The clinical and cost-effectiveness of patient education models for diabetes: a systematic review and economic evaluation

E Loveman*
C Cave
C Green
P Royle
N Dunn
N Waugh

Wessex Institute for Health Research and Development, University of Southampton, UK

*Corresponding author

Executive summary

*Corresponding author

Executive summary

Health Technology Assessment 2003; Vol. 7: No. 22
Description of the proposed service

This systematic review examines the clinical and cost-effectiveness of patient education models for adults with Type 1 or Type 2 diabetes.

Epidemiology and background

Diabetes mellitus (diabetes) is characterised by a state of chronic hyperglycaemia (raised blood sugar). There are two main types of diabetes: Type 1 and Type 2. Type 1 diabetes is an autoimmune condition involving a process of destruction of the beta cells of the pancreas, leading to severe insulin deficiency. About one-fifth of patients with diabetes in England and Wales have Type 1 diabetes. Type 2 diabetes is characterised by insulin resistance and relative insulin deficiency and is linked to being overweight or obese, and to physical inactivity. Type 2 diabetes primarily affects people aged over 40 years. The basic target in the treatment of diabetes is the normalisation of blood glucose levels. Poor control of diabetes can in the short term result in diabetic ketoacidosis, a serious and potentially fatal condition, and in the long term can increase the risk of complications such as diabetic retinopathy and nephropathy. However, studies have shown that good diabetic control is associated with a reduced risk of these complications. Diabetic control is affected by both lifestyle factors such as diet, and by pharmacological treatments, and the management of diabetes is largely the responsibility of patients. A key component in empowering patients to manage their own diabetes is education.

Education of patients with diabetes is considered a fundamental aspect of diabetes care and aims to empower patients by improving knowledge and skills. Structured educational programmes for diabetes self-management are often multifaceted interventions providing patients with information not only about diabetes but also management issues such as diet, exercise, self-monitoring of blood glucose and medication use.

Methods

A systematic review of the literature and an economic evaluation were undertaken.

Data sources

Electronic databases were searched, including the Cochrane Library, MEDLINE, EMBASE, PubMed, Science Citation Index, Web of Science Proceedings, DARE and HTA databases, PsychINFO, CINAHL, NHS Economic Evaluation Database and EconLit. References of all retrieved articles were checked for relevant studies, and experts were contacted for advice and peer review and to identify additional published and unpublished references. Sponsor submissions to the National Institute for Clinical Excellence were reviewed.

Study selection

Studies were included if they fulfilled the following criteria:

- Interventions: educational interventions compared with usual care or another educational intervention.
- Participants: adults with Type 1 or Type 2 diabetes mellitus.
- Outcomes: must report glycated haemoglobin, hypoglycaemic episodes, diabetic complications or quality of life. Other reported outcomes from included studies were discussed.
- Evaluation of outcomes ≥12 months from inception of intervention.
- Design: randomised clinical trials (RCTs), and controlled clinical trial (CCTs) with a concurrent control were included.
- Reporting: studies were only included if they reported sufficient detail of the intervention to be reproducible (e.g. topics covered, who provided the education, how many sessions were available).

Studies in non-English language or available only as abstracts were excluded.

Titles and abstracts were checked by two reviewers. Full texts of selected studies were assessed for inclusion by one reviewer and checked by a second. Differences in opinion were resolved through discussion.
Data extraction and quality assessment
Data extraction and quality assessment were undertaken by one reviewer and checked by a second, with any disagreement resolved through discussion involving a third reviewer if necessary. The quality of included studies was assessed in accordance with Centre for Reviews and Dissemination Report 4.

Data synthesis
Data on clinical effectiveness were synthesised through a narrative review with tabulation of results from included studies. Studies were too diverse to be combined in a meta-analysis. Cost-effectiveness analyses were reported in a narrative review.

Number and quality of studies
Searches identified 24 studies comparing education with either a control group or with another educational intervention. These were 18 RCTs and six CCTs. Four studies included adults with Type 1 diabetes, 16 studies included adults with Type 2 diabetes and four studies included adults with either Type 1 or Type 2 diabetes. The quality of reporting and methodology of the studies was generally poor by today’s standards with only two RCTs reporting adequate randomisation procedures and none demonstrating adequate allocation concealment.

Economic evaluations
Literature searches identified only two studies reporting cost-effectiveness results: one cost-utility analysis and one cost-effectiveness analysis using intermediate outcomes only.

Summary of benefits
Studies of education in Type 1 diabetes suggest that education programmes offered as a part of intensified treatment interventions can result in significant and long-lasting improvements in metabolic control and reductions in complications. These are studies in which education is part of a package of care also including treatment changes (for example diet and insulin) and therefore it is not possible to draw conclusions about potential effects of education per se in Type 1 diabetes.

Diverse educational programmes in Type 2 diabetes did not yield consistent results. Although some trials reported significant improvements in metabolic control and/or quality of life or other psychological outcomes, many others did not report significant effects of educational interventions. No clear characterisation is possible as to what features of education may be beneficial in this patient group.

Studies that included patients with either Type 1 or Type 2 diabetes also produced mixed results with only poorer quality studies reporting significant effects.

Costs
Literature searches identified a small number of studies offering cost data in relation to patient education models. These were all studies undertaken outside the UK and they covered a variety of methodologies. We are not able to generalise from these studies as to the cost-effectiveness of patient education models. Patient education models will predominantly consist of direct costs for resource inputs to particular education packages, for example staff time (diabetes specialist nurse, dietitian and/or consultant) and education materials. The Dose Adjustment for Normal Eating (DAFNE) intervention is estimated to cost approximately £545 per person attending.

Costs per life year gained
Owing to the absence of accurate data on health outcomes, we are not able to provide cost-effectiveness summary statistics. The evidence base does indicate that improved glycaemic control is likely to have a positive impact on the incidence of long-term diabetic complications. Therefore, where the costs associated with patient education are assumed to be in the region of £500–600 per patient, the benefits over time would have to be very modest to offer an attractive cost-effectiveness profile for the intervention. The submission from the DAFNE study group predicts a scenario in which the DAFNE intervention results in cost savings and added health benefits over time, when compared with usual practice.

Implications
The main implication for the NHS would be staff time, particularly of diabetes specialist nurses, but also dietitians. Provision of increased education may be hindered by a shortage of trained specialist nurses, which will take some years to resolve.
**Future research needs**

The paucity of high-quality trials that have tested education *per se* in diabetes reveals a need for more research. Such research should focus on RCTs with clear designs based on explicit hypotheses and with a range of outcomes evaluated after long follow-up intervals. In order to draw conclusions about the effects of education alone, such trials should manipulate only education rather than confounding education with other factors.

**Publication**

How to obtain copies of this and other HTA Programme reports.
An electronic version of this publication, in Adobe Acrobat format, is available for downloading free of charge for personal use from the HTA website (http://www.hta.ac.uk). A fully searchable CD-ROM is also available (see below).

Printed copies of HTA monographs cost £20 each (post and packing free in the UK) to both public and private sector purchasers from our Despatch Agents.

Non-UK purchasers will have to pay a small fee for post and packing. For European countries the cost is £2 per monograph and for the rest of the world £3 per monograph.

You can order HTA monographs from our Despatch Agents:
– fax (with credit card or official purchase order)
– post (with credit card or official purchase order or cheque)
– phone during office hours (credit card only).

Additionally the HTA website allows you either to pay securely by credit card or to print out your order and then post or fax it.

Contact details are as follows:
HTA Despatch Email: orders@hta.ac.uk
c/o Direct Mail Works Ltd Tel: 02392 492 000
4 Oakwood Business Centre Fax: 02392 478 555
Downley, HAVANT PO9 2NP, UK Fax from outside the UK: +44 2392 478 555

NHS libraries can subscribe free of charge. Public libraries can subscribe at a very reduced cost of £100 for each volume (normally comprising 30–40 titles). The commercial subscription rate is £300 per volume. Please see our website for details. Subscriptions can only be purchased for the current or forthcoming volume.

Payment methods
Paying by cheque
If you pay by cheque, the cheque must be in pounds sterling, made payable to Direct Mail Works Ltd and drawn on a bank with a UK address.

Paying by credit card
The following cards are accepted by phone, fax, post or via the website ordering pages: Delta, Eurocard, Mastercard, Solo, Switch and Visa. We advise against sending credit card details in a plain email.

Paying by official purchase order
You can post or fax these, but they must be from public bodies (i.e. NHS or universities) within the UK. We cannot at present accept purchase orders from commercial companies or from outside the UK.

How do I get a copy of HTA on CD?
Please use the form on the HTA website (www.hta.ac.uk/htacd.htm). Or contact Direct Mail Works (see contact details above) by email, post, fax or phone. HTA on CD is currently free of charge worldwide.

The website also provides information about the HTA Programme and lists the membership of the various committees.
The NHS R&D Health Technology Assessment (HTA) Programme was set up in 1993 to ensure that high-quality research information on the costs, effectiveness and broader impact of health technologies is produced in the most efficient way for those who use, manage and provide care in the NHS.

The research reported in this monograph was commissioned by the HTA Programme on behalf of the National Institute for Clinical Excellence (NICE). Technology assessment reports are completed in a limited time to inform the appraisal and guidance development processes managed by NICE. The review brings together evidence on key aspects of the use of the technology concerned. However, appraisals and guidance produced by NICE are informed by a wide range of sources.

The research reported in this monograph was funded as project number 01/55/01.

The views expressed in this publication are those of the authors and not necessarily those of the HTA Programme, NICE or the Department of Health. The editors wish to emphasise that funding and publication of this research by the NHS should not be taken as implicit support for any recommendations made by the authors.

**Criteria for inclusion in the HTA monograph series**

Reports are published in the HTA monograph series if (1) they have resulted from work commissioned for the HTA Programme, and (2) they are of a sufficiently high scientific quality as assessed by the referees and editors.

Reviews in *Health Technology Assessment* are termed ‘systematic’ when the account of the search, appraisal and synthesis methods (to minimise biases and random errors) would, in theory, permit the replication of the review by others.