Doctors' characteristics do not predict long-term glycaemic control in type 2 diabetic patients

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SUMMARY

Glycaemic control in type 2 diabetic patients varies widely between general practitioners (GPs). To increase our understanding of this variation, linear random effects models were used to examine the predictive value of GP characteristics on the course of annual $HbA1_c$ measurements, in 688 newly diagnosed type 2 diabetic patients between one and five years after diabetes diagnosis. We found that characteristics of centrally supported GPs, such as interest in diabetes, experience, practice type, list size, and weekly working hours, did not predict their patients' glycaemic control.

Keywords: *diabetes mellitus; glycaemic control; practice organisation; GP characteristics; family practice.*

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Introduction

EFFORTS to control hyperglycaemia may delay the development of complications in type 2 diabetic patients.[1] However, glycaemic control varies widely between general practitioners (GPs) and practices.[2,3]

Few studies have investigated the effect of GP characteristics on glycaemic control, and those that there are have been cross-sectional.[2,4,5] Only a special interest in diabetes showed an association with glycaemic control.[2,4]

We studied whether GP characteristics affected the course of glycated haemoglobin ($HbA1_c$) in newly diagnosed type 2 diabetic patients between one and five years after diagnosis.

Method

In 1988, a random sample of two-thirds of Danish general practices were invited to participate, excluding single-handed practices having a doctor aged 60 years or over.[6] Of 1902 doctors, 484 (25.5%) volunteered. Their practices were randomised to an intervention group or a control group.[6] Detailed information on the course of $HbA1_c$ was collected in the intervention group only. This sub-study was therefore confined to 194 intervention doctors who had relevant characteristics and who had participating patients.

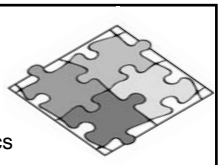
The GPs included all patients (n = 868) aged 40 years and over with diabetes, diagnosed between 1 March 1989 and 28 February 1992.[6]

However, 107 patients were excluded because of life-threatening somatic disease (37%), severe mental illness (30%), or unwillingness to participate (33%). In addition, the following were excluded: 26 patients because of treatment with steroids, 30 because of missing data on their doctors, and 17 who were considered to have type 1 diabetes.

The GPs were prompted to review patients regularly and encouraged to pursue the goal of optimal glycaemic control.[6] They were given clinical guidelines supported by seminars and descriptive feedback reports on individual patients.[6] In questionnaires, doctors and patients gave information about themselves at baseline.

$HbA1_c$ was measured at Odense University Hospital[6] (reference interval = 5.4% to 7.4%) in blood samples from annual reviews. The course of $HbA1_c$ for each individual was modelled as a linear regression line for all available $HbA1_c$ measurements, from 334 days after inclusion in the project until January 1998. The slope of this line corresponds to the average trend in $HbA1_c$ over time. Data were censored in the event of a patient's death, withdrawal from the study or a change of doctor. A median slope was calculated for all the patients within each category of the GP characteristics

HOW THIS FITS IN



What do we know?

It is not clear whether doctor characteristics are associated with glycaemic control in type 2 diabetic patients.

What does this paper add?

In newly diagnosed type 2 diabetic patients, characteristics of centrally supported GPs, such as interest in diabetes, experience, practice type, list size, and weekly working hours, did not predict the development of glycaemic control between one and five years after diabetes diagnosis.

investigated (Table 1).

All the GP characteristics in Table 1 and potential confounders related to the patients were entered into a multivariate random effect model, to investigate simultaneously GP-related predictors on the trend in $HbA1_c$ over time (Table 2). Random effects on intercept and slope were added to model the large inter-patient variability.

Results

At one year after a diagnosis of diabetes, 22 patients had died, 21 had changed doctor, and one had withdrawn from the study. Of the remaining 644 patients, 610 (94.7%) had $HbA1_c$ measured in the subsequent study period.

A considerable heterogeneity in the course of $HbA1_c$ is observed for the 610 patients, as can be seen from the interquartile ranges in Table 1. Furthermore, $HbA1_c$ increased over time in most patients irrespective of the characteristics of their GP. However, for at least one-quarter of the patients, a decreasing trend was seen.

No GP characteristics predicted the average trend in $HbA1_c$ over time (Table 2).

Discussion

We could not identify any GP characteristics that predicted the trend in $HbA1_c$ over time.

The strengths of the study are the prospective blood sampling in a population-based group of type 2 diabetic patients and the standardisation of $HbA1_c$ measurements. The major limitation of our study was the self-selected sample of GPs.

Table 1. Glycaemic control at one year after diabetes diagnosis and the course of glycated haemoglobin ($HbA1_c$) thereafter and its relation to doctor and practice characteristics.

Characteristics	Number	Median (IQR) trend in $HbA1_c$ over time (% per year)[a]
Sex		
Female	32	0.200 (–0.087 to 0.462)
Male	162	0.218 (–0.046 to 0.564)
Years of experience as a GP		
≥ 10	107	0.217 (–0.025 to 0.563)
<10	87	0.215 (–0.058 to 0.555)
Months at hospital medical departments before entering practice		
≥ 24	100	0.251 (–0.033 to 0.590)
<24	90	0.192 (–0.093 to 0.508)
Interest in diabetes compared with other diseases		
More	13	0.184 (–0.065 to 0.571)
The same	174	0.221 (–0.044 to 0.549)
Less	6	0.495 (–0.003 to 1.014)
Number of continuing medical education courses attended in the past year		
≥ 8	71	0.226 (–0.018 to 0.602)
<8	115	0.202 (–0.087 to 0.541)
Practice type		
Single-handed	73	0.234 (–0.070 to 0.644)
Group	121	0.214 (–0.042 to 0.527)
Practice location		
Copenhagen	42	0.149 (–0.131 to 0.663)
Large towns	72	0.267 (–0.004 to 0.567)
Rural area	80	0.193 (–0.046 to 0.494)
Number of patients per GP		
≥ 1350	93	0.244 (–0.002 to 0.567)
<1350	101	0.199 (–0.096 to 0.551)
Weekly working hours per GP		
≥ 40	158	0.227 (–0.038 to 0.556)
<40	36	0.193 (–0.131 to 0.577)
Weekly hours of help from ancillary staff per GP		
≥ 30	120	0.226 (–0.033 to 0.542)
<30	70	0.191 (–0.105 to 0.605)

[a]Reference range of $HbA1_c$ = 5.4–7.4%.

Table 2. Multivariate regression analysis of the influence of GP characteristics on the trend in $HbA1_c$ over time.

GP characteristics	The trend in $HbA1_c$ over time		
	Coefficients	Standard error	*P*-value
Overall trend	0.1670	–	–
Sex			
Female	–0.0232	0.0749	0.76
Male	0		
Years of experience as a GP	–0.0005	0.0039	0.90
Months at hospital medical departments	0.0023	0.0013	0.08
Interest in diabetes compared with other diseases			
More	0.1948	0.2504	0.44
The same	0.1564	0.2309	0.50
Less	0		
Number of continuing medical education courses attended in the past year	0.0019	0.0040	0.63
Practice type			
Group	–0.0566	0.0583	0.33
Single-handed	0		
Practice location			
Copenhagen	0.0328	0.0799	0.68
Large towns	0.0169	0.0562	0.76
Rural area	0		
Number of patients per GP	0.0251	0.1144	0.83
Weekly working hours per GP	–0.0031	0.0052	0.55
Weekly hours of help from ancillary staff per GP	–0.0022	0.0026	0.39

A multivariate linear random effects model with patient identification and the time trend in $HbA1_c$ as random effects. Data are maximum likelihood estimates of coefficients with *P*-values based on an *F*-test from the selected model. The selected model includes the GP variables indicated above as well as patients' age, sex, $HbA1_c$ at diabetes diagnosis, and body mass index at diagnosis.

This is the first prospective study to examine the influence of GP characteristics on glycaemic control. Our results confirm the findings from cross-sectional studies, which have found no association between glycaemic control and the sex of the GP,[2,4,5] practice type,[2,4] continuing medical education (CME) attendance,[2] and practice location.[2] In contrast with previous studies,[2,4] we found no association between doctors' interest in diabetes and glycaemic control.

There are several possible explanations of our findings. First, variation among the GPs in the way they tried to achieve tight glycaemic control could have been reduced because these doctors were encouraged to pursue optimum glycaemic control. Secondly, our volunteering doctors may be alike in their motivation for pursuing the goal of tight glycaemic control in their patients. It is, however, also possible that factors other than GP characteristics can better explain the heterogeneous course of $HbA1_c$ observed among these patients.

In conclusion, we could not identify GP characteristics that predicted the long-term course of $HbA1_c$ in newly diagnosed type 2 diabetic patients, treated by motivated doctors receiving educational and surveillance support. In this setting, our results provide no evidence that glycaemic control could be further improved by making organisational changes in general practice, such as transferring single-handed practices to group practices. Nor could it be improved by identifying subgroups of poorly performing doctors according to certain characteristics, such as sex and years of experience, and targeting these for CME.

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