Comparison of Dietary Patterns, Perceptions of Health, and Perceived Barriers to a Heart Healthy Diet Before and After Coronary Artery Angiography

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Poor dietary patterns are associated with coronary artery disease (CAD) and cardiovascular events. The aim of this study was to determine whether reported dietary patterns change after undergoing invasive coronary angiography. Participants without a history of coronary revascularization were prospectively enrolled before undergoing coronary angiography at a tertiary center between February 2015 and February 2017. Enrolled participants completed the Rate Your Plate (RYP) survey at baseline (before angiography), 1-month, and 6-month follow-ups. RYP scores range from 24 to 72 (higher scores indicate healthier dietary patterns) are presented as median (interquartile range), and are compared from baseline to follow-up using a nonparametric related-sample test. No dietary guidance was given outside of usual care. Of the 400 participants, 326 (82%) completed at least 1 follow-up survey with no differences in baseline characteristics of participants who had at least 1 versus no follow-up survey. The median RYP score significantly improved from baseline (53 [47 to 57]) to 1-month (58 [52 to 62]) and 6-month (59 [54 to 63]) follow-ups ($p < 0.001$). Angiography demonstrated severe CAD in 125 (38%) and normal or nonobstructive CAD in 201 (62%) participants. RYP scores significantly improved over time in both groups ($p < 0.001$), but the percent change in RYP score over time was greater in participants with versus without severe CAD (13.9% [5.8 to 22.5] vs 9.6% [4.8 to 19.1], $p = 0.03$). In conclusion, self-reported dietary patterns improved after invasive coronary angiography, particularly in the subset with CAD. Future studies to determine how best to utilize the periprocedural period to further improve dietary patterns in this population are warranted. **Published by Elsevier Inc. (Am J Cardiol 2019;123:865−873)**

Poor dietary patterns are associated with coronary artery disease (CAD) and adverse cardiovascular outcomes.[1−4] The current dietary recommendations include a diet abundant in fruits, vegetables, and whole grains, and a limited intake of saturated fat, trans-fat, and processed foods, which aim to reduce both CAD risk and related morbidity and mortality.[5] The American College of Cardiology recommends the use of the "Rate Your Plate" (RYP) survey to gather baseline diet information in a time-efficient manner, potentially allowing clinicians to include personalized dietary counseling in a busy practice.[6] Few studies have evaluated whether dietary patterns and perceptions of health and perceived barriers to healthy lifestyles change after a patient is aware of whether or not they have CAD. The primary aim of this study was to determine whether dietary patterns as assessed using the RYP survey change after a diagnostic invasive coronary angiogram (CAG). Secondary aims are to evaluate change in dietary pattern over time by severity of CAD and change in perceptions of health and perceived barriers to a heart healthy diet after CAG.

Methods

Patients referred for CAG were identified as potential participants for this prospective cohort study from 2 sites at a tertiary medical center in New York City between February 2015 and February 2017. Exclusion criteria included presentation for emergent revascularization,[7] history of coronary revascularization, or primary language other than English or Spanish (RYP survey was unavailable in other languages at the time of the study). All participants provided written informed consent before their scheduled CAG. The study was approved by the New York University School of Medicine Institutional Review Board and is registered at clinicaltrials.gov (NCT02382250).

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Trained research personnel administered 2 surveys to participants, the RYP survey and a health perceptions survey. RYP is a 24-question tool designed to capture information related to intake of fat, animal protein/dairy, fruit, vegetables, whole grains, snacks, and sweets.[8,9] Each question has 3 answer options, which describes how often the participant consumes the food item in question. Each answer is graded on a 3-point scale; scores can range from 24 to 72, with higher scores indicating better diet quality. The health perceptions survey was designed by the research team and included 6 questions aimed to gather information regarding the participants' perceptions of their current health and perceived barriers to healthier lifestyles. Follow-up surveys were administered through telephone by research staff on follow-up at 1 month (±1 week) and 6 months (±1 month). No dietary guidance was given outside of usual care.

Demographics, socioeconomic factors, and medical histories were obtained from the participants at the time of the baseline survey administration and verified with electronic medical records. Height (Seca 216, Model 1814009, Chino, California) and weight (Conair Weight Watchers, Model WW24WN, East Windson, New Jersey) were measured by trained clinical staff, and waist circumference was measured at the level of the iliac crest while the participant was in standing position by trained research staff (Mabis tape measure, Model 35-780-000, Waukegan, Illinois). Participants were determined to have diabetes mellitus if self-reported, on glucose-lowering medications, or hemoglobin A1c was 6.5% or higher, and chronic kidney disease was defined as having a baseline creatinine greater than 1.5 mg/dl. Current tobacco use was defined as any use of cigarettes/cigars/pipes within the prior 6 months. The presence of severe CAD was defined as ≥70% diameter stenosis by visual estimate or physiologically significant by an invasive measurment (e.g., fractional flow reserve) at the clinical operator's discretion.

The primary outcome was change in total RYP score from baseline to 1-month follow-up. Secondary outcomes included change in total RYP score from baseline to 6-month follow-up and individual components of the health perceptions survey.

Continuous variables are presented as median (interquartile range) and categorical variables as proportion (frequency). Individual responses to the RYP diet survey are presented as mean (standard deviation). Baseline characteristics were compared between participants who completed at least 1 versus those who did not complete any follow-up RYP survey using Mann-Whitney test for continuous variables and test of proportions for categorical variables. Changes in RYP scores were evaluated using related-samples Friedman's 2-way analysis of variance by ranks test for comparison from baseline to 1- and 6-month follow-ups, and further evaluated using the Wilcoxon signed-rank test for baseline versus 1-month follow-up and baseline versus 6-month follow-up comparisons.

Secondary analyses evaluated for differences in RYP survey results over time based on CAD status. Baseline characteristics were compared between participants with versus those without severe CAD using Mann-Whitney test for continuous variables and test of proportions for categorical variables. Changes in RYP scores were evaluated within each group using related-sample tests as described for the overall cohort. The percent change in RYP score

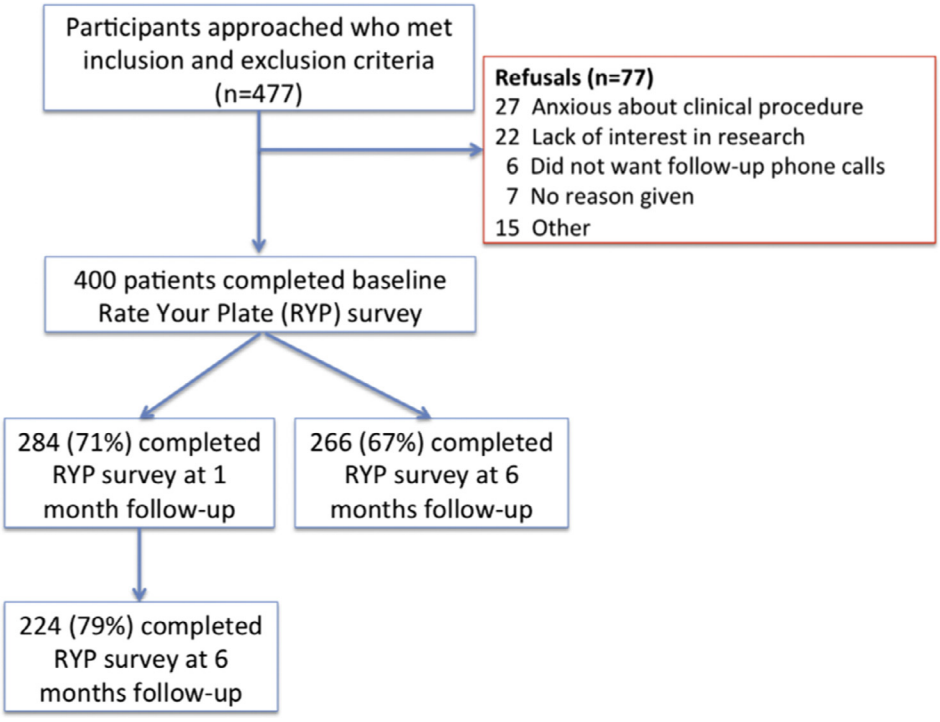


Figure 1. Study enrollment and follow-up.

Table 1
Baseline characteristics of patients with at least 1 versus no follow-up Rate Your Plate survey

Variable	Follow-up		p value
	At least one (n = 326)	None (n = 74)	
Age (years)	61 [53-68]	64 [53-68]	0.56
Men	192 (59%)	42 (57%)	0.79
White	173 (53%)	45 (61%)	0.60
Black	98 (30%)	20 (27%)	
Asian	35 (11%)	5 (7%)	
Other	20 (12%)	4 (5%)	
Hispanic	69 (21%)	16 (22%)	0.99
Body mass index (kg/m^2)	28.8 [25-33]	29.3 [25-33]	0.90
Highest education level			0.37
Less than high school	73 (22%)	12 (16%)	
High school or some college	147 (45%)	39 (53%)	
4-year college or more	106 (30%)	22 (30%)	
Employment status			0.94
Full time	113 (35%)	26 (35%)	
Part time, looking for work, student, or homemaker	69 (21%)	14 (19%)	
Retired or disabled	144 (44%)	32 (43%)	
Income			0.88
Less than $25,000	129 (41%)	26 (38%)	
$25,000-$74,999	85 (27%)	18 (267%)	
Greater than or equal to $75,000	102 (32%)	24 (35%)	
Marital status			0.14
Single or never married	85 (26%)	12 (16%)	
Married or domestic partnership	175 (54%)	41 (55%)	
Previously married	65 (20%)	20 (27%)	
Hypertension	229 (70%)	58 (78%)	0.20
Dyslipidemia*	212 (65%)	50 (68%)	0.79
Diabetes mellitus	119 (37%)	22 (30%)	0.29
Congestive heart failure	23 (7%)	10 (14%)	0.10
Chronic kidney disease	19 (6%)	2 (3%)	0.39
Aspirin†	205 (64%)	40 (54%)	0.15
P2Y2 inhibitor†	50 (15%)	9 (12%)	0.59
Statin therapy for at least 7 days prior to procedure†	177 (55%)	42 (57%)	0.80
Beta blocker†	156 (49%)	39 (53%)	0.61
Angiotensin converting enzyme inhibitor or angiotensin receptor blocker†	138 (43%)	38 (51%)	0.24
Diuretic†	97 (30%)	28 (38%)	0.21
Indication for angiogram			0.99
Stable ischemic heart disease	252 (78 %)	58 (78%)	
Acute coronary syndrome‡	74 (23%)	16 (22%)	
Presence of severe coronary artery disease	125 (38%)	30 (41%)	0.79

Continuous variables are shown as median (interquartile range) and compared between groups using Mann-Whitney test.
Categorical variables are shown as frequency (proportion) and compared between groups using test of proportions.
* Dyslipidemia was defined as self-reported diagnosis, presence of diagnosis in electronic medical record, on cholesterol-lowering therapies, total cholesterol greater than 200, or LDL cholesterol greater than 130.
† Medications are described as those taken at baseline within 30 days of procedure and did not include medications started while in the hospital.
‡ Acute coronary syndrome pertains participants who underwent nonemergent invasive coronary angiography.7

from baseline to 6-month follow-up was compared between participants with versus without severe CAD using test of proportions.

Changes in nominal data from the health perceptions survey were evaluated using chi-square test, and changes in continuous data from the health perceptions survey were evaluated using related-samples Friedman's 2-way analysis of variance by ranks test.

Two-sided significance level was set at 0.05. Statistical analyses were conducted with the SPSS Statistics software, version 23 (IBM Corporation, Armonk, New York).

Results

Of the 477 participants who met study criteria and were approached for study participation, 400 participants (84%)

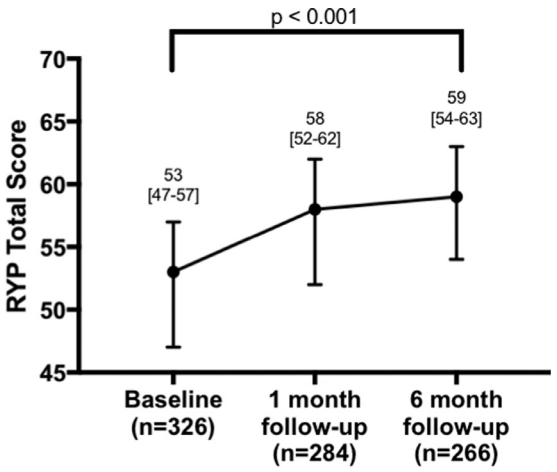


Figure 2. Rate Your Plate (RYP) total score before and after invasive coronary artery angiography in the study cohort.

were enrolled and 326 participants (82%) completed at least 1 follow-up RYP survey (Figure 1). Characteristics did not differ between participants with at least 1 follow-up versus those with no follow-up (Table 1).

The median RYP score improved from 53 [47 to 57] at baseline to 58 [52 to 62] on 1-month follow-up (p <0.001) and remained high at 59 [54 to 63] on 6-month follow-up (p <0.001; Figure 2). A sensitive analysis among different annual income levels demonstrated similar results (<$25,000: median RYP score at baseline 51 [44 to 56], 1 month 58 [50 to 62], 6 months 57 [53 to 62] , p <0.001; $25,000 to $75,000: baseline 53 [47 to 57], 1 month 57 [52 to 62], 6 months 60 [55 to 64], p <0.001; >$75,000: baseline 55 [48 to 59], 1 month 59 [54 to 62], 6 months 60 [57 to 63], p <0.001). Additionally, median RYP score also statistically improved over time for participants who work full-time (baseline 53 [47 to 58], 1 month 58 [53 to 61], 6 months 59 [55 to 63]) and those who work part-time or stay at home (baseline 53 [47 to 57], 1 month 58 [52 to 62], 6 months 59 [54 to 63]) (p <0.001).

Upon evaluation of the individual components of the RYP survey, each of the components improved over time to a healthier option, with the exception of meatless meals, dairy foods, and nuts/seeds, which did not differ significantly over time (Table 2).

Baseline characteristics of the participants with (n = 155, 39%) versus without (n = 245, 61%) severe CAD on CAG are shown in Table 3. Notably, participants with severe CAD were older, white, male, with a higher burden of cardiovascular co-morbidities, and more likely to present with acute coronary syndrome.

When evaluated by presence or absence of severe CAD, RYP scores were not significantly different at baseline (severe CAD 52 [47 to 57] vs no severe CAD 53 [47 to 57], p = 0.47) but improved when compared with baseline in both groups (Figure 3). Furthermore, the percent change in RYP score from baseline to 6 months was greater in participants with versus those without severe CAD (13.9% [5.8 to 22.5] vs 9.6% [4.8 to 19.1], p = 0.03).

Table 2
Responses to individual Rate Your Plate survey questions before and after invasive coronary artery angiography

RYP question topic	Baseline (n = 326)	Follow-up		p value
		1 month (n = 284)	6 months (n = 265)	
Meats	2.22 (0.83)	2.53 (0.65)	2.67 (0.57)	<0.001
Chicken/Turkey	2.32 (0.86)	2.64 (0.64)	2.71 (0.57)	<0.001
Ground meat/poultry	2.29 (0.86)	2.56 (0.73)	2.71 (0.58)	<0.001
Processed meat and poultry	2.37 (0.76)	2.66 (0.58)	2.72 (0.51)	<0.001
Portion size of meat/poultry	2.20 (0.73)	2.36 (0.66)	2.48 (0.66)	<0.001
Fish/shellfish	1.93 (0.86)	2.17 (0.86)	2.15 (0.85)	<0.001
Cooking method (meats/fish)	2.56 (0.68)	2.75 (0.52)	2.84 (0.38)	<0.001
Meatless meals	2.15 (0.91)	2.30 (0.87)	2.25 (0.86),	0.004
Whole eggs	2.36 (0.86)	2.46 (0.82)	2.55 (0.72)	<0.001
Milk (yogurt, cream)	2.13 (0.89)	2.29 (0.83)	2.45 (0.73)	<0.001
Cheese, fat type	1.72 (0.82)	2.01 (0.81)	2.17 (0.72)	<0.001
Servings of dairy foods	1.99 (0.72)	2.01 (0.71)	1.97 (0.68)	0.59
Whole grains	1.71 (0.67)	1.85 (0.63)	1.90 (0.65)	<0.001
Fruits and vegetables	2.02 (0.74)	2.22 (0.71)	2.47 (0.65)	<0.001
Cooking method (vegs/pasta)	2.47 (0.76)	2.60 (0.66)	2.77 (0.50)	<0.001
Fat type in cooking or baking	2.71 (0.65)	2.81 (0.53)	2.84 (0.46)	0.002
Salt from processed foods	1.90 (0.94)	2.16 (0.93)	2.00 (0.92)	<0.001
Table spreads	1.94 (0.94)	2.24 (0.88)	2.38 (0.76)	<0.001
Salad dressings, mayonnaise	2.21 (0.93)	2.38 (0.86)	2.46 (0.75)	<0.001
Snack foods	2.29 (0.78)	2.52 (0.68)	2.57 (0.64)	<0.001
Nuts, seeds	2.05 (0.85)	2.08 (0.86)	2.05 (0.86)	0.85
Frozen desserts	2.28 (0.83)	2.50 (0.73)	2.54 (0.68)	<0.001
Sweets, pastries, candy	2.04 (0.80)	2.27 (0.75)	2.36 (0.74)	<0.001
Eating out or take out	2.14 (0.86)	2.33 (0.77)	2.42 (0.73)	<0.001

Responses to individual Rate Your Plate diet survey questions are coded as 1 (least healthy option), 2, or 3 (healthiest option).
Data are shown as mean (standard deviation) and compared over time using related-samples Friedman's 2-way analysis of variance by ranks test.

Table 3
Baseline characteristics of study participants stratified by absence or presence of severe coronary artery disease (CAD) on invasive coronary artery angiography

Variable	Severe CAD		p value
	Yes (n = 155)	No (n = 245)	
Age (years)	64 [56-71]	59 [52-68]	0.001
Men	107 (69%)	127 (52%)	0.001
White	95 (61%)	123 (50%)	0.003
Black	30 (19%)	88 (36%)	
Asian	21 (14%)	19 (8%)	
Other	9 (6%)	15 (6%)	
Hispanic	34 (22%)	51 (21%)	0.80
Body mass index (kg/m^2)	27.6 [25-32]	29.9 [26-34]	0.017
Highest Education Level			0.21
Less than high school	40 (26%)	45 (18%)	
High school or some college	69 (45%)	117 (48%)	
4-year college or more	46 (40%)	82 (34%)	
Employment status			0.95
Full time	53 (34%)	86 (35%)	
Part time, looking for work, student, or homemaker	32 (21%)	51 (21%)	
Retired or disabled	70 (45%)	106 (44%)	
Income			0.16
Less than $25,000	68 (45%)	87 (37%)	
$25,000-$74,999	33 (22%)	70 (30%)	
Greater than or equal to $75,000	50 (33%)	76 (33%)	
Marital status			0.43
Single or never married	40 (26%)	57 (23%)	
Married or domestic partnership	78 (50%)	138 (56%)	
Previously married	37 (24%)	48 (20%)	
Hypertension	117 (76%)	170 (69%)	0.21
Dyslipidemia*	121 (78%)	141 (58%)	<0.001
Diabetes mellitus	67 (43%)	74 (30%)	0.01
Congestive heart failure	13 (8%)	20 (8%)	0.99
Chronic kidney disease	9 (6%)	12 (5%)	0.82
Aspirin†	108 (71%)	137 (56%)	0.004
P2Y2 inhibitor†	34 (22%)	25 (10%)	0.001
Statin therapy for at least 7 days prior to procedure†	107 (70%)	112 (46%)	<0.001
Beta blocker†	81 (53%)	114 (47%)	0.26
Angiotensin converting enzyme inhibitor or angiotensin receptor blocker†	76 (50%)	100 (41%)	0.10
Diuretic†	50 (33%)	75 (31%)	0.66
Indications for coronary angiogram			<0.001
Stable ischemic heart disease	101 (65%)	209 (85%)	
Acute coronary syndrome‡	54 (35%)	36 (15%)	

Continuous variables are shown as median (interquartile range) and compared between groups using Mann-Whitney test.
Categorical variables are shown as frequency (proportion) and compared between groups using test of proportions.
* Dyslipidemia was defined as self-reported diagnosis, presence of diagnosis in electronic medical record, on cholesterol-lowering therapies, total cholesterol greater than 200, or LDL cholesterol greater than 130.
† Medications are described as those taken at baseline within 30 days of procedure and did not include medications started while in the hospital.
‡ Acute coronary syndrome pertains participants who underwent nonemergent invasive coronary angiography.[7]

Participants' individual health perceptions are shown in Table 4. Overall, participants described an improvement in overall health and healthiness of their diet after CAG. However, there was no difference in the participants' perception of how easy it would be to eat a healthier diet after CAG. Participants also perceived fewer barriers to achieve a healthier diet and made more efforts to improve diet after CAG.

The 3 most common barriers to achieve a healthier diet at baseline, 1-month and 6-month follow-ups were "Healthy foods are expensive" (baseline 34.7%, 1 month 31.6%, 6 months 29.0%; p = 0.34), "I am too stressed" (31.6, 24.1%, 17.9%; p = 0.001), and "I don't have time to cook" (19.0%, 16.7%, 9.2%; p = 0.003). Although 21.8% stated "None of the above stand in my way of eating healthy," this proportion increased to 28.7% at 1-month and 37.0% at 6-month follow-ups (p <0.001; Figure 4).

The 4 most common efforts to improving diet at baseline, 1-month and 6-month follow-ups were "Eat less fried foods" (baseline 52.1%, 1 month 60.3%, 6 months 57.4%; p = 0.12), "Eat less red meat" (47.9%, 55.3%, 60.4%;

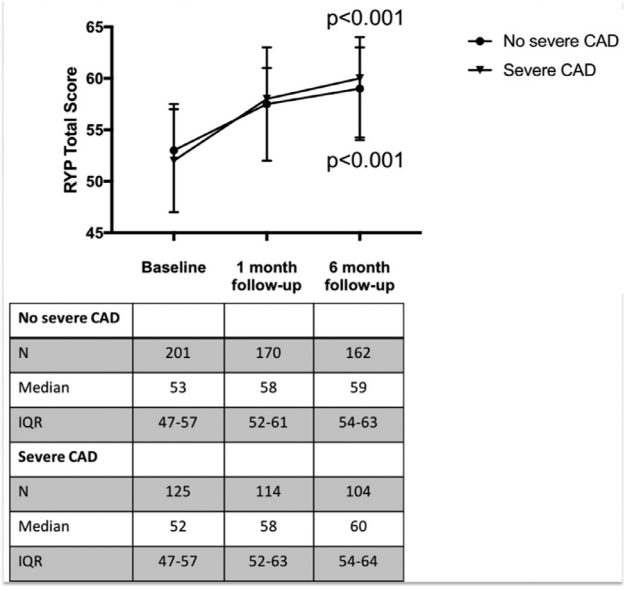
Table 4
Perceptions of health and perceived barriers to a heart healthy diet before and after invasive coronary artery angiography

Health perceptions	Baseline (n = 326)	Follow-up		p value
		1 month (n = 282)	6 months (n = 265)	
How would you describe your overall health?				<0.001
Poor	54 (17%)	18 (6%)	14 (5%)	
Fair	105 (32%)	70 (25%)	39 (15%)	
Good	147 (45%)	155 (55%)	170 (64%)	
Excellent	20 (6%)	39 (14%)	42 (16%)	
How healthy is your diet?				<0.001
Not healthy	57 (18%)	16 (6%)	11 (4%)	
Somewhat healthy	147 (45%)	104 (37%)	76 (29%)	
Healthy	97 (30%)	131 (46%)	135 (51%)	
Very healthy	25 (8%)	31 (11%)	43 (16%)	
How willing are you to make changes to eat a healthier diet?				0.02
Not willing	11 (4%)	7 (3%)	4 (2%)	
Somewhat willing	66 (20%)	47 (17%)	33 (12%)	
Willing	126 (39%)	130 (46%)	141 (53%)	
Very willing	123 (38%)	98 (35%)	87 (33%)	
How easy would it be for you to eat a healthier diet?				0.25
Not easy	71 (22%)	54 (19%)	41 (15%)	
Somewhat easy	88 (27%)	85 (30%)	78 (29%)	
Easy	103 (32%)	100 (35%)	103 (39%)	
Very easy	64 (20%)	43 (15%)	42 (16%)	
Number of barriers to healthier diet	2 [1-3]	1 [0-2]	1 [0-2]	<0.001
Number of efforts made to eat healthier	3 [1-6]	5 [2-8]	4 [2-6]	<0.001

Categorical data are shown as frequency (proportion) and compared using chi-square test.

Continuous data are shown as median (interquartile range) and compared over time using related-samples Friedman's 2-way analysis of variance by ranks test.

p = 0.009), "Eat more vegetables" (44.5%, 60.6%, 70.1%; p <0.001), and "Eat more fruit" (42.9%, 60.3%, 60.0%; p <0.001). Although 18.4% stated "I have not made an effort to do any of these things," this proportion decreased to 12.4% at 1-month and 9.8% at 6-month follow-ups (p = 0.008; Figure 4).



No severe CAD			
N	201	170	162
Median	53	58	59
IQR	47-57	52-61	54-63
Severe CAD			
N	125	114	104
Median	52	58	60
IQR	47-57	52-63	54-64

Figure 3. Rate Your Plate (RYP) total score before and after invasive coronary artery angiography by absence or presence of severe coronary artery disease (CAD).

Discussion

This prospective study demonstrated a marginal but significant improvement in diet after undergoing CAG, with a greater improvement observed in participants with versus without severe CAD. These findings paralleled the participants' perceptions of the healthiness of their diet. This study also provided insight into perceived barriers to a heart healthy diet and highlighted potential opportunities to support healthier eating efforts.

Few studies have evaluated the diet of patients referred for CAG; those that did only studied dietary patterns at the time of presentation.[10,11] This study systematically captured dietary intake in participants before and after CAG. Although there is a self-reported improvement in diet after CAG, it remains unclear what is the cause of the improvement. The act of surveying participants of their dietary habits before undergoing CAG, the procedure itself or periprocedural hospital contact, or standard counseling provided by treating clinicians may have contributed to the positive dietary changes observed. However, the greater improvement in RYP scores observed in participants with versus without severe CAD suggests a contribution of coronary anatomy knowledge.

This study captured an improvement in dietary patterns without an active educational intervention. All participants received standard of care information about heart disease

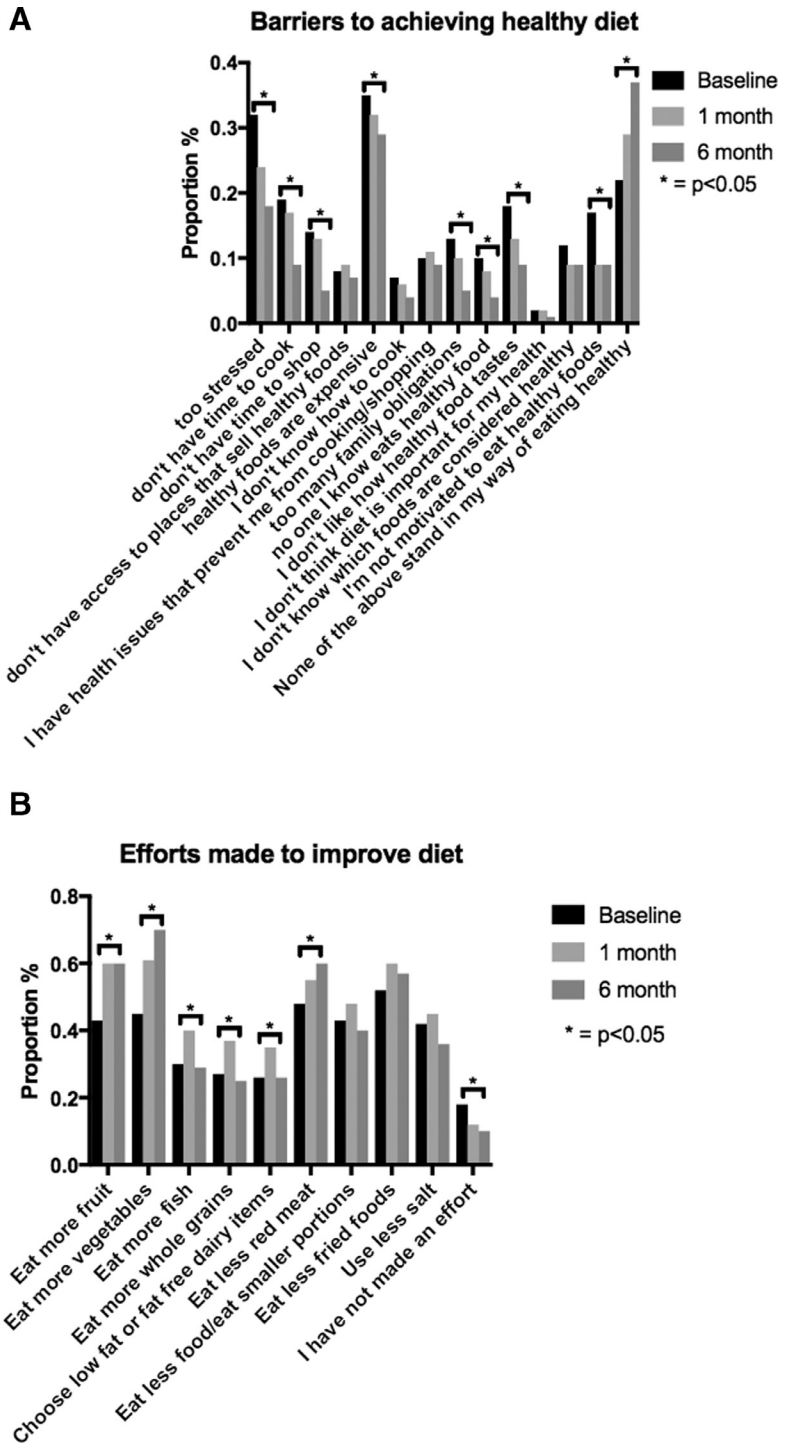


Figure 4. Participants' perceptions regarding *(A)* barriers to achieving a healthier diet and *(B)* efforts made to improve diet at baseline and on follow-up.
(A) Answer choices included "I am too stressed," "I don't have time to cook," "I don't have time to shop," "I don't have access to places that sell healthy foods," "Healthy foods are expensive," "I don't know how to cook," "I have health issues that prevent me from cooking and/or shopping," "I have too many family obligations," "No one I know eats healthy food," "I don't like how healthy food tastes," "I don't think diet is important for my health," "I don't know which foods are considered healthy," "I'm not motivated to eat healthy foods," and "None of the above stand in my way of eating healthy."
(B) Answer choices included "Eat more fruit," "Eat more vegetables," "Eat more fish," "Eat more whole grains," "Choose low fat or fat free dairy items," "Eat less red meat," "Eat less food/eat smaller portions," "Eat less fried foods," "Use less salt," and "I have not made an effort to do any of these changes."

separate from study protocol, and the simple connection between diet and cardiac care may be enough to see changes in dietary patterns. However, it remains unclear if there is an additional opportunity after CAG to further encourage long-term improvement in dietary habits, and if so, what interventions are most cost-effective. The Live-Well study showed that even brief dietary counseling performed by primary care providers led to improvements in

diet as well as low-density lipoprotein cholesterol.[12] A prospective randomized study at our institution demonstrated that a cardiovascular prevention consult for patients who underwent a cardiovascular procedure led to more patients on goal-directed medical therapy as compared with standard of care.[13]

In the present study, the most common perceived barriers to a healthier diet included cost and difficulty in incorporation of a healthier diet into an already stressful and/or busy lifestyle. It remains uncertain whether these findings are particular to the New York City region or urban setting. One nationally represented survey of 1,008 women in the United States did show that approximately 25% of women reported stress or high cost as barriers to cardiovascular health.[14] Furthermore, it is unclear which targeted interventions would be the most effective in improving outcomes. The randomized Post-Myocardial Infarction Free Rx Event and Economic Evaluation Trial did not demonstrate a decrease in first major vascular event or revascularization with elimination of prescription drug co-payment, suggesting that lowering the cost for a therapeutic intervention alone does not necessarily improve outcomes.[15] In contrast, recent trans-fatty acid restrictions in New York State were shown to be associated with fewer cardiovascular events 3 or more years after its implementation.[16] Comprehensive lifestyle intervention programs have demonstrated an improvement in outcomes. The Multisite Cardiac Lifestyle Intervention Program was a 3-month intensive lifestyle change program that increased healthy nutritional habits and improved cardiovascular risk factors.[17] The Ornish Program also reduced hospitalization rates over 3 years.[18] Although the sample size was small, the majority of these patients maintained lifestyle changes for up to 5 years.[19] In the present study, participants most commonly ate more fruits and vegetables and less red meat to improve their diet. Programs that focus on other less commonly made efforts, such as consumption of more whole grains and better portion control, may be warranted.

There were several limitations to our study. First, the motivation for participants to improve their diet after CAG is uncertain as the present study lacked a comparison group that did not undergo CAG. Second, there may be interview bias during survey administration, and it is possible that the increase in scores over time was related to potential acquisition of knowledge from the survey itself or the desire to please the interviewer. However, there was a greater improvement in RYP score over time in participants with severe versus without severe CAD, suggesting that knowledge of CAD may play a role. Third, the participants who chose to respond to the follow-up survey may be more motivated to change their diets than those who did not follow-up. Fourth, follow-up was relatively short. Finally, physical activity measurements were not obtained.

In conclusion, this prospective study demonstrated that self-reported dietary patterns and perceptions of health improved on short-term follow-up after CAG. A greater improvement in dietary patterns was observed in those with versus without severe CAD. This simple diet-related encounter may provide an additional opportunity to improve overall cardiovascular health. Studies that aim to delineate the specific motivational factors for improvement in dietary habits and how best to utilize the periprocedural period to further improve dietary patterns in this population are warranted.

Disclosures

The authors have no conflicts of interest to declare in relation to this manuscript.

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