The Impact of Portion Plates on Patients in the Cardiac Rehabilitation Program

Authors
Mary Flesher, Regional Surgical Program, Vancouver Coast Health (VCH), Vancouver, BC, Canada
Karen Tyldesley, Clinical Nutrition, VCH Richmond Hospital, Richmond, BC, Canada,
Joan Prescesky, Healthy Heart Program, VCH Richmond Hospital, Richmond, BC, Canada,
Chris Salgado, Healthy Heart Program, VCH Richmond Hospital, Richmond, BC, Canada

Address for Correspondence
Mary Flesher,
5171 Bunting Avenue
Richmond, BC
V7E 5X3
604-363-1835
E-mail: mary.flesher@vch.ca

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Abstract: Introduction: The purpose of this study was to determine if the use of a portion plate could improve the waist circumference, weight loss and blood pressure of cardiac rehabilitation patients. Methods: The data collected at their time of admission to the program (week 0) and at their completion of the program (week 8). Both groups were analyzed and compared using means and ranges. Results: The study included 86 patients, with 49 patients who received the portion plate at week 0 (study group) and 37 patients who received the portion plate at week 8 (control group). The mean weight reduction for the study group was 6.1 kg (6.5%) versus the control group which had a mean reduction of 0.6 kg (0.1%). The study group reduced their mean BMI by 0.85 kg/m² (2.6%) while the control group reduced their mean BMI by 0.25 kg/m² (0.1%). The study group reduced their mean waist circumference by 2.3 cm (2.1%) and the control group reduced it by 1.0 cm (0.9%). Conclusions: For waist circumference, BMI and weight, the portion plate group showed a greater improvement compared with the control group. Given the results, the cardiac rehabilitation program is considering the plates in their routine care.

Key Words: Portion plate, Weight management tool

Introduction:
In Canada, 67% of men and 54% of women are overweight or obese based on measure weight.(1) The overall cost of obesity in British Columbia (2006) is estimated to be $563 million dollars.(2) An increase in food portion sizes and sedentary lifestyle of Canadians has contributed to the imbalance in caloric intake and usage.(1-3) Obesity is the leading risk factor for many chronic diseases and has been linked directly to an increased incidence of heart disease and hypertension.(4) Cardiac Rehabilitation (CR) Phase I involves the rehabilitation of patients with cardiac disease in an outpatient setting at the Richmond Hospital. It is an 8-week interdisciplinary program involving exercise, group education, and individual counselling. Currently, patients are referred by a cardiologist to the CR program and have parameters like their blood pressure and waist circumference measured at the first and final visits. Patients are offered an optional individual dietitian visit and are required to attend weekly nutrition education classes.

Weight Loss with Portion Plates
Portion sizes are essential in determining the amount of calories consumed at meal times.(5,6) The Canadian Community Health Survey (2004) found that the average adult consumed about 2732 kilocalories daily, which is increased from the average of 2356 kilocalories in 1991.(7) One randomized controlled study looked at the impact of a portion control tool (portion plate) on the weight changes in diabetic patients and found a significantly greater weight loss in patients using the tool versus the control group.(8) No other studies were found that measured the efficacy of these tools in cardiac patients.

Hypertension and Weight Reduction
Body mass index (BMI) is a common tool used to compare height and weight, that is calculated by weight (kg) divided by height squared (m²). A reduction in BMI through non-pharmacological methods like caloric reduction and physical activity has significantly improved cardiac risk factors in some studies.(9) Routine physical activity has been shown to reduce blood pressure.(9,10) Studies on blood pressure and exercise have showed improvements of 10-20%. (11) Systolic blood pressure was reduced by 1.6 mm Hg systolic and 1.1 mm Hg diastolic for every 1 kg of weight lost in overweight patients.(12,13) Studies demonstrated that a reduction of 5 g or 87 mmol/day of dietary sodium was associated with a decline in blood pressure.(14)
Aim for the amount to the size of your fist.

- Add a fruit and dairy for a well-balanced meal.

Vegetable section makes up half the plate and instructions on the plate are “Fill half the plate with vegetables. Choose 2 or more colours when possible. Add a fruit and dairy for a well-balanced meal.”

Starch section makes up a quarter of the plate and instructions on the plate are “Choose either potatoes, rice, pasta, bread or a grain. Aim for the amount to the size of your fist.”

Protein section makes up a quarter of the plate and instructions on the plate are “Choose either chicken, lean meat, fish, tofu or beans to the size of a deck of cards.”

The hypothesis of this study was that subjects from the experimental group would have an average reduction in: (a) waist circumference by > 5%, (b) weight or BMI by > 5%, and (c) systolic and diastolic blood pressure by >10%. The subjects in the control group were hypothesized to show an average less than these targets for the experimental group.

Materials and Methods

The study was approved by the University of British Columbia Clinical Research Ethics Board. Patients in the cardiac rehabilitation program were asked if they wished to participate in the study by either the nurse or the dietitian at the initial visit. All patients in the cardiac rehabilitation program receive individual counseling and attend 8 weeks of group nutrition classes, and this was provided to both the portion plate group and control group. Data was collected from subjects’ charts that had agreed to participate by informed consent. No new information was measured that is not routinely done at this time and the only demographic information collected was gender. The data collected included waist circumference, weight, height and blood pressure at their time of admission to the program (week 0) and at their completion of the program (week 8). The portion plate group received their plate at the beginning of the program and the control group was offered the portion plates at the completion of their 8 weeks.

Portion plates (pictured in Figure 1) are a divided plate in which half the plate is intended for vegetables, one quarter for starch and one quarter for protein. The plate specifies that food should not be excessively loaded onto the plate, that the starch portion should be about the size of the participant’s fist and that protein should be about the size of a deck of cards. Each subject was provided verbal instruction similar to the above and provided written instructions on how to use the plate.

Waist Circumference and Weight Loss

Waist circumference that is indicative of an increased risk of diseases, including coronary heart disease, is > 88 cm for women and > 102 cm for men. (14,15) Reducing waist circumference through weight loss can lower a person’s risks of hypertension and coronary heart disease. (15) Elevations in both BMI and waist circumference are independent risk factors in heart disease, increasing the heart disease risk factors by 2-4 fold. (3,15)

Purpose of the Study:

The purpose of this study was to determine if the use of a portion control tool (portion plate) could reduce waist circumference, enhance weight loss and reduce blood pressure of the patients within a cardiac rehabilitation program. If the tool was shown to statistically improve these outcomes when compared with a control group receiving usual care, the tool may be added to the usual care.

Hypothesis, Objectives and Research Question

This randomized controlled study will ask: How will portion control plates impact the weight, blood pressure and waist circumference of patients in a cardiac rehabilitation program? Patients currently have their waist circumference, weight, height and blood pressure measured at their first visit (week 0) and at their final visit (week 8). This study sought to compare these three parameters at these same times (week 0 and week 8) between the control and experimental groups. The control group received the usual care while the experimental group received usual care plus be given a portion control plate at week 0.

The hypothesis of this study was that subjects from the experimental group would have an average reduction in: (a) waist circumference by > 5%, (b) weight or BMI by > 5%, and (c) systolic and diastolic blood pressure by >10%. The subjects in the control group were hypothesized to show an average less than these targets for the experimental group.

Results

One hundred and one patients agreed to participate in the study but fifteen subjects could not be used because their data was incomplete at discharge. Of these 86 patients, there were 33 females and 53 males. Data was completed for 49 patients who received the portion plate at week 0 (study group) and 37 patients who received the portion plate at week 8 (control group). Information was collected on the waist circumference, weight, BMI and blood pressure between the two groups using alpha = 0.05 (p-value). Both groups were analyzed and compared for changes in these parameters by means and ranges. The results were statistically analyzed using descriptive statistics and regression analysis within the Excel program that included standard deviation and p-value.

Figure 1: Portion Plate provided to Study and Control Groups

The sample size included 90 subjects, which was calculated based on the averages for each parameter from the previous two years, using t test. Subjects were randomly assigned to either experimental or control groups, by flipping a coin. This sample size had an 80% power to compare weight loss, waist circumference and blood pressure between the two groups using alpha = 0.05 (p-value). Both groups were analyzed and compared for changes in these parameters by means and ranges. The results were statistically analyzed using descriptive statistics and regression analysis within the Excel program that included standard deviation and p-value.
Blood pressure was measured in both the portion plate group and the control group. At baseline (week 0), the mean blood pressure for the portion plate group was 139/78 and this was reduced to a mean of 119/69 (change systolic 17% and diastolic 13%) at week 8. For the control group, the mean blood pressure was 132/75 and this was reduced to 119/69 (change systolic 11% and diastolic 9%). Both groups showed a reduction in blood pressure that was significant, although blood pressure management is part of the routine care of the cardiac rehabilitation program so a direct correlation cannot be made to the use of the portion plate.

**Discussion**

Dietary management of the cardiac rehabilitation management patients has traditionally involved individual counseling and group education to promote healthy eating habits and use. Use of the portion plate tool, which encourages a more balanced diet in healthy portions, was trialed with this patient group and showed greater improvements in waist circumference, weight and BMI as compared with the control group. Over the 8 week period, the portion plate group showed waist circumference improvement by >2% although we had hypothesized an improvement of more than 5%. For weight, the portion plate group improved by >5% while the improvement in BMI was 2.6%. Both groups improved in blood pressure control.

The results showed that there was a significant improvement in weight as compared with the control group. Both BMI and waist circumference also showed improvement although they did not reach their hypothesized goal. Given the time period was only 8 weeks from the baseline to the end of the program, it would be useful to use these parameters for a longer term to see if the trend continues to show a sustained or continual improvement in weight, waist circumference and BMI. The time period is a limitation of the study because it is difficult to predict whether this would be sustained over a longer period of time.

### Table 1: Means and Ranges for Portion Plate Group and Control Group for Weight, BMI and Waist Circumference

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<td>Week 0</td>
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<tr>
<td>Mean Weight (kg)</td>
<td>100 ± 6.2 (± 5.5)</td>
<td>94.5 ± 5.7</td>
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<td>Weight Range (kg)</td>
<td>71.0 - 132.0 (0 - 0)</td>
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<td>Mean BMI (kg/m2)</td>
<td>32.7 ± 5.2 (2 - 2.6)</td>
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<td>BMI Range (kg/m2)</td>
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<td>Mean Waist Circumference (cm)</td>
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<td>Range Waist Circumference (cm)</td>
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Blood pressure was measured in both the portion plate group and the control group. At baseline (week 0), the mean blood pressure for the portion plate group was 139/78 and this was reduced to a mean of 119/69 (change systolic 17% and diastolic 13%) at week 8. For the control group, the mean blood pressure was 132/75 and this was reduced to 119/69 (change systolic 11% and diastolic 9%). Both groups showed a reduction in blood pressure that was significant, although blood pressure management is part of the routine care of the cardiac rehabilitation program so a direct correlation cannot be made to the use of the portion plate.

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