The diabetes pandemic: is structured education the solution or an unnecessary expense?

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Abstract
Structured education is a recommended clinical and cost-effective approach that adds value to traditional medical care. A clinical trial demonstrated that the X-PERT Diabetes Programme significantly improves health and quality of life. In order to determine if the national implementation of the X-PERT Programme meets standards identified in the published trial, it is necessary to conduct continuous audit.

To meet the key criteria to implement National Institute for Health and Clinical Excellence guidance, educators are trained to deliver X-PERT Diabetes and X-PERT Insulin Programmes and submit baseline, six-month and annual results onto the X-PERT Audit Database.

Forty-seven percent of X-PERT centres (55/118) have submitted data for 16,031 people with diabetes. Audit standards have been met with excellent attendance, evaluation and empowerment scores. All outcomes improved at one year: glycated haemoglobin (0.6%); body weight (-3.0kg); waist circumference (-2.1cm); systolic (-0.9mmHg) and diastolic (-2.2mmHg) blood pressure; total (-0.2mmol/L) and LDL (-0.1mmol/L) cholesterol; triglycerides (-0.2mmol/L); HDL cholesterol (+0.1mmol/L); requirement for prescribed diabetes medication (23% less likely to increase medication, number needed to treat \[NNT\] = 4; 5% more likely to reduce medication, \[NNT\] = 19).

National implementation of the X-PERT Programme has met audit standards. X-PERT increases skills, knowledge and confidence for diabetes self-management, resulting in intensification of glycaemic control and reducing cardiovascular disease risk factors in people with newly diagnosed and existing diabetes. Structured education is a clinical and cost-effective approach that should be offered to all people with diabetes as an integral part of their diabetes treatment and management, potentially saving the NHS £367 million per annum. Copyright © 2011 John Wiley & Sons.

Key words
X-PERT; structured education; diabetes; self-management; empowerment; audit; NHS; clinically effective; cost effective; cost saving

Introduction
In England the estimated prevalence of diabetes (diagnosed and undiagnosed) in people aged 16 and over is 7.4%. The prevalence of diabetes has now reached 3.65 million in the UK with 2.8 million people being aware that they have the condition, adding to stress on the health care budget at a time of financial stringency. NHS efficiency savings have been proposed aiming for a £15–20 billion saving between 2011 and 2014 and it is anticipated that these can only be achieved through quality improvements and advances in innovation.

Diabetes is a costly condition taking up 10% of the NHS budget; a significant part of this cost is attributable to inpatient care and treating the devastating, but largely preventable, diabetes-related conditions. Intensifying glycaemic control has been shown to reduce the onset of diabetes-related complications but there is emerging evidence from clinical trials that achieving target blood glucose levels through prescribed diabetes medication may cause harm. In the UK, although prescription costs for type 2 diabetes have increased by 89% between 1997 and 2007, glycaemic control has only improved by 0.1% from 8.8% to 8.7% (73mmol/mol to 72mmol/mol). This may be due to poor adherence to medication regimens.

The clinical and cost effectiveness of both structured education and medical nutrition therapy has been established. National Institute for Health and Clinical Excellence (NICE) guidance states that all newly diagnosed people with diabetes should have an opportunity to attend a structured patient education programme with annual follow up. Up to 90% of people will access structured education if offered as an integral part of diabetes treatment and...
management. The NICE quality standard defines both personalised advice on nutrition and physical activity and structured education as specific quality statements. However, in England 50% of primary care trusts do not monitor whether people are offered structured education and 58% do not have sufficient places on the programmes they commission.

The X-PERT Programme has been shown to improve clinical, lifestyle and psychosocial outcomes in people with newly diagnosed and existing diabetes, and has been demonstrated to be a cost-effective strategy to implement both structured education and medical nutrition therapy/physical activity advice for the treatment and management of diabetes in a clinical trial setting. The cost for four educators to deliver the X-PERT Diabetes Programme to 432 people with diabetes is £55/participant including health care professional and administrative time, and £26 excluding human resource (HR) costs. If those four educators delivered more sessions to benefit 3456 people with diabetes, the cost/participant would reduce to £55 including HR and £12 excluding HR costs. These calculations include educator training, equipment, recruitment materials, participant handbooks, travel, refreshments, quality assurance and audit.

Materials and methods
To prepare for national implementation the structured curriculum (Educator’s Manual) was printed and the X-PERT Diabetes Educator’s Course developed. Competencies to deliver the content of the programmes using the theories that support adult education and person-centred care are documented in a framework for continual professional development. Educators deliver the structured education programmes to people living with type 1 and type 2 diabetes within their geographical areas. Each programme consists of six weekly sessions lasting 2.5 hours (the total length of the structured education programme is 15 hours). It is recommended that one trained educator delivers to groups of 15–18 people with diabetes plus carers.

Educators submit attendance data, and the audit report shows the percentage of participants who attended at least one session and the percentage who attended four or more sessions.

Participant satisfaction is recorded by participants completing an evaluation questionnaire that scores the structured education programme for enjoyment, usefulness, degree of self-management obtained and impact on living with diabetes. The mean satisfaction score for each programme is calculated from the total questionnaire scores and entered onto the database. The audit report presents the mean score and percentage for participant satisfaction.

Participant empowerment is assessed at baseline, six weeks and thereafter annually by participants completing a validated questionnaire. The mean empowerment score is calculated for the group from individual questionnaires and is entered onto the audit database. The audit report provides the mean score for each time point and the percentage change from baseline.

The following clinical outcomes are recorded at baseline, six months and thereafter annually and entered onto the audit database: glycated haemoglobin (HbA1c %), body weight (kg), body mass index (BMI kg/m²), waist circumference (cm), blood pressure (systolic and diastolic BP mmHg) and lipid profile (total, LDL, HDL and triglyceride cholesterol mmol/L). The audit report presents the number of participants for each outcome and the mean value at each time point.

Data regarding prescribed diabetes medication are collected at baseline, six months and thereafter annually and entered onto the audit database.

Audit reports can be generated for any time period per programme, per educator, per organisation, or for all participants. Standard reports present the number of participants (n) and the mean values for each outcome. Outcomes are compared to audit standards identified from the published randomised controlled trial (RCT) and national targets.

The raw data were analysed by statisticians and where the full subset of data was available; standard deviations were applied to the mean outcomes; confidence intervals using the 95% rule were applied to the mean differences; and statistical tests (repeated measures analysis of variance, ANOVA) were applied to test significance between means. IBM SPSS version 19 was used.

Results
On 31 January 2011, 144 organisations had registered on the national X-PERT audit database. Eighteen organisations had merged and eight organisations had also registered for X-PERT Insulin. Thus, there were 118 registered organisations for X-PERT Diabetes and 55 of these (47%) had started to submit data. Outcomes for 16 031 participants had been entered on to the audit database.

Fifty-three organisations had submitted attendance scores. The mean attendance score was 95.3% (range 65.8–100) for participants attending at least one of the six sessions, and 89.9% (range 51–100) for those attending four or more sessions. The audit standard of 95% of participants attending at least one session and 80% of participants attending four or more sessions has been met. However, this varied between organisations with 34 organisations (64%) meeting the audit standard and 19 organisations (36%) not meeting the audit standard.

Forty-four organisations had submitted participant satisfaction scores. The mean participant evaluation score was 94.2% (range 86.7–100). The audit standard of 90% has been met with 42 organisations (95%) meeting the audit standard and two organisations (5%) not meeting the standard.

Forty-three organisations submitted empowerment scores at six weeks and 13 organisations at one year. Mean empowerment scores increased by 22.9% (range -2.4 to 82.6) at six weeks and by 25.7% (range 2.6–104.3) at 12 months. Thirty-five organisations (81%) achieved the audit standard at six weeks.

There was an improvement in all clinical outcomes at six months, one and two years. Audit standards were applied to the one-year data. At one year, 23 organisations had submitted HbA1c data. The mean reduction was 0.6% (range 0.2–0.9) meeting the audit standard of 0.5%. Seventeen organisations (74%) achieved the audit standard.

Twenty organisations had submitted body weight data at one year. The mean reduction in body weight at one year was 3.0kg (range -2.9 to 7.4),
which met the audit standard of no increase in body weight. There was variation with 17 organisations (85%) meeting the audit standard and five organisations (25%) reporting mean weight losses between 5–10% body weight in line with the national target. Twenty organisations had also submitted BMI data and the mean reduction was 1.0kg/m² (range -0.9 to 2.5) with 15 organisations (75%) meeting the audit standard and nine organisations (45%) reporting a mean reduction of ≥1.0kg/m².

Eighteen organisations reported a mean reduction in waist circumference of 2.1cm (range -3.9 to 8.5) at one year. Thirteen organisations (72%) reported a mean reduction of ≥2cm meeting the audit standard.

Twenty organisations reported a mean reduction in systolic BP of 0.9mmHg (range -7.4 to 6.2) at one year. The audit standard of a reduction of 5mmHg or more did not apply as the mean baseline systolic BP was within target at 134.1mmHg. Two organisations (20%) achieved a mean reduction greater than 5mmHg.

Twenty organisations submitted diastolic BP data and a mean reduction of 2.2mmHg (range -1.4 to 5.8). Twenty-one organisations submitted total cholesterol data. The mean reduction in total cholesterol was 0.2mmol/L (range 0.0–0.9). Fifteen organisations (71%) reported a ≥5% in total cholesterol from baseline and five organisations (24%) met the national target with a mean total cholesterol ≤4mmol/L. LDL cholesterol was reported by 19 organisations at one year. The mean reduction in LDL cholesterol was 0.1mmol/L (range -0.1 to 0.6). Sixteen organisations (84%) reported a 4–23% reduction in LDL cholesterol and seven organisations (37%) reported a reduction >10%. Two organisations (11%) achieved the national target with a mean LDL cholesterol ≤2mmol/L. Twenty organisations reported HDL cholesterol at one year and there was a mean increase of 0.1mmol/L (range -0.4 to 0.3). Seven organisations (35%) reported an increase in HDL cholesterol between 0.1 and 0.3mmol/L. Triglycerides were reported by 20 organisations at one year. The mean reduction in
triglyceride levels was 0.2mmol/L (range 0–0.8). Nineteen organisations (95%) reported a reduction of ≥5%, 16 organisations (80%) reported a percentage reduction between 11–35% and 13 organisations (65%) achieved the national target of ≤1.7mmol/L.

Audit data used for the number needed to treat (NNT) calculations are compared against the RCT data. There were diabetes medication data entered for 1788 participants at baseline, 974 participants at six months, 814 participants at year one and 87 participants at year two. Forty-eight participants (5%) reduced diabetes medication at six months, 48 participants (6%) at one year, and seven participants (8%) at two years; 692 participants (71%) remained on the same dose at six months, 577 participants (71%) at one year and 39 participants (45%) at two years; 234 participants (24%) increased diabetes medication at six months, 189 participants (23%) at one year and 41 participants (47%) at two years.

Participants who have attended the X-PERT Programme are 23% less likely to increase prescribed diabetes medication (absolute risk reduction 95% CI 14.31–31.69). Therefore, for every four participants who attended the X-PERT Programme one participant could expect to prevent an increase in their diabetes medication by 14 months, NNT = 4 patients (95% CI 3.2–7.0).

Participants who have attended the X-PERT Programme are 5.3% more likely to reduce medication (absolute benefit 95% CI 3.17–7.43). Therefore, for every 19 participants who attended the X-PERT Programme, one participant could expect to have reduced their diabetes medication by 14 months, NNT = 4 patients (95% CI 13.5–31.6).

Discussion
National implementation of the X-PERT structured education programme has been successful with all relevant audit standards identified from the RCT being met, leading to significant health improvement. The mean attendance rate was better than that for individual diabetes appointment.37

Participants rate the programme as enjoyable and useful and found that it had supported them in developing knowledge, skills and confidence for diabetes self-management which resulted in greater personal empowerment. All clinical outcomes improved with statistically significant reductions in: HbA1c; body weight, BMI and waist circumference; systolic and diastolic BP; total cholesterol, LDL cholesterol and triglycerides; and a reduced requirement for prescribed diabetes medication.

Limitations of the findings. National implementation of the X-PERT Programme has been assessed by conducting an audit where the trained X-PERT educators submit data onto the national audit database. Structured education is a complex intervention and there are many confounding variables that impact on outcomes such as standard diabetes care, the taking of medication and educator skills. Outcomes were benchmarked to the results in the published RCT but it could be advantageous if future audits were compared to a control group of people with diabetes not receiving X-PERT structured education.

There were considerable variations between organisations. There were 63 organisations (53%) that have not submitted data onto the audit database. As national and international implementation increases, it is considered necessary to introduce licence agreements to ensure standards are maintained and to protect outcomes from being diluted.

Interpretation compared to other approaches to intensify glycaemic control. Type 2 diabetes is considered a progressive disease characterised as a triad of insulin resistance, beta-cell dysfunction and impaired hepatic glucose production.38 It is accepted that people with the condition will require increased prescribed diabetes medication over time to obtain target glycaemic control.39

However, the mean reduction in HbA1c from attending X-PERT structured education is similar to that reported in the UK Prospective Diabetes Study. The difference between the two methods to intensify glycaemic control is that, in the UKPDS, targets were achieved through traditional medical management. Patients were assessed individually in clinics where verbal advice was followed up with written material and increased prescription of diabetes medication leading to weight gain and increased risk of hypoglycaemia.39 In contrast, X-PERT structured education demonstrated a significant improvement in all health results and cardiovascular disease risk factors with a 23% less chance of increasing medication and a 5.3% greater chance of reducing diabetes medication.

Cost savings. Tables 1 and 2 outline savings made from reducing medication after implementation of X-PERT.

The X-PERT Audit Database is undergoing an upgrade and in the future it will be possible to audit further outcomes such as type of diabetes, ethnicity, blood pressure and lipid medication, kidney function and depression.

Conclusion
National implementation of the X-PERT Programme has met audit standards.

The structured education programme increases skills, knowledge and confidence for diabetes self-management, resulting in intensification of glycaemic control in addition to other health and well-being benefits among individuals with newly diagnosed and existing diabetes.

Structured education is a clinically and cost-effective approach that should be offered to all people with diabetes as an integral part of their diabetes treatment and management. Receiving the right education, at the right time, delivered in the right way, can reverse the progression of type 2 diabetes – resulting in improved health, reduced prescribed medication and decreased risk of developing preventable microvascular and macrovascular complications with significant benefits to length and quality of life and the NHS budget.

Declaration of interests
Trudi Deakin is the chief executive of the X-PERT Health charitable organisation.

References
References are available (along with the full article) at www.practicaldiabetes.com under ‘online only’.