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# Integrating a diet quality screener into a cardiology practice: assessment of nutrition counseling, cardiometabolic risk factors and patient/provider satisfaction

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## ABSTRACT

**Objective** We assessed factors related to the integration of an office-based diet quality screener: nutrition counselling, cardiometabolic risk factors and patient/physician satisfaction.

**Methods** We evaluated the impact of a 10-item diet quality measure (self-rated diet quality question and a 9-item Mediterranean Diet Score (MDS)) prior to the cardiology visit on assessment of nutrition counselling, cardiometabolic risk factors and patient/provider satisfaction. Study staff trained the nine participating physicians on the purpose and use of the screener. To assess physician uptake of the diet quality screener, we reviewed all charts having a documented dietitian referral or visit and a 20% random sample of remaining participants that completed the screener at least once to determine the proportion of notes that referenced the diet quality screener and documented specific counselling based on the screener.

**Results** Between December 2017 and August 2018, 865 patients completed the diet quality screener. Mean age was 59 (SD 16) years, 54% were male and mean body mass index was 27.4 (SD 6.0) kg/m$^2$. Almost one-fifth (18.5%) of participants rated their diet as fair or poor, and mean MDS (range 0–9) was moderate (mean 5.6±1.8 SD). Physicians referred 22 patients (2.5%) to a dietitian.

**Conclusion** Integrating the screener into the electronic health record did not increase dietitian referrals, and improvements in screener scores were modest among the subset of patients completing multiple screeners. Future work could develop best practices for physicians in using diet quality screeners to allow for some degree of standardisation of nutrition referral and counselling received by the patients.

### What this paper adds

- ► Integrating a diet quality screener within the electronic health record is feasible.
- ► Diet quality in a preventive cardiology practice is less than desirable, leaving room for nutrition interventions to reduce cardiometabolic risk.
- ► Self-rated diet quality was inversely correlated with cardiometabolic risk factors.

## INTRODUCTION

An unhealthy diet is one of the leading risk factors for chronic disease-related morbidity and mortality.[1] Despite the proven benefits of a healthy diet, diet quality in the USA is far from optimal.[2] Nutrition interventions have been shown to be similar[3–5] or superior[6] to medication in some trials, yet physicians spend very little time counselling patients on a healthy diet, and the services of dietitians are underutilised.[7] In a survey of 236 New York University (NYU) physicians, average time spent on nutrition in a clinical encounter was 3 min or less.[8] One of the limitations to dietary counselling and referral is the need for a rapid assessment of a patient's dietary habits, and the lack of a specific tool with which to do this assessment.[9]

Single-item measures of self-rated health (box 1) are widely used as inexpensive tools that are powerful and consistent independent predictors of health outcomes.[10 11] In a prospective cohort of over 75 000 Swedish adults, those with poor self-rated health were twice as likely to suffer from myocardial infarction compared with those with better self-rated health.[12] A single-item self-rating of diet quality was positively associated with household availability of dark green vegetables and low-fat milk, and negatively associated with availability of sugary drinks and the frequency of fast-food and food-away-from-home consumption.[13] In a study of 485 New York City residents, a single-item measure of diet quality correlated with the Healthy Eating Index score (r=0.3, p<0.01), a measure of diet quality, in the group with the lowest

**Box 1 Self-rated diet quality, National Health and Nutrition Examination Survey[13]**

In general, how healthy is your overall diet?
1. Excellent
2. Very Good
3. Good
4. Fair
5. Poor

quality diets.[14] Those with the lowest quality diets would be most in need of nutrition interventions and referrals.

While single-item measures can be useful, brief diet quality screeners providing more detailed information are important to clinical practice. The Mediterranean Diet Score has been correlated with lower risk of diabetes, cardiovascular disease and better cognitive function and can be a useful tool for dietary assessment.[15–22] This 9-item screener has been widely used and has been recommended as a screening tool by the American Heart Association.[23] By combining a measure of perceived diet quality with a more detailed diet quality measure, providers may gain useful insight into health beliefs and behaviours.

Incorporating a diet quality screener in the waiting room is expected to improve efficiency of the clinical encounter by reducing the amount of time the provider spends on dietary assessment, guiding clinician counselling and increasing referrals to nutrition professionals in addition to improving physician satisfaction. The opportunity to facilitate informed discussion about a patient's current dietary patterns, and make useful recommendations and referrals based on a quantitative score, could work to improve patient outcomes and reduce risk of diet-related chronic disease. The objective of this project was to evaluate the utility of adding a diet quality screener, an adaptation of two validated screeners,[14 24] aimed at improving dietary counselling for reduction in cardiometabolic risk. We assessed factors related to the integration of an office-based diet quality screener: nutrition counselling, cardiometabolic risk factors and patient/provider satisfaction.

## METHODS

### Sample and study procedures

Patients having a cardiology appointment within NYU's Prevention Center between December 2017 and August 2018 were asked to complete a diet quality screener through MyChart, a secure electronic patient portal where patients can schedule appointments, correspond with their providers and review their laboratory and medical reports. If patients did not complete the screener in advance of their visit, medical office staff encouraged patients to complete the screener in the office. Patients seen for follow-up during the data collection period of December 2017–August 2018 were asked to repeat the screener. The time interval varied and data were not collected on how many patients were eligible to complete the screener versus how many actually completed the screener a second time.

Since the long-term objective of this work is to administer the questionnaire to all patients, this study was as inclusive as possible, and no exclusion criteria were developed. Physician satisfaction with the diet quality screener was assessed 6 months after integration of the diet quality screener. Patient satisfaction was assessed by calling a sample of 121 patients of one of the physicians in the practice who had completed the diet quality screener.

This was a quality improvement project put forth by the NYU Center for Healthcare Innovation and Delivery Science division with the plan to incorporate the questionnaire into the electronic health record (EHR) to improve quality of clinical care. Because the purpose of this project was quality improvement, the NYU Institutional Review Board (IRB) deemed the study as 'non-human subject research'. Instead, investigators filed a Quality Improvement certificate with the IRB.

The diet quality screener was integrated into the EHR, so patients could complete the screener online through MyChart, and results would be available by question item and with an overall score in the EHR. Study staff oriented the nine cardiologists in the practice to the purpose and use of the diet quality screener. Physicians were informed of the scoring of the screener and the procedures for appropriate referral of patients to the dietitian. Providers received patient scores in the EHR, so data were available upon meeting with patients to more expediently review, counsel and refer patients for dietary interventions. Scores were based on the Mediterranean Diet Score (MDS; out of nine points); the PDQ was not scored. The score was visible to patients in MyChart, and the physician could discuss the score with the patient if they chose to.

Medical charts for all patients having a documented referral (n=21) and a 20% random sample of patients not receiving a referral (n=169) were selected using Microsoft Excel's 'RAND' function and reviewed to assess: (1) Was the diet quality screener in the chart? (2) Was the diet quality screener mentioned in the physician note? (3) Did the physician comment on the diet quality screener score? (4) Did the physician document specific counselling? and (5) Did the physician refer to a dietitian? Physician satisfaction surveys were emailed to the nine cardiologists in the practice.

### Measures

#### Diet quality screener

To measure self-rated diet quality, the first question was adopted from nutrition surveillance systems including the National Health and Nutrition Examination Survey (Box 1).[14] To measure adherence to a Mediterranean Diet, a 9-item Oldways screener was adapted,[23 25] querying intake of vegetables, fruit, whole grains, wine, fish, legumes/beans, nuts/seeds, fat and red/processed meat (see online supplementary table 1).

### Dietitian referrals

To measure the impact of integrating the diet quality screener into the EHR, the number of patients referred to a dietitian for the 9-month period following implementation of the screener was measured. This was accomplished by: (1) adding a procedure code for referring to a dietitian in the EHR; (2) reviewing dietitian records of visits; and (3) a chart review that included all patients receiving a referral per the two aforementioned methods and a 20% random sample of the remaining patients who completed at least one diet quality screener. The study team documented all referrals in one of these ways to ensure all referrals within the timeline of the study were captured.

### Cardiometabolic risk factors

Body mass index (BMI), blood pressure (BP), haemoglobin A1C (HbA1c), total cholesterol, high density lipoprotein (HDL) cholesterol and triglycerides measured at the clinic visit corresponding to the completion of the first and last diet quality screener within the 9-month period were pulled from the EHR.

### Provider satisfaction measures

Physician satisfaction surveys comprised 5-point Likert scales, yes/no, and open-ended questions. Physician survey Likert scales queried the impact of the diet quality screener on quality of patient care, efficiency of the clinical visit, patient communication and the likelihood they would recommend the screener to other providers. Physicians could select 'strongly agree', 'agree', 'neither agree nor disagree', 'disagree' or 'strongly disagree'. Physicians were also asked about their knowledge of the questionnaires, scoring rubrics, whether the questionnaires were useful and/or burdensome.

### Patient satisfaction measures

Patient satisfaction surveys were given to a sample of patients from one provider within the practice. Surveys comprised 5-point Likert scales. Likert scales queried whether the diet quality screener was helpful, satisfying, confusing, perceptions of impact on care and level of burden, and the likelihood they would recommend the screener to other patients.

## Analytical approach

The utility of the diet quality screener was measured over a 9-month period (December 2017–August 2018) by (1) referrals to a dietitian; (2) correlations between baseline diet quality screener scores and BMI, BP, lipids and HbA1c; (3) pre–post changes in diet quality screener scores and (4) physician satisfaction. The proportion of patients referred to a dietitian was calculated by dividing the total number of referrals by the total number of patients completing at least one diet quality screener. Continuous measures were summarised using means and SD, and categorical measures were summarised using numbers and percentages. Spearman correlations were used to assess associations between diet quality screener scores and cardiometabolic risk factors. Linear regression models were used to estimate baseline associations between diet quality scores and cardiometabolic risk factors, controlling for age, sex and race (model 1), with additional adjustment for BMI (model 2). Provider satisfaction surveys were summarised to ascertain whether incorporating the screener effectively targets nutrition counselling efforts and reduces burden on the healthcare provider. Statistical significance was set at $p<0.05$, and SAS V.9.4 (SAS Institute) was used to conduct all analyses.

# RESULTS

## Patient characteristics

Mean age of the 865 patients who completed the diet quality screener at least once was 59 (SD=16) years (table 1). Just less than half of the patients were female (46.5%); more than half of patients presented with a BMI in the overweight or obese range (62.1%). Approximately one-fifth (18.5%) of patients reported their overall diet quality as 'poor' or 'fair' and mean MDS was 5.6 (SD=1.8) out of a possible nine points.

## Documentation of diet quality screener in the medical record

Of the 190 charts reviewed, 42 (22%) had a follow-up visit that included completing a repeat diet quality screener. The diet quality screener was found in the chart over 80% of the time (first visit 160/190; follow-up visit 35/42). This corroborates with data on the entire sample suggesting that the diet screener was completed before the visit 80% of the time (n=693), while it was completed after visit check-in 20% of the time (n=172). The diet quality screener was recorded in the body of the physician's note ~10% of the time (first visit 19/190; follow-up visit 3/42), and commentary on the score was minimal (first visit 6/190; follow-up visit 0/42). The nature of the commentary was either to support continuation of appropriate dietary choices by the patient or to support the necessity of dietary intervention/referral. There was no evidence for a difference in baseline MDS score for specific counselling (no counselling: mean 5.6±1.8 SD vs counselling: mean 5.2±1.9 SD p=0.325). Follow-up visits were tracked only for the duration of data collection, and visits after the study end date were not included.

## Referrals to a dietitian

During the 9-month period, the code for referring to a dietitian in the EHR was used for five patients. The dietitian recorded 16 visits from patients, and the chart review yielded one additional referral for a total of 22 documented referrals out of 865, or 2.5% of patients. Patients receiving a dietitian referral tended to have a lower baseline MDS score (not referred: mean 5.7±1.7 vs referred: mean 4.1±1.5 SD p<0.001).

## Baseline diet quality screener scores and cardiometabolic risk factors

Self-rated diet quality was inversely correlated with BMI (r=−0.34), diastolic BP (r=−0.11), HbA1c (r=−0.26) and

**Table 1** Patient characteristics, overall and by mean baseline Mediterranean Diet Score (MDS; n=865)

| | Combined | MDS <5.6 | MDS >5.6 |
|---|---|---|---|
| Age, mean±SD (years) | 59±16 | 58±16 | 60±16 |
| Sex, n (%) | | | |
| Male | 463 (53.5) | 208 (54.0) | 255 (53.1) |
| Female | 402 (46.5) | 177 (46.0) | 225 (46.9) |
| BMI, mean±SD (kg/m2) | 27.4±6 | 28.6±6.2 | 26.5±5.6 |
| BMI category, n (%) | | | |
| Underweight (BMI <18.5) | 16 (2.0) | 3 (0.9) | 13 (3.0) |
| Normal weight (18.5–24.9) | 280 (35.9) | 95 (27.7) | 185 (42.3) |
| Overweight (25.0–29.9) | 279 (35.8) | 128 (37.3) | 151 (34.6) |
| Obese (30+) | 205 (26.3) | 117 (34.1) | 88 (20.1) |
| Race, n (%)* | | | |
| Asian | 52 (6.0) | 21 (5.5) | 31 (6.5) |
| Black | 45 (5.2) | 21 (5.5) | 24 (5.0) |
| White | 630 (72.8) | 284 (73.8) | 346 (72.1) |
| Other (other race, patient refused, unknown) | 138 (16.0) | 59 (15.3) | 79 (16.5) |
| Self-rated diet quality, n (%) | | | |
| Poor | 19 (2.2) | 15 (3.9) | 4 (0.8) |
| Fair | 141 (16.3) | 105 (27.3) | 36 (7.5) |
| Good | 340 (39.3) | 169 (43.9) | 171 (35.6) |
| Very good | 287 (33.2) | 77 (20.0) | 210 (43.8) |
| Excellent | 77 (8.9) | 18 (4.7) | 59 (12.3) |
| MDS, n (%) meeting goal | | | |
| Vegetables | 595 (69) | 181 (20.9) | 414 (47.9) |
| Fruit | 571 (66) | 184 (21.3) | 387 (44.7) |
| Whole grains | 567 (66) | 186 (21.5) | 381 (44.0) |
| Wine | 254 (29) | 65 (7.5) | 189 (21.8) |
| Fish | 507 (59) | 153 (17.7) | 354 (40.9) |
| Legumes/beans | 518 (60) | 135 (15.6) | 383 (44.3) |
| Nuts/seeds | 542 (63) | 144 (16.6) | 398 (46.0) |
| Fat | 739 (85) | 283 (32.7) | 456 (52.7) |
| Red or processed meats | 569 (66) | 201 (23.2) | 368 (42.5) |
| Total score, mean±SD | 5.6±1.8 | 4.0±1.2 | 6.9±0.9 |

*Data on ethnicity (hispanic, non-hispanic) were too unreliable to report (n=511 missing).
BMI, body mass index.

triglycerides (r=−0.16), and positively correlated with HDL cholesterol (r=0.25; table 2). The MDS was inversely correlated with BMI (r=−0.18) and positively correlated with HDL cholesterol (r=0.12; table 2). In multivariable regression analyses adjusting for age, sex, and race/ethnicity, a one point higher self-rated diet quality and MDS was associated with a lower BMI (2.3 and 0.6 units, respectively; table 3). In multivariable regression analyses adjusting for age, sex, race and BMI, a one point higher self-rated diet quality was associated with a 0.2% lower HbA1c and a 2.2 mg/dL greater HDL cholesterol (table 3).

### Changes in diet quality screener scores

A follow-up diet quality score was available for 23.6% of patients (204 for overall diet quality and 205 for MDS). The average time between initial screener and follow-up was 1 month, but in some cases patients were seen less frequently. Over time, self-rated diet quality significantly increased, with the proportion rating their diet quality as poor or fair decreasing from 18.5% to 15.7% (table 4). Likewise, MDS increased from 5.6 to 5.9 (table 4). MDS improved for 40.5% of patients, with scores remaining the same for 37% and decreasing for 22.5% of patients between baseline and follow-up.

### Physician satisfaction surveys

One-third (n=3) of physicians completed satisfaction surveys. All three reported knowing how to access the screeners and the scoring criteria for the screeners within the EHR. Among completers, two physicians strongly agreed that consults were more clinically efficient after reviewing the screeners, while one physician neither agreed nor disagreed. Two reported that the screeners improved their ability to care for their patients, while one reported they did not. There were no suggestions provided on how to improve the screeners.

### Patient satisfaction surveys

Just 12.4% (n=15) of the 121 patients contacted completed satisfaction surveys. The majority of participants found the screener helpful (66.7%), satisfying (80%), felt the screener improved the quality of care (66.7%) and were thinking about changing their diet and/or exercise routine after consultation with their provider (66.7%). Few found the screener confusing (6.7%), a hindrance (13.3%), or that the screener took more time than expected (13.3%). All but one (93.3%) stated they would recommend the screener to other patients.

## DISCUSSION

There is currently no gold standard screener or tool for diet assessment in clinical care.[9] The findings from this work present a simple, sustainable, low-cost screening tool that does not require extensive training, which physicians can use in clinical encounters. The diet quality screener may facilitate the evaluation of patient diet and prompt referral for nutrition interventions, which are inadequately addressed in clinical care at present. Less than a quarter of medical visits by patients with cardiometabolic disease include any discussion of nutrition,[26] and the use of the diet quality screener may prompt diet assessment and intervention by physicians and increase referrals for nutrition counselling by the dietitian.

These data suggest a high prevalence of modifiable behavioural risk factors in a preventive cardiology practice that could benefit from dietary interventions, but low referral rates. On the hiring of a dietitian dedicated to the office, the system implemented for referring to a dietitian was to place an order in the EHR which could then allow

**Table 2** Baseline cardiometabolic risk factors and correlations with diet quality measures

| | Cardiometabolic risk factor | | Self-rated diet quality | | Mediterranean Diet Score* | |
|---|---|---|---|---|---|---|
| | N | Median (IQR) | R | P value | R | P value |
| Body mass index, kg/m$^2$ | 780 | 26.5 (23.3–30.3) | **−0.34** | **<0.0001** | **−0.18** | **<0.0001** |
| Systolic blood pressure, mm Hg | 800 | 122.5 (112.0–136.0) | −0.05 | 0.12 | 0.01 | 0.72 |
| Diastolic blood pressure, mm Hg | 800 | 76.0 (70.0–80.0) | **−0.11** | **0.001** | −0.008 | 0.81 |
| Haemoglobin A1C, % | 261 | 5.4 (5.2–5.9) | **−0.26** | **<0.0001** | −0.01 | 0.83 |
| Total cholesterol, mg/dL | 348 | 164.0 (136.0–194.5) | 0.04 | 0.44 | 0.04 | 0.51 |
| HDL cholesterol, mg/dL | 348 | 51 (41.0–63.5) | **0.25** | **<0.0001** | **0.12** | **0.02** |
| Triglycerides, mg/dL | 348 | 94 (66–129) | **−0.16** | **0.003** | −0.07 | 0.18 |

Not all measures were taken at every visit; N varies by risk factor based on what clinician and staff measured at the recorded visit.
Ratings ranged from a low of 1 (poor) to a high of 5 (excellent).
IQR (25th percentile, 75th percentile); correlations were assessed using Spearman correlations.
*Scores ranged from a low of 0 to a high of 9.
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for the tracking of consults and the staffing to reach out to the patient to schedule. This should have allowed for the tracking of all dietitian visits; however, it is possible that some patients may have been referred elsewhere or that the patients were verbally referred at the visit and there was no order or documentation of the referral. Despite efforts to simplify the process of data acquisition for the physician to improve the workflow for counselling, the rate of documented counselling and referral to dietitians remained low. Physicians must accomplish multiple goals during one visit; perhaps, a greater focus is needed in educating physicians on how to counsel patients in a rapid and efficient manner and the benefits of referral to a dietitian. As more data are collected about the utility of the diet quality screener, physicians may be more likely to refer based on the results. In addition, processes that could facilitate referrals, but do not

**Table 3** Multivariable associations between cardiometabolic risk factors, self-rated diet quality score and Mediterranean Diet Score

| | Self-rated diet quality | | Mediterranean Diet Score |
|---|---|---|---|
| | N | β (95% CI) | β (95% CI) |
| Body mass index*, kg/m$^2$ | 779 | **−2.3 (−2.8 to −1.9)** | **−0.6 (−0.8 to −0.5)** |
| Systolic blood pressure | | | |
| Model 1* | 799 | **−1.4 (−2.6 to −0.1)** | −0.1 (−0.7 to 0.5) |
| Model 2† | 773 | −0.2 (−1.5 to 1.2) | 0.2 (−0.4 to 0.8) |
| Diastolic blood pressure | | | |
| Model 1 | **799** | **−1.3 (−2.0 to −0.5)** | 0.1 (−0.3 to 0.5) |
| Model 2 | 773 | −0.7 (−1.5 to 0.1) | 0.2 (−0.2 to 0.6) |
| Hemoglobin A1C (%) | | | |
| Model 1 | 254 | **−0.4 (−0.5 to −0.2)** | **−0.1 (−0.2 to −0.02)** |
| Model 2 | 247 | **−0.2 (−0.3 to −0.03)** | −0.1 (−0.1 to 0.03) |
| Total cholesterol (mg/dL) | | | |
| Model 1 | 348 | 2.7 (−2.9 to 7.4) | 1.7 (−0.8 to 4.1) |
| Model 2 | 327 | 1.1 (−4.1 to 6.4) | 0.1 (−2.5 to 2.6) |
| HDL cholesterol (mg/dL) | | | |
| Model 1 | 348 | **4.7 (2.8 to 6.5)** | **1.5 (0.5 to 2.5)** |
| Model 2 | 327 | **2.2 (0.2 to 4.2)** | 0.6 (−0.4 to 1.6) |
| Triglycerides (mg/dL) | | | |
| Model 1 | 348 | **−12.4 (−19.8 to 5.0)** | −3.1 (−7.0 to 0.9) |
| Model 2 | 327 | −4.4 (−12.3 to 3.6) | −1.4 (−5.3 to 2.5) |

*Model 1: linear regression model adjusted for age, sex and race/ethnicity.
†Model 2: linear regression model adjusted for model 1 covariates +body mass index.

**Table 4** Comparison of diet quality scores among patients completing diet quality questionnaires at more than one visit

| Self-rated diet quality, n=204* | Baseline | Follow-up | P value |
|---|---|---|---|
| Poor | 7 (3.4) | 4 (2.0) | <0.0001 |
| Fair | 36 (17.7) | 28 (13.7) | |
| Good | 76 (37.3) | 85 (41.7) | |
| Very good | 70 (34.3) | 74 (36.3) | |
| Excellent | 15 (7.4) | 13 (6.4) | |
| Mediterranean Diet Score (MDS), n=205 | | | |
| Vegetables | 131(64) | 148 (72) | <0.0001 |
| Fruit | 134 (65) | 148(72) | <0.0001 |
| Whole grains | 127(62) | 136(66) | <0.0001 |
| Wine | 58(28) | 62(30) | <0.0001 |
| Fish | 115(56) | 128(62) | <0.0001 |
| Legumes/beans | 122(60) | 127(62) | <0.0001 |
| Nuts/seeds | 128(62) | 135(66) | <0.0001 |
| Fat | 174(85) | 178(87) | <0.0001 |
| Red or processed meats | 133(65) | 143(70) | <0.0001 |
| MDS, mean±SD | 5.6±1.8 | 5.9±1.8 | <0.0001 |

*Twenty-four per cent of the patients repeated the screener.

directly impact physician visit time (educational materials placed within the office, group educational sessions, streamlined referral process and appointment setting by the office staff for patients) may assure that more preventive counselling occurs.

The pre–post changes in diet quality screener scores suggested an improvement in diet quality over time. A 2.2 point increase in MDS has been associated with a reduction in CVD and all-cause mortality.[21] While the improvements in MDS seen in the current study were smaller, they may still be of clinical significance and they highlight the potential for change when physicians discuss diet with patients. If physicians, dietitians and other clinicians use a unified, evidence-based message for diet and lifestyle change, they can help to support patients as they improve their diet quality and reduce their CVD risk, as well as reduce confusion from mixed dietary messages that can be found in the media. The use of this diet quality screener can facilitate this as the score would be available in the medical record, and there are excellent resources available for counselling on the adoption of heart-healthy diets including recipes, cooking classes and other tools. Importantly, patients largely found the screener to be beneficial to their care and did not find it to be overly burdensome.

In a cardiology practice, it is likely that a large percentage of the patient population could benefit from diet assessment by the physician and referral to nutrition counselling with a dietitian. Nationally, just 12% of patient visits include nutrition counselling and only 25% of visits by patients with a chronic disease include nutrition counselling,[26] so the rate of uptake in this study was comparable. With experience and more guidance on where in the patient visit workflow the screener would be best implemented, we expect that more patients would be screened and referred for nutrition counselling. Likewise, physicians may benefit from standardised language for follow-up or notes from the dietitian regarding patient lifestyle-related goals to facilitate completion of follow-up screeners by patients and reinforcement of patient progress by physicians.

A limitation of this study was the small proportion of physicians (33%) that responded to the survey. For the most part, responding physicians rated the integration of the diet quality screener into the EHR positively. Another limitation was the degree of counselling physicians provided to patients based on dietary screener scores varied widely, which may have influenced the magnitude of change in diet quality screener score. Furthermore, data on response rate to the diet quality screener were not collected, so we could not describe how patient characteristics compared between those who completed the screener versus not. Future work could develop best practices for physicians in using diet quality screeners to allow for some degree of standardisation of counselling received by patients. A brief training for physicians on how to counsel a patient in a very short time frame could make a tremendous impact if coupled with the use of the patient diet quality screener. Another limitation was the use of self-reported dietary intake and diet quality where patients are known to under-report intake; however, these tools are inexpensive and have been used in many studies, correlating well with cardiometabolic risk factors. The patient satisfaction survey results were also limited by a low response rate, but the data gathered provided valuable insight into the potential for more widespread use of the diet screener. Lastly, referral to a dietitian was done with a new EHR consult referral tab which some of the physicians were not accustomed to using and may have referred to a dietitian outside of the EHR; these referrals would not have been captured by the chart review completed by study staff. This EHR-based nutrition consult order may enhance referrals to a dietitian and potentially lead to better attendance of patients at visits and efforts to educate physicians on its use will continue.

## CONCLUSION

Integrating the screener into the EHR did not increase dietitian referrals, and improvements in screener scores were modest among the subset of patients completing multiple screeners. Future work should include more physicians in the process of selecting screeners and implementing them into the EHR. Next, more structured guidance to physicians on when and how to use the screener, including how to give counselling or plan referrals based on screener scores could facilitate improvements in care. Focus groups and qualitative interviews with providers may also assist researchers in streamlining tools and removing barriers to nutrition care in clinical practice.

The use of the diet quality screener within the EHR is a simple, low-cost way to guide nutrition interventions in clinical care. A low-diet quality screener score can prompt referral to a dietitian for further dietary intervention. This tool can also track changes in patient diet, allowing for further support of the patient by providers within the hospital system, as they work towards healthy lifestyle change. The integration of the MDS with a measure of self-rated diet quality is a scalable intervention that can be used across medical specialties.

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