Randomised controlled trial of patient centred care of diabetes in general practice: impact on current wellbeing and future disease risk

Ann Louise Kinmonth, Alison Woodcock, Simon Griffin, Nicki Spiegal, Michael J Campbell on behalf of the Diabetes Care from Diagnosis Research Team

Primary Medical Care Group (Aldermoor Health Centre), Faculty of Health, Medicine and Biological Sciences, University of Southampton, Southampton SO16 5ST
Ann Louise Kinmonth, *professor*
Alison Woodcock, *senior research fellow*
Simon Griffin, *Wellcome training fellow*

Willowbank, Spicers, Ashdell Park, Alton, Hampshire GU34 2SJ
Nicki Spiegal, *management consultant*

Medical Statistics and Computing, Faculty of Health Medicine and Biological Sciences, University of Southampton
Michael J Campbell, *senior lecturer in medical statistics*

Correspondence to: Professor Ann Louise Kinmonth, General Practice and Primary Care Research Unit, Institute of Public Health, University Forvie Site, Cambridge CB2 2SR

alk25@medschl.cam.ac.uk

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Abstract

Objective To assess the effect of additional training of practice nurses and general practitioners in patient centred care on the lifestyle and psychological and physiological status of patients with newly diagnosed type 2 diabetes.

Design Pragmatic parallel group design, with randomisation between practice teams to routine care (comparison group) or routine care plus additional training (intervention group); analysis at one year, allowing for practice effects and stratifiers; self reporting by patients on communication with practitioners, satisfaction with treatment, style of care, and lifestyle.

Setting 41 practices (21 in intervention group, 20 in comparison group) in a health region in southern England.

Subjects 250/360 patients (aged 30-70 years) diagnosed with type 2 diabetes and completing follow up at one year (142 in intervention group, 108 in comparison group).

Intervention 1.5 days' group training for the doctors and nurses—introducing evidence for and skills of patient centred care and a patient held booklet encouraging questions.

Main outcome measures Quality of life, wellbeing, haemoglobin A_{1c} and lipid concentrations, blood pressure, body mass index (kg/m^2).

Results Compared with patients in the C group, those in the intervention group reported better communication with the doctors (odds ratio 2.8; 95% confidence interval 1.8 to 4.3) and greater treatment satisfaction (1.6; 1.1 to 2.5) and wellbeing (difference in means (d) 2.8; 0.4 to 5.2). However, their body mass index was significantly higher (d = 2.0; 0.3 to 3.8), as were triglyceride concentrations (d = 0.4 mmol/l; 0.07 to 0.73 mmol/l), whereas knowledge scores were lower (d = −2.74; −0.23 to −5.25). Differences in lifestyle and glycaemic control were not significant.

Conclusions The findings suggest greater attention to the consultation process than to preventive care among trained practitioners; those committed to achieving the benefits of patient centred consulting should not lose the focus on disease management.

Introduction

It is well understood that doctors and nurses do not deal with diseases alone but with individuals who are ill or concerned about their health.[1] A "patient centred" clinical method recognises this and specifically teaches practitioners ways of integrating the patients' perspectives with the consultation.[2 3]

When this integrated approach is achieved processes and outcomes of care can improve.[4] Outcomes studied include satisfaction,[5] anxiety,[6 7] adherence to treatment,[7] symptom resolution,[4] and physiological and functional status.[8] Most studies have been in secondary care and have integrated patients' concerns by direct coaching of patients.[5 8] A Medline search (1966-96) identified no trials of increased patient involvement in primary care through training programmes for practitioners that measured both disease and patient centred outcomes. We evaluated a practical programme for primary care practitioners to use with patients with newly diagnosed type 2 diabetes.

The hypothesis was that additional training for practitioners in a patient centred approach would lead to better communication between patient and practitioner, healthier lifestyle choices, and improved clinical, social, and psychological outcomes among patients during their first year with diabetes, compared with routine care.

Methods

Assignment and masking

The hypothesis was tested in a pragmatic trial with initial stratified random allocation of practices by computer to two groups—one trained to give patient centred care (intervention group) and a comparison group trained to give routine care (fig 1). Practice teams agreed to randomisation to "different approaches to early diabetes care." Assessment of patients was by research nurses, also unaware of the groups. The trial was conducted within a wider study of the incidence and presentation of type 2 diabetes.

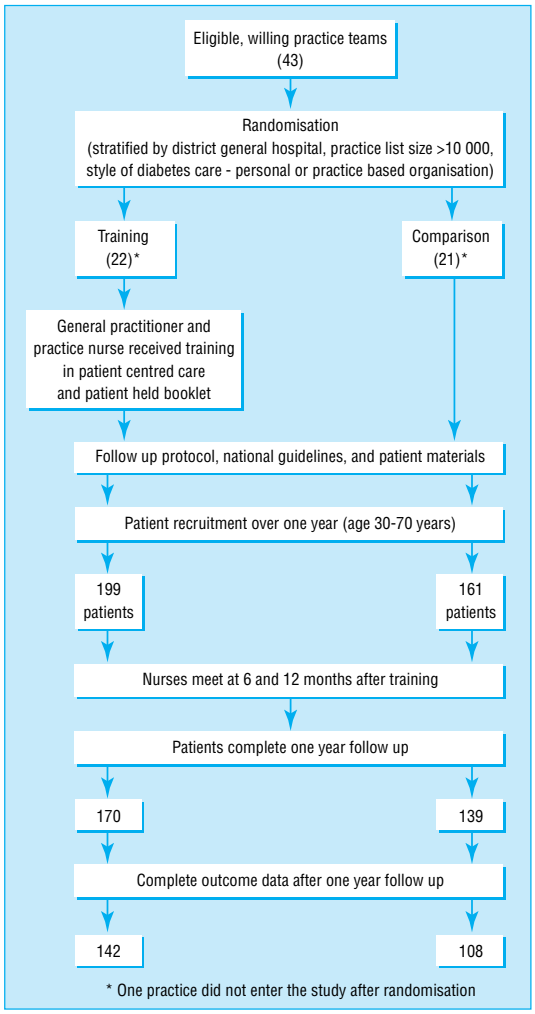


Fig 1 Study design

Protocol

Setting

The study comprised 41 practices (mid-study list size 455 566) in Wessex, a health region in southern England; 21 practices were randomised to the intervention group and 20 to the comparison group.

Recruitment of practice teams

Inclusion criteria were: ⩾4 medical partners; list size >7000; a diabetes register with >1% of practice population; and a diabetes service registered with the health authority. In all, 245/467 (52%) of all practice teams were eligible. Forty three practice teams were recruited.[9] Immediately after randomisation, one practice in each group dropped out because of unexpected commitments. Results are presented for the 41 practice teams who began recruiting patients. Teams in the intervention practices had a total of 23 doctors and 32 nurses; teams in the comparison practices had 20 doctors and 32 nurses. At least one doctor and one nurse from each intervention practice received training.

Recruitment of patients

For 12 months nurses reported all new cases of diabetes, as defined by the doctor, to the trial office. Willing patients aged 30-70 years were included in the trial. Patients were excluded if they were private patients, housebound, mentally ill, had severe learning difficulties, or were subsequently found to have been diagnosed previously with, or not to have, diabetes, or were found to have type 1 diabetes. Patients signed two consent forms—one near the time of diagnosis allowing the practice to release anonymised clinical information, and the second later on, agreeing to the collection of clinical and psychological data by questionnaire.

Approaches to care

The two approaches to care were developed in collaboration with practice teams and patients. Care was based on national guidelines[10 11] and materials for patients,[12] with (intervention group) or without (comparison group) additional training in patient centred care. Nurses in the intervention group were offered half a day's training to review the evidence for patient centred consulting and a further full day in which to practise the skills learned, with an experienced facilitator throughout. Doctors received only the first half day's training. Skills included active listening and negotiation of behavioural change. Materials produced for the intervention group included a booklet for patients, *Diabetes in your Hands* (which encouraged patients to ask questions), an optional leaflet for patients encouraging discussion of complications and concerns, and a booklet for practitioners describing approaches to behaviour change.

During two further half day support sessions with the facilitator, nurses reviewed their skills and attitudes in the light of experience (fig 1). Nurses in the comparison group were offered similar support sessions focusing on use of guidelines and materials.[10–12] The training programme and its evaluation by practitioners has been described.[9]

Measures

Baseline and one year clinical data, including details of prescriptions, were provided by nurses from clinical notes; research nurses and project staff collected one year data from patients and practitioners, by questionnaire and home interviews, and measures of height, weight, and blood pressure. The baseline measures for practices, practitioners, and patients are summarised in the table: there were no significant differences between groups for important baseline variables at these 3 levels; practitioners reported slightly greater confidence in managing diabetes than the average person in their profession.[13] A minority of patients attended hospital for diabetes education in both groups.

Processes measured comprised use of skills and materials; patients' ratings of communication with doctors and nurses (covering the ability to tell the doctor or nurse personal or troubling things and feeling understood); satisfaction with treatment[14] and style of care; agreement between patient and practitioner on main concerns over the previous year; perceived control of diabetes[14]; and patient knowledge (covering critical areas of self care—such as diet and avoidance of hypoglycaemia and complications—and monitoring skills).

Principal outcomes included lifestyle, blood glucose control, and psychological status. Lifestyle was assessed by self report measures.[15–17]

Clinical status was determined by percentage of glycated haemoglobin (haemoglobin A_{1c} ion exchange chromatography; reference range 4.68-6.80%), total plasma cholesterol concentration (cholesterol oxidase), plasma triglyceride concentration (glycerol phosphate-oxidase), height (Harpenden pocket stadiometer), weight (Seca 835 electronic scales), systolic and diastolic blood pressure (Omron electronic), and ratio of urinary albumin and creatinine (immunoturbidometric assay and modified Jaffé reaction). Smoking status was reported to research nurses and confirmed by determining urinary cotinine concentration (commercial immunoassay kit).

We used several measures of functional and psychological status (see fig 4). The audit of diabetes dependent quality of life (ADDQoL) measures the perceived impact of diabetes on different areas of patients' lives, weighted by importance to the individual.[14] The wellbeing questionnaire[14] excludes somatic symptoms, which can overlap with symptoms of uncontrolled diabetes.

Some of the above measures were developed for the study, others were modified from published sources. Details are available from the authors.

Validation and quality assurance

Postal questionnaires were piloted (report to the British Diabetic Association, 1996). Research nurses were trained in interviewing using videotaping. Measurement errors in height, weight, and blood pressure between and within observers were assessed before and after the study and were small. Patients were allocated to research nurses in equal proportions across the two groups. Biochemical tests were carried out in a single laboratory. Ethical approval was obtained in eight districts of the region.

Statistical analysis and sample size

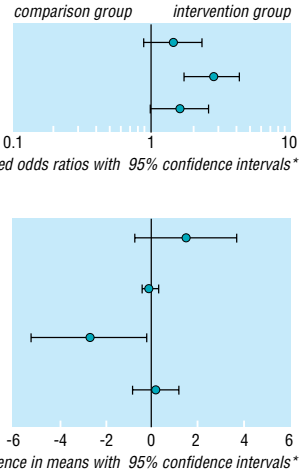
With 80% power and 95% confidence, 100 patients in each group allowed detection of 20% difference in dietary change[16] and 1% (SD 2.22%) difference in haemoglobin A_{1c}.[8] Practice numbers were based on

Baseline comparisons for practices, practitioners, and patients

Variable	Intervention group	Comparison group	Difference	Significance (P value)
Practices' characteristics				
No of practices	21	20		
Mean list size	10 715	11 528	–813	0.43*
% (No) of practices with list size over 10 000 patients	52 (11)	60 (12)	–7.6	0.62†
% (No) of practices with designated GP and nurse providing diabetes care (throughout year)	19 (4)	30 (6)	–10.9	0.41†
Nurse rating of strength of association (%) between blood glucose and development of complications§:				
Mean (range)	83.3 (39.0-100.0)	86.4 (59.5-100.0)	–3.1	0.44‡
No of nurses	32	32		
GPs' rating of strength of association (%) between blood glucose and development of complications§:				
Mean (range)	73.5 (38.5-100.0)	79.3 (50.0-100.0)	–5.8	0.18‡
No of doctors	22	20		
Nurse confidence in managing diabetes compared with peers (scale 1-5¶):				
Mean (range)	3.72 (1-5)	3.94 (2-5)	–0.22	0.53‡
No of nurses	32	32		
GPs' confidence in managing diabetes compared with peers (scale 1-5¶):				
Mean (range)	3.77 (2-5)	4.00 (3-5)	–0.23	0.30‡
No of doctors	22	20		
No of nurses' training days in diabetes in past 5 years**:				
Mean (range)	14.5 (1-70)	12.0 (0-35)	2.5	0.61‡
No of nurses	29	17		
No of GPs' diabetes training days in diabetes in past 5 years**:				
Mean (range)	4.03 (0-30)	3.94 (0-20)	0.09	0.90‡
No of doctors	19	17		
Patients' characteristics				
No of patients	142	108		
Mean (range) age (years)	57.9 (30.7-71.0)	57.4 (33.5-70.6)	0.5	0.66*
% (No) of men	59 (83/142)	60 (65/108)	–1.7	0.78†
% (No) in manual social class	52 (72/139)	53 (56/106)	–1.0	0.87†
% (No) employed (*v* unemployed, retired, housewife)	35 (50/141)	38 (41/108)	–5.4	0.38†
% (No) with partner or spouse (*v* unmarried, widowed, separated, divorced)	82 (115/141)	79 (85/108)	2.9	0.57†
% (No) diagnosed by GP	84 (118/141)	86 (92/107)	–2.3	0.62†
% (No) with history of ischaemic heart disease	12 (17/142)	17 (18/106)	–5.0	0.26†
% (No) of current smokers (report to practice nurse)	22 (31/142)	21 (22/103)	0.4	0.93†
Mean (range) body mass index (kg/m^2)	30.6 (18.7-49.6)	29.7 (18.9-52.2)	0.9	0.25*
Mean (range) weight (kg)	87.5 (48.4-139.7)	84.7 (56.0-154.4)	2.8	0.22*
Mean (range) blood pressure (mm Hg):				
Systolic	144.1 (80.0-190.0)	141.5 (100.0-200.0)	2.6	0.29*
Diastolic	85.5 (60.0-118.0)	83.7 (50.0-110.0)	1.8	0.18*
% (No) who attended hospital diabetes education groups	18 (25/141)	17 (18/108)	1.0	0.83†

*t test. †χ^2 test. ‡Mann-Whitney U test. §For details of measure, see Marteau et al.[13] ¶1=much less confident, 5=much more confident. **Includes study training (1.5 days for nurses, 0.5 day for doctors).

Measure	Intervention group (No/ practices)	Comparison group (No/ practices)	Intervention group (% of patients)	Comparison group (% of patients)	P value
Maximum score for communication with nurse †	142/20	108/20	45.8	38.0	0.12
Maximum score for communication with GP (% of patients)	140/20	107/19	55.0	35.5	<0.001
High satisfaction with treatment ‡	140/20	108/20	47.1	39.8	0.05
			Mean (range)	Mean (range)	
Satisfaction with style of care (possible range 0-36)	141/20	107/20	28.8 (1-38)	27.5 (9-38)	0.19
Patient/professional agreement on main concern (possible range 0-4)	108/19	89/19	1.6 (1-4)	1.6 (1-4)	0.63
Knowledge score (possible range 0-47)	141/19	108/20	23.3 (0-45)	25.4 (6-45)	0.03
Perceived personal control of diabetes (possible range 0-30)	130/19	104/20	24.0 (10.3-30)	24.0 (6.7-30)	0.72



* Adjusted for district general hospital, practice list size, organisation of diabetes care, and clustering of patients by practice: hence values differ slightly from absolute values in text

† Score range 0-6 (6 = patient always able to tell the practitioner very personal things, ask the practitioner about troubling things, and get the practitioner to understand his or her point of view)

‡ Score range 0-36 (high satisfaction defined as above the overall median score (Bradley[14]))

Fig 2 Process: patients' ratings of communication, satisfaction with treatment, style of care, and knowledge of perceived control of diabetes

published incidence estimates.[18] Patients' results were corrected for clustering at practice level (STATACORP 1997) and adjusted for stratifiers (fig 1). Intraclass correlation coefficients were 0.045 for body mass index and 0.047 for haemoglobin A_{1c}. Analysis was by intention to treat. Multiple or logistic regression was used as appropriate. Adjusted odds ratios on scales dichotomised at the median, or adjusted differences between means are presented.

Results

Participant flow

From April 1994 to June 1995 the 41 practice teams diagnosed type 2 diabetes in 522 patients, of whom 360 (range 1-22 per practice) were aged 30-70 years and therefore eligible for inclusion. In all, 250 (69.4%) of the patients with type 2 diabetes completed the study (142 in the intervention group, 108 in the comparison group)—85% of the patients who were not dead and had not moved away. The non-respondents were equally distributed across both groups; sex distribution was similar among the respondents and non-respondents, but non-respondents were on average 2.5 years younger (P = 0.04).

Application of intervention

All trained nurses who responded (28/32) used the booklet *Diabetes in Your Hands*, and at the end of the study 105 (74%) patients in the intervention group recognised it, compared with two (2%) in the comparison group. Only seven nurses gave the leaflet on complications and concerns to all patients, and 35 (25%) patients in the intervention group recalled having seen it. Similar proportions of patients in both groups had seen the British Diabetic Association's publications (79 (56%) in the intervention group, 68 (63%) in the comparison group)).[12] All responding trained nurses (28/32) and doctors (19/23) reported using patient centred consulting, with 17 nurses and 15 doctors reporting extensive use (4-5 on a 5 point scale). Nurses reported considerable use of listening skills, open questions, and affirming comments but less use of aids to behaviour change. Further details are reported separately.[19]

Analysis

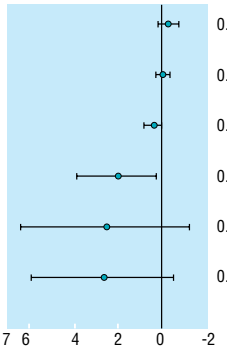
Process of care

Results for patients' ratings of the process of care are shown in figure 2. Communication and satisfaction were rated highly by both groups. Patients in the intervention group were significantly more likely than those in the comparison group to report excellent communication with doctors and great satisfaction with treatment. Agreement between patients and practitioners on main concerns discussed over the year and perceived personal control were similar in both groups. Knowledge scores were significantly lower in the intervention group than the comparison group, and differences were confined to the patients who had been prescribed hypoglycaemic drug treatment. Knowledge of diet was similar in both groups, as was belief that poor control of diabetes may lead to complications (133 (94%) patients in the intervention group, 106 (98%) in the comparison group) and that they would have diabetes for the rest of their lives (124 (88%) and 94 (87%) patients respectively).

Outcomes

Diet and exercise scores were similar in both groups. Both groups reported high intakes of fibre and unsaturated fat and low intake of total fat.[15] Similar proportions in both groups reported change towards

Measure	Intervention group (No/ practices)	Comparison group (No/ practices)	Intervention group (mean, range)	Comparison group (mean, range)	P value
Haemoglobin A_{1c}%†	131/20	100/20	7.07 (4.17-12.83)	7.17 (4.16-14.05)	0.31
Total cholesterol (mmol/l)	130/20	101/20	6.04 (3.70-9.80)	5.99 (3.30-9.10)	0.92
Triglyceride (mmol/l)	130/20	101/20	2.62 (0.60-13.5)	2.23 (0.60-11.6)	0.02
Body mass index (kg/m^2)	138/18	102/20	31.3 (19.8-51.9)	29.5 (19.1-48.5)	0.03
Systolic BP (mm Hg)‡	138/19	107/20	144.3 (99.0-193.5)	142.8 (87.0-204.0)	0.18
Diastolic BP (mm Hg)‡	138/19	107/20	89.0 (59.5-133.5)	87.2 (60.5-131.0)	0.10
			% of patients	% of patients	
Urinary albumin/ creatinine ratio >2.0 mg/mmol§	126/20	101/20	28.6	26.7	0.66
Smoking at one year¶	128/20	103/20	22.7	22.3	0.74



* Adjusted for district general hospital, practice list size, organisation of diabetes care, and clustering of patients by practice: hence values differ slightly from absolute values in text

† Normal range 4.68-6.80%

‡ Mean of two readings

§ Equivalent to an overnight albumin excretion rate of >30 µg/min (Gatling et al[29])

¶ Research nurses' interview data adjusted for patients denying smoking but with urinary cotinine >500 µg/l

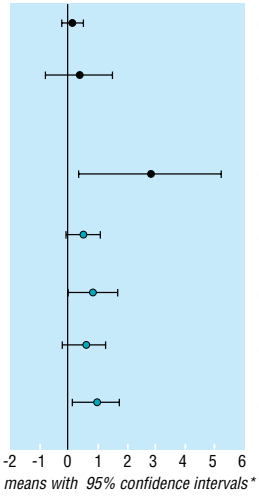
Fig 3 Clinical measures at one year

a healthy diet.[16] Mean exercise scores were 26.2 in the intervention group and 29.7 in the comparison group (score of 21 represents 15 minutes' light exercise daily, 35 represents 15 minutes' moderate exercise daily).[17]

Fifty per cent (66/133) of the patients in the intervention group and 46% (46/99) in the comparison group were prescribed hypoglycaemic agents; 47% (62/133) and 40% (40/99) respectively were prescribed sulphonylureas, and 11% (15/133) and 15% (15/99) respectively were prescribed metformin. Two patients were prescribed insulin and 20 both sulphonylureas and metformin.

The results of clinical measures at one year are shown in figure 3. Mean haemoglobin A_{1c} concentrations were close to the normal range, with those in the intervention group 0.24% lower than those in the comparison group (when adjusted, not significant). Differences were no larger among patients in whom diabetes was diagnosed later in the study. Mean body mass index (weight(kg)/(height(m)^2)) was high (30.5) and 2.04 higher in the intervention group than the comparison group. Weight loss measured over the year by practice nurses was 0.75 kg in the intervention group (n = 130) and 1.74 kg in the comparison group (n = 93) (adjusted difference 0.60 kg; P = 0.41). Adjustment for prescribed hypoglycaemic agents by inclusion in the regression analysis did not affect these findings. However, stratification by prescribed hypoglycaemic drugs increased the group differences. Among the patients prescribed such drugs, the difference in haemoglobin A_{1c} concentrations between the two groups was −0.31% (95% confidence interval −0.76% to 0.13%), and body mass index was 4.99 higher in the intervention group (3.46 to 6.53). Among the patients who did not receive hypoglycaemic agents, the difference in body mass index between the two group was −0.37 (−3.45 to 2.72). Blood triglyceride concentrations were higher in the intervention group than the comparison group, with a similar but non-significant

Measure	Intervention group (No/ practices)	Comparison group (No/ practices)	Intervention group (mean, range)	Comparison group (mean, range)	P value
Diabetes specific					
a) Quality of life questionnaire† (possible range -9 to 9)	142/20	108/20	-1.09 (-7.09-0.25)	-1.23 (-6.09-0.27)	0.27
b) Depressed Wellbeing questionnaire† (possible range 0 to 18)	141/20	107/20	2.88 (0-17.0)	2.98 (0-16.0)	0.48
Generic					
Wellbeing questionnaire†					
Total (possible range 0 to 66)	141/20	107/20	48.0 (15.0-66.0)	45.9 (3.0-66.0)	0.03
Subscales					
(a) Depression (possible range 0 to 18)	141/20	108/20	3.58 (0-14.0)	4.05 (0-15.0)	0.11
(b) Anxiety (possible range 0 to 18)	142/20	108/20	4.68 (0-17.0)	5.20 (0-18.0)	0.06
(c) Energy (possible range 0 to 12)	142/20	107/20	7.17 (0-12.0)	6.85 (0-12.0)	0.12
(d) Positive wellbeing (possible range 0 to 18)	142/20	108/20	13.0 (3.0-18.0)	12.2 (0-18.0)	0.02



* Adjusted for district general hospital, practice list size, organisation of diabetes care, and clustering of patients by practice: hence values differ slightly from absolute values in text

† For details of measures see Bradley[14]

Fig 4 Functional and psychological status

trend for blood pressure. The two groups did not differ in total blood cholesterol concentration, microalbuminuria, or smoking status.

Functional and psychological status favoured the intervention group, and wellbeing scores were significantly higher in the intervention group than the comparison group (fig 4).

Discussion

This is the first randomised trial in primary care to show that training in patient centred care, with a focus mainly on nurses, can significantly improve communication, wellbeing, and satisfaction among patients with newly diagnosed diabetes, without loss of glycaemic control.

Methodology

The trial employed rigorous methodology, conforming both to the CONSORT statement[20] and to many of the guidelines for participatory research,[21] and was completed by 85% of eligible patients.

Our analysis was conservative, allowing for clustering at practice level. In addition, concealment of the hypothesis from practitioners meant that committed patient centred practitioners might have been randomised to the comparison group and "disease centred" practitioners randomised to receive patient centred training. Despite this conservatism, the pragmatic design still showed important effects on process and patient outcomes, which should be generalisable to the increasing number of larger practices providing organised diabetes care.

However, we had hypothesised that the intervention would lead to improved agreement between patients and practitioners on main concerns,[22] greater perceived control of diabetes,[14] healthier lifestyle, and greater knowledge of self care[23]—all aspects previously associated with improved health status and possibly the result of greater adherence to treatment.[7 24] We did not find this, but we do not know whether this is because of the limitations of our measures or lack of a real effect. In particular, measurement of diet and exercise by self report has considerable limitations[25] and may reflect knowledge rather than behaviour, as suggested by the discrepancies here between reported diet and observed weight.

Interpretation

The differences in knowledge scores are consistent with a less systematic approach to teaching among practitioners in the intervention group. They may have dealt with patients' immediate concerns, rather than integrating them with management of disease risk. Certainly, practitioners in the intervention group used the booklet *Diabetes in your Hands* (which encourages patients to ask questions) much more than the accompanying leaflet identifying possible diabetic complications. Nurses also reported greater use of listening skills than negotiation of behavioural change.[19] Nor did we find evidence that management improved with experience: haemoglobin A_{1c} concentrations among the patients in whom type 2 diabetes was diagnosed later in the study were no lower at one year. Use of listening skills by practitioners without negotiation of behavioural change could result in higher cardiovascular risk despite improved satisfaction and wellbeing.

Key messages

- A training programme in patient centred care for practitioners led to patients with newly diagnosed diabetes reporting better communication with doctors, greater wellbeing, and greater treatment satisfaction at one year, without loss of glycaemic control
- Knowledge scores were lower and weight and other cardiovascular risk factors higher among patients attending trained practice teams
- Trained practitioners may have found it difficult to integrate attention to wellbeing with management of disease risk
- Professionals using patient centred consulting should not lose the focus on disease

Another explanation, however, also deserves consideration. Weight was higher in the intervention group than the comparison group, and blood pressure differences followed weight differences. These differences were confined to patients prescribed hypoglycaemic agents and were not accounted for by small differences in prescribing rates between the two groups.

Evidence is increasing that involving patients more in consultations can increase adherence to treatment,[7 24] and after type 2 diabetes is diagnosed weight increases more with more intensive treatment.[26] It would be ironic if this mechanism contributed to the higher cardiovascular risk in the intervention group and underlines the therapeutic dilemma in type 2 diabetes of treating both hyperglycaemia and cardiovascular risk effectively.

In retrospect, our study, based on effect sizes among patients with established diabetes,[8] was underpowered to detect the small differences in blood glucose concentrations achievable one year after diagnosis.[26] Despite near normal concentrations achieved in both groups, however, the results are compatible with clinically important differences in haemoglobin A_{1c} favouring the intervention group. Longer, larger studies are still needed to test the effect of patient centred care on diabetes control after diagnosis. It remains unclear whether the risks of increasing body weight and associated adverse cardiovascular risk will outweigh any benefits of improved communication, wellbeing, treatment satisfaction, or even improved glycaemic control over time. The results of the UK prospective diabetes study provide reassurance on these points,[27] but further detailed research on the psychosocial correlates of survival and health status is needed.[27 28] Results of current trials and other studies of the psychosocial correlates of survival and health status should inform this question. In the meantime, clinical method must balance listening and directing and address not only patients' wellbeing but also the threat to it of adverse risk profiles.

Conclusion

Despite limitations, this study shows the power of the consultation to affect patients' health and wellbeing. Professionals committed to achieving the benefits of patient centred consulting should take care not to lose the focus on disease while paying attention to the unique experience of illness of each patient.

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Contributors: ALK developed the original research question and wrote the protocol with AW and MJC and NS. AW led the work on the overall project management, quality assurance, psychological measures, and analysis; MJC led the work on power calculations and analysis; and NS led the training programme. SG took responsibility for the biochemical and physiological measures, quality assurance, and analysis. Helen Burgess was the research secretary; Candy McCabe and Valerie Davill were the research nurses; Robert Peveler was consultant on measures and design; David Rowe was consultant on biochemistry; Claire Bradley was consultant on psychometrics. Staff at the collaborating practices provided clinical data. All the authors participated in the interpretation of the data and writing the paper. ALK will act as guarantor.

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Endpiece

How to buy gadgets

Just think, for example, how tedious it is to handle a nasal spray, one of those little pharmaceutical bottles that you press with two fingers to allow a beneficent aerosol to penetrate the nostrils. But relief is at hand! Just insert the bottle into the Viralizer machine, and it is squeezed for you, so efficiently that the spray reaches the most intimate areas of the respiratory tract. Naturally, you have to hold the machine in your hand, and the photographs suggest a Kalashnikov being fired, but then everything comes at a price.

Umberto Eco, *How to Travel with a Salmon and Other Essays* (1994)

Submitted by Jeff Aronson, honorary consultant physician, Oxford