

Adherence to recommended standards of diabetes care by Swiss primary care physicians

Patrick A. Bovier^a, Paul Sebo^a, Gilbert Abetel^b, François George^c, Hans Stalder^a

^a Medical outpatient clinic, University Hospital of Geneva, Switzerland

^b community-based general internist, Orbe, Switzerland

^c community-based general internist, Geneva, Switzerland

Summary

Objectives: To assess adherence to recommended standards of diabetes care by Swiss primary care physicians.

Methods: Medical files of community-based primary care physician were reviewed to assess adherence to recommended standards of diabetes care. These standards of care were based on a uniform set of definitions addressing medical care processes involved in the detection and follow-up of pre-diabetic and diabetic patients.

Results: 186 physicians agreed to participate and 3,682 medical files were assessed. The prevalence of diabetes was 11% and 5% had impaired glucose tolerance (pre-diabetic). Screening of diabetes based on family or personal history was reported for 83% of the patients and on cardiovascular risk factors for 69%. Counselling for dietary changes was reported for 91% of diabetic patients and for 79% for physical activity, but only for 66% and respectively 60% of pre-diabetic patients. Among diabetic patients, regular HbA_{1c} control

was reported for 65%, yearly fundoscopy for 62%, yearly feet examination for 65%, yearly microalbuminuria control for 49%, regular blood pressure control for 96%, and yearly lipid profile for 89%. Regular screening of microangiopathic complications was reported for only 33% of diabetic patients.

Conclusion: Adherence to recommended standards of diabetes care displayed important variations among this convenience sample of Swiss primary care patients. Screening and counselling of diabetic patients were frequent, whereas counselling for lifestyle changes of pre-diabetic patients and regular follow-up of microangiopathic complications among diabetic patients were suboptimal. These results could help to target areas of diabetes care that need to be addressed to improve adherence to recommended standards.

Key words: quality of care; diabetes care; primary care; quality indicator

Introduction

The management of diabetes mellitus in primary care, with its rising prevalence [1] associated with increasing obesity and sedentary lifestyle worldwide [2–4], has become a priority. It remains a challenging task, because effective interventions have to take into account multiple aspects of care [5–10], and involve a collaborative approach between health professionals [5, 11], patients [12] and communities [13].

Rising attention has also been given to pre-diabetic patients with impaired glucose tolerance, because lifestyle changes have been shown to prevent or delay the onset of diabetes [14–16]. Unfortunately generalising change of lifestyle behaviours in primary care is a complex task, even tough communication skills, such as motivational interviewing, is increasingly perceived as a key element in primary care for chronic diseases [17, 18].

In Switzerland the prevalence of diabetes mellitus is increasing [19]. In 1996 the Swiss Diabetes Foundation conducted a survey based on diabetic patients self-reports [20]. In this convenience sample of 6,392 diabetic patients, HbA_{1c} controls were reported by half of respondents (53%), glycaemic self-controls by 39%, foot examination by 54%, eye examination by 77%, microalbuminuria controls by 13%, blood pressure controls by 92%, and lipid profiles by 15%. Based on these results, the Swiss Diabetes Foundation recommended reinforcing continuing medical education activities for primary care physicians. However, since this first assessment based on diabetic patients self-reports, no further assessment of the adherence to recommended standards of diabetes care by Swiss primary care physicians has been performed.

To overcome this lack of information, we con-

ducted a cross-sectional survey among community-based primary care physicians to measure adherence to recommended standards of diabetes

care, including screening and follow-up of pre-diabetic and diabetic patients.

Materials and methods

Context

In Switzerland, primary care physicians are generally certified as generalists or general internists after a minimum of 5 years of residency for both training programs. Both programs also encourage training periods in outpatient settings for at least 12 months, which can take place in community-based offices or medical outpatient clinics. Most doctors then go into independent community-based practice and are paid on a fee-for-service basis. At the time of the survey, there was no national quality assurance program for diabetes care and no diabetic patients' registry for performance feedback. Electronic health records were also rarely used by primary care physicians.

The majority of patients benefit of a health care plan based on the principle of a patient's free choice of physician ("any-willing provider" or compulsory contracting) and only few patients (<10%) belong to managed care insurance plans. Patients are subject to out-of-pocket costs. They can choose different levels of deductibles for outpatient care (higher deductibles results in lower premium) and have a fixed co-payment for hospital care. Patients with type 2 diabetes are generally taken care by primary care physicians and patients with type 1 diabetes by specialists.

Design, sample and data collection

A cross-sectional assessment was conducted between July and September 2004 in the French-speaking part of Switzerland. The survey included a convenience sample of 186 community-based primary care physicians of the Cantons of Geneva ($n = 93$) and Vaud ($n = 93$). Community-based physicians were recruited by mail or by phone on a voluntary basis. Forty-eight percent were general practitioners ($n = 89$), 46% general internists ($n = 85$), and 6% had no specialty qualification ($n = 12$). Participating community-based physicians represented 15% of all primary care physicians in these two Cantons and their socio-demographic characteristics were similar to non-participating physicians (personal communication of local medical associations). The assessment was based on a uniform set of definitions addressing medical care processes involved in the detection and follow-up of pre-diabetic and diabetic patients (Appendix). Prior to the visit of the research assistants (11 medical students from the University of Lausanne and 11 from the University of Geneva), the participating physicians were asked to keep the medical files of the last 20 consecutive patients that had visited his/her office. During the face-to-face assessment, the participating physicians answered the research assistants' questions according to the information contained in the medical files. Patients' personal information (name, date of birth, address) were not recorded, to insure confidentiality, and medical files were not consulted by the research assistants at any time. The face-to-face interviews lasted approximately 1 hour.

Measures

The questions used to assess adherence to diabetes care standards [21, 22] were based on a list of quality care indicators proposed by a group of English primary care physicians and diabetes specialists [23]. It was adapted to

local recommendations [24] by three senior primary care physicians working at the medical outpatient clinic of the University Hospital of Geneva and then reviewed for criteria consistency and validity by two diabetes specialists working in the same hospital and involved in post-graduate training of community-based primary care physicians.

The first part of the questionnaire was used to identify patients already known as having diabetes or taking anti-diabetic treatment. If this was not the case, patients were categorised as non-diabetic (fasting plasma glucose <6.1 mmol/l or random plasma glucose <7.8 mmol/l), pre-diabetic (fasting plasma glucose ≥ 6.1 mmol/l and <7 mmol/l or random plasma glucose ≥ 7.8 and <11 mmol/l), or diabetic (fasting plasma glucose ≥ 7 mmol/l or random plasma glucose ≥ 11.1 mmol/l), based on available plasma glucose measures performed during the last year.

For non-diabetic patients, questions about screening based on family or personal history (first-degree relative with diabetes, gestational diabetes), and on cardiovascular risk factors (dyslipidaemia, hypertension, overweight) were asked. When family or personal history was positive, the research assistants asked whether the physicians performed a fasting plasma glucose control in the last 3 years, respectively in the last year when cardiovascular risk factors were positive.

For pre-diabetic and diabetic patients, delivery and observance of lifestyle counselling (dietary advice, promotion of daily physical activity, weight loss) were assessed.

For diabetic patients, the following aspects of diabetes care were documented: regular controls of HbA_{1c} (at least 3 times in the last year), glycaemic self-control, self-management of anti-diabetic treatment, yearly fundoscopy (4 times per year whenever abnormal), yearly foot examination with evaluation of paresthesia (follow-up by podologist or pedicure whenever abnormal; feet examination at each medical consultation whenever paresthesia <4/8), yearly microalbuminuria control (treatment with angiotensin-converting enzyme inhibitor or angiotensin II receptor antagonist whenever abnormal), regular blood pressure controls (control at each consultation or lifestyle counselling and/or anti-hypertensive therapy whenever abnormal), yearly lipid profile (control at least 3 times per year or dietary advice and/or lipid lowering therapy whenever abnormal), and vaccinations against influenza (in the last year) and pneumococcal diseases (at least once).

Data analysis

We estimated the prevalence rate of diabetic patients based on reports of diabetes diagnosis in the medical files, current anti-diabetic treatment, and fasting plasma glucose ≥ 7 mmol/l or random plasma glucose ≥ 11.1 mmol/l. We classified patients as pre-diabetic whenever a fasting plasma glucose ≥ 6.1 mmol/l and <7 mmol/l or random plasma glucose ≥ 7.8 and <11 mmol/l was mentioned. All other patients were classified as non-diabetic (patients with normal glycaemia or patients without venous glycaemia performed in the last 12 months. Because several standards of diabetes care refer to medical activities in the last 12 months, we restricted the analyses to diabetic patients who had been cared by their physicians since at least one year.

For each patient's category and corresponding set of quality indicators, we computed the proportion of patients who had received the recommended care. Because we were interested to obtain a global view of the quality of di-

abetes care, we did not explore how patients' or physicians' characteristics would influence the performance of care. These analyses for diabetic patients have been reported in another paper [25].

Results

Over 99% of eligible patient files were reviewed (3,684/3,720). The main reason why patient's charts could not be reviewed was lack of time (6 physicians). The mean age of the patients was 55 years (standard deviation (SD): 20 years) and 59% (2,162/3,684) were women. Community-based physicians were predominantly men (72%, 134/186) and their mean age was 52 years (SD: 8).

Ten percent of the patients were known or treated for diabetes (384/3,684) (figure 1). Only 6 patients had type 1 diabetes. A diagnosis of diabetes was mentioned in 96% of medical files (367/384). In the remaining 3,300 patients, a venous glycaemia performed during the last 12 months was available for 64% (2,097/3,300). Glycaemia was in the normal range for 90%

Figure 1
Prevalence of diabetes among 3,684 Swiss primary care patients.

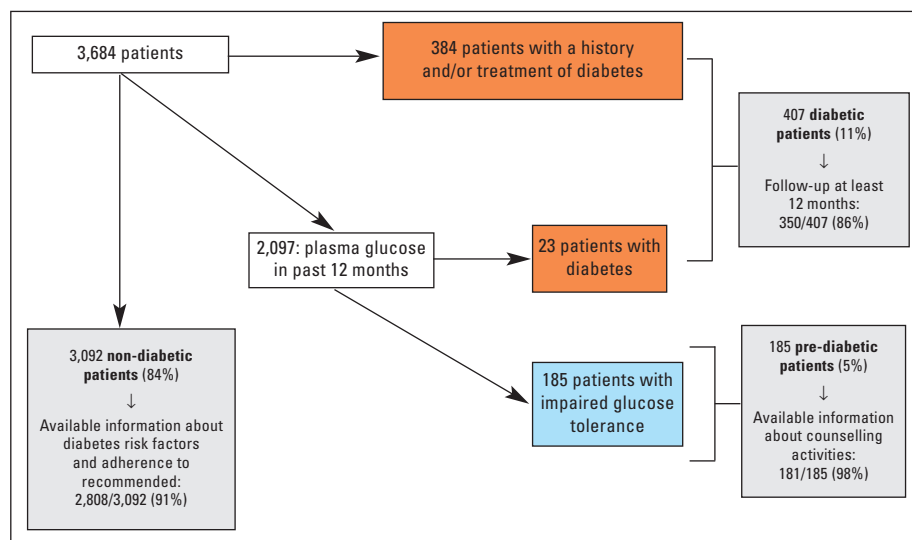


Table 1
Screening of diabetes according to history and cardio-vascular risk factors in non-diabetic patients of Swiss primary care physicians.

	n/N *	%
Family and personal history		
First-degree relative with type 2 diabetes	257/2,808	9
Missing information	473/2,808	17
Gestational diabetes or delivered a baby ≥4 kg	14/1,701	1
Missing information	363/1,701	21
IGT on previous testing [†]	261/2,808	9
Missing information	381/2,808	14
Glycaemic control every 3 years whenever at least 1 of the above criteria is present	394/473	83
Cardiovascular risk factors		
Treated dyslipidaemia or abnormal lipid profile in the last year [‡]	654/2,808	23
Missing information	398/2,808	14
Treated hypertension or blood pressure ≥140/90 mm Hg in the last year	898/2,808	32
Missing information	97/2,808	4
Overweight in the last year [§]	851/2,808	30
Missing information	77/2,808	3
Glycaemic control every year whenever at least 1 of the above criteria is present	1,048/1,512	69

*: n = number of patients with this risk factor, N = number of patients eligible for screening of this risk factor

†: impaired glucose tolerance (random plasma glucose ≥7.8 mmol/l and <11 mmol/l or fasting plasma glucose ≥6.1 mmol/l and <7 mmol/l)

‡: cholesterol >6.5 mmol/l or HDL cholesterol <1 mmol/l or triglycerides >2 mmol/l

§: body mass index ≥25 kg/m², and/or waist circumference >100 cm (men) or 90 cm (women)

Table 2

Reported lifestyle counselling and lifestyle changes in pre-diabetic and diabetic patients of Swiss primary care physicians.

	n/N *	%
Pre-diabetic patients		
Reported counselling for:		
Diet changes	119/181	66
Physical activity increase	108/181	60
Weight loss [†]	62/77	81
Smoking cessation	35/43	81
Reported change for:		
Diet changes	46/181	25
Physical activity increase	108/181	60
Weight loss [†]	10/77	13
Smoking cessation	6/43	14
Diabetic patients followed since at least 12 months		
Reported counselling for:		
Diet changes	316/346	91
Physical activity increase	273/345	79
Weight loss [†]	154/169	91
Smoking cessation	65/68	96
Reported change for:		
Diet changes	170/346	49
Physical activity increase	125/345	36
Weight loss [†]	30/169	18
Smoking cessation	16/68	24

*: n = number of patients with this lifestyle characteristic, N = number of patients eligible for lifestyle counselling

†: for patients with body mass index >30 kg/m², and/or waist circumference >100 cm (men) or 90 cm (women)

(1,889/2,097), in the range of impaired glucose tolerance for 9% (185/2,097), and consistent with diagnosis of diabetes in 1% (23/2,097). Combining these data, the prevalence of diabetic patients was 11% (407/3,684) and of pre-diabetic patients 5% (185/3,684). The remaining patients were considered as non-diabetic (84%, 3,092/3,684). For subsequent analyses, only diabetic patients with a follow-up in the 12 months were considered (86%, 350/407).

Diabetes risk factors and adherence to recommended screening in non-diabetic patients

Due to missing information, only 91% (2,808/3,092) non-diabetic patients could be evaluated for adherence to recommended screening. Seventeen percent of non-diabetic patients (473/2,808) had a positive family or personal history (table 1). A history of first-degree relative with type 2 diabetes or of personal impaired glucose glycaemia was reported for 9% of patients (257/2,808), whereas a history of gestational diabetes was found in less than 1% of all women (14/1,701). Among the 473 patients who had at least one of these risk factors, fasting plasma glucose had been performed in the last 3 years in 83% (394/473) of the cases.

Fifty-four percent (1,512/2,808) had at least one of the following cardiovascular risk fac-

Table 3

Performance of diabetes care by Swiss primary care physicians (for diabetic patients with a follow-up of at least 12 months).

	n/N *	%
Regular HbA _{1c} control (at least 3 times in the last year)	228/349	65
Glycaemic self-control	165/350	47
Self-management of anti-diabetic treatment	182/350	52
Yearly eye examination (fundoscopy)	217/350	62
Abnormal fundoscopy [†]	38/212	18
Regular fundoscopy if abnormal (4 times/year)	10/36	28
Yearly foot examination with pallesthesia	227/350	65
Abnormal foot examination [†]	49/223	22
Follow-up by podologist or pedicure if abnormal	28/43	65
Foot control at each consultation if pallesthesia <4/8	18/37	49
Yearly microalbuminuria control	171/348	49
Microalbuminuria [§]	33/169	20
ACEF [‡] and/or ARA if persistent microalbuminuria [¶]	24/32	75
Regular blood pressure control (4 times/year)	335/350	96
Hypertension [#]	190/332	57
BP control at each consultation if hypertension	176/193	91
Lifestyle counselling and/or anti-hypertensive drug if persistent hypertension**	165/186	89
Yearly lipid profile	310/350	89
Dyslipidaemia ^{††}	125/307	41
Dietary advice and/or lipid lowering drug if dyslipidaemia	116/124	94
Regular lipid profile if dyslipidaemia (at least 3 times/year)	65/124	52
Vaccination		
Influenza (in the last 12 months)	288/350	83
Pneumococcal diseases (at least once)	98/350	28

*: n = number of patients for who this process of diabetes care has been performed, N=number of patients eligible for this process of diabetes care.

†: pre-proliferative retinopathy or more severe stage.

‡: callus, ulcers, absence of pedal pulses, pallesthesia <4/8.

§: albumin-to-creatinine ratio in a non-timed urine specimen ≥2.5 µg/µmol (men) and 3.5 µg/µmol (women), or 24-hour urine albumin >30 mg.

‡: angiotensin-converting enzyme inhibitor, angiotensin II receptor antagonist.

¶: ≥2 abnormal values (cf. §).

#: >130/80 mm Hg in the last year.

** : ≥3 abnormal values in the last year.

††: ≥2 of the following criteria: total cholesterol >5 mmol/l, total cholesterol / HDL cholesterol >5 mmol/l, LDL cholesterol >3 mmol/l.

tors: hypertension (32%, 898/2,808), overweight (30%, 851/2,808), dyslipidaemia (23%, 654/2,808). Among the 1,512 patients who had at least one of these cardiovascular risk factors, fasting plasma glucose had been performed in the last year in 69% (1,048/1,512) of the cases.

Screening of diabetes based on both family or personal history and/or cardiovascular risk factors was reported for 71% (1,202/1,695) of patients.

Delivery of lifestyle counselling to pre-diabetic and diabetic patients

Information about counselling activities was available for 98% (181/185) of pre-diabetic patients and 99% (346/350) of diabetic patients (table 2). Lifestyle counselling tended to be delivered more often to diabetic patients than pre-diabetic patients (figure 2A), in spite of similar prevalence of overweight and active smoking (49% *vs* 43% and 20% *vs* 24% respectively). Counselling for both dietary changes and physical activity increase was reported for 52% (94/181) of pre-diabetic patients and for 75% (260/345) of diabetic patients. Adherence to counselling was more frequent among pre-diabetic patients for physical activity increase and among diabetic patients for dietary advices (figure 2B).

Adherence to recommended standards for diabetic patients

Regular HbA_{1c} control, yearly funduscopy and feet examination were reported in less than two thirds of the patients and microalbuminuria control in less than half (table 3). In one fifth of these patients funduscopy, feet examination or microalbuminuria control was abnormal. A specific treatment was reported in most patients with microalbuminuria, whereas only 28% (10/36) of patients with retinopathy had a regular follow-up. Regular screening for all three microangiopathic complications (annual eye, foot and renal controls) was reported for only 32% (112/348). In contrast, regular blood pressure and yearly lipid controls were reported for 96% (335/350) and 89% (310/350) of the patients. Fifty-seven percent (190/332) had hypertension and 41% (125/307) dyslipidaemia. Approximately 90% of the patients had received specific advices and/or treatment for these two conditions. Vaccination against influenza was reported for 83% (288/350) of the patients and against pneumococcal diseases for 28% (98/350).

Discussion

Our study is to our knowledge the first to report how Swiss primary care physicians adhere to recommended standards of diabetes care, based on data obtained from medical files. Screening of non-diabetic patients was frequently performed by community-based physicians, but could be improved by a more systematic documentation of family and personal history and of lipid profile. Lifestyle counselling tended to be more systematically delivered to diabetic patients, especially dietary changes and physical activity increase. Reported diet changes were more frequent for diabetic patients, whereas reported increase of physical activity was more frequent for pre-diabetic patients. Because of the evidence that lifestyle change may delay the onset of diabetes [15], monitoring how primary care physicians implement these ad-

vices could be of great value for the community. Successful counselling for weight loss and smoking cessation were modest. This is not a surprise, as specific communication skills are essential to change of lifestyle behaviours and are not systematically taught during post-graduate training in Switzerland.

For diabetic patients, compared to the previous work performed by the Swiss Diabetes Foundation in 1996 and based on diabetic patients self-reports [20], several aspects of care improved. HbA_{1c} controls were more frequently reported in our survey (past survey: 53% *vs* current survey: 65%), as well as glycaemic self-controls (39% *vs* 47%), microalbuminuria controls (13% *vs* 49%), lipid profiles (15% *vs* 89%) and foot examination (54% *vs* 65%), whereas eye examination was less

Figure 2
Differences in reported lifestyle counselling and lifestyle changes between pre-diabetic and diabetic patients of Swiss primary care physicians (black bars: pre-diabetic patients; grey bars: diabetic patients).

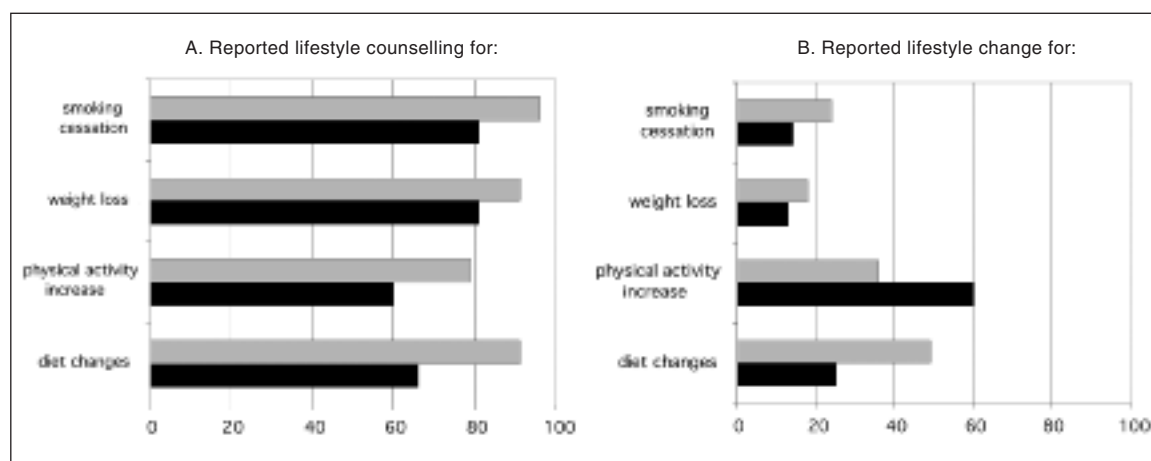


Table 4

Variations in process of diabetes care in different primary care settings.

	HbA _{1c} screen %	Foot screen %	Renal screen %	Eye screen %	Lipid screen %	Quitting advice to smoker %
Self-reported care by Swiss patients, 1995 (n = 6392) [20]	53	54	13	77	15	–
Swiss primary care practitioners, 2004 (n = 186)	65	65	49	62	89	91
British primary care physicians (495 practices) [30]	73	68	66	68	38	–
American primary care physicians (n = 7) [31]	20–37	15–47	30–39	21–33	43–50	35
Veteran Affairs medical centres (n = 109) [26]	94	87	75	69	81	–
Indian health service, New Mexico, USA [27]	55–80	59–61	81–84	55–56	80–85	–

frequently reported (77% *vs* 62%). Blood pressure controls remained almost systematically performed (92% *vs* 96%). The prevalence of smoking increased slightly (17% *vs* 20%), whereas overweight and hypertension sharply increased (13% *vs* 49% and respectively 15% *vs* 57%). Finally the prevalence of complications also tended to increase (retinopathy: 16% *vs* 18%, nephropathy: 6% *vs* 20%). However, as these data have collected using different methods (diabetic patients self-reports *vs* medical files review), these differences must be interpreted with caution.

When compared to other countries, the performance of care for Swiss diabetic patients in 2004 was generally high (table 4). Based on our results Swiss primary care physicians exceed American and British primary care physicians, in the absence of disease or case management programs, diabetic patients registries, mandatory audits, or electronic health records. Better results have been reported by Veteran Affairs medical centres [26] and the Indian Health Service [27], but both systems rely on a central “command and control” style made at the highest levels of the health organisation that permeated down to individual physicians. In the absence of such systems in Switzerland, we hypothesised that continuing medical education played an important role for attaining these high levels of performance over the last decade.

Even though regular screening for microangiopathic complications (annual eye, foot and renal screening) was not systematically performed, the performance of this sample of Swiss primary care physicians was much better than their American peers. We believe that these results reflect, among other possible cause, the low use of disease and case management for diabetes care by Swiss primary care physicians. Only some local pilot projects have tried to implement case managements, with encouraging results [28, 29]. Ward et al. [26] found also higher levels of physicians adherence to diabetes guidelines when communication between nurses and doctors was efficient, when educational programs were used, and when a respected physician had been designated to locally implement diabetes guidelines. The same authors also found that regular feedback on quality of care had a favourable influence. However, implementation of these measures in our country may be difficult

because of the reluctance of some primary care physicians to transfer the coordination of care to another health professional.

Finally, community-based physicians should be commended for their excellent immunisation rates of diabetic patients against influenza, which reflects their increasing involvement in promoting its use with the support of the national health authorities.

Limitations and strengths

Our study has several limitations. First, community-based primary care physicians were not selected at random. As physicians volunteered for this project, it is not possible to determine a true refusal rate. Furthermore preferential participation by physicians with a special interest in diabetes care cannot be excluded. Even though according to the medical association (personal communication), the socio-demographic profile of participating physicians was similar in terms of age, sex and specialty to non-participating physicians, we probably selected more dedicated and more conscientious primary care physicians compared to those who declined to take part to this study. Therefore the estimates we have obtained are probably a “best case” scenario. Second, we cannot exclude that some physicians gave the “desirable” answer and thus introduced a response bias, because the interviewers completed the questionnaires according to the physicians’ answers without checking the information in the patient’s file. We also believe that this source of bias was unlikely because medical students had only little medical knowledge about diabetes care, which helped to create a confident atmosphere during the interviews and minimise response bias. Third, classification bias due inter-observer variability remains possible, as 22 different people conducted the interviews. We tried to minimise this source of variation with the use of a structured questionnaire with explicit criteria, specific training sessions (4 hours), and detailed written instructions for each item. Finally we conducted this survey in a defined region of Switzerland and therefore these results do not necessarily reflect the situation in the other regions of the country.

Finally, it should be noted that the study and its questionnaire were remarkably well accepted,

as over 99% of eligible patients' files were reviewed. Moreover, data were collected from a large sample of community-based providers, representing a large group of outpatients. We were therefore able to explore how recommended standards were applied in non-diabetic, pre-diabetic and diabetic patients, obtaining a global view of all aspects of diabetes care.

Conclusion

Adherence to recommended standards of diabetes care displayed important variations among this convenience sample of Swiss primary care patients. Screening and counselling of diabetic patients were frequently reported, whereas counselling for lifestyle changes of pre-diabetic patients and regular screening of microangiopathic complications among diabetic patients were suboptimal. These results could help to target areas of diabetes care that need to be addressed to improve adherence to recommended standards.

The authors would like to thank Professors Jacques Philippe and Alain Golay who served as diabetes experts to validate the set of definitions addressing medical care processes involved in the detection and follow-up of pre-diabetic patients and diabetic patients, P. de Vevey, MD, president of the primary care physicians association of Canton of Vaud, for his support to identify community-based physicians eligible for this project, all the primary care practitioners who accepted to participate in this project, the medical students of the University of Lausanne and Geneva who conducted the interviews of community-based physicians, and Paola d'Ippolito, RN, who conducted the interviews of the residents.

Correspondence:

Patrick A. Bovier, MD
 Division of Primary Care Medicine
 Geneva University Hospital
 24 rue Micheli-du-Crest
 CH-1211 Geneva 14
 Switzerland
 E-Mail: patrick.bovier@hcuge.ch

References

- Roglic G, Unwin N, Bennett PH, Mathers C, Tuomilehto J, Nag S, et al. The burden of mortality attributable to diabetes: realistic estimates for the year 2000. *Diabetes Care*. 2005;28:2130-5.
- Prentice AM. The emerging epidemic of obesity in developing countries. *Int J Epidemiol*. 2005.
- Lyratzopoulos G, McElduff P, Heller RF, Hanily M, Lewis PS. Comparative levels and time trends in blood pressure, total cholesterol, Body Mass Index and smoking among Caucasian and South-Asian participants of a UK primary-care based cardiovascular risk factor screening programme. *BMC Public Health*. 2005;5:125.
- Haslam DW, James WP. Obesity. *Lancet*. 2005;366:1197-209.
- Renders CM, Valk GD, Griffin S, Wagner EH, Eijk JT, Assendelft WJ. Interventions to improve the management of diabetes mellitus in primary care, outpatient and community settings. *Cochrane Database Syst Rev*. 2001:CD001481.
- Stevenson K, Baker R, Farooqi A, Sorrie R, Khunti K. Features of primary health care teams associated with successful quality improvement of diabetes care: a qualitative study. *Fam Pract*. 2001;18:21-6.
- Rundall TG, Shortell SM, Wang MC, Casalino L, Bodenheimer T, Gillies RR, et al. As good as it gets? Chronic care management in nine leading US physician organisations. *BMJ*. 2002;325:958-61.
- Bodenheimer T, Lorig K, Holman H, Grumbach K. Patient self-management of chronic disease in primary care. *JAMA*. 2002;288:2469-75.
- Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. *JAMA*. 2002;288:1775-9.
- Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness: the chronic care model, Part 2. *JAMA*. 2002;288:1909-14.
- Olivarius NF, Beck-Nielsen H, Andreassen AH, Horder M, Pedersen PA. Randomised controlled trial of structured personal care of type 2 diabetes mellitus. *BMJ*. 2001;323:970-5.
- Ellis SE, Speroff T, Dittus RS, Brown A, Pichert JW, Elasy TA. Diabetes patient education: a meta-analysis and meta-regression. *Patient Educ Couns*. 2004;52:97-105.
- Horowitz CR, Williams L, Bickell NA. A community-centered approach to diabetes in East Harlem. *J Gen Intern Med*. 2003;18:542-8.
- Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med*. 2002;346:393-403.
- Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalainen H, Ilanne-Parikka P, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med*. 2001;344:1343-50.
- Tuomilehto J, Lindstrom J. The major diabetes prevention trials. *Curr Diab Rep*. 2003;3:115-22.
- Channon S, Huws-Thomas MV, Rollnick S, Gregory JW. The potential of motivational interviewing. *Diabet Med*. 2005;22:353.
- Rollnick S, Butler CC, McCambridge J, Kinnersley P, Elwyn G, Resnicow K. Consultations about changing behaviour. *BMJ*. 2005;331:961-3.
- Morabia A, Costanza MC. The obesity epidemic as harbinger of a metabolic disorder epidemic: trends in overweight, hypercholesterolemia, and diabetes treatment in Geneva, Switzerland, 1993-2003. *Am J Public Health*. 2005;95:632-5.
- Groupe de travail de la fondation de l'Association Suisse du Diabète. La déclaration de St. Vincent: une enquête sur la prise en charge des diabétiques en Suisse. *Bull Med Suisse*. 1996;77:628-35.
- Standards of medical care for patients with diabetes mellitus. *Diabetes Care*. 2003;26 Suppl. 1:S33-50.
- Connor H, Annan F, Bunn E, Frost G, McGough N, Sarwar T, et al. The implementation of nutritional advice for people with diabetes. *Diabet Med*. 2003;20:786-807.
- Freeman A, Hall M. Diabetes mellitus. In: Marshall M, Campbell S, Hacker J, Roland M. Quality indicators for general practice. Glasgow, Royal Society of Medicine Press Ltd., 2002:38-45.
- Kuntschen F, Rohrer-Theus A. La prise en charge moderne du diabète de type 2. *Bull Med Suisses*. 2000;81:1405-6.
- Sebo P, Abetel G, Stalder H, Bovier P. Importance of lifestyle counselling by primary care physicians for diabetic patients. *Swiss Med Wkly*. 2006;136:566-73.
- Ward MM, Yankey JW, Vaughn TE, BootsMiller BJ, Flach SD, Welke KF, et al. Physician process and patient outcome measures for diabetes care: relationships to organizational characteristics. *Med Care*. 2004;42:840-50.
- Acton KJ, Shields R, Rith-Najarian S, Tolbert B, Kelly J, Moore K, et al. Applying the diabetes quality improvement project indicators in the Indian Health Service primary care setting. *Diabetes Care*. 2001;24:22-6.
- Tschopp JM, Frey JG, Pernet R, Burrus C, Jordan B, Morin A, et al. Bronchial asthma and self-management education: implementation of Guidelines by an interdisciplinary programme in health network. *Swiss Med Wkly*. 2002;132:92-7.

- 29 Kleiber-Noth H, Steyaert G, Huard P. Another way to take care of diabetic patients: diabetic pathway "diabaide". *Rev Med Suisse*. 2005;1:1511-4.
- 30 Khunti K, Baker R, Rumsey M, Lakhani M. Quality of care of patients with diabetes: collation of data from multi-practice audits of diabetes in primary care. *Fam Pract*. 1999;16:54-9.
- 31 Kirkman MS, Williams SR, Caffrey HH, Marrero DG. Impact of a program to improve adherence to diabetes guidelines by primary care physicians. *Diabetes Care*. 2002;25:1946-51.

Appendix

Questionnaire used to assess adherence to recommended standards of diabetes care.

1. Patient known for a diagnosis and/or treatment of diabetes?	YES ¹ (go to 2, then 13)	NO ² (go to 4)
2. Diagnosis mentioned in the medical file?	YES ¹	NO ²
3. Blood glucose test in the past 12 months?	YES ¹ (go to 4)	NO ² (go to 5)

	Fasting plasma glucose <6.1 mmol/l or random plasma glucose <7.8 mmol/l	Fasting plasma glucose ≥6.1 and <7 mmol/l or random plasma glucose	Fasting plasma glucose ≥7 mmol/l or random plasma glucose ≥11.1 mmol/l ≥7.8 and <11.0 mmol/l
4. Categorise the patient according to the plasma blood glucose value:	1 (go to 5)	2 (go to 13)	3 (go to 13)

Screening

5. Family history of first-degree relative with non-insulin dependent diabetes mellitus.	YES ¹	NO ²	unknown ³
6. Personal history of fasting plasma glucose ≥6.1 and <7 mmol/l or random plasma glucose ≥7.8 and <11.0 mmol/l.	YES ¹	NO ²	unknown ³
7. For woman, personal history of gestational diabetes or delivery of a baby ≥4 kg.	YES ¹	NO ²	unknown ³
8. In case of any positive answer to questions 5-7, plasma fasting glucose performed in the last 3 years?	YES ¹	NO ²	unknown ³
9. Treated dyslipidaemia or abnormal lipid profile in the last 12 months (cholesterol >6.5 or HDL cholesterol <1.0 or triglycerides >2.0).	YES ¹	NO ²	unknown ³
10. Treated hypertension or blood pressure ≥140/90 mm Hg in the last 12 months.	YES ¹	NO ²	unknown ³
11. Body mass index ≥25 kg/m ² , and/or waist circumference >100 cm (man) or 90 cm (woman).	YES ¹	NO ²	unknown ³
12. In case of any positive answer to questions 9-11, plasma fasting glucose performed in the last 12 months?	YES ¹	NO ²	unknown ³

In case of a negative answer to question 1, stop the questionnaire here (non-diabetic patient).

Lifestyle counselling for pre-diabetic and diabetic patients	discussed with the patient		change achieved		
13. Change in diet and/or follow-up by a dietician.	YES ¹	NO ²	YES ¹	NO ²	unknown ³
14. Daily physical activity of 20-30 minutes.	YES ¹	NO ²	YES ¹	NO ²	unknown ³
15. Losing weight whenever body mass index ≥30 kg/m ² and/or waist circumference >100 cm (man) or >90 cm (woman).	YES ¹	NO ²	YES ¹	NO ²	unknown ³
16. For active smoker, smoking cessation	YES ¹	NO ²	YES ¹	NO ²	unknown ³

In case of answer to question 5 = 2, stop the questionnaire here (pre-diabetic patient).

Otherwise carry on with the following questions (diabetic patient).

Diabetic patient care	abnormal			
17. Follow-up for at least 12 months.	YES ¹	NO ²		
18. Regular controls of HbA _{1c} (at least 3 times in the last 12 months).	YES ¹	NO ²		
19. Glycaemic control by the patient.	YES ¹	NO ²		
20. Management of anti-diabetic treatment by the patient.	YES ¹	NO ²		
21. Yearly funduscopy. (abnormal: pre-proliferative retinopathy or more severe stage according to ophthalmologist)	YES ¹	NO ²	YES ¹ (go to 22)	NO ² (go to 23)
22. Control every 3 months in case of abnormal funduscopy.	YES ¹	NO ²		
23. Yearly foot examination with evaluation of pallesthesia. (abnormal: callus, bony deformity, ulcers, absent pedal pulses, pallesthesia <4/8)	YES ¹	NO ²	YES ¹ (go to 24-25)	NO ² (go to 26)
24. Follow-up by podologist or pedicure whenever abnormal.	YES ¹	NO ²		
25. Feet examination at every medical consultation whenever pallesthesia <4/8.	YES ¹	NO ²		

26. Yearly microalbuminuria control. (abnormal: non-timed urine specimen: albumin-to-creatinine ratio ≥ 2.5 [mg/mmol] (man) or ≥ 3.5 [mg/mmol] (woman) or 24-hour urine albumin >30 mg)	YES ¹	NO ²	YES ¹ (go to 27)	NO ² (go to 28)
27. Treatment with angiotensin-converting enzyme inhibitor or angiotensin II receptor antagonist whenever abnormal (at least two values).	YES ¹	NO ²		
28. Regular blood pressure control at least 4 times per year. (abnormal: $>130/80$)	YES ¹	NO ²	YES ¹ (go to 29-30)	NO ² (go to 31)
29. Control at every medical consultation whenever abnormal.	YES ¹	NO ²		
30. Lifestyle counselling and/or anti-hypertensive therapy whenever at least 3 measures $>130/80$ in the past 12 months.	YES ¹	NO ²		
31. Yearly lipid profile. (Abnormal when at least two of the following criteria are present: cholesterol >5.0 mmol/l, ratio total chol. / HDL cholesterol >5.0 mmol/l or LDL cholesterol >3.0 mmol/l)	YES ¹	NO ²	YES ¹ (go to 32-33)	NO ² (stop)
32. Lifestyle counselling and/or lipid lowering therapy whenever abnormal.	YES ¹	NO ²		
33. Control every 3-4 months whenever abnormal.	YES ¹	NO ²		