

Stages and Processes of Change for Weight Loss in Acute Stroke or TIA Patients Living with Obesity

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Keywords

Obesity · Weight loss · Stages of change · Processes of change · Stroke · Behavior change

Abstract

Background: Obesity is associated with an increased prevalence of vascular risk factors and incidence of stroke. As such weight loss is recommended for patients living with obesity in the secondary prevention of stroke. Few studies, however, have examined the stages and processes of change for weight loss in stroke patients living with obesity. **Objective:** The aim of the study was to evaluate the stages and processes of change for weight loss in patients living with obesity who have had a recent stroke or TIA. **Methods:** Using a validated questionnaire, we assessed each patient's stage of behavioral change according to the transtheoretical model (precontemplation, contemplation, preparation, action, and maintenance). We also examined 4 processes of behavioral change, which quantify activities and experiences that patients undergo on the way to behavioral change: emotional reevaluation (EMR), weight management action (WMA), weight consequence evaluation, and supporting relationships. Processes scores were compared between patients in

the action and maintenance stages and those in the precontemplation, contemplation, and preparation stages. **Results:** Out of 49 patients who provided informed consent, 44 met the inclusion/exclusion criteria. Of these 44 patients, 6 (14%) were in the precontemplation stage of change, 7 (16%) were in contemplation, 2 (5%) were in preparation, 13 (30%) were in action, and 16 (36%) were in maintenance. Those in the action and maintenance stages accounted for the majority of participants ($n = 29, 66\%$). Patients in the action and maintenance stages ($N = 29$) had higher EMR scores (mean 79, SD 13 vs. mean 68, SD 19, $t = 2.0, p = 0.03$) and WMA scores (mean 69, SD 13 vs. mean 59, SD 19, $t = 2.0, p = 0.03$) as compared to those in the precontemplation, contemplation, and preparation stages ($N = 15$). **Conclusions:** Our results suggest that without counseling or specific intervention, approximately two-thirds of stroke/TIA patients living with obesity are in the action or maintenance stage of behavior change with respect to weight loss and therefore more likely to succeed in intensive lifestyle-based interventions targeted towards weight loss. Patients who score higher in EMR and WMA are more likely to be in the action or maintenance stage of change.

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Introduction

More than one-third of the US adult population is living with obesity [1]. Among patients with recent stroke or TIA, the prevalence of obesity is likely even higher [2]. Obesity is associated with increased prevalence of vascular risk factors such as diabetes, hyperlipidemia, and hypertension [3] and increased incidence of stroke [4]. Weight loss of 5–10% of baseline body weight is enough to improve these risk factors [5]. Accordingly, weight loss is recommended in the current guidelines for the secondary prevention of stroke [6]. These guidelines also recommend referral to behavioral weight management programs to focus on weight loss [6].

Achieving and maintaining weight loss over a period of time, however, is challenging even with intensive, ongoing, lifestyle-based intervention. In order for people living with obesity to achieve success in an intensive intervention, they must be ready and willing to undergo behavioral change. In addition, clinicians must be able to identify appropriately motivated individuals for referral to behavioral programs. Established theoretical frameworks can accurately identify patients who are ready to undergo a lifestyle change. One such framework – the transtheoretical model – identifies 5 *stages* of change that indicate an individual's preparedness or readiness to make significant behavioral modifications [7]. To obtain a deeper understanding as to how patients move through the *stages* of change (and therefore become more ready to change behavior), the concept of *processes* of change was developed to describe the attitudes and behaviors that allow individuals to advance through the stages of change [7]. Patient-facing questionnaires can measure the stage and processes of change for an individual with respect to weight loss [8–10].

In individuals living with obesity without recent stroke or TIA, only 0–13% of such individuals are in the active stage of change or higher with respect to weight loss as defined by the transtheoretical model [11–13]. Studies examining the stages and processes of change for weight loss after stroke are scarce [14, 15], and few have specifically addressed these stages and processes of change for weight loss in post-stroke individuals living with obesity as the primary outcome. We hypothesized that after a stroke, patients may be highly motivated to make behavioral changes to reduce the risk of recurrence, and therefore, be more likely to be in an active stage of change. The primary objective of our study was to assess the stages and processes of behavior change for weight loss in stroke patients living with obesity.

Materials and Methods

The study is a cross-sectional survey designed to describe the stages and processes of change for weight loss among participants with recent stroke or TIA who are living with obesity.

Participants

Participants were recruited at 2 centers: Yale New Haven Hospital in New Haven, CT, USA, and Beth Israel Deaconess Medical Center in Boston, MA, USA. The inclusion criteria for participants were (1) an acute ischemic stroke or TIA within 7 days of screening, (2) age 18–80 years, (3) BMI ≥ 27 mg/kg², and (4) no cognitive impairment as determined by the 6-item screener [16]. Exclusion criteria included (1) being at high risk for malnutrition, (2) inability to tolerate food by mouth, and (3) inability to provide informed consent. All patients provided informed consent with a waiver of signed consent, as no identifiers were collected. The study was approved the Institutional Review Board at both institutions.

Sex and race were identified by self-report. Race information was collected to ensure the survey population was representative of the stroke population served at the 2 hospitals. Past medical history was collected by self-report and verified in the medical record. National Institutes of Health Stroke Scale (NIHSS), stroke versus TIA classification and vascular risk factors were collected from the medical record.

Outcome Measures

The stages and processes of change questionnaires in weight management, otherwise known as the S-Weight and P-Weight questionnaires, respectively, are used to assess the stages and processes of change with respect to weight loss [8–10].

Stages of Change

Each participant's stage of change was determined using the S-Weight Questionnaire [8]. Here, patients are asked which of the following 5 weight loss-related statements they identify most closely with:

1. At the moment I'm not doing anything to lose weight and I have no intentions of doing anything over the next 6 months
2. At the moment I'm not doing anything to lose weight but I'm thinking about doing something over the next 6 months.
3. During the last year I haven't done anything to lose weight but I'm planning to do something over the next 30 days.
4. I've been making an effort to lose weight (by dieting and/or exercising) for less than 6 months.
5. I've been making an effort to maintain my weight (by dieting and/or exercising) for more than 6 months.

These statements correspond to the following stages of behavior change:

- (1) precontemplation; (2) contemplation; (3) preparation; (4) action; (5) maintenance.

We categorized patients in the action and maintenance stages of change as being in an active phase of change and those in the precontemplation, contemplation, and preparation stage as being in a nonactive phase of change.

Processes of Change

Processes of change refer to the “covert and overt activities and experiences that individuals engage in when they attempt to mod-

ify problem behaviors” [8]. The P-Weight Questionnaire was used to quantify 4 processes of behavioral change in our participants [8].

1. Emotional reevaluation (EMR): the emotional reactions to being overweight. EMR describes how a patient feels about his or her weight and how the weight loss journey impacts his or her emotional well-being. For example, patients that score highly in EMR would tend to agree with statements such as “When I lose weight I feel proud of myself.”
2. Weight management actions (WMAs): the specific actions performed by individuals when managing their weight. WMA describes how a patient has taken steps to achieve weight control. For example, patients that score highly in WMA would tend to agree with statements such as “I have learnt to control my appetite.”
3. Weight consequence evaluation (WCE): the awareness of the consequences that obesity has on one’s life. WCE describes how a patient sees obesity or weight as negatively impacting their daily activities or relationships. For example, patients that score highly in WCE would tend to agree with statements such as “My family and friends are worried about my weight.”
4. Supporting relationships (SRs) – the support an individual receives from others while striving for weight loss. SR describes the support network that a patient has in place during his or her weight loss journey. For example, patients that score highly in SR would tend to agree with statements such as “People around me support me in trying to lose weight.”

After completion of the P-weight questionnaire, a raw process score was generated by tallying up the responses to questions. The raw score (with a range of 5–54) was then converted to a 100-point scale to allow for comparisons across processes. Process scores were normally distributed. We described mean scores with standard deviations (SD) in patients with active and nonactive phases of change, and compared means using a 2-tailed independent *t* test, with a significance level set at $p = 0.05$.

Results

Out of 49 patients who provided informed consent, 44 met all inclusion/exclusion criteria. The majority of patients ($n = 39$) were enrolled from the Yale site, and 23 were women. Enrollment by race was representative of the population served at both hospitals (Table 1). Past medical history is detailed in Table 1. The majority of patients had minor stroke (mean NIHSS 3 on admission, SD 3). The distribution of the stages of change in our sample was as follows: $n = 6$ (14%) precontemplation; $n = 7$ (16%) contemplation; $n = 2$ (5%) preparation; $n = 13$ (30%) action; and $n = 16$ (36%) maintenance (Table 1). Those in the active phase of change (action and maintenance stages) accounted for the majority of participants ($n = 29$, 66%), while those in the nonactive phase of change (precontemplation, contemplation, and preparation stages) made up a smaller percentage ($N = 15$, 34%).

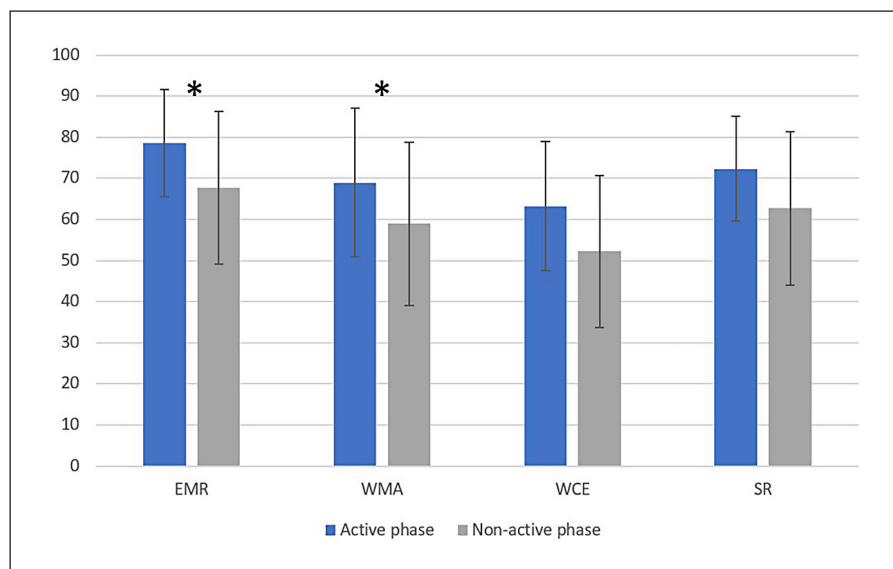
Table 1. Baseline participant characteristics ($n = 44$)

Age, mean \pm SD	62 \pm 10
Sex, female, n (%)	23 (52)
Center, n (%)	
Yale	39 (89)
BIDMC	5 (11)
Race, n (%)	
White	29 (66)
Black	10 (23)
Asian/other	5 (11)
Past medical history, n (%)	
Prior stroke or TIA	15 (34)
Hypertension	37 (84)
Hyperlipidemia	28 (64)
Diabetes mellitus	17 (39)
Atrial fibrillation	8 (18)
Myocardial infarction	6 (14)
Admission NIHSS,* mean \pm SD	3 \pm 3
Number with stroke (not TIA), n (%)	36 (82)
Vascular risk factors, mean \pm SD	
Body mass index, kg/m ²	37 \pm 8
Waist circumference, cm	48 \pm 9
Hemoglobin A1C	6.7 \pm 1.5
Low-density lipoprotein, mg/dL	100 \pm 37
Systolic blood pressure, mm Hg	135 \pm 24
Diastolic blood pressure, mm Hg	79 \pm 13
Stage of change, n (%)	
Precontemplation	6 (14)
Contemplation	7 (16)
Preparation	2 (5)
Action	13 (30)
Maintenance	16 (36)
Processes of change, mean \pm SD	
EMR	75 \pm 16
WMA	69 \pm 17
WCE	59 \pm 19
SRs	66 \pm 16

Values are shown as n (%) unless otherwise specified. SD, standard deviation; BIDMC, Beth Israel Deaconess Medical Center. * NIHSS for stroke patients only ($n = 36$).

Mean process scores with SD are provided in Table 1. Participants in the active phase of change ($N = 29$) had higher mean EMR scores (active phase mean EMR Score 79, SD 13 vs. nonactive phase mean EMR score 68, SD 19, $t = 2.0$, $p = 0.03$) and WMA scores (active phase mean WMA score 69, SD 13 vs. nonactive phase mean WMA score 59, SD 19, $t = 2.0$, $p = 0.03$) as compared to participants in the nonactive phase of change ($n = 15$, Fig. 1). Participants in the active phase of change had similar mean WCE scores (active phase mean WCE score 63, SD 18 vs. nonactive mean WCE score 52, SD 20, $t = 2.0$, $p = 0.07$) and SR scores (active phase mean SR score 73, SD

Fig. 1. Comparison of mean process scores between participants in the active phase of change (action and maintenance stages of change) ($N = 29$) and participants in the nonactive phase of change (precontemplation, contemplation, and preparation stages of change) ($N = 15$). The * indicates significantly greater EMR and WMA scores for patients in the action and maintenance stages versus those in the precontemplation, contemplation, and preparation stages ($p < 0.05$).



16 vs. nonactive phase mean SR score 63, SD 18, $t = 2.0$, $p = 0.08$) as compared to those in the nonactive phase of change.

Discussion/Conclusion

The main finding of our study was that the majority of post-stroke patients living with obesity were in the active phase of behavior change and are therefore more likely to change behavior with a goal of losing weight. We also found that patients in the active phase tend to connect emotionally with the negative consequences of increased weight (high EMR scores) and are taking actions to reduce their weight (high WMA scores). Our results therefore demonstrate the following: (1) the potential for the majority of patients living with obesity to be ready to participate in and succeed in behavioral weight management programs after stroke and (2) the processes of behavioral change that are most likely to be present in patients who are in an active phase of change.

Our study is consistent with the results of 2 prior reports of the stages of behavioral change in patients with prior stroke. The first cross-sectional single-center study in Australia enrolled 65 patients with recent stroke and found that 40 (62%) were in the action stage with respect to weight loss or maintenance [14]. The second cross-sectional single-center study in the UK enrolled 52 patients with recent stroke or TIA and found that 23 (52%) of patients were in the action stage of change [15]. One major difference between these 2 studies and ours is that

neither study specifically enrolled participants living with obesity. The second study measured behavioral change in general and did not specifically focus on behavior change with respect to weight loss. Taken together, all 3 small studies conducted in 3 different populations support the notion that patients living with obesity with recent stroke appear to have a greater readiness to lose weight than obese and overweight patients without prior stroke, where only 0–13% are in the action stage of change or higher [11–13].

Processes of change for weight loss have not been previously examined in stroke patients. In non-stroke individuals living with obesity, it has previously been shown that process scores are higher in those in the action and maintenance stages than those in the pre-action stages [10, 17]. Our study demonstrated that patients in the nonactive phase of change are less engaged in EMR and WMA processes. Addressing patient's emotional connection to weight loss and potential actions taken to lose weight could represent targets for increasing the likelihood of adopting healthy weight loss behaviors in those who are in the nonactive phase of change. For example, patients with low EMR scores tend to believe that weight loss would not change how they feel about themselves and those with low WMA scores tend to continue to participate in activities that encourage overeating, such as restaurant buffets. Targeted programs that address these perceptions may shift participants' stage of change. We also demonstrated that the mean scores for WCE and SR scores were not significantly lower in patients in the nonactive phase of change. Despite our lack of observed dif-

ference between groups for WCE and SR, there may also be value in addressing patient's connection to the negative consequences of obesity and the value of SRs in one's weight loss journey. Behavioral interventions may help to improve each process for post-stroke patients living with obesity, which in turn, may have a positive impact on behavior change.

The main limitations of our study are the small sample size, being mostly a single center study in New England, and selection bias given that patients participating in a research study may be more motivated to lose weight and thus more likely to be in the action or maintenance stage of change. Another important limitation is that our study did not address whether participants had participated in weight loss programs prior to their stroke – this may have influenced their stage and processes of change at the time of this cross-sectional study. We were also unable to interview and include patients with aphasia and higher stroke severity. Last, as with any survey, our results may be limited by response bias as our outcomes were obtained through self-report. Given these limitations, our study's results are not definitive but rather serve to generate hypotheses for future studies with larger more representative samples.

Our study suggests that without counseling or specific intervention, approximately two-thirds of stroke/TIA patients living with obesity are in the action or maintenance stage of change and are ready to lose weight. Patients who have an emotional connection to weight loss, and who take action regarding their weight are more likely to be in an active phase of behavior change for weight loss. These results require validation with a larger representative sample.

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Statement of Ethics

This study protocol was reviewed and approved by the Committee on Clinical Investigation of Beth Israel Deaconess Medical Center, Approval No. 9-2015. Written informed consent was obtained from participants.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

M.W. performed data analysis and wrote the first draft of the manuscript. H.O. helped design the project and collected the data, and edited the manuscript. J.D.T. provided the study concept and edited the final manuscript.

Data Availability Statement

Data are available through Harvard Dataverse and can be found at <https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/F7E0JM>.

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