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International exchange

The role of the APO method in improving diabetes care in general practice: the results of a Danish prospective multipractice audit circle

Christel N Hansen MD PhD
Senior Researcher, Audit Project Odense

Dorte Gilså Hansen MD
PhD Student and Research Fellow, Audit Project Odense

Jakob Kragstrup MD DMSc PhD GP
Professor of General Medicine

Research Unit of General Practice, University of Southern Denmark, Denmark

Ole Busch MD GP
General Practitioner, Esbjerg, Denmark

Anders P Munck MD GP
Head of Audit Project Odense, Research Unit of General Practice, University of Southern Denmark, Denmark

ABSTRACT

Aim To describe and improve the quality of diabetes care in general practice.

Setting General practices in Ribe County, Denmark.

Design and methods A medical two pass multipractice audit circle including feedback and continuing medical education following the principles of the Audit Project Odense (APO) method. The intervention was aimed at improving the delivery of diabetes care in general practice, with focus on performance of clinical measurements, laboratory tests and referral of patients with diabetes to treatment and control by specialists.

Results Delivery of diabetes care in general practice has not always met standards of care and variation between general practitioners is wide. Completion of the APO circle significantly increased the relative frequency of HbA_{1C} testing from 52% to 67%, albumine-to-creatinine ratio testing from 6% to 15% and the use of microalbumin dipstick from 6% to 17% per general practitioner. Referral of patients to treatment and control by ophthalmologists, endocrinologists in diabetes outpatient clinics or chiropodists was significantly increased from 48% to 56%, from 2% to 11% and from 5% to 24%, respectively.

Conclusion Performance of diabetes care in general practice is highly variable and leaves room for quality improvement. Standards of diabetes care can be improved by a combination of audit, feedback and prolonged medical education following the principles of the Audit Project Odense (APO) method.

Keywords: clinical audit, diabetes, general practice, multipractice audit

Introduction

Diabetes is a common chronic and lifelong disease with a potential high risk of disabling complications. These complications can be prevented or delayed through a good metabolic control guided by regular surveillance of risk factors and changes of the disease.[1–3]

In Denmark, as in most other European countries, the focus of care for patients with diabetes has shifted from secondary to primary care.[4] At the same time the role of the general practitioner (GP) in delivering diabetes care has become increasingly important. The demands of the standard of diabetes care in general practice have increased in parallel. Although the performance of diabetes care in general practice in some circumstances might reach hospital standards, the quality appears to be highly variable with scope for improvement.[5–8]

In the past decade, the use of audit for monitoring healthcare quality has become well accepted. Recent Cochrane reviews have suggested that audit in combination with feedback and continuing education meetings might be effective in improving the practice of healthcare professionals and healthcare outcomes.[9,10] In the Nordic countries the Audit Project Odense (APO) method has been widely used for identification of problem areas in patient care and quality improvement in general practice.[11,12]

The aims of this study were to describe the quality of primary diabetes care in general practice and to determine whether the standard of diabetes care can be improved by means of the APO method.

Research design and methods

The APO method

The APO method is an easy to use instrument for quality development and improvement of health services in general practice.[12] The basic principle of audit according to the APO method is a circle of six consecutive elements:

1 an initial planning process including pilot testing of the registration chart
2 the first audit registration
3 individual feedback and follow up group meetings with debate, critical analysis, identification of quality problems and determination of process measures
4 follow up activities, such as workshops, clinical skills courses and clinical training and subsequent implementation
5 a second audit registration
6 the final evaluation.

Details of the APO method have been described elsewhere.[11,12]

Methods

In 1998 all GPs in Ribe County, Denmark (n = 149), were invited to participate in a prospective diabetes audit circle following the principles of the APO method.

The first audit registration period consisted of a 30-day self-registration of relevant diabetes-related process parameters in relation to all consultations with patients with type-2 diabetes. For this purpose a simple pre-printed one-page registration chart was used.[12] The registration chart included information about:

- frequency of controls in patient
- clinical examination of patient (e.g. blood pressure and weight measurement and foot examination)
- laboratory tests (e.g. blood glucose tests, albumin-to-creatinine ratio (A/C ratio) measured within the previous six months, HbA_{1C} test performed within the previous three months and use of dipstick tests for microalbuminuria assessment)
- cardiovascular risk factors (e.g. hypertension, smoking and hypercholesterolaemia)
- present microvascular complications (e.g. neuropathy, nephropathy and retinopathy)
- referral to specialist treatment or control within the previous six months (e.g. by ophthalmologists, endocrinologists in diabetes outpatient clinic and by chiropodist)
- current antidiabetic treatment.

Subsequent data analysis and identification of health quality problems to be improved were followed by individual feedback on baseline performance to GPs. GPs were subsequently offered medical education in terms of four clinical skills courses and workshops led by diabetes specialists. The topics covered by the course activity were: 'diabetes diet', 'health psychology', 'late diabetic complications' and 'second treatment failure in patients with diabetes'.

The following year the audit circle was completed with a second 30-day registration using a similar chart and a final evaluation of the results.

Process measures of diabetes care

Based on the results of the initial registration period the participating GPs agreed that the primary aims of this diabetes audit were to increase the use of HbA_{1C} tests and A/C-ratio measurements, increase the use of microalbuminuria dipstick tests, and the referral of

patients to specialist treatment by ophthalmologists, endocrinologists in diabetes outpatient clinics and by chiropodists.

Data analysis

The GP was the unit of analysis and all analyses were performed on data aggregated at GP level. Process measures of diabetes care from the first and second registration were given as relative frequencies per GP and interquartile range (IQR). For comparison of groups of GPs at baseline the Mann–Whitney *U* test was used. For comparisons of GPs who completed both registrations the Wilcoxon signed rank test was used. Level of significance was 5%. All data analyses were performed using SPSS 11.0.

Results

A total of 45 GPs participated in the first audit registration and 28 of these completed both registrations. The average number of registrations per GP during the 30-day registration periods was 16, ranging from five to 45.

Results of first registration

Results of the baseline diabetes audit registration are shown in Table 1. In general the variation between GPs was considerable, as reflected by wide interquartile ranges.

Table 1 Performance of diabetes care activities among general practitioners in first audit registration

Effect parameters	Relative frequency of effect parameters in GPs at baseline		
	All GPs (n = 45)	GPs participating in first registration only (n = 17)	GPs participating in both registrations (n = 28)
Registrations			
Number of registrations	708	265	443
Mean per GP (range)	16 (5–45)	16 (7–45)	16 (5–30)
Clinical examination % (IQR)			
Blood pressure measured	88.3 (80.9–100)	82.4 (76.0–97.0)	91.8 (84.4–100)*
Weight measured	65.1 (50.0–85.7)	67.0 (50.9–85.7)	63.4 (50.0–86.9)
Inspection of feet	25.1 (5.6–43.1)	26.3 (0–47.5)	24.4 (6.8–43.8)
Laboratory tests % (IQR)			
Blood glucose	95.3 (90.2–100)	93.7 (87.1–100)	96.2 (91.6–100)
Microalbumin dipstick	9.2 (0–11.6)	14.0 (0–26.5)	6.3 (0–10.8)
HbA_{1C} (<3 months)	49.1 (22.8–76.5)	44.8 (16.6–70.1)	51.7 (25.4–88.5)
A/C ratio (< 6 months)	6.2 (0–5.6)	6.3 (0–11.4)	6.3 (0–0)
Specialist treatment < 6 months % (IQR)			
Ophthalmologist	47.0 (22.7–72.1)	44.6 (23.6–71.4)	48.4 (20.6–76.7)
Diabetes outpatient clinic	2.7 (0–4.7)	4.2 (0–7.4)	1.7 (0–0)
Chiropodist	4.8 (0–8.7)	5.3 (0–13.0)	4.5 (0–8.3)

n = number of GPs; IQR = interquartile range; * difference between GPs participating in 1998 registration only and GPs participating in both registrations significant, $P < 0.05$

Comparing GPs ($n = 17$) who only participated in the first audit registration with GPs ($n = 28$) who participated in both registrations, there were no significant differences in any of the process parameters, except a higher frequency of blood pressure measurements in those who completed both registrations. Nor were there any differences in characteristics of patients in the two groups with regard to age, sex, presence of cardiovascular risk factors or microvascular complications.

Comparison of first and second registrations

The changes in relative frequency of process parameters from first to second registration period are shown in Figure 1a, 1b and 1c. These figures and comparisons include only GPs who participated in both registrations ($n = 28$).

Clinical examinations (Figure 1a)

The frequency of blood pressure measurements remained unchanged, whereas non-significant improvement in weight measurements (64% vs 71%) and foot examinations (24% vs 35%) were seen.

Laboratory tests (Figure 1b)

Significant improvements were obtained in the use of microalbuminuria dipstick tests (6% vs 16%), in A/C-ratio measurement (6% vs 15%) and in HbA_{1C} tests (52% vs 67%).

Referral of patients to specialist (Figure 1c)

The increase in referral of patients to control or treatment by ophthalmologists (48% vs 56%), to endocrinologist in diabetes outpatient clinics (2% vs 11%) and to chiropodists (5% vs 24%) was significant.

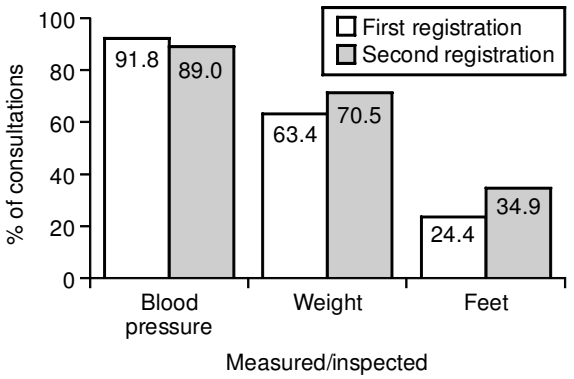

Figure 1a Clinical examinations

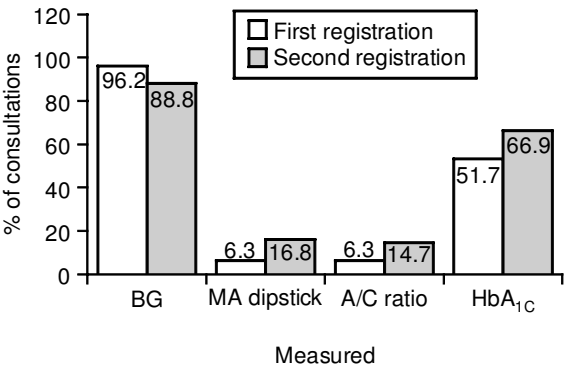

Figure 1b Laboratory tests

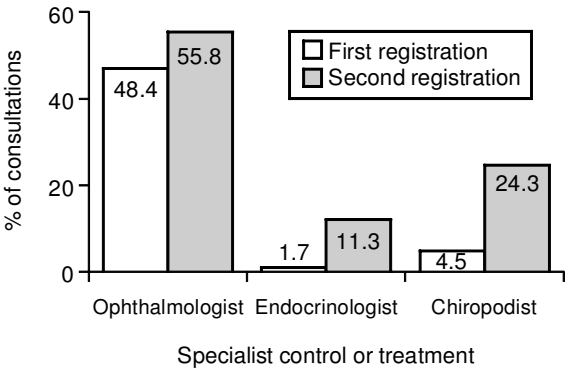

Figure 1c Referral of patients to specialists

Figure 1 Comparison of process parameters in first and second registration among GPs

Discussion

This study demonstrates the efficacy of the APO method in improving diabetes healthcare delivery in general practice.

The assessment of the standard of diabetes healthcare delivery was based on information about commonly used and well accepted quality indicators in relation to clinical examination, blood and urine test and referral of patients to specialists. Results of the first registration period in the APO circle showed major deficiencies in the provision of diabetes care among participating GPs. The performance of GPs was both highly variable and did not meet the standards of care recommended by national and international guidelines.[13,14] These findings are in agreement with several other studies, that have demonstrated how diabetes care in general practice is often unsatisfactory and unstructured.[6,15,16] Assuming that the GPs who volunteered for the first registration period might be particularly interested in diabetes care, this study may even underestimate the

gap between clinical guidelines and delivery of diabetes healthcare in general practice.

Information about diabetes healthcare was obtained by self-registrations from participating GPs, as this procedure is inherent to the APO method. In the present study we had no access to alternative data sources, and hence we were unable to check the accuracy of self-registrations. However, the validity of self-reported audit registrations in general practice has previously been shown to be fairly reliable, and the baseline performance in this study gives us no reason to believe that registrations were biased.[17]

The aims of this audit were not only to establish whether acceptable standards of diabetes care are being met, but also to improve delivery of healthcare.[11,12] GPs who completed the APO circle successfully improved their performance of all process parameters that after the first registration period were selected for improvement. The performance of HbA_{1C} tests and tests for detection of increased urine albumin excretion were both increased, as were referrals to specialist treatment in diabetes outpatient clinics and to chiropodists in particular. In an APO-like study, which included a control group, a Dutch study group obtained similar results on performance of blood pressure, HbA_{1C}, urine albumin and blood lipid measurements.[18] Likewise, an American study group offering an APO-like multifaceted intervention to a smaller group of GPs succeeded in improving adherence to American Diabetes Association (ADA) guidelines for blood pressure measurements, annual eye and foot examinations and HbA_{1C} measurements.[19]

Our study did not include outcome measures for patients with diabetes, as the intervention was targeted solely at GP performance. However, coupling the qualities of the process of care to the effect on patient outcomes seems reasonable. Unstructured care and poor follow up on patients with diabetes have been shown to be associated with worse glycaemic control mortality.[5] A recent Danish randomised controlled trial of structured care in type-2 diabetes has demonstrated how effective regular follow up and individual goal setting for patients supported by prompting, feedback and continuing medical education of doctors can be in reducing several risk factors as well as morbidity and mortality outcomes in individuals with type-2 diabetes.[20]

This study shows that the performance of diabetes care in general practice can be improved by a multifaceted combination of audit, feedback and continuing medical education (CME), such as offered by the APO method. In preventive diabetes care a structured, regular surveillance and control of both risk factors and complications are essential for the long-term outcome. The performance of diabetes care in general practice might reach the standards of hospital outpatient care under very structured or experimental circumstances.[5,20] However, development and passive disseminations of clinical guidelines to GPs do not alone lead to implementation of these in clinical practice, and feedback alone has also proved to be without impact on GPs' behaviour.[15,21,22] It has therefore been proposed that combined interventions are more effective than single ones.[23,24] It is our belief that joining an APO circle with its prolonged CME activities can help the GPs obtain a more systematic structure in the management of diabetes and possibly also other chronic diseases.

As the APO method relies on multifaceted intervention, the impact of the different elements of the APO circle cannot be separated. Frequently mentioned in behavioural studies is the Hawthorne effect (i.e. change of behaviour due to observation), which is often considered to be a threat to accurate evaluation of interventions on physicians' behaviour.[25] The Hawthorne effect may be accounted for by a control group, but only if participants in the control group are unaware that they are being monitored, or by use of an incomplete block study design. However, such studies are complex to design, operate and analyse.[26,27] On the other hand, the Hawthorne effect might be regarded as an intrinsic and important feature of interventions combining audit, feedback and CME, as it might cause an alertness that makes the GPs change their behaviour.

The fact that participating GPs in this APO circle were both willing and self-selected might affect the generalisability of this study to all GPs. The baseline registration revealed no differences in delivery of diabetes care or patient characteristics between GPs who participated in the baseline registration period only and those who completed the whole APO circle, including the second registration. We therefore have reason to believe that the same positive effect would have been obtainable in those who chose to be part of the first registration only.

Conclusion

The quality of diabetes care delivery in general practice is insufficient and highly variable. The APO method is effective in improving standards of diabetes care by changing physicians' practices. Further research is needed to study differences in change of performance between practices and ways to increase participation rates in medical audit.

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ADDRESS FOR CORRESPONDENCE

Christel N Hansen, Audit Project Odense, Research Unit of General Practice, University of Southern Denmark, Winslł wparken 19, 3, DK-5000 Odense C Denmark. Tel: +45 65 50 38 27; fax: +45 65 91 82 96; email: cnohr@health.sdu.dk

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