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Diet and physical activity counseling during ambulatory care visits in the United States

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Abstract

Background. Research is limited regarding national patterns of behavioral counseling during ambulatory care. We examined time trends and independent correlates of diet and physical activity counseling for American adults with an elevated cardiovascular risk during their outpatient visits.

Methods. The National Ambulatory Medical Care Survey (NAMCS) and National Hospital Ambulatory Medical Care Survey (NHAMCS) provided 1992–2000 national estimates of counseling practices in private physician offices and hospital outpatient departments.

Results. Rates of diet and physical activity counseling among visits by at-risk adults exhibited a modest ascending trend from 1992 to 2000, with the biggest growth found between 1996 and 1997. Throughout the 1990s, however, diet counseling was provided in <45% and physical activity counseling in ≤30% of visits by adults with hyperlipidemia, hypertension, obesity, or diabetes mellitus. Lower likelihood of either counseling was significantly associated with patients who were ≥75 years of age, seen by generalists, and those with fewer risk factors. Also, diet counseling was less frequently provided during visits by whites vs. ethnic minorities and by men vs. women.

Conclusions. Despite available national guidelines, diet and physical activity counseling remain below expectations during outpatient visits by adults with an elevated cardiovascular risk. Given recent trends, immediate, satisfactory improvement is unlikely without future innovative interventions.

Keywords: Counseling; Cardiovascular risk; Physical activity

Introduction

Cardiovascular disease (CVD) affects one in five Americans and contributes to substantial morbidity and mortality [1]. CVD remains the number one cause of death in the United States, regardless of gender and ethnicity, causing 709,894 deaths in 2000 [2]. As a result, CVD is associated with enormous health care expenditures, estimated at US$209 billion in 2003 [1]. The high prevalence and societal burden of CVD are closely associated with high rates of CVD risk factors. Many of these risk factors, including smoking, hypertension, diabetes mellitus, obesity, and hyperlipidemia, are preventable and modifiable [3]. Lifestyle modifications, such as engaging in healthy dietary patterns and adequate physical activity, are integral to the prevention and treatment of CVD and its risk factors [4–7].

Lifestyle modifications can be approached via population-based national health initiatives, community-wide interventions, and patient-centered clinical services. For maximum effectiveness, clinical preventive services may require efforts and resources beyond the practice level to include the organization and community [8]. Nevertheless, individual physicians and other health providers undeniably share responsibility for promoting healthy behavior. Eighty percent of Americans cite their physician as their primary source of information about health, with the average adult making 2.7 visits to a physician per year [9]. Clinicians, particularly physicians, represent a credible source of health information for their patients, who in turn may be especially receptive to information about their health during clinic visits [10,11]. Therefore, patient-centered clinical services present a unique opportunity to reinforce and complement other sources of health advice or information.

Various health organizations and agencies have devoted great effort to developing and disseminating clinical guidelines on behavioral counseling to promote healthy eating

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and active living [4,12]. Some of these guidelines emphasize the importance of behavioral counseling for both primary and secondary prevention purposes, whereas others recommend that counseling efforts be aggressively pursued in high-risk patients because of greater cost-effectiveness [4,6,7,13–15]. While the importance of behavioral counseling is virtually self-evident, its effectiveness in clinical settings warrants further research and improvement [8,15,16]. In particular, the effectiveness of counseling to promote physical activity and a healthy diet remains unknown in unselected primary care patients [15,16].

Studies that examine physician practice regarding behavioral counseling have consistently suggested suboptimal adherence to clinical guidelines [17–23]. Several factors influence the implementation of behavioral counseling in clinical settings. The likelihood of counseling, for example, has been found to vary by nonclinical factors, such as patient demographics, payment source, geographic region, and physician specialty [24–26], as well as by clinical factors, with patients at greater risk for CVD more likely to receive behavioral counseling services [21–24,26]. A majority of past studies, however, are limited by their small sample sizes and/or inability to track changes over time.

Our primary aim is to examine national trends in the provision of diet and physical activity counseling in both private physician offices and hospital outpatient departments. We anticipate that counseling rates have increased over time. Our secondary aim is to examine the independent effects of patient and health provider characteristics (i.e., nonclinical factors) and patient CVD risk status (i.e., clinical factors) on counseling practices. In so doing, our goal is to identify patient subgroups that may particularly benefit from increased behavioral counseling.

Methods

Data sources

Data between 1992 and 2000 for this study were obtained from the National Ambulatory Medical Care Survey (NAMCS) and the Outpatient Department (OPD) component of the National Hospital Ambulatory Medical Care Survey (NHAMCS). NAMCS captures health care services provided by office-based physicians, while NHAMCS surveys practices in hospital outpatient departments. Both surveys, conducted by the National Center for Health Statistics (NCHS) in Hyattsville, MD [27], utilize multistage probability sampling procedures and enable essentially unbiased national estimates to be made. Between 1992 and 2000, annual participation rates among physicians selected for NAMCS averaged 70%, while the participation rate of selected hospitals with outpatient departments was 90% in NHAMCS. We combined NAMCS and NHAMCS data to include a wider range of outpatient settings and a broader socioeconomic spectrum of patients seeking ambulatory care.

The unit of analysis in both surveys is the patient visit. For each selected patient visit, a standard encounter form is completed by the physician with staff assistance when possible in NAMCS, and by hospital staff in NHAMCS. The encounter form contains information on patient demographics (e.g., age, race, ethnicity, payment source), visit characteristics (e.g., patient new to practice, general exam, duration of visit), physician characteristics (specialty, region of the country), diagnostic information [*International Classification of Disease, Ninth Revisions, Clinical Modification* (ICD-9-CM) codes and reasons for visit], new and continuing medications, and other medical services provided at the visit (e.g., diagnostic testing and preventive counseling). Item nonresponse rates are generally 5% or less in both surveys, with some exceptions. The NAMCS and NHAMCS encounter forms differ slightly from each other and are revised every 2 years. Therefore, specific variables are not always available for the entire study span or for both surveys in the same year.

Dependent variables

Dependent variables under investigation are the reported provision of counseling on diet and exercise as indicated by a check box on the NAMCS/NHAMCS encounter forms. Of note, diet counseling was not assessed on the 1993 and 1994 encounter forms.

Independent variables

Patient and visit characteristics

Patient characteristics consist of race/ethnicity, insurance status, age, gender, geographic region, metropolitan area status, survey year, and site of care. The patient's medical insurance status was classified as private (Blue Cross/Blue Shield, health maintenance organization, or other private insurance) and non-private (Medicare, Medicaid, workers' compensation, other insurance, and self-pay). The patient visit was classified as a new patient visit, a general medical examination (GME) visit, or a return non-GME visit. New and GME visits were grouped together in that both types of visits were less influenced by what occurred at other visits by the same patients, compared with return non-GME visits.

Health provider characteristics

The NAMCS and NHAMCS encounter forms report the type of health provider seen at the visit. Four categories were used in our study: (1) physician, including staff physician, resident/intern, and other physician; (2) physician assistant, including physician assistant, nurse practitioner, and nurse midwife; (3) nursing staff, including registered nurse and licensed practical nurse; and (4) more than one type of provider seen (physician followed by physician assistant or nursing staff). In 2000, the proportion of all adult visits seen

by each provider type was 39.7% for physicians, 2.7% for physician assistants, 3.7% for nursing staff, and 53.9% for more than one type of provider seen. Physician specialty is available in NAMCS and was categorized as follows: (1) general/family practice (6.1%), (2) internal medicine (4.2%), (3) cardiology (3.0%), and (4) all other specialties (86.7%).

Cardiovascular disease risk status

Both the NAMCS and NHAMCS allow assessment of the presence of one or more of the following conditions: hyperlipidemia, hypertension, obesity, diabetes, atherosclerosis, and coronary heart disease (CHD). Each of these disease conditions is documented on the encounter forms in one of three ways: (1) by an *International Classification of Disease, Ninth Revisions, Clinical Modification* (*ICD-9-CM*) diagnostic code [28]; (2) by a N(H)AMCS-specific "reason for visit" code; or (3) for some of the years, by a check-off indicator. A patient's CVD risk status was classified into the following mutually exclusive categories: (1) low CVD risk (no risk factors present), (2) single risk factor (hyperlipidemia, hypertension, obesity, or diabetes), (3) two risk factors, (4) three or four risk factors, and (5) atherosclerosis or CHD. Cigarette smoking, a known CVD risk factor, was not included because smoking status was inquired only in the 1992–1994 NAMCS surveys.

Statistical methods

Statistical analyses were performed using SAS for Windows software (SAS Institute, Cary, NC) and SUDAAN software (RTI, Research Triangle Park, NC). In NAMCS and NHAMCS, each visit record is assigned a visit weight that accounts for unequal selection probabilities resulting from the sample design and nonresponse. All analyses took into account visit weights, which are available for the entire study span (1992–2000). At present, only 1995–2000 N(H)AMCS data contain masked sample design information that allows to take into account the complex sample designs of the surveys using SUDAAN. All statistical analyses were performed at the $P < 0.01$ level given that true estimate variance may be underestimated even with masked sample design variables.

The volume of patient visits and the rate of counseling practices were extrapolated to the national level using PROC SURVEYMEANS in SAS. We reported weighted means and 99% confidence intervals (CIs) of national rates of diet and physical activity counseling among all adult visits by patients at risk for CVD. At-risk patients were defined as those with hyperlipidemia, hypertension, obesity, or diabetes. Similar statistics also were reported for at-risk adult patients seeking a general medical examination (GME) only. Unlike all adult visits, GME visits are much less likely to recur on an annual basis and, therefore, are less subject to the bias caused by the absence of information on services provided outside of the index visits. GME visits also are less confounded by patient needs of acute care and present as reasonable opportunities for preventive services including behavioral counseling. Therefore, GME visits provide a method of validating patterns observed for the entire adult sample where possible biases are minimized.

Before 1997, weight reduction counseling and cholesterol reduction counseling, both related intimately to diet and physical activity counseling, also were available for selection on the encounter forms of both NAMCS and NHAMCS. Discontinued reporting of these two counseling services could result in artificial increases in diet and physical activity counseling. To investigate this possibility, we computed

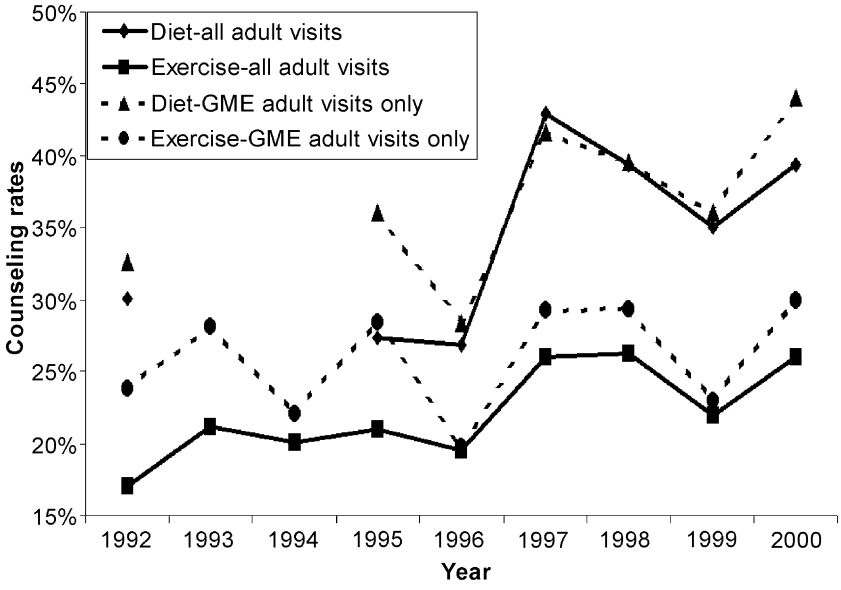

Fig. 1. National trends in the rates of diet and physical activity counseling during all visits as well as general medical examination-only (GME only) visits by adults with hyperlipidemia, hypertension, obesity, or diabetes mellitus. National Ambulatory Medical Care Survey (NAMCS) and National Hospital Ambulatory Medical Care Survey (NHAMCS), 1992–2000.

aggregate annual rates of all four types of counseling for 1992 through 1996 and aggregate annual rates of diet and physical activity counseling for 1997 through 2000.

Multivariate logistic regression models were built using PROC RLOGIST in SAS-callable SUDAAN to assess the association between diet and physical activity counseling rates and the presence of the selected nonclinical and clinical factors. NAMCS and NHAMCS data from 1995 through 2000 were examined.

Results

Magnitudes and temporal trends

Rates of diet and physical activity counseling generally increased from 1992 to 2000, although fluctuations are evident in intermediate years (Fig. 1). In 1992, diet counseling was reportedly provided during 30% [99% confidence interval (CI): (28% 32%)] and physical activity counseling was reported during 17% (15% 19%) of total visits by at-risk adult patients. The rates of reported diet and physical activity counseling during visits by at-risk adults both increased significantly from 1996 [diet: 27% (25% 28%); physical activity: 20% (18% 21%)] to 1997 [diet: 43% (40% 46%); physical activity: 26% (24% 29%)]. The occurrence of these increases coincides with the release of *Guide to Clinical Preventive Services* in 1996 [12]. After 1997, neither type of counseling manifested additional increases through 2000 [diet: 39% (36% 42%); physical activity: 26% (23% 28%)]. These rates and time trends of diet and physical activity counseling during all visits by at-risk adults were closely comparable to those found for their GME visit-only counterparts (Fig. 1). Over time, provision of counseling was

Table 1
Independent effects of patient and physician characteristics on the likelihood of diet and physical activity counseling in adults ≥18 years, NAMCS/NHMCS 1995–2000

		Diet *N* (%)[a]	Adjusted odds ratio[b] (99% CI)	Physical activity *N* (%)	Adjusted odds ratio (99% CI)
Race/ethnicity	non-Hispanic whites	18,833 (14%)	1.00 (reference)	13,271 (11%)	1.00 (reference)
	non-Hispanic blacks	5047 (17%)	1.22 (1.03 1.43)	2376 (11%)	0.97 (0.81 1.16)
	Hispanics	4233 (18%)	1.38 (1.06 1.79)	2247 (13%)	1.17 (0.85 1.62)
	Asians/Pacific islanders	1200 (22%)	1.67 (1.16 2.40)	685 (15%)	1.20 (0.85 1.69)
	American Indians	64 (11%)	1.00 (0.56 1.77)	53 (9%)	0.87 (0.41 1.84)
Medical insurance	private	11,203 (15%)	1.06 (0.94 1.20)	8430 (12%)	1.04 (0.92 1.18)
	non-private	21,332 (14%)	1.00 (reference)	12,481 (10%)	1.00 (reference)
Age (years)	18–29	6170 (13%)	1.04 (0.89 1.21)	3060 (9%)	1.24 (1.02 1.51)
	30–49	10,365 (13%)	1.03 (0.91 1.18)	7115 (11%)	1.42 (1.21 1.66)
	50–64	7785 (16%)	1.32 (1.17 1.49)	5351 (13%)	1.65 (1.43 1.91)
	65–74	4927 (16%)	1.31 (1.18 1.45)	3278 (12%)	1.44 (1.28 1.62)
	75+	3614 (13%)	1.00 (reference)	2267 (9%)	1.00 (reference)
Sex	female	22,129 (15%)	1.16 (1.07 1.26)	13,161 (11%)	1.05 (0.96 1.14)
	male	10,732 (14%)	1.00 (reference)	7910 (11%)	1.00 (reference)
Geographic region	Northeast	10,263 (15%)	1.21 (0.92 1.58)	5566 (11%)	0.96 (0.71 1.30)
	Midwest	6908 (14%)	1.13 (0.87 1.46)	4439 (11%)	0.99 (0.73 1.34)
	South	9494 (14%)	1.02 (0.79 1.31)	6363 (10%)	0.86 (0.65 1.14)
	West	6196 (14%)	1.00 (reference)	4703 (12%)	1.00 (reference)
Metropolitan statistical area	yes	28,871 (14%)	1.11 (0.90 1.37)	18,195 (11%)	1.20 (0.92 1.55)
	no	3990 (15%)	1.00 (reference)	2876 (11%)	1.00 (reference)
Visit type	new or GME visits	7454 (16%)	1.18 (1.06 1.32)	4920 (12%)	1.22 (1.09 1.38)
	return non-GME visits	25,407 (14%)	1.00 (reference)	16,151 (10%)	1.00 (reference)
Physician specialty	GP/FP	4058 (19%)	1.00 (reference)	3121 (14%)	1.00 (reference)
	internal medicine	3447 (23%)	1.29 (1.03 1.62)	2443 (16%)	1.18 (0.90 1.54)
	cardiology	2113 (29%)	1.78 (1.28 2.48)	1670 (23%)	1.81 (1.28 2.55)
	other	23,243 (9%)	0.44 (0.37 0.53)	13,837 (7%)	0.50 (0.42 0.61)
Health provider type	nursing staff	1222 (6%)	1.00 (reference)	760 (3%)	1.00 (reference)
	physicians/residents	9716 (12%)	2.32 (1.46 3.67)	7740 (10%)	2.77 (1.49 5.14)
	physician assistant/nurse practitioner	913 (16%)	3.28 (1.91 5.64)	486 (11%)	3.42 (1.52 7.69)
	multiple providers	21,010 (16%)	3.05 (1.94 4.80)	12,085 (12%)	3.46 (1.88 6.39)
Survey year	1995–1996	10,800 (13%)	1.00 (reference)	5925 (10%)	1.00 (reference)
	1997–1998	11,384 (15%)	1.22 (1.01 1.48)	7984 (11%)	1.11 (0.90 1.36)
	1999–2000	10,677 (14%)	1.13 (0.94 1.36)	7162 (11%)	1.01 (0.82 1.25)
Site of care	private physician offices	16,122 (14%)	0.80 (0.65 0.99)	13,505 (11%)	1.06 (0.83 1.36)
	hospital outpatient departments	16,739 (12%)	1.00 (reference)	7566 (6%)	1.00 (reference)

[a] The number and percentage of adult visits during which diet and physical activity counseling, respectively, were reported.
[b] The odds ratios for each variable were adjusted for all other variables listed in the table.

consistently associated with longer visit durations. Visits with diet counseling averaged 20.1 min (19.8–20.4) and visits with exercise counseling averaged 20.6 min (20.2–20.9), in contrast with an average of 18.3 min (18.2–18.4) for visits without counseling.

After taking weight and cholesterol counseling into account, the aggregate counseling rate in total visits by at-risk adults still increased significantly from 33% (31% 34%) in 1996 to 45% (42% 48%) in 1997. The aggregate counseling rate in GME-only visits by at-risk adults also demonstrated an increase between 1996 and 1997, which did not reach statistical significance however.

Nonclinical and clinical correlates

Ethnic minorities had 1.2 to 1.7 times the odds of receiving diet counseling than did non-Hispanic whites, with the exception of American Indians where the sample size was small (Table 1). Visits by 50- to 74-year-olds vs. those by the elderly ≥ 75 years, visits by women vs. those by men, and new or GME visits vs. return non-GME visits had 1.2–1.3 times the odds of receiving diet counseling. With regard to provider characteristics, diet counseling was two to three times more likely to be provided during visits seen by physicians, physician assistants, and nurse practitioners compared with visits seen by nursing staff. Visits to internists had 1.3 times and visits to cardiologists had 1.8 times the odds of receiving diet counseling than did visits to general and family practitioners, whereas visits to other specialties had 0.4 times the odds. Relative to 1995 and 1996, the frequency of diet counseling increased significantly in 1997–1998, but the increase did not sustain in 1999 and 2000. There was no difference in the likelihood of diet counseling based on insurance status, geographic region, metropolitan area status, or site of care.

Physical activity counseling was more likely during visits by patients younger than 75 years (1.2–1.4 times the odds vs. visits by patients 75 years and older), new or GME visits (1.2 times the odds vs. return non-GME visits), and visits to cardiologists (1.8 times the odds vs. visits to general and family practitioner). No difference was detected according to other selected patient and visit characteristics. Like diet counseling, physical activity counseling was least likely during visits to physicians in specialties other than internists and cardiologists relative to visits to general and family practitioners and during visits seen by nursing staff relative to visits seen by all other providers.

After appropriately controlling for significant nonclinical correlates identified above, the likelihood of diet and physical activity counseling increased significantly with the presence of atherosclerosis and selected CVD risk factors. Among these clinical correlates, obesity and hyperlipidemia were associated with the greatest odds of either type of counseling, with odds ratios ranging from 2.7 [99% CI: (2.1 3.4)] to 5.8 (4.8 7.0) (Table 2). Interestingly, a positive diagnosis of CHD had no effect on the likelihood of diet or physical activity counseling. When examined according to aggregate CVD risk, the likelihood of diet and physical activity counseling increased incrementally from visits with one single risk factor to visits with three or all four risk factors, relative to visits in the absence of hyperlipidemia, hypertension, obesity, or diabetes. Increases in the odds of counseling due to the presence of CHD or atherosclerosis were of similar magnitude to those associated with the presence of a single CVD risk factor.

Table 2
Independent effects of CVD risk on the likelihood of diet and physical activity counseling in adults 18 years and older, NAMCS/NHMCS 1995–2000

		Diet *N* (%)[a]	Adjusted odds ratio[b] (99% CI)	Physical activity *N* (%)	Adjusted odds ratio[c] (99% CI)
Hyperlipidemia	yes	1814 (50%)	4.23 (3.45 5.19)	1031 (33%)	2.68 (2.14 3.36)
	no	31,047 (14%)	1.00 (reference)	20,040 (10%)	1.00 (reference)
Hypertension	yes	7312 (29%)	1.86 (1.67 2.07)	4156 (20%)	1.72 (1.54 1.93)
	no	25,549 (13%)	1.00 (reference)	16,915 (10%)	1.00 (reference)
Obesity	yes	4087 (48%)	5.79 (4.81 6.97)	2246 (35%)	4.43 (3.59 5.46)
	no	28,774 (13%)	1.00 (reference)	18,825 (10%)	1.00 (reference)
Diabetes mellitus	yes	5225 (37%)	2.98 (2.58 3.44)	2204 (20%)	1.59 (1.37 1.84)
	no	27,636 (13%)	1.00 (reference)	18,867 (10%)	1.00 (reference)
Atherosclerosis	yes	2742 (28%)	1.48 (1.19 1.84)	1999 (21%)	1.52 (1.23 1.89)
	no	30,119 (14%)	1.00 (reference)	19,072 (10%)	1.00 (reference)
Coronary heart disease	yes	1826 (32%)	1.10 (0.84 1.45)	1375 (24%)	1.16 (0.87 1.55)
	no	31,035 (14%)	1.00 (reference)	19,696 (11%)	1.00 (reference)
Overall CVD risk	low risk	18,529 (10%)	1.00 (reference)	13,134 (8%)	1.00 (reference)
	single risk factor	7925 (29%)	3.78 (3.39 4.23)	4201 (19%)	2.71 (2.40 3.06)
	two risk factors	3091 (44%)	7.73 (6.55 9.11)	1473 (27%)	4.32 (3.60 5.18)
	3+ risk factors	574 (59%)	16.33 (11.62 22.93)	264 (37%)	7.47 (5.44 10.25)
	CHD or atherosclerosis	2742 (28%)	4.01 (3.36 4.79)	1999 (21%)	3.18 (2.64 3.83)

[a] The number and percentage of adult visits during which diet and physical activity counseling, respectively, were reported.
[b] Covariates include race/ethnicity, age, sex, new patient status, physician specialty, health provider type, and survey year.
[c] Covariates include age, new patient status, physician specialty, health provider type, and survey year.

Discussion

The persistently high prevalence of CVD and its modifiable risk factors in the United States suggests an imperative need for standard prevention and treatment practices. National data have shown increased prevalence of several CVD risk factors over the past decade. For example, obesity among U.S. adults has increased from 22.9% to 30.5% between 1988 and 2000 alone [29]. Several national guidelines have been developed to guide the prevention and treatment of modifiable CVD risk factors in clinical settings [4,6,14,15]. In these guidelines, behavioral counseling to promote healthy eating and active living is a commonly recommended preventive measure, especially for patients with elevated cardiovascular risk.

Despite these national recommendations, results from this study suggest that behavioral counseling about diet and physical activity is performed at a suboptimal level for patients with proven risk factors for cardiovascular events (e.g., a diagnosis of hypertension, diabetes, obesity, or hyperlipidemia) [17,19–21,26,30]. Like our study, a body of past research has documented many missed opportunities for promoting beneficial behavior change through counseling in clinical settings [17–23]. Our data show that based on physician reports from 1992 to 2000, diet counseling was provided in less than 45% and physical activity counseling in less than 30% of ambulatory care visits by American adults with hyperlipidemia, hypertension, obesity, or diabetes mellitus. Comparable rates were reported during general medical visits by these at-risk adults. These rates fall below expectations, especially given that general medical visits present a unique window of opportunity for preventive services, such as behavioral counseling. Our time series data showed slight increases in the frequency of diet and physical activity counseling throughout the 1990s except for a 59% increase in diet counseling and a 30% increase in physical activity counseling between 1996 and 1997. The statistical significance of these increases was confirmed by multivariate logistic regression. These increases may be partially attributed to the release of the U.S. Preventive Services Task Force recommendations in 1996 [12].

Although previous studies have shown the influence of patient and health care provider characteristics on clinical counseling about diet and physical activity, few have examined these factors on a national level and across multiple years. In agreement with other researchers, we identified patient age and gender as independent factors influencing counseling practices [17,20,23,24]. Lower frequencies of diet and physical activity counseling during visits by patients >75 years of age, relative to their younger counterparts, raise concerns about health providers' under-appreciation of the importance of healthy eating and active living in maintaining or improving cardiovascular function, strength and muscle mass, postural stability, and quality of life for the elderly [31–33]. The greater likelihood of diet counseling for women than men may be attributed to the fact that women are more conscious about their eating and weight and, therefore, more likely to initiate diet-centered discussions. In addition, ethnic minorities were more likely to be counseled about diet, compared with whites. Traditional ethnic diets are a strong contributor to cardiovascular risk, particularly in African Americans and Hispanics [1].

In terms of health provider characteristics, this study supports extant evidence that patient visits to cardiologists are more likely to receive diet and physical activity counseling, compared with visits to general and family practitioners [18,23,24,34,35]. Additionally, our data noted a higher frequency of diet and physical activity counseling by attending physicians, residents, physician assistants, and nurse practitioners than nursing staff. These variations by physician specialty and provider type may reflect differences in training and comfort level. Previous studies have shown that a provider's age, personal lifestyle habits, and knowledge and experience can significantly impact their counseling practices [34,35]. In addition, the apparently greater tendency to counsel about diet and physical activity by cardiologists, relative to primary care physicians, may be a manifestation of greater disease severity and lower frequency of return visits among their patients. However, given the centrality of CVD to their training and practice focus, it is surprising that counseling on diet and physical activity occurred during only 23–29% of cardiologists.

Our results clearly show that the provision of diet and physical activity counseling correlated significantly with the presence and the number of CVD risk factors. In concert with previous studies, these findings demonstrate that counseling about behavioral change is likely provided to patients whose health is already compromised, that is, counseling for therapeutic or secondary prevention purposes rather than primary prevention [21–24,26]. This suggests a practice pattern that is inconsistent with empirical evidence documenting the overall health benefits and reduced health care costs associated with primary CVD prevention [36–38]. In addition, having a CHD diagnosis did not improve the odds of behavioral counseling beyond that associated with the presence of one single risk factor, which may be explained in part by the focus on pharmaceutical and surgical therapies. This, however, suggests a practice pattern that under-appreciates the importance of lifestyle change in tertiary prevention.

The above nonclinical and clinical factors suggest potential mediators that deter the practice of behavioral counseling. In addition, past research has identified a range of barriers to counseling in clinical settings, including lack of time, inadequate provider counseling skills and training, inadequate reimbursement, perceived ineffectiveness of counseling, low provider confidence, patient nonadherence, patient comorbidity, and lack of organizational support [39–41]. Our knowledge of these barriers and mediators can guide the development of future interventions that will improve behavioral counseling in clinical practice. At present, some intervention strategies have shown promise in

improving the effectiveness of counseling practice. Examples of such strategies include region-wide partnerships between clinics and communities to develop and disseminate preventive services; physician-led counseling interventions targeting patients' motivational readiness to change behavioral CVD risk factors; and interactive, computer-based, health communication technologies that prioritize areas for behavioral interventions in primary care clinics. Research has shown that each of these strategies resulted in improvements in physician counseling practices and subsequent improvements in patient exercise and nutrition behavior [8,37,38].

Both the NAMCS and NHAMCS have several limitations, and consequently, caution should be exercised in interpreting the findings. Both data sources are serial, cross-sectional surveys of patient visits, recorded by health care providers and their staff. Therefore, actual patient exposure to behavioral counseling over time may be underestimated due to the inability to ascertain multiple visits by the same patient in a year or to account for services provided during non-recorded visits. Also, the degree of underestimation may be disproportionately higher among patients likely to make return visits on an annual basis (e.g. visits to primary care physicians vs. visits to specialists). In addition, neither NAMCS nor NHAMCS collected data regarding biomedical measures (e.g., blood pressure and lipid levels) or family history of cardiovascular disease. As a result, these data do not allow for standard cardiovascular risk stratification based on Framingham risk scoring. Alternatively, we identified visits for at-risk patients via relevant physician-reported diagnoses. This approach likely results in the underestimation of the degree of suboptimal diet and exercise counseling owing to incomplete inclusion of at-risk patients. Furthermore, neither survey provided information on the appropriateness, content, or intensity of counseling, nor did either survey measure the use of ancillary medical services (e.g., registered dietitians) by physicians or patients. Finally, the patient's socioeconomic status, level of educational attainment, and weight status were not collected as part of the NAMCS and NHAMCS surveys. However, these variables merit further examination and may further elucidate group differences in diet and physical activity counseling practices in the United States.

In conclusion, this study suggests many missed opportunities for diet and physical activity counseling during ambulatory care visits by U.S. adult patients with elevated risk for cardiovascular disease. Further, there is no indication that satisfactory improvement would occur in the immediate future given recent trends. Counseling rates are disproportionately lower in certain subpopulations, such as patients of older ages and patients cared for by primary care physicians. Consensus is yet to be reached as to the provision of diet and physical activity counseling in unselected primary care patients, and more is to be learned about the effectiveness of such counseling and strategies that can improve its delivery. There is a compelling need, however, to improve clinical practice of preventive counseling that will curtail the pathophysiologic progression among patients with elevated cardiovascular risk.

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