

Research: Care Delivery

Determining in-patient diabetes treatment satisfaction in the UK—the DIPSat study

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Abstract

Aims To measure in-patient diabetes treatment satisfaction and its relationship to in-patient diabetes care.

Methods In a cross-sectional study, diabetes in-patient specialist nurses at 58 UK hospitals asked insulin-treated in-patients with diabetes to complete the recently updated Diabetes Treatment Satisfaction Questionnaire for In-patients and a general questionnaire; 1319 in-patients completed these questionnaires.

Results Satisfaction with the general diabetes treatment items in the Diabetes Treatment Satisfaction Questionnaire for In-patients was high, but there were high levels of extreme dissatisfaction with meal choices, meal quality and lack of similarity of hospital meals to normal domestic choices—23% would never or rarely have made similar meal choices at home. Hyperglycaemia or hypoglycaemia was reported for much of the in-patient stay (20% and 7%, respectively) and 26% reported at least one severe hypoglycaemic episode; these groups had lower satisfaction with the timing of medication in relation to meals ($P < 0.003$). More frequent in-patient hyperglycaemia or hypoglycaemia were associated with significantly poorer overall satisfaction scores and negative well-being scores (both $P < 0.0001$). Previous experience of a multiple daily insulin injection regimen was associated with more dissatisfaction than other regimens ($P < 0.01$). Multiple regression models explained 36% of variability in overall treatment satisfaction, with most (22.4%) accounted for by satisfaction with time spent with a diabetes in-patient specialist nurse ($P < 0.0001$). Self-administration of insulin was independently associated with higher treatment satisfaction ($P < 0.006$) in this model.

Conclusions The DIPSat programme describes the complex relationships between diabetes in-patient treatment satisfaction and in-patient diabetes care.

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Introduction

The care of in-patients with diabetes has been not been a priority for diabetes specialist teams until recently, although 15% of all acute hospital beds in the UK are now occupied by people with diabetes [1]. Recent literature describes variability between UK hospitals in in-patient diabetes services [1–3], but we do not know what contributes to in-patient diabetes treatment satisfaction [4,5]. Patient

unhappiness with their in-patient diabetes care appears to be common and has been suggested previously [1,6–8]. Importantly, we do not know how in-patient diabetes treatment satisfaction is influenced by the manner of insulin administration, glycaemic management, the timing and quality of meals, or the ability to self-manage in hospital.

We recently developed the first psychometrically validated Diabetes Treatment Satisfaction Questionnaire for In-patients (DTSQ-IP) [9], based on the original and widely used standard Diabetes Treatment Satisfaction Questionnaire (DTSQ) for adult outpatients with diabetes [10,11]. For this national programme, we updated the DTSQ-IP to be linguistically and culturally suitable for people of South Asian origin as well as British white people and undertook

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*CB is the academic lead on questionnaire design, development and linguistic validation and copyright holder for the Diabetes Treatment Satisfaction Questionnaire for in-patients (DTSQ-IP). Please direct correspondence relating to the DTSQ-IP to CB.

assessment of in-patient diabetes treatment satisfaction in 58 UK hospitals to investigate the determinants of in-patient diabetes treatment satisfaction.

Patients and methods

Study design and patient selection

The 4-year DIPSat programme started in 2008. The present data are based on British-born in-patients with diabetes who described English as their first language and completed the standard English DTSQ-IP [DTSQ-IP © Professor Clare Bradley 19 January 2004 Standard UK English (revised 28 August 2007)]. The majority of these respondents described themselves as White British. This element of data collection ended in August 2010 when a pre-specified sample size was reached.

Study population and site selection

The UK hospitals participating in the DIPSat programme are listed (see Supporting Information, Table S1). Half of the hospitals selected were intentionally in areas with a high South Asian origin local population based on available population data [12]. All acute hospitals had a diabetes in-patient specialist nurse, or a service provided by other diabetes specialist nurses, responsible for the management of all in-patients with diabetes [3]. In each hospital, the DTSQ-IP and the general information questionnaire were given to a maximum of 160 in-patients with diabetes aged over 18 years old who had received insulin during their in-patient stay, and the initial aim was for each hospital to distribute these questionnaires over a 4-month period, with an estimated return rate of 20–25% based on pilot data [9]. The hospital sample size and numbers of distributed questionnaires were based on previous data to generate a sample size of 1400 returns [9]. In all hospitals, these materials were given to in-patients with diabetes by the diabetes specialist nurse who was seeing the patient as part of routine clinical care. Participants completed the questionnaires shortly before discharge and did not receive assistance from the diabetes specialist nurse or ward staff in completing the questionnaires. In most UK hospitals, the role of the diabetes in-patient specialist nurse is to take responsibility for diabetes care across the whole in-patient population within the hospital, with a focus on higher-risk patients, those on complex insulin regimens and having individual training in self-management.

Diabetes Treatment Satisfaction Questionnaire for In-patients and general information questionnaire

The DTSQ-IP used in the DIPSat programme is available from www.healthpsychologyresearch.com. The DIPSat general information questionnaire used to collect patient-reported demographic and diabetes-related data is also

available from www.healthpsychologyresearch.com and included a 4-item subscale from the 12-item Well-Being Questionnaire (WBQ12) [13] to measure negative well-being, with two items measuring depressed mood and two measuring anxiety. The general questionnaire also asked who administered insulin during the in-patient stay (patient, staff or both), and the term 'self-management' is applied to those who administered their own insulin.

Ascertainment of length of stay

Participant self-reported admission data on length of stay were verified with clinical records from 20 hospitals, providing 368 records with both participant reported length of stay and nurse reported length of stay. There was a strong association between these methods ($r = 0.84$, $P < 0.0001$). A Bland–Altman analysis showed a bias of only 0.038 (confidence interval -0.394 to 0.47) days per stay, suggesting patient-reported length of stay corresponds closely to hospital-recorded length of stay in this population.

Power estimates and sample size

In an earlier single-centre study [9], mean composite DTSQ-IP score was 79.2 (SD 16.5). Therefore, a sample size of 1216 would give 90% power at a 5% significance level to detect a mean difference of 0.25 SD in mean composite DTSQ-IP between the upper and lower quartiles of a continuous variable. We aimed to recruit 1400 in-patients in DIPSat.

Data analysis

The primary dependent variable was composite DTSQ-IP score. Differences between groups were analysed by Mann–Whitney *U*-test or Kruskal–Wallis test. Kendall's tau (btau) correlation was employed to examine relationships between variables. Hierarchical multiple regression analyses were undertaken to determine which independent variables contributed to variability in the main dependent variables. Statistical methodology and full regression analyses are available online (see also Supporting Information, Table S3 and S4).

Results

Returned questionnaires

In total, 1319 participants from 58 acute hospitals returned data (mean return rate 23.5%).

DTSQ-IP psychometrics

Psychometric analyses demonstrated that this scale worked well with this population. Principal components analysis showed that 17 of the 22 items combined to give an overall in-patient diabetes treatment satisfaction score accounting for

53.1% of the item variance. This 17-item scale was shown to have excellent internal consistency reliability ($\alpha = 0.94$) and results of these psychometric analyses are provided in the online Supporting Information and are outlined in detail (see Supporting Information, Table S2a–d). A composite DTSQ-IP score could be computed for 1234 participants, as 85 participants did not complete sufficient items in the DTSQ-IP.

Clinical characteristics of the study population (Table 1)

The overall study population ($n = 1319$; mean age 60.1 years) were predominantly ($n = 971$; 73.6%) insulin treated before admission, with a median duration of diabetes of 17.3 years and median insulin treatment prior to admission of 10 years. Participants were not asked to describe themselves as having either Type 1 or Type 2 diabetes because of diagnostic uncertainty, but were asked how their diabetes was treated prior to admission; most were insulin treated with the age of onset and duration of insulin use

Table 1 Clinical characteristics of 1319 insulin-treated in-patients with diabetes who completed the Diabetes Treatment Satisfaction Questionnaire for In-patients (DTSQ-IP) during an in-patient stay

		Missing, <i>n</i> (%)
Age (years): mean (SD)	60.1 (17.1)	33 (2.5%)
Male:female (%)	56.3:43.5	3 (0.2%)
Insulin treated before admission	971 (73.6%)	79 (6%)
Diabetes duration (years)	17.3 (16.1)	
Insulin treated (years)	10 (16.5)	
Insulin treated > 6 months	911 (69.1%)	
Insulin treated first time current admission	269 (20.4%)	
Admission because of hyperglycaemia*	332 (25.2%)	190 (14.4%)
Admission because of hypoglycaemia*	78 (5.9%)	336 (25.5%)
Surgery during admission	444 (33.7%)	22 (1.7%)
Severe hypoglycaemia during admission*§	339 (25.7%)	60 (4.5%)
Blood glucose monitored by		43 (3.3%)
Patient alone	133 (10.1%)	
Patient and nursing staff	354 (26.8%)	
Nursing staff alone	789 (59.8%)	
Insulin administered by		66 (5.0%)
Patient alone	569 (43.1%)	
Patient and nursing staff	398 (30.2%)	
Nursing staff alone	265 (20.1%)	
Length of stay (days): median (interquartile range)	7 (interquartile range 10)	255 (19.3%)

Data shown as *n* and percentage unless otherwise stated.
 *Patient self-reported.
 §Severe hypoglycaemic episode that required staff assistance.

indicating probable Type 2 diabetes. However, 269 (20.4%) started insulin for the first time as an in-patient on this admission. Self-administration of insulin ($n = 569$; 43.1%) or blood glucose monitoring ($n = 133$; 10.1%) were undertaken by a minority of in-patients.

Individual DTSQ-IP item scores (Table 2)

General diabetes treatment items indicated high levels of satisfaction (items 1, 4–9, 16–19, 20b and 21), but a striking observation was that 22.7% of in-patients said they would never/rarely have made similar meal choices at home (item 12), and the meal-related items (items 10–14) recorded most extreme dissatisfaction. Twenty per cent of respondents indicated an unacceptably high perceived frequency of hyperglycaemia (scoring 6 or 5; item 2) for most of their in-patient stay, and 7% indicated a unacceptably high perceived frequency of hypoglycaemia for most of their in-patient stay (scoring 6 or 5; item 3).

High and low perceived frequency of hyperglycaemia or hypoglycaemia and experience of a severe hypoglycaemic episode (Table 3)

In this population, 26% reported a severe hypoglycaemic episode during their hospital stay that required help from clinical staff and 20% reported frequent hyperglycaemia. The groups with significant exposure to hyperglycaemia or hypoglycaemia all had significantly poorer composite satisfaction scores and poorer satisfaction with the timing of medications in relation to meals ($P < 0.005$). In-patients experiencing frequent hyperglycaemia, or a severe hypoglycaemic episode, reported significantly higher ($P < 0.005$) negative well-being scores.

Insulin regimen before admission

In-patients using a multiple daily injection regimen before admission were less satisfied overall ($P < 0.001$), and with most individual DTSQ-IP items ($P < 0.005$), than those on other insulin regimens. They were also more likely to report a severe hypoglycaemic episode while in hospital than those using other insulin regimens prior to hospitalization [χ^2 $df=3$] = 30.104, $P < 0.0001$ with 34% of those using multiple daily injection regimen reporting severe hypoglycaemia requiring medical assistance compared with 28.5% in the twice-daily premixed-insulin group, 17.5% in the basal-only-insulin group and 15.2% in the new-to-insulin group].

Self-management of glucose monitoring and insulin administration in hospital (Table 4)

Neither self-management of glucose monitoring nor self-management of insulin administration were significantly

Table 2 Frequency of response (%) to each item in the Diabetes Treatment Satisfaction Questionnaire for In-patients (DTSQ-IP) in 1319 insulin-treated in-patients in 58 UK hospitals

Item and score	Frequency of response (%)							Missing
	0	1	2	3	4	5	6	
1 How satisfied... diabetes treatment in hospital	2.9	1.5	3.0	5.9	10.5	18.2	50.3	7.7
2 How often have you felt blood sugars unacceptably high*	23.2	10.3	11.0	14.2	11.7	8.6	11.4	9.6
3 How often have you felt blood sugars unacceptably low*	44.8	13.8	10.5	9.4	4.7	4.2	3.0	9.6
4 How convenient have you found your treatment...	3.9	1.8	3.7	9.4	9.7	18.7	44.4	8.3
5 How flexible have you found your treatment...	5.0	2.2	4.0	9.9	11.8	18.6	39.4	9.2
6 How satisfied... your understanding... diabetes treatment	2.7	1.7	3.0	6.6	9.2	17.9	50.9	8.0
7 Would you speak well of this treatment...	5.0	1.9	3.8	5.9	9.2	16.0	49.7	8.4
8 How satisfied to continue... present form of treatment	2.5	1.8	2.5	5.8	6.5	17.4	55.0	8.5
9 How satisfied... monitoring of your diabetes	2.3	1.4	2.5	5.5	7.7	17.3	55.7	7.6
10 How satisfied... availability of snacks	8.9	5.8	7.1	13.1	12.1	12.9	31.1	9.1
11 How satisfied... choice of meals offered	8.6	4.7	8.0	10.5	14.4	15.6	30.0	8.3
12 How often... eat similar meals at home*	15.2	7.5	10.2	14.5	17.9	13.4	12.9	8.4
13 How satisfied... quality of meals offered	9.4	6.2	8.6	11.9	15.5	16.5	22.9	8.9
14 How satisfied... with the timing of meals	3.3	3.2	7.6	10.4	13.0	22.4	31.8	8.4
15 How satisfied... timing of diabetes medication... to meal timing	4.8	3.3	5.2	7.5	11.5	19.3	38.6	9.7
16 How satisfied... staff knowledge... diabetes treatment	3.7	3.2	3.9	6.0	10.8	17.9	44.2	10.3
17 How satisfied... quality of communication... staff	3.9	3.0	5.0	6.8	10.5	18.7	42.9	9.2
18 How satisfied speed staff... diabetes needs	3.9	3.8	4.4	7.7	12.1	19.0	40.8	8.3
19 How satisfied... privacy...	4.0	3.1	4.1	8.0	12.7	17.7	41.7	8.7
20a How often has a diabetes in-patient specialist nurse visited*	—	20.5	22.0	14.1	8.3	8.8	—	26.3
20b How satisfied with the time the diabetes in-patient specialist nurse spent*	1.8	0.8	1.4	4.1	6.7	14.0	46.0	25.2
21 How satisfied... treatment plans... when you leave hospital	2.4	1.4	2.0	6.0	7.1	17.8	51.6	11.8

The full DTSQ-IP is available from www.healthpsychologyresearch.com. All items relate to diabetes treatment in a single hospital admission. All data are shown as a frequency of response (%) for each item ranging from 0 (very dissatisfied/very inconvenient etc) to 6 (very satisfied/very convenient etc) (items 1, 4–11, 13–21) or 0 (none of the time) to 6 (most of the time) (items 2, 3, 12) or as a frequency of visit (item 20a). *Items 2, 3, 12, 20a and 20b do not contribute to the overall diabetes treatment satisfaction score.

associated with differences in satisfaction scores. However, self-management of these tasks was associated with lower perceived frequency of hyperglycaemia (Table 4).

Impact of the diabetes in-patient specialist nurse on patient satisfaction

In-patient satisfaction with the time spent with the diabetes in-patient specialist nurse was significantly and directly related to overall treatment satisfaction ($\text{bt} = 0.40$, $P < 0.0001$), as was the number of times in-patients saw a diabetes in-patient specialist nurse ($\text{bt} = 0.10$, $P < 0.001$). Furthermore, satisfaction with the time spent with the specialist nurse was significantly associated with less frequent unacceptably high ($\text{bt} = -0.09$, $P = 0.001$) or low ($\text{bt} = -0.14$, $P < 0.0001$) blood glucose levels.

Patient satisfaction and length of stay

There was no significant relationship between DTSQ-IP composite score and either self-reported length of stay or with the actual length of stay. However, the patient's view of the appropriateness of their length of stay was related to diabetes treatment satisfaction. Those who believed that their length of stay was 'too short' were the least satisfied ($P < 0.0001$). Furthermore, those who felt their length of stay was 'too short' had significantly higher negative well-

being scores ($P < 0.001$) and a reported two- to fourfold greater frequency of hyperglycaemia ($P < 0.05$) and hypoglycaemia ($P < 0.0001$), scoring 5 or 6 on DTSQ-IP items 2 or 3 compared with those who felt their length of stay was appropriate.

Determinants of variability in DTSQ-IP composite score

Hierarchical multiple regression analysis produced an overall model explaining 36% of the variability ($R^2 = 0.36$, $F_{(21,700)} = 19.06$, $P < 0.0001$) in overall diabetes treatment satisfaction. The largest amount of R^2 change (23%) was accounted for by the satisfaction with the time spent with the diabetes in-patient specialist nurse. In the final model, which includes all the predictors, the significant predictors of in-patient treatment satisfaction were: satisfaction with the diabetes in-patient specialist nurse, $t_{(700)} = 15.8$, $P < 0.0001$, $\beta = 0.50$; being new to insulin compared with those on a multiple daily insulin injection regimen, $t_{(700)} = -3.0$, $P = 0.002$, $\beta = -0.15$; being an older in-patient, $t_{(700)} = 2.9$, $P = 0.004$, $\beta = 0.12$; hypoglycaemia being the patient-reported cause of admission, $t_{(700)} = 3.1$, $P = 0.002$, $\beta = 0.10$; administering insulin independently during the hospital stay, $t_{(700)} = 2.8$, $P = 0.006$, $\beta = 0.10$; and reporting fewer perceived hyperglycaemic episodes (DTSQ-IP2), $t_{(700)} = -2.6$, $P = 0.008$, $\beta = -0.09$ (see also Supporting Information, Table S3).

Table 3 High and low perceived frequency of hyperglycaemia, hypoglycaemia and reported severe hypoglycaemic episodes during an in-patient stay by diabetes treatment satisfaction, negative well-being and length of stay

	'High blood sugar' (DTSQ-IP2)			'Low blood sugar' (DTSQ-IP3)			Severe hypoglycaemic episode		
	Most/much of the time (score 6 or 5)	None of the time/rarely (score 0 or 1)	P	Most/much of the time (score 6 or 5)	None of the time/rarely (score 0 or 1)	P	Severe hypo	No severe hypo	P
	n (%)	n (%)		n (%)	n (%)		n (%)	n (%)	
DTSQ-IP composite score	264 (20%)	442 (33.5%)	—	95 (7.2%)	773 (58.6%)	—	339 (25.7%)	920 (69.7%)	—
Satisfaction with food*	4.77 (2.1)	5.18 (1.5)	0.001	4.52 (2.3)	5.06 (1.4)	0.000	4.8 (1.8)	5 (1.5)	0.000
Snack availability	4.4 (2.6)	4.6 (2.4)	NS	3.9 (3.0)	4.6 (2.2)	NS	4.2 (2.4)	4.4 (2.2)	NS
Choice of meals	5 (4)	5 (3)	0.005	4 (5)	4.5 (3)	NS	4 (4)	4 (3)	NS
Quality of meals	4 (4)	4 (3.5)	NS	4 (4)	5 (3)	NS	4 (3)	5 (3)	NS
Timing of meals	5 (3)	5 (2)	NS	5 (4)	4 (2)	NS	4 (4)	4 (3)	NS
Timing medication and meals	5 (3)	5 (2)	0.003	5 (3)	5 (2)	0.002	5 (3)	5 (3)	NS
Timing medication and meals	4.27 (1.96)	4.74 (1.7)	—	4.02 (2.13)	4.71 (1.68)	—	4.24 (1.92)	4.64 (1.7)	0.000
Similarity of meals†	3 (4)	3 (3)	NS	3 (3)	3 (3)	NS	3 (4)	3 (3)	NS
Negative well-being score	2 (6)	1 (4)	0.002	2 (7)	2 (5)	NS	3 (6)	2 (4)	0.000
Length of stay (days)	7 (9)	6 (9)	NS	10 (10)	6 (8)	0.000	9 (15)	6 (9)	0.000

Data shown as median (interquartile range), apart from the timing of medications and meals item, the Diabetes Treatment Satisfaction Questionnaire for In-patients (DTSQ-IP) composite score, *the food sub scale (mean and SD), and differences analysed by Mann-Whitney U-test. Perceived exposure to hyperglycaemia and hypoglycaemia are based on self-reported frequency of unacceptably high or low blood sugars for 'most/much of the time' (score of 6 or 5) or 'none of the time or rarely' (score of 0 or 1) on DTSQ-IP items 2 or 3.

†The significant differences in Timing medication and meals are not interpretable from the medians, so mean and SD are presented in addition to illustrate the nature of the differences between the subgroups.

‡Single item not included in the scale scores.

NS, not significant.

Discussion

The DIPSat Study is the first to use a psychometrically validated instrument (DTSQ-IP) to quantify in-patient diabetes treatment satisfaction in a large UK population, and to link satisfaction to aspects of in-patient diabetes care. In-patients with insulin-treated diabetes reported high levels of satisfaction with the general diabetes treatment items (such as flexibility and convenience of treatment) and with the time spent with the diabetes in-patient specialist nurse, but there was a high prevalence of extreme dissatisfaction with meal items (particularly meal choice and similarity to normal domestic choices) and with in-patient glycaemic variability.

The high levels of dissatisfaction with in-hospital meal choices (compared with normal domestic choices) were striking, with 22.7% indicating they would never, or rarely, have made similar meal choices at home; and 15.6% were extremely dissatisfied with the quality of meals offered. The UK Care Quality Commission [14] found that 13% of 62,601 general in-patients rated hospital food as poor. This dissatisfaction with in-patient meals is a particular issue for an insulin-treated in-patient population, often prescribed an insulin regimen based on domestic meal choices and meal pattern, and not adjusted for probable in-patient meals.

Twenty per cent of participants reported their blood glucose levels had been unacceptably high for most or much of the time during their in-patient stay. The clinical consequences of in-patient hyperglycaemia are well documented [15–17]. Our data show that hyperglycaemia is also associated with treatment dissatisfaction and with greater anxiety and depressed mood, and that dissatisfaction with the timing of medication in relation to the timing of meals was related to reports of more hyperglycaemia.

Twenty-six per cent of the DIPSat population also reported at least one discrete severe hypoglycaemic episode that needed staff assistance and 7% felt they were exposed to hypoglycaemia for most or much of their time in hospital (Table 2). Those experiencing a severe hypoglycaemic episode were more dissatisfied, had significantly poorer well-being scores and a more prolonged length of stay than those who did not experience a severe hypoglycaemic episode. No differences were found in the frequency of self-management, or in satisfaction with meal choices, but those who experienced severe hypoglycaemia or reported frequent unacceptably low blood glucose levels were more dissatisfied with the timing of insulin in relation to meals (as were those with hyperglycaemia). This supports the findings from the English National Diabetes In-patient Audit [1] that show that 17.2% of in-patients who rated timing of meals as unsuitable had a severe hypoglycaemic episode compared with 10.4% who reported that the timing was always or almost always suitable. This suggests that it is the poor timing of insulin administration in relation to meals, rather than meal choice, that is associated with hypoglycaemia and hyperglycaemia [18].

Table 4 Differing levels of independence of management of glucose monitoring and insulin administration in hospital by treatment satisfaction, perceived frequency of hyperglycaemia, hypoglycaemia, negative well-being and length of stay

	Glucose monitoring			Insulin administration				
	Patient only	Patient and nurse	Nurse only	Patient only	Patient and nurse	Nurse only		
Total, <i>n</i> (%)	133 (10.1%)	354 (26.8%)	789 (59.8%)	569 (43.1%)	398 (30.2%)	265 (20.1%)		
Severe hypo (<i>n</i> = 339)	26 (7.7%)	102 (30.1%)	209 (61.7%)	145 (42.8%)	115 (33.9%)	71 (20.9%)		
Low blood sugar caused admission (<i>n</i> = 78)	10 (12.8%)	16 (20.5%)	49 (62.8%)	27 (34.6%)	28 (35.9%)	21 (26.9%)		
DTSQ-IP composite score*	4.77 (1.8)	4.94 (1.5)	5 (1.5)	NS	4.94 (1.5)	5 (1.5)	4.9 (1.7)	NS
DTSQ-IP2 perceived frequency hyperglycaemia	1 (4)	3 (3)	3 (4)	0.004	2(4)	3 (4)	3 (5)	0.000
DTSQ-IP3 perceived frequency hypoglycaemia	1 (2)	1 (2)	1 (3)	NS	1 (2)	1 (3)	0 (2)	NS
Negative well-being score	1.5 (5)	2 (5)	2 (5)	NS	1 (5)	2 (5)	2 (4)	NS
Length of stay (days)	8 (11)	7 (10)	7 (10)	NS	7 (9)	8 (12)	7 (12)	0.008

All DTSQ-IP, Negative well-being and length of stay data shown as median (interquartile range) except for the Diabetes Treatment Satisfaction Questionnaire for In-patients (DTSQ-IP) composite score* (mean and SD), with Kruskal–Wallis ANOVA test across groups. Perceived exposure to hyperglycaemia and hypoglycaemia are based on self-reported frequency of unacceptably high or low blood sugars for ‘most/much of the time’ (score of 6 or 5) or ‘none of the time or rarely’ (score of 0 or 1) on DTSQ-IP items 2 or 3.

The DIPSat data also show that satisfaction with the time spent with the diabetes in-patient specialist nurse was significantly associated with less frequent unacceptably high or low blood glucose levels, and that time spent with the specialist nurse was a significant independent element contributing to higher satisfaction scores in the multiple regression model. This suggests that time spent with the diabetes in-patient specialist nurse is associated with enhanced in-patient diabetes treatment satisfaction, as well as a reduction in the excess length of stay in in-patient populations with diabetes demonstrated in other studies [4].

We found 43% of this population were self-managing their own insulin administration and 10% were self-managing their own blood glucose monitoring while in hospital. Self-management of diabetes is promoted by many diabetes care organizations [19,20] and is supported in many UK hospitals. This seems sensible, as many insulin-experienced in-patients are better able to manage their insulin regimen than some of their healthcare professionals [21]. The recent Trainees Own Perception of Delivery of Care (TOPDOC) survey of 2149 junior doctors in the UK found only 27% were fully confident in managing intravenous insulin, only 18% fully confident in altering diabetes therapy before an operation, with only a minority feeling that their training in diabetes had been adequate [22]. In DIPSat, in-patients on multiple daily injection regimens prior to hospitalization were least satisfied with diabetes treatment in hospital, perhaps because of their greater knowledge and experience of insulin use than those using premixed insulin, basal insulin only, or those new to insulin, who may be less aware of staff training inadequacies. Self-management of insulin and blood glucose monitoring was not clearly associated with different satisfaction or different negative well-being scores and may reflect patient

ability and choice being met in each hospital. However, once all other variables were controlled for in the regression analysis, self-administration of insulin was found to be a significant independent predictor of greater satisfaction.

A weakness of this analysis is that the DIPSat population is a homogenous group of predominantly white adult in-patients who were insulin treated and reviewed by a diabetes in-patient specialist nurse as part of routine clinical care and the patient population would reflect the more complex end of the in-patient diabetes care distribution; not all UK Hospitals have a diabetes in-patient specialist nurse, and those with a specialist nurse tend to be above average size [2]. Recruitment by a diabetes in-patient specialist nurse provides some consistency across the UK in the case-mix of patients approached. Measuring the effects of ethnicity on in-patient treatment satisfaction will be possible in future, as DTSQ-IP data have also been collected in four South Asian languages and English for South Asians in the DIPSat programme. Furthermore, the DTSQ-IP has yet to be adapted and evaluated for in-patients with Type 2 diabetes managed with diet or oral diabetes agents, and the DIPSat population also did not define themselves as having Type 1 or Type 2 diabetes (often prone to misclassification), but as ‘insulin treated’. Finally, this is a cross-sectional study, so there should be caution in attributing causality in the analyses.

The different approaches to patient recruitment also limit the comparability of our data and the English National Diabetes In-patient Audit (NaDIA) data [1], which commenced after the DIPSat programme. In DIPSat, all patients saw a diabetes in-patient specialist nurse and all were insulin treated, while in the National Diabetes In-patient Audit only 54% had seen a member of the diabetes team and 38% were insulin treated. In addition, the return rate in DIPSat (23.5%)

is lower than that seen in the National Diabetes In-patient Audit data, although the overall return rate met the pre-specified sample size. This may reflect the fact that patients in DIPSat were asked to complete their questionnaire after their entire admission pathway was finished (often after discharge), and that they had had time to reflect on their full in-patient stay. In the National Diabetes In-patient Audit, data from each patient were often collected and overseen directly by clinical staff responsible for care, which may enhance return rates, although it is unclear if this influences satisfaction data. The DIPSat materials were completed and returned solely by the in-patient without clinical supervision.

This paper offers the first description of diabetes treatment satisfaction in a large UK in-patient population using a validated method of assessing satisfaction. Future intervention studies need to be developed aiming to increase patient satisfaction by providing better meal choice, and better timing of insulin delivery in conjunction with meal times. Nearly 15% of acute hospital beds in the UK are occupied by people with diabetes [1] and the DIPSat programme provides a platform for interventions aimed at improving in-patient diabetes treatment satisfaction.

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Competing interests

CB is director and majority shareholder of Health Psychology Research (HPR) Ltd, a spin-out company which licences her questionnaires, including the DTSQ-IP, for others to use. HPR Ltd has funded conference expenses to allow presentation of this work by CB and has contributed to 1 month of CR's salary via Royal Holloway, University of London to allow preparation of guidelines for use of the DTSQ-IP. All other authors: none declared.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1. A list of the 58 UK Acute Hospitals participating in the DIPSat programme.

Table S2. (a) Principal components analysis (unforced) of all 22 DTSQ-IP items; (b) forced principal components analysis (single factor solution) of the DTSQ-IP; (c) internal consistency reliability of all 22 DTSQ-IP items using Cronbach's alpha statistics; (d) internal consistency reliability of 17 items (excluding DTSQ-IP 2, 3, 12, 20a and 20b) using Cronbach's alpha statistics.

Table S3. Hierarchical regression analysis investigating variables predictive of in-patient treatment satisfaction (DTSQ-IP composite score).

Table S4. Hierarchical regression analysis investigating variables predictive of in-patient length of stay.