight loss plan includes	Normal weight *N* = 4 %	Overweight *N* = 24 %	Obese, class I *N* = 23 %	Obese, class II+ *N* = 20 %	Total *N*	Total %
Individual factors						
Eating differently (dieting)	100.0	75.0	82.6	90.0	59	83.1
Avoiding particular foods or food groups	75.0	75.0	78.3	80.0	55	77.5
Physical exercise	50.0	58.3	65.2	35.0	38	53.5
Taking over-the-counter weight loss medication	25.0	25.0	8.7	30.0	15	21.1
Meal replacements[b]	0.0	8.3	8.7	15.0	7	9.9
Pre-packaged meals	0.0	16.7	8.7	0.0	6	8.5
A comprehensive weight loss program	0.0	4.2	4.4	15.0	5	7.0
Keeping a log or journal for eating or exercise	0.0	8.3	0.0	10.0	4	5.6
Taking prescription weight loss medication	0.0	0.0	0.0	0.0	0	0.0
Combinations of factors						
Eating differently or avoid particular foods/food groups + physical exercise	50.0	58.3	65.2	35.0	38	53.5
Eating differently or avoid particular foods/food groups + taking over-the-counter weight loss medication	25.0	25.0	8.7	30.0	15	21.1
Taking over-the-counter weight loss medication + physical exercise	25.0	20.8	8.7	0.0	8	11.3

Normal weight: LLA-BMI = 18.5–24.9; Overweight: LLA-BMI = 25.0–29.9; Obese, Class I: LLA-BMI = 30.0–34.9; Obese, Class II: LLA-BMI ≥35.0.

aBody mass index adjusted for limb loss; see Methods for details.
bMeal replacements include bars, powder, liquid, tablet/pill or water forms.

The most commonly reported barriers to changing eating patterns were habit (51%), too little money (44%), stress/depression (41%), too little time (34%), and too much high calorie food at work and home (33%, Fig. 1); the proportion reporting barriers to changing eating habits were similar among those trying and not trying to lose weight.

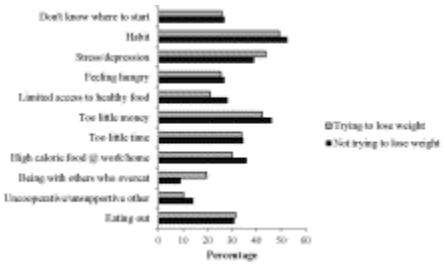

Fig. 1

Percent reporting factor was a barrier to changing eating habits (rated 3–5), by whether they were trying to lose weight.

Approximately 21% of participants reported ≥6 barriers to changing their eating habits (Table 5). Those 65–74 years of age (vs. the reference group of 55–64 years) and with higher physical and mental health scores more frequently reported *fewer than* 6 barriers (corresponding to a RR < 1); conversely, age <55 years, arthritis, and diabetes more frequently reported a ≥6 barriers (RR > 1). To assess the robustness of our findings, we re-analyzed our data using a cut-point of 5 barriers. Findings did not change importantly for the associations of physical and mental health scores and diabetes. However, a "high" number of barriers was no longer associated with age or arthritis. Instead, trying to lose weight (RR = 0.55, 95% CI: 0.34–0.90) was inversely associated, and BMI≥35 kg/m^2 (vs. the reference category of 18.5–24.9; RR = 3.1, 95% CI: 1.5-6.4) was positively associated with a "high" burden of barriers.

Table 5Factors associated with barriers to changing eating habits

Characteristic	≥6 barriers to changing eating				Adjusted[a] associations with ≥6 barriers to changing eating habits	
	No (*N* = 117)		Yes (*N* = 32)			
	N	%	*N*	%	RR	95% CI
Trying to lose weight						
No	60	51.3	18	56.3	1.0	Ref
Yes	57	48.7	14	43.8	0.52	0.26, 1.03
Body mass index[b] (kg/m^2)						
18.5–24.9	30	25.4	5	15.6	1.0	Ref
25–29.9	40	33.9	10	31.3	1.6	0.64, 4.2
30–34.9	29	24.6	10	31.3	1.7	0.63, 4.4

≥35	19	16.1	7	21.9	1.9	0.58, 5.9
Age (years)						
<55	9	7.7	9	30.0	2.3	1.2, 4.7*
55–64	44	37.6	16	53.3	1.0	Ref
65–74	38	32.5	3	10.0	0.31	0.10, 0.99*
≥75	26	22.2	2	6.7	0.28	0.07, 1.1
Race/ethnicity						
White	101	85.6	26	81.3	1.0	Ref
Other/missing	17	14.4	6	18.8	1.5	0.65, 3.3
Currently married or living with partner						
No	47	39.8	14	45.2	1.0	Ref
Yes	71	60.2	17	54.8	1.0	0.54, 1.9
Level of amputation						
Toe(s)	30	25.4	10	31.3	1.0	Ref
Partial foot	10	8.5	3	9.4	1.2	0.37, 4.0
Transtibial	46	39.0	12	37.5	0.76	0.37, 1.5
Transfemoral	32	27.1	7	21.9	0.51	0.18, 1.5
Amputation due to trauma						
No	72	61.0	23	71.9	1.0	Ref
Yes	46	39.0	9	28.1	0.59	0.31, 1.2
Time since amputation						
6 months to <2 years	14	11.9	5	15.6	1.8	0.55, 5.8
2 to <5 years	19	16.1	9	28.1	1.7	0.73, 4.1
5–19 years	37	31.4	7	21.9	0.81	0.32, 2.1
≥20 years	31	26.3	7	21.9	1.0	Ref
Missing	17	14.4	4	12.5	0.89	0.24, 3.2
Median (range)	8.9	0.5, 56	4.6	0.5, 45	–	–
Hypertension						
No	41	34.8	11	34.4	1.0	Ref
Yes	77	65.3	21	65.6	1.2	0.59, 2.3
Arthritis						
No	55	46.6	9	28.1	1.0	Ref
Yes	63	53.4	23	71.9	2.4	1.3, 4.6**
Diabetes						
No	59	50.0	9	28.1	1.0	Ref
Yes	59	50.0	23	71.9	2.5	1.3, 4.7**
High blood cholesterol						

No	71	60.2	17	53.1	1.0	Ref
Yes	47	39.8	15	46.9	1.6	0.83, 2.9
Heart disease						
No	75	63.6	19	59.4	1.0	Ref
Yes	43	36.4	13	40.6	1.4	0.79, 2.6
Physical health score[c]	34.9	16, 45	28.2	16, 40	0.92	0.88, 0.95***
Mental health score[c]	45.8	25, 68	37.6	21, 59	0.93	0.90, 0.97***

*$p < 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$.

Values presented are *N* (%) or are medians (ranges) where specified.

[a]Models are adjusted for trying to lose weight (yes/no), age, and limb loss-adjusted body mass index, except for these three variables, which were adjusted only for the other two (i.e., the RR for trying to lose weight was adjusted only for age and LLA-BMI).
[b]Body mass index adjusted for limb loss; see Methods for details.
[c]Values presented are medians (ranges). Higher scores indicate better health.

Discussion

The study surveyed veterans with lower extremity amputations regarding weight loss intentions, dietary behaviors and perceptions, and current weight management strategies. Three-quarters of individuals in this primarily older male cohort were overweight or obese and a large percentage of the participants had some obesity-related condition (e.g., diabetes and hypertension). Nearly half reported that they were trying to lose weight, and the percentage trying to lose weight was especially high among those who were obese and younger. National surveys conducted in the general population have observed similar rates (38–65% of women and 24–44% of men were trying to lose weight).[32, 33, 34] More recent surveys tended to report higher frequencies than older surveys.[32, 33, 34]

To inform weight management interventions for this population, we collected information and assessed associations between characteristics and weight loss intentions and barriers to changing eating habits. Physical activity barriers have been reported elsewhere.[35] In addition to younger age and greater LLA-BMI, those with better physical and mental health scores were more likely to report trying to lose weight. Prior studies have determined that health-related quality of life (HRQOL) plays a role in an individual's decision to try to lose weight. Bish and colleagues found that moderate HRQOL among men and better HRQOL among women were associated with trying to lose weight.[36] The authors hypothesized that men may link poor health to greater body weight and try to lose weight based on their self-evaluation. Conversely, women with good health were half as likely to try to lose weight as women who reported excellent/very good health. In a qualitative study, participants reported that trying to lose weight is time-consuming

and requires effort.[37] The motivation to lose weight may be lacking in individuals burdened with poor HRQOL, providing a possible explanation for our findings and those in women in the study by Bish et al. It is notable as well, that physical health scores in the current study were substantial lower than the general population mean, and thus it is hard to conjecture how findings from studies in the general population might apply to the population under study. It may be that "low/moderate" HRQOL in prior studies corresponds with better HRQOL in this population. Future studies are needed to further explore this question.

Data from this study, however, also indicate that despite weight loss intentions, few followed a comprehensive program to lose weight. The two dietary behaviors that emerged as being associated with weight loss intention were more frequently eating vegetables and leaner protein such as chicken and fish. In exploratory analyses that compared dietary patterns in those trying to lose weight who reported avoiding certain foods or food groups as their weight loss strategy, we found no differences in consumption patterns (data not presented). Furthermore, one in 5 individuals with a BMI $\geq$35 kg/m^2 reported taking over-the-counter weight loss medication, exceeding estimates in the general population of approximately 11%.[38] Since many weight loss medications or supplements have no proven long-term benefit and may cause harm,[39] care providers should be aware of such intake, recognizing that these medications or supplements may adversely interact with other prescription medications. After 'habit', two of the most frequently cited barriers to changing eating behaviors were lack of money and stress/depression. As this population was lower income, it may be especially important to teach individuals how to eat a healthier diet on a limited budget. Additionally, treating depression and teaching individuals how to cope with stressors that do not involve eating will be essential.

This study should be interpreted in light of several limitations. While our response rate is good for a mailed survey and exceeded that of nearly all other similar studies in people with LEA,[40, 41, 42, 43] about half of selected individuals did not participate. As survey respondents may differ from non-respondents, it is not clear if our findings can generalize to all VA patients with LEA. Our sample reflects the typical age, sex, and race distribution of Veterans who receive their care at the VHA.[44] Global and physical health scores were nearly 2 standard deviations below the general population mean, while mental health scores were about a half standard deviation below the general population mean,[22, 45] indicating that our study population was not especially healthy. Because we sampled a VA population, participants were primarily older White men. Thus, our findings may not generalize to women or younger men of non-white race. Furthermore, approximately 1 in 8 people whom we identified as having a LEA informed us that they did not have a LEA, indicating that some ICD-9 codes (e.g., "V" codes) and prosthetic codes may have led to misclassification, a problem with administrative data that has been reported for other diseases and conditions.[46, 47, 48] While we are confident that those who participated in the study did have an LEA, this misclassification makes it more difficult to estimate the true response rate to our survey. Additionally, weight and height, along with other measures, were self-reported, resulting in potential over or under-reporting. We used published formulas to estimate BMI adjusted for limb loss ("LLA-BMI"), but these formulas rely on certain assumptions and likely introduce some error in classifying people as overweight and obese. To reduce participant burden, we did not include a comprehensive dietary assessment in this survey. Instead, we focused on markers of more or less healthy dietary patterns. We also did not ask people why they were trying to change eating patterns. While some may have been trying to eat differently to lose

weight, others may have been eating differently to control their diabetes or hypertension or for other reasons. More information about their reasons for wanting to make changes would have been helpful.

Conclusions

This study attempted to address a gap in what is known about the dietary habits of persons with LEA who are overweight/obese or are trying to lose weight, a topic about which little is known. Notwithstanding the limitations described above, these data indicate that many persons with LEA are interested in losing weight, and most who are trying to lose weight are not using a comprehensive weight management program. Secondary prevention of obesity-related conditions in this population is of great importance to maximize physical functioning and social participation. Although diet modification is central to a comprehensive weight loss plan, it takes on even greater importance for people with mobility impairments.[20] Future weight loss interventions should target individuals soon after they have recovered from their amputation, to prevent weight gain and to ensure healthy habits are learned and maintained. A small but growing body of evidence indicates that modest (4–8%) weight loss can be achieved in overweight, older adults with disabilities using comprehensive programs involving self-management, exercise, and diet, and, more importantly, that such programs can improve functional outcomes.[49, 50, 51, 52] Because individuals with LEA may face some unique challenges to weight management, future studies of weight management are needed to inform programs and policies for this population. This information will be especially important to institutions like the VHA, which treats a large number of people with LEA. Nevertheless, as the number of people with LEA is expected to grow,[2] understanding how best to intervene in this population will also be of interest to a wide audience.

References

1. Adams, P.F., Hendershot, G.E., and Marano, M.A. Current estimates from the National Health Interview Survey, 1996. (Data from the National Health Survey) (Epub 2005/03/24)Vital Health Stat Ser 10. 1999; : 1–203

2. Ziegler-Graham, K., MacKenzie, E.J., Ephraim, P.L., Travison, T.G., and Brookmeyer, R. Estimating the prevalence of limb loss in the United States: 2005 to 2050. (Epub 2008/02/26)Arch Phys Med Rehabil. 2008; 89: 422–429

3. Kurdibaylo, S.F. Obesity and metabolic disorders in adults with lower limb amputation. (Epub 1996/10/01)J Rehabil Res Dev. 1996; 33: 387–394

4. Rose, H.G., Schweitzer, P., Charoenkul, V., and Schwartz, E. Cardiovascular disease risk factors in combat veterans after traumatic leg amputations. (Epub 1987/01/01)Arch Phys Med Rehabil. 1987; 68: 20–23

5. Tzamaloukas, A.H., Patron, A., and Malhotra, D. Body mass index in amputees. (Epub 1994/07/01)JPEN J Parenter Enteral Nutr. 1994; 18: 355–358

6. Modan, M., Peles, E., Halkin, H. et al. Increased cardiovascular disease mortality rates in traumatic lower limb amputees. (Epub 1998/12/01)Am J Cardiol. 1998; 82: 1242–1247

7. Ogden, C.L., Carroll, M.D., Kit, B.K., and Flegal, K.M. Prevalence of childhood and adult obesity in the United States, 2011-2012. (Epub 2014/02/27)JAMA. 2014; 311: 806–814

8. Kulkarni, J., Hannett, D.P., and Purcell, S. Bariatric amputee: a growing problem?. (Epub 2014/03/29)Prosthet Orthot Int. 2014; : 1–6

9. Rosenberg, D.E., Turner, A.P., Littman, A.J. et al. Body mass index patterns following dysvascular lower extremity amputation. (Epub 2012/10/26)Disabil Rehabil. 2013; 35: 1269–1275

10. Gailey, R., Allen, K., Castles, J., Kucharik, J., and Roeder, M. Review of secondary physical conditions associated with lower-limb amputation and long-term prosthesis use. (Epub 2008/06/21)J Rehabil Res Dev. 2008; 45: 15–29

11. Naschitz, J.E. and Lenger, R. Why traumatic leg amputees are at increased risk for cardiovascular diseases. (Epub 2008/02/19)QJM. 2008; 101: 251–259

12. Coffey, L., Gallagher, P., Horgan, O., Desmond, D., and MacLachlan, M. Psychosocial adjustment to diabetes-related lower limb amputation. (Epub 2009/11/11)Diabet Med. 2009; 26: 1063–1067

13. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in Adults–The evidence report. National Institutes of health. Obes Res. 1998; 6: 51S–209S

14. Fabricatore, A.N. and Wadden, T.A. Obesity. (Epub 2007/08/25)Annu Rev Clin Psychol. 2006; 2: 357–377

15. Gailey, R., McFarland, L.V., Cooper, R.A. et al. Unilateral lower-limb loss: prosthetic device use and functional outcomes in service members from Vietnam war and OIF/OEF conflicts. (Epub 2010/08/31)J Rehabil Res Dev. 2010; 47: 317–331

16. Gallagher, P., O'Donovan, M.A., Doyle, A., and Desmond, D. Environmental barriers, activity limitations and participation restrictions experienced by people with major limb amputation. (Epub 2011/09/23)Prosthet Orthot Int. 2011; 35: 278–284

17. Laferrier, J.Z., McFarland, L.V., Boninger, M.L., Cooper, R.A., and Reiber, G.E. Wheeled mobility: factors influencing mobility and assistive technology in veterans and service members with major traumatic limb loss from Vietnam war and OIF/OEF conflicts. (Epub 2010/08/31)J Rehabil Res Dev. 2010; 47: 349–360

18. Schooley, B.L., Horan, T.A., Lee, P.W., and West, P.A. Rural veteran access to health care services: investigating the role of information and communication technologies in overcoming spatial barriers. (Epub 2010/08/11)Perspect Health Inf Manag. 2010; 7: 1f

19. Schoppen, T., Boonstra, A., Groothoff, J.W., de Vries, J., Goeken, L.N., and Eisma, W.H. Employment status, job characteristics, and work-related health experience of people with a lower limb amputation in The Netherlands. (Epub 2001/03/10)Arch Phys Med Rehabil. 2001; 82: 239–245

20. Fox, M.H., Witten, M.H., and Lullo, C. Reducing obesity among people with disabilities. (Epub July 12, 2013)J Disabil Policy Stud. 2013; : 1–11

21. Reeve, B.B., Hays, R.D., Bjorner, J.B. et al. Psychometric evaluation and calibration of health-related quality of life item banks: plans for the Patient-Reported Outcomes Measurement Information System (PROMIS). (Epub 2007/04/20)Med Care. 2007; 45: S22–S31

22. Hays, R.D., Bjorner, J.B., Revicki, D.A., Spritzer, K.L., and Cella, D. Development of physical and mental health summary scores from the patient-reported outcomes measurement information system (PROMIS) global items. (Epub 2009/06/23)Qual Life Res. 2009; 18: 873–880

23. Revicki, D.A., Kawata, A.K., Harnam, N., Chen, W.H., Hays, R.D., and Cella, D. Predicting EuroQol (EQ-5D) scores from the patient-reported outcomes measurement information system (PROMIS) global items and domain item banks in a United States sample. (Epub 2009/05/28)Qual Life Res. 2009; 18: 783–791

24. Durkin, J.L. and Dowling, J.J. Analysis of body segment parameter differences between four human populations and the estimation errors of four popular mathematical models. (Epub 2003/09/13)J Biomech Eng. 2003; 125: 515–522

25. Osterkamp, L.K. Current perspective on assessment of human body proportions of relevance to amputees. (Epub 1995/02/01)J Am Diet Assoc. 1995; 95: 215–218

26. Paxton, A.E., Strycker, L.A., Toobert, D.J., Ammerman, A.S., and Glasgow, R.E. Starting the conversation performance of a brief dietary assessment and intervention tool for health professionals. (Epub 2010/12/15)Am J Prev Med. 2011; 40: 67–71

27. Butryn, M.L., Phelan, S., Hill, J.O., and Wing, R.R. Consistent self-monitoring of weight: a key component of successful weight loss maintenance. (Epub 2008/01/17)Obesity (Silver Spring). 2007; 15: 3091–3096

28. ([text]) ([cited 2013 June 2013]; November 2005: Available from:)VA. MOVE! Weight Management Program. Clinical Reference Manual. VA National Center for Health Promotion and Disease Prevention, ; 2005

    http://www.move.med.va.gov

29. Dahn, J.R., Fitzpatrick, S.L., Llabre, M.M. et al. Weight management for veterans: examining change in weight before and after MOVE!. (Epub 2010/12/04)Obesity (Silver Spring). 2011; 19: 977–981

30. Kinsinger, L.S., Jones, K.R., Kahwati, L. et al. Design and dissemination of the MOVE! Weight-Management Program for Veterans. (Epub 2009/06/17)Prev Chronic Dis. 2009; 6: A98

31. Lumley, T., Kronmal, R., and Ma, S. Relative Risk Regression in Medical Research: Models, Contrasts, Estimators, and Algorithms. (UW Biostatistics Working Paper Series) (Paper 293); 2006: 1–24

32. Yaemsiri, S., Slining, M.M., and Agarwal, S.K. Perceived weight status, overweight diagnosis, and weight control among US adults: the NHANES 2003–2008 Study. (Epub 2010/11/03)Int J Obes (Lond). 2011; 35: 1063–1070

33. Andreyeva, T., Long, M.W., Henderson, K.E., and Grode, G.M. Trying to lose weight: diet strategies among Americans with overweight or obesity in 1996 and 2003. (Epub 2010/03/27)J Am Diet Assoc. 2010; 110: 535–542

34. Kruger, J., Galuska, D.A., Serdula, M.K., and Jones, D.A. Attempting to lose weight: specific practices among U.S. adults. (Epub 2004/05/29)Am J Prev Med. 2004; 26: 402–406

35. Littman, A.J., Boyko, E.J., Thompson, M., Haselkorn, J.K., Sangeorzan, B.J., and Arterburn, D.E. Physical activity barriers and enablers in older Veterans with a lower extremity amputation. J Rehabil Res Dev. 2014; 51: 895–906

36. Bish, C.L., Michels Blanck, H., Maynard, L.M., Serdula, M.K., Thompson, N.J., and Kettel Khan, L. Health-related quality of life and weight loss among overweight and obese U.S. adults, 2001 to 2002. (Epub 2006/12/01)Obesity (Silver Spring). 2006; 14: 2042–2053

37. Brink, P.J. and Ferguson, K. The decision to lose weight. (Epub 1998/02/25)West J Nurs Res. 1998; 20: 84–102

38. Blanck, H.M., Serdula, M.K., Gillespie, C. et al. Use of nonprescription dietary supplements for weight loss is common among Americans. (Epub 2007/02/28)J Am Diet Assoc. 2007; 107: 441–447

39. Pittler, M.H. and Ernst, E. Dietary supplements for body-weight reduction: a systematic review. (Epub 2004/03/31)Am J Clin Nutr. 2004; 79: 529–536

40. Deans, S.A., McFadyen, A.K., and Rowe, P.J. Physical activity and quality of life: a study of a lower-limb amputee population. (Epub 2008/06/24)Prosthet Orthot Int. 2008; 32: 186–200

41. Burger, H. and Marincek, C. The life style of young persons after lower limb amputation caused by injury. (Epub 1997/04/01)Prosthet Orthot Int. 1997; 21: 35–39

42. Kars, C., Hofman, M., Geertzen, J.H., Pepping, G.J., and Dekker, R. Participation in sports by lower limb amputees in the Province of Drenthe, The Netherlands. (Epub 2009/12/02)Prosthet Orthot Int. 2009; 33: 356–367

43. Kegel, B., Webster, J.C., and Burgess, E.M. Recreational activities of lower extremity amputees: a survey. (Epub 1980/06/01)Arch Phys Med Rehabil. 1980; 61: 258–264

44. National Center for Veterans Analysis and Statistics. VA Benefits & Health Care Utilization. ([cited 2013 April 29]; Available from:); 2013

http://www.va.gov/VETDATA/docs/Quickfacts/Winter_13_sharepoint.pdf

45. Fries, J.F., Bruce, B., and Cella, D. The promise of PROMIS: using item response theory to improve assessment of patient-reported outcomes. (Epub 2005/11/09)Clin Exp Rheumatol. 2005; 23: S53–S57

46. Hou, J.K., Tan, M., Stidham, R.W. et al. Accuracy of diagnostic codes for identifying patients with ulcerative colitis and Crohn's disease in the veterans affairs health care system. (Epub 2014/05/13)Dig Dis Sci. 2014; 59: 2406–2410

47. Chung, C.P., Rohan, P., Krishnaswami, S., and McPheeters, M.L. A systematic review of validated methods for identifying patients with rheumatoid arthritis using administrative or claims data. (Epub 2013/12/18)Vaccine. 2013; 31: K41–K61

48. Nehra, M.S., Ma, Y., Clark, C., Amarasingham, R., Rockey, D.C., and Singal, A.G. Use of administrative claims data for identifying patients with cirrhosis. (Epub 2012/10/24)J Clin Gastroenterol. 2013; 47: e50–e54

49. Chen, Y., Henson, S., Jackson, A.B., and Richards, J.S. Obesity intervention in persons with spinal cord injury. (Epub 2005/08/17)Spinal Cord. 2006; 44: 82–91

50. Rejeski, W.J., Marsh, A.P., Chmelo, E., and Rejeski, J.J. Obesity, intentional weight loss and physical disability in older adults. (Epub 2009/11/20)Obes Rev. 2010; 11: 671–685

51. Villareal, D.T., Miller, B.V. 3rd, Banks, M., Fontana, L., Sinacore, D.R., and Klein, S. Effect of lifestyle intervention on metabolic coronary heart disease risk factors in obese older adults. (Epub 2006/12/13)Am J Clin Nutr. 2006; 84: 1317–1323

52. Miller, G.D., Nicklas, B.J., Davis, C., Loeser, R.F., Lenchik, L., and Messier, S.P. Intensive weight loss program improves physical function in older obese adults with knee osteoarthritis. (Epub 2006/08/11)Obesity (Silver Spring). 2006; 14: 1219–1230

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