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Low-sodium diet self-management intervention in heart failure: pilot study results

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Abstract

Background—Self-care management of a low-sodium diet is a critical component of comprehensive heart failure (HF) treatment.

Aims—The primary purpose of this study was to examine the effectiveness of an educational intervention on reducing the dietary sodium intake of patients with HF. Secondary purposes were to examine the effects of the intervention on attitudes, subjective norm, and perceived behavioural control towards following a low-sodium diet.

Methods—This was a randomized clinical trial of an educational intervention based on The Theory of Planned Behavior. Patients were randomized to either a usual care (n=25) or intervention group (n=27) with data collection at baseline, 6 weeks, and 6 months. The intervention group received low-sodium diet instructions and the usual care group received no dietary instructions. Nutrition Data Systems-Research software was used to identify the sodium content of foods on food diaries. Attitudes, subjective norm, and perceived behavioural control were measured using the Dietary Sodium Restriction Questionnaire.

Results—Analysis of covariance (between-subjects effects) revealed that dietary sodium intake did not differ between usual care and intervention groups at 6 weeks; however, dietary sodium intake was lower in the intervention group (F=7.3, df=1,29, p=0.01) at 6 months. Attitudes subscale scores were higher in the intervention group at 6 weeks (F=7.6, df=1, 38, p<0.01).

Conclusion—Carefully designed educational programmes have the potential to produce desired patient outcomes such as low-sodium diet adherence in patients with heart failure.

Keywords

Adherence; education; heart failure; low-sodium diet

Introduction

Heart failure (HF) clinical practice guidelines cite the importance of restricting dietary sodium intake to prevent fluid retention and associated symptoms in patients with HF; yet little concrete or specific information for promoting adherence is provided.[1,2] Recommendations for daily dietary sodium intake for those with HF range from ≤2000–4000 mg.[3–5] General advice for teaching patients about low-sodium diet adherence includes teaching about the sodium content of foods,[1] avoiding extra table salt or cooking with salt,[6] and providing tips for restaurant dining to limit sodium intake.[7] Heart failure disease

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management programmes are comprehensive programmes in which the specific interventions to increase low-sodium diet adherence are part of the larger programme. These programmes often require substantial investments in multidisciplinary staff time which may not be feasible or sustainable in clinics with limited resources.[7–10] Smaller, more specific interventions, such as the one used in this study, to target adherence to a low-sodium diet may be less resource intensive and more cost effective and yield considerable benefits. The purpose of this study was to examine the short-term (6 week) and long-term (6 month) impact of a theory-based educational intervention on dietary sodium intake in patients with HF. We also examined the short-term and long-term effects of the intervention on patient attitudes, subjective norm, and perceived behavioural control towards following a low-sodium diet.

The Theory of Planned Behavior (TPB) guided the intervention for this study.[11–18] Behavioural intention is considered the most important determinant of healthy behaviours such as adhering to a low-sodium diet.[11] According to the TPB, direct determinants of behavioural intention are attitude, subjective norm, and perceived control. Attitude is defined as the individual's beliefs about outcomes of performing a behaviour such as following a low-sodium diet (behavioural beliefs) weighted by an evaluation of the value of those outcomes.[12] The intervention in this study was designed to heighten positive behavioural beliefs by explaining in simple terms the physiological aspects of HF and the significance of fluid volume excess. Subjective norm is defined as an individual's normative beliefs regarding important significant others approval or disapproval of the behaviour.[12] Normative beliefs are weighted by the individual's motivation to comply with the beliefs of significant others. For example, individuals who believe that significant others think a behaviour should be performed, and who are motivated to meet the expectations of the significant others, will have a positive subjective norm towards the behaviour.[12] Significant others, for the purposes of this study, were family members, friends, and healthcare providers. Perceived behavioural control, the third construct of the TPB, is defined as beliefs concerning the availability of resources and the presence of barriers to behavioural performance such as following a low-sodium diet.[12] Control beliefs are weighted by the impact of each resource and impediment that facilitates or inhibits the behaviour.[12] Resources and impediments to adhering to a low-sodium diet were identified as part of the educational intervention. Teaching was individualized to increase resources and reduce barriers to low-sodium diet adherence.

Methods

Design

A randomized, repeated measures (baseline, 6 weeks, and 6 months) experimental design was used. Patients randomized to the 6-week education intervention group received instruction and advice on low-sodium diet adherence from the intervention nurse during home visits and phone calls. Participants in the usual care control group were visited at three data collection time periods. The constructs of TPB – Attitudes, Subjective Norm, and Perceived Behavioral Control – were measured using the Dietary Sodium Restriction Questionnaire (DSRQ).

Sample and setting

After obtaining Institutional Review Board approvals, patients were recruited from a cardiology clinic (63.5%), community hospital (23%), and a university hospital (13.5%). Patients who met the following inclusion criteria were enrolled: (1) a confirmed diagnosis of HF due to left ventricular systolic dysfunction or with preserved systolic function; (2) New York Heart Association Class II–IV; (3) no cognitive impairments limiting the ability to

complete an interview or engage in the educational intervention; (4) not living in an extended care facility; (5) 21 years of age or older; (6) hospitalization or emergency department treatment of HF 1 year prior to study entry; 7) residence ≤90 miles from the hospital or clinic; and (8) English speaking. Exclusion criteria were: (1) heart transplantation anticipated within 6 months; (2) documented cognitive disorders; (3) myocardial infarction within past 3 months; (4) a coexisting terminal illness; and (5) the presence of a major psychiatric disorder other than depression. Participants (n=52) were randomized to one of two groups, usual care or intervention, using predetermined randomization schedules designed for this study using the PLAN procedure in SAS 9.2, an analytic software program. Randomization occurred after signed informed consent was obtained and baseline data were collected.

Food diaries

Patients provided detailed 3-day food diaries at baseline, 6 weeks, and 6 months to document dietary sodium intake. Specific instructions on completing the 3-day food diaries were given to all patients. Patient instruction included return demonstrations on weighing foods on digital scales, measuring portion sizes with standardized kitchen utensils, and estimating portion sizes with the use of diagrams and models after demonstration of the skills by the intervention nurse. The food diary forms prompted patients for specific details related to preparation and types of foods eaten (e.g. brand name, diet, low fat, condiments added). The visiting intervention nurse reviewed food diaries with patients to clarify specific details and ensure accuracy upon retrieval. The contents of the 3-day food diaries were entered into a nutrition computer program, the Nutrition Data Systems-Research (NDSR; Nutrition Coordinating Center, Minneapolis, MN, USA) diet analysis software.[19] The NDSR is a comprehensive dietary nutrient calculation software that has a database of over 18,000 foods including 7000 name brand products and many ethnic and regional foods, dietary supplements, and medications containing sodium. The analysis accounts for different food preparation methods providing for more than 160,000 possible food variants. The output program provides data on over 130 dietary nutrients consumed including sodium. Annual updates to the NDSR database assure nutrient data are current.[19]

Dietary Sodium Restriction Questionnaire

Attitudes, Subjective Norm, and Perceived Behavioral Control, the constructs of the TBP, were measured using the DSRQ.[20] The DSRQ consists of statements related to resources, barriers, referents, and attitudes/beliefs towards following a low-sodium diet. The items were based on clinical expertise, extensive review of the literature, and a qualitative study.[20,21] The instrument consists of a qualitative section and 23 items that comprise three subscales to measure the constructs of the TPB: Attitudes, Subjective Norm, and Perceived Behavioral Control. Scores were calculated for each of these subscales. The instrument has demonstrated adequate reliability and validity.[20]

The qualitative section of the questionnaire asked patients to describe specific instructions they received from healthcare providers for following a low-sodium diet. Patients were also asked how and why they follow a low-sodium diet if they reported adherence.

Attitudes subscale—This 7-item subscale measured the patient's attitude towards following a low-sodium diet. Patients were instructed to indicate how much they agree or disagree with statements such as ‘It is important for me to follow my low-salt diet’ and ‘Eating a low-salt diet will keep fluid from building up in my body’. Agreement was rated on a Likert-type scale from 1 (‘strongly disagree’) to 5 (‘strongly agree’). Higher scores indicate better attitude towards following a low-sodium diet. Internal consistency was high with Cronbach's alpha of 0.86 in this study.

Subjective Norm subscale—This 4-item subscale measured the patient's motivation to comply with the beliefs of significant others. Patients were instructed to rate how much they agree or disagree with the statements such as ‘My doctor thinks I should follow a low-sodium diet’ and ‘My spouse or other family members think I should follow a low-salt diet’. Agreement was rated on the same Likert-type scale. Higher scores indicate greater motivation to comply with the beliefs of significant others. Cronbach's alpha was 0.71 for this subscale.

Perceived Behavioral Control subscale—This subscale was used to measure perceived control. The 12-item subscale measured barriers and facilitators to following a low-sodium diet. Patients were instructed to rate how much items such as ‘the cost of low-salt food’ and ‘the taste of low-salt foods’ kept them from following a low-sodium diet. A Likert-type scale was used to score each item with higher scores indicating less perceived control for following a low-sodium diet. Cronbach's alpha was 0.64 for this subscale.

Intervention

The intervention consisted of six weekly sessions by home visit or phone call during the first 6 weeks of the study to provide instruction on behaviours to promote low-sodium diet adherence. Patients received instructions on the relationship between high dietary sodium intake and symptoms of fluid volume excess, identifying high- and low-sodium foods, strategies for reducing dietary sodium intake, and tips for choosing low-sodium food items while dining away from home. A detailed description of the intervention is available elsewhere.[22] The timeline, teaching activities, and theoretical outcomes for the intervention are described in Table 1.

Statistical analyses

Analyses were conducted using SPSS Statistics 17.0 software. Frequency distributions, means and standard deviations, independent t- and Chi-squared tests were used to describe participant characteristics depending on level of measurement. Relationships between key variables and dietary sodium intake at 6 months were explored with Pearson's correlation coefficient. Between-group pre- and post-intervention scores of the usual care and intervention groups were compared with a one-way analysis of covariance (ANCOVA) for averaged daily dietary sodium intake and scores on the Attitudes, Subjective Norm, and Perceived Behavioral Control subscales at 6 weeks and 6 months using baseline scores as a covariate. Independent-samples t-tests were used to examine group differences in the means for items on the Attitudes, Subjective Norm, and Perceived Behavioral Control subscales at baseline, 6 weeks, and 6 months.

Results

Characteristics of the 52 patients compared by group are presented in Table 2. The sample was nearly equally divided by gender (53.8% male) but was primarily Caucasian (75%). The only difference between groups was age. The intervention group was on average 6 years younger than the usual care group with a mean age of 59.2±8.3 years ($t(51)=2.2$, $p<0.05$). More than half of the patients had greater than a high school education. The majority of participants were retired with about one-third on sick leave or disability. Ischaemia was the primary aetiology of HF. Male gender correlated with higher sodium intake at 6 months. Correlations between key variables and dietary sodium intake at 6 months are presented in Table 3.

The qualitative portion of the DSRQ asked participants to describe specific instructions they received from their healthcare providers for following a low-sodium diet. Over 80% of

patients were advised to follow a low-salt diet with 31% indicating that they 'always' followed the prescribed diet. The most common instruction was 'cut back or watch salt or sodium in diet' (n=36). Only six participants reported receiving written information about limiting sodium intake and as few as five participants reported receiving a specific daily sodium intake recommendation.

Dietary sodium intake

Daily sodium intake was not significantly different between groups at baseline ($t(47)=0.46$, $p=0.64$; Table 2). Dietary sodium intake was not significantly different between groups at 6 weeks; however, dietary sodium intake was significantly lower (F=7.3, df=1,29 ,$p=0.01$) in the intervention group at the 6 month study endpoint while controlling for baseline sodium intake (Table 4). The effect size of intervention group assignment at 6 months was small (0.20).

Attitudes

Total Attitudes subscale scores were significantly higher in the intervention group at 6 weeks (F=7.6, df=1,38, $p<0.01$). There were no significant differences in total Attitudes subscale scores between the usual care and intervention groups at baseline (Table 2) or at the 6 month study endpoint (Table 4). Attitudes subscale scores at 6 weeks were negatively correlated with sodium intake at 6 months (Table 3). Item mean scores for 'eating a low-salt diet will keep fluid from building up in my body', 'eating a low-salt diet will keep my swelling down', and 'salty food is not good for me' were significantly higher in the intervention group at 6 weeks (Table 5). Item mean scores for 'eating a low-salt diet will help me breathe easier' were higher in the intervention group at 6 weeks and 6 months.

Subjective norm

There were no differences in total Subjective Norm subscale scores between the usual care and intervention groups at baseline (Table 2), 6 weeks, or 6 months (Table 4). The majority of participants strongly agreed that they want do what their healthcare provider thinks they should do with regards to following a low-sodium diet (53.8%). Fewer (32.7%) strongly agreed that they should follow the advice of a spouse or family member on the issue when they entered the study. Subjective Norm subscale scores at baseline, 6 weeks, and 6 months were negatively correlated with dietary sodium intake at 6 months (Table 3). Item mean scores for 'my doctor thinks I should follow a low-salt diet' were significantly higher in the intervention group at baseline; however, differences in the means were not noted between groups at 6 weeks or 6 months (Table 5).

Perceived behavioural control

There were no differences in total Perceived Behavioral Control subscale scores in the usual care and intervention groups at baseline (Table 2) or at 6 weeks and 6 months (Table 4). The Perceived Behavioral Control mean subscale scores for all participants at 6 weeks were positively correlated with dietary sodium intake at 6 months (Table 3). Item mean scores for 'a low-salt diet is difficult because others around me do not eat low-salt foods' and 'a low-salt diet is difficult to follow because of no willpower' were higher in the intervention group at baseline; these differences were not noted between groups at 6 weeks and 6 months (Table 5). Higher item mean scores for 'a low-salt diet is difficult due to cost' and 'a low-salt diet is difficult due to time needed to prepare' were noted in the intervention group at 6 weeks. Following a low-sodium diet was more difficult at 6 weeks for the usual care group because of the inability to select low-sodium foods in restaurants and restaurants not serving preferred low-sodium foods (Table 5).

Discussion

Dietary sodium intake

Daily dietary sodium intake decreased from baseline in the intervention group at 6 months. In contrast, the sodium intake of the usual care group increased from baseline at 6 months. The US Department of Agriculture recommends a sodium intake of 2300 mg per day.[23] A sodium restriction of 1500 mg per day for all adults has also been suggested.[24] The intervention group met the 2300 mg per day recommendation at the 6-month study endpoint. Dunbar et al. obtained similar results in a shorter, 3-month trial. Decreased dietary and urinary sodium levels were reported from baseline to 3 months in their study of HF patients and family members (n=61) receiving education and counselling on self-management of a low-sodium diet.[25] Bentley et al.[21] cited 'lack of knowledge' as one of three primary themes for nonadherence to a low-sodium diet in a qualitative study of 20 heart failure patients. While the intervention group decreased their sodium intake over time which could produce health benefits, additional research is needed to determine the ideal sodium intake for patients with heart failure.

While low-sodium diet instruction has been linked to low-sodium diet adherence,[25] participants in this study reported minimal instructions from their healthcare providers prior to study entry. Thirty-six participants summarized instructions from their healthcare providers in simple statements such as 'cut back on salt' or 'watch your salt'. A substantially lower number of participants reported receiving written instructions for monitoring or decreasing sodium intake or specific numerical goals for daily sodium intake from their providers. It is clear that improvement in the education process for ensuring low-sodium diet adherence is warranted. Specific recommendations on dietary sodium restriction should be provided by healthcare providers according to established guidelines.

Constructs of the Theory of Planned Behavior

Attitudes—Patients in the intervention group reported more positive attitudes about following a low-sodium diet compared to the usual care group at 6 weeks. While a more positive attitude towards following a low-sodium diet continued in the intervention group at 6 months, there were no group differences in subscale scores at the study endpoint. Intervention group members were more aware of the potential health benefits of following a low-sodium diet than usual care group members. At 6 weeks, intervention group members more strongly agreed that salty food was not good for them, that eating a low-sodium diet would keep fluid from building up in their bodies and keep swelling down, and that dietary adherence would help them breathe easier when their attitudes were compared to attitudes from the usual care group. The stronger beliefs about the connection between low-sodium diet adherence and ease of breathing continued in the intervention group at 6 months. Links between a more positive attitude towards following a low-sodium diet and lower dietary sodium intake were revealed among the participants in this study. Knowledge about the positive physical effects of following a low-sodium diet may influence dietary sodium intake for an extended time after instruction. Emphasizing the potential physical benefits of following a low-sodium diet is recommended when providing dietary instruction.

Subjective norm—More than half of the patients in the study strongly agreed that they should follow their healthcare providers' advice for adhering to a low-sodium diet. Participants in the intervention group more strongly agreed that their physician believed they should follow a low-sodium diet at baseline but there were no differences between groups on this item at 6 weeks or 6 months. Participants also believed that they should follow similar advice from their spouse or significant others. Participants randomized to an education and family partnership intervention showed a greater decrease in urinary sodium

levels at 3 months when compared to the education only cohort.[25] Better self-reported adherence to a low-sodium diet was documented with the Eating Behavior Questionnaire (EBQ) in a sample of 74 Veterans Hospital heart failure patients when the patients received emotional support from significant others.[26] These findings suggest that support and encouragement for following a low-sodium diet from healthcare providers as well as significant others can positively influence a patient's decision to follow low-sodium diet instructions.

Perceived behavioural control—Total subscale scores for Perceived Behavioural Control appeared to indicate more behavioural control in the intervention group compared to the usual care group at 6 weeks and 6 months; however, there were no significant differences in group means on this scale. Intervention group members reported more difficulty following a low-sodium diet than the usual care group at 6 weeks because of the high cost of food and preparation time needed for a low-sodium menu. One plausible explanation for this difference is that patients in the usual care group may not have purchased or prepared low-sodium foods to the same extent as patients in the intervention group; therefore, cost and preparation burdens were less problematic for this group. Usual care group members reported more difficulty selecting low-sodium foods in restaurants and finding restaurants that serve low-sodium foods at 6 weeks than the intervention group. The intervention included instruction on how to select low-sodium foods in restaurants which corroborates this difference in the groups. Participants in the intervention group were more likely to experience difficulty following a low-sodium diet because significant others were not eating a low-sodium diet at baseline; however the groups were not different on this item at 6 weeks and 6 months. Usual care participants reported more willpower at baseline than the intervention group but these differences did not carry through to 6 weeks and 6 months. Willpower improved over time in the intervention group and remained consistent in the usual care group. Learning how to manage a low-sodium diet may be motivating and improve willpower in some patients with HF.[27] Heart failure patients need to understand how to operationalize the instructions provided by their healthcare providers. Providing information about ways to reduce the cost and food preparation effort for low-sodium foods can decrease barriers to low-sodium diet adherence. Including practical advice on how to select accommodating restaurants and low-sodium foods from a menu during dietary instruction can make dietary adherence more manageable for patients with HF.

Limitations

A small sample size poses some limits on statistical analyses. The sample size for data analysis was reduced by participant attrition and item omissions on the DSRQ. Twelve participants did not complete the study protocol due to an increase in the severity of illness or death (n=6), cognitive impairments or inability to follow instructions (n=3), and loss to follow up (n=3). Self-report of dietary intake is subject to bias when social desirability of responses is high.[28] Participants may inaccurately document food intake to meet a social norm; however, this would be equally true for usual care and intervention groups. The intervention nurse for this study reviewed the contents of the 3-day food diaries with the participants after diaries were completed to ensure accuracy. A neutral, information gathering communication style was used to instruct patients on the use of food diaries and during the reconciliation procedure. The sodium content of foods was not discussed with patients in the usual care group during the data collection procedures. The cost of intervention was not determined. It would be enlightening to compare the cost of a home-based educational intervention to promote low-sodium diet adherence to the cost of preventable hospitalizations that are attributed to high sodium intake and fluid retention.

Conclusions

The educational intervention in this study was effective in reducing dietary sodium intake in patients with HF at the 6 month study endpoint. Attitudes towards following a low-sodium diet was also improved at 6 weeks in the intervention group. Individualized instruction in the home with well-organized, specific teaching strategies can produce dietary changes such as low-sodium diet adherence among patients with newly diagnosed or long-standing HF.

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Table 1

Intervention timeline and Theory of Planned Behavior actions/outcomes

Week	Intervention protocol	Actions/outcomes
1	Baseline questionnaires during home visit	Collect data to address the three constructs of the TPB: Perceived Behavioral Control, Subjective Norms, and Attitudes
	Identify significant others and include in intervention	Provide teaching related to perceived behavioural control (knowledge, barriers)
		Create positive subjective norm
2	Individualized teaching	Develop positive attitude towards behaviour
	Pathophysiology of heart failure	Create positively valued outcomes resulting from performance of the desired behaviour
	Negative consequences volume overload	
	Clear linkage between high-sodium foods and volume overload	
	Positive outcomes of low-sodium diet	
3	Follow-up phone call	Facilitate behavioural change
	Reinforce previously taught content	
	Answer questions	
	Provide encouragement and applaud efforts	
4	Further individualized teaching in participant's home	Increase perceived behavioural control
	Teach high- and low-sodium foods, reading food labels, salt substitutes/seasoning, menu development, fast-food choices	Increase knowledge and skills in order to decrease barriers and increase sense of ability
		Impact control beliefs: increase presence of resources and decrease presence of impediments
		Increase perceived power by impacting number of resources to facilitate behavioural change
5	Follow-up phone call	Facilitate behavioural change
	Reinforce previously taught content	
	Answer questions	
	Provide encouragement and applaud efforts	
6	Repeat baseline questionnaires	Facilitate behavioural change
	Answer questions	
	Provide encouragement and applaud efforts	
24	Repeat baseline questionnaires	Facilitate behavioural change
	Answer questions	
	Provide encouragement and applaud efforts	

Table 2

Comparison of baseline characteristics between usual care and intervention groups (n=52)

Characteristics	Usual care (n=25)	Intervention (n=27)	p-value
Sex			
Women	12 (48)	12 (44)	0.797
Men	13 (52)	15 (56)	
Age (years)	65.5±11.8	59.2±8.3	0.033
Marital status			
Married/cohabitate	11 (44)	12 (44)	0.974
Single/divorce/widow	14 (56)	15 (56)	
Education level			
Did not complete high school	4 (17)	9 (33)	0.271
Completed high school	7 (29)	4 (15)	
At least some college or technical school	13 (54)	14 (52)	
Ethnicity			
African American	3 (12)	7 (25.9)	0.430
Caucasian	21 (84)	18 (66.7)	
American Indian or Alaskan Native	0	1 (3.7)	
Mixed	1 (4)	1 (3.7)	
Income perception			
More than enough income to make ends meet	10 (40)	10 (37)	0.482
Enough income to make ends meet	11 (44)	9 (33)	
Do not have income to make ends meet	4 (16)	8 (30)	
NYHA class			
Class II	14 (56)	11 (41)	0.271
Class III or IV	11 (44)	16 (59)	
Employment status			
Employed full-time outside home	2 (8)	5 (19)	0.121
Sick leave/disability/retired due to HF	16 (64)	16 (59)	
Retired	7 (28)	3 (11)	
Other	0	3 (11)	
Heart failure aetiology			
Ischaemic	15 (60)	13 (48)	0.392
Non-ischaemic	10 (40)	14 (52)	
LVEF%	41.6±19.3	37.8±20.6	0.499
Dietary sodium intake	3070±1352	2880±1489	0.645
Attitudes subscale	30.5±4.3	30.7±4.5	0.821
Subjective Norm subscale	16.7±2.3	17.5±2.2	0.239
Perceived Behavioral Control subscale	21.5±5.9	25.1±7.3	0.060

Values are n (%) or mean±SD. LVEF, left ventricular ejection fraction; NYHA, New York Heart Association.

Table 3

Correlations between key variables and dietary sodium intake at 6 months *(n=52)*

Variable	*r*	*p*-value
Age	–0.187	0.305
Gender	–0.351	0.049
Group	–0.457	0.009
Dietary sodium intake – baseline	0.397	0.024
Dietary sodium intake – 6 weeks	0.317	0.077
Attitudes – baseline	0.025	0.893
Attitudes –6 weeks	–0.407	0.023
Attitudes – 6 months	–0.069	0.709
SN – baseline	–0.355	0.050
SN – 6 weeks	–0.559	0.001
SN – 6 months	–0.390	0.027
PBC – baseline	–0.044	0.823
PBC – 6 weeks	0.384	0.040
PBC – 6 months	0.218	0.264

Gender, 0=male, 1= female. Group, 0=usual care, 1=intervention.

PBC, Perceived Behavioral Control subscale; SN, Subjective Norm subscale

Table 4

Group differences in outcome variables at 6 weeks and 6 months

Variable	Usual care (*n*=25)	Intervention (*n*=27)	*p*-value
Dietary sodium intake			
6 weeks	3011.1±1194.8 (*n*=20)	2327.8±1435.4 (*n*=20)	0.224
6 months	3164±885.9 (*n*=17)	2262±925.4 (*n*=15)	0.011
Attitudes subscale			
6 weeks	31.7±3.2 (*n*=20	33.8±1.8 (*n*=21)	0.009
6 months	31.5±3.8 (*n*=20)	33±3.6 (*n*=20)	0.258
Subjective Norm subscale			
6 weeks	17.9±1.9 (*n*=20)	18.2±2.0 (*n*=21)	0.964
6 months	17.5±2.4 (*n*=20)	18.2±2.5 (*n*=20)	0.511
Perceived Behavioral Control subscale[a]			
6 weeks	21.4±4.6 (*n*=17)	19.3±4.7 (*n*=17)	0.162
6 months	18.9±5.9 (*n*=18)	17.5±5.9 (*n*=15)	0.304

Values are mean±SD.

[a]Lower scores indicate more perceived behavioural control.

Table 5

Group differences in Attitudes, Subjective Norm, and Perceived Behavioral Control subscale item means

Item	Usual care			Intervention		
	Baseline (*n*=24)	6 weeks (*n*=21)	6 months (*n*=21)	Baseline (*n*=27)	6 weeks (*n*=21)	6 months (*n*=20)
Attitudes						
Eating a low-salt diet will keep fluid from building up in my body	4.6±1.0	4.6±0.5[a]	4.6±0.6	4.4±0.8	4.9±0.3[a]	4.8±0.7
Eating a low-salt diet will keep my swelling down	4.4±0.8	4.4±0.8[a]	4.6±0.6	4.3±0.8	4.9±0.3[a]	4.9±0.7
Eating a low-salt diet will help me breathe easier	3.9±0.9	4.0±0.9[a]	4.1±0.9[a]	4.3±1.0	4.8±0.4[a]	4.7±0.7[a]
Salty food is not good for me	4.7±0.5	4.7±0.5[a]	4.7±0.6	4.9±0.4	5.0±0.2[a]	4.9±0.4
Subjective Norm						
My doctor thinks I should follow a low-salt diet	4.4±0.8[a]	4.4±0.7	4.4±0.7	4.7±0.4[a]	4.6±0.8	4.6±1.0
Perceived Behavioral						
Control						
Low-salt diet difficult: cost	1.7±1.2	1.1±0.5[a]	1.6±1.2	1.4±1.0	2.0±1.5[a]	2.0±1.3
Low-salt diet difficult: time to prepare	1.2±0.6	1.2±0.8[a]	1.3±0.9	1.5±1.1	2.0±1.4[a]	1.6±1.1
Low-salt diet difficult: can't pick in restaurants	2.7±1.5 (*n*=23)	3.1±1.5[a]	2.6±2.0	2.6±1.6 (*n*=24)	1.9±1.1 (*n*=20)[a]	2.4±2.0 (*n*=16)
Low-salt diet difficult: restaurants don't serve	3.1±1.6 (*n*=21)	3.2±1.4[a]	2.8±1.9	2.7±1.6 (*n*=23)	2.1±1.2 (*n*=20)[a]	2.2±2.1 (*n*=17)
Low-salt diet difficult: others do not eat	1.5±0.8[a]	1.2±0.5	1.2±0.7	2.2±1.4[a]	1.6±1.2	1.2±0.5
Low-salt diet difficult: no willpower	1.6±0.9[a]	1.5±0.9	1.6	2.3±1.6[a]	1.3±0.6	1.2±0.5

Values are mean±SD.

[a] $p \leq 0.05$