Self-Reported Body Weight Changes, Perceptions, and Weight Loss Techniques among Stroke Survivors

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Background: Little is known about the body weight goals and trends of stroke survivors, despite evidence that overweight and obesity can negatively influence poststroke rehabilitation outcomes. Thus, the purpose of this study was to identify self-reported body weight trends over time in stroke survivors and nonstroke controls (>50 years old) and describe the methods used to attempt to achieve body weight goals. *Methods:* Self-reported body weight 1) at age 25 years, 2) 10 years prior to the current assessment, 3) 1 year prior to the current assessment, 4) current weight, and 5) age of heaviest body weight were collected from adults self-reporting a stroke in the 2011-2012 and 2013-2014 National Health and Nutrition Examination Surveys (stroke: N = 387 and nonstroke: N = 5085). Questionnaires were used to assess body weight goals and weight loss techniques during the previous year. *Results:* Of the stroke survivors, 54% reported that their heaviest weight occurred after their stroke. Approximately 70% of stroke and nonstroke were overweight or obese. Only 24% of stroke survivors reported trying to lose weight compared with 35% of nonstroke, with only 10%-15% successful (≥5% body weight loss), during the past year. Popular weight loss methods in both groups included eating less, exercising, and eating more fruits/vegetables. The majority of stroke survivors report their heaviest weight after their stroke and a desire to weigh less; however, few report successful weight loss. *Conclusions:* Future research is needed to identify optimal body weight and ways to incorporate preferred methods of lifestyle modification, including diet and exercise, to promote weight management in stroke survivors.

Key Words: Body weight trends—weight loss—stroke survivor—obesity
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Introduction

Stroke is the leading cause of long-term disability in the United States.[1] Currently an estimated 6.6 million Americans have survived a stroke, and thus face the possibility of debilitating consequences, such as impairments in physical function,[2] cognition,[3,4] and vision.[5] These consequences often result in physical inactivity and deconditioning,[6,7] ultimately contributing to weight gain and obesity. In fact, the prevalence of overweightness and obesity in stroke survivors is 1.2 times greater than that observed in the general population.[4] It is well-known that being overweight or obese has negative consequences on physical and metabolic functioning in able-bodied adults,[8] but the effect on recovery outcomes poststroke is less clear.

Studies examining the effects of overweightness and obesity on poststroke outcomes have demonstrated lower rates of recurrent stroke[9,10] and cardiovascular and all-cause mortality,[11,12] suggesting that being above normal body weight may have protective effects. However, the majority of these studies examine baseline body weight as predictors rather than weight change dynamics. Importantly, this poststroke obesity paradox is not universally observed.[13,14] In fact, studies have demonstrated that overweight and obese adults with a history of cardiovascular disease, including stroke, who maintain a 5 kg

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weight loss 12 months after a 6-week intentional, pharmacotherapy-induced weight loss phase, have a reduced risk of cardiovascular mortality.[15] Furthermore, studies have found that stroke rehabilitation is less effective in overweight patients, and even less effective in those who are obese.[16,17] Thus, there is at least some evidence that achieving and maintaining a normal weight after stroke may be associated with better long-term recovery. However, research into weight change after stroke is lacking, and surprisingly little is known about body weight goals and weight management strategies of stroke survivors.

The purpose of this study is to identify self-reported changes in body weight across time in stroke survivors and to describe the methods used to attempt to achieve body weight goals. We address the following 3 research questions: (1) Does body weight change over time in adult stroke survivors? (2) What are stroke survivors' current perceptions of their body weight? (3) What methods do stroke survivors use to attempt to lose weight? Further, we examined how these trends compare with nonstroke controls. These data may ultimately be used to develop translatable strategies to promote optimal body weight in this at-risk population.

Methods

Design

In this retrospective study, we analyzed data from the 2011 to 2012 and 2013 to 2014 National Health and Nutrition Examination Survey (NHANES); a program of studies designed to assess the health and nutritional status of a nationally representative sample of Americans using questionnaires and physical examinations. The demographic, body measures, diabetes, and weight history data sets were used to collect variables of interest. Full details of the study design can be accessed from the US Department of Health and Human Services.[18]

Study Sample

NHANES data were included in the present analysis if the participant had self-report data on whether or not they had previously suffered a stroke and regarding their weight loss in the past year, determined by their responses in the medical history and weight history questionnaires. We define our first domain as a set of cases respondents of at least age 50 who have been told they have had a stroke and suffered a stroke after the age of 18 years; the set of comparison respondents is the remaining group of people age 50 and older who did not indicate a history of stroke. We categorized body mass index (BMI) measured by an NHANES health technician less than 18.5 kg/m^2 as underweight, 18.5-24.9 kg/m^2 as normal weight, 25.0-29.9 kg/m^2 as overweight, and greater than 30.0 kg/m^2 as obese and waist circumference greater than 102 cm for men and greater than 88 cm for women as high risk.[19]

Study Variables

Body Weight Change

To investigate changes in body weight over time, we analyzed self-reported weight at age 25 years old, at the time of the current assessment, 10 years prior, 1 year prior, and their heaviest weight. For stroke survivors, we also used their self-reported age at which they suffered a stroke and were their heaviest to determine when their heaviest weight occurred in relation to their stroke.

Body Weight Perceptions

To investigate perceptions about weight, we analyzed data regarding respondents' self-reported feelings about their current and desired weight. The respondent's current self-reported weight and their self-reported weight 1 year prior to the current assessment also was used to identify those who successfully achieved moderate weight loss (weight loss $\geq$5% considered clinically meaningful/successful,[20]) regardless of their current BMI.

Weight Loss Techniques

To investigate approaches used to lose weight, all of the people in our first domain who also reported actively trying to lose weight in the past year were identified and further divided by stroke survivor cases and nonstroke controls. Regardless of their current BMI and weight loss success, individual responses on weight loss methods were used to determine popular approaches.

Statistical Analyses

All analyses were carried out using SAS 9.4. We used the SAS Survey Procedures (SURVEYMEANS and SURVEYFREQ) to account for NHANES' complex sample design. We used the 2-year MEC sampling weight and adjusted for clustering and stratification using the appropriate variables included in the public use dataset. All means, standard errors, and confidence intervals for continuous variables are reported using the weights and controlling for design. Categorical variables reported as counts and percentages are presented here with unweighted counts and weighted percentages. Due to the weighting and rounding error some reported percentages may not add up to 100%. We used the DOMAIN option in SAS to control for our subgroups in the analysis without losing whole clusters by reducing the dataset to interesting cases only a priori.

Results

Given the above eligibility criteria, 387 stroke survivors and 5085 nonstroke controls were available for analysis. Overall, stroke survivors were 8.6 (7.3-9.9; range: 1-45)

Table 1. *Demographic data*

Mean (95% CI)	Stroke survivors (N = 387)	Nonstroke controls (N = 5085)
Female (%)†	54.1	53.2
Caucasian (%)†	69.3	75.2
Age at screening (years)*,†	69.1 (67.7-70.4)	63.2 (62.6-63.4)
Age of stroke diagnosis (years)*,†	60.4 (59.1-61.8)	-
Body mass index (kg/m^2)†	28.95 (27.8-30.1)	29.3 (28.9-29.6)
Waist circumference (cm)†		
Men	106.1 (102.2-110.1)	105.3 (104.3-106.3)
Women	100.2 (95.4-105.1)	100.2 (98.2-100.3)
T2DM (%)*,†	34.7 (28.2-41.2)	16.7 (15.5-18.1)
Coronary heart disease (%)*,†	20.5 (14.2-26.8)	5.9 (4.9-7.0)
Hypertension medication usage (%)*,†	97.3 (95.2-99.4)	91.9 (90.2-93.7)
Hypercholesterolemia medication usage (%)*,†	90.8 (86.8-94.9)	83.0 (80.6-85.5)

*Based on self-report.
†Weighted means or percentages.

years poststroke and similar to nonstroke controls with regard to age, sex, and race (Table 1). By measured BMI, 3% of stroke survivors were underweight, 28% were normal weight, 31% were overweight, and 39% were obese at the time of data collection, which was similar to nonstroke controls (underweight: 1%, normal weight: 25%, overweight: 35%, obese: 39%). A higher percent of men (stroke: 50% versus nonstroke: 78%) and women (stroke: 57% versus nonstroke: 75%) nonstroke controls had waist circumference in the high-risk category.

Body Weight Change

The self-reported weight trends of stroke survivors and nonstroke controls over time can be viewed in Figure 1. Weight was reported to increase by 13.0 (10.8-15.5) kg and 14.5 (13.0-15.9) kg from age 25 to the current time, which averaged 44.0 (42.7-45.4) years and 38.0 (37.5-38.4) years prior (range: 25-55 years) for stroke survivors and nonstroke controls, respectively. Weight from 10 years prior was reported to be 1.5 (−.2 to 3.1) kg higher for stroke survivors and 3.5 (2.0-5.4) kg lower for nonstroke controls than their current weight. Similarly, weight from 1 year prior was reported to be 3.0 (1.9-4.2) kg higher for stroke survivors and.2 (−.8 to 1.1) kg lower for nonstroke controls from the current weight. Self-reported current weight was 13.3 (11.1-15.5) kg lower for stroke survivors than their reported highest weight, which occurred, on average, 13.7 (12.2-15.1) years previously (range: 0-61 years). This trend appears similar in nonstroke controls, where self-reported current weight was 8.6 (7.2-10.0) kg lower than their reported highest weight, which occurred, on average, 10.7 (10.2-11.2) years previously (range: 0-65 years). Age at which stroke respondents experienced their heaviest weight in relation to when they had a stroke revealed that the majority of individuals were heaviest after they suffered a stroke (at time of stroke: 11%; before stroke: 38%; after stroke: 51%).

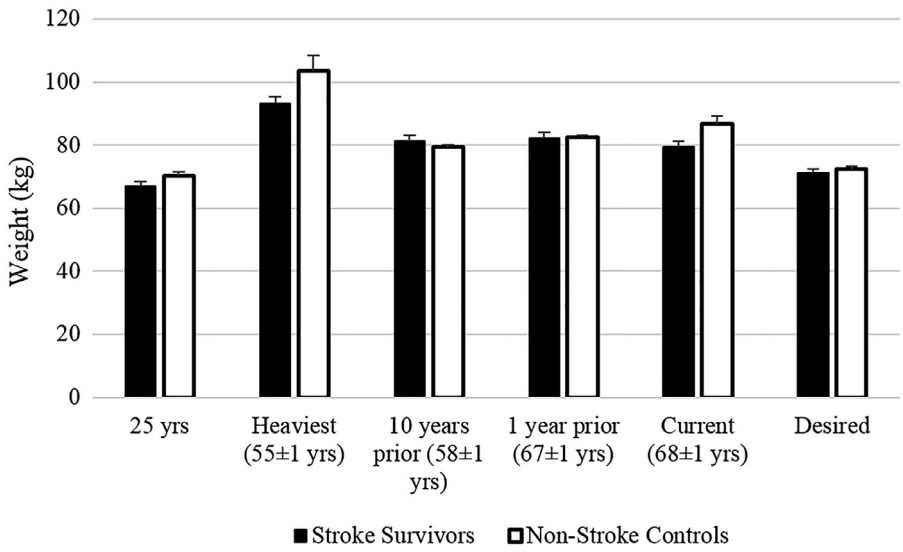

Figure 1. *Self-reported body weight trends by age.*

Table 2. *Popular weight loss methods used to try to lose weight*

Weight loss method	Stroke survivors (N = 84)		Nonstroke controls (N = 1369)	
	N*	%†	N*	%†
Ate less	57	79.6	874	65.9
Exercised	39	47.2	722	49.8
Ate more fruits/vegetables/salads	34	42.8	533	37.8
Ate less fat	32	39.3	418	25.7
Ate less junk food/fast food	27	36.6	372	25.2
Ate less sugar/candy/sweets	27	40.0	399	28.5
Ate fewer carbohydrates	26	30.8	353	26.6
Changed eating habits	24	31.5	366	25.5
Switched to foods with lower calories	21	26.1	386	29.1
Drank a lot of water	22	26.0	399	28.2
Skipped meals	114	20.4	194	12.7
Consumed diet foods or products	9	9.4	81	5.6

*Unweighted counts.
†Weighted percentages.

Body Weight Perceptions

By self-report, a lower percentage of stroke survivors considered their weight overweight (underweight: 8%, about right: 49%, overweight: 44%) compared with nonstroke controls (underweight: 4%, about right: 36%, overweight: 60%). Fifty-four percent of stroke survivors reported wanting to weigh less (versus 8% wanting to weigh more and 38% wanting to stay the same), while 67% of nonstroke controls reported wanting to weigh less (versus 4% wanting to weigh more and 29% wanting to stay the same). On average, stroke survivors and nonstroke controls reported their desired weight to be 14.2 (2.4-26) kg and 12.5 (9.4-15.7) kg less, respectively, than their current weight (Fig 1). However, only 24% of stroke survivors reported trying to lose weight within the past year, compared with 35% of nonstroke controls. Of those actively pursuing weight losses, regardless of current obesity status, only 10%-15% of stroke survivors and nonstroke controls reported successfully achieved weight loss greater or equal to 5%, while 20% of stroke survivors and nonstroke controls gained greater or equal to 5%.

Weight Loss Techniques

An overview of popular weight loss strategies used can be seen in Table 2. The most common weight loss methods used by stroke survivors and nonstroke controls included eating less, exercising, and eating more fruits and vegetables.

Discussion

Weight loss trends in this nationally representative sample of adult stroke survivors revealed that weight trends remained relatively stable over the prior 10 years, which appears similar to nonstroke controls across the same time points. Interestingly, the majority of stroke survivors reported experiencing their heaviest weight after suffering their stroke. While malnutrition and unintentional weight loss after stroke may be predictors of frailty and mortality,[21] these data indicate that overweightness and obesity may be a more prevalent issue in this population. In fact, a study examining predictors of weight loss in stroke survivors found that only 26% of their sample had lost weight in the year following their stroke, while the majority of the sample had either gained or maintained their weight.[22] A sedentary lifestyle and skeletal muscle wasting common poststroke may lead to declines in resting metabolic rate, which is the largest component of daily energy expenditure. We have previously shown that resting metabolic rate is 14% lower than predicted in chronic stroke survivors.[23] The resulting imbalance between energy intake and expenditure may lead to obesity among stroke survivors.

Some studies have found that being above normal weight is protective of all-cause mortality in stroke survivors.[10] However, there are findings to suggest that this is age dependent, with data indicating overweight or obese individuals under the age of 70 years are at in increased risk of cardiovascular and all-cause mortality compared with their normal weight counterparts.[12] Furthermore, this age differential effect can potentially be explained by survivorship bias among the older population,[12] which may indicate the impact of obesity on mortality is being underestimated in those over the age of 70 years.

When investigating body weight perceptions, we found that 54% of stroke respondents reported a desire to weigh less, which was ~10% less than nonstroke controls. However, only 24% of stroke survivors stated they had actively tried to lose weight, of which only 12% reported achieving a weight loss greater or equal to 5%. This percentage of stroke survivors actively pursuing weight loss is lower than that observed in our nonstroke controls (35%) and previous reports in obese adults (63%)[24] and adults with type 2 diabetes mellitus (59%)[25] in the United States.

This discrepancy may be due to the high prevalence of residual functional deficits[2] and comorbidities[26] following stroke impacting weight loss efforts. This also lends explanation to the large discrepancy among stroke survivors who successfully achieved greater or equal to 5% weight loss (11%) compared with prior reports of successful weight loss in relatively healthy adults with obesity (40%).[24] Despite the known cardiovascular benefits of weight loss in individuals who are overweight or obese,[27] little is known about intentional weight loss in a population of stroke survivors. To the best of our knowledge, only one study has examined the effect of a health promotion intervention, consisting of exercise and nutritional counseling, on cardiovascular risk factors in a population of stroke survivors.[28] Their findings suggest that a health promotion intervention is effective at lowering body weight by an average of 2.8 lbs and decreasing total cholesterol compared with controls, indicating a potential cardiovascular benefit for weight loss in this population.

Popular weight loss methods used by stroke survivors were similar to those used by the nonstroke controls, as well as what has been documented by other populations previously, including individuals with obesity, type 2 diabetes mellitus, and chronic kidney disease.[24,25,29] These approaches were primarily comprised of lifestyle modifications, including altering diet and increasing exercise, and provide insight to clinicians on potentially well-received methods to impact weight and promote maintenance of weight loss in this population.

While there is a robust body of literature examining malnutrition and unintentional weight loss in stroke survivors, literature regarding intentional weight change and weight loss perceptions in this population is scarce. These data highlighting weight trends and desires of stroke survivors reveal the potential advantage of adding weight loss interventions to address the goals of stroke survivors during rehabilitation. This study is not without limitations. The most notable of which is the cross-sectional design, which relied heavily on self-reported information with long recall periods and cannot provide causal associations. Additionally, we do not have information about body weight at time of stroke, stroke subtype, stroke severity, or success in recovery. This information would be valuable in identifying patients who may benefit the most from weight modification and should be collected in future studies. Additionally, this study did not examine maintenance of weight loss and thus cannot speak to its effect on cardiovascular disease risk factors, including recurrent stroke.

In sum, findings from the present study suggest the majority of stroke survivors experience their heaviest weight after their stroke, and a desire to weigh less. However, few are able to achieve clinically significant weight loss. Lifestyle modifications, such as diet and exercise, appear to be the preferred method of weight loss in this population, and may be utilized to improve weight loss success and compliance. Future research is warranted regarding the effects intentional weight loss interventions on cardiovascular risk factors, and ultimately recurrent stroke, in stroke survivors.

Supplementary Materials

Supplementary data to this article can be found online at doi:10.1016/j.jstrokecerebrovasdis.2019.01.028.

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