



Effectiveness of a community orientated diabetes education (CODE) programme for people with type 2 diabetes

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Introduction

Diabetes self-management education is a critical component in diabetes care. Based on adult learning models, recent guidelines suggest that all people with type 2 diabetes (T2DM) should have access to a structured diabetes education programme.¹ In Ireland there are currently three available structured programmes to which people with T2DM can be referred. This reflects the *ad hoc* development of services rather than any planned implementation of an educational framework. DESMOND (Diabetes Education and Self-management for Ongoing and Newly Diagnosed) is delivered over six hours by two health care professionals (HCPs). Results demonstrate that reduction in weight and smoking are the main benefits.² The X-PERT programme (EXpert Patient Education versus Routine Treatment) comprises six two-hour weekly sessions delivered by a dietitian with support from other HCPs. Results demonstrate improved

Summary

Evaluation is an essential component of structured diabetes education with most established programmes showing positive effects at group level. However, evaluation of post-educational intervention outcomes is dependent on the participant completing the programme. There is, currently, little research into the psychological or demographic attributes of non-attendees for post-educational intervention evaluation.

This study aimed to use the evaluation of a structured diabetes education programme in order to explore the characteristics of participants and determine if any association existed between personal characteristics and benefits of attendance and/or non-attendance for post-programme evaluation.

Using a convenience sample of people, a pre-post research design was employed to identify the psychological characteristics of people who benefit from and those who fail to complete an educational intervention programme for type 2 diabetes. The sample consisted of valid responses from 392 (98%, n=401) participants attending the Community Orientated Diabetes Education (CODE) programme, a structured diabetes education programme delivered to people with type 2 diabetes in the Republic of Ireland. The programme is based on an empowering philosophy with the main outcome measurement being diabetes-related empowerment, quality of life (QOL), knowledge, weight and biomedical markers.

In all, 237 (60%) completed the post-programme evaluation and demonstrated positive outcomes in empowerment, QOL and knowledge at group level but these were not sustained at individual level. However, over one-third of participants did not attend for post-evaluation and these were more likely to be younger and report poorer QOL.

The findings indicate the need to evaluate change at an individual level and to target younger people to retain their attendance for the full educational intervention.

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Key words

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glycaemic control, reduced total cholesterol levels, body weight, waist circumference and body mass index (BMI), reduced medication requirements and overall positive improvement in psychological markers over a 14-month period.³ CODE is Community Orientated Diabetes Education delivered in four two-hour sessions over six months by one HCP. Results indicate positive improvements in weight loss, BMI, waist circumference and improved empowerment as measured by the DES-SF, and quality of life (QOL) as measured by the WHO-5.⁴

The structured education programmes currently available to people with T2DM in Ireland meet all of the quality criteria for education programmes.⁵ Most educational evaluation of outcomes is at a group level with positive results in biomedical and psychological outcomes reported. However, given the pre- and post-evaluation procedures, there is a need to examine the post-evaluation results at an individual level. In addition, there is limited knowledge regarding those people who fail to complete the post-evaluation outcome measurement tools. Gucciardi *et al.* suggested



that attrition rates should be a focus of evaluation in order to improve programme effectiveness.⁶ In addition, according to a meta-analysis of educational interventions, the only significant predictor of glycaemic control is the contact time between patient and care giver.⁷ However, other authors argue that the impact of diabetes education programmes depends on programme reach and retention, irrespective of programme efficacy.⁸ In the current climate of cost-effective care, it is imperative to identify those most at risk of attrition so that they may be targeted for retention. There is no clear definition of attrition but the American Diabetes Association clinical practice guidelines recommend that patients, at a minimum, participate in the core components of diabetes education which are initial assessment, education and evaluation.⁹ Therefore, for the purposes of this paper, attrition is defined as those participants who attend for the programme but do not attend for post-programme evaluation.

The aim of this paper was to use the evaluation of the 2009 CODE programme to explore the characteristics of participants and to determine if any association existed between personal characteristics and benefits of attendance and/or non-attendance for post-programme evaluation.

Methods

The 2009 CODE programme targeted 492 people with T2DM who had not previously attended a structured education programme, and was delivered in 31 local settings such as health/community and primary care centres. The local GP identified and invited patients with T2DM suitable for group education (Figure 1). The HCP delivering CODE had training in motivational interviewing, facilitation skills, problem solving and goal setting along with an accredited diabetes qualification. Using the CODE curriculum (Table 1), the programme

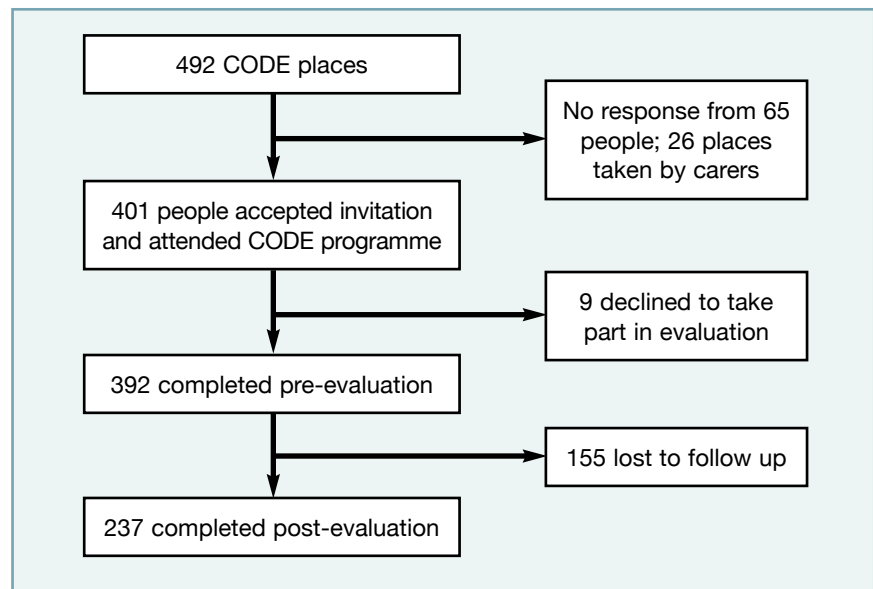


Figure 1. Flow chart of self-selection of participants to take part in the Community Orientated Diabetes Education (CODE) evaluation

CODE has sufficient flexibility to permit people with diabetes to talk in a supportive atmosphere about their own diabetes for the benefit of all in the group. It is up to the person themselves to evaluate the benefits and drawbacks of any action or inaction. It is through this personal evaluation that personal goals are identified and inner motivation reinforced

Week 1	Pre-programme evaluation; diabetes explained; what, if anything, predisposed you to get diabetes; signs and symptoms you may have; why the emphasis is on cardiovascular disease
Week 2	Healthy eating; physical activity; lifestyle changes and personal goal setting
Week 3	Importance of regular follow up; complications; self-management and optimal diabetes control
Week 10	Follow-up phone call to review personal goals
Week 26	Review of achievements + goal setting; post-programme evaluation

Table 1. Curriculum for the CODE programme to be delivered by a trained facilitator with diabetes expertise

was delivered over three successive weeks with a 10-week support telephone call and a 26-week follow-up appraisal/support session. Outcome measures were both process orientated (quantitative) and participant orientated (qualitative) and were collected at baseline during the first session, and at 26 weeks during the final session. Participants gave consent for all data collected to be used for

evaluation of CODE. Ethical approval was not necessary because evaluation is an essential component of structured education programmes.⁵

Anthropometric measurements of BMI and waist circumference were collected as per the Irish Nutrition and Dietetic Institute BMI factsheet. Blood results on HbA_{1c} and blood lipid levels were recorded as part of normal diabetes care.



Instrument	Description	Range of scores
DES-SF	The DES-SF is composed of 8 simple statements to which participants indicate their level of agreement, and assesses need for change, coping with feelings, asking for support, motivating oneself, supporting oneself, developing a plan, overcoming barriers, and making diabetes-related decisions appropriate for individual self-care	Range for each item: 5 (most positive) to 1 (most negative) Range for total score: 0–5 with higher score showing more empowerment
WHO-5	The WHO-5 is composed of 5 statements regarding life satisfaction to which participants indicate their level of agreement, and measures psychological wellbeing, i.e. positive mood (good spirits, relaxation), vitality (being active and waking up fresh and rested), and general interests (being interested in things)	Range for each item: 5 (present all of the time) to 0 (none of the time) Range for total score: 0–25 with higher score showing better quality of life
Knowledge quiz	The knowledge quiz is composed of 12 statements which the participants indicated as true/false, with each correct answer getting a point and each wrong answer deducting a point to reduce guessing responses	Range for total score: 12 (good knowledge and understanding) to minus 12 (no knowledge or 12 incorrect responses)

Table 2. Instruments used to collect data for evaluation of the 2009 CODE programme

Diabetes-related psychosocial self-efficacy was measured using the diabetes empowerment scale, the DES-SF.¹⁰ QOL was assessed using the World Health Organization's QOL instrument (WHO-5) which permits the participant to describe their own emotional wellbeing over the previous two-week period and thereby indicate their QOL.¹¹ Participants' diabetes knowledge and understanding of diabetes management were assessed using a knowledge quiz which was validated on a pre-post test of 150 HCPs attending a diabetes study day in 2007. Table 2 gives a full description of instruments.

Data analysis. Statistical analysis was carried out using SPSS 15. Cronbach's alpha was computed for the DES-SF and WHO-5 on baseline data to establish their reliability for this population. Missing data were

not replaced but were coded as missing from questionnaire or missing attendance for that evaluation. Using independent samples *t*-tests for continuous data and Pearson's chi-squared statistic for categorical data, the differences in personal characteristics for those attending the pre- and post-evaluation (attendees) were compared to those of the full group attending for pre-evaluation only (Week 26 non-attendees). This procedure highlighted personal characteristics that might be associated with attrition and non-completion of the programme. Paired *t*-tests allowed for group change to be identified with examination of quartiles used to identify change at a more individual level.

Results

During 2009, out of a total target population of 492 people, 401 plus 26 carers attended 31 CODE

Males n (%)	231 (59)
Females n (%)	161 (41)
Age years (range)	64±10.2* (32–80)
Duration of diabetes years (range)	6.5±5.98* (0–38)
Smokers n (%)	45 (12)
Diabetes treated n (%)	
Without medications	58 (15)
With oral medications	283 (72)
With insulin	43 (11)
Not known	8 (2)
Body mass index n (%)	
Normal	37 (9)
Overweight	127 (32)
Obese	176 (45)
BMI >40kg/m ²	25 (7)
Declined to be measured	27 (7)
*Data are means ± SD	

Table 3. Baseline characteristics of the 392 CODE participants

programmes delivered throughout Ireland; nine eligible participants declined to complete the questionnaires, leaving data from 392 (98%, n=401) attending participants for analysis. The invitation to attend was delivered independently of the CODE programme; therefore, it was not possible to follow up the 65 people who failed to respond to the invitation. More men than women attended; the majority (254, 65%, n=392) were in the 60–80 age group, had had diabetes for less than nine years (265, 68%) and managed their diabetes with oral agents (283, 72%). Descriptive characteristics of CODE participants are outlined in Table 3.

Attendees. At group level, attendance at the structured diabetes education programme showed improvements in all outcome variables



(Table 4). Empowerment scores had a possible range of five but from a pre-attendance range of three had expanded to four post-attendance with paired sample *t*-tests proving significant ($p=0.047$). The results suggest that attendance at the programme assisted people in knowing the best way in which to manage their diabetes and to feel better about having diabetes, but there was a greater variance in empowerment scores post-attendance.

For reported QOL, the range of scores had decreased from 25 to 21 and the average score had increased (increase showing better QOL, $p=0.00$). There was a significant difference in reported QOL for women pre-evaluation (mean [M]=15.58, SD=5.48) when compared to men (M=17.01, SD=5.20; $t[341]=2.44$; $p=0.02$), and post-evaluation (M=17.17, SD=4.72) compared to men (M=19.41, SD=3.71; $t[201]=3.76$; $p=0.00$). Almost a third (58) of participants who completed all five parts of the WHO-5 pre- and post-attendance (n=182) showed a significant change (>10% increase) in their self-reported wellbeing using WHO criteria.

Knowledge had also increased significantly ($p=0.01$). People had lost on average 0.5kg (SD=2.93, range 1–15kg; $p=0.00$) with a similar reduction in BMI (M=31.52, SD=5.09) pre-attendance and (M=31.28, SD=4.93) post-attendance ($p=0.00$). Although not reaching significance, there was a trend towards positive change in blood results.

In summary, at a group level people who attended the full programme gained a better understanding of their diabetes and put this into practice, resulting in improved biomedical markers with participants reporting that they felt happier about their diabetes and general wellbeing.

The correlation co-efficient of the paired sample tests ranged from 0.308

Characteristic	Pre-attendance		Post-attendance			<i>t</i>	<i>p</i> -value
	Mean	SD	Mean	SD	df		
Average weight (kg)	87.92	15.78	87.38	15.61	201	2.46	0.00*
Knowledge	6.09	3.18	7.84	2.68	210	-7.63	0.01*
Quality of life	17.28	4.87	18.57	4.29	201	-4.06	0.00*
Empowerment	4.07	0.564	4.16	0.51	198	-2.003	0.047**
HbA _{1c} (%)	6.90	1.03	6.81	0.99	128	1.49	0.14
Total cholesterol (mmol/L)	4.32	0.99	4.08	0.92	125	2.79	0.06

* $p \leq 0.01$; ** $p \leq 0.05$.

Table 4. Mean difference of paired sample *t*-tests between psychological and biomedical variables of participants from pre-attendance at the CODE programme to post-attendance (n=392)

for empowerment scores, 0.367 for knowledge and 0.568 for wellbeing, indicating that the participants who scored well in the pre-evaluation did not necessarily score well in the post-evaluation. At pre-evaluation, younger people (defined as <60 years) were less empowered ($p=0.013$) than older people. However, both groups had a similar increase at post-evaluation. Examination of the quartiles showed that 190 participants completed all parts of the DES-SF pre- and post-attendance and demonstrated change. However, of these the empowerment scores of 97 increased and 64 decreased. No demographic variable significantly predicted post-evaluation empowerment score.

Pearson product moment correlation co-efficient showed there was a significant relationship between a change in empowerment level and a change in reported QOL ($r=0.227$; $p=0.00$). Participants who became more empowered post-evaluation also reported improved QOL.

There was an indication that women were more likely to have a higher knowledge score at pre-evaluation and to improve on that score post-evaluation ($p=0.06$). It was also

noted that a quarter of the participants scoring the highest at pre-evaluation contributed to half of the decrease in knowledge scores post-evaluation. Some people who had answered the majority of knowledge questions correctly prior to attending the programme only answered half that number correctly post-attendance.

Attendees and Week 26 non-attendees. Week 26 non-attendees were those participants who failed to attend the final session (n=155). Independent samples *t*-test demonstrated no difference in characteristics between attendees and Week 26 non-attendees except for age (Table 5). Attendees were older (M=65.10, SD=9.65) than Week 26 non-attendees (M=62.07, SD=10.72; $t[381]=2.87$; $p=0.004$) indicating that older people were more likely to attend the full programme.

Pearson's *r* was used to examine the difference in characteristics recorded as categorical data between attendees and Week 26 non-attendees. No significant difference was found for gender, treatment type or presence of co-morbidity. However,



smoking was significant ($p=0.01$) with 20 of the 45 people who smoked, not completing the post-programme evaluation.

Discussion

Attendance at the CODE structured diabetes education programme resulted in positive changes for many people but not for all of those who completed the programme. In addition, there was a significant difference in the age of participants who completed the programme and those who did not attend the final session, further nullifying the positive change effects.

Attendees who completed the pre- and post-evaluation questionnaires of the CODE programme showed positive effects following attendance when analysed at group level. Empowerment increased, as is reported in other similar educational interventions using the same measurement tool.^{3,4} Younger people reported being less empowered which may reflect that they were more recently diagnosed and had yet to come to terms with living with diabetes. However, it more likely reflects that younger people are more affected by the diagnosis of a chronic disease than older people¹² and as a result feel less empowered to take control of life outcomes. In addition, almost one-third of people had a decrease in empowerment post-attendance. There may be many explanations for this. Gaining additional knowledge about diabetes may have contributed to people realising the many aspects of diabetes they are unable to control and therefore reduced their self-efficacy. The value of promoting self-efficacy by focusing on specific manageable goals and building on past successes is very important.¹³ Although CODE facilitators help participants to identify one lifestyle behaviour to change at a time, it may be that people are overwhelmed by the multiple lifestyle changes necessary.

Characteristic	Attendees (n=237)		Week 26 non-attendees (n=155)			t	p-value
	Mean	SD	Mean	SD	df		
Age (years)	65.10	9.65	62.07	10.72	381	2.872	0.004*
Duration of diabetes (years)	6.21	5.56	6.99	6.56	370	1.243	0.215
Average weight (kg)	87.95	15.86	90.12	21.77	371	1.035	0.302
Knowledge	6.10	3.19	6.12	3.11	375	0.054	0.267
Quality of life	16.92	5.46	15.75	5.15	340	-0.664	0.507
Empowerment	4.05	0.61	4.01	0.63	361	-1.988	0.048**
HbA _{1c} (%)	6.98	1.15	7.23	1.27	261	1.571	0.117
Cholesterol (mmol/L)	4.22	0.97	4.29	0.99	257	0.489	0.625
LDL	2.38	0.79	2.31	0.87	217	-0.574	0.567
HDL	1.19	0.38	1.25	0.38	215	0.986	0.325
Triglycerides	1.65	1.11	1.96	1.21	224	1.889	0.06

* $p<0.01$; ** $p\leq 0.05$. LDL = low density lipoprotein; HDL = high density lipoprotein.

Table 5. Mean difference between characteristics of participants who completed the pre- and post-evaluation for CODE (attendees) and participants who only completed the pre-evaluation (Week 26 non-attendees); (n=392)

Self-reported QOL also increased, as has been reported post-attendance at other diabetes educational interventions.¹⁴ Similar to that reported elsewhere, women reported a lower QOL.¹⁵ This may be that men manage their life with diabetes by minimising the intrusiveness of the disease, considering it part of life and not as an illness,¹⁶ and therefore their QOL is less affected by it.

Knowledge increased at a group level which supports the usefulness of attendance at the programme. Knowledge increase is a key objective of the programme and the knowledge assessed is based on the deliverables of CODE. Nevertheless, knowledge is the most significant predictor of diabetic outcomes⁷ and therefore this is an important finding in this study. Some people who attended the full programme, and scored high for pre-attendance knowledge,

decreased their knowledge score post-attendance. The findings in this study indicate the need for more individualised evaluation.

Despite these positive outcomes, it is of concern that almost 40% of people did not complete the post-evaluation questionnaire. These people may have attended three-quarters of the programme but failure to complete the post-evaluation questionnaire affects the generalisability of positive outcomes. It cannot be assumed that missing data from the post-intervention evaluation have the same characteristics as those of participants who have completed data.¹⁷ The lack of reporting of drop-out rates and the differences between those who completed the education programme, and those who did not, are usually neglected and this may potentially bias positive findings in all educational interventions. A meta-analysis of 31 educational



interventions reported greater than 20% attrition rates in one-third of the studies.⁷ The majority of studies included were American in origin where different demographic and health care service backgrounds may affect attrition rates. There are no published data for Ireland. The only published study looking at attrition rates is dated and followed clinic appointments rather than educational attendance, therefore identifying the need to further research this area. Funding has been secured to support a study exploring the reasons for attrition and failure to attend future CODE programmes. In addition, the 65 participants who failed to respond to the initial invitation need to be invited to subsequent programmes and, if still not available, warrant further investigation.

Some authors state that working full time affects attrition rates.⁷ CODE delivery is based on when participants are available to attend – morning, afternoon, evening, weekend – with educators reporting that evening sessions have the highest attrition rates. The high attrition rate may reflect the low-priority that patients with T2DM place on diabetes self-management education and their perception of it as a ‘mild’ form of the disease, with the high morbidity and mortality rates associated with diabetes being attributed to ageing or co-morbidity. It may also reflect a cultural perspective whereby developing diabetes self-management skills is not yet valued because patients do not hold personal responsibility for their illness. There is no national diabetes framework for diabetes in Ireland¹ and, if policy makers do not place an emphasis on diabetes management, it is unlikely that local HCPs or patients will do so.

Those who failed to complete Week 26 evaluation were younger and reported a lower QOL, suggesting that specific targeted

interventions are needed for this group in order to facilitate retention. The CODE programme was originally designed for delivery by external educators but developments for 2010 included delivery by practice nurses. Strategies for recruitment and retention are most effective when they build on a relationship of trust with participants and the community.¹⁸ Having the local HCP deliver CODE is anticipated to reduce attrition as the participant is more likely to view attendance as part of their medical care plan. Lower QOL has previously been associated with non-attendance;¹⁹ however, in that study, measurement was of psychological distress, whereas in this study measurement was of psychological wellbeing.

Limitations. The study has several limitations. First, the study participants were a sample of people invited to attend for group diabetes education and may not be representative of all people with T2DM. Second, the size of the sample was outside the control of the researcher. Lack of power or chance findings may explain why there was only positive change in some outcome measures. Third, a sample of participants was excluded from data analysis because they failed to complete the post-attendance evaluation; this area will be further researched in future CODE programmes, initially as a qualitative study. Finally, the focus of the CODE evaluation is on the short-term outcomes of empowerment, QOL and knowledge change. There is no way of knowing if the positive effects are sustained beyond attendance at the programme without funding to do a longitudinal study.

Conclusion

Increasing patients’ self-management skills to manage their T2DM is extensively the target of diabetes education. Most educational

interventions report positive outcomes based on patterns of group level change. There is a need to focus on individual change by collecting data at more intervals and thereby facilitate individual change analysis. This study showed that, at a group level, results may be positive but, on closer inspection, some people demonstrated a decrease in scores which warrants more detailed research. Finally, a group of people were not included in the post-evaluation because they failed to complete the evaluation or failed to complete the programme without explanation. This study identified younger age and reported poorer QOL as possible causes of attrition. This group needs to be targeted for more intensive retention strategies and their reasons for attrition identified and addressed.

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Declaration of interests

There are no conflicts of interest declared.

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