The Incremental Value of Medical Nutrition Therapy In Weight Management

Overweight or obese patients who participated in a medical nutrition therapy benefit sponsored through their insurer were compared with individuals who did not participate. Outcomes, including weight change, body mass index, waist circumference, and physical exercise, were collected at baseline and 2 years later.

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ABSTRACT

Objective: To evaluate the incremental cost of and health benefits attributable to medical nutrition therapy (MNT) for managed care members participating in an obesity-related health management program.

Design: Retrospective case-control.

Methodology: Overweight or obese adult managed care members who utilized the MNT benefit (n=291) were matched, using propensity score matching, with similar individuals (n=1,104) who did not utilize the MNT benefit. Health outcomes data on weight, body mass index (BMI), waist circumference, and physical exercise were collected via surveys administered at baseline and approximately 2 years later.

Principal findings: Both groups experienced statistically significant reductions in weight, BMI, and waist circumference and increases in exercise frequency. Compared with matched controls, individuals who received MNT were about twice as likely to achieve a clinically significant reduction in weight, with an adjusted odds ratio of 2.2 (95% confidence interval, –1.7–2.9; $P<.001$). They also experienced greater average reductions in weight (3.1 vs. 1.4 kg; $\beta = -1.75$; $t[1314] = -2.21$; $P=.028$) and were more likely to exercise more frequently after participating in the program ($F[1,1358] = 4.07$, $P=.044$). There was no difference between the groups in waist circumference. The MNT benefit was used by 5% of eligible members and cost $0.03 per member per month.

Conclusion: MNT is a valuable adjunct to health management programs that can be implemented for a relatively low cost. MNT warrants serious consideration as a standard inclusion in health benefit plans.

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Don W. Bradley, MD, Esther F. Myers, and Linda G. Snetselaar report no conflicts. Gwen Murphy discloses that the American Dietetic Association Foundation funded about 20% of her salary throughout the study's data collection period. Laura Qualls discloses that she is employed by Blue Cross & Blue Shield of North Carolina.

INTRODUCTION

Being overweight and being obese affect over two thirds of Americans, posing a major public health challenge for the United States (Ogden 2006). These individuals are at increased risk of developing type 2 diabetes, hypertension, hyperlipidemia, some types of cancer, and cardiovascular disease (NIH 1998). In addition, the economic toll of being overweight and obesity is substantial. The direct cost of inactivity and obesity has been estimated to account for over 9% of national health care expenditures in the United States. Further, 41% of total health care costs for diseases for which obesity is a known risk factor have been attributable to obesity (Colditz 1999, Oster 2000). Bachman et al found that the point estimates of increased health care costs for overweight or obese patients compared with health care costs for normal-weight patients ranged from 2% to 23% for pre-obese/overweight, 21% to 54% for obese class 1, 43% to 57% for obese class 2, and 78% to 111% for obese class 3 (Bachman 2007).

The clinical benefits associated with weight reduction have been well documented. In a review of weight-loss studies, Goldstein found that a substantial proportion of obese individuals with type 2 diabetes, hypertension, and hyperlipidemia experienced positive health benefits with modest weight losses of approximately 10% or less of body weight (Goldstein 1992). The Diabetes Prevention Program demonstrated that lifestyle interventions that produced

weight losses of at least 7% reduced the risk of developing diabetes by 58% in those with impaired glucose tolerance (Knowler 2002). In a study of patients with type 2 diabetes, patients who lost more than 5% of their body weight had significant improvements in glycosylated hemoglobin values at 1 year (Wing 1987).

Although obesity is widely recognized as an epidemic and the benefits of weight reduction have been shown, the treatment is inconsistent. Studies have shown that both diet and exercise are important components of weight-loss therapy, and that, in addition to facilitating weight loss, as little as 30 minutes per day of moderate-intensity physical activity can reduce the incidence of type 2 diabetes and cardiovascular events (Curioni 2005, Bassuk 2005). Although the U.S. Preventive Services Task Force (USPSTF) has issued recommendations supporting dietary counseling for adult patients with hyperlipidemia and other known risk factors for cardiovascular- and diet-related chronic disease, health plans have not routinely provided nutritional counseling by a registered dietitian (RD) as a primary benefit offering (USPSTF 2003).

Based on the USPSTF's recommendations and feedback from the provider community that physicians do not have the time or skill to provide nutritional counseling to their patients, in 2005 Blue Cross and Blue Shield of North Carolina (BCBSNC) began covering medical nutrition therapy (MNT) as a component of its Member Health Partnership (MHP) obesity-related health management program. The MHP program is offered to individuals who are obese or have obesity-related conditions including diabetes, hyperlipidemia, and hypertension. The program includes up to 4 physician visits for the diagnosis and evaluation of obesity; access to one-on-one telephonic nursing support; educational materials and behavior change tools such as reference books, step counters, a lifestyle diary, and semiannual newsletters; discounts on selected blood pressure monitors, heart rate monitors, and scales; and online tools and resources including a health organizer and exercise tracker. MNT involves nutritional diagnostic, therapy, and counseling services furnished by an RD that are based on Evidence-Based Nutrition Practice Guidelines for adult weight management (ADA 2006), disorders of lipid metabolism (ADA 2011), and hypertension (ADA 2008). With the new MNT benefit, program participants were eligible for up to 6 MNT visits a year, and office visits to a credentialed licensed RD were covered at 100%.

The objective of this study was to evaluate the incremental cost of, and health benefits attributable to, MNT for individuals participating in the MHP program. The health outcomes measured in this study were changes in weight, body mass index (BMI), waist circumference, and physical exercise. Our hypothesis was that individuals who used the MNT benefit would have better health outcomes than those who did not, and that the MNT benefit would cost less than $0.05 per member per month (PMPM).

METHODS

Study design and sample

Health outcomes: A 2-year, retrospective, case-control study was conducted to evaluate the health outcomes attributable to the MNT benefit. Eligible study participants were overweight or obese individuals age 18 years or over who enrolled in the MHP program between January 2006 and May 2008 and provided information on whether they had diabetes or hypertension (WHO 2004). Individuals who were pregnant, had outpatient renal dialysis or bariatric surgery, or were treated for cancer were excluded from the study.

The cases, hereafter referred to as MNT group, were all eligible study participants who received MNT within 4 weeks of enrolling in the MHP program. The control group, NoMNT, was created by matching each individual in the MNT group with up to 10 eligible study participants who did not choose to receive MNT. Matching was conducted using propensity scores that required an exact match on gender, obesity category, diabetes status, and hypertension status, and the closest possible match on age, race, smoking status, coronary artery disease status, and hyperlipidemia status (WHO 2004, Oakes 2006).

Utilization and cost of the MNT benefit: The utilization and cost of the MNT benefit were measured for all individuals who participated in the MHP program between January 2006 and May 2008.

Data collection and definitions

Health outcomes: Baseline data were obtained from the MHP program enrollment survey, and follow-up data were obtained from a survey administered approximately 2 years after program enrollment. These data were collected by BCBSNC through standard quality improvement business processes that did not require approval by an institutional review board. The following health parameters were reported by patients in the baseline and follow-up surveys: weight, height, waist circumference, and frequency of exercise (phrased as, "How many days in a normal week do you exercise for at least 30 minutes doing moderate to vigorous activity?"). Pre-post health outcomes were the changes in weight, BMI, waist circumference, and the percentage of participants who exercised at least 3 days a week. The rationale for the

exercise frequency goal was that it was a more pragmatic short-term goal for these individuals than the National Heart Lung and Blood Institute (NHLBI)'s long-term goal of accumulating at least 30 minutes or more of moderate-intensity physical activity on most, and preferably all, days of the week (NIH 1998).

Clinically significant health outcomes were the percentage of study participants who maintained or lost weight, achieved a clinically significant weight loss, or achieved a clinically significant reduction in waist circumference. A clinically significant weight loss was defined as at least a 5% decrease in weight. A clinically significant change in waist circumference was defined as a reduction from a high-risk waist circumference (>102 cm [40 in] for men and >88 cm [35 in] for women) to a waist circumference below those thresholds. The thresholds for clinical significance were based on the NHLBI's obesity guidelines (NIH 1998).

Utilization and cost of the MNT benefit: MNT claims and membership data were extracted from BCBSNC's database. MNT claims data were restricted to allowed claims incurred by MHP program participants, and we measured the total allowed cost including member liability.

The utilization and cost metrics were the percentage of MHP program participants who used the MNT benefit, the number of MNT claims per user, and the MNT claims cost PMPM. Member months were calculated by summing the number of members in each measurement month, and PMPM costs were calculated by dividing total costs by total member months.

TABLE 1
Baseline characteristics of the health outcomes study population*

Characteristic	MNT Group (n=291)	NoMNT Group (n=1104)
Female	74.6% (217/291)	75.7% (836/1104)
Age category		
• Less than 35	10.0% (29/291)	11.6% (128/1104)
• Between 35 and 44	24.4% (71/291)	25.9% (286/1104)
• Between 45 and 54	36.1% (105/291)	35.3% (390/1104)
• 55 and above	29.6% (86/291)	27.2% (300/1104)
Race		
• Black	20.8% (56/269)	19.7% (200/1013)
• White	77.3% (208/269)	77.3% (783/1013)
• Other	1.9% (5/269)	3.0% (30/1013)
Smoking prevalence	6.9% (20/291)	6.4% (71/1104)
Prevalence of medical conditions		
• Diabetes	19.2% (56/291)	15.9% (175/1104)
• Hypertension	37.8% (110/291)	40.4% (446/1104)
• Hyperlipidemia	40.8% (117/287)	40.4% (446/1104)
• Coronary artery disease	2.8% (8/289)	2.6% (29/1104)
Weight, mean (SD), kg	94.4 (20.5)	95.2 (21.8)
Body mass index, mean (SD)	33.4 (5.9)	34.1 (6.9)
Obesity category		
• Pre-obese (BMI 25.0–29.9)	32.3% (94/291)	30.3% (334/1104)
• Obese class 1 (BMI 30.0–34.9)	36.1% (105/291)	34.5% (381/1104)
• Obese class 2 (BMI 35.0–39.9)	16.5% (48/291)	16.4% (181/1104)
• Obese class 3 (BMI≥40.0)	15.1% (44/291)	18.8% (208/1104)
Waist circumference, mean (SD), cm	102.5 (14.4) (n=160)	101.3 (14.4) (n=607)
Exercise 30 minutes a day at least 3 times a week	46.9% (136/290)	43.1% (471/1094)

*There were no statistically significant differences between the MNT and NoMNT groups.

Data analysis

Data were analyzed using PC SAS version 9.1.3 (SAS Institute, Cary, NC). A result was considered to be statistically significant if the observed significance level (*P* value) was <.05. Study participants who had missing or invalid responses for weight, BMI, or waist circumference on either survey were excluded from the outcomes analysis of that parameter. Thresholds for valid responses were established based on the empirical experience of the authors and RDs.

Within-group differences were analyzed using paired *t* tests for quantitative variables and the McNemar test for categorical variables. Between-group differences were analyzed using ordinary least squares regression for quantitative variables, logistic regression for categorical variables, and repeated measures ANOVA with between-subjects factors for the proportion of individuals who exercised at least 3 days a week.

Covariates were included in the between-group comparisons to control for clinically relevant differences between the groups.

Gender, diabetes, hypertension, and the time between surveys were included in all comparisons, and the regression models also included the value of the dependent variable at baseline.

TABLE 2
Within-group results for pre-post health outcomes

Parameter	Group	Baseline	Follow-up	Difference	HEADING	*P* Value
Weight, mean (SD), kg	MNT	94.0 (20.4)	90.9 (21.2)	–3.1 (10.6)	t(278) = –4.9	<.001
	NoMNT	94.6 (21.1)	93.1 (21.9)	–1.4 (12.3)	t(1051) = –3.7	<.001
Body mass index, mean (SD)	MNT	33.4 (6.0)	32.3 (6.3)	–1.1 (3.8)	t(278) = –4.9	<.001
	NoMNT	33.9 (6.6)	33.5 (6.9)	–0.4 (4.3)	t(1041) = –2.9	.004
Waist circumference, mean (SD), cm	MNT	103.3 (14.1)	100.4 (13.1)	–2.9	t(134) = –2.8	.006
	NoMNT	101.4 (14.2)	100.2 (14.1)	–1.1	t(501) = –2.1	.034
Exercise 30 minutes a day at least 3 times a week, percent (n)	MNT	47.2% (135/286)	64.0% (183/286)	16.8 percentage points	S(1) = 21.3	<.001
	NoMNT	43.1% (465/1078)	52.5% (566/1078)	9.4 percentage points	S(1) = 27.3	<.001

RESULTS

Health outcomes study population

Baseline measurement data were obtained for 838 MNTs and 3103 NoMNTs. The follow-up survey response rates for the MNTs and NoMNTs were nearly identical (34.7% and 35.6%, respectively), resulting in a final study population of 291 MNTs and 1104 NoMNTs. The mean time between surveys was 20.3 months and was slightly longer among MNTs than NoMNTs (21.6 vs. 20.0 mo).

Descriptive statistics for the relevant baseline characteristics of each group are provided in Table 1. Age and gender were obtained from BCBSNC's membership records while all other variables were self-reported on the enrollment survey. Statistical testing employing chi-square and *t* tests revealed no significant differences between the groups on any of these baseline characteristics.

Less than 6% of study participants had missing or invalid BMI, weight, or exercise frequency responses on either survey. Waist circumference was eliminated from the survey in February 2008 and was therefore missing nearly half of the time, and 11% of the responses were considered invalid.

Pre-post health outcomes

Within-group results: Baseline and follow-up metrics for weight, BMI, waist circumference, and exercise frequency are shown in Table 2. As the table illustrates, both groups achieved statistically significant improvements in weight, BMI, waist circumference, and exercise frequency between baseline and follow-up.

***Between-group results*:** After controlling for clinically relevant baseline characteristics, and measurement time, MNTs experienced greater decreases in weight and BMI than NoMNTs (Table 3). There was no difference between the groups in waist circumference. The increase in the proportion of individuals who exercise regularly was statistically significantly higher among MNTs (16.8 percentage points) than NoMNTs (9.4 percentage points).

TABLE 3
Between-group differences in pre-post health outcomes

Outcome	MNT group	No MNT group	Unadjusted group difference	Adjusted group difference	*P* Value
Change in mean weight in kg from baseline to follow-up	–3.1	–1.4	–1.7	β = –1.75, t(1314) = –2.21	.028
Change in mean BMI from baseline to follow-up	–1.1	–0.4	–0.7	β = –0.79, t(1314) = –2.88	.004
Change in mean waist circumference in cm from baseline to follow-up	–2.9	–1.1	–1.8	No difference	7.05
Percentage point increase between baseline and follow-up in exercise 30 minutes a day at least 3 times a week	16.8	9.4	7.4	F(1,1358) = 4.07	.044

TABLE 4
Within- and between-group results for clinically significant health outcomes

Outcome	MNT	NoMNT	Group difference	Adjusted OR (95% CI)	*P* Value
Maintained or lost weight (n)	66.3% (185/279)	57.5% (605/1052)	8.8 percentage points	1.5 (–1.2–2.0)	.003
Achieved clinically significant reduction in weight[1] (n)	39.8% (111/279)	24.0% (253/1052)	5.8 percentage points	2.2 (–1.7–2.9)	≤0.001
Achieved clinically significant reduction in waist circumference[2] (n)	16.7% (15/90)	17.8% (57/320)	–1.1 percentage points	No difference	>0.1

[1] A clinically significant weight loss was defined as at least a 5% decrease in weight from baseline weight
[2] A clinically significant change in waist circumference was defined as a reduction from a high-risk waist circumference (>102 cm for men and >88 cm for women) to a waist circumference below those thresholds).

Clinically significant health outcomes

Results for clinically significant health outcomes are shown in Table 4. The percentage of study participants who maintained or lost weight was higher among MNTs than NoMNTs, at 66.3% and 57.5%, respectively. After controlling for group differences in clinically relevant baseline characteristics and measurement time, MNTs had one and a half times the odds of maintaining or losing weight than did NoMNTs. Likewise, the percentage of individuals who achieved a clinically significant reduction in weight was higher among MNTs (39.8%) than NoMNTs (24.0%), with MNTs having twice the odds of achieving this outcome compared with NoMNTs. The percentage of participants who achieved a clinically significant reduction in waist circumference was similar for both groups, at 16.7% for MNTs and 17.8% for NoMNTs, and the difference between groups was not statistically significant.

Utilization and cost of the MNT benefit

Between January 2006 and May 2008, 109,226 individuals participated in the MHP program. Of these participants, 5.0% (5504/109 226) utilized the MNT benefit. The average number of MNT visits among these individuals was 2.6. Slightly less than half of the individuals (45.2%) used only 1 visit, while 20.7% used 2 visits and 34.1% used 3 or more visits. Utilization among the subset of the population who were in the MNT group for the health outcomes analysis was slightly higher than for the overall population, averaging 3.9 visits. The cost of the MNT benefit was $0.03 PMPM.

DISCUSSION

This study shows that MNT yields significant health benefits within the context of an obesity health management program. Individuals who received MNT were more successful than their matched controls at maintaining or losing weight (66.3% vs. 57.5%), and had twice the odds of achieving a clinically significant weight loss. They also experienced greater mean reductions in weight (3.1 vs. 1.4 kg) and BMI (1.1 vs. 0.4 points), and they were more likely to exercise more frequently after participating in the program.

Encouragingly, both the MNT and NoMNT groups experienced statistically significant reductions in weight, BMI, and waist circumference and increases in exercise frequency. The fact that the majority of individuals in both groups maintained or lost weight is a reversal of what one would expect absent any intervention. In a study published in 1999, Mott et al noted that body fat increased in all ethnic populations except Puerto Ricans by approximately 0.22 kg (0.5 lb) per year between ages 20 and 60 (Mott 1999). Assuming a corresponding increase in weight, this would equate to a weight gain of 0.37 kg over the 20-month study period versus the experienced weight loss of 1.4 to 3.1 kg. These results are consistent with previous analyses of shorter-term program results, and further demonstrate the value of an obesity health management program (Harris 2006).

Since the health outcomes data in this study were self-reported, it is important to understand the reliability of such data. In a related study of a subset of the MNT group (unpublished observations), the authors found a high rate of agreement between self-reported and clinician-reported weights taken within 2 weeks of one another. The correlation between RD-measured weight and self-reported weight was 98.6%, with the self-reported data averaging 0.63 kg less than the RD-reported data. Waist circumference data were less reliable, with a correlation of 87.9% and self-reported data averaging 2.3 cm less than the RD-reported data. This is not surprising, given the variability in how waist circumference is measured, and suggests that the

pre-post changes in waist circumference reported in this study should be interpreted with caution.

This study did not evaluate the motivation or readiness to change of the individuals in the study groups. Since members were not randomly assigned to MNT vs. NoMNT, there is some risk that those seeking MNT were more motivated or ready to change than those in the NoMNT group. However, the fact that individuals in both groups elected to participate in a health plan program related to nutrition and exercise mitigates these potential differences.

Utilization of the MNT benefit was fairly modest, with only 5% of the MHP program participants taking advantage of the benefit and using only 2.6 visits on average. It is worth noting that the higher rate of utilization among the MNT group (average of 3.9 visits) may be necessary to attain the health outcomes reported here. Additional research is warranted to determine what, if any, incentives would increase the use of the benefit, and if those individuals would then achieve similar health outcomes.

The incremental cost of the benefit was relatively inexpensive, at $0.03 PMPM. The medical expense savings attributable to the MNT benefit was not in the scope of the current study since the economic benefits are likely to be longer term than this study's duration. Further research is needed to evaluate the impact of MNT on medical expense.

Although this paper demonstrates the value of MNT, there may be an opportunity for improvement in the content and consistency of MNT. The American Dietetic Association has established guidelines for MNT for weight management, but the only research that has been done to establish adherence to the guidelines has been for diabetes in institutional settings (ADA 2006, Pastors 2003, Wolf 2004). Further research is needed to evaluate adherence to guidelines in community settings and to evaluate which components of MNT provide the most benefit.

In conclusion, this research translates previous research from randomized controlled trials showing that MNT provides patient benefits (Wolf 2004) into application in practice, and it is the first published study that evaluates a policy decision by an insurance company to provide coverage for MNT. The current study provides encouraging results that MNT is a valuable adjunct to health management programs that can be implemented for a relatively low cost. MNT warrants serious consideration as a standard inclusion in health benefit plans.

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