ABCD Spring Meeting Abstracts

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The ABCD meeting at the Grand Central Hotel in Glasgow on the 23d & 24th May, saw another strong selection of research, service improvement work and clinical cases submitted for presentation. Details of the three top scoring abstracts are included here and the remaining can be found online at www.bjd-abcd.com

The top abstract was

Efficacy and safety of continuous subcutaneous insulin infusion of fast-acting insulin aspart compared with insulin aspart in type 1 diabetes

Evans M, Klonoff DC, Lane W, Kempe H-P, Renard E, DeVries JH, Graungaard T, Hyseni A, Battelino T

This abstract has already been published in *Diabetes Technology and Therapeutics* Volume 20, issue S1/February 2018 – https://www.liebertpub.com/doi/10.1089/dia.2018.2525.abstractsd

Quality improvement project on inpatient diabetes care leading to enhanced knowledge of insulin therapy and hypoglycaemia among health care professionals

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Aim: To measure the impact and effectiveness of information cards in improving the knowledge and awareness of junior doctors and nurses in the management of hypoglycaemia and insulin prescribing.

Method: A questionnaire was initially designed to test existing knowledge of staff directly involved in the management of patients with diabetes, namely the junior doctors and nurses. Based on the knowledge gaps identified, pocket size information cards were given to all junior doctors and nurses across the trust, detailing the correct management of hypoglycaemia and providing basic information on the different types and duration of insulin therapy. The original questionnaire was then redistributed to assess improvement in knowledge.

Results: Out of 157 participants, 80 (50.9%) completed the pre-training analysis and 77 (49%) completed the post-training analysis. 45% of nurses answered all questions correctly related to insulin nomenclature and characteristics post-training compared with 5% pre-training ($p<0.01$). 58% of nurses and 52% of doctors answered all questions correctly related to hypoglycaemia diagnosis and management post-training compared with 26% of nurses and 16% of doctors pre-training ($p<0.01$).

Conclusion: This project showed significant improvement in staff knowledge across all areas. The information cards were agreed to be effective and powerful learning/reference tools. It highlights the effective and powerful role some of these simple learning tools and methodologies can play in the upskilling of basic knowledge of diabetes amongst healthcare professionals.

Variable rate insulin infusions on medical and surgical wards: are we getting it right?

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Aim: A quality improvement project undertaken at University Hospital Birmingham to improve the management of patients on variable rate intravenous insulin infusions (VRIII) to allow a consistent standard of care in keeping with Joint British Diabetes Societies (JBDS) guidelines.

Methods: All episodes where a patient was started on a VRIII were included. Data were collected at intervals from September 2016 to November 2017. Analysed data included: supplementary intravenous fluid choice, episodes of hypoglycaemia and electrolyte imbalance. Chi-squared analysis was used to compare and assess the significance of baseline and final cycle data. Action changes were implemented between cycles; presentation of results at the grand round, release and distribution of new trust guidelines, medicines management approval of JDBS suggested VRIII fluid, and medical staff education.

Results: 382 total episodes of VRIII treatment were identified across the time period. The percentage of episodes using correct fluids as per trust guidelines increased sequentially from 23% at baseline to 95% at the final cycle ($p<0.0001$). There was a reduction in the incidence of episodes of hyponatraemia (sodium <135 mmol/L) from 28.6% to 8.3% ($p=0.01$), and of hypoglycaemia (blood glucose <4 mmol/L) from 24.2% to 8.3% ($p=0.03$). There was a non-significant but absolute reduction in the incidence of hypokalaema (potassium <3.5 mmol/L) from 6.6% to 2.8% ($p=0.38$).

Conclusion: Action changes instigated within the trust improved the treatment of patients on a VRIII with significant improvement in the correct fluid use and reduced episodes of hypoglycaemia and electrolyte imbalance.

The diagnostic utility of urinary C-peptide/creatinine ratio (UCPCR): insights from a review of the local use of UCPCR in the diabetes clinic

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Background: UCPCR is a less burdensome measure of endogenous insulin secretion than traditional serum C-peptide and 24-hour urinary C-peptide. It can be used to diagnose maturity onset diabetes of the young (MODY), and helps identify absolute insulin deficiency.

Methods: All UCPCR results at our NHS Trust from September 2015 to September 2017 were identified. Electronic notes were reviewed to collect the following information: clinical justification, age, time to initiating insulin, antibody serology, family history and HbA1c. Changes in diagnosis and management following UCPCR quantification were recorded.

Results: Eighty UCPCR requests were identified. The diagnosis for 40 patients was changed after consideration of UCPCR and other clinical data. Ten people with a clinical diagnosis of type 1 diabetes were reclassified as type 2, and one as HNF1A MODY. Eight people with apparent type 2 diabetes were reclassified as type 1. There was a change in management in 32 cases. Ten individuals have restarted oral medication of which five patients are off insulin and five now on basal only; four such patients had been on insulin for over 15 years, of whom two were on insulin pump therapy. Three patients with LADA are under surveillance using serial UCPCR as well as HbA1c and glucose measurements to inform decision-making on the need for exogenous insulin therapy.

Conclusion: UCPCR is a convenient tool for classifying diabetes and guiding management in the absence of serum or 24-hour urinary C-peptide.

Effect of testosterone deficiency and testosterone therapy in men with type 2 diabetes on quality of life in a 7-year follow-up study

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Barnsley Hospital NHS Foundation Trust; University of Sheffield; King's Mill Hospital, Sutton-In-Ashfield; Sheffield Hallam University

Background: The 36-item Short Form Questionnaire (SF-36) is a well-recognised tool for assessing patients' health-related quality of life (HRQOL). It has been shown that the changes in some SF-36 domains in patients with diabetes (T2D) predict the relative risk of mortality, hospitalisation, inability to work and losing ability to work.

Objective: To assess SF-36 domains in men with T2D and hypogonadism and the impact of testosterone therapy (TTh) over 7 years.

Methods: Using the research data from a baseline study (N=356) and a 7-year follow-up study (N=203) involving men with T2D, the change in domains was calculated. All men were divided into 3 groups according to their testosterone (T) status: group 1 – men with low T (<12 nmol/L), untreated (N=57); group 2 – men with low T (<12 nmol/L) on TTh (N=31); and group 3 – men with normal T (≥12 nmol/L) (N=78). None of the hypogonadal men was on TTh at baseline. Statistical analysis was carried out using SPSS software, change in domains was analysed using univariate analysis of variance for normally distributed data and the Mann–Whitney U test for non-normally distributed data.

Results: Mean age at baseline was 56.8±8.7 years (range 34–75) and at follow-up was 63.9±8.7 years (range 41–83). Mean total T level at baseline for group 1 was 9.16±2.24 nmol/L (range 2.62–11.9); for group 2 was 7.95±2.36 nmol/L (range 2.99–11.74); and for group 3 was 16.91±4.09 nmol/L (range 12.06–27.31). At follow-up, mean total T level was 9.28±3.75 nmol/L (range 0.4–17.8) for group 1; 16.56±7.02 nmol/L (range 3.8–37) for group 2; and 12.64±5.22 nmol/L (range 1.3–26.8) for group 3. For three domains we found a significant difference in the 7-year change between groups 1 and 2: Vitality (V) (p=0.02), Mental Health (MH) (p=0.01) and General Health (GH) (p=0.035). In a further three domains the difference between groups 1 and 2 was trending towards statistical significance: Role limitations due to physical health (p=0.165), Role limitations due to emotional problems (p=0.134) and Social functioning (p=0.143). In all the above-mentioned domains there was no significant difference between treated hypogonadal men and men with normal T level at baseline. In all other domains of SF-36, it showed the change (slowed down decline or even improvement) except Bodily Pain, but the difference was not statistically significant. Age, HbA1c, BMI, pre-existing IHD, smoking and alcohol consumption were used as covariates.

Conclusions: (1) Hypogonadal men with T2D have a poorer HRQOL than eugonadal T2D men. (2) TTh in hypogonadal men improves Psychological function, Vitality (energy and fatigue) and perception of General Health resulting in an overall benefit in QoL. (3) When the subjects were divided into groups according to their total T level (using a cut-off of 12 nmol/L), the 7-year change in the scores in three domains (V (p=0.02), MH (p=0.01) and GH (0.035)) was statistically significantly different between treated and untreated hypogonadal men and the difference was not statically significant between treated hypogonadal and eugonadal men. (4) Testosterone status should be assessed in symptomatic men with T2D and considered for TTh if indicated and without contraindications.

Improving patient outcomes by introducing a Renal Diabetes Multidisciplinary Team (MDT) Service

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Introduction: Diabetes mellitus (DM) is the commonest cause of end stage renal failure in the UK. Patients with DM and chronic kidney disease (CKD) are referred to the MDT service, consisting of a diabetologist, nephrologist and specialist nurses. Either of the physicians sees the patient initially and presents to the MDT, where management plans are made. Patients are either followed up or discharged with a clear guidance for management and re-referral.

Methods: We retrospectively collected data from the electronic patient records. The data showed a non-parametric distribution, hence most were presented as median and analysed using the Spearman's rank correlation.

Results: 88 subjects (59 men, 29 women) of median age 73 years (range 17–92) with DM for an average of 18 years (SD 10, range 3–50) were included. They were followed up for 32 months (range 13–94). The diagnosis was type 2 DM in 79 and type 1 DM in 9 (n=88). 66 (90.9%) were non-smokers at referral. 13.6% mortality during the follow-up period. Median estimated glomerular filtration rate (eGFR) was 31 ml/min/1.73 m2 at referral and 24.5 after 32 months follow-up (Figure 1). Subjects classified as having impaired

Figure 1. Decline in estimated glomerular filtration rate over time

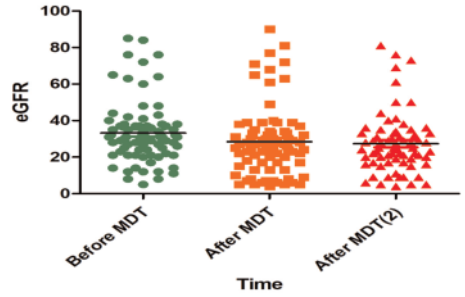
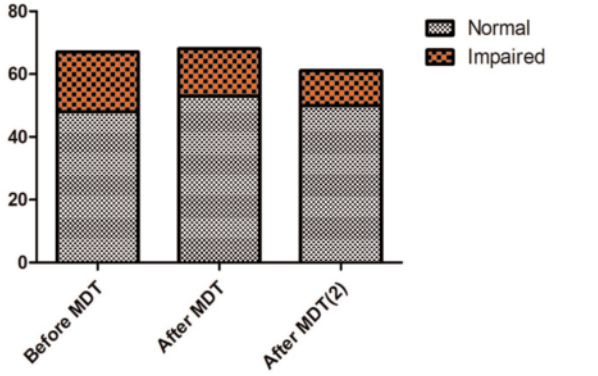


Figure 2. Hypoglycaemia awareness



hypoglycaemia awareness were reduced from 19 of 57 at referral to 11 of 61 after MDT(2) (Figure 2).

Discussion: Although the decline in eGFR over time pre-MDT to post-MDT in our cohort was statistically significant (p=0.01), the decline was lower than expected. Typically, the decline expected would be eGFR loss >3.5 mL/min/year.[1] In our cohort the eGFR loss was 2.44 mL/min/year over the 32-month follow-up. As this is an audit, it is not powered enough to identify the responsible individual factor. We can, however, speculate that this could be multifactorial, due to BMI reduction (Figure 3), fall in systolic blood pressure (Figure 4), smoking reduction (Table 1) and use of newer antidiabetic medications such as GLP-1 analogues and DPP-4 inhibitors which may confer improved renal outcomes. HbA1C improvement (Figure 5) was not statistically significant. Mortality in this group of patients remains high at 13.6% in our cohort.

Conclusions: Our integrated DM renal service slows down the decline in renal function in patients with DM. It reduces the use of sulfonylureas and potential risk of hypoglycaemia which is usually under-appreciated but relevant to survival.

Figure 3. Body mass index change over time

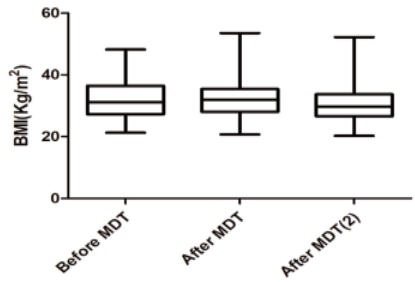


Figure 4. Systolic blood pressure change over time

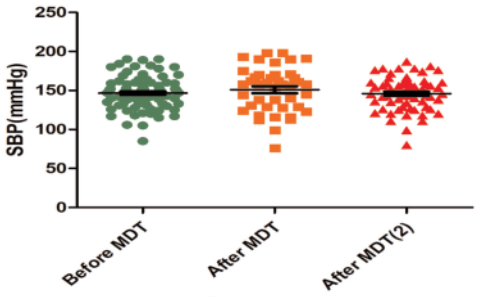
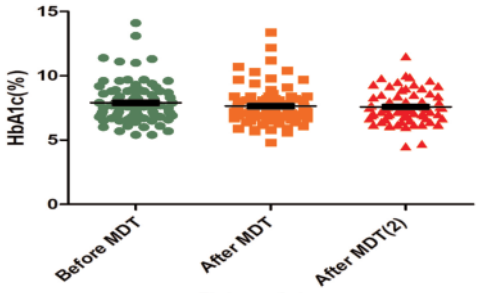


Figure 5. HbA1c change over time.



Reference

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Table 1

		Smoking	Statins	Insulin	Sulfonylureas	ACE inhibitors	Angiotensin receptor blockers
		n=66	n=83	n=82	n=83	n=48	n=47
Before MDT	Yes	6 (9.1%)	70 (84.3%)	53 (64.6%)	24 (28.9%)	18 (37.5%)	17 (36.2%)
	No	60 (90.9%)	13 (15.7%)	29 (35.4%)	59 (71.1%)	30 (62.5%)	30 (63.8%)
		n=47	n=66	n=66	n=66	n=53	n=53
After MDT(2)	Yes	3 (6.4%)	57 (86.4%)	46 (69.7%)	9 (13.6%)	20 (37.7%)	23 (43.4%)
	No	44 (93.6%)	9 (13.6%)	20 (30.3%)	57 (86.4%)	33 (62.3%)	30 (56.6%)

Patchworks: FreeStyle Libre data interpretation training for type 1 diabetes

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The FreeStyle Libre flash glucose monitoring system is now available with NHS funding to selected patients depending on criteria set out by their CCG. This will see a substantial increase in the usage of this device and with it will come a huge amount more data to be analysed, in addition to the usual glycaemic control checks consisting of HbA1c and finger prick blood glucose monitoring. In order to get the most out of the FreeStyle Libre device, those using it need to understand how the system works and how to analyse the data it supplies them with. We created Patchworks, a patient-centred course which will be rolled out as part of a modular education programme for people with type 1 diabetes, which will teach patients how to interpret and analyse data from the Freestyle Libre. The course was designed with a large amount of input from patients with type 1 diabetes, including from those who attended a focus group to help with the design of the course. Patchworks includes teaching on the physiology behind flash glucose monitoring, treatment of hypoglycaemia, how to respond to trend arrows and interpretation of the ambulatory glucose profile (AGP) using the patients' own AGP uploads. The course piloted on 23 January 2018 and full roll-out started on 28 June 2018. Future plans include potentially having patients leading sessions to educate their peers.

Autoimmune diabetes as result of immunotherapy for malignant melanoma

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Introduction: Immune checkpoint inhibitor therapy has been uncommonly associated with the development of endocrinopathies. This case report describes a patient who developed autoimmune diabetes following treatment with immunomodifiers, in the context of managing malignant melanoma.

Case details: A 76-year-old female was diagnosed with stage 4 malignant melanoma of the scalp (BRAF-negative), managed with resection and adjuvant radiotherapy. The patient received four cycles of ipilimumab for systemic metastatic disease with further pembrolizumab treatment planned. Following the first cycle of pembrolizumab, she was admitted with severe acute hyperglycaemia. Hba1c was mildly elevated at 48.6 mmol/mol, suggesting recent onset of glycaemic dysregulation. She appeared euglycaemic throughout previous immunotherapy treatment. There was no family history of diabetes mellitus or autoimmune disease. Pancreatic islet cell and glutamic acid decarboxylase antibodies were positive. Cortisol levels, thyroid and pituitary function were normal. Blood lymphocyte immunophenotyping identified that the frequency of the patient's Treg cells was increased, complemented by an overall skewing of CD4 cells towards a CD45RA-negative memory phenotype (Figure 1). This was deemed to be compatible with unrestricted co-stimulation as a result of anti-CTL-associated antigen-4 (aCTLA-4) and anti-programmed cell death protein 1 (aPD-1). The CD4/CD8 ratio was similar to age-matched type 1 diabetes controls, indicating no preferential expansion of CD8 cells (Figure 2). The endocrinopathy was presumed to be immunotherapy-related autoimmune toxicity.

Figure 1. Blood lymphocyte immunophenotyping for the presented case, indicated increased frequency of the patient's Treg cells and an overall skewing of CD4 cells towards a CD45RA-negative memory phenotype

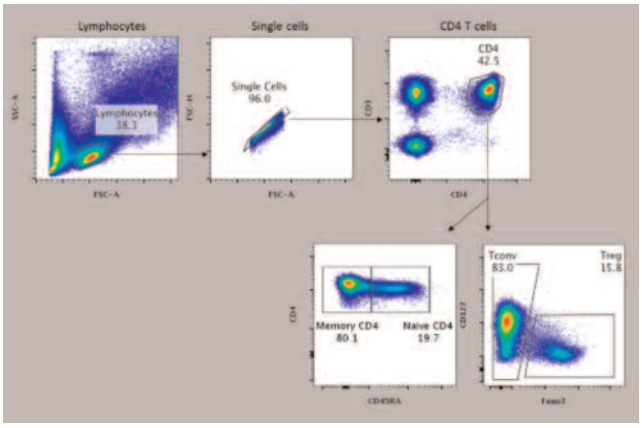
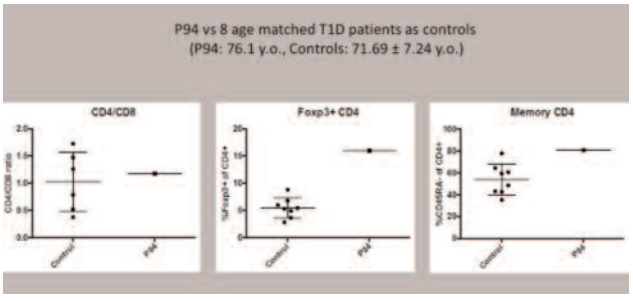


Figure 2. Comparison of CD4/CD8 ratio with eight age-matched control type 1 diabetes patients, retrieved from the data available in our laboratory



Discussion: Combination immunotherapy is a risk factor for the development of endocrinopathies. Autoimmune-mediated diabetes mellitus can occur in 1 per 1,000 cases treated with pembrolizumab. Two similar reports support the possible association of immunomodifiers with autoimmune diabetes, in cases presenting with diabetic ketoacidosis following the third infusion of pembrolizumab[1] and after the ninth infusion.[2] Immunophenotyping may allow further insight into understanding changes involved in autoimmune disease. Regular monitoring following the initiation of such treatments would enable early detection and appropriate management of endocrinopathies.

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Development and implementation of diabetes 10-point training programme for patient-facing staff to improve patient safety and awareness of diabetes in different clinical settings

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Aims/objectives: The original diabetes 10-point training module was developed to ensure that ward staff possess core diabetes competencies to keep patients safe.

Methods: Flexibility of training approach was fundamental. Participants completed questionnaires on self-assessed confidence, measured on a 3-point Likert scale. National diabetes inpatient audit data were compared 2015–2016.

Results: Of 640 attendees trained at Poole Hospital, 230 completed questionnaires prior to training and 99 at 3 months. There was overall significantly higher confidence after training compared with before. National diabetes inpatient audit data were compared, demonstrating significant improvements in patient safety. Medication and prescription errors were reduced (46.9% in 2015 vs. 26.7% in 2016 and 38.8% in 2015 vs. 15.0% in 2016).

Conclusions/summary: Training has been adapted to three other Trusts and a module for community nursing staff was developed and used in Camden, London and Purbeck, Dorset. The author now works with a transformation team and is focusing on standardising ward staff training across eight clinical commissioning groups. Improving inpatient safety should not be isolated to acute hospitals and an adapted training programme for mental health workers and patients with diabetes has been developed. Training will be extended to mental health hospitals as a matter of priority. This is in recognition that serious mental illness is associated with a high prevalence of diabetes, worse outcomes and premature mortality, and the quality of diabetes care is frequently suboptimal in all settings.

A retrospective study of diabetic ketoacidosis management in a district general hospital

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Aim: A retrospective study of the management of diabetic ketoacidosis (DKA) at Conquest Hospital, mainly looking at different 'care processes' used in DKA management guidelines.

Method: A retrospective cross-sectional study was performed of patients admitted with DKA at Conquest Hospital between June 2015 and December 2016. Data were obtained from a combination of case notes and the hospital electronic database. Comparison was made with results obtained from the National Survey of Management of DKA in the UK in 2014.

Results: During the 18-month period, data on 24 patients admitted with DKA were analysed. Of the cohort, 15 were male and 9 female. 63% of patients were below the age of 40 and 50% were known type 1 diabetics for 5–15 years. Among different variables analysed, most correlated well with national survey results. Significant results noted were 39% had an episode of hypoglycaemia within 24 hours of treatment and 42% in total; 16% had hypokalaemia during the first 24 hours; only 71% had CBG monitored hourly while on IV insulin; 58% had length of stay less than 48 hours and only 25% had serum ketones measured; 62% had no previous DKA.

Conclusion: In our cohort of patients there were significant risks identified in management of DKA, in hourly CBG monitoring, serum ketone measurement, episodes of hypoglycaemia and hypokalaemia. An action plan in the form of additional educational input to staff managing DKA was made and implemented.

Hyperglycaemia rates in oncology patients receiving systemic anti-cancer therapy (SACT)

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Background: Hyperglycaemia is a significant cause of morbidity in cancer patients accounting for up to 5% of oncology admissions.1 One significant factor is the high doses of steroids administered as part of their anti-emetic regime. There is currently no consensus regarding blood glucose level (BGL) monitoring in patients receiving systemic anti-cancer therapy (SACT) at the Royal Free Hospital.

Method: During a three-week period, all oncology patients receiving SACT had their blood sugar checked using a capillary blood glucose machine. Blood glucose diagnostic cut-off figures were used as per diabetes UK guidelines for normal, borderline diabetic and diabetic values.

Results: 166 patients had their BGL checked during this time period. Eighteen patients (11%) had a blood sugar diagnostic of diabetes, 25 (15%) had a borderline blood sugar and 123 (74%) had normal blood sugars. In the group with blood sugars diagnostic of diabetes, four (23%) were not known to be diabetic. In the borderline group only 20 (80%) were not known to have a pre-existing diagnosis of diabetes. One patient was admitted to hospital as a direct result of the blood sugar measurement.

Conclusion: Forty-three patients (25.8%) had abnormal blood sugars and all of these patients were receiving steroids as part of their anti-cancer treatment. NICE advocates frequent monitoring of all patients on high-dose steroids, and we suggest that the routine BGL monitoring of all patients on SACT and early liaison with the local diabetes team could prevent unnecessary admission to hospital.

Reference

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Observational study of the psychological characteristics of patients with type 1 diabetes with extreme glucose fluxes

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Method: A study using a prospective repeated measures design of 76 adults (18–65 years) with type 1 diabetes (T1DM) was conducted to examine within- and between-person temporal associations of factors within the Hypoglycaemia Fear Survey (HFS-II) and Hyperglycaemia Avoidance Scale (HAS) and its association with the Low

Blood Glucose Index (LBGI) and High Blood Glucose Index (HBGI). Measures of physical and mental well-being using the SF-12 and PCS scales were also examined.

Results: Those with increasing hypoglycaemia burden (high LBGI), although found to have excess worry over hypoglycaemia ($p<0.00001$), tended not to be proactive with avoidance of hypoglycaemia, with no correlation with either avoidance of hypoglycaemia or maintaining higher glucose levels (both $p>0.1$). However, these patients were found to have significant behaviour traits related to avoidance of hyperglycaemia (ie, taking action of hyperglycaemia, preference for hypoglycaemia rather than hyperglycaemia ($p<0.00001$)) and also had a significant worry of hyperglycaemia ($p<0.00001$).

Conclusions: Patients with T1DM with a high hypoglycaemic load had worries over both hypoglycaemia and hyperglycaemia, with a possible acceptance of the low blood glucose range but very proactive in the hyperglycaemic range, potentially aggravating hypoglycaemia through drastic measures to correct hyperglycaemia. We also found that those who had a worry for both hypoglycaemia and hyperglycaemia had worsening scores on both the SF-12 (Physical and Mental scores) and the PHQ-9 (screen for depression) scales. Therefore we feel it is pertinent to identify and explore patients' health beliefs and worries with regard to the extremes of glucose flux, and to tailor advice accordingly to address these fears.

Liver abscess secondary to a duodenal-jejunal bypass liner (DJBL) successfully treated with antibiotics but without removal of the device

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Background: Endoscopic duodenal-jejunal bypass liner (DJBL) therapy is a 60 cm impermeable liner open at both ends. This minimally invasive technique improves HbA1c and promotes weight loss in obese patients with T2DM.[1] Its utility has been questioned owing to the association of this treatment with hepatic abscess, although the largest German registry (n=234) postulates that this may be as low as 1.7%.[2]

Method and Results: We present the case of a 51-year-old woman with T2DM (gliclazide 160 mg twice daily, liraglutide 1.8 mg daily, HbA1c 8.8%), weight 136.2 kg (BMI 53.9 kg/m2) who was a participant in the ABCD REVISE Diabesity (ISRCTN00151053) trial. Six weeks following EndoBarrier insertion in July 2014 she presented with nausea, upper abdominal pain and fever. She was found to have a 8.0 x 6.5 cm abscess in the left hepatic lobe on CT imaging, not amenable to ultrasound-guided drainage. Despite counselling, the patient refused (because of weight loss already achieved and anticipated) to have the EndoBarrier removed. Antibiotic treatment was commenced with device removal planned if there was no resolution. She was treated with 2 weeks of intravenous piperacillin/tazobactam then 12 weeks of oral ciprofloxacin, resulting in clinical, biochemical and radiological improvement with a reduced abscess size on interval CT of 2.5 x 2.0 cm with only a small abscess remnant seen following device removal at 12 months. During that time her weight fell by 18.9 kg and HbA1c rose to 9.7% (with gliclazide halved and liraglutide stopped).

Conclusion: Our case suggests that some, but not all, cases of Endobarrier-associated hepatic abscess may be treated simply with careful monitoring and antibiotics without removal of the EndoBarrier device.

References

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Can identifying psychologically distressed patients with type 1 diabetes and providing them with psychotherapy lower HbA1c and reduce admissions?

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Aims: To explore whether identifying psychological distress or inpatient admissions in patients with type 1 diabetes, and providing those individuals with access to specialized psychotherapy, can help reduce HbA1c levels and reduce admission incidents.

Methods: We identified individuals suffering psychological distress relating to their type 1 diabetes through consultant and DSN appointments, and through identifying and following up inpatient admissions in patients with type 1 diabetes. Following a psychological assessment, we then offered these individuals access to specialised diabetes psychotherapy. This amounted to a mean of 12 50-min sessions of psychotherapy with a psychotherapist, exploring belief systems and emotions that might contribute to neglect of their diabetes self-care and identifying ways of bettering self-care. This was carried out initially with a small tranche of patients, and has been increased over time as results have demonstrated the potential to decrease admissions and reduce HbA1c.

Results: Where individuals were identified as suffering distress around their type 1 diabetes or had had admissions as inpatients and undertook a series of specialised psychotherapy sessions, the results showed that 27 patients had a mean reduction in HbA1c of 29%. Admissions for some individuals stopped completely and in others fell by a significant amount.

Conclusions: In patients who were assessed as suffering psychological distress relating to their diabetes and were willing to undertake psychotherapy relating to their diabetes, admissions were reduced or halted and HbA1c levels were also reduced by a mean of 29%.