

## ORIGINAL RESEARCH

# Diabetes Quality of Care in Academic Endocrinology Practice: A Descriptive Study

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## ABSTRACT

**OBJECTIVE:** To describe the quality of diabetes care delivered by academic endocrinologists practicing at 4 teaching hospitals affiliated with a single medical school.

**METHODS:** Up to 30 patients who first saw an endocrinologist for an ambulatory consultation for diabetes between January 2004 and December 2005 were randomly selected for chart review. Process and intermediate measures of quality of care were abstracted.

**RESULTS:** There were 417 patient charts available for analysis. Quality of care was generally high, with 61% of patients achieving a glycated hemoglobin of  $\leq 7.0\%$ , 77% achieving blood pressure  $\leq 130/80$  mm Hg and 73% achieving a low-density lipoprotein cholesterol level of  $\leq 2.5$  mmol/L. More than 80% of patients had had eye examinations, microalbuminuria screening and foot examinations. There were no significant differences in quality between hospitals.

**CONCLUSIONS:** The quality of diabetes care delivered by academic endocrinologists in this setting was high and approached the "ideal" levels of care recommended by practice guidelines. Compared to past studies in both the primary and specialist care settings, the results show that high-quality care can be delivered in routine academic clinical practice without having previously instituted a specific quality improvement program.

**KEYWORDS:** academic practice, endocrinology practice, quality of care

## RÉSUMÉ

**OBJECTIF :** Décrire la qualité des soins diabétologiques prodigués par des endocrinologues de quatre hôpitaux d'enseignement affiliés à une même école de médecine.

**MÉTHODES :** On a analysé le dossier de jusqu'à 30 patients choisis au hasard qui avaient consulté pour la première fois un endocrinologue d'une clinique de soins ambulatoires entre janvier 2004 et décembre 2005. Les mesures de processus et les mesures intermédiaires de la qualité des soins ont été extraits.

**RÉSULTATS :** Le dossier de 417 patients a été analysé. La qualité des soins était en général élevée : 61 % des patients ont obtenu un taux d'hémoglobine glycosylée de 7,0 % ou moins, 77 % ont obtenu une tension artérielle de 130/80 mm Hg ou moins et 73 % des patients ont obtenu un taux de cholestérol des lipoprotéines de basse densité de 2,5 mmol/L ou moins. Un examen de la vue, un dépistage de la microalbuminurie et un examen des pieds ont été effectués chez plus de 80 % des patients. Il n'y a pas eu de différences significatives de la qualité des soins entre les hôpitaux.

**CONCLUSIONS :** La qualité des soins diabétologiques prodigués par des endocrinologues exerçant dans des hôpi-

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taux d'enseignement a été élevée, se rapprochant des niveaux de soins « idéaux » recommandés dans les lignes directrices de pratique clinique. Par rapport aux études menées dans le passé sur les soins prodigués par les médecins de premiers recours et les spécialistes, les résultats montrent que des soins de grande qualité peuvent être prodigués dans les hôpitaux d'enseignement sans qu'un programme spécifique d'amélioration de la qualité ait été mis en place.

**MOTS CLÉS :** endocrinologie, hôpitaux d'enseignement, qualité des soins

## INTRODUCTION

Diabetes is a common chronic disease, affecting a large and growing proportion of the population (1). It results in microvascular and macrovascular complications (2), and it is associated with impaired quality of life, premature mortality and significant economic costs (3-5). Fortunately, many pharmacological and nonpharmacological interventions have been shown to reduce diabetes complications. For this reason, high-quality care is essential to ensure that patients achieve optimal health outcomes.

Unfortunately, the quality of care received by patients with diabetes often falls below the expectations of practice guidelines (6-11). For example, a large national survey of Canadian primary care practices found that half of patients with diabetes did not achieve the recommended target for glycemic control (glycosylated hemoglobin [A1C]  $\leq 7.0\%$ ) (12). Many endocrinologists believe that this problem is confined to primary care and that they deliver "gold standard" diabetes care; in reality, however, studies have demonstrated that the quality of care delivered by diabetes specialists is only marginally better than that delivered by primary care physicians, and that tremendous gaps between actual and ideal care remain (13). That being said, most of this literature has examined care by diabetes specialists in general, not academic endocrinologists specifically, and little of it has studied care in the Canadian healthcare framework. We conducted this descriptive study to determine the quality of care delivered by academic endocrinologists practicing in teaching hospitals affiliated with a large Canadian medical school.

## METHODS

### Setting

This study was conducted at the University of Toronto, Canada's largest university. There are 10 fully affiliated teaching hospitals located throughout the city, 5 of which have divisions of adult endocrinology staffed by 39 full-time endocrinologists. Each of these hospitals also provides diabetes education through interdisciplinary programs involving physicians, registered nurses and dietitians. Patients are referred to endocrinologists by either family physicians or

other specialists. Referring physicians may be affiliated with the teaching hospital, or they may be community-based. Patient self-referral is not permitted.

Ambulatory patient visits are structured differently at each hospital: at some sites, patients are seen in "hospital clinics" administered and supported by the hospital; at others, patients attend physicians' private clinics, sited within or adjacent to the hospital. Each hospital has its own electronic medical records, but the format and content vary between systems. The type and extent to which formal and informal standardized care plans are used varies between hospitals, but all participating endocrinologists are guided by the Canadian Diabetes Association's clinical practice guidelines (14). At some hospitals, patients are automatically scheduled for a visit with the diabetes education team prior to their initial visit with the endocrinologist, and any results from these initial assessments are included in the endocrinologist's charts. At other hospitals, visits with other health professionals are arranged on an ad hoc basis by the endocrinologist after the initial visit. None of the hospitals use point-of-care A1C testing.

Four teaching hospitals were included in this study (Mount Sinai Hospital, St. Michael's Hospital, Sunnybrook Health Sciences Centre and University Health Network). The study was approved by the institutional review boards of each participating hospital.

### Patient selection

Eligible patients were those aged  $\geq 18$  years with any type of diabetes, except gestational or post-transplantation diabetes, who were first seen for an ambulatory consultation by an endocrinologist at a participating hospital between January 2004 and December 2005. Whether or not patients had care from other endocrinologists before or after the initial consultation visit could not be reliably ascertained from the charts, so this criterion was not used as an exclusion.

All endocrinologists at the 4 hospitals who cared for patients who would be eligible for the study agreed to participate. A maximum of 30 eligible patients were randomly selected from each participating endocrinologist's practice.

### Data collection

A trained professional abstractor collected data from each patient's chart in the endocrinologist's office and used the hospital's electronic medical records to collect laboratory test results. Data up to 30 days prior to the initial consultation were collected, including laboratory or other results accompanying the request for consultation and data from pre-assessments by other health professionals in the diabetes healthcare team. Data collection continued to the last entry in the chart. Chart abstractions were performed between October 2006 and February 2007, for a maximum

follow-up period of 3 years.

The following parameters were collected for each patient: date of birth, sex, type of diabetes, health card number, dates of foot examinations and microalbumin screening tests (either urine albumin:creatinine ratio or 24-hour urine protein), and dates and results of A1C tests, blood pressure measurements and lipid profiles.

### Derivation of performance measures

From the collected data, quality-of-care indicators were derived based on clinical practice guideline targets (14) and the National Diabetes Quality Improvement Alliance (NDQIA) 2005 performance measures set (15). Quality of care could not be assessed for patients who were never seen in follow-up after the initial consultation, so only those patients who had at least 1 return visit were included in the study. Process indicators were measurement of A1C, blood pressure and lipid profile, and microalbumin screening and foot examination. Intermediate indicators were lowest A1C achieved, practice guideline A1C target achieved ( $\leq 7.0\%$ ), NDQIA A1C target achieved ( $< 9.5\%$ ), blood pressure target achieved (systolic blood pressure  $\leq 130$  mm Hg and diastolic blood pressure  $\leq 80$  mm Hg), low-density lipoprotein cholesterol (LDL-C) target achieved ( $\leq 2.5$  mmol/L) and total cholesterol (TC):high-density lipoprotein cholesterol (HDL-C) ratio target achieved ( $\leq 4.0$  mmol/L). Target achievement was based on the lowest value for each measure during follow-up.

One additional process indicator (eye examination) was determined by linking patients with the physician service claims database, an administrative database from the provincial ministry of health. Individuals were linked deterministically to the administrative data through their health card number. Because physician care is provided to all Ontario residents by the provincial government without direct patient costs, these data include billing claims for virtually all consultations, visits and assessments performed by physicians and optometrists in Ontario. We determined whether each patient had a claim from an optometrist or ophthalmologist for an eye examination within 2 years after the initial consultation with the endocrinologist. This measure was determined using administrative data rather than the chart abstraction because of concerns about the accuracy of documentation of these visits in endocrinologists' charts. Other NDQIA measures, such as smoking status or influenza vaccination, were not assessed, as they may not have been systematically documented in the endocrinologists' charts and were not available from other data sources.

Each participating physician received an anonymous feedback report showing his/her own performance with respect to the above indicators, compared to their hospital peers and the overall study.

### Statistical analysis

Each indicator was averaged by hospital and compared using ANOVA testing (for A1C levels) or chi-square testing (for other indicators). Because of multiple comparison testing, there was an increased risk that a statistically significant difference between hospitals could be found purely by chance. In addition, because many process measures for quality of care are likely to be correlated within a single physician's practice and within a single hospital, the standard deviation around each measurement is artificially narrowed, potentially leading to spurious statistical significance. For this reason, a p value of 0.01 was selected a priori for statistical significance.

## RESULTS

The charts of 545 patients were abstracted from 21 endocrinologists' offices at the 4 hospitals. However, 128 (23.5%) of these patients did not have a follow-up appointment with the endocrinologist, and so were excluded from this analysis, leaving 417 patients.

Baseline characteristics are shown in Table 1. Patient characteristics varied between hospitals, with endocrinologists at some hospitals treating younger patients or more patients with type 1 diabetes, and others treating older patients or more patients with type 2 or other types of diabetes.

Process and intermediate quality indicators are also shown in Table 1. All process measures had very high rates of compliance, ranging from 83% for microalbuminuria screening to 100% for blood pressure measurement. In addition, intermediate indicators also demonstrated high-quality care: about three-quarters of patients met blood pressure and lipid targets, and the mean A1C achieved was 7.1%. Virtually all patients met the NDQIA glycemic control target of  $< 9.5\%$ , and the majority met the clinical practice guideline target of  $\leq 7.0\%$ . There were no differences between hospitals in any of the process or intermediate quality indicators.

## DISCUSSION

The quality of diabetes care delivered by academic endocrinologists working in the participating teaching hospitals was high and approached the "ideal" levels of care recommended by practice guidelines. For example, process measures that could be conducted directly by the endocrinologist (physical examination manoeuvres and laboratory tests) occurred for 88 to 100% of patients. Achievement of treatment targets was also extremely high, with three-quarters of patients meeting blood pressure and lipid targets. Glycemic control was less successfully achieved: 61% of patients met the practice guideline target of A1C  $\leq 7.0\%$ , 12% more than the proportion of patients on target in Canadian primary care (12). It is noteworthy that this level of care was measured

**Table 1. Baseline characteristics and quality-of-care indicators for patients with diabetes seen by academic endocrinologists — overall and at individual hospitals**

<b>Characteristics/ indicators</b>	<b>Overall</b>	<b>Hospital</b>				<b>p value</b>
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	
Total patients, n	545	90	167	192	82	NA
Patients included in analysis, n	417	68	130	146	73	NA
<b>Patient characteristics</b>						
Age, y, mean±SD	52.1±15.9	59.3±14.0	47.4±15.0	55.2±15.2	47.9±16.9	<0.0001
Sex, % female/% male	41/59	46/54	33/67	49/51	38/62	0.06
<i>Diabetes type</i>						<0.0001
Type 1, %	19	7	28	11	29	
Type 2, %	73	63	72	79	70	
Other/unknown, %	8	29	0	10	1	
<b>Quality-of-care indicators</b>						
<i>A1C</i>						
Measured, %	97	99	96	97	99	0.6
%, mean±SD	7.1±1.5	7.3±1.7	7.0±1.3	7.1±1.5	6.9±1.5	0.6
Guideline target (≤7.0%), %	61	62	58	59	67	0.6
NDQIA target (<9.5%), %	93	88	97	93	93	0.1
<i>Blood pressure</i>						
Measured, %	100	100	100	99	100	0.6
Target, %	77	68	82	76	81	0.1
<i>Lipids</i>						
Measured, %	93	93	91	95	93	0.7
Target LDL-C, %	73	67	68	77	79	0.1
Target TC:HDL-C, %	78	78	71	82	82	0.2
Microalbumin screening, %	88	87	88	84	97	0.05
Foot examination, %	89	96	83	92	88	0.02
Eye examination, %	83	84	75	86	90	0.03

A1C = glycated hemoglobin

LDL-C = low-density lipoprotein cholesterol

NA = not applicable

NDQIA = National Diabetes Quality Improvement Alliance

TC:HDL-C = total cholesterol:high-density lipoprotein cholesterol ratio

retrospectively based on actual clinical care; it does not represent the care delivered as part of a trial or prospective study, where the Hawthorne effect might influence physician and patient behaviour (16).

These results are strikingly better than those of previous studies reporting on the quality of diabetes care by endocrinologists. For example Lafata and colleagues (17) reported that, among patients followed by endocrinologists at 30 American clinics in the late 1990s, only 61% had had a lipid test and only 42% had had an eye examination. During a similar period, about 55% of patients followed by specialists

in Italy received a full lipid profile or an eye examination, and about 50% underwent screening for microalbuminuria or a foot examination (18). In the same study, only 14% achieved a blood pressure level of 130/85 mm Hg, 15% achieved an LDL-C level of <2.9 mmol/L and only 50% achieved an A1C of ≤7.0% (18). Another study examining quality of care delivered by academic endocrinologists at Emory University found that process measures were performed for between 55 and 87% of patients (19). The authors also reported that 61% of patients achieved A1C levels ≤7.0% (19). The quality of care demonstrated by endocrinologists in the current study

is dramatically better than that described previously. This difference may have occurred in part because at the time of the earlier studies, fewer glucose-lowering pharmacological agents were available and cardiovascular risk factor control may have been less emphasized as part of diabetes management. Encouragingly, these findings show that high-quality care is achievable, even in relatively unstructured practice environments that have not implemented formal, intensive quality-improvement initiatives.

In the current era of quality improvement, several lessons can be drawn from this study. First, many practitioners familiar with previous studies describing quality of diabetes care in various populations and settings may be disheartened by the nearly uniformly poor quality of care displayed. Conversely, specialists not familiar with this literature may blindly assume that their care is excellent. This study demonstrates the value of actually conducting quality-of-care evaluations of one's own practice, as the results may be unexpected. In particular, those practicing in academic centres who are training the next generation of physicians ought to ensure that their quality of care is of the highest standard. Second, the study highlights that traditional quality indicators, such as those defined by practice guidelines or the NDQIA, may not be the most important measures in all settings: compliance with processes was extremely high, and even intermediate measures approached the likely ceiling for achieving targets. Instead, other quality indicators, for example those based on prescribing, have been suggested (20,21), and they might better uncover quality problems amenable to intervention. In the current study, other potential threats to care were identified: for example, nearly one-quarter of patients seen in initial consultation did not return for a follow-up visit. This observation has led to new research directions for our group on the coordination of care between specialists and primary care physicians. Furthermore, it demonstrates that detailed understanding and assessment of the local practice environment is essential for identifying the sometimes unanticipated quality issues requiring attention in each practice, group or institution.

As with most quality indicators, failure to achieve them can result from several factors beyond simply poor quality of care. Process measures are most directly under the physician's control, but if, for example, the patient does not visit a laboratory for testing, or if the results are misplaced, the indicator would be negative despite the physician's attempt to provide high-quality care. Some process measures derived from chart abstraction may also be negative because of a failure to adequately document them, rather than a failure to perform them. Achievement of clinical targets is less within the physician's control, since it is heavily influenced by patient factors: biological and genetic variability in baseline levels and response to treatment, and willingness to comply

with lifestyle interventions or medications. Nonetheless, the observed findings offer a benchmark of what can be achieved in clinical practice.

In summary, this study showed that patients seeing academic endocrinologists at university-affiliated teaching hospitals received high-quality diabetes care — substantially better than what was reported in previous studies from a decade ago.

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## REFERENCES

1. Lipscombe LL, Hux JE. Trends in diabetes prevalence, incidence, and mortality in Ontario, Canada 1995-2005: a population-based study. *Lancet*. 2007;369:750-756.
2. Harris MI, Cowie CC, Stern MP, et al. *Diabetes in America*. Washington, DC: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases; 1995.
3. Stewart AL, Greenfield S, Hays RD, et al. Functional status and well-being of patients with chronic conditions. Results from the Medical Outcomes Study. *JAMA*. 1989;262:907-913.
4. Gu K, Cowie CC, Harris MI. Mortality in adults with and without diabetes in a national cohort of the US population, 1971-1993. *Diabetes Care*. 1998;21:1138-1145.
5. Dawson KG, Gomes D, Gerstein H, et al. The economic cost of diabetes in Canada, 1998. *Diabetes Care*. 2002;25:1303-1307.
6. Saaddine JB, Engelgau MM, Beckles GL, et al. A diabetes report card for the United States: quality of care in the 1990s. *Ann Intern Med*. 2002;136:565-574.
7. Saydah SH, Fradkin J, Cowie CC. Poor control of risk factors for vascular disease among adults with previously diagnosed diabetes. *JAMA*. 2004;291:335-342.
8. Jha AK, Perlin JB, Kizer KW, et al. Effect of the transformation of the Veterans Affairs Health Care System on the quality of care. *N Engl J Med*. 2003;348:2218-2227.
9. Harris SB, Stewart M, Brown JB, et al. Type 2 diabetes in

- family practice. Room for improvement. *Can Fam Physician*. 2003;49:778-785.
10. Rossi MC, Nicolucci A, Arcangeli A, et al; Associazione Medici Diabetologi Annals Study Group. Baseline quality-of-care data from a quality-improvement program implemented by a network of diabetes outpatient clinics. *Diabetes Care*. 2008;31:2166-2168.
  11. Huppertz E, Pieper L, Klotsche J, et al. Diabetes mellitus in German primary care: quality of glycaemic control and subpopulations not well controlled — results of the DETECT study. *Exp Clin Endocrinol Diabetes*. 2009;117:6-14.
  12. Harris SB, Ekoé J-M, Zdanowicz Y, et al. Glycemic control and morbidity in the Canadian primary care setting (results of the Diabetes in Canada Evaluation study). *Diabetes Res Clin Pract*. 2005;70:90-97.
  13. Shah BR, Hux JE, Laupacis A, et al. Deficiencies in the quality of diabetes care: comparing specialist with generalist care misses the point. *J Gen Intern Med*. 2007;22:275-279.
  14. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Canadian Diabetes Association 2003 clinical practice guidelines for the prevention and management of diabetes in Canada. *Can J Diabetes*. 2003;27:S1-S115.
  15. National Diabetes Quality Improvement Alliance. *National Diabetes Quality Improvement Alliance Performance Measure Set for Adult Diabetes*. Available at: <http://www.nyqa.org/pdf-lib/NDQIA%20Diabetes%20DomainFinal2005Measures.pdf>. Accessed August 13, 2009.
  16. Leonard K, Masatu MC. Outpatient process quality evaluation and the Hawthorne effect. *Soc Sci Med*. 2006;63:2330-2340.
  17. Lafata JE, Martin S, Morlock R, et al. Provider type and the receipt of general and diabetes-related preventive health services among patients with diabetes. *Med Care*. 2001;39:491-499.
  18. De Berardis G, Pellegrini F, Franciosi M, et al; QuED study. Quality of care and outcomes in type 2 diabetic patients: a comparison between general practice and diabetes clinics. *Diabetes Care*. 2004;27:398-406.
  19. Miller CD, Phillips LS, Tate MK, et al. Meeting American Diabetes Association guidelines in endocrinologist practice. *Diabetes Care*. 2000;23:444-448.
  20. Berlowitz DR, Ash AS, Glickman M, et al. Developing a quality measure for clinical inertia in diabetes care. *Health Serv Res*. 2005;40(6 Pt 1):1836-1853.
  21. Martirosyan L, Braspenning J, Denig P, et al. Prescribing quality indicators of type 2 diabetes mellitus ambulatory care. *Qual Saf Health Care*. 2008;17:318-323.