

Attitudes and Behaviors of Primary Care Physicians Regarding Tight Control of Blood Glucose in IDDM Patients

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OBJECTIVE — To evaluate attitudes and practices of primary-care physicians toward tight blood glucose control in IDDM.

RESEARCH DESIGN AND METHODS — A mail and telephone questionnaire survey was conducted on a systematic, stratified sample of 1429 family-practice physicians, general practitioners, internists, and pediatricians in active practice in the United States who treated patients with IDDM. Physicians were asked about methods they used for clinical and laboratory assessment of blood glucose control and about their attitudes and beliefs in treating IDDM. They were asked also what they consider to be acceptable ranges for blood glucose and HbA_{1c} in IDDM patients. A score was developed reflecting three criteria for tight blood glucose control: fasting glucose 70–120 mg/dl (3.9–6.7 mM), 2-h postprandial glucose <180 mg/dl (<10 mM), and HbA_{1c} ≤8% (the nondiabetic value was specified as 5–7%). Physicians were accorded one point when their acceptable range agreed with an intensive treatment criterion (range for score 0–3).

RESULTS — Only 31% of physicians agreed with all three criteria for tight control of blood glucose; 37% agreed with none or only one of the standards. Pediatricians were particularly low in their agreement with the HbA_{1c} standard. Physicians who agreed with one of the three criteria often did not agree with the other two. With increasing value for the score, there was a greater proportion of physicians whose management practices (e.g., frequent measurement of HbA_{1c}, multiple insulin injections, patient SMBG, use of dietitian/educator in care of patients) are conducive toward tight control of blood glucose. However, even among physicians with a score of 3, HbA_{1c} was ordered infrequently, three or more insulin injections/day was prescribed rarely, patient SMBG was less than fully endorsed, and both a dietitian and diabetes educator were used by a minority of physicians.

CONCLUSIONS — It appears that primary-care physicians are not fully aware of recommended criteria for intensive treatment of blood glucose in IDDM patients or of the importance of multiple insulin injections, use of HbA_{1c}, and patient SMBG. Physician practice behaviors are less than optimal for intensive management of IDDM patients, even among physicians who agree with all three standards for intensive treatment of blood glucose in IDDM.

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IDDM, INSULIN-DEPENDENT DIABETES MELLITUS; NIDDM, NON-INSULIN-DEPENDENT DIABETES MELLITUS; ADA, AMERICAN DIABETES ASSOCIATION; SMBG, SELF-MONITORED BLOOD GLUCOSE.

There is considerable controversy over whether poor metabolic control is the major contributing factor to the development of complications in IDDM (1). Some studies indicate that genetically determined factors influence susceptibility to microvascular complications (2–9), whereas others find that elevated blood glucose levels are the major cause of these complications (10–17). The Diabetes Control and Complications Trial, a randomized controlled clinical trial, is being conducted to assess the relationship between glycemic control and the development, progression, or amelioration of early vascular complications in people with IDDM (18,19). Until this controversy is resolved, practicing physicians may choose either to treat their diabetic patients intensively to strive for tight control or less intensively to maintain average or minimal control of blood glucose, based on the degree to which they believe elevated blood glucose levels contribute to the development of complications.

There is general agreement that normalization of blood glucose, although the ideal goal, is difficult to obtain and that attempting to achieve and maintain normoglycemia may lead to severe and/or frequent hypoglycemia in IDDM patients (20–23). Therefore, tight control in the nonpregnant patient allows for some fluctuation of blood glucose outside of the nondiabetic range. Although recommended blood glucose values vary somewhat, the consensus of experts (18,24–27) is that tight control is defined as maintenance of fasting blood glucose between 70 and 120 mg/dl (3.9–6.7 mM), 2-h postprandial blood glucose <180 mg/dl (<10 mM), and HbA_{1c} ≤8% (given a nondiabetic range of 5–7%).

Patient motivation depends on both the patient's acceptance and understanding of diabetes and the physician's approach to the disease (28). Knowledge and attitudes toward management of diabetes may play different roles in the

physician's treatment of patients, i.e., attitudes may be better indicators of physicians' practice behaviors than their knowledge of the disorder (29). Many diabetologists believe that, to achieve tight control, professional support beyond that provided by the patient's physician is required to provide ongoing instruction and emotional support for patients and their families (24,30). Primary instruction and emotional support aimed at motivating the patient to achieve a desirable medical outcome and sense of well-being can be provided, for example, by a dietitian and a diabetes educator.

There is minimal literature describing the beliefs and practice behaviors of physicians other than diabetologists and endocrinologists regarding tight control, despite that >90% of all outpatient visits for diabetes are to physicians other than these two specialists (31). In a community-based study of physicians and their diabetic patients in Michigan in 1985 (32), 70% of IDDM patients were taking insulin two or more times/day, and 70% had been told to SMBG. In a state-wide survey of 610 primary-care physicians in Pennsylvania in 1988 (33), 95% of physicians provided patient education in their offices, but the quality of this education or the use of dietitians and diabetes educators was not assessed. Only 52% of IDDM patients were SMBG.

In this study, we used data from a representative national sample of family-practice physicians, general practitioners, internists, and pediatricians in the U.S. We evaluated the extent to which physicians who are not diabetologists or endocrinologists believe in tight control of blood glucose for their IDDM patients and whether their medical management practices reflect this belief.

RESEARCH DESIGN AND METHODS

Methods— The Survey of Physician Practice Behaviors Related to Diabetes Mellitus was conducted by the National Institute of Diabetes and Digestive and Kidney Diseases from June to December

1989 (34). Pediatricians, internists, general practitioners, and family-practice physicians were selected for this survey because they represent the major physician groups who provide primary care to people with diabetes (31). A questionnaire was designed to assess physician demographic and practice characteristics, patient treatment, and attitudes and knowledge about diabetes. Separate but similar questionnaires were prepared for pediatricians and the three adult specialists. The major types of diabetes (IDDM, NIDDM using insulin, NIDDM not using insulin) were defined in the questionnaires, and separate answers were requested for each type of diabetes so as to require the physician to distinguish among them. IDDM was defined as diabetes having its onset most frequently in youth with almost all IDDM patients <40 yr of age and always treated with insulin.

The design and conduct of the survey have been described (this issue, Siebert et al., p. 759–64). Briefly, the sample design was a systematic, stratified sample of physicians in the four specialties in the U.S. The American Medical Association file of active physicians formed the sampling frame.* Of 3,481 questionnaires mailed, responses were received from 65.7%. To be included in analysis, physicians were required to be in one of the four target specialties, treat at least 1 patient with IDDM, and spend at least 50% of time in direct patient care. A total of 1429 physicians met these requirements.

Physicians were asked what they consider to be acceptable ranges for fasting blood glucose, 2-h postprandial blood glucose, and HbA_{1c} for their IDDM patients (the nondiabetic range for HbA_{1c} was specified as 5–7%). Based on their responses, a score was developed indi-

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* THE AMERICAN OSTEOPATHIC ASSOCIATION FILE WAS ALSO INCLUDED, BUT ONLY 32 DOCTORS OF OSTEOPATHY IN THE FINAL SAMPLE INDICATED THAT THEY TREATED PATIENTS WITH DIABETES.

cating the degree to which each physician considered tight control of blood glucose for their IDDM patients. ADA recommendations (24), published literature relating to intensive control of IDDM (25–27), and discussions with diabetologists (see ACKNOWLEDGMENTS) were used as guidelines. These sources produced the following consensus about tight control: fasting blood glucose values should range between 70 and 120 mg/dl (3.9–6.7 mM) and 2-h postprandial blood glucose levels should be <180 mg/dl (<10 mM). Given a nondiabetic range for HbA_{1c} of 5–7% as specified in the questionnaire, the highest level indicating tight control is 8%. A score of 1 was assigned to a physician response conforming to each of these three guidelines. The three scores were summed for each physician, yielding a value ranging from 0–3 (score of 3, for example, indicating conformity to all 3 standards for tight control).

Data were analyzed with SAS. When responses from physician specialties were combined, sample data were weighted to reflect the probability of selection of eligible physicians among the total number of physicians in each specialty. Significant differences among physician specialties were calculated by χ^2 tests for categorical variables and analysis of variance for continuous variables. $P < 0.01$ (2 tailed) was statistically significant.

RESULTS— Demographic and practice characteristics of the 1429 eligible physicians are shown in Table 1. General practitioners had a higher mean age than physicians in the other three specialties. Most physicians were in solo private practice or partnership/group private practice. A higher percentage of pediatricians were in a prepaid plan than the other three specialties, and a rural location for the practice was more common among family-practice physicians and general practitioners.

Agreement with the three standards for tight blood glucose control is

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Table 1—Demographic and practice characteristics of primary-care physicians who treat patients with IDDM

	PHYSICIAN SPECIALTY			
	FAMILY PRACTICE	GENERAL PRACTICE	INTERNAL MEDICINE	PEDIATRICS
N	428	248	406	347
MEAN AGE (YR)	47.0	55.1	47.4	45.9
PRACTICE TYPE (%)				
PREPAID PLAN	3.9	0.8	6.3	10.0
SOLO PRIVATE PRACTICE	47.1	68.6	42.0	29.3
PARTNERSHIP OR GROUP PRIVATE PRACTICE	42.1	23.6	37.5	49.3
OTHER	7.0	7.0	14.2	11.4
LOCATION OF PRACTICE (%)				
CITY	41.8	40.7	64.1	59.2
SUBURB	23.4	20.8	26.0	29.0
RURAL	34.8	38.6	9.9	11.7
REGION (%)				
NORTHEAST	17.8	14.9	30.3	26.8
MIDWEST	30.8	33.5	21.2	20.5
WEST	20.3	21.0	20.2	18.2
SOUTH	31.1	30.7	28.3	34.6

examined in Table 2. Among all physicians, 55.1% responded that 70–120 mg/dl (3.9–6.7 mM) is an acceptable fasting blood glucose for their IDDM patients, and 74% stated that a 2-h postprandial blood glucose should be <180 mg/dl (<10 mM). Proportions were similar among each of the specialties for these two blood glucose values. How-

ever, only 33.2% of pediatricians believed that $HbA_{1c} \leq 8\%$ is the acceptable level for IDDM patients (given a normal range of 5–7%), whereas the proportion among the other specialties was twice as great. Combining the score for each of the three glucose standards resulted in a score range of 0–3, distributed with 31% of all physicians having a score of 3,

32.5% with a score of 2, 25.5% with a score of 1, and 11% with a score of 0 (Table 2). Less than one-third of all physicians agreed with all three standards for tight control of blood glucose. The proportion was similar among family-practice physicians, general practitioners, and internists (29.7–36.6%) but was significantly lower for pediatricians (17.6%,

Table 2—Percentage of physicians who meet standards for intensive treatment of IDDM

	PHYSICIAN SPECIALTY				TOTAL
	FAMILY PRACTICE	GENERAL PRACTICE	INTERNAL MEDICINE	PEDIATRICS	
INTENSIVE TREATMENT STANDARD					
FASTING BLOOD GLUCOSE 70–120 MG/DL	55.2	51.3	57.3	55.2	55.1
2-H POSTPRANDIAL BLOOD GLUCOSE <180 MG/DL	73.4	77.2	76.0	70.4	74.0
$HbA_{1c} \leq 8\%$ *	64.9	63.0	67.0	33.2	57.3
SCORE					
NO STANDARDS CORRECT (SCORE = 0)	11.1	12.5	8.6	15.9	11.0
ONLY 1 STANDARD CORRECT (SCORE = 1)	23.9	24.7	25.0	31.8	25.5
ONLY 2 STANDARDS CORRECT (SCORE = 2)	34.2	33.1	29.8	34.7	32.5
ALL 3 STANDARDS CORRECT (SCORE = 3)	30.8	29.7	36.6	17.6†	31.0

*Nondiabetic range was specified as 5–7%.

†P < 0.01, pediatricians vs. other 3 specialties.

Table 3—Consistency of physicians' agreement with blood glucose and HbA_{1c} standards for intensive treatment of IDDM patients

PHYSICIAN'S ACCEPTABLE LEVEL	PHYSICIANS AGREEING WITH INTENSIVE TREATMENT STANDARD (%)		
	FASTING BLOOD	2-H POSTPRANDIAL	HbA _{1c}
	GLUCOSE 70–120 MG/DL	BLOOD GLUCOSE <180 MG/DL	≤8%
FAMILY AND GENERAL PRACTITIONERS AND INTERNISTS*			
FASTING BLOOD GLUCOSE 70–120 MG/DL		90.5	73.1
2-H POSTPRANDIAL BLOOD GLUCOSE <180 MG/DL	67.1		68.0
HbA _{1c} ≤8%†	63.4	77.8	
PEDIATRICIANS			
FASTING BLOOD GLUCOSE 70–120 MG/DL		86.0	36.4
2-H POSTPRANDIAL BLOOD GLUCOSE <180 MG/DL	67.4		35.9
HbA _{1c} ≤8%†	61.0	75.5	

*These 3 specialties were combined because of the similarity of their responses in Table 2.

†Nondiabetic range was specified as 5–7%.

$P < 0.01$). Mean score did not differ by type of practice ($P = 0.68$) or location of practice ($P = 0.37$), although mean score decreased slightly with increasing age (mean score 1.9 at <40 yr, 1.8 at 40–55 yr, 1.7 at >55 yr of age; $P = 0.006$).

The consistency of physicians' responses regarding acceptable blood glucose and HbA_{1c} values in IDDM is examined in Table 3. Data for family-practice physicians, general practitioners, and internists were combined because their responses were similar in Table 2 for all three criteria. Among those who agreed with the standard for fasting blood glucose, most (90.5% of physicians treating adult patients, 86% of pediatricians) also agreed with the standard for postprandial blood glucose; agreement with HbA_{1c} ≤8% was lower, particularly for pediatricians (36.4%). For physicians agreeing with the standards for postprandial glucose or HbA_{1c}, agreement with the other standards ranged from 61 to 78%, with the exception that pediatricians' agreement was consistently low for HbA_{1c}.

Physician behaviors and attitudes

toward management of IDDM are examined in Tables 4 and 5. Although most physicians believed that achieving normal blood glucose is important and will slow or prevent complications of diabetes, there was less agreement with the importance of HbA_{1c}. Only 16–18% of physicians ordered an HbA_{1c} measurement every 2–3 mo, and only 28% of physicians treating adult patients and 46% of pediatricians used HbA_{1c} frequently as a basis for change in insulin dose. Virtually all physicians believed that patient education improves glucose control, but only 38% of physicians treating adult patients and 55% of pediatricians used both a dietitian and diabetes educator in patient care.

Implicit in tight control is two or more insulin injections per day for patients <18 yr of age, three or more injections/day for patients ≥18 yr of age, and patient SMBG. Physicians treating adult patients prescribed two or more injections per day for 81% of their patients <18 yr old; among pediatricians, the proportion was slightly higher (88%). However, only 50% of patients

≥18 yr old were recommended to use two or more injections per day, and only 5% used three or more injections per day. Most (89%) physicians treating adult patients believed that SMBG is appropriate for IDDM patients. Only 47% recommended SMBG for all of their IDDM patients. An additional 19% recommended blood glucose monitoring in combination with urine glucose testing; however, urine glucose testing is inadequate as a measure of tight blood glucose control. Only 22% of physicians recommended blood glucose testing three or more times per day for IDDM patients who routinely use SMBG. Among pediatricians, only 31% recommended SMBG three or more times per day for their patients who practice SMBG. Pediatricians appear to be less reluctant than physicians who treat adult patients to have their patients adjust their own insulin dose and to use patient records of blood glucose as a basis for change in insulin dose.

The relationships between increasing physician scores and behaviors/attitudes toward diabetes management are examined in Tables 4 and 5. With increasing value for the score, there was a greater proportion of physicians whose management practices would be considered conducive toward tight control of blood glucose. These include, for example, having patients on multiple insulin injections, using HbA_{1c} to monitor blood glucose, and recommending patient SMBG. In addition, physician attitudes toward diabetes care, such as involvement of dietitians/educators in management of diabetes and encouraging patients to change their insulin dose in response to values obtained during SMBG, showed a similar relationship to score.

CONCLUSIONS — In this study, physicians' agreement with standards for tight control of blood glucose was measured by a score based on their responses to questions on acceptable ranges for fasting blood glucose, 2-h postprandial

Table 4—Relationship between diabetes management practices of family-practice physicians, general practitioners, and internists and agreement with standards for intensive treatment of blood glucose in IDDM patients

	MEAN	SCORE*			
		0	1	2	3
BLOOD GLUCOSE CONTROL					
ACHIEVING NORMAL BLOOD GLUCOSE IS VERY IMPORTANT (% AGREE)	79	67	73	80	87
ACHIEVING NORMAL BLOOD GLUCOSE WILL SLOW OR PREVENT COMPLICATIONS (% AGREE)	87	76	85	88	91
ACHIEVING TARGET HbA _{1c} IS VERY IMPORTANT (% AGREE)	49	26	42	50	60
ORDER HbA _{1c} EVERY 2–3 MO (%)	16	12	13	16	19
ALMOST ALWAYS USE HbA _{1c} AS BASIS FOR CHANGE IN INSULIN DOSE (%)	28	21	26	28	31
PATIENT EDUCATION IMPROVES GLUCOSE CONTROL (% AGREE)	96	93	94	97	98
ROUTINELY USE DIETITIAN AND DIABETES EDUCATOR IN PATIENT CARE (%)	38	31	36	38	42
RECOMMENDED INSULIN USE					
≥2 INJECTIONS/DAY NEEDED TO MANAGE IDDM (% AGREE)	50	29	43	52	59
≥2 INJECTIONS/DAY, PATIENTS AGE <18 YR (% OF PATIENTS)†	81	62	73	84	86
≥2 INJECTIONS/DAY, PATIENTS AGE ≥18 YR (% OF PATIENTS)†	50	42	46	52	54
≥3 INJECTIONS/DAY, PATIENTS AGE ≥18 YR (% OF PATIENTS)†	5	2	3	7	6
PATIENT SELF-MONITORING					
SMBG IS APPROPRIATE FOR MOST IDDM PATIENTS (% AGREE)	89	77	88	90	92
SMBG ALONE IS PRESCRIBED FOR 100% OF IDDM PATIENTS (%)	47	28	43	49	55
SMBG ≥3 TIMES/DAY IS RECOMMENDED FOR PATIENTS WHO ROUTINELY PRACTICE SMBG (%)	22	13	13	25	27
MANY PATIENTS CAN ADJUST THEIR OWN INSULIN DOSE (% AGREE)	70	59	70	70	74
PATIENTS ADJUST THEIR OWN INSULIN DOSE BASED ON SMBG (% OF PATIENTS)	38	27	33	42	43
PHYSICIAN ALMOST ALWAYS USES PATIENT RECORDS OF SMBG AS BASIS FOR CHANGE IN INSULIN DOSE (%)	54	46	49	56	59

*See Table 2 for definition of score.

†Physicians were asked about all insulin-treated patients (IDDM and insulin-treated NIDDM).

blood glucose, and HbA_{1c} in IDDM patients. Only 31% of primary-care physicians agreed with all three standards for intensive treatment of IDDM. Fully 36.5% agreed with none or only one of the standards. The most frequent agreement with a standard (74% of physicians) occurred for 2-h postprandial blood glucose <180 mg/dl. Half of physicians believed that 70–120 mg/dl is an acceptable range for fasting blood glucose. There was agreement with the standard for HbA_{1c} for two-thirds of physicians treating adult IDDM patients but only one-third of physicians treating children and adolescents. There was considerable inconsistency in responses; physicians who agreed with the intensive treatment standard for one measurement

often did not agree with one or both of the other two standards. Thus, there is disagreement among primary-care physicians regarding criteria for intensive treatment of blood glucose in IDDM patients.

A substantially lower proportion of pediatricians believed that the acceptable level for HbA_{1c} is ≤8% (given a normal range of 5–7%). This may indicate a reluctance by pediatricians to keep their young patients in strict glucose control because of the risk of hypoglycemia. HbA_{1c} is a measure of the average blood glucose concentration over the previous 4–6 wk and reflects the patient's fasting and postprandial glucose levels (35,36). Consequently, we would have expected that pediatricians who

agreed with tight standards for fasting and postprandial blood glucose would also have been consistent with regard to values of HbA_{1c} that reflect tight control.

With increasing value for the score, there was a greater proportion of physicians whose attitudes and management practices would be considered conducive toward tight control of blood glucose in IDDM. These include ordering HbA_{1c} frequently, using a dietitian and diabetes educator in care of patients, and having patients inject insulin two or more times/day. Thus, increasing knowledge of blood glucose values that can achieve tight control is accompanied by increasing levels of other factors that facilitate tight control. The proportion of physicians who follow treatment guide-

Table 5—Relationship between diabetes management practices of pediatricians and agreement with standards for intensive treatment of blood glucose in IDDM patients

	MEAN	SCORE*			
		0	1	2	3
BLOOD GLUCOSE CONTROL					
ACHIEVING NORMAL BLOOD GLUCOSE IS VERY IMPORTANT (% AGREE)	71	60	68	75	80
ACHIEVING NORMAL BLOOD GLUCOSE WILL SLOW OR PREVENT COMPLICATIONS (% AGREE)	88	82	87	92	90
ACHIEVING TARGET HbA _{1c} IS VERY IMPORTANT (% AGREE)	64	50	58	66	85
ORDER HbA _{1c} EVERY 2–3 MO (%)	18	18	17	19	19
ALMOST ALWAYS USE HbA _{1c} AS BASIS FOR CHANGE IN INSULIN DOSE (%)	46	42	44	45	56
PATIENT EDUCATION IMPROVES GLUCOSE CONTROL (% AGREE)	98	93	99	98	100
ROUTINELY USE DIETITIAN AND DIABETES EDUCATOR IN PATIENT CARE (%)	55	49	56	55	56
RECOMMENDED INSULIN USE					
≥2 INJECTIONS/DAY NEEDED TO MANAGE IDDM (% AGREE)	73	65	70	77	80
≥2 INJECTIONS/DAY, PATIENTS AGE <13 YR (% OF PATIENTS)	87	78	89	87	91
≥2 INJECTIONS/DAY, PATIENTS AGE 13–17 YR (% OF PATIENTS)	91	85	92	92	91
PATIENT SMBG					
SMBG IS APPROPRIATE FOR MOST IDDM PATIENTS (% AGREE)	94	87	95	97	95
SMBG ALONE IS PRESCRIBED FOR 100% OF IDDM PATIENTS (%)	47	41	51	43	53
SMBG ≥3 TIMES/DAY IS RECOMMENDED FOR PATIENTS WHO ROUTINELY PRACTICE SMBG (%)	31	21	27	35	39
MANY PATIENTS CAN ADJUST THEIR OWN INSULIN DOSE (% AGREE)	83	83	78	85	85
PATIENTS ADJUST THEIR OWN INSULIN DOSE BASED ON SMBG (% OF PATIENTS)	62	59	64	59	65
PHYSICIAN ALMOST ALWAYS USES PATIENT RECORDS OF SMBG AS BASIS FOR CHANGE IN INSULIN DOSE (%)	82	80	84	80	86

*See Table 2 for definition of score.

lines may still be unsatisfactory, however. Even among physicians with a score of 3, HbA_{1c} was ordered infrequently, three or more injections/day was prescribed rarely, patient self-monitoring was less than fully endorsed for adult IDDM patients, and a dietitian and diabetes educator were used by <50% of physicians. The percentage of physicians believing that achieving normal glucose will slow or prevent the complications of diabetes was high at each level of score. Although the physicians held this belief, only 31% agreed with all three criteria for intensive control.

These data suggest the need for additional education for primary-care physicians to increase their understand-

ing of appropriate medical care for their patients according to recommendations of the ADA and practicing diabetes specialists. Such education may include medical-update seminars on the care of patients with IDDM, such as those provided by ADA affiliates. However, knowledge deficiencies may not be the sole cause of inadequate diabetes care. Physicians may not have access to diabetes educators and dietitians, laboratories for measuring HbA_{1c}, or SMBG equipment. The use of resources at teaching hospitals and referral of patients to subspecialists in the area could be encouraged to provide these services; however, the cost of these services to the patient may be prohibitive. It is probable that

physicians do not engage in more aggressive treatment practices due to doubts about patient ability to adhere, concern about hypoglycemic episodes and adverse effects on patient quality of life, and belief that IDDM patients do not require aggressive treatment practices. Physicians who have a very small number of patients with diabetes may not fully appreciate the psychological and socioeconomic implications of diabetes. In addition, there may well be health-care system, reimbursement, resource, and cost issues affecting patient-provider interactions, especially for poorer patients, that may make physicians less aggressive than they would be otherwise.

Our study had no means to vali-

date physician responses, and there may be disparity between what physicians reported in the survey and what their actual beliefs and practice behaviors are. In particular, there may have been overreporting of what would be considered appropriate responses. If this occurred, the actual practice behaviors of physicians would be even less desirable than found in our study. Only 66% of physicians selected to receive the questionnaire actually responded to the questionnaire, and the possibility for nonresponse bias cannot be dismissed. However, among those contacted by telephone because they had not returned the questionnaire, only 20% were eligible for the survey. Consequently, it is likely that a considerable proportion of nonrespondents were also not eligible. In addition, some questionnaires not returned may have been sent to physicians who were deceased, retired, or had moved; one study found that 13% of undeliverable mail is not returned (37).

Although virtually all diabetes patients of pediatricians are IDDM, a substantial proportion of adult diabetes seen by the other three specialties is represented by insulin-treated NIDDM (38,39). The major types of diabetes (IDDM, insulin-treated NIDDM, NIDDM not treated with insulin) were distinguished in the questionnaire given to physicians treating adult patients, and separate answer spaces for each type of diabetes were provided. However, it is possible that some physicians failed to distinguish IDDM from insulin-treated NIDDM and that their answers reflect treatment of both types of diabetes combined. If this occurred, physician responses to questions about IDDM in adults may be underestimates of tight control beliefs and practices, because insulin-treated NIDDM patients may not be managed as intensively as IDDM patients.

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