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Low attendance at structured education for people with newly diagnosed type 2 diabetes: general practice characteristics and individual patient factors predict uptake.

Authors: Kirsty Winkley[a], Daniel Stahl[b], Mark Chamley[c], Rosanna Stopford[a], Monica Boughdady[d], Stephen Thomas[e], Stephanie A Amiel[d], Angus Forbes[f], Khalida Ismail[a]

[a]Dept. of Psychological Medicine, King's College London & Institute of Psychiatry, Psychology & Neuroscience, London, UK

[b]Dept. of Biostatistics, King's College London & Institute of Psychiatry, Psychology & Neuroscience, London, UK

[c]Lambeth Diabetes Clinical Lead, Crown Dale Medical Centre, Lambeth, London, UK

[d]Dept. of Diabetes & Nutrition, King's College London & School of Medicine, London, UK

[e]Dept. of Diabetes & Endocrinology, Guy's & St Thomas' NHS Foundation Trust, London, UK.

[f]Dept. of Primary and Intermediate Care, King's College London & Nightingale School of Nursing & Midwifery, London, UK

Corresponding author at: K Winkley, kirsty.winkley@nhs.net

Diabetes & Mental Health Unit, Department of Psychological Medicine, King's College London & Institute of Psychiatry, Psychology & Neuroscience, Weston Education Centre, London, SE5 9RJ, UK. +44(0)207 848 5664

Objective

The aims were to determine the association between individual and neighbourhood factors and attendance at structured education amongst people with newly diagnosed type 2 diabetes (T2DM).

Methods

Multi-level analysis of questionnaire data from a prospective cohort of adults newly diagnosed T2DM. Setting was primary care, London, UK. Main outcome was attendance at structured education within 2 years.

Results

Of 1790 people recruited, attendance data were available for 1626 (91%). Only 22.4% (n=365/1626) attended education. Attendance was independently associated with female gender (OR 1.28, 95% CI 1.05-1.46), lower HbA1c (OR 0.98 mmol/mol 95% CI 0.97- 0.99) and non-smoker status (OR 1.36, 95% CI 1.07-1.55). General practice covariates, achievement of primary care targets for glycaemic control (OR 1.05, 95% C.I. 1.01-1.08) and recording of retinal screening (OR 0.96, 95% C.I. 0.93-0.99) were independently associated with attendance but unexplained general practice clustering accounted for 17% of the variance.

Conclusion

Education uptake is low amongst people with new onset T2DM. Attenders are more likely to be female, non-smokers with better HbA1c. General practices achieving glycaemic targets are more likely to have patients who attend education.

Practice Implications

Strategies are needed to improve attendance at structured diabetes education particularly amongst hard to reach groups.

Keywords:

Type 2 diabetes mellitus; general practice; primary health care; education; attendance; uptake

1. Introduction

Diabetes self-management education (DSME) for people with newly diagnosed Type 2 diabetes (T2DM) is the cornerstone of diabetes self-care [1, 2]. The United Kingdom's (UK) landmark multi-centre trial of 824 participants randomised to Diabetes Education for Ongoing and Newly Diagnosed (DESMOND), a one day group course compared to attention control demonstrated improvements in weight, lipids and psychological variables but not glycaemic control 12 months later [3], although the benefits had reduced by 3 years [4]. This is in contrast to a recent systematic review and meta-analysis of 21 randomised controlled trials (RCT) (total n=2833) of group based DSME which concluded that HbA1c was significantly reduced by an average of 5mmol/mol at 6 and 12 months compared with the control group [5]. There is also now a significant evidence base to suggest that group DSME programmes can deliver improvement in cardiovascular risk, self-efficacy and diabetes knowledge [5-8]. Findings such as these are embedded in the UK National Institute for Health and Clinical Excellence (NICE)[9], International Diabetes Federation Global Guideline for T2DM [1] and the United States (US) National Standards for Diabetes Education [2]. In the UK, DSME, usually termed structured diabetes education to meet pre-specified NICE criteria, is usually available at no cost for people with newly diagnosed T2DM but the UK National Diabetes Audit suggests attendance rates vary between 0-48% [10]. In Canada and the US attendance rates have been reported to be 30-35% [11, 12].

Reasons for low attendance at group DSME are understudied. Well known barriers to optimal diabetes self-care include psychological and social factors [13] and low levels of health literacy may discourage attendance or prevent those affected from benefitting from this mode of self-management support [14-17]. Qualitative research of patient barriers to attending structured education programmes have identified: lack of information regarding DSME from health professionals, not perceiving the benefit of attendance, difficulties in access, and shame and stigma of diabetes [18]. Poor uptake is also associated with being older, lower socio-economic status, ethnicity, male gender and diabetes duration >3 years [11, 12, 19, 20]. Characteristics of general practices (primary care centres) are known to influence outcomes, in the UK general practices achieving diabetes targets for HbA1c are associated with lower risk of diabetic retinopathy [21]. Practice characteristics influencing patient attendance at education have not been studied. In the UK, area level deprivation is associated with overall quality of care by general practices [22] but perhaps less so in inner-city settings [23]. The aims of this study were to determine the rate of attendance at structured education amongst people with newly diagnosed T2DM and use multi-level modelling to determine which individual and general practice factors are independently associated with attendance at structured diabetes education.

2. Methods

2.1 Design, setting and sampling frame

The UK South London Diabetes Study (SOUL-D) is a prospective urban cohort of people with newly diagnosed T2DM recruited from primary care and followed up for 2 years. Potential participants resident in the UK south London boroughs of Lambeth, Southwark and Lewisham were identified by their General Practitioner. Ninety-six of the 138 primary care centres participated. The methods have been described previously [24].

2.2 Case definition

Eligible adults had a recent diagnosis (≤ 6 months) of T2DM, diagnosed according to World Health Organisation criteria, and aged 18-75 years. Participants were excluded if: diagnosed with T2DM >6 months, had other types of diabetes, were temporary residents/living outside of the catchment area of participating general practices, not fluent in spoken English, had severe mental illness such as dementia, bipolar disorder, substance dependence, personality disorder, advanced/terminal disease; or severe advanced diabetes complications, defined as being registered blind, requiring dialysis or having had an above-knee amputation.

2.3 Measures

2.3.1 Individual level

Individual factors measured at baseline recruitment included sociodemographics: age (years); gender and self-reported ethnicity, measured according to the UK's 2001 census method and resulting data collapsed into 3 main categories, white European, black African/Afro-Caribbean and South Asian/other ethnicity [24]. We also included measures of social support: partnership status and number of people within social network. We recorded employment status and years of full-time education as a measure of social class. A serum blood sample was taken at baseline entry to the study to measure glycaemic control by glycated haemoglobin, (HbA1c in mmol/mol and %) was assessed using HPLC (Premier 9210 analyser, Menarini, Italy). We measured mode of onset of diabetes: diabetes symptoms (polyuria, polydipsia, fatigue, blurred vision and weight loss) present at diagnosis versus symptoms absent. Macrovascular and microvascular complications were recorded and the method for determining diabetes complication status has been reported [24]. We recorded whether patients were prescribed oral blood glucose-lowering medication and/or insulin to treat their diabetes. The 10-item Alcohol Use Disorders Identification Test was used to determine harmful or hazardous alcohol consumption (a score >/= 8 was defined as having an alcohol use problem) [25]. Cigarette smoking was defined as current or non-smoker.

Depressive symptoms at baseline were measured using the self-report Patient Health Questionnaire-9 (PHQ-9) [26]. The cut-off of 10 or more is the current standard for measuring probable cases of depression, with a sensitivity and specificity of 73% and 98%, respectively. In this study people with a score <10 were coded as non-depressed. The PHQ-9 is a valid method for determining depression status in diabetes populations [27]. Diabetes distress was measured using the Problem Areas in Diabetes scale (PAID) which is a 20 item measure of the negative emotions individuals may experience when coping with diabetes. Responses for all items are summed and the total multiplied by 1.25 to achieve a final score between 0 and 100, scores≥ 40 represent high risk of emotional burnout [28]. The Confidence in Diabetes Self Care Scale (CIDS), this 20-item self-report questionnaire was used to assess self-efficacy, the perceived ability to perform diabetes self-care tasks [29]. Scores are summed and then transformed into a 0-100 scale higher scores indicate better self-efficacy. The 14-item Beliefs about Insulin Treatment (BIT) questionnaire was used to measure psychological insulin resistance, BIT encompasses 5 sub scales, these include fear of injection and self-testing, expectations regarding positive insulin-related outcomes, expected hardship from insulin treatment, stigmatization by insulin injection, and fear of hypoglycaemia [30]. For our analysis the BIT sub scores were summed and mean calculated.

2.3.2 General practice level

In the UK patients usually attend the general practice that is nearest their home address. Each general practice has a catchment area. There are likely to be considerable variations between practices in terms of how the topic of diabetes self-management education is discussed or promoted [18]. General practice level data on achievement of Quality and Outcomes Framework (QOF) diabetes targets were taken from the NHS Health and Social Care Information Centre (HSCIC). At the time of the study, there were 15 diabetes performance indicators (2011/2012). We used the figures referred to as 'percent receiving the intervention' as it avoids 'exception reporting' where centres submit performance statistics for a selected group of patients only. We used individual targets for proportion of diabetes patients achieving glycaemic control targets, HbA1c </=59 mmols/mol (7.5%) and HbA1c </=69 mmols/mol (8%), and the proportion of record of attendance at diabetes eye screening. We used data from the 2011/12 financial year as this was the mid-point of the SOUL-D study. If data for this period were not available we used data from 2012/13. Data prior to 2011 are not available on the HSCIC website.

The Index of Multiple Deprivation (IMD) [31] was used as a measure of deprivation in the population serviced by the general practice. The IMD is an aggregate measure of deprivation across seven domains: income, employment, health and disability, education skills and training, barriers to housing and other services, crime and living environment. The full unit postal code was obtained for each general practice and linked with Lower Super Output Area (LSOA) (the smallest administratively

defined area in the UK). This was assigned an IMD rank (out of 32,482 LSOAs in England a rank of 1 is the most deprived).

2.3.3 Main outcome

The main outcome was attendance at a structured diabetes education course during the period from diagnosis of T2DM to the date of the 2 year SOUL-D follow-up. Self-reported attendance data were collected at 3 time points: recruitment, 12 month follow-up and 2 year follow-up. Participants were given a brief description of the DESMOND course, as this is the course offered locally, and asked if they had attended, and if not whether they were on the waiting list. The DESMOND programme is a structured group self-management education course delivered by trained educators in both healthcare settings and community venues, usually a diabetes nurse and dedicated diabetes dietician, over one whole day or 2 half days to groups of 6-10 people. It has a curriculum and sessions include: thoughts and feelings of the participants with diabetes; how diabetes affects the body; monitoring, medication and dietary control; physical activity; and planning for the future. Self-report data on attendance at DESMOND were checked against medical record data. If data were incomplete or if attendance could not be confirmed, for example if a participant was coded as being on the waiting list at recruitment or 1 year follow up, but had missing data at the next follow up, a researcher contacted the participant by telephone using a standardised telephone script.

2.4 Statistical analysis

The characteristics of the cohort at baseline are summarised as mean (SD), median (IQR) or as number/proportion (percentage). The association between patient and general practice level factors and attendance at structured diabetes education within 2 years of diagnosis was assessed first in unadjusted logistic regression analysis and second using a generalised linear mixed model (GLMM), with fixed and random effects. Fixed effects included patient level variables such as age, sex, ethnicity, recruitment HbA1c and diabetes-specific health beliefs. Fixed general practice level effects included number of clinicians in the practice and percent diabetes targets achieved. Random effect was general practice. The intraclass correlation was calculated to quantify the degree to which observations among individuals attending the same general practices resemble each other (clustering effect). Analyses were adjusted for multiple testing using the Simes improved Bonferroni correction [32] and conducted using STATA 12.

3. Results

Ninety six GP practices out of 138 agreed to participate from which we recruited 1790 eligible participants to SOUL-D (see Figure 1 and Table 1). GP practices that participated in SOUL-D were more likely to have more doctors (5.42 SD 2.90 vs. 3.71 SD 2.39, p=<0.0001), larger list sizes (10,073 SD 4962 vs. 5822 SD 3376, p=<0.0001), but there was no difference in deprivation (IMD rank 7,750 SD 4562 vs 8254 SD 4489, p=0.61) than those that did not participate. Of participants with eligible data (n=1626), only 365 (22.4%, 95% C.I. 0.21 to 0.25) reported attending structured education. The mean follow-up time was 24.48 months (SD 2.31). Attendees were more likely to be younger, female, have better glycaemic control at recruitment, non-smokers and more positive regarding insulin treatment than non-attendees. There were no differences in attendance by ethnicity, employment status, diabetes complications, mean change in HbA1c or in depressive symptoms between baseline and year 2 follow-up.

Ninety of the 96 GP practices participating in the SOUL-D study recruited eligible patients to the study (94%), 6/96 (6%) GP practices either did not recruit patients or patients recruited were ineligible or withdrew. The median list size of the 90 practices providing participants was 9,356 (IQR 6,188-13,9510), see Table 2, with a median IMD rank score for the LSOAs for their post codes of 6684 (IQR 4882-8455). The median number of doctors per surgery was 5 (IQR 3-7). Data on diabetes QOF targets achieved in 2011/12 were available for 88 surgeries. QOF data were missing for two: one general practice closed in 2012; and one was taken over by an independent health service provider and no QOF target data were publicly available on the HSCIC website. One general practice had been taken over by a local general practice so the merged list was used and one further surgery did not have data available for 2011/12 so 2012/13 data were used. The mean QOF targets achieved

by the general practices (n=88) for glycaemic control were almost 70% achieving HbA1c </= 64mmol/mol (8%) and almost 60% achieved the QOF target for their patients to have HbA1c </= 59mmol/mol (7.5%). Eighty six percent of general practices had retinopathy status recorded in their medical record for their diabetes patients.

In the unadjusted multilevel analysis (Table 3), after correcting for multiple testing, individual factors including female gender, lower recruitment HbA1c, non-smoking status, and fewer negative beliefs regarding insulin treatment remained associated with attending structured diabetes education. At the general practice level, only number of doctors at the general practice was associated with attendance in the unadjusted model. In the adjusted multi-level model attendance at structured diabetes education was independently associated with female gender, lower recruitment HbA1c and non-smoking status. General practice level covariates such as achievement of HbA1c target 59 mmols/mol (7.5%) was positively associated with attendance and having a record of retinal screening was negatively associated. The variance explained by the general practice covariates was 3%, leaving 17% of the primary care clustering variance unexplained.

4. Discussion and conclusions

4.1 Discussion

This study investigated the association between individual and general practice level covariates and attendance at structured diabetes education for T2DM. The main findings were that the attendance rate was very low with only a fifth attending. Those who did not attend were a high risk group for diabetes complications: men, people with poorer glycaemic control within 6 months of diagnosis of T2DM, and smokers. At the general practice level, practices with more patients achieving HbA1c </=59mmol/mol (7.5%) were positively associated with attendance, whereas record of retinal screening at the primary care centre was negatively associated with attendance. However, general practice variables explained 3% of the variance in attendance and there was a clustering effect of 17% suggesting unknown differences between practices in supporting their patients to participate in structured diabetes education.

The strengths of this study are that we investigated both individual biopsychosocial and general practice level factors associated with attendance at education and that we used a multi-ethnic urban cohort of people with newly diagnosed T2DM. The rate of missing data on the main outcome was low. Limitations of this study include that there is likely to be residual confounding we did not measure health literacy which may discourage some patients from attending [33]. Diabetes education attendance data could be considered a process measure as we did not have access to data demonstrating the effectiveness of the DESMOND programme. Data on attendance had to be self-reported as there are no formal registers unlike those for diabetes eye complications screening. We used achievement of glycaemic control target and record of retinopathy status as there was no specific financial incentive for referral to or attendance at structured diabetes education during the study period. However, referral has recently been added to the QOF pay for performance indicators [34]. We also used number of physicians per general practice as a marker of quality rather than practice nurses as this has previously shown an association with more effective care provision in the US [35].

Our finding that males were less likely to attend for education is in keeping with previous quantitative studies [20, 36, 37]. In contrast, we did not find an association with age which has been identified in US studies [11, 12, 38]. In the US and Canada, younger people are more likely to attend diabetes education [12, 19] which could be because they are more likely to be employed and therefore have medical insurance whereas in the UK there is no such incentive [38, 39]. Those with better glycaemic control, non-smokers, and those with positive health beliefs about their diabetes treatment are more likely to attend suggests that current models of care are not targeting those who may need it the most and similar patterns have been observed in other health settings, such as diabetes clinics [39], cardiac rehabilitation [40], and mammography screening [41]. On a positive note we did not find an association between ethnicity and attendance at structured education, found in one US study [12], although we did broadly group participants into ethnic groups and qualitative research has demonstrated that some West Africans might be opposed to group education for fear of stigmatisation

[18]. Overall, the findings contrast with patient-reported barriers to diabetes self-management, which have identified psychological and psychosocial barriers [13]. We found no association between self-reported depression, diabetes-related distress, or diabetes self-efficacy with attendance at structured education and there is no suggestion as to what the underlying mechanisms are which motivate people to attend. Neither did we find an association between employment and attendance at education, whereas qualitative research suggests that people find it difficult to fit diabetes education around work commitments because of the timing or duration of the course [18].

Although effect sizes were small, there were associations between the general practice factors studied and attendance at structured diabetes education. General practices where more people achieve HbA1c target of <59 mmol/mol (7.5%) are perhaps more proactive in encouraging patients to attend and the better outcome may be related to the education itself and/or other aspects of care provided. Achieving HbA1c targets is important, as, for example, sight-threatening retinopathy is less prevalent at general practices achieving better glycaemic control for their patients [21]. In our study, record of retinopathy status was negatively associated with attendance at structured diabetes education. One explanation for this could be that as retinopathy data are sent from the Diabetes Eye Complication Screening (DECS) service there may be delays involved in the general practices uploading the data and not necessarily a reflection on the clinical care provided. Another potential explanation is that quality indicators such as these are easier to perform on as they are essentially administrative and do not necessarily involve the same level of continuous management as glycaemic control. Whilst the 3 specific primary care level covariates we examined in the multi-level analysis explained 3% of attendance, there remained significant unexplained variance (17%) in attendance at structured diabetes education. Possible explanations for this are: 1. that although widely available some health professionals may not inform or refer their patients to education [18]; 2. even if they do inform patients of the education on offer they may not necessarily discuss the benefits of attending in a patient-centred way [42, 43]; or 3. health professionals may not view structured education as beneficial [42]. However, further investigation is needed so that more patients have access to diabetes self-management support.

4.2 Conclusion

In our population-based prospective cohort of 1790 patients with a new diagnosis of type 2 diabetes recruited from a multi-ethnic inner-city primary care setting, only 365/1626 (22.4%) attended structured education. There were independent associations between female gender, non-smoking status and better glycaemic control and attendance at structured education. There were also independent associations between performance of general practices on diabetes clinical outcomes and attendance at education.

4.3 Practice Implications

Clinical implications are that 80% of people with newly diagnosed diabetes within an urban setting of the UK with high rates of deprivation are not getting adequate self-management support. Furthermore, there is an identifiable subgroup of patients at high risk of developing diabetes complications, namely males, cigarette smokers and people with poorer glycaemic control. Better organised general practices with regard to the achievement of diabetes glycaemic control targets are more likely to encourage their patients to attend education and this is associated with better glycaemic control. There are likely to be additional factors at both the individual participant level and primary care level that are not yet understood. It is not clear from this study what the underlying mechanisms are that either motivate or prevent someone attending structured diabetes education. This study suggests that more and further qualitative and quantitative studies on the barriers to attending diabetes education in general practice are needed.

Ethical approval

Ethical approval was granted by the King's College Hospital Research Ethics Committee London UK (reference 08/H0808/1) and by Lambeth, Southwark, and Lewisham Primary Care Trusts London UK (reference RDLSLB 410) and all participants gave informed consent.

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Informed consent and patient details
I confirm all patient/personal identifiers have been removed or disguised so the patient/person(s) described are not identifiable and cannot be identified through the details of the story.

Conflicts of interest
None.

Statement of contribution
KW devised the study, conducted data collection, statistical analysis, produced the first draft of the manuscript and is the guarantor for the study. KW affirms the manuscript is an honest, accurate and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned have been explained.
DS, conducted statistical analysis, contributed to the study design and contributed to the draft of the manuscript.
MC, contributed to the study design and contributed to the draft of the manuscript.
RS, conducted data collection and contributed to the draft of the manuscript.
MB, conducted data collection and contributed to the draft of the manuscript.
SL, contributed to the study design and the draft of the manuscript.
SAA, contributed to the study design and the draft of the manuscript.
AF, devised the study, contributed to the study design and contributed to the draft of the manuscript.
KI, devised the study, contributed to the study design and contributed to the draft of the manuscript.

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Table 1 – Main individual characteristics of the sample at baseline stratified by attendance at structured education (N=1790)

	Total N=1790	**Attended n=365**	**Did not attend n=1261**	
Variable	**Mean (SD)/n(%)**	**Mean (SD)/n(%)**	**Mean (SD)/n(%)**	**p**
Age (years)	56.04 (11.02)	57.22 (10·38)	55·92 (11·24)	**0·05**
Gender (Males)	987 (55.1)	175 (47.9)	711 (56.4)	**0·004* n=1626**
Ethnicity White	881 (49.2)	184 (50.4)	615 (48.8)	0·518*n=1615
Black	711 (39.7)	148 (40.5)	500 (39.7)	
South Asian/other	186 (10.4)	32 (8.8)	136 (10.8)	
Partnership status Single	454 (25.4)	95 (26.0)	318 (25.2)	0·682* n=1626
Widowed/divorced/separated	346 (19.3)	76 (20.8)	242 (19.2)	
Married, have partner	990 (55.3)	194 (53.3)	701 (55.6)	
Social network	5.72 (2.02)	5.65 (2·00)	5·75 (2·00)	0·412* n=1725
Employment status Employed	858 (47.9)	173 (47.4)	602 (47.7)	0·898* n=1789
Unemployed, retired, sick	931 (52.0)	193 (52.9)	658 (52.2)	
Education (years)	13.22 (3.03)	13.34 (3·23)	13.11 (2.99)	0·302* n=1143
Recruitment HbA1c (mmols/mol)	53.03 (15.83)	50.04 (13·63)	53·48 (16·09)	**<0·001* n=1661**
Change in HbA1c (mmols/mol) from recruitment to year 2	-0.19 (15.61)	1.16 (14·05)	-0·32 (15·71)	0·08*n=1151
Mode of onset Symptoms present	767 (43.3)	160 (43.8)	535 (42.4)	0·620* n=1773
No symptoms	1006 (56.7)	202 (55.3)	717 (56.9)	
Macrovascular complication	162 (9.1)	37 (10·1)	120 (9.5)	0·726* n=1603
Microvascular complication	484 (33.4)	109 (29.9)	324 (25.7)	0·208* n=1451
Diabetes Medication Oral anti-hyperglycaemic	954 (53.3)	194 (53.2)	673 (53.4)	0·830* n=1602
Insulin	63 (3.5)	13 (3.6)	46 (3·6)	0·932* n=1614
Alcohol problem (AUDIT score >/=8)	199 (11.5)	36 (9.8)	150 (11.9)	0·268* n=1733
Smoker	363 (20.3)	60 (16.4)	279 (22.1)	**0·018* n=1573**
Presence of depression (PHQ9, >/=10)	270 (15.5)	52 (14.2)	190 (15.1)	0·661* n=1740
PHQ-9 total score	4.34 (5.26)	4.00 (4·79)	4·35 (5·22)	0·258*
PAID total score	10.52 (14.69)	10.89 (14·47)	10·12 (14·67)	0·397* n=1612
PAID score >/=40 (distress present)	101 (6.2)	23 (6.3)	66 (5.2)	0·488* n=1612
CIDS score	89.21 (11.38)	88.24 (11·08)	89·41 (11·54)	0·09* n=1676
BIT mean total score BIT subscales:	4.64 (1.50)	4.50 (1·48)	4·67 (1·50)	0·067* n=1601
fear of injections/self-testing	3.47 (2.91)	3.22 (2·92)	3·55 (2·92)	0·07*
positive insulin expectations	5.61 (1.85)	5.58 (2·07)	5·57 (1·78)	0·925*
expectations of hardship	2.66 (3.49)	2.30 (2·28)	2·76 (3·84)	**0·036***
stigmatization	5.57 (2.62)	5.34 (2·65)	5·56 (2·61)	0·31*
fear of hypoglycaemia	6.93 (3.08)	7.02 (2·99)	6·87 (3·11)	0·44*

AUDIT=Alcohol Use Dependence Identification Test, PHQ-9=Patient Health Questionnaire 9, PAID=Problems Areas In Diabetes, CIDS=Confidence In Diabetes Self-care, BIT=Beliefs in Insulin Treatment , *some missing data

Table 2 – Characteristics of general practices participating in the SOUL-D study

Variable	Total n=90
	Mean (SD)
Mean list size	10,073 (4962)
Mean IMD rank score of GP surgery	7,750 (4562)
Mean number of doctors per practice	5.42 (2.90)
QOF %retinopathy status recorded	85.89 (6.25)* n=88
QOF %HbA1c target of 59mmol/mol (7·5%)achieved	59.97 (5.18)* n=88
QOF %HbA1c target of 64mmol/mol (8%) achieved	69.14 (5.19)* n=88

IMD=Indices of Multiple Deprivation, QOF=Quality Outcome Framework, *some missing data

Table 3 – Unadjusted and adjusted multi-level associations between individual characteristics and general practice level characteristics and attendance at structured education for type 2 diabetes within 2 years.

Individual characteristics	**Unadjusted Odds ratio**	**95% C.I.**	**p**	**Adjusted Odds ratio**	**95% C.I.**	**p**
Age (years)	**1·01**	**1·00 to 1·02**	**0·05** [t]	1·01	1·00 to 1·02	0·177
Gender (Males)	**0·71**	**0·56 to 0·90**	**0·004***	**0·72**	**0·54 to 0·95**	**0·021***
Ethnicity						
White	1			1		
Black	0·99	0·77 to 1·27	0·932	1·06	0·77 to 1·47	0·707
South Asian/other)	0·79	0·52 to 1·20	0·261	0·98	0·58 to 1·63	0·925
Recruitment HbA1c (mmol/mol)	**0·98**	**0·97 to 0·99**	**<0·001***	**0·98**	**0·97 to 0·99**	**0·001***
Smoker	**0·69**	**0·51 to 0·94**	**0·019***	**0·64**	**0·45 to 0·93**	**0·018***
BIT Expectations of hardship	**0·94**	**0·89 to 0·99**	**0·015***	**0·94**	**0·88 to 1·00**	**0·044**[t]
General practice characteristics						
QOF target: % HbA1c </=7.5%	1·00	1·00 to 1·00	0·824	**1·05**	**1·01 to 1·08**	**0·005***
QOF target: %record of retinal screening	1·00	1·00 to 1·00	0·732	**0·96**	**0·93 to 0·99**	**0·006***
Number of doctors	**1·05**	**1·01 to 1·09**	**0·013***	1·08	0·99 to 1·17	0·083

BIT=Beliefs in Insulin Treatment, QOF=Quality Outcomes Framework

*= Remains significant after Simes improved Bonferroni correction for multiple testing t = trend (p<0·1) after Simes improved Bonferroni correction