Quality of Care for Patients With Type 2 Diabetes in Primary Care in Norway Is Improving

Results of cross-sectional surveys of 33 general practices in 1995 and 2005

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OBJECTIVE — To assess changes in the quality of care in Norway for patients with type 2 diabetes.

RESEARCH DESIGN AND METHODS — Two cross-sectional surveys were examined that identified all patients (n = 1,470 in 1995 and n = 2,699 in 2005) with type 2 diabetes attending 33 general practices in 1995 and 2005.

RESULTS — Between 1995 and 2005, there were significant improvements in the proportion of patients for whom important laboratory analyses, smoking habits, height, weight, and referral to eye examination were recorded. Mean A1C declined from 7.74 to 7.15%, systolic blood pressure from 150.0 to 140.4 mmHg, and cholesterol from 6.28 to 5.0 mmol/l ($P < 0.001$, age and sex adjusted). The 10-year risk of coronary heart disease for an average male patient declined from 42 to 29%.

CONCLUSIONS — There have been substantial improvements in type 2 diabetes primary care in Norway that are potentially related to major improvements in health outcomes.

Diabetes Care 32:81–83, 2009

Improving the quality of diabetes care has been a major focus of the Norwegian College of General Practice since the first diabetes guidelines for general practice were published in 1988. Guidelines were revised in 1995, 2000, and the late autumn of 2005 (1). Guideline targets for A1C ≤7.5% and serum cholesterol ≤5.0 mmol/l remained unchanged from 1995 to 2005, whereas target blood pressure was lowered from ≤140/90 to ≤140/85 mmHg in 2000. Our objective in this study was to assess changes in the quality of type 2 diabetes care in general practice from 1995 to 2005.

RESEARCH DESIGN AND METHODS

— Quality of diabetes care was assessed in a cross-sectional survey of 33 practices in 1995 (2). All practices (n = 35) with electronic medical records in two representative areas of Norway were selected to take part in the first survey. The same 33 practices agreed to participate in the survey of 2005.

All patients with type 2 diabetes in 1995 (n = 1,667) and 2005 (n = 3,013) were identified using electronic search programs with manual verification. Patients in nursing homes, patients receiving diabetes care from specialists, and patients with less than 6 months of follow-up were excluded, leaving 1,470 subjects (49.5% of whom were male) in 1995 and 2,699 (51.2% male) in 2005 for analysis. Variables included demographic data, processes of care, outcomes of care, and medications. The most recent result was recorded if more than one value was available. Variables had identical definitions in both surveys.

Statistical tests were performed using SPSS version 13. Differences between means in Table 1 were tested using an ANOVA analysis adjusted for age and sex. Other results were adjusted for clustering by using practice-specific proportions or means as observations in Student's t test. The UK Prospective Diabetes Study risk-engine model (3) was used to calculate the 10-year risk reduction for coronary disease.

RESULTS — The majority of patients were Caucasian (98%). Between 1995 and 2005, mean age decreased (69.1 to 66.3 years; $P < 0.001$), mean diabetes duration increased (6.6 to 7.0 years; $P = 0.047$), and mean weight increased (81.1 to 86.1 kg; $P < 0.001$), whereas mean height was comparable between both surveys. The proportion of patients for whom important processes of care had been recorded improved as follows: cholesterol 46 to 88% (difference [Δ] 42% [95% CI 35–48]; $P < 0.001$), HDL cholesterol 18 to 61% (Δ43% [36–49]; $P < 0.001$), microalbumin 13 to 33% (Δ20% [12–27]; $P < 0.001$), smoking habits 13 to 57% (Δ44% [39–50]; $P < 0.001$), height 13 to 39% (Δ26% [16–36]; $P < 0.001$), weight 38 to 56% (Δ18% [8–28]; $P = 0.001$), and referral to eye examination 30 to 74% (Δ44% [37–50]; $P < 0.001$). A1C and blood pressure were recorded for approximately 90% of subjects in both surveys.

Table 1 shows mean values for risk factors related to treatment groups and the proportion of patients achieving national targets. Treatment was more intensive in 2005 compared with 1995.

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Received 25 March 2008 and accepted 30 September 2008.
Published ahead of print at http://care.diabetesjournals.org on 13 October 2008. DOI: 10.2337/dc08-0605.

Table 1—*Treatment groups, risk factors, and patients achieving national targets and differences between 1995 and 2005*

	1995 (n = 1,470)			2005 (n = 2,699)				
Treatment groups	Total patients	Patients measured	Performance	Total patients	Patients measured	Performance	Differences between 1995 and 2005	P*
A1C (%)								
Diet alone	30.7 (452)	84.7 (383)	6.75 ± 0.98	28.4 (766)	86.3 (661)	6.46 ± 0.85	0.29 (0.18–0.41)	<0.001
Metformin alone	2.2 (33)	87.5 (28)	7.78 ± 1.42	17.3 (467)	94.9 (443)	6.93 ± 0.99	0.85 (0.46–1.24)	<0.001
Sulfonylurea alone	33.5 (491)	88.8 (436)	7.74 ± 1.43	12.9 (348)	93.7 (326)	7.16 ± 1.14	0.58 (0.39–0.77)	<0.001
Metformin and sulfonylurea	5.4 (80)	95.0 (76)	8.52 ± 1.86	13.9 (374)	96.5 (361)	7.38 ± 1.06	1.31 (0.82–1.44)	<0.001
Insulin alone	25.4 (374)	90.1 (337)	8.52 ± 1.65	15.6 (422)	93.8 (396)	7.79 ± 1.26	0.73 (0.51–0.94)	<0.001
Insulin and oral agents	1.1 (17)	100 (17)	8.66 ± 1.61	9.4 (255)	95.3 (243)	7.78 ± 1.30	0.88 (0.20–1.56)	0.011
Overall		88.5 (1,301)	7.74 ± 1.59		92.5 (2,496)	7.15 ± 1.20	0.59 (0.50–0.68)	<0.001
SBP (mmHg)								
Not on BP-lowering therapy	52.2 (767)	82.1 (630)	146.2 ± 20.9	34.9 (942)	82.5 (777)	134.9 ± 17.4	11.2 (9.2–13.3)	<0.001
BP-lowering therapy	47.8 (703)	91.3 (642)	153.8 ± 22.3	65.1 (1,757)	94.1 (1,653)	143.0 ± 19.5	10.8 (8.9–12.6)	<0.001
Overall		86.5 (1,272)	150.0 ± 22.0		90.0 (2,430)	140.4 ± 19.2	9.6 (8.2–10.9)	<0.001
Cholesterol (mmol/l)								
Not on statin therapy	95.2 (1,399)	46.6 (652)	6.31 ± 1.37	54.3 (1,465)	80.8 (1,184)	5.43 ± 1.08	0.89 (0.77–1.00)	<0.001
Statin therapy	4.8 (71)	95.8 (68)	5.99 ± 1.54	45.7 (1,234)	96.1 (1,186)	4.63 ± 1.0	1.36 (1.11–1.62)	<0.001
Overall		50 (720)	6.28 ± 1.39		87.8 (2,370)	5.0 ± 1.1	1.26 (1.16–1.35)	<0.001
Achievement of national targets (%)								
A1C ≤7.5%			51.3			69.2	17.9 (12.5–23.3)	<0.001
SBP ≤140 mmHg			46.7			65.7	19.0 (14.5–23.5)	<0.001
DBP ≤85 mmHg			64.5			78.1	13.6 (8.6–18.7)	<0.001
Cholesterol ≤5 mmol/l			16.8			52.9	36.2 (30.7–41.6)	<0.001
All four targets			4.2			22.7	18.5 (15.2–21.7)	<0.001

Data are % (n), means ± SD, or differences (95% CI) unless otherwise indicated. *P values for differences in means of outcome measures are derived from an age- and sex-adjusted ANOVA analysis. P values for differences in percentage achieving national targets are adjusted for clustering by using practice-specific means as proportions in a paired t test. BP, blood pressure; DBP, diastolic blood pressure; SBP, systolic blood pressure.

Among patients using antihyperglycemic therapy, 23 vs. 12% (Δ11% [95% CI 7–16]; $P < 0.001$) received two or more oral hypoglycemic agents and 13 vs. 1% (Δ12% [9–14]; $P < 0.001$) received both oral hypoglycemic agents and insulin. Few patients used glitazones (2%) or acarbose (1%) in 2005. Of patients using antihyperglycemic therapy, the percent of patients with A1C <6.5% increased from 10 to 22% (Δ12% [7–17]; $P < 0.001$). Among patients treated for hypertension, 64 vs. 29% (Δ35% [30–41]; $P < 0.001$) received two or more antihypertensive agents. More patients received aspirin (35 vs. 19%; Δ16% [12–20]; $P < 0.001$) and statins (45 vs. 4%; Δ41% [38–45]; $P < 0.001$). National targets for treatment of hyperglycemia, blood pressure, and cholesterol were achieved by significantly more patients in 2005 (Table 1). There were no clinically important sex differences in the improvement of risk factor control or treatment.

Coronary risk reduction was calculated for an average patient (age 67 years, nonsmoking, with 7 years' diabetes duration) using mean values for major risk factors in 1995 and 2005. The absolute 10-year risk reductions were from 42 to 28% for men and from 39 to 27% for women.

CONCLUSIONS — Risk factor control has improved considerably. Between 1995 and 2005, reductions in mean values for A1C, blood pressure, and cholesterol were 0.6%, 10/4 mmHg, and 1.3 mmol/l, respectively, despite weight gain. This could be explained by more intensive treatment due to increased impact of guidelines after the publication of the UK Prospective Diabetes Study results, changes in diagnostic criteria, increased efforts to diagnose diabetes earlier, or a trend toward healthier living because blood pressure and cholesterol have decreased in the general population of Norway (4). Some of these factors together with an increase in the prevalence of diabetes due to obesity may explain the marked increase in the number of patients with type 2 diabetes attending the practices. Very similar reductions in A1C and blood pressure among patients with type 2 diabetes in general practice have been reported by the Swedish National Diabetes Register between 1996 and 2005 (5). A decline in A1C from 7.8 to 7.2% between 1999 and 2004 among adult patients with diabetes in the U.S. has been reported in an analysis of National Health and Nutrition Examination Survey data (6). Other studies (5–10) that have performed the latest survey since 2002 report improvements in risk factor control, whereas studies reporting in 2002 or earlier (11–14) find little or no improvement.

Improvements in risk factor control, processes of care, and the more widespread use of metformin suggest that practitioners are responding to guidelines. Apart from educational meetings, there are no additional incentives for practitioners to follow national guidelines. An independent study has confirmed that the guidelines are used by 52% of general practitioners (15).

Our findings are probably represen-

tative of Norway, given that similar mean values were reported from a Norwegian primary care survey in 2004 of 975 patients between 18 and 75 years of age with type 2 diabetes (8). Furthermore, nearly identical mean values for A1C, cholesterol, and blood pressure were found in two other regions of Norway in 2005 (n = 2,764) at primary care centers that did not participate in the 1995 survey.

We conclude that there have been substantial improvements in type 2 diabetes primary care in Norway that are potentially related to major improvements in health outcomes.

Acknowledgments— No potential conflicts of interest relevant to this article were reported.

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