

Is Diabetes Treated as an Acute or Chronic Illness in Community Family Practice?

BARBARA YAWN, MD, MSc¹
STEPHEN J. ZYZANSKI, PHD^{2,3,5,6}
MEREDITH A. GOODWIN, MS^{2,3,6}

ROBIN S. GOTLER, MA^{2,6}
KURT C. STANGE, MD, PHD^{2,3,4,5,6}

OBJECTIVE — Poor quality of diabetes care has been ascribed to the acute care focus of primary care practice. A better understanding of how time is spent during outpatient visits for diabetes compared with visits for acute conditions and other chronic diseases may facilitate the design of programs to enhance diabetes care.

RESEARCH DESIGN AND METHODS — Research nurses directly observed consecutive outpatient visits during two separate days in 138 community family physician offices. Time use was categorized into 20 different behaviors using the Davis Observation Code (DOC). Time use was compared for visits for diabetes, other chronic conditions, and acute illnesses during 1,867 visits by patients ≥ 40 years of age.

RESULTS — Of 20 DOC behavioral categories, 10 exhibited differences among the three groups. Discriminant analysis identified two distinct factors that distinguished visits for chronic disease from visits for acute illness and visits for diabetes from those for other chronic diseases. Compared with visits for other chronic diseases, visits for diabetes devoted a greater proportion of time to nutrition counseling, health education, and feedback on results and less time to chatting. Compared with visits for acute illness, visits for diabetes were longer and involved a higher proportion of dietary advice, negotiation, and assessment of compliance.

CONCLUSIONS — Visits for diabetes are distinct from visits for other chronic diseases and acute illnesses in ways that may facilitate patient self-management. Novel quality-improvement interventions could support and expand existing differences between family physicians' current approaches to care of diabetes and other chronic and acute illnesses.

Diabetes Care 24:1390–1396, 2001

Generalists provide the majority of care (>2 million visits each year) for people with type 2 diabetes (1) as well as other chronic diseases. Yet, the majority of visits to family physicians are for acute problems (1–3).

The acute care focus of generalist practice has been identified as a major potential impediment to improved chronic disease management (4) and specifically to diabetes care (5,6). However, little is

known about how family physicians structure time use during patient visits for diabetes and how time use affects the quality of care (7–12). Are visits for diabetes similar to visits for other chronic illnesses? How do visits for diabetes and other chronic illnesses differ from visits for acute illnesses?

Understanding how physicians structure time use in visits for patients with diabetes may provide important insights

for the design and redesign of programs to enhance care of diabetic patients in primary care settings. Therefore, we used a unique direct observation study of primary care to compare visit content and duration during outpatient visits for diabetes, other chronic illnesses, and acute illnesses. We hypothesized that visits for diabetes would have unique characteristics that would distinguish them from visits for other chronic illnesses and that outpatient visits for chronic illnesses would be distinguishable from acute illness visits, using a standardized measure of key components of outpatient visits.

RESEARCH DESIGN AND METHODS

Study design and data collection

This study analyzed data from the Direct Observation of Primary Care (DOPC) Study, a cross-sectional study of the content and context of outpatient visits to family physicians, conducted between October 1994 and August 1995. By using a multimethod approach (2,13–17), this study aimed to describe generalist practice (18–30) and its health system context (31–39) and theoretical underpinnings (31,40–42). The methods of the DOPC study have been previously described in detail (2,13,42). Briefly, participating physicians were members of the Research Association of Practicing Physicians, a network of 138 family physicians from 84 practices in Northeast Ohio. Each physician was visited by a team of research nurses while providing outpatient care on two separate days. The patient sample consisted of consecutive patients seen during the two observation days. Patients were informed of the study in the waiting room before their visit and were enrolled if they gave verbal informed consent. To avoid biasing their behavior, patients and physicians were told that the study was to examine the content and context of outpatient family practice and were not informed of any focus on diabetes during data collection.

From the ¹Department of Research, Olmsted Medical Center, Rochester, Minnesota; the Departments of ²Family Medicine, ³Epidemiology and Biostatistics, and ⁴Sociology, Case Western Reserve University; ⁵Ireland Comprehensive Cancer Center, University Hospitals of Cleveland; and the ⁶Center for Research in Family Practice and Primary Care, Cleveland, Ohio.

Address correspondence and reprint requests to Barbara Yawn, Department of Research, Olmsted Medical Center, 210 9th St SE, Rochester, MN 55904. E-mail: Yawnx002@tc.umn.edu.

Received for publication 26 December 2000 and accepted in revised form 27 April 2001.

Abbreviations: DOC, Davis Observation Code; DOPC, Direct Observation of Primary Care.

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

Trained research nurses collected data using the following methods: direct observation of the patient visit, patient exit questionnaire, medical record review of all directly observed visits, billing data on Current Procedural Terminology (CPT) codes and ICD-9-CM (*International Classification of Diseases, Ninth Revision, Clinical Modification*) diagnoses for the observed visits, and a questionnaire completed by the physicians after their participation in the study. Inter-rater reliability among the nurses was excellent, with κ ranging from 0.65 to 1.00 for most observed behaviors (13).

Measures

The main outcome measure for this study was time use by physicians during patient visits, as measured by a modified (2) version of the Davis Observation Code (DOC) (43). The DOC categorizes time use into 20 different behavioral categories during 15-s intervals and has shown good to excellent reliability (43). The 20 DOC categories and their definitions are shown in the appendix.

Whether or not a visit was for diabetes was determined by ICD-9-CM diagnosis codes for each outpatient visit. Up to five ICD-9-CM codes for each visit were obtained from the billing information provided by the practice. These diagnoses were grouped into diagnosis clusters, as described by Schneeweiss et al. (44). Visits were considered to be for diabetes if any of the ICD-9-CM codes collected on their visit fell within the diagnosis cluster for diabetes (ICD-9-CM codes 250.0–250.9).

The length of the visit and the major reason for the visit (classified as care of an acute illness, chronic illness, well care, or other) were measured by direct observation. Patient age and sex were measured by medical record review. Patient race (classified as white versus nonwhite) was assessed by the research nurse using direct observation and verified by patient report for those patients returning questionnaires ($\kappa = 0.90$ for agreement between nurses and patients).

Analyses

The main objective of the study was to compare time use during visits made for diabetes with visits for other chronic and acute illnesses. The sample for these analyses was restricted to individuals ≥ 40 years of age. This restriction decreased

Table 1—Time use during visits for diabetes, other chronic illnesses, and acute illnesses

DOC Category	Visits for diabetes	Chronic illness visits by nondiabetic patients	Acute illness visits by nondiabetic patients	F	P*
n	227	634	1,006	—	—
History taking	57.7†	58.4†	57.5†	0.5	0.61
Planning treatment	32.8	33.2	33.2	0.1	0.93
Physical examination	19.5	19.9	21.0	2.1	0.13
Health education	19.7	17.4	20.0	6.0	0.002
Feedback on evaluation results	15.8	13.5	14.6	5.2	0.005
Family information	8.9	9.5	8.6	1.6	0.21
Chatting	7.0	8.7	7.7	3.3	0.04
Structuring the interaction	7.6	7.7	7.9	0.2	0.84
Patient questions	7.0	7.5	7.5	0.6	0.57
Preventive services	2.8	3.3	2.2	7.4	0.001
Procedures	0.7	1.0	3.0	11.5	<0.001
Nutrition advice	6.4	2.3	1.3	91.1	<0.001
Counseling	1.4	1.9	1.3	1.9	0.15
Exercise advice	2.8	2.1	1.6	7.8	<0.001
Compliance assessment	3.3	2.4	1.5	28.0	<0.001
Smoking behavior assessment or advice	0.8	1.3	1.3	1.4	0.24
Assessing patient's health knowledge	1.2	1.2	1.4	1.0	0.38
Health promotion	2.6	1.3	1.0	17.6	<0.001
Negotiation	1.4	1.5	1.0	5.4	0.005
Substance use assessment or advice	0.4	0.4	0.3	1.0	0.35
Length of visit (min)	11.0	10.5	9.7	8.1	<0.001

†Data are % of visit time spent on each behavioral category. Percents sum to >100 because more than one behavior could be observed in each 15-s observation interval. *Only $P < 0.005$ were considered statistically significant; †mean adjusted for patient age and race.

age-related confounding of differences in time use between visits by diabetic and nondiabetic patients and simplified interpretation of study findings by assuring that the vast majority of patients in the study would have type 2 diabetes. Multivariate and univariate analyses of covariance were used to compare time use between the three groups while controlling for potential confounders (patient age and race) and multiple significance testing (45,46). In addition, a three-group discriminant analysis was conducted to determine the best linear combination of DOC variables (controlling for confounders) that distinguishes between the three groups. The results of the discriminant analyses were prepared for visual comparison by substituting the mean value for the three types of visits based on the included variables for each function. The resulting centroids were graphed to depict the relationship among time use during visits by patients presenting for care of diabetes, other chronic illness, or an acute illness.

RESULTS— The characteristics of family physicians in this direct observation study are generally representative of family physicians nationally (3) but include a slightly higher proportion of residency-trained and women physicians than in the nation as a whole (2,13,42). Physicians saw an average of 104 outpatients per week. The mean physician age was 43 years, and 28% were women. The mean number of years in practice was 11, and 89% had completed a family practice residency.

Among patients presenting for care on the observation days, 89% agreed to participate in the study. Participants were similar to nonparticipants in sex, race, and number of years as a patient but tended to be slightly older (2,13,42). The patient sample has previously been shown to be similar in age, sex, and race to outpatients visiting general and family physicians nationally (1,3). For these analyses, restricted to patients ≥ 40 years of age, the mean patient age was 60 years; 62% were female, 89% were white, and

4% were new patients. Patients presenting for visits for chronic illnesses were significantly older than those presenting for acute illnesses.

Visits for chronic conditions were on average longer than visits for acute conditions, and visits for diabetes were longer than the average visit for other chronic conditions. During each diabetes visit, an average of 2.5 problems was addressed compared with an average of 2.1 problems during visits for other chronic conditions and an average of 1.8 problems during acute care visits ($F = 54.8, P < 0.001$). Patients with diabetes also made more visits per year compared with the other two groups (5.6 vs. 5.1 vs. 4.4, respectively, $F = 25.1, P < 0.001$).

Although sex was not found to be associated with diabetes status, age (mean age 63.5 vs. 59.6 years, diabetic vs. non-diabetic patients, $P < 0.001$) and race (14% of nonwhites and 9% of whites had diabetes, $P < 0.001$) were both associated and treated as potential confounding variables. Wilks' multivariate test statistic revealed a significant difference in time use across the 20 DOC categories ($F = 6.08, P < 0.001$), thus rejecting the null hypothesis. This significant omnibus test statistic supports the validity of evaluating univariate differences between the three study groups for each DOC behavior. Table 1 shows the differences in time use for visits for diabetes, other chronic illness, and acute illness adjusted for age and race. Of the 20 categories of the DOC, 11 differ at an $\alpha < 0.05$. However, using the Benjamini-Hochberg method to adjust for multiple testing, only categories with $P < 0.005$ were considered statistically significant (44,45). The Benjamini-Hochberg approach to multiple significance testing controls the expected proportion of falsely rejected hypotheses with increased power compared with the traditional Bonferroni-type approach (45).

Compared with visits for other chronic conditions, visits for diabetes were characterized by a higher proportion of time devoted to nutrition counseling, compliance assessment, feedback on test results, health education, exercise, and health promotion. Compared with acute illness visits, patient visits for diabetes were longer and involved more diet advice, negotiation, and assessment of compliance; exercise advice; preventive services; and health promotion; less time

Table 2—Standardized canonical discriminant function coefficients

	Function 1*	Function 2†
	Visits for diabetes versus chronic illness	Visits for diabetes versus acute illness
Nutrition advice	0.63	0.44
Age	0.40	-0.34
Compliance assessment	0.38	0.10
Time	0.28	0.10
Health promotion	0.17	0.13
Preventive services	0.05	0.37
Procedures	-0.20	0.28
Feedback on evaluation results	0.05	0.28
Health education	-0.22	0.27
Race	0.21	0.27
Chatting	0.08	-0.22
Negotiation	0.16	-0.18
Exercise advice	0.06	-0.11

A larger coefficient indicates a larger contribution to the total function score. *Primarily discriminates differences between visits for diabetes and visits for other chronic illnesses; †primarily discriminates between visits for diabetes and acute illnesses.

was spent on procedures. Effect sizes range from large (nutrition advice) to medium (compliance assessment and health promotion) to small (~0.2 SD difference among means) for the remaining significant behavior categories.

The results of the discriminant function analysis are shown in Table 2. Both discriminant functions were statistically significant at $P < 0.001$, indicating that the description of time use by the three study groups is complex and requires more than one dimension to characterize. In interpreting each function, the larger

the standardized regression coefficient, the greater the contribution to the total function score. The large regression coefficients (interpreted similar to correlation coefficients) also indicate the DOC categories most useful in interpreting the weighted total function score. The first discriminant function primarily characterizes differences in time use between diabetes-related visits and visits related to other chronic diseases. This discriminant function highlights the behavioral categories for which extra time is devoted to diabetic patients beyond that given to

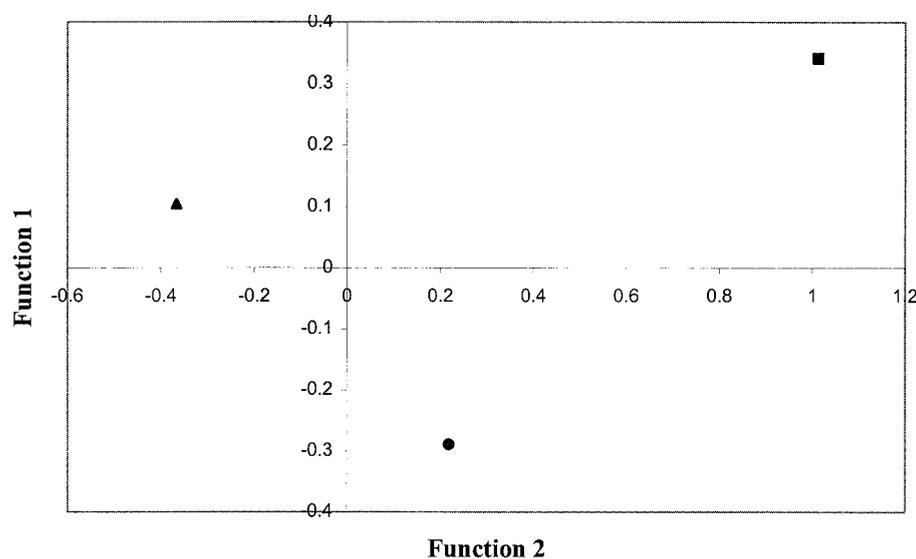


Figure 1—Plot of group centroids. Indicates a large difference in time use between visits for diabetes (■), other chronic illnesses (●), and acute illnesses (▲).

patients with other chronic diseases. High scores (diabetic visits) on this function characterize visits that include a higher proportion of time spent on nutrition counseling, compliance assessment, feedback on evaluation results, health education, and health promotion, whereas a lower proportion of time was spent on delivering preventive services.

The second discriminant function describes differences in time use during visits for acute illness versus visits for diabetes and other chronic diseases. Specifically, low scores (acute visits) on this function characterize visits that are shorter, with a significantly lower proportion of time spent on nutrition counseling, compliance assessment, health promotion, preventive services, exercise, and negotiation, whereas a significantly greater proportion of time was spent on procedures and health education.

The centroid means for the three study groups, derived from the two discriminant functions, are depicted graphically in Fig. 1 and illustrate why two functions are necessary to describe DOC variation among the three study groups. All three centroids are statistically different from one another on both functions. High scores characterize diabetic patient visits on both the first and second functions. Low negative scores on the first function and average scores on the second function best profile patient visits for other chronic diseases. Acute patient visits are described by the reverse pattern, i.e., low negative scores on the second function and average scores on the first function.

Correct classification of study groups based on the 10 DOC behaviors, race, and age was 63% for visits for acute illness, 49% for visits for chronic illness, and 52% for visits for diabetes.

CONCLUSIONS— In this unique direct observation study of a large sample of visits to community family physicians, outpatient visits for diabetes are distinctly different from visits for acute illness and also differ in important ways from visits for other chronic illnesses. Visits for diabetes concern a broad range of topics, which are consistent with primary care for a person with any chronic disease. In fact, visits for diabetes address an average of 2.5 problems. However, diabetes visits also emphasize topics that deal with lifestyle issues, such as exercise and nutri-

tion, that are central to the management of diabetes.

Visits for both acute and chronic problems include approximately the same proportion of time spent on the basics of medical care: history taking, physical examination, and treatment planning. However, visits for acute and chronic problems, excluding diabetes, differ in other areas of time use. The larger proportion of time spent performing procedures during acute visits may be caused by the need to establish the diagnosis of an acute condition. The greater proportion of time devoted to health education may reflect the need to discuss all the details of management, anticipated disease course, and disease prevention in a single acute care visit, whereas chronic illnesses provide multiple opportunities for patient education over time.

The increased emphasis on compliance and negotiation during visits for chronic conditions is consistent with the need to facilitate lifestyle change and the daily use of medication for chronic conditions (47,48). Chronic care visits to family physicians in this study also reflect the broad perspective of complete care by including health promotion, preventive service delivery, and even substance abuse assessment or advice (49). It is possible that family physicians use chronic illness visits as teachable moments for these services (2).

Visits for diabetes and other chronic diseases are similar in many ways but differ in the proportion of time spent on a number of behaviors. Visits for diabetes are on average slightly longer than visits for other chronic conditions and include more time for nutritional information, feedback on test results, exercise advice, health education, health promotion, and compliance assessment. This greater proportion of time for feedback and education reflects the need to facilitate collaborative care in diabetes (47,48,50–53). The foundations of diabetes care are all based on self-management (54) activities that require significant patient input, effort, and lifestyle adjustment, such as diet, monitoring of blood glucose, exercise, and medication. Feedback and education are often the cornerstones for behavior change and collaborative care (47,48,50). Family physicians appear to recognize this unique need in diabetes and incorporate it into their diabetes-related visits. The greater emphasis on

health promotion in diabetes may also reflect the importance of reducing comorbid conditions and risk factors associated with the increased likelihood of early diabetes-related complications (51–53). The greater focus on exercise is particularly encouraging, in light of a recent report showing that physical activity is the only self-management behavior associated with increased quality of life among patients with diabetes (55). Diabetes-related visits also appear to reflect the complex nature of diabetes care, dealing with more problems per visit than either acute care or chronic care visits. This need to address a broad range of topics during a single visit emphasizes the family physician's role in total rather than disease-focused health care.

The findings in this study must be interpreted in light of the strengths and weaknesses of the study methods. The physician sample, while largely representative of family physicians nationally, characterizes recent demographic trends by over-representing female and residency-trained physicians. Thus, the findings may be less illustrative of the patterns of care of non-residency-trained general practitioners. The use of billing data to identify visits for diabetes could have engendered misclassification if diabetes was not a major focus of the visit. However, this would have biased findings toward the null, making the observed differences all the more remarkable. The possibility of a Hawthorne effect, i.e., the observation altering the pattern of care, is unlikely because of a number of factors: the broad focus of the study did not provide any incentive to focus on diabetes care to a greater extent; no diabetes-related questions or hypotheses were shared with participants; and the observation of consecutive patients by a nurse standing in the least obtrusive corner of the room minimized the intrusiveness of the observation and made it unlikely that time use during the visit would be systematically altered in a way that would affect the study findings.

This study is unique in using direct observation to assess time use during outpatient visits to community primary care physicians and in comparing visits for diabetes with other types of visits. The DOC reflects important aspects of the outpatient visit in a manner that is comparable across different reasons for a visit but does not measure specific aspects of diabetes

care that are recommended by expert and evidence-based panels (7–11). Therefore, the data cannot reveal whether the discussions of compliance included compliance with regular visits and follow-up testing or focused on self-management of diet, exercise, and medication use. Similarly, time spent on “prevention” might relate to general preventive health strategies (smoking and early cancer identification) or diabetes-related prevention, such as screening for renal or eye disease. The need for more in-depth and broader evaluation of these issues in the context of primary care visits is consistent with the work of Jaén et al. (40), which highlighted family physicians’ need to care for multiple problems at each visit (an average of 2.5 problems per visit in our data). These competing demands for time may focus attention away from diabetes-related issues, such as testing for glycosylated hemoglobin or completing dilated eye examinations.

Family physicians appear to provide both focused and specialized care during diabetes-related visits while attending to the broad agenda of primary care necessary for complete care of any person with a chronic condition. The findings of this study have the potential to enlighten efforts to integrate diabetes care into the primary care setting in which most patients are seen, although the focus of this setting is on breadth of care rather than on depth of care for a single disease (31). The broad focus and relationship context of the primary care setting may represent its greatest advantages, but it also presents unique challenges for efforts to improve the care of important individual chronic diseases, such as diabetes.

This study’s findings show that patient visits for diabetes are distinct from acute care visits and distinguishable from visits for other chronic illnesses in ways that appear consistent with fostering patient self-management. Thus, family physicians appear to be tailoring care in an attempt to meet both diabetes-specific and general care needs. Efforts to improve the quality of diabetes care in a primary care practice might focus on systems to support diabetes-specific care and patient self-management within the relationship context and broad focus of primary care practice. Opportunities to use acute illness visits and visits for other chronic illnesses as opportunities (25) for diabetes care remain to be explored.

Acknowledgments— This study was supported by grants from the National Cancer Institute (1R01CA60862, 2R01C60862, and K24CA81031) and by a Family Practice Research Center Grant from the American Academy of Family Physicians.

The authors are grateful to the participating physicians, practices, and patients.

APPENDIX

Operational definitions for modified DOC

Chatting: Physician or patient discussing topics not related to current visit, e.g., small talk or humor which might be used to build rapport.

Structuring interaction: Physician or patient discussing what is to be accomplished in current interaction or physician asks patient for any questions. Excludes requests by physician for patient to do anything that is part of the physical exam or is done to prepare for physical exam. Excludes planning treatment. Can include statements describing what will be done in physical exam.

Counseling: Physician discusses interpersonal relations or current emotional state of patient or patient’s family, provides reassurance, advice, or support or uses self-disclosure to reassure patient. Excludes “advice,” asking for health behavior change (see “Health promotion”). Physician restates what patient has said (in regard to above) or reflects on the patient’s nonverbal behavior.

History taking: Physician inquiring about or patient describing details related to the current chief complaint or to previous illnesses or treatment. Includes physician reading medical record. Includes patient response to current treatment. Includes physician asking whether physical exam maneuver produces pain or feeling described in chief complaint or history.

Family information: Physician inquires about or discusses family medical or social history or about current functioning of family (family can include unrelated significant others from social or work groups).

Negotiation: Physician comments or asks questions that facilitate or invite patient participation in diagnosis, treatment planning, or problem solving, e.g., “What do you think?,” “What would work for you?,” “How do you feel about doing it

this way?,” and/or “Are there any ways you think might work?”

Health knowledge: Physician asks or patient spontaneously offers what patient knows or believes about health or disease (as opposed to patient’s own treatment history which is coded “History taking”).

Evaluation feedback: Physician tells patient about results of history, physical examination, lab work, etc. (includes telling that lab tests are incomplete, inconclusive, etc.). Results can be preliminary or speculative.

Physical examination: Physician conducts any aspect of physical examination of patient, including taking samples for lab tests or diagnostic procedures. Also includes asking patient to prepare for physical exam, telling patient to do something in physical exam, or asking if maneuver hurts or is tender.

Patient question: Patient asks question of physician about diagnosis treatment, side effects, history, or disease.

Compliance: Physician inquiring about or discussing what patient is currently doing or has done recently regarding previously requested behavior focusing on taking medication, changing nutrition, exercising, or other behavior changes.

Preventive services: Physician discusses, plans, or performs any screening task associated with disease prevention or asks history on disease prevention, e.g., Pap smear, breast exam, vaccination, hip click exam, testicular exam, rectal exam, thyroid exam, or scoliosis exam.

Health education: Physician presents information regarding health to patient. This may include information regarding diagnosis, etiology, drug effects, and treatment or accident prevention. May also include statements about health attitudes and motivation.

Health promotion: Physician asks for a change in patient’s behavior to increase or promote patient’s health (including accident prevention). This excludes changing behavior concerning taking a medication. Any explanation of the procedure itself, its side effects, drug interactions, or contraindications should be coded health education. Excludes asking a patient to take medication.

Planning treatment: Physician prescribes a medication, diagnostic, or treatment plan to be followed other than a behavior change (see “Health promotion”). Includes physician asking whether a prescription refill is needed.

Exercise: Any question about or discussion of exercise.

Smoking behavior: Any question about or discussion of smoking or other use of tobacco.

Nutrition: Any question about or discussion of nutrition. Includes discussion of diet and/or food intake (excludes questions regarding only appetite, which is coded as history).

Substance use: Any question about or discussion of drinking alcohol or use of another substance.

Procedure: Any treatment or diagnostic procedure done in office, e.g., removing skin tags, warts, drawing blood, casting, dressing, debriding, etc. Excludes preventive services, such as Pap smear.

References

- Woodwell D: *National Ambulatory Medical Care Survey: 1998 Summary*. Hyattsville, MD, National Center for Health Statistics, 2000, p. 315
- Stange KC, Zyzanski SJ, Flocke SA, Kelly RB, Jaén CR, Miller WL, Crabtree BF, Callahan EJ, Gillanders WR, Shank JC, Chao J, Medalie JH, Gilchrist V, Langa DM, Goodwin MA: Illuminating the black box: a description of 4454 patient visits to 138 family physicians. *J Fam Pract* 46:377-389, 1998
- American Academy of Family Physicians: *Facts About Family Practice*. Kansas City, Missouri, American Academy of Family Physicians, 1996
- Institute of Medicine: *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC, National Academy Press, 2001
- Glasgow RE, Hiss RG, Anderson RM, Friedman NM, Hayward RA, Marrero DG, Taylor CB, Vinicor F: Report of the health care delivery work group: behavior research related to the establishment of a chronic disease model for diabetes care. *Diabetes Care* 24:124-130, 2001
- Glasgow RE, Wagner EH, Kaplan RM, Vinicor F, Smith L, Norman J: If diabetes is a public health problem, why not treat it as one? A population-based approach to chronic illness. *Ann Behav Med* 21:157-170, 1999
- Glasgow RE, Boles SM, Calder D, Dreyer L, Bagdade J: Diabetes care practices in primary care: results from two sample and three measurement sets. *Diabetes Educ* 25: 755-763, 1999
- Woolf SH, Davidson MD, Greenfield S, Bell HS, Ganiats TG, Hagen MD, Palda VA, Rizza RA, Spann SJ: Controlling blood glucose levels in patients with type 2 diabetes mellitus: an evidence-based policy statement by the American Academy of Family Physicians and American Diabetes Association. *J Fam Pract* 49:453-460, 2000
- Yawn BP, Casey M, Hebert P: The rural health care workforce implications of practice guideline implementation. *Med Care* 37:259-269, 1999
- General Accounting Office: Most beneficiaries with diabetes do not receive recommended monitoring services. 29 March 1997, publication #HEHS-97-48
- Roman SH, Silberzweig SB, Siu AL: Grading the evidence for diabetes performance measures. *Eff Clin Pract* 3:85-91, 2000
- Glasgow RE, Strycker LA: Preventive care practices for diabetes management in two primary care samples. *Am J Prev Med* 19: 9-14, 2000
- Stange KC, Zyzanski SJ, Smith TF, Kelly R, Langa DM, Flocke SA, Jaén CR: How valid are medical records and patient questionnaires for physician profiling and health services research? A comparison with direct observation of patient visits. *Med Care* 36:851-867, 1998
- Flocke SA: Measuring attributes of primary care: development of a new instrument. *J Fam Pract* 45:64-74, 1997
- Flocke SA: Primary care instrument (Letter). *J Fam Pract* 46:12, 1998
- McIlvain H, Crabtree BF, Medder J, Stange KC, Miller WL, Dodendorf D, Aita V: Using 'practice genograms' to understand and describe practice configurations. *Fam Med* 30:490-496, 1998
- Crabtree BF, Miller WL: *Doing Qualitative Research*. 2nd ed. Newbury Park, CA, Sage Publications, 1999
- Flocke SA, Goodwin MA, Stange KC: The effect of a secondary patient on the family practice visit. *J Fam Pract* 46:429-434, 1998
- Flocke S, Stange K, Zyzanski S: The association of attributes of primary care with preventive service delivery. *Med Care* 36: AS21-AS30, 1998
- Flocke S, Stange K, Goodwin M: Patient and visit characteristics associated with opportunistic preventive services delivery. *J Fam Pract* 47:202-208, 1998
- Medalie JH, Zyzanski SJ, Langa DM, Stange KC: The family in family practice: is it a reality? Results of a multi-faceted study. *J Fam Pract* 46:390-396, 1998
- Callahan EJ, Jaén CR, Goodwin MA, Crabtree BF, Stange KC: The impact of recent emotional distress and diagnosis of depression or anxiety on the physician-patient encounter in family practice. *J Fam Pract* 46:410-418, 1998
- Gross DA, Stange KC, Zyzanski SJ, Cebul R, Borawski E: Patient satisfaction with time spent with them by their family physician. *J Fam Pract* 46:133-137, 1998
- Jaén CR, Crabtree BF, Zyzanski SJ, Stange KC: Making time for tobacco cessation counseling. *J Fam Pract* 46:425-428, 1998
- Stange KC, Flocke SA, Goodwin MA: Opportunistic preventive service delivery: are time limitations and patient satisfaction barriers? *J Fam Pract* 46:419-424, 1998
- Goodwin MA, Flocke SA, Borawski EA, Zyzanski SJ, Stange KC: Direct observation of preventive service delivery to adolescents seen in community family practice. *Arch Pediatr Adolesc Med* 153: 367-373, 1999
- Podl T, Goodwin M, Kikano G, Stange K: Direct observation of exercise counseling in community family practice. *Am J Prev Med* 17:207-210, 1999
- Medalie JH, Zyzanski SJ, Goodwin MA, Stange KC: Two physician styles of focusing on the family: their relationship to patient outcomes and process of care. *J Fam Pract* 49:209-215, 2000
- Stange KC, Flocke SA, Goodwin MA, Kelly R, Zyzanski SJ: Direct observation of preventive service delivery in community family practice. *Prev Med* 31:167-176, 2000
- Gotler R, Flocke S, Goodwin M, Zyzanski S, Murray T, Stange K: Facilitating participatory decision-making: what happens in real-world community family practice? *Med Care* 38:1200-1209, 2000
- Stange KC, Jaén CR, Flocke SA, Miller WL, Crabtree BF, Zyzanski SJ: The value of a family physician. *J Fam Pract* 46:363-368, 1998
- Flocke SA, Stange KC, Zyzanski SJ: The impact of insurance type and forced discontinuity on the delivery of primary care. *J Fam Pract* 45:129-135, 1997
- Zyzanski SJ, Langa DM, Flocke SA, Stange KC: Trade-offs in high volume primary care practice. *J Fam Pract* 46:397-402, 1998
- Chao J, Gillanders WR, Goodwin MA, Stange KC: Billing for physician services: a comparison of actual billing with CPT codes assigned by direct observation. *J Fam Pract* 47:28-32, 1998
- Kikano GE, Goodwin MA, Stange KC: Physician employment status and patterns of care. *J Fam Pract* 46:499-505, 1998
- Frank SH, Stange KC, Langa DM, Workings M: Direct observation of community-based ambulatory encounters involving medical students. *JAMA* 278:712-716, 1997
- Kikano GE, Goodwin MA, Stange KC: Evaluation and management services: a comparison of medical record documentation with actual billing in community family practice. *Arch Fam Med* 9:68-71, 2000
- Aita VA, Crabtree B: Historical reflections on current preventive practice. *Prev Med*

- 30:5–16, 2000
39. Acheson LS, Goodwin MA, Wiesner G, Stange KC: Familial screening for cancer risk by community family physicians. *Genetic Med* 2:180–185, 2000
 40. Jaén CR, Stange KC, Nutting PA: The competing demands of primary care: a model for the delivery of clinical preventive services. *J Fam Pract* 38:166–171, 1994
 41. Miller WL, Crabtree BF, McDaniel R, Stange KC: Understanding change in primary care practice using complexity theory. *J Fam Pract* 46:369–376, 1998
 42. Crabtree B, Miller W, Aita V, Flocke S, Stange K: Primary care practice organization and preventive services delivery: a qualitative analysis. *J Fam Pract* 46:403–409, 1998
 43. Callahan EJ, Bertakis KD: Development and validation of the Davis Observation Code. *Fam Med* 23:19–24, 1991
 44. Schneeweiss R, Cherkin DC, Hart LG, Revicki DA, Wollstadt LJ, Stephenson MJ, Froom J, Dunn EV, Tindall HL, Rosenblatt RA: Diagnosis clusters adapted for ICD-9-CM and ICH-2. *J Fam Pract* 22:69–72, 1986
 45. Benjamini Y, Hochberg Y: Controlling the false discovery rate: a practical and powerful approach to multiple testing. *JR Stat Soc B* 57:289–300, 1995
 46. Hochberg Y: A sharper Bonferroni procedure for multiple tests of significance. *Biometrika* 75:800–802, 1988
 47. Fain JA, Nettles A, Funnell MM, Charron D: Diabetes patient education research: an integrative literature review. *Diabetes Educ* 25 (Suppl. 6):7–15, 1999
 48. Peyrot M: Behavior change in diabetes education. *Diabetes Educ* 25 (Suppl. 6):62–73, 1999
 49. Donaldson M, Yordy K, Lohr K, Vanselow N: *Primary Care. America's Health in a New Era*. Washington, DC, National Academy Press, 1996
 50. Ridgeway NA, Harvill DR, Harvill LM, Falin TM, Forester GM, Gose OD: Improved control of type 2 diabetes mellitus: a practice education/behavior modification program in a primary care clinic. *South Med J*. 92:667–672, 1999
 51. Spollett GR: Preventing amputations in the diabetic population. *Nurs Clin North Am* 33:629–641, 1998
 52. Ierardi RP, Shuman CR: Control of vascular disease in patients with diabetes mellitus. *Surg Clin North Am* 78:385–392, 1998
 53. Williams MV, Baker DW, Parker RM, Nurss JR: Relationship of functional health literacy to patients' knowledge of their chronic disease: a study of patients with hypertension and diabetes. *Arch Intern Med* 158:166–172, 1998
 54. Ruggiero L, Glasgow R, Dryfoos JM, Rossi JS, Prochaska JO, Orleans CT, Prokhorov AV, Rossi SR, Greene GW, Reed GR, Kelly K, Chobanian L, Johnson S: Diabetes self-management: self-reported recommendations and patterns in a large population. *Diabetes Care* 20:568–576, 1997
 55. Glasgow RE, Ruggiero L, Eakin EG, Dryfoos J, Chobanian L: Quality of life and associated characteristics in a large national sample of adults with diabetes. *Diabetes Care* 20: 562–567, 1997