Prevalence and Correlates of Preventive Care Among Adults With Diabetes in Kansas

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OBJECTIVE — To assess the prevalence and correlates of recommended preventive care among adults with diabetes in Kansas.

RESEARCH DESIGN AND METHODS — A cross-sectional telephone survey was conducted among a sample of adults (≥18 years of age) with self-reported diabetes. Recommended preventive care was defined based on four criteria: number of health-care provider (HCP) visits per year (≥4 for insulin users and ≥2 for nonusers), number of foot examinations per year (≥4 for insulin users and ≥2 for nonusers), an annual dilated eye examination, and a blood pressure measurement in the past 6 months.

RESULTS — The mean age of the 640 respondents was 61 years, 58% were women, and 86% were white. In the preceding year, 62% of respondents reported the appropriate number of visits to a HCP, 27% the appropriate number of foot examinations, 65% an annual dilated eye examination, and 89% a blood pressure measurement in the preceding 6 months. Only 17% (95% CI 14–20) met all four criteria for recommended care. The adjusted odds of receiving recommended care were higher for males than for females (odds ratio [OR] 1.6; 95% CI 1.1–2.5), higher for people whose HCP scheduled follow-up appointments than for those who self-initiated follow-up (OR 2.7; 95% CI 1.6–4.8), and higher for former smokers than for current smokers (OR 3.1; 95% CI 1.6–6.9).

CONCLUSIONS — Preventive care for people with diabetes is not being delivered in compliance with current guidelines, especially for women and current smokers. Scheduling follow-up visits for patients, targeting certain high-risk populations, and developing protocols to improve foot care may be effective in improving care.

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Diabetes affects an estimated 15.7 million people in the U.S. and is a leading cause of death and disability (1). It accounts for almost $100 billion in expenditures annually, a large portion of which is attributed to the care of people with diabetes-related complications (2). Many of these complications are preventable. Strict glycemic control, aggressive treatment of hypertension, foot care, and screening for retinopathy decrease the risk of diabetes-related complications and disability and reduce costs (3–11). Such evidence supports the standards of medical care recommended by the American Diabetes Association (ADA) for the continuing care of people with diabetes (12).

Despite these demonstrated benefits, studies have repeatedly documented low rates of preventive care (13–17). Researchers have begun to explore possible barriers to and predictors of receipt of preventive care. For example, people with diabetes who are insulin users are more likely to receive preventive care services than nonusers of insulin (13,17,18). Having a regular health-care provider is also associated with receiving better preventive care (19). Physician forgetfulness, especially by physicians with a large patient caseload, has been reported as a reason for poor implementation of practice guidelines (20). Much of this research has been conducted in urban and health maintenance organization settings and is not population-based. There remains a paucity of information regarding the determinants of providing quality diabetes care. To develop effective interventions, we need to identify population subgroups at risk, patients' perceptions of physician practices, and obstacles within the medical system.

The Kansas Diabetes Program, in an effort to inform policy development, conducted a telephone survey of adults with diabetes. This dataset provided much-needed baseline information for Kansas and an opportunity to explore the antecedents of suboptimal care in a population-based sample. We used this dataset *1*) to assess the level of diabetes preventive care in compliance with ADA guidelines among people with diabetes in Kansas and *2*) to determine patient and provider characteristics associated with receiving recommended care.

RESEARCH DESIGN AND METHODS

Data collection

In 1996, the Kansas Department of Health and Environment conducted a cross-sectional telephone survey of a sample of noninstitutionalized adults (age ≥18 years). A random sample of telephone numbers was

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Abbreviations: ADA, American Diabetes Association; HCP, health care provider; OR, odds ratio.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

generated from a list of all telephone prefixes in Kansas and prescreened to eliminate businesses, institutions, and nonworking numbers. Almost all the 20,000 residential telephone numbers so obtained were contacted. Eligible participants were identified by asking, "Does an adult, 18 years or older, in your household have diabetes?" Qualifying households (n = 842) were called back at a later date to conduct the interview. The prevalence of diabetes in the population screened (4.2%) was similar to national estimates (3.9%) (1).

In households reporting more than one member with diabetes, only one among the eligible participants was randomly selected using a Kish table (21). Trained interviewers administered a 77-item questionnaire to survey participants after obtaining verbal consent. This was designed to obtain data on demographic characteristics and clinical status, including complications caused by diabetes, presence of risk factors, access to health care, and use of diabetes-related preventive care services. To maintain confidentiality, no identifying information was collected.

Outcome measures

The outcome of interest for this study, recommended care, was defined based on four criteria selected from the 1996 ADA standards of care (12). First, an appropriate number of visits to the health care provider (HCP) in the past year for diabetes care, defined as four or more visits for insulin users and two or more visits for nonusers of insulin. Similarly, criteria for foot care required four or more foot exams per year for insulin users and two or more foot exams for nonusers. A primary HCP or a podiatrist may have conducted the foot exams. The other criteria were reporting a blood pressure measurement within the past 6 months and a dilated eye exam within the past year. Respondents were considered to have received recommended care only if all four criteria were met.

Independent variables

The following variables were treated as potential correlates of receipt of recommended care. Indicators of sociodemographic status were age, sex, race, level of education, and urban or rural residence. Urban residence was defined as self-reported residence in a metropolitan statistical area (22).

Clinical status variables were type and duration of diabetes, insulin use, diabetes-related complications, and hypertension. People were classified as having type 1 diabetes if their age at diagnosis was <30 years and they currently used insulin; all others were classified as having type 2 diabetes (23). Respondents were asked a forced-choice question "Has your diabetes caused you any of the following health problems?" to identify diabetes-related complications. They affirmed or denied the presence of the following complications: loss of vision, loss of kidney function, losing protein in urine, skin sores or ulcers, numbness, tingling or pain of lower extremities, amputation, heart disease, and frequent infections. Respondents were then categorized as either reporting one or more complications or none. Having ever been told that they had high blood pressure was used to identify people with hypertension.

Cardiovascular disease risk factors studied were obesity, physical activity, and smoking status. BMI, a measure of obesity computed from self-reported weight and height (kg/m^2), was used as a continuous variable in analysis. Respondents were classified as normal weight (BMI <25), overweight (BMI ≥25 and <30), or obese (BMI ≥30) for descriptive purposes (24). Respondents were categorized as active if they reported physical activity lasting 20 min or longer three or more times a week. Individuals who did not meet these criteria were categorized as inactive (25). Persons were classified as never smokers if they reported smoking fewer than 100 cigarettes in their lifetime, as former smokers if they reported smoking at least 100 cigarettes but none at the time of the survey, and as current smokers if they were still smoking (25).

Health-care access indicators included reporting any insurance coverage, having a regular HCP, reporting problems paying for diabetes supplies, and reporting being unable to see a health-care provider due to cost concerns. In addition, we also queried whether patients' appointments were scheduled by their HCP or whether their follow-up was self-initiated (i.e., they scheduled the appointment themselves or walked in as needed).

Analytic procedures

Categorical variables were summarized as frequencies and percentages; means and SDs were calculated for continuous variables. Fisher's exact test was used to assess the bivariate relation between recommended care and categorical variables; odds ratios (ORs) were calculated to describe the strength of the associations. Two sample t tests were used to determine whether mean values of continuous variables for those who received recommended care and those who did not were statistically different. Differences were considered to be significant at $P \leq 0.05$.

Logistic regression models were constructed with receiving or not receiving recommended care as the dependent variable. We selected independent variables based on the results of the bivariate analysis and others that were relevant based on published literature. The stepwise logistic regression procedure was used to determine which factors were independent correlates of recommended care and to calculate the adjusted ORs for receiving recommended care. The 0.05 level of significance was used to determine which factors entered or left the model at each iteration. The SAS statistical package (Version 6.12 for Windows; SAS Institute, Cary, NC) was used for all analytic procedures (26).

RESULTS

Of 842 adults eligible for the survey, 640 (76.0%) completed the interview; 99 (11.8%) denied having an eligible participant when called back, 49 (5.8%) were lost to follow-up, 40 (4.8%) refused to participate, and 14 (1.7%) were unable to communicate. Only 20 households had more than one member with diabetes.

Characteristics of survey respondents are detailed in Table 1. Most respondents were elderly, white, educated, had type 2 diabetes, and had insurance. Diabetes-related complications were reported by two-thirds of respondents. Numbness, tingling, or pain of the lower extremities was the most frequently reported complication (45.5%), followed by vision problems (25.9%) and heart disease (16.9%).

Preventive care practices

Visits to a HCP in compliance with ADA guidelines were reported by 62.3% of all respondents; however, 12.2% of respondents had not visited a HCP in the past year. The proportion of respondents reporting foot examinations in compliance with guidelines was 27.2%; nearly half (45.2%) reported no foot examinations in the past year. Most respondents (88.8%) had received a blood pressure measurement within the past 6 months. Although 64.5% reported a dilated eye examination in the past year, 7.7% of all respondents had

never had a dilated eye examination. Overall, 17.3% of all respondents met all four criteria for recommended care.

Insulin users and nonusers differed in their compliance with individual ADA guidelines. Insulin users reported more HCP visits (mean 6.2 vs. 3.6), as well as more foot exams (mean 3.3 vs. 1.9), in the preceding year than nonusers of insulin. However, they were less likely to be in compliance with the ADA standards, which require them to have twice as many visits and foot exams than nonusers of insulin (Table 2). Where the ADA standard had the same criteria for both groups, namely annual eye exam, insulin users performed better than nonusers. Interestingly, equivalent proportions of users and nonusers of insulin met all four criteria for recommended care.

Characteristics associated with receiving recommended care

We found statistically significant bivariate associations between receipt of recommended care and the following variables: having a regular HCP (OR 8.6; 95% CI 1.2–63.5), having insurance (2.9; 1.0–8.2), having a HCP who scheduled the follow-up appointment (2.7; 1.6–4.7), being a former smoker (2.2; 1.5–3.4), being physically active (2.0; 1.3–3.1), being male (1.6; 1.1–2.5), and reporting problems with paying for diabetic supplies (1.6; 1.0–2.6). There was no significant association between receiving recommended care and age, race, education, residence in a metropolitan statistical area, duration or type of diabetes, insulin use, presence of diabetes-related complications, hypertension, obesity, or being unable to see a HCP because of cost concerns.

Results of the multiple logistic regression modeling indicate that the adjusted odds of receiving recommended care were higher for males than for females (OR 1.6; 95% CI 1.1–2.5; $P < 0.05$), higher for people whose health-care provider scheduled follow-up appointments than for those who scheduled appointments themselves (2.7; 1.6–4.8; $P < 0.001$), and higher for former smokers than for current smokers (3.1; 1.6–6.9; $P < 0.01$). Although never smokers were more likely to receive recommended care than current smokers, this association had borderline significance (2.0; 1.0–4.4; $P = 0.06$). The Hosmer and Lemeshow goodness-of-fit test yielded a P value of 0.97, indicating a well-fitted model (27).

Table 1—*Characteristics of adults with self-reported diabetes in Kansas, 1996*

n	640
Sociodemographic characteristics	
Age (years)	61.0 ± 15.2
Female	58.3
Ethnicity	
White	86.3
African-American	7.0
Other	6.7
Education	
Some college	42.5
High school graduate	39.4
Some high school	18.1
Residence in metropolitan statistical area (urban)	43.1
Clinical status	
Duration of diabetes (years)	11.4 ± 10.6
Type of diabetes*	
Type 1	7.7
Type 2	87.8
Not classified	4.5
Insulin use	
Yes	39.7
No	60.3
Diabetes-related complications†	63.6
Hypertension	57.1
Behavioral risk factors	
BMI	
Overweight (BMI ≥25<30)	32.9
Obese (BMI ≥30)	45.0
Smoking status	
Current smoker	14.9
Former smoker	34.8
Never smoker	50.2
Physically inactive‡	60.3
Health care access	
Insurance coverage	91.2
Regular HCP	93.8
Reported problem paying for supplies	23.8
Unable to see HCP because of cost	13.3
Follow-up appointment scheduled by HCP	67.8

Data are *n*, means ± SD, or %. *Type 1 diabetes is defined as age at onset <30 years and insulin user; type 2 diabetes is defined as all other diabetic subjects. †Affirmed presence of one or more of the following complications: loss of vision; loss of kidney function; losing protein in urine; skin sores or ulcers; numbness, tingling, or pain of lower extremities; amputation; heart disease; and frequent infections. ‡Less than 20 minutes of activity or less than three times a week.

Given the strong association between HCP-scheduled appointments and receipt of recommended care, we examined this variable further (Table 3). Persons with HCP-scheduled appointments reported a higher prevalence for each individual criterion as well as for the combined recommended care measure than people with self-initiated appointments. This difference was statistically significant for all variables except eye exams.

CONCLUSIONS

The findings of this study indicate that less than a fifth of adults with diabetes in Kansas receive preventive care in compliance with the ADA guidelines as assessed by four selected indicators, with lack of foot care being a primary contributor. Approximately half of all respondents had not received a foot exam in the past year. Even reporting a lower extremity complication did not increase the likelihood of receiving appropriate foot examinations.

Table 2—*Prevalence of meeting ADA guidelines for preventive care by insulin use, Kansas, 1996*

Criteria	Insulin users (%)	Non–insulin users (%)	ORs (95% CI)
HCP visits*	49.6	70.7	0.4 (0.3–0.6)
Foot checks†	23.2	29.8	0.7 (0.5–1.0)
Blood pressure check‡	86.6	90.2	0.7 (0.4–1.2)
Annual dilated eye examination	72.4	59.3	1.8 (1.3–2.5)
Recommended care§	16.9	17.6	1.0 (0.6–1.5)

ORs are presented with non–insulin users as a reference group. *Four or more visits per year for insulin users and two or more for nonusers. †Four or more foot examinations per year for insulin users and two or more for nonusers. ‡Blood pressure check within the past 6 months for both groups. §Respondents who met all four criteria.

We found that insulin users were no more likely than nonusers of insulin to receive care as recommended. Previous studies that reported a higher likelihood of receipt of care for insulin users compared with nonusers of insulin based their assessments solely on the presence of preventive care and not on the intensity of the practice (15,19). In our study, insulin users had a higher likelihood of receiving care as recommended only for care practices that were measured similarly for both groups (annual eye examination). Where the intensity of care was stricter for insulin users (frequency of visits to the HCP or foot examinations), proportionally fewer insulin users received recommended care. A similar pattern has also been reported with national data (13).

Several unique findings emerged from our study and highlight the complex interplay between provider characteristics and patient behavior. Respondents whose health-care providers scheduled the next appointment were more likely to receive recommended care. This association, to the best of our knowledge, has not been reported previously and needs further exploration. Having an appointment scheduled may promote access to care because patients may forget when they have to follow-up or call too late to be scheduled in a timely manner. However, it may indicate a provider who accepts greater responsibility for patient outcomes, fulfills all elements of care, and schedules the follow-up visit. It may also be a marker for longitudinal health care rather than acute problem-oriented care.

We found that never and former smokers were more likely than current smokers to receive recommended care. This association was statistically significant for former smokers. Although former smoking status has been reported as being strongly associated with hypertension control, there are no data linking former smoking status and diabetes care (28). However, current smokers are more likely to drop out of a structured diabetes-care program to improve glycemic control (29). Former smokers possibly have a different psychosocial profile from current or even never smokers. For example, their ability to quit smoking may be a marker for a raised consciousness toward improving other areas of their health. Alternatively, former smokers may be sicker, the severity of their illness causing them not only to quit smoking, but also to receive more care.

In our study, men were more likely than women to receive recommended care. Published literature contains many hypotheses about the effects of biological sex and psychosocial gender differentiation on health (30). Traditionally, sex differentials in health have been reported as a higher mortality rate for men and a greater morbidity and higher utilization of health services for women (31). Given these data, our finding that men were more likely to receive recommended care appears counterintuitive. However, males with diabetes have been reported to have lower HbA_{1c} levels and fewer complications, as well as greater confidence in their ability to manage their diabetes, more social support, fewer lapses in self-care, and a higher quality of life compared with females with diabetes (32). The increased confidence of men with diabetes may possibly be due to the better care they receive. In a study of people with heart disease, men were significantly more likely than women to report their heart-related visits as being regularly scheduled as opposed to self-initiated (33). Men and women in our study were equally likely to have HCP-scheduled appointments (OR 0.7; 95% CI 0.5–1.1). But even among respondents with HCP-scheduled appointments, more men (26.6%) than women (17.6%) received recommended care (OR 1.7; 95% CI 1.0–2.8).

Several issues must be considered when interpreting the results of this study. To understand the correlates of receiving preventive care, we decided to use a summary measure to assess compliance with as many elements of diabetes preventive care as possible. Most previous studies have evaluated individual care practices (e.g., proportion of people with diabetes receiving one foot exam per year) and identified specific areas of deficiency. However, each component of the ADA guidelines addresses a different aspect of preventive care. None are complete in themselves, nor does receipt of one modify the need for the others. Because all aspects of care were not assessed in the survey, the summary measure we chose consisted of four separate measures: appropriate number of visits to the HCP and foot examinations per year, blood pressure monitoring, and an annual dilated eye examinations. We did not include measurements of glycosylated hemoglobin because nearly 75% of respon-

Table 3—*Prevalence of meeting ADA guidelines for preventive care among patients with provider-scheduled appointments compared with patients with self-initiated appointments, Kansas, 1996*

Criteria	Follow-up appointment (%)		ORs (95% CI)
	Provider-scheduled	Self-initiated	
HCP visits*	71.8	44.1	3.2 (2.2–4.6)
Foot checks†	31.5	17.3	2.2 (1.4–3.4)
Blood pressure check‡	92.9	81.2	3.1 (1.8–5.3)
Annual dilated eye exam	66.8	60.4	1.3 (0.9–1.9)
Recommended care§	21.2	8.9	2.8 (1.6–5.0)

ORs are presented with patients with self-initiated appointments as a reference group. *Four or more visits per year for insulin users and two or more for nonusers. †Four or more foot examinations per year for insulin users and two or more for nonusers. ‡Blood pressure check within the past 6 months for both groups. §Respondents who met all four preceding criteria.

dents were unaware of the term, precluding meaningful analysis. In using a measure where only those who met all four criteria were recognized as receiving recommended care, we lacked the sensitivity to assess variability across a continuum of care. Persons who did not meet any criteria were placed in the same category as those who met three of the four criteria. It is likely there is a difference in these groups. However, our study was not designed to answer that question, and we lacked the power to make any meaningful interpretation of such an ordinal scale.

In our study, identification of people with diabetes and the frequency of care practices depended on self-reported information and are subject to recall bias. Previous studies have documented considerable reliability and validity of self-identification of diabetes, as well as a high correlation between self-reported information by people with diabetes and corresponding medical record data (19,34–39). We do not know, however, the proportion or characteristics of people who refused to participate by denying their diagnosis.

Our estimates may also be biased because we surveyed a sample of Kansas adults with diabetes who had a telephone. Thus, the results may not be generalizable to minority groups, people with lower income or education, or those who are unemployed, all of whom have lower telephone coverage rates (40). However, only 4% of households in Kansas do not have a telephone at any one time according to the U.S. Bureau of the Census.

Implications

In light of the findings of this survey, the Kansas Diabetes Program is planning the following initiatives: *1*) conducting a direct-to-consumer quality care education campaign and organizing a community-level coalition to create a local expectation for providers to achieve excellence in care; *2*) encouraging employers to promote preventive care among contracted HCPs; and *3*) working with HCPs to develop office protocols to improve care, such as having patients routinely remove their socks and shoes when they see their provider, standing orders for HbA_{1c} measurements, checklists to prompt HCPs, and scheduling return appointments.

Because the levels of diabetes preventive care found in Kansas are comparable with national estimates, similar approaches to improve the quality of diabetes care could be considered nationally. We encourage providers to consistently schedule their patients' follow-up appointments because it has a strong association with receipt of recommended care and can be easily implemented. In addition, incorporating preventive care algorithms and protocols into their routine practices could facilitate delivery of preventive care. Targeting care practices that are particularly low, such as foot examinations, may lead to substantial improvement in outcomes. Although the effectiveness of such interventions needs to be evaluated, implementation should not be delayed, since the current level of preventive care is poor. Further research also needs to explore provider characteristics and how they relate to delivery of preventive care.

This study also identified patient characteristics that were associated with receipt of recommended care. Sex differences need to be examined further; should other studies also document that care received by women differs from that received by men, interventions will need to focus on promoting improved health care for women with diabetes. Smoking, an independent cardiovascular risk factor, also decreased the likelihood of receiving recommended care in our study. Prevention messages targeting diabetic smokers should not only encourage cessation but also educate them about diabetes preventive care. Finally, educating providers, third-party payers, and people with diabetes about quality care must be a priority.

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