

**Group Intervention Services for People with Type 2
Diabetes**

A Literature Review

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EXECUTIVE SUMMARY

Type 2 Diabetes Mellitus is a global public health problem with serious chronic health consequences and enormous costs both socially and economically. The cornerstones for treatment of the disease are diet, physical activity, and medical management, so the burden on public and private health care services to provide this therapy is profound. In 2006 a landmark decision to include multidisciplinary group education within the Australian Medicare rebate schedule was made. This review provides background knowledge on current multidisciplinary group practice in the medical literature.

Findings indicate that multidisciplinary group education has a positive impact on physiological parameters and diabetes knowledge and may also improve a range of psychosocial parameters. Although there is no best format identified for delivery, the review summarises known intervention format and identifies pointers for practice. Further work is required to delineate best practice for disease stage, age, gender, and minority groups, as well as the interaction between dietitian, educator and exercise physiologist – the three disciplines to be covered under the new Medicare rebate.

INTRODUCTION

Diabetes is set to become a principal cause of death and disability worldwide in the next two decades¹. In the year 2000 it was estimated that just over 4% of the world's population had diabetes². The prevalence of diabetes in Australia is one of the highest rates in the developed world³. This means there is a great burden to bear in terms of social and economic cost. There are serious long-term effects and complications of diabetes including retinopathy, nephropathy, and neuropathy, among others⁴. Diabetes accounts for 2-3% of total health care costs and the rising prevalence of the disease will have a great impact in economic terms⁵. Because type 2 diabetes represents 85-90% of all cases it accounts for a large proportion of these costs.

In May 2006, Australian Federal Health Minister, Tony Abbott, made a landmark announcement of funding for a new Medicare item to support multidisciplinary group education services for people with type 2 diabetes. The three professions covered by the new item are Accredited Practising Dietitians, Credentialed Diabetes Educators and Accredited Exercise Physiologists. Whilst group practice for people with type 2 diabetes is currently prevalent in the public health system, private practitioners within these professions are more likely to consult on an individual basis. The new Medicare item represents a significant shift in approach to health care services currently covered by Medicare in Australia since rebates are usually based on individual consultation.

The aim of the current review is to provide background information on group education interventions for adults with type 2 diabetes and will incorporate literature using a multidisciplinary team approach. Specifically, this review will report on group processes, success indicators, and key findings. This report, together with the findings from a targeted professional survey, will underpin the development of an information pack suitable for the three professions.

METHODS

The search strategy identified relevant studies up to February 15th 2007. Citations within the Cochrane Reviews and Database of Abstracts of Reviews of Effectiveness (DARE) formed the initial search. A major review on group intervention for people with type 2 diabetes was located as a Cochrane Review⁶. Results from the review and the individual studies within this review, formed the basis for literature up to January 2003. DARE articles were also reviewed for relevancy. To obtain more recently completed studies, the search strategy from the Cochrane Review⁶ was repeated with

modifications (see Appendix 1) in PubMed for relevant articles from January 2003 until February 15th 2007. Unlike the Cochrane Review, this latter search was limited to English Only articles. The results of the search were scanned (title first, then abstract, then article if necessary) for relevant articles. Articles that reported peer-led interventions and mixed interventions in which individual consultations by the specialist (not the general practitioner/nurse) regularly occurred during the group interventions were excluded.

Individual studies were separated from reviews. The final selection of articles were reported on as a whole, as well as relates to minority groups (cultural or socially/economically disadvantaged), multidisciplinary practice, age, and gender. Due to time restraints, these were not searched separately in addition to the main search.

RESULTS AND DISCUSSION

Selected Studies

A summary of source of citations included in this review is found in Table 1. One highly relevant Cochrane review⁶ was located and of eleven studies included in this review, four could eventually be located. One of these studies was a peer-led group intervention and was excluded. One other Cochrane review⁷ was hand-searched for relevant studies resulting in three citations. One of these was more than twenty years old, and another could not be located, leaving one⁸. Three additional DARE reviews were retained⁹⁻¹¹, however on closer inspection these did not focus on group intervention. The search of PubMed cited 1,184 articles including 50 reviews. After assessment for relevancy, 23 abstracts were initially kept. This list was culled to twenty and finally twelve studies were sourced on group interventions. Quality assessment was not conducted.

Table 1 Summary of citation sources

<i>Type</i>	<i>n</i>
Cochrane Review	1
DARE Reviews	0
Cochrane Review citations	4
PubMed	12
Others (from hand-searches)	1
Total	18

Reviews: Group intervention for type 2 diabetes

A recent Cochrane review⁶ has concluded that group-based, patient-centred training results in effective clinical, lifestyle and psychosocial outcomes for people with type 2 diabetes. This review included eleven studies, eight of which were randomized controlled trials, and the remaining three were controlled clinical trials. A summary of intervention characteristics for the studies included in the review is given in Appendix 2. Full details can be found in the original citation with a summary as reported below on page 1 of the document.

Key findings included:

- Reduced glycated haemoglobin (Hb_{A1c}) at four-six months (1.4%; 95% confidence interval (CI) 0.8 to 1.9; $P < 0.00001$), at 12-14 months (0.8%; 95% CI 0.7 to 1.0; $P < 0.00001$) and two years (1.0%; 95% CI 0.5 to 1.4; $P < 0.00001$);
- Reduced fasting blood glucose levels at 12 months (1.2 mmol/L; 95% CI 0.7 to 1.6; $P < 0.00001$);
- Reduced body weight at 12-14 months (1.6 kg; 95% CI 0.3 to 3.0; $P = 0.02$);
- improved diabetes knowledge at 12-14 months (self management of diabetes 1.0; 95% CI 0.7 to 1.2; $P < 0.00001$)
- Reduced systolic blood pressure at four to six months (5 mmHg; 95% CI 1 to 10; $P = 0.01$).
- Reduced need for diabetes medication (odds ratio 11.8, 95% CI 5.2 to 26.9; $P < 0.00001$; RD = 0.2; NNT = 5). For every five patients attending a group-based education programme expect one patient to reduce diabetes medication

Studies within the review were mostly delivered by a combination of physicians, nurses, diabetes educators and dietitians. Number of participants in the groups were mostly 4-10 and were mostly mixed males and females. Only one group was newly diagnosed, the remaining studies were with participants who had had type 2 diabetes for a number of years and with a mean age of over 50 years. Only one study reported a drop-out rate of more than 25%¹².

Subgroup analysis was based on a very limited numbers of studies, but indicated evidence in favour of delivery of group education by health professionals and less evidence for delivery by lay people, and that larger groups of up to 16-18 could be effective. There was also evidence for the effectiveness of education based on participatory/empowering and adult-centred principles. Confirmation of these findings is required.

Individual studies: Group intervention for type 2 diabetes

Studies included in this section were mixed in design and groups consisted mainly of type 2 diabetes patients occasionally mixed with patients with type 1 diabetes. Outcomes of group education sessions were either compared pre- and post-intervention compared with "individual treatment" or control groups receiving no care or usual care. Whilst the review presented above focus on physiological parameters, many of those retrieved from the later search highlighted the benefit of group education for people with type 2 diabetes on psychosocial parameters. Please refer to Appendix 3 for a summary of reviewed studies.

a) Group Processes

Number/duration of sessions and duration/frequency of intervention

Interventions lasted from 4 weeks¹³ to four years⁸ except for one single intervention conducted over five days¹⁴. Where duration was reported, sessions were one to three hours long. Sessions tended to be grouped weekly or bi-weekly, but could be monthly, or three- to six-monthly. The most extensive intervention was an extended education course over five days with up to fifteen group sessions (three or four per year) over the next four years⁸.

Number of Participants

Where numbers were reported they tended to be between five and ten participants per group. One study in a retirement community allowed for up to twenty participants, although only 6-16 attended with the highest attendance at the first session and up to twelve thereafter¹⁵.

Drop out rates

These are difficult to interpret due to the heterogeneity of the interventions included in terms of format and duration. The highest dropout rate recorded in an intervention group was 26% at 12 months¹⁶ for an intervention delivering an assessment session plus 12 hours of group contact over twelve months.

Targeting

There were several studies reporting on minority groupings including culturally diverse and lower socio-economic groups. Unfortunately all studies were outside the Australian context. Strategies employed to support minority groups included having sessions conducted in the first language of participants^{13, 17},

emphasizing visual aids vs written materials¹⁷, having the intervention reflect ethnic beliefs, values, customs, food preferences, language, learning methods and health care practices¹⁸, using "culturally specific and literacy-sensitive strategies"¹⁹ (p225), using bilingual staff^{13, 19}, relating risk content specific to the cultural group²⁰, addressing cultural barriers/beliefs that may support/hinder diabetes management²⁰, food preparation incorporating cultural preferences¹³, resources in the first language¹³, and using a culturally appropriate approach with language, diet, social emphasis, family/community participation and incorporation of cultural health beliefs¹³.

One study reported an intervention for a lower income Hispanic group¹⁹. Strategies employed included those appropriate for lower literacy and Hispanic people, and included intensive intervention (frequency of contact), simplification and repetition of messages, large visuals, use of soap opera drama, attendance by family members, facilitation of frequent feedback, and tailoring foods depicted in visuals and in food preparation/recipes to those consumed by the group. Other interventions targeted one major concept at once to enhance uptake of a lower literacy group¹⁸, and minimised written materials¹³.

Studies specifically targeting minority groups all used a high frequency of contact: all were weekly for at 4-12 weeks with the latter continuing at reduced frequency after twelve weeks. Each session ran for 1-3 hours.

Age was not generally targeted in this group of studies. One pilot study reported an intervention in elderly participants of mean age 79 years old living in a continuing care retirement centre¹⁵. The structure of the program was twelve bi-weekly sessions of one hour in length. The sessions were multidisciplinary with registered nurse certified diabetes educator, registered nurse, dietitian, exercise trainer and physician involved. In this study, measures of well-being and satisfaction with treatment, knowledge, or time of check-ups did not change and Hb_{A1c} worsened by ~0.51% (to a mean of 7.56%). However the group reported good scores at baseline. Feedback from this pilot study indicated that participants would prefer a longer length session (1.5 hours). Other expressed preferences were for large print materials, hand-held materials (for vision and information retention), and more extensive information on diet. Participants reportedly enjoyed the outings to the grocery store and restaurant provided within the course.

Gender and disease stage were not specifically targeted within these studies.

One study was cross-sectional in nature to examine differences between type 1 diabetes (n=101) and type 2 diabetes (n=107) patients on selected variables to determine whether combined group education was appropriate²¹. The study found that patients with these two disease presentations differ on medical issues, lifestyle, self-management, and psychosocial characteristics and would not be suitable for combined group therapy. However this might vary according to context.

Multidisciplinary Practice

All but one intervention was delivered by more than one practitioner. Practitioners included registered nurses (five citations), specialist nurse/diabetes educator (seven citations), dietitians (seven citations), general practitioner/ physician/specialist physician (six citations), exercise trainer/rehabilitation specialist (two citations), other assistants (six citations: educationist, lay-people/community, intervention leader, research staff, intervention assistant). It should be noted that three references reported on different aspects of follow-up/intervention of the same study – the group session was run by an educationist and two physicians²²⁻²⁴.

Lack of studies listing exercise physiologists as assisting with delivery may be because there was no access to exercise-specific databases for the literature search. Alternatively this could be because type 2 diabetes multidisciplinary sessions have traditionally involved the other professions, particularly outside Australia. Physical activity is a cornerstone of type 2 diabetes treatment. Accredited exercise physiologists are identified in Australia as experts in health service delivery in this field, so it is expected that future practice involving exercise physiologists within the multidisciplinary team will build on what is known about successful multidisciplinary practice.

Content

Content varied across programs, however some common elements could be extracted. These are listed in Figure 1.

Figure 1: Topics delivered in group education

About diabetes/pathophysiology ^{8, 14, 16, 17, 19, 20, 25}
Nutrition (including cooking/recipe/shopping) ^{8, 13, 14, 16-20, 24-27}
Physical activity ^{8, 13, 14, 16, 17, 19, 20, 24-27}
Medications/Injections ^{8, 13, 16, 19, 24, 25}
Monitoring/using results ^{8, 13, 16, 17, 19, 20, 24, 26, 27}
Acute complications ^{8, 13, 14, 16, 25}
Chronic complications/risk factors ^{8, 13, 14, 16, 17, 19, 20, 24, 25}
Goal setting and problem solving ^{13, 16, 20, 27}
Psychosocial adjustment/stress/coping/support ^{8, 13, 16, 17, 19, 26, 27}
Pre-conception care/pregnancy/gestational diabetes ^{8, 14, 16}
Health care system/relating with health professionals ²⁷
Treatment/therapy – general ^{8, 14}
Sick days/Traveling ^{8, 13, 14}
Weight Management/Burden of overweight ^{8, 17, 20, 24}
Smoking cessation ^{17, 24}
Diabetes and other illnesses ⁸
Wound/foot care ^{8, 13, 20}
Children ⁸
Cultural barriers/support ²⁰

b) Success Indicators

Of the seventeen reviewed studies, the most commonly measured outcomes were

- Physiological: Hb_{A1c}, blood lipids, anthropometry (weight, body mass index (BMI)), fasting blood glucose, blood pressure
- Psychosocial: anxiety/depressive symptoms/diabetes-related stress, quality of life, well-being, health beliefs/diabetes-related health beliefs,
- Behavioural: self-management/health care behaviours generally, blood glucose monitoring, diet, physical activity, drug compliance etc.
- Knowledge/satisfaction

Hospital admissions and projected health care costs were also estimated by one study¹⁶. Coronary heart disease events and microvascular disease events were estimated to be reduced by 12% and 15% respectively over 10 years. Costs were estimated to be reduced by \$US415 per program completer with group intervention.

c) Key findings – Individual studies

- Group intervention often has a positive effect on blood glucose control measured by Hb_{A1c}. Reductions of 0.4%²⁶ to 2%¹⁷ over 6 months have been reported.
- Other positive physiological effects were reported, including reduction in weight or BMI^{8, 23, 28}, blood lipids^{17, 23}, blood glucose⁸.
- Participants in group intervention may increase locus of control²², reduce anxiety/distress^{20, 23, 25}, increase knowledge^{13, 15, 17, 23}, increase satisfaction in knowledge²⁶, increase quality of life²³, increase feelings of well-being¹⁴, and change health care behaviours (exercise, diet and self-management)^{8, 18, 19, 23, 26}.
- Successful group interventions vary in frequency, duration and format, but generally have five to ten participants with sessions one to three hours long.
- Groups tailored for minority groups can achieve significant physiological and psychosocial improvements. Frequent contact may be beneficial.
- Most interventions were multidisciplinary and achieved positive outcomes for participants. There may be additional positive benefit multi-professional versus uni-professional group education, however this effect was not exposed in the current review.

CONCLUSIONS

In conclusion, multidisciplinary group education for people with type 2 diabetes has a positive effect on blood glucose control and may have positive effects on other physiological parameters that impact on further development of chronic complications in this population. As Deakin et al⁶ suggest, as each education program contains different components, it is "difficult to identify the active ingredient(s) with any precision" (p.19). Studies included within the review varied in frequency of contact, but tended to include low duration sessions with group size of less than ten. Further review and potentially further research is required to identify differences in practice defined by disease stage, age, Aboriginal and other minority groups, as well as to confirm the expected beneficial inclusion of exercise physiologists into the multidisciplinary team.

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APPENDIX 1: SEARCH STRATEGY

Electronic searches: PubMed

This search was replicated from Deakin et al⁶ except where otherwise indicated.

Unless otherwise stated, search terms were free text terms; MeSH: Medical subject heading (Medline medical index term); pt = publication type; TIAB = title/abstract; or/ indicated an OR was placed between each search indicated by the given range.

Note: some terms yielded >600 citations and were replaced as indicated.

1. diabetes mellitus, type 2 [MeSH Terms]
2. insulin resistance [MeSH Terms]
3. impaired glucose tolerance [TIAB]
4. glucose intolerance [TIAB]
5. insulin resistance [TIAB]
6. mody [TIAB]
7. dm2 [TIAB]
8. niddm [TIAB]
9. iddm [TIAB]
10. non insulin dependent [TIAB]
11. noninsulin dependent [TIAB]
12. noninsulindependent [TIAB]
13. type 2 diabet* [TIAB]
14. type ii diabet* [TIAB]
15. nonketotic diabet* [TIAB]
16. non ketotic diabet*
17. adult onset diabet* [TIAB]
18. late onset diabet*
19. metabolic syndrom* [TIAB]
20. plurimetabolic syndrom* [TIAB]
21. syndrome x [TIAB] (this term was added replacing the original search #3 which was not found and deleted from the current search: obesity in diabetes [MeSH])
22. or/1-21
23. dermatomyositis[MeSH Terms]
24. Myotonic dystrophy[MeSH Terms]
25. Diabetes insipidus[MeSH Terms]
26. dermatomyositis[TIAB]
27. myotonic dystroph*[TIAB]
28. diabet* insipidus[TIAB] (yielded >600citations, this term was replaced with searches on diabetes insipidus [TIAB] and diabetic insipidus [TIAB] as separate searches
29. or/23-28
30. 22 not 29
31. education [MeSH Terms]
32. self care [MeSH Terms]
33. patient education [MeSH Terms]
34. self efficacy [MeSH Terms]
35. behavior therapy [MeSH Terms]
36. empowerment [TIAB]
37. self care [TIAB]
38. education* [TIAB]
39. self efficac* [TIAB]
40. program* [TIAB]
41. group method* [TIAB]
42. group management [TIAB]
43. evaluation* [TIAB]
44. lifestyle [TIAB]
45. behavio?r* therap* [TIAB]] (this term was not found, so was replaced with behavior therapy [TIAB] and behaviour therapy [TIAB]
46. or/31-45
47. randomized controlled trial [Publication Type]
48. randomized controlled trials [MeSH Terms] (term not found, eliminated from search)

49. random allocation [MeSH Terms] random [TIAB]
50. allocat*[TIAB]
51. assign [TIAB]
52. controlled clinical trial [Publication Type]
53. clinical trial [Publication Type]
54. clinical trials [MeSH Terms]
55. clinical trial* [TIAB]
56. double blind method [MeSH Terms]
57. single blind method [MeSH Terms]
58. single blind*[TIAB]
59. single mask*[TIAB]
60. double blind* [TIAB]
61. double mask* [TIAB]
62. placebos [MeSH Terms]
63. placebo [TIAB]
64. research design [MeSH Terms]
65. comparative study [MeSH Terms] (term not found, replaced with comparative study [PT])
66. evaluation studies [MeSH Terms]
67. follow up studies [MeSH Terms]
68. prospective studies [MeSH Terms]
69. control stud*[TIAB]
70. volunteer study [TIAB]
71. intervention studies [MeSH Terms]
72. intervention stud*[TIAB]
73. or/47-72
74. 30 and 46 and 73

APPENDIX 2: SUMMARY OF GROUP INTERVENTION CHARACTERISTICS FROM THE COCHRANE REVIEW⁶.

	Trial Design	Setting	Country	Number	Age+/-SD	Sex	Ethnicity	Diabetes Duration	Socioeconomic Status	Education Background	Drop out (%)	Intervention	Duration	# Participants per Group
Brown, et al 2002	RCT	Community	US	IG = 128, CG = 128	IG = 54.7+/-8.2, CG = 53.3+/-8.3	IG = 40% M, CG = 32%	Mexican Americans	IG = 7.6+/-5.8, CG = 8.1+/-6.9	Starr county is the poorest county in Texas with high unemployment at 24.4%	Not stated but language of preference = Spanish with 40% reading little or no English	Overall 10%	Group education programme delivered by nurse, dietitian & community worker.	52 hours over 12 months (12 weekly meetings + 14 biweekly sessions)	Unclear
Deakin, et al 2003	RCT	Primary care	UK	IG = 157, CG = 157	IG = 61.3+/-9.7, CG = 61.8+/-11.0	IG = 48.4% M, CG = 54.8% M	IG = 116 white Caucasian/41 South Asian, CG = 118 white Caucasian/39 South Asian	IG = 6.6+/-6.4yr, CG = 6.7yr+/-6.7yr	Not stated	Not stated	IG = 4.5%, CG = 10.2%	Group education programme delivered by diabetes educator	6 consecutive weeks, each session 2 hours (total time = 12 hours)	16
Domenech, et al 1994/1995	Clinical controlled trial	Primary care	Argentina	IG = 40, CG = 39	IG = 52.7+/-3.1, CG = 53.1+/-1.1	IG = 55% M, CG = 56% M	Not stated	IG = 6.3+/-1.3, CG = 6.9+/-0.7	Reported to be the same in both groups but no data given	Not stated	IG = 25%, CG = 45%	Group based structured teaching/treatment programme provided by previously trained physicians.	4 weekly sessions lasting 90-120 min (total 6-8 hrs)	5 - 8
Heller, et al 1988	RCT	Hospital diabetes clinic	UK	IG = 36, CG = 39	IG = 56.5, CG = 56.4	IG = 55% M, CG = 41% M	Not stated	New diagnosed	Not stated	Not stated	IG = 10, CG = 17%	Group education programme. Diabetes specialist nurse and dietitian	4.5 hr for 3 consecutive weeks. 1.5 hr at both 3 & 6 months (total = 7.5 hr)	4-6 patients plus spouse or friend
Holtrop, et al 2002	RCT	Primary care	US	IG = 67, CG = 65	IG = 58, CG = 65	IG = 0% M, CG = 0% M	IG = 95% Caucasian, CG = 95% Caucasian	Not stated	Not stated	86% achieved high school education	Unclear	Group programme delivered by trained lay health advisors	six weekly 1 1/2 hour sessions (total time = 9 hours)	Not stated
Kronsbein, et al 1988	Controlled clinical trial	Primary care	Germany	IG = 50, CG = 49	IG = 65+/-9, CG = 63+/-8	IG = 42% M, CG = 39% M	Not stated	IG = 7+/-5, CG = 7+/-6	Not stated	Not stated	IG = 23%, CG = 21%	Group structured treatment and teaching programme (DTTP) delivered by paramedical staff (physician assistants)	1 1/2 - 2 hours per week for 4 weeks (total time = 6-8 hours)	4-6
Lozano, et al 1999	RCT	Primary care	Spain	IG = 120, CG = 123	IG = 63.8, CG = 64.7	IG = 48% M, CG = 48% M	Not stated	IG = 8.1, CG = 9.1	Low-medium socioeconomic status	Not stated	IG = 4%, CG = 3%	Health educational workshop delivered by nurses	1hr 30 min on two consecutive days and repeated in year two	Unclear
Pieber, et al 1995	Controlled clinical trial	Primary care	Austria	IG = 45, CG = 49	IG = 63.9+/-8.2, CG = 65.4+/-11.2	IG = 42% M, CG = 47% M	Not stated	IG = 7.6+/-5.6, CG = 6.9+/-6.1	Not stated	Not stated	IG = 13.5%, CG = 10.9%	Diabetes Treatment and teaching Programme (DTTP) delivered by physician and office staff	4 weekly sessions (total 6-8 hr)	4-8
Rickheim, et al 2002	RCT	Diabetes centre	US	IG = 87, CG = 83	IG = 51.6+/-9.2, CG = 52.9+/-12.8	IG = 35.6% M, CG = 32.5% M	IG = 89.5% Caucasian, CG = 96.4% Caucasian	IG = 1.1+/-4.0, CG = 0.6+/-1.7	Not stated	% high school or lower IG = 25.3%, CG = 24.1%	IG = 51%, CG = 41%	group diabetes education programme. Nurse and dietitian.	Consisted of 4 sessions (total 7 hours)	4-8
Trento, et al 1998	RCT	Diabetes outpatient department	Italy	IG = 55, CG = 57	IG = 61.6, CG = 61.0	IG = 47% M, CG = 61% M	Not stated	IG = 9.1 year, CG = 9.2 year	(IG/CG) Housewife - 15%/8%; Retired - 21%/28%; White collar worker - 4%/5%; Blue collar worker - 9%/8%; Other - 4%/7%	Despite randomisation the CG were more literate and had attended more years of schooling	8 declined to participate (IG=5/CG=3) and 16% (IG) & 12% (CG) dropped out during first year	Structured group education program delivered by two physicians and educationist	every 3 months for 1 year (4 x 60/70 mins)	10
Trento, et al 2001	RCT	Diabetes outpatient department	Italy	IG = 56, CG = 56	IG = 62, CG = 61	IG = 48% M, CG = 61% M	Not stated	IG = 9.4, CG = 9.8	(IG/CG) Housewife - 14%/10%; Retired - 24%/27%; White collar worker - 4%/2%; Blue collar worker - 7%/8%; Other - 7%/9%	Despite randomisation the CG were more educated	IG = 23%, CG = 16%	Structured education program delivered by two physicians and educationist	every 3 months for 2 years (1 hour x 8 = 8hr/2 yr)	10
Trento, et al 2002	RCT	Diabetes outpatient department	Italy	IG = 56, CG = 56	IG = 62, CG = 61	IG = 48% M, CG = 61% M	Not stated	IG = 9.4, CG = 9.8	(IG/CG) Housewife - 14%/10%; Retired - 24%/27%; White collar worker - 4%/2%; Blue collar worker - 7%/8%; Other - 7%/9%	Despite randomisation the CG were more educated	IG = 20%, CG = 20%	Structured education program delivered by two physicians and educationist	every 3 months for 2 years and 7 sessions in year 3 +4 (total 15hrs/4yrs)	10
Zapotoczky, et al 2001	RCT	Hospital diabetes unit	Austria	IG = 18, CG = 18	IG = 62+/-8.2, CG = 53+/-11.4	IG = 44% M, CG = 28% M	Not stated	Not stated	Not stated	Not stated	0%	group education delivered by dietitian	1.5 hour monthly group education for 10 months (total time = 15 hours)	18

RCT=randomised controlled trial; IG=intervention group; CG=control group; M=male

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APPENDIX 3: SUMMARY OF INDIVIDUAL STUDIES REVIEWED

Author/year	Subjects	Key Outcomes/Indicators	Results	Description	Disciplines	Dropouts			
Anderson-Loftin, et al 2005 (17)	n=97 adult of americans randomly assigned to usual care or intervention. T2D. Usual care was referral to (attendance not checked) local 8 hr usual class. Age 32-86yo, M&F	HbA1c, BMI, lipids, dietary behaviours	Difference in BMI and diet significant for IG vs CG. NS difference for cholesterol or HbA1c	4 x 1.5 hr weekly classes on low fat diet strategies (planning, purchasing, making), 5 monthly peer-professional group, weekly phone follow-up. Intervention reflected the ethnic beliefs, values, customs, food preferences, language, learning methods, health care practices of Southern African Americans see p 557	Diabetes educator for peer-professional, dietitian for low fat food class	retention 84% in IG, 56% in CG. 32 ppts (33%) dropout. 69% attended at least 1/2 of sessions.			
Balamurugan, et al 2006 (15)	n=11 T1D + n=201 T2D vs n=21,886 no group care. M&F	HbA1c, hospital admissions, projected care costs per person	HbA1c reduced by 0.45%, less hospital admissions, lower projected costs	1 hr assessment, 12 hrs nutrition/SM over 1 yr. 0,6,12mo, Content in p895	Registered nurse, dietitian	retained 87% at 6mo, 74% at 12mo			
Brown, et al 2002 (12)	n=256 M&F with T2D 35-70yo, accomplish physical activity by a family member or friend. N=128 randomly allocated to IG, others allocated to wait list for treatment. On insulin or hypoglycaemic agents	HbA1c, fasting blood glucose, diabetes knowledge, diabetes-related health beliefs	IG significantly lower HbA1c and fasting blood glucose than the CG at 6 (P<0.001 and P<0.001) and 12 mo (P<0.001 and P<0.02) and higher diabetes knowledge scores and 3 and 12 mo (P<0.001; 6mo not measured).	See p 261 for full details. Included cultural approach. 3 mo of weekly instructional x 2 hrs on nutrition, self-management of blood glucose, physical activity, other self care, 6mo bi-weekly plus 3 mo monthly 2hr support group problem solving and food preparation incorporating mexican/american preferences	Dietian and nurse plus trained community workers assisted with preparations	?			
D'Eramo, et al 2004 (19)	n=25 community black women with T2D	HbA1c, fasting blood glucose, weight, diabetes knowledge, diabetes self-efficacy, diabetes-related emotional distress	significant improvement in HbA1c: decrease ~1.3% (P=0.002), weight (P=0.03), BMI (P=0.005), diabetes-related emotional distress from 0 to 3 mo (P=0.01)	6 x weekly sessions 5-10 women, incorporating TMBC processes. Topics: diabetes and risks for black Americans, cultural barriers/beliefs to support/hinder diet modification/weight management + role social support, energy in foods and food labels, blood glucose management and eating, activity and foot care, reaching goals emphasising cultural reinforcement.	Advanced practice nurses certified diabetes educators. Dietitian was consultant to design.	90% attendance rate, 1 participant dropped out.			
Jenhani, et al 2005 (24)	n=87 T1D&T2D + insulin	HbA1c, anxiety	Reduction in HbA1c (~1.2%), increase satisfactory HbA1c, decrease severe anxiety by 1/3	6 monthly - see reference for specific content (pathophysiology, injecting, hypoglycaemia awareness, hyperglycaemia awareness, diet, chronic complications)	GP and nurse				
Jiang, et al 1999 (8)	n=208 T2D group participants, n=127 in advanced, n=87 in basic, age 35-70yo with HbA1c > 8% and stable	SM techniques assessed by questionnaire - blood glucose monitoring & recording, diet control, physical activity, drug compliance, management of hypoglycaemia, foot care. Fasting blood glucose, triglycerides, HbA1c, cholesterol, blood pressure, weight, waist-to-hip ratio	significant increase total score on SM, all physiological parameters significantly improved in intervention group except diastolic bp and triglycerides. Only HbA1c improved in control. Intensiveness of program the only significant variable correlated with reduced fasting blood glucose and diastolic blood pressure		Diabetes physicians, dietitians, nurse educators	not indicated, but values for n=208 reported baseline and 4mo			
Karlson, et al 2004 (26)	T1D+T2D age 25-70yo, n=31 IG, n=32 CG, 3 IGs for T1D, 2 IGs for T2D	diabetes-related stress, self blame, HbA1c	Significant decrease stress, self blame. No change HbA1c, but pre-test was 7.88%.	6 sessions 0-6 mo (1.5 hrs), 3 sessions 6-12mo	Specialist nurse plus people with diab as co-leaders				
Mauldon, et al 2006 (11)	16 latino pts (in us) m&F with diab mean 8yrs, 12dm.	HbA1c, BMI, lipids, diabetes related distress, health beliefs, knowledge, language-based acculturation variables. DKQ-24 (spanish knowledge q), DM-related health belief instrument (spanish), +other q'r. variables collected 0,3,6mths	inc knowledge scores, improvement lipid profiles, reduce hba1c (average reduction of 2.08% P=0.001) - most participants reached target of 7% by 6mo, improvement was seen in 82%. Men greater (but temp) inc in emotional distress during 1st 3 months	6-weekly, 3 hour CB ed sessions in spanish, content: clinical aspects of DM, nutrition, dyslipidaemia, H/t, SM (BG monitoring, pa, healthy eating, smoking cessation, wt loss), psych (stress, depression), health system navigation. Use of demonstration and visual aids emphasised, written material de-emphasised	intervention leader + research staff??	17 enrolled, 1 dropout	IV pre/post test		pilot ****note: process and psych/ph ysiologic outcomes presented
T2D=type 2 diabetes; T1D=type 1 diabetes; M=male;F=female; HbA1c=glycated haemoglobin; BMI=body mass index ;NS=not significantly different (P≥0.05); IG=intervention group; CG=control group; SM=self-management; GP=general practitioner; mo=months; yrs=years; hrs=hours									

APPENDIX 3: SUMMARY OF INDIVIDUAL STUDIES REVIEWED

Rosal, et al 2005 (18)	low income spanish in US 15 randomly assigned to intervention, 10 to control	assessments 0,3,6months. Primary outcome Hba1c	Significant decrease in HBA1c in intervention vs controls at 3 (mean -0.8%; P0.02) and 6 months (-0.85%; p=0.005). Difference between groups significant at 3 (P=0.009) and 6mths (P=0.01). Trend to increased physical activity in intervention vs control (p=0.11) - differences estimated to be 640kcal/wk at 3mo (P=0.08) and 789kcal/wk at 6mo (P=0.01). Evidence of increase self management of blood glucose over time via monitoring of software download (P<0.001). Depression symptoms Significant reduced at 3 mo and 6 mo.	10 group sessions targetting knowledge, attitudes, self-management skills through culturally-specific & sensitive strategies, cognitive behaviour framework	Bilingual nutritionist, nurse, intervention assitant who were trained in the program delivery	Completion rates 100%, 92%, 92% for assessments. Intervention participants attended 7.8 or 10 sessions and showed high compliance to intervention activities (logs, self-management of blood glucose)		
Sarkadi, et al 2004 (25)	77 T2DM	HbA1c, satisfaction, self-managment indicators	I/v group significant decreaseHbA1c after 6mths (P<0.05) and by 0.4% at 24mths (P<0.05) - values not given, Significant increases atisfaction in knowledge (check), exercise to influence T2DM, ability to predict. Effect on repeated HbA1c: Initial HbA1c (P<0.0001), satisfaction with own diabetes-related knowledge from participating in intervention (P<0.006), participating in intervention (P<0.010), and the treatment (P<0.0005). No other factor or demographic significant. Significant difference between control and intervention: being more satisfied with knowledge on diabetes (P=0.008), exercising more to affect bood glucose (P=0.015), being able to predict own bood glucose before measuring (p=0.048)	1 yr program + 1 yr follow-up. HbA1c 0, 6, 12, 24 months. Groups, booklets, walks/jogs, cook/shop etc	Pharmacist assisted by specialist nurse			
Smaldone, et al 2006 (20)	208 M&F with T2DM (107) or T1DM (101). Mean age T1DM = 44+/-12.4, mean age T2DM 57+/-9.2	HbA1c, lipids (unavailable for 20 x T1DMdm), bp, anthropometry, SM, depressive symptoms, diabetes related emotional stress, quality of life, coping, diet, activity, blood glucose	Cross-sectional. Types were similar with regard to depression, diabetes stress, % on anti-hypertensives. More T2DM were treated for dyslipidaemia, T2DM heavier & larger waist, lower steps, T1DM poorer quality of life & measured blood glucose more frequently and relied on emotional coping styles more frequently than T2DM	Cross-sectional study to explore the potential of educating T1DM and T2DM together.	n/a	n/a		
Tankova, et al 2004 (13)	n=319 subjects, n=241 controls T1DM (66%), T2DM (34%) M&F insulin-treated, no prior structured ed, ? Differences between groups at baseline	"well-being" measured by WHO/IDF questionnaire (22 items), HbA1c	Significant increase overall well-being at 1 and 2 yrs due to reduction in depression and anxiety and increase in positive well-being after 1y and decrease in depression and increase positive well-being >2y compared to control. HbA1c Significantly reduced in intervention group (from ~9.8 to 8.92 to 9.1 vs 10.1, 9.7, 9.85) - although both groups Significant reduced, the difference between groups was significant at one and 2 yrs.	5 day program x 1, 6-8 patients per group. Follow-up at 1y and 2y	Doctors, nurses, rehabilitation specialist	18 patients did not attend follow-up and were excluded from follow-up analysis so n=319		
Trento, et al 2001 (22)	group vs individual, 56 vs 56, groups 9-10	HbA1c, lipids, BMI, quality of life, knowledge, health care behaviours	Significant reduction Hba1c grp vs indiv (HbA1c stable in intervention group but worsened in control subjects, HDL increase for intervention not control (P<0.05), tended decrease BMI (P=0.06) & triglycerides (P=0.053), increase quality of life, increase knowledge, increase health care behaviours	Groups 3months to 2 yrs 4 sessions per 12 months, rep yrs 1-2, and 7 sessions over yrs 3-4, topics: burden of overweight, choosing food, meal planning, exercise, checking/improving metabolic control, smoking cessation, starting medications, preventing complications	2 x physicians, 1x educationist			
Trento, et al 2002 (23)	56 T2DM group care (6 groups of 9-10), 56 control individual care, T2DM pts <80yo, attendance at clinic >1y, mixed M&F	Hba1c, BMI, HDL-C, quality of life, knowledge, dose of medications, progression retinopathy, diastolic BP, relative CVD	Significant ↑HbA1c control group but unchanged in intervention, ↓BMI intervention, ↑HDL-C intervention, ↑QOL & knowledge intervention and ↓in ctrl, meds ↓ in intervention, retinopathy progressed less in intervention, diastolic BP & relative CVD risk ↓ both groups (results reported significant)	5-7 yrs of intervention see Trento, et al 2001-2004	2 x physicians, 1x educationist	11 form each group as at year 4		
Trento, et al 2006 (21)	n=56 vs n=51 individual care	locus of control questionnaires x 2	Reduction in score for chance vs control, increase in internal control vs control, NS difference powerful others	16 x 1 hour sessions (content p 98) cognitive behavioural therapy. Sessions included role plays, goal setting, problem solving etc.	2 x physicians, 1x educationist	post-hoc		
Weber, et al 2006 (27)	1 group 7 (control), 1 group n=8 (treatment) schitzophrenic patients.	Weight, WHR, BMI, fasting blood glucose	Cognitive behavioural therapy led to greater weight loss than control group	12x 1hr sessions conducted bi-weekly, content p 39. Lecture format, handouts, blackboard illustrations. Trip to grocery store, dinner/discussion/restaurant practical.	Trained psychiatric nurse	100% retention of treatment group. 2 dropped out of control (relapse/hospitalisation)		
Wendel, et al 2003 (14)	16 M&F T2DM mean age 79yo.	fasting blood glucose, HbA1c, knowledge, satisfaction (current treatment, knowledge, time of checkups), SF-36	Knowledge significant increased (%), but HbA1c significant increased. Other values not significant. High knowledge scores at baseline, HbA1c ~7% at baseline		Diabetes educator, physician, dietitian, exercise trainer	18 recruited, 16 completed pre/post both. Not all participants attended each session		

T2D=type 2 diabetes; T1D=type 1 diabetes; M=male;F=female; HbA1c=glycated haemoglobin; BMI=body mass index ;NS=not significantly different (P≥0.05); IG=intervention group; CG=control group; SM=self-management; GP=general practitioner; mo=months; yrs=years; hrs=hours