adverse events. Patients were divided by age: 23 prepubertal, 127 adolescent, and 129 young adults. The data collected a year preceding CSII was compared to the period following onset of CSII (ranged 1–6 years).
Results: A significant decrease in HbA1c was demonstrated after onset of CSII use, for the entire cohort (–0.51%, $p < 0.001$), prepubertal (–0.48%, $p < 0.05$), adolescents (–0.26%, $p < 0.05$), and young adults (–0.76%, $p < 0.001$) groups. There was a significant interaction between the change in HbA1c level and HbA1c value at initiation of CSII (–1.7% for patients with HbA1c ≥ 10%, +0.2% for patients with HbA1c ≤ 7%; $p < 0.001$), and between the decrease in HbA1c levels and duration of CSII therapy for the first 3 years ($p < 0.001$ for each additional year). The rate of severe hypoglycemic episodes decreased significantly in the adolescent group, from 36.5 to 11.1 events per 100 patient-years ($p < 0.01$), and in the young adult group, from 58.1 to 23.3 ($p < 0.05$). There was no significant change in the rate of diabetic ketoacidosis between the two periods. The young adults showed a significant decrease in BMI SDS (–0.08 ± 0.37, $p < 0.05$).
Conclusions: CSII improves glycemic control in youth with type 1diabetes, especially those with a history of poor glycemic control. This improvement is associated with a decrease in the rate of severe hypoglycemia, in the absence of weight gain.

P53

Insulin pump treatment in children with type 1 diabetes: a study of patient preferences, satisfaction and metabolic control

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Background: Insulin pump treatment in childhood has become increasingly popular. The results on metabolic control are however conflicting.
Aim: To investigate the influence of insulin pump treatment on quality of life, patient preference and metabolic control in children aged 6–12 years.
Methodology: Twenty children (13 boys), mean age (± SD) 9.3 (±2.0) years, mean diabetes duration (±SD) 4.9 (±2.1) years and mean HbA1c 7.6 (±0.5)%, were randomised to either 3 months of insulin pump treatment or 3 months of pen treatment, and then switched to the opposite treatment arm for 3 months. Eight-point blood glucose profiles were performed every fortnight and CGMS four times during the study. Children and parents filled in questionnaires of satisfaction three times and a preference questionnaire at study end (WHO-DTSQ).
Results: After the trial all patients continued with pump treatment and there was a higher patient satisfaction ($p < 0.01$) during the pump period. HbA1c decreased significantly during pump treatment [mean (SE) 7.35 (0.10)] % vs. [mean (SE) 7.67 (0.10)]% ($p = 0.0273$). The total mean of the 8-point blood glucose profiles were lover during pump treatment mean (SE) 8.07 (0.56) mmol/l vs. 10.68 (0.53) mmol/l, and CGMS showed more readings in the interval 5–10 mmol/l during pump treatment ($p = 0.0387$). Patients on pen received more insulin than those on pump [mean (SE) 0.94 (0.02) U/kg/24 h] vs. [mean (SE) 0.80 (0.02) U/kg/24 h], while patients on pump were treated with significantly more bolus insulin [mean (SE) 0.55 (0.02) U/kg/24 h] vs. [mean (SE) 0.35 (0.02) U/kg/24 h] (pen group) compared to the pen group. There were no episodes of ketoacidosis, but two episodes of severe hypoglycaemia (convulsions and unconsciousness) (1/20 patient years) in each study arm.
Conclusion: Young Danish TID patients prefer insulin pump treatment. Pump treatment improves quality of life and is associated with improved glycaemic control.

P54

Insulin pumps vs. multiple injections from the onset of type-1 diabetes in children

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Introduction: Continuous subcutaneous insulin infusion (CSII) has become increasingly popular in children with type-1 diabetes. Still there remains evidence showing improved metabolic control when comparing CSII with multi-injection treatment (MI) from the onset of diabetes.
Aims: We wanted to investigate whether treatment of children from the onset of type 1 diabetes with CSII is feasible and if children treated with CSII achieve a better metabolic control compared to children treated with MI.
Methodology: Two cohorts of patients were compared: the 29 children with type 1 diabetes diagnosed in 2003–2004 (24 months) all treated with CSII and 11 children in the Hvidore study diagnosed between December 1999 and November 2000 (12 months) treated with MI. The groups went through the same education programme with the same diabetes team and were followed regularly in the outpatient clinic. HbA1c (4.3–6.1%) was measured every third month and a Sustacal stimulated C-peptide test was performed at 6 and 12 months after diagnosis.
Results: Eleven children (mean age 8.8 years, CI 6.2–11.5) from 1999–2000 and 29 patients (9.0, 7.4–10.5) from 2003–2004 were enrolled in the study. HbA1c at three months was in the CSII-group 7.3% and in the MI-group 7.4%, similar numbers at six months were 7.1/7.9, 9 months 7.4/8.3, 12 months 7.9/8.1, 15 months 7.5/8.7, 18 months 7.9/8.7, 21 months 7.8/9.0 and at 24 months 8.1/8.5. In spite of the consistently lower HbA1c-values in the CSII-group, the difference was statistically significant only at 15 months ($p = 0.03$). No statistical difference was found in median stimulated C-peptide, the values at 6 months where 410 (CSII) and 284 (MI), and at 12 months 225 (CSII) and 207 (MI).
Conclusion: This study shows that treatment with CSII from the onset of type-1 diabetes in children is feasible and indicates that CSII results in better metabolic control than treatment with multiple injections in the first 2 years of diabetes.

P55

Is there a benefit of continuous glucose monitoring on insulin pump dosing in children and adolescents with type-1 diabetes?

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Introduction: Although insulin pump therapy (CSII) is frequently used in pediatric patients with type-1 diabetes, no age-dependent standard scheme for an initial insulin dosing is available. Aim of this randomized clinical trial was to investigate variations of insulin dosing at the start of CSII and after 6 weeks depending on the preceding use of continuous glucose monitoring system (CGMS) or conventional self-monitoring of blood glucose (SMBG).
Patients and methods: Thirty-one patients (11 boys, 20 girls) were included into the study to receive CSII. Median age was 12.1 years (range 1–18) and median diabetes duration 3.3 years (0.3–10.2). 15 patients were randomized to perform ambulatory CGMS (MedtronicMinimed) over 3 days immediately before CSII was

started (arm A), while 16 patients performed SMBG (arm B). Clinical data and insulin therapy were analyzed before CSII, at start of CSII, and after 6 weeks. Baseline characteristics were not significantly different between both arms.

Results: In the total cohort, HbA1c improved from 8.3 ± 1.2% at start of CSII to 7.5 ± 0.7% at 6 weeks ($p < 0.001$). HbA1c decreased by -1.1 ± 1.2% ($p = 0.003$) in arm A, and by -0.5 ± 0.7% ($p = 0.021$) in arm B ($p = 0.140$ between arms). In arm A, average total insulin dose (U/kg) decreased from 0.89 before and 0.92 at start of CSII to 0.81 at 6 weeks, but remained unchanged (0.91, 0.89, and 0.90) in arm B ($p = 0.066$ between arms at 6 weeks). The amount of basal insulin (percent of total insulin dose) changed from 44.4% to 36.7% and 37.6% in arm A, and from 46.9% to 42.7% and 40.3% in arm B, without significant differences between arms. Furthermore, no significant difference was found in the number of basal rate changes made from initial to 6-week pump setting.

Conclusions: CGMS might be helpful to optimize insulin dose at the beginning of CSII and to improve glycemic control.

P56

MiniMed Paradigm® REAL-Time insulin pump and continuous glucose monitoring system (PRT): daily use in three patients

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Introduction: The MiniMed Paradigm REAL-Time System is the world's first system that integrates an insulin pump with REAL-Time continuous glucose monitoring. The first part of the system is the MiniMed Paradigm REAL-Time 522 or 722 insulin pump, built on the MiniMed Paradigm platform. The second part of the system is the optional REAL-Time Continuous Glucose Monitoring component, which offers REAL-Time glucose readings, safety alarms, and glucose trend data.

Aim: In our study we had evaluated the usefulness of PRT system in three kids from our Centre (that is one among the 30 Centres that in Italy had the possibility to evaluate the usefulness of the system in 60 patients, two or three for each Centre).

Methodology: We choose to enrol in the evaluation phase: two kids (one in mild control and one in bad control), that previously used an insulin pump for their insulin therapy, and one kid that switched from multiple insulin daily injections (MDI) with glargine and aspart to insulin pump therapy.

Results: D.M., 11-year-old boy, with type 1 diabetes since 4 years, using an insulin pump since 2 years, started to use the PRT system in January 2006 with a glycated haemoglobin (HbA1c) of 7.6%; after 3 months his HbA1c decreased to 6%. G.T., 9-year-old boy, with type 1 diabetes since 3 years, using MDI since the diagnosis, started to use the PRT system in January 2006 with a glycated haemoglobin (HbA1c) of 8.5%; after 3 months his HbA1c decreased to 7.1%. M.P., 14-year-old girl, with type 1 diabetes since 7 years, using an insulin pump since 2 years, started to use the PRT system in January 2006 with a glycated haemoglobin (HbA1c) of 8.7%; after 3 months her HbA1c decreased to 7.6%. During the study period none of them did not experience any severe hypoglycaemia and did not report any major discomfort in using the PRT system (some minor pain inserting the glucose sensor and noise from the alarm, specially during the night were reported by the three kids).

Conclusions: In our experience, PRT system has been shown a good tool to ameliorate metabolic control in children with type 1 diabetes. These results have to be confirmed in larger groups and for longer time.

P57

Post-prandial glucose excursions following three methods of bolus insulin administration in adolescent girls with type 1 diabetes

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Aims: To determine if one method of short-acting insulin bolus administration is superior to other methods in managing a meal with the same content of calories and carbohydrates but with different content of fat.

Methodology: Thirteen girls aged 13–19 years with type 1 diabetes and treated with continous subcutaneous insulin infusion using insulin lispro (Humalog®) or aspart (Novorapid®) agreed to consume two different lunch meals on six occasions with 1 week apart. The meals were exactly identical with the same content of calories and carbohydrates but with 30 or 36% fat. They received the same dose of bolus insulin on each of the six occasions as a single dose immediately prior to the meal as a single bolus (N), a dual-wave (60% as a single bolus and 40% as square wave over 1 h, DF) or as a square wave over 1 h (F). The plasma-glucose levels were followed with CGMS every fifth minute between 30 min before and until 3 h after the meal.

Results: The maximal change of plasma-glucose occurred after 110 min (2.7 mmol), 85 min (2.6 mmol) and 55 (3.8 mmol) min after the 30% fat meal with the N, DF and F bolus administration. The maximal change of plasma-glucose after the 36% fat meal with the N, DF and F bolus after 75 min (2.6 mmol), 45 min (1.8 mmol) and 65 min (2.8 mmol) The area under the curve between start and 180 min was lowest after the DF bolus for both types of meals ($p < 0.001$).

Conclusions: The dual wave method for bolus administration seams to be the most effective method for a recommended type of main-meal or a 'pizza'-type of meal.

P58

Twenty-four hour CGMS and microdialysis (MD) determinations of glucose compared with P-glucose in T1DM adolescents under daily life conditions

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Fluctuation in B-glucose is associated with impaired glycemic control in T1DM. Studies of CGMS or MD glucose determinations against P-glucose in children with T1DM under daily life conditions are few. We have compared CGMS (every 5 min) and MD (1 h collection intervals) glucose determinations with 30 min measurements of P-glucose during two 24 h periods in 12 T1DM adolescents. We have previously reported that during the first period on NPH insulin, P-glucose variability was significantly larger than during the second period on insulin Glargine. P-glucose and CGMS determinations were well correlated throughout both 24-h registrations in all patients (974 paired values, $r = 0.88$, $\alpha = 0.94$). A total of 78 well defined P-glucose peaks were identified of which 74 coincided in time with CGMS readings while two occurred more than 30 min delayed and two were not detected by CGMS. A total of 66 nadirs in P-glucose were identified with four delayed CGMS readings and five occurring 30 min or more prior to P-glucose. CGMS registrations from the glucose-oxidase based sensor are equilibrated against P-glucose (8 points/24-h). In contrast, microdialysate is collected over 1 h and the average interstitial level is determined. Consequently, CGMS determinations were closer to P-glucose in absolute terms. In general MD glucose was 1–5 mmol/l lower that P-glucose but values correlated well (476 paired values,

r = 0.87, α = 0.82). It appeared that some individuals had larger discrepancies both on NPH and Glargine suggesting that the transfer of glucose to adipose tissues may be individually determined. Upward and downward trends in P-glucose were generally well predicted by MD measurements. In conclusion, CGMS and to some extent MD glucose measurements reliably predict P-glucose. During daily life conditions, approximately 10% of highs or lows in P-glucose may not be coordinated in time or missed using CGMS.

P59

An evaluation of the accuracy of the Glucoday continuous blood glucose monitoring device using Clarke's error grid analysis

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Introduction: Continuous blood glucose monitoring (CGMS) using a variety of techniques is increasingly being employed to assist clinicians in optimising glycaemic control. It is important to establish the clinical accuracy of these devices, particularly within the paediatric population.

Aims: We evaluated the accuracy of one such sensor, the Menarini Glucoday, using Clarke's error grid analysis.

Methodology: Data was collected as part of a larger study of nocturnal hypoglycaemia in which venous samples were taken every 30 min overnight and compared to measurements taken simultaneously using the Glucoday. A total of 140 paired data values, from eight children (age 6–15 years), were analysed using Clarke's error grid analysis technique. The Glucoday uses a microdialysis technique and requires only a single calibration time point. The error grid has five zones. Zone A represents accurate values within 20% of reference values. Zone B represents values that deviate by more than 20% but would lead to benign or no treatment. Zones C, D & E contain values which, if acted upon, could cause sugars to move out of the desired range. The American Diabetes Association recommends that for accurate CGMS, 95% of values should fall in zones A & B.

Results: Initially the Glucoday was calibrated using the glucose at 0700 hours. Only 79.2% of readings fell within zones A & B. Zones C, D and E contained 13.6%, 6.4% and 0.8% of values respectively (correlation coefficient = 0.58). If recalibrated using a different time point, 0300 hours, 84.5% of readings fell within zones A & B and 10.5%, 4.2% and 0.8% in zones C, D and E respectively (correlation coefficient = 0.66).

Conclusions: The calibration time point chosen for the Glucoday appears to have a significant effect on accuracy which failed to meet the accepted standard (>95% values in zones A and B). Caution is required interpreting CGMS results.

P60

Diabetes research in children network (DirecNet) pilot study to evaluate the freestyle navigator continuous glucose monitoring system in the management of T1D in children

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Since the more recent real-time glucose sensors (GS) offer the potential to revolutionize treatment of T1D, the current pilot study was undertaken to examine the accuracy, tolerability, and short-term safety of the Freestyle Navigator (Navigator; Abbott Diabetes Care, Alameda, CA) real-time GS in 30 children 4–17 years with T1D. Following outpatient use of a masked Navigator for 4–7 days and a 24 h inpatient admission, subjects were asked to wear an unmasked Navigator daily for 13 weeks and were contacted frequently (q 1–4 weeks) to monitor its use. Accuracy of the Navigator was similar during outpatient and inpatient assessments (median relative absolute difference 14% and 12%, respectively) and sensors performed well up to 5 days. Subjects averaged 137 h/week of Navigator use at baseline and 131 h/week during weeks 11–13. Despite low A1c levels at baseline (7.1 ± 0.6%), A1c levels fell to 6.8 ± 0.7% after 13 weeks (p = 0.02) associated with an increase in the percent of sensor values in the target range (71–180 mg/dl) from 52% to 59% (p = 0.009). Glycemic variation as measured by the SD and MAGE also decreased during the study period, but this did not achieve statistical significance. Both patients (≥9 year) and their parents reported high overall satisfaction with the Navigator on the CGM Satisfaction Scale at 13 weeks with average item scores of 3.6 and 3.9, respectively, on a 5-point Likert scale. The Navigator was well tolerated by children and well received by parents. Only two subjects withdrew and two additional subjects had a severe skin reaction. These data provide a compelling rationale for larger scale randomized trials to assess the efficacy of this device in optimizing metabolic control of childhood T1D.

P61

Screening for diabetes in children with cystic fibrosis – a new approach to CGMS analysis

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Aims: To assess and correlate results from Continuous Glucose Monitoring Sensing (CGMS), HbA1c, and Oral Glucose Tolerance Testing (OGTT) on children with cystic fibrosis (CF). To define reference levels for CGMS analysis which correlate with the clinical scenario including BMI and pulmonary function.

Methods: Eighty-six children with CF, 10–20 years (50 m & 36 f) completed OGTT, HbA1c and CGMS screening on the same day. MMCP: Mean blood glucose, Mean of daily differences (MODD), Continuous overall net glycaemic action 1 h (CONGA1) and Percentage of Total Time >7.7 mmol/l (%TT) were calculated.

Results: n = 86 Mean number of valid readings on CGMS = 857 (range 499–2138). Mean CGMS blood glucose = 6.7 (range 2.2–29). CGMS + OGTT agree but not very strongly (kappa = 0.52). BMI and $\%FEV_1$ did not correlate with OGTT classification. Wilcoxin tests showed that there is a significant difference for the three groups N, IGT & CFRD in the following: HbA1c, CFRD higher (p = <0.015); Mean blood glucose, CFRD higher (p = <0.0001); MODD for IGT and CFRD are higher (p = <0.001); CONGA1 values for IGT and CFRD are higher (p = <0.001). ANOVA of %TT >7.7 mmol/l comparing the three groups by OGTT was statistically significant (p = <0.0001). Neither HbA1c nor OGTT are sensitive screening tools in isolation.

	CGMS					
OGTT	MMCP	MEAN mmol/l	MODD	CONGA	%TT mean > 7.7 mmol/l	HbA1c %
Normal 61 (71%)	54 (63%)	6.2	1.4	1.0	14*	5.3
IGT 12 (14%)	10 (12%)	7.2	2.6*	1.5*	28*	5.3
CFRD 13 (15%)	22 (26%)	8.2*	2.8*	1.8*	51*	6.3*

*p = <0.05

Conclusion: We report a high prevalence of glucose intolerance (38%) using CGMS + HbA1c and OGTT. MMCP is a statistically significant method of CGMS analysis. It is a simple method of assessing both mean and variability of blood glucose when comparing IGT and CFRD to Normal. It correlates well with the clinical scenario. Further research and prospective studies are needed to redefine reference levels for diabetes in children with CF.

P62

Major differences in glycemic control between centers caring for adolescents with type 1 diabetes have been previously described. To explore these differences a third study in 2005 investigated the demographic, parental, physical and psychological influences on HbA1c, in addition to diabetes specific factors, clinic targets, strategies and services provided

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Methodology: Questionnaires were completed by patients aged 11–18 years attending sequentially in 21 international clinics. HbA1c (DCCT adjusted) was measured centrally.

Results: Questionnaires were completed by 2062 adolescents (Mean age 14.4 years ± 2.3 years; 51% males; Mean duration 6.1 years ± 3.5 years, mean HbA1c: 8.2% SD 1.4). Females had higher HbA1c levels (8.3 ± 1.5% vs. 8.1 ± 1.3%, $p < 0.01$). In individuals HbA1c was associated positively with age, duration and ketoacidosis and negatively with the rate of severe hypoglycemia. HbA1c between centers ranged from 7.7 to 9.3%. Age but not diabetes duration differed significantly across centers. After adjustment for age, a significant difference in HbA1c between centers ($p < 0.001$) remained. In 17 centers participating in previous studies there were slight individual changes in levels of glycemic control, but the relative ranking of centers remained the same ($r = 0.71$).Analysis of different insulin regimens showed that although individual patients (7%) on premixed insulin had higher HbA1c (8.6% SD 1.6 $p < 0.001$), and patients (7%) on free mixing of twice daily insulin injections had significantly lower HbA1c (7.6% SD 1.3), these differences could be explained mainly by the center impact rather than the insulin regimen. Pump users (15%) did not differ from those on basal bolus regimens (39%) (HbA1c resp 8.1% SD 1.3 vs. 8.3% SD 1.5). When adolescents stated that they adjust insulins according to glucose levels ($F = 4.4$; $p < 0.004$) or their intended food intake ($F = 6.0$; $p < 0.001$) or for additional snacks ($F = 3.01$; $p < 0.05$) the glycemic control was better than for non-adjusters. Young people who test their blood glucose when treating hypoglycemic episodes also have lower HbA1c levels ($F = 3.9$; $p < 0.01$).

Conclusions: This new cross-sectional observational study confirms that center differences persist over a 10 year period. The effect of insulin regimens appears to be weak compared to the impact of the center itself and the ability of adolescents to adjust insulins according to circumstances.

P63

An exploratory pilot study comparing camera phones and paper based diaries as a method of capturing dietary intake

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Introduction: The food diary is currently the gold standard in dietary assessment. However inaccuracies are acknowledged because of difficulties with patient recall, establishing portion sizes and compliance with their completion.

Aim: To develop innovative methods of accurately obtaining dietary assessment data, so tailored education and advice can be given to help patient's optimise carbohydrate counting and accurate insulin dose adjustment.

Methodology: Five patients were recruited to a pilot study to determine the potential of using camera phones to record all dietary intake over a 4 day period. Patients were also asked to complete a standard 4 day paper diary. The photos were downloaded to a computer and reviewed by our dietitian to establish the validity of this method as a means of assessing.

Results: Inconsistencies were identified when comparing the written and photographic diary. Written diaries consistently failed to give any indication of portion size, whereas photographs did provide visual information for the dietitian to base an estimation. The photographs also helped to detail food types not recorded in the written diaries (e.g. brown or white bread). However, the written diary did provide information not apparent from photographs alone (e.g. semi-skimmed or full fat milk). There was also food detailed in the written diary not captured in photographs, particularly drinks with meals. Semi-structured interviewing highlighted that patients found the photographs fun and easy to record, whereas the diary was perceived boring and frequently completed in retrospect.

Conclusions: Camera phones provide a novel and innovative method of recording dietary intake. These provided information that was deficient from paper based diaries. Although they had some limitations they provide additional concomitant data. Importantly, mobile phones are now an integral part of a teenager's life and their almost ubiquitous use provide a perfect medium for engaging young people in diabetes self management issues.

P64

Dietary intake in Belgian diabetic children 8–18 years of age

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Introduction: Adequate nutrition is one of the cornerstones in the management of IDDM. The ISPAD guidelines recommend that total daily energy intake should be distributed approximately as carbohydrate > 50%, fat 30–35% and protein 10–15%.

Aims: To compare the dietary intake of children and adolescents with IDDM with that of healthy, non-related age-matched subjects and to determine whether the intake meets the current ISPAD recommendations.

Methodology: The dietary intake of 24 IDDM children [group D; 12 girls; mean ± SD (range) age: 13.2 ± 2.7 (8.9–18.0) years; duration of IDDM: 4.0 ± 3.1 (0.5–12.1) years] and of 34 non-diabetic children [group H; 20 girls; age: 13.3 ± 2.6 (8.5–18.0) years] was studied by the 7-day record method. Data were analysed for the content of macronutrients with the help of a computer database program.

Results: Energy intake was somewhat lower in the group D (1755 ± 288 kcal/day vs. 1958 ± 448 kcal/day; NS).

Carbohydrate intake (percentage of daily energy intake) was 48.9 ± 4.6% in group D and 51.8 ± 4.6% in group H ($p < 0.03$). 10 (42%) IDDM did not reach the >50% carbohydrate limit. The intake of mono- and disaccharides was 16.7 ± 4.9% in group D and 22.8 ± 5.3% in group H ($p < 0.001$). Fiber intake was higher in group D (21.7 ± 5.9% vs. 17.5 ± 5.3%, $p < 0.01$). Fat intake was identical (35.2 ± 3.8% vs. 35.2 ± 4.4%). Fat intake was >35% in 11 (46%) IDDM patients. Protein intake was higher in group D (16.0 ± 2.5% vs. 13.2 ± 1.7%, $p < 0.001$). Protein intake was >15% in 16 (67%) IDDM patients.

Conclusions: The overall dietary intake of these IDDM children was comparable to that of non-diabetic subjects except for a smaller intake of carbohydrates, especially mono- and disaccharides, and a larger intake of fibers and proteins. Despite extensive nutritional education at diagnosis of IDDM, about 1/2 of the IDDM patients did not meet the recommended levels. Continuous nutritional education and advice remain indicated at least once a year.

P65

Do differences in nutritional intake, eating habits and lifestyle in adolescents influence glycemic outcome and explain the differences between international centers?

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Aims: Do differences in nutritional intake, eating habits and lifestyle activities have an influence on metabolic control in a large international cohort of adolescents with type 1 diabetes

Methodology: Cross-sectional clinical data were collected and questionnaires completed by adolescents and parents/carers attending sequentially in 21 international centers. HbA1c (DCCT adjusted) was measured centrally.

Results: Questionnaires were completed by 2062 adolescents (age: 14.4 ± 2.3 years; 50.6% male; diabetes duration: 6.1 ± 3.5 years). Mean HbA1c was 8.2% ± 1.4 with a significant difference between centers ($F = 12.3$; $p < 0.001$, range 7.7%–9.3%) BMI showed no differences between males and females, nor association with HbA1c or centers. Adolescents bingeing more frequently have poorer HbA1c ($r = 0.2$) as do those who skip breakfast during weekdays or snack regularly between lunch and dinner. Food frequency items were subjected to factor analysis. Two food groups were extracted ('wholesome foods' e.g. fruit, vegetables, brown bread; and 'calorie dense foods', e.g. pastries, cola, chips, burgers). Greater consumption of wholesome foods was associated with lower HbA1c ($r = 0.04$) and greater consumption of calorie dense foods was associated with higher HbA1c ($r = 0.08$), with significant differences between centers with regard to calorie dense ($F = 14.7$; $p < 0.001$) and wholesome foods ($F = 12.7$; $p < 0.001$). Physical activity was not associated with HbA1c ($r = -0.005$) however individuals who spent more time watching TV had higher HbA1c ($r = 0.03$) and individuals who spend more time doing homework had lower HbA1c ($r = 0.08$). In multivariate analysis, adding these diet and lifestyle effects marginally reduces the impact of the center on HbA1c (center alone $F = 12.9$; center after food and activity added $F = 11.7$)

Conclusions: At an individual level, food intake of 'unhealthy' nutrients as well as skipping breakfast, bingeing and more TV watching are associated with poorer glycemic outcomes. However, these lifestyle differences do not seem to have a strong influence on explaining the glycemic outcomes in the 21 international centers studied.

P66

Obesity and type 1 diabetes mellitus (DM1): data from São Jose do Rio Preto, Brazil

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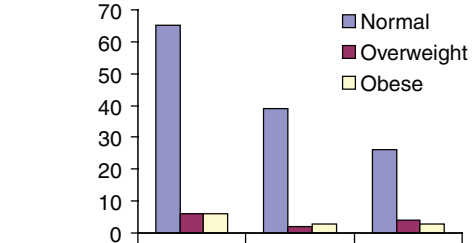
Introdution: DM1 is a frequent pediatric endocrinology disturbance, 1 in 300–500 infants and adolescents with less of 18 years suffer from DM1. The increase in the global childhood obesity is one of the biggest problems all over the word. Previous accounts related increase of weight in DM1 patients, mainly in female adolescents.

Objective: Know the prevalence of obesity in DM1 and this distribution by sex, age and its correlation with glycated hemoglobin (HbA1).

Methodology: Transversal revision of DM1 medical charts from patients in follow-up at Pediatric Diabetes Unit was conduct. Weight, stature, sex, age and values of the HbA1c measured by HPLC were reviewed.

Results: Seventy-seven DM1 patients with ages between 3 and 18 years, 44 females and 33 males were evaluated. BMI varied between 15.07 and 28.62. When BMI results were compared with CDC 2000 data, 16% (12 patients) presented nutritional disturbance, obesity in 8% (six patients) and overweight in 8%. Overweight and obesity were more prevalent in boys: 21% (seven patients), 12% (4) with overweight and 9% (3) with obesity. Girls presented with overweight and obesity in 12% (five patients), 5% with overweight and 7% with obesity. HBA1c median was of 9.44% with standard deviation of 2.45%.



	Total	Female	Male
Normal	65	39	26
Overweight	6	2	4
Obese	6	3	3v

Conclusion: The prevalence that we have found of obesity and overweight was similar that have being found in others studies in no diabetic population, so in our population, obesity was not a important problem.

P67

Prospective audit of the food intake of children and adolescents with diabetes in the UK

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Introduction: Limited evidence exists on the effectiveness of dietary advice at diagnosis and whether sustained positive changes are made by young people with diabetes compared with non-diabetic peers.

Aims: To describe the food choices made during the first 2 years after diagnosis of diabetes and to compare them to children without diabetes.
Methods: A validated 24 h recall Food Intake Questionnaire (FIQ) was distributed to all newly diagnosed young people attending six hospitals across the Trent health region. Foods were collated into nine food groups (sugary, unhealthy snacks, low sugar, fatty, altered fat products, salty, fibre, unhealthy, healthy). The mean number of 'yes responses' to consumption of foods were compared on four occasions. Data were compared to the FIQ used in non-diabetic peers.
Results: A consistent intake in each food group was observed for the first 2 years after diagnosis. Substantial and positive differences were observed in sugary, unhealthy snacks, low sugar products and unhealthy foods between children with and without diabetes.

Table: Comparison of reported food consumption in young people with and without diabetes

	Mean yes responses (SD)				
Foods (No: food items)	Before diagnosis n = 218	6 months n = 158	1 year n = 118	2 years n = 85	Non-diabetic n = 174
Sugary (11)	6.7 (2.9)	1.9 (1.9)	1.7 (1.4)	1.3 (1.0)	5.7
Unhealthy snacks (7)	5.2 (2.0)	2.2 (1.5)	2.0 (1.3)	1.8 (1.1)	4.0
Low sugar (3)	1.4 (0.9)	1.9 (0.8)	1.9 (0.8)	1.9 (0.9)	0.8
Fatty (10)	6.1 (2.1)	2.8 (2.0)	2.5 (1.8)	2.2 (1.6)	2.7
Altered fats (5)	1.7 (1.0)	1.6 (0.9)	1.6 (0.8)	1.5 (0.8)	1.4
Salty (7)	4.7 (1.7)	2.2 (1.6)	2.1 (1.4)	1.9 (1.5)	2.0
Fibre (9)	6.1 (2.0)	3.8 (1.9)	3.6 (1.9)	2.9 (1.8)	2.9
Unhealthy (21)	12.6 (4.2)	4.8 (3.1)	4.4 (2.5)	3.8 (1.8)	8.7
Healthy (22)	11.6 (3.2)	7.8 (3.1)	7.4 (2.8)	6.5 (2.6)	5.5

Conclusion: Children with diabetes appear to consume healthier food choices compared with non-diabetic peers.

P68

Validation of prediction equations of percentage body fat from skinfold measurements against dual energy X-ray absorptiometry in girls with type 1 diabetes

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Introduction: Skinfold measurements are frequently used for assessment of percentage body fat (%BF) in adolescents with type 1 diabetes.
Aim: To validate published prediction equations of %BF from skinfold measurements against that obtained by dual energy X-ray absorptiometry (DXA) in adolescent girls with type 1 diabetes and healthy age-matched control girls. Methodology 49 healthy girls and 44 girls with type 1 diabetes aged 12–19 years old were included. Skinfold thickness was measured at the biceps, triceps, subscapular and suprailiac areas. The %BF was calculated from the six most commonly used prediction equations developed for use in young people.
Results: The sum of skinfold was significantly higher in girls with diabetes. Bland-Altman plots demonstrated a significant association between %BF and the difference between measured and estimated %BF for all tested equations in girls with diabetes. Regression analysis showed that the association between subcutaneous fat deposit measured by skinfolds and %BF (DXA) differed significantly between girls with diabetes compared to healthy controls.
Conclusions: Prediction equations based on skinfold thickness is not suitable for estimating %BF in adolescent girls with type 1 diabetes. There is a need for diabetes specific skinfold prediction equations.

P69

Development and evaluation of an educational program for parents of newly diagnosed children with type 1 diabetes

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Introduction: Parents play a significant role in their child's diabetes management. A structured diabetes education program (including a textbook) for parents covering medical and psychological aspects of caring for a child with newly diagnosed T1DM was developed.
Aim: To evaluate process and outcome quality of structured parental education in 10 German paediatric diabetes units.
Methodology: Time needed to individually educate 81 parents (nine single parents) of newly diagnosed children (4–14 years) with T1DM was documented. Parents' diabetes self-management competence was assessed following the course and their diabetes knowledge with an evaluated diabetes questionnaire (DWT: Typ – 1, 30 items) and after 6 months. Parents' satisfaction with the training course and the textbook was assessed on a six-point rating-scale.
Results: The children stayed in hospital for 12.4 ± 2.5 days. All mothers and 64 fathers attended the course regularly. On average 18.5 ± 4.9 lessons (duration: 45 min) for information and 12.1 ± 6.7 lessons for practical training were required (mean ± SD). The course was rated as good or very good by all except one parent. The textbook was rated as very helpful and comprehensible by 97% of parents. Mothers' diabetes knowledge score was 20.7 ± 5.4, fathers' 19.3 ± 4.8 out of 30. Both scores exceed the standard for the best educated adult patients (18.2 ± 6.2). The score increased significantly after 6 months to 23.0 ± 5.8 and 21.2 ± 4.9 respectively. All mothers and 90% of the fathers were able to inject insulin, to measure blood glucose and to manage hypoglycaemia correctly.
Conclusion: This structured individualized diabetes education program for parents proved to be an effective tool to help them to cope successfully with their child's chronic disease.

P70

Evaluation of a nurse-led paediatric diabetes out-of-hours emergency help-line – 4 years experience

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Background: Services for 450 children and young people with diabetes across three health boards are delivered by a managed clinical network. Through the network we are able to offer an out of hours help-line delivered by six paediatric diabetes specialist nurses. The help-line offers out-of-hours emergency information and advice to both carers of children with diabetes, and to young people themselves. Standardised information and advice is given according to agreed clinical guidelines.

Aims: To compare use of the help-line in the first 6 months from 1/11/00 to 30/4/01 (period 1) to the corresponding months 4 years later (period 2).
Methodology: Data were collected routinely for number, nature and time of calls.
Results: Number of calls to the service period 1: 126/period 2: 134. Percentage of total calls by category, period 1/period 2:
- Sick day management 37.3/30.6
- Hyperglycaemia 27.0/28.4
- Hypoglycaemia 9.7/14.2
- Other reasons 26.0/26.8
- Percentage of total calls by time, period 1/period 2:
- Weekday (7 AM Monday to 12 PM Friday) 60.3/52.0
- Weekend (7 AM Saturday to 12 PM Sunday) 39.7/48.0
- In addition overnight calls (12 PM–7 AM) accounted for (4.8%) 0% of total calls.

Conclusion: Number of calls has not significantly changed over time. There has been a reduction in the number of calls about 'sick days' whilst the percentage of calls made for 'other' reasons has remained static. Despite initial concerns about the potential workload data show that the help-line has been sustainable over time and in fact the small uptake (4.8%) of calls overnight resulted in withdrawal of overnight service. Preliminary results suggest a reduction in episodes of DKA and severe hypoglycaemia since the help-line was established.

P71

Assessing National Guidelines for physical activity in childhood: a longitudinal study of their impact on adiposity and metabolic risk

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Background: Physical activity reduces diabetes risk by lowering insulin resistance. We aimed to establish whether meeting current US and UK national guidelines for physical activity (PA) of >60 min/day at ≥3 METs, equivalent to walking at 4 km/h, affects changes in adiposity, insulin resistance and metabolic risk markers
Methods: Accelerometers recorded weekly physical activity in a cohort of 212 children (113 boys, 99 girls) at 5 years, 6 years, 7 years and 8 years. Physical activity profiles were based on the average of these four successive measures, giving 90% reliability. Physical activity was assessed in relation to changes in adiposity (BMI, skin-fold thicknesses, waist circumference) and metabolic risk (insulin resistance by HOMA-IR, triglycerides, cholesterol/HDL ratio and mean arterial blood pressure –analysed separately and also combined as a composite z-score).
Results: 42% (47/113) of boys and 11% (11/99) of girls met the guidelines. Overall, meeting the guidelines had no significant impact on individual metabolic risk factors, although most markers progressed more favourably in those who did. In boys, the mean increase in composite metabolic risk z-score was significantly less in those who met the guidelines (-0.11 vs. 0.10 z-score, $p = 0.04$), although the three measures of adiposity were not significantly different between groups (all $p > 0.18$). In contrast, the mean increase in adiposity in girls was lower in those who met the guidelines (BMI: -0.4 vs. 1.2, $p = 0.01$, skin-folds: 1.0 vs. 2.1 cm, $p = 0.05$) while the mean change in composite metabolic risk z-score was no different ($p = 0.68$).
Conclusion: This report offers some evidence that children who meet current US and UK guidelines for physical activity throughout the pre-pubertal years derive some health benefits from so doing. However, fewer than half the boys and only one eighth of the girls achieved the guidelines, and the question remains how best to encourage less active children to do more.

P72

Children's physical activity levels are not determined by socio-economic status. The EarlyBird Diabetes Study

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Background: Physical inactivity has been linked to increasing rates of obesity and diabetes. *Sport England* recently reported a marked decline in school-based physical education. They predicted that poorer children would suffer most from this lack of provision, arguing that the opportunity for structured out-of-school activity would be limited. As a result, interventions to raise activity levels tend to target areas of social and economic deprivation. We used objective measures of physical activity to test their prediction.
Methods: Total weekly physical activity (PA) was recorded in 216 healthy children (129 boys, 87 girls) from the EarlyBird cohort, attending 53 schools and representing a wide socio-economic mix. PA was assessed using MTI accelerometers and averaged over two separate 7-day periods recorded a year apart (at age 7 year and 8 year). Parents reported number of weekly sessions of structured out-of-school activity/sports clubs attended by their child. Socio-economic status (SES) was assessed by parental occupation using a 1–7 scale (High SES = levels 1&2, Low SES = levels 6&7).
Results: *In girls:* Total PA was unrelated to SES: High SES = 34.1, Low SES = 34.1 units (10^5/week, $p = 0.99$. Participation in out-of-school activity/sports clubs was related to SES: High SES = 1.6, Low SES = 0.8 sessions/wk, $p < 0.001$. However, out-of-school activity was unrelated to total PA ($R^2 = 0\%$, $p = 0.97$). *In boys*: Total PA was again unrelated to SES: High SES = 38.3, Low SES = 40.0 units (10^5/week, $p = 0.60$. Participation in out-of-school activity/sports clubs was similar between SES groups: High SES = 1.7, Low SES = 1.4 sessions/week, $p = 0.45$. Out-of-school activity was related to total PA ($R^2 = 7\%$, $p = 0.01$), but the effect size was small and direction of causality unclear.
Conclusion: Our data offer no evidence that socio-economic deprivation negatively impacts on children's overall physical activity. These findings do, however, support the argument that each child's physical activity level is under central biological control, unrelated to SES, and that opportunity has minimal effect.

P73

Use of a modified basal rate of insulin to prevent post-exercise hypoglycemia in adolescents with type 1 diabetes on continuous subcutaneous insulin infusion

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Introduction: An increased number of adolescents with Type 1 Diabetes Mellitus are choosing CSII to maintain normoglycemia. However, the optimal changes to make in the basal rate of insulin to prevent post-exercise hypoglycemia are not known.
Aims/Methodology: To address this question, eight adolescents (age: 14.6 ± 0.5 years) were studied in our General Clinical Research Center on two occasions following a standard evening meal. At each visit, the patients underwent a similar exercise protocol 2 h after eating: 30 min of standardized strenuous activity on an exercise bicycle. On one visit (CONTROL), no changes were made in the basal rate of insulin administration; on the other visit (TEST), the basal rate was halved for 3½ h around the exercise. The patients' plasma glucose levels were measured serially for 10 h.
Results: Initial mean plasma glucose concentrations were similar on the two study days (TEST = 194 ± 24 mg/dl; CONTROL = 180 ± 15 mg/dl). There was a similar fall in plasma glucose

concentrations (expressed as % of basal) in each of the groups. (TEST = -31 ± 5% of basal; CONTROL = -36 ± 10% of basal). There was no difference in the area under the plasma glucose curve on both visits, nor was there any difference in the slopes of the plasma glucose curves during and immediately after exercise. Two of the patients in the CONTROL group developed asymptomatic hypoglycemia (plasma glucose < 70 mg/dl) within 6 h of the exercise, but this was not statistically different.

Conclusion: In our study, halving the basal rate of insulin did not make a significant difference on plasma glucose values after exercise. Further studies with larger subject numbers need to be performed to determine the optimal changes to make in CSII to prevent post-exercise hypoglycemia.

P74

Welcome to the Third Millennium; an algorithm based approach to insulin dose reduction for children at a diabetes camp

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Management of diabetes has become complex at diabetes children's camp with the emergence of intensive regimes, analogues & pumps. Traditionally at camp insulin is empirically decreased by ~25%, with wide variations in efficacy (hypoglycaemia, ketonuria).

Aims: Construct a 'scientific' algorithm for insulin adjustment at the 2006 six day diabetes camp, Auckland, New Zealand.

Methods: From a 25% reduction in current dose, further percentage changes were calculated by additional algorithm: female sex +3%, puberty +3%, BMI (-5 to +10%), HbA1c (-5 to +15%), Activity (-10%), on pump (-5%), Honeymoon (+5%), recent Ketonuria (-10%), recent hypoglycaemia (+10%). Standardised blood testing was performed on all children. Hypoglycaemia was defined as glucose < 4 mmol/l. According to our pre estimated algorithm each child's regime was revised and percentage insulin reductions calculated on a daily basis. Values are MEAN (SD).

Results: Thirty-nine children, 21 female, aged 10.6 (1.1) years, BMI 19.1 (3.0) kg/m^2, HbA$_1$c 7.8% (0.8%), on a total daily dose of insulin 41.4 (24) units were studied: >95% were on analogue insulin (fast or long), seven (18%) were on insulin pump therapy, six were on a gluten free diet. By algorithm the grand mean percent reduction was 26% (10%), range of 8–46%: this equated to a reduction in TDD units of 11.8 (10.6%) units, and a wide range of 1.6–49.7. There were one moderate and 0.7/child/day mild hypos, 0.07/child/day episodes of ketonuria & no DKA. On this algorithm only two children needed increased insulin dosing, and most children on a pump needed additional insulin reduction.

Conclusions: This study suggests that an algorithm in adjusting insulin at children's camp may be effective in individualizing insulin dose reduction, allowing for individual and metabolic factors to be taken into account. Further studies are required in order to further clarify this approach, in particular in relation to children using insulin pumps.

P75

'Over 10 Program': preliminary evaluation of an intervention in teens with persistently poorly controlled type 1 diabetes (T1D)

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We are currently evaluating a multidimensional intervention (The over 10 Program) targeting teens with persistently elevated A1c levels (≥10% for ≥6 months). This group is at greatest risk for the development of diabetes-related complications. We aim to determine the effects of the program on A1c, quality of life and self-efficacy over 2 years. Teens and their parent(s) are evaluated by a nurse specialist, social worker, and psychologist, by interview and standardized questionnaires (Stages of Change and Self-Efficacy; Eating Disorder Inventory; Family Environment Scale; Symptom Check List and Quality of Life), for family configuration, mental health issues, compliance, parental support, and family functioning. An individualized intervention is negotiated after the initial assessment, including increased contact with the health care team and usually increased parental involvement. Educational enhancement, family counselling and individual psychotherapy are frequently prescribed. Preliminary results: 28 of 30 eligible subjects have agreed to participate; 22 are female; mean age 16.0 ± 1.2 year, diabetes duration 7.1 ± 3.6 year and A1c 11.4 ± 1.9%; 12 are from single parent families; 10 have a parent with mental health issues; 20 teens have significant mental health problems [eating disorders (9), depression (6), anxiety (2), fear of hypoglycemia (2), substance abuse (1), and attention deficit disorder (1)]. Serious family systems difficulties were apparent in 22 teens; noncompliance is universal; and 75% of the parents were regarded as unsupportive. Although A1c decreased by 0.9% to a mean of 10.4% after 3 months, likely demonstrating a study effect, levels at program entry and after 6 months of intervention, remained unchanged (11.4% ± 1.9 and 11.6% ± 1.8 respectively). We conclude that the vast majority of teens with persistently high A1c levels have serious personal and/or interpersonal challenges that are refractory to change in the short-term despite intensive individualized interventions. Further evaluation will help to identify whether (i) some teens are more likely to respond, and (ii) longer term follow-up is required to demonstrate improved glycemic control.

P76

'Talking Diabetes' in routine care encounters: development of a complex intervention to support behaviour change (The DEPICTED study)

The DEPICTED Study Team

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Introduction: 'Talking Diabetes – the DEPICTED study' is developing a learning programme for clinicians to facilitate behaviour change among children and adolescents (and their families) with type 1 diabetes. Three of the key research components underpinning the development phase of the programme will be presented. The programme itself will be formally evaluated in a national cluster randomised controlled trial starting in 2007 and funded by the UK Department of Health.

Aims: To develop an evidence-based learning programme for clinicians by systematically synthesising existing data, and by generating additional data via a series of discrete research components. To maximise the relevance, feasibility and acceptability to service providers and service users of the developed learning programme.

Methods: Developmental activities included: (i) Structured sample telephone survey of UK clinicians (ii) Qualitative focus groups with service users (patients and parents) (iii) Update of systematic literature review of educational and psychosocial interventions for children with Type 1 diabetes. A multi-professional and lay user 'stakeholder' group are guiding the process of formulating the learning programme.

Results: Consultants and nurses representing 51 UK clinical services responded to the survey, providing a detailed overview of psychosocial provision within UK paediatric diabetes. 32 service users in six focus groups highlighted the importance of legitimising non-medical topics in consultations, the need for genuine and collaborative communication styles and shared involvement in care decisions. The literature review update has identified an additional 36 relevant RCTs.

Conclusions: The problem-based learning programme being developed will feature a new approach to communicating about behaviour change during routine care encounters. Staff training will be complemented by an agenda-setting tool for patients and parents. The programme will be delivered as a complex behavioural intervention.

P77

Adolescents with type 1 diabetes and risky behaviours

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Background and aims: A growing body of literature indicates that adolescents with chronic conditions are as likely, or more likely, to take risky behaviours than their healthy peers. Very few data exists about adolescents with type 1 diabetes mellitus (T1DM). The aim of our study was to assess whether adolescents with T1DM in Northern Italy differ from their healthy peers in risky taking behaviours.

Materials and methods: Data were drawn from 187 patients attending four summer camps, aged 12–20 years (mean 14 ± 2 years) and with a mean disease duration of 7 ± 5 years (range 1–19 years). During the camp each of them filled an anonymous confidential questionnaire to determine the prevalence of sexual behaviour, drug use (tobacco, alcohol, cannabis, cocaine, and synthetic drugs), and only in T1DM group the frequency of mismanagement related to diabetes care. The control group comprised 464 healthy adolescents recruited among high school students. Personal, family and school related variables were analysed to ensure comparability between groups. Analysis was carried out separately by gender. Chi-square, Fisher's and Student's tests were used to compare categorical and continuous variables.

Results: The T1DM group showed similar rates of sexual intercourse among males and lower rates among females (34.1% vs. 35.5%, p NS, and 27.3% vs. 41.4%, $p < 0.05$, respectively). For most studied drugs, T1DM males reported higher rates of use than control group only about tobacco, while females showed similar or higher rates for every drug studied (see table). Among T1DM group, the patients who engaged in risky behaviours showed higher rates in treatment mismanagement (76% vs. 34%, $p < 0.01$).

	T1DM males	Control males	P	T1DM females	Control females	P
Tobacco	47.1%	38.1%	<0.05	54.5%	55.1%	NS
Cannabis	33%	37%	NS	25%	28%	NS
Alcohol	56%	61%	NS	65%	51%	<0.05
Other drugs	2%	3%	NS	5%	3%	<0.01

Conclusion: Adolescents with T1DM in our sample are as likely, or more likely, to take risky behaviours than their healthy peers, and should receive the same anticipatory guidance, also because this could lead to a worsening of glycemic control.

P78

Monitoring Health Related Quality of Life (HRQoL) in adolescents. Baseline data from a randomised controlled cross-over multi-centre study (RCT: ISRCTN65138334)

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Background: Systematic monitoring of psychosocial functioning in adolescents with type 1 diabetes may help to improve psychosocial adaptation and glycaemic control. In an ongoing RCT (2005–2007), we investigate the effects of monitoring of HRQoL on psychosocial adaptation, HbA1c and satisfaction with care in adolescents with type 1 diabetes.

Aims: At baseline both adolescents and parents underwent a comprehensive psychosocial assessment that is presented here.

Methodology: Four outpatient paediatric diabetes clinics in the Netherlands (n = 90) were randomized over CAU (2) and monitoring condition (2), including 3-monthly computerised HRQoL assessment and discussion of outcomes with paediatrician or nurse. Demographic, medical and psychosocial data were gathered at baseline. Patients completed the CHQ-CF87, CES-D (depression), Diabetes-related Family Conflict Scale (DFCS) and the Well-being Index (WHO-5). Parents completed the CHQ-PF50, CES-D, DFCS and the WHO-5.

Results: Mean age is 14.9 years (±1.09), 46 boys, mean HbA1c 8.75% (±1.65; 6.2–15.0%).On the CES-D, 3.3% of the patients scored above 23, indicating moderate to severe depression. Compared to healthy controls, patients scored significantly lower on CHQ sub-scales Role/Social–Physical Limitations ($p = 0.005$), Behaviour ($p < 0.001$) and General Health ($p < 0.001$). Adolescents rated their Behaviour more positive then parents ($p < 0.001$). Compared to girls, boys reported more Bodily Pain ($p = 0.04$) and Diabetes-related Family Conflicts ($p = 0.03$). Less Diabetes-related Family Conflict is associated with better scores on Psychosocial ($p = 0.001$) and Physical Health subscales ($p = 0.05$) and less Depressive symptoms (CES-D) ($p = 0.02$). Living in a one-parent family, not being Caucasian and reporting lower Psychosocial Health are associated with higher HbA1c values ($p < 0.001$).

Conclusion: Preliminary results from this ongoing trial are in line with literature, pointing to the importance of psychosocial factors in diabetes management, in particular family conflict. The study will show if monitoring HRQoL periodically will contribute to improved psychosocial functioning and diabetes control.

P79

Predictors of intensive regimen prescriptions for youth with type 1 diabetes

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Background: Intensive treatments improve glycemic control and reduce the risk for complications in youths with type 1 diabetes.

Aims: The purpose of this study was to describe the intensity of regimens for diverse youths and examine factors related to intensity.

Methodology: Ninety-six youths (57% female) between 10 and 17 years were recruited from two endocrinology clinics. Physicians were asked to record prescribed regimens and perceptions of regimen adherence and child and family competence. The sample included Hispanic (79%), non-Hispanic white (7%), black (12%), and Asian (2%) youths with varied socioeconomic (SES) backgrounds (annual family income from $6,000 to $450 000; mother's education level from <8th grade to graduate studies). Youths had diabetes for an average of 6 (±3.5) years, and had an average of 2.0 (±8.5) diabetes-related hospitalizations. Intensity of regimen was composed of three categories: number of injections, sliding scale type, and number of blood glucose checks prescribed.

Results: Fifty-five percent were prescribed two or fewer injections, 26% three or more, and 19% insulin pump therapy; 57% were prescribed only a blood glucose sliding scale, 31% a carbohydrate sliding scale, and 12% of the sample were not prescribed a sliding scale. Youths were prescribed an average of 4.5 (±1.7) blood

glucose checks daily. Analyses indicated that regimen intensity was not related to gender, SES, language acculturation, or duration of diabetes. However, physicians' ratings of youth regimen adherence were related to the intensity of regimen prescribed ($r = 0.55$, $p < 0.001$). In addition, physicians' perceptions of child ($r = 0.61$) and family ($r = 0.55$) competence at supervising and implementing the regimen were positively associated with regimen intensity (p's < 0.001).

Conclusions: These findings indicate that whether or not a youth is prescribed an intensive regimen is strongly related to physician perceptions of regimen adherence and child and family competence.

P80

To determine the prevalence of ED and their sub-threshold variants in a DMT1 group from Paediatric Diabetes Unit, Verona. To establish the relationship between these disorders and both glycosylated hemoglobin (HbA_1c) and compliance to therapy

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Introduction: Eating disorders are increasing in western society especially in female population. EDIS (dieting and binge eating) are common among DMT1 subjects. In the international literature ED and their sub-threshold variants are more common in subjects with than without diabetes.

Aims: To determine the prevalence of ED and their sub-threshold variants in a DMT1 group from Paediatric Diabetes Unit, Verona. To establish the relationship between these disorders and both glycosylated hemoglobin (HbA_1c) and compliance to therapy.

Methodology: All patients, older than 10 years of age, had diabetes for at least 1 year, without history of other severe disease or ED. We studied 134 patients, 42 males and 92 females, aged 10–30.6 years (mean 18.9 ± 3.5 years), mean duration of diabetes 9.5 years. All patients were on intensive insulin therapy with a multidisciplinary approach. The Eating Disorder Examination Questionnaire, modified for diabetes, was administered to all subjects.

Results: The mean HbA_1c was 8.6 ± 1.32 (males 8.32 ± 1.08; females 8.73 ± 1.38). No major ED, such as anorexia and bulimia, were found, while unspecified minor ED, such as binge eating and dieting were more frequently detected. 34% of subjects had not disturbed eating; binge eating episodes were reported by 36.6%, while dieting by 57.5% of subjects. EDIS were associated with poor metabolic control and low compliance to therapy. Mean HbA_1c was significantly higher among those with binge eating (9.65%) than with non-disordered behaviour (6.95%; $p = 0.0001$). Scale compliance to therapy was significantly higher among those without disordered eating behaviour: no binge eaters 8.5 vs. 3.5 ($p = 0.0001$); no dieters 7.5 vs. 5.5 ($p = 0.0001$).

Conclusions: We did not found cases of anorexia and bulimia in our group of DMT1 patients, while there was a significant prevalence of sub-threshold variants that correlated to poor metabolic control and low compliance to therapy.

P81

Psychological aspects and quality of life in the young with type 1 diabetes: evaluation by different questionnaires

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Few data exist on complete psychological evaluations in children with type 1 DM. Psychological state and quality of life in relationship to HbA1c were investigated in 88 pts with type 1 DM (age 6–18 years). Pts were subdivided into three age groups: group 1 (6–10 years; n = 12), group 2 (11–13 years; n = 38) and group 3 (14–18 years; n = 38). Groups 1 and 2 were compared with 252 age-matched nondiabetic subjects. All cases underwent Achenbach's and Rescorla's Child Behavior Checklist (CBCL) which is designed to be filled in by parents and also the Youth Self Report (YSR). Pts and parents completed the Pediatric Quality of Life Inventory (PedsQL). All parameters were correlated with HbA1c.

Results: In the whole group HbA1c levels correlated positively with anxiety problems ($p = 0.02$), depression ($p = 0.02$), somatic complaints ($p = 0.03$) and negatively with general QOL ($p = 0.01$), emotional ($p = 0.03$) and psychosocial health ($p = 0.01$) and school performance ($p = 0.01$). In group 1 no significant differences were found between pts and controls. No differences were found for self-reports in pts of group 2. For parent reports, pts of group 2 were significantly worse than controls in: social ($p = 0.04$) and affective ($p = 0.02$) problems, rule-breaking ($p = 0.01$), aggressive behaviour ($p = 0.000$) and conflicts with other people ($p = 0.000$). Pts between 14 and 18 years were subdivided into two groups (or) according to their mean HbA1c value (8.6%). Adolescents with worse control reported lower scores of QOL in: physical ($p = 0.05$) emotional ($p = 0.04$) and psychosocial health ($p = 0.02$), school performance ($p = 0.03$) and total scale ($p = 0.01$). Also parent reports also showed that pts with HbA1c > 8.6 were worse than pts with HbA1c < 8.6 in CBCL scales: depression ($p = 0.05$), anxiety ($p = 0.01$).

Conclusions: We confirm that good metabolic control and well being are directly related. Younger children seem to have no psychological disturbances, while preadolescents are reported by their parents to be more problematic. A worse quality of life, depression and anxiety are more frequent in adolescents with poorer metabolic control. Emotional and psychological state should be considered above all in the management of adolescents with diabetes.

P82

Strength in numbers: a comprehensive group work program for children and adolescents with diabetes and their families

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Introduction: Group work is an effective intervention to support young people and families living with a chronic illness such as diabetes. Group work provides opportunities for participants that are not achievable through individual therapy. We identified the need for emotional support and problem solving skills that could be achieved through structured peer interactions.

Aim: Develop a group program that: (i) reduces isolation experienced by young people with diabetes; (ii) increases participants' confidence in managing psycho-social pressures; (iii) develops coping skills.

Methods: The groups function over four sessions as a mutual aid system whereby participants discuss common issues and have the opportunity to empathise, develop mutual support, and model and solve problems. Specific group programs are conducted to cater for different ages and needs of our broader clinic population. The groups are: the Adolescent Group and Parent Support Group; Newly Diagnosed Parent Support Group; Tween group; and Siblings group. Outcomes are assessed by written survey of participants. Topics include: communication; conflict resolution; body image; friendship; risk taking; teamwork; parenting issues, emotional reactions and coping skills.

Results: Average group attendance for adolescents and tweens is 10/session, for siblings 5, and parents 6.5. Attendance has increased 50% over 2 years for the adolescent program. Ratings from written surveys are positive. Benefits listed by participants include 'meeting peers', 'gaining confidence', 'not being the only one', 'common problems', communication, increasing responsibility and independence, having fun.
Conclusions: Our comprehensive group program provides a novel and valuable enhancement of our therapeutic work with families. It breaks down the isolation felt by many children with diabetes and their parents. The participants report positive benefits with enhancement of self confidence, and improved ability to cope with living with diabetes. The program effectively addresses the varying needs of families impacted by diabetes.

P83

Surveying psychosocial practice in paediatric diabetes care: preparation for the DEPICTED study

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Introduction: The DEPICTED study aims to develop a training programme for clinic staff to help facilitate behaviour change in children with diabetes. The survey was one of several research activities designed to inform its development.
Aims: The survey explored psychosocial activities and initiatives within services, their effects on the delivery of routine care and assessed service providers' attitudes towards psychosocial care provision.
Methodology: One hundred and twelve consultants from paediatric diabetes services in the UK were invited to take part in a 20 min telephone interview. 67 expressed an interest in taking part, and 44 consultants and seven specialist nurses from 51 services completed the interview. Clinicians were asked about education and support activities within their service, routine clinic procedures, psychosocial initiatives, and psychological support. Responses were analysed using a combination of descriptive methods and content analysis.
Results: The provision of care within services varied enormously in terms of availability of nursing support (equivalent support per week for 100 patients ranged from 0.8 sessions to 33.3 sessions), dietetic and psychological support, with very little psychological provision for the majority of patients in most services (average of 1.9 sessions available per month). There was also variation across services in terms of the types of psychosocial and educational activities available to patients and their families. Many activities have had informal positive feedback from patients and families, but 65% of education activities were said to be poorly attended, and few had been formally evaluated.
Conclusions: The under-resourcing of psychological, dietetic and nursing support in services continues to contribute to the current lack of psychosocial support available for patients and families living with diabetes. Findings from the survey will be used to inform the development of a training programme for clinic staff.

P84

What diabetes-related issues should diabetologists discuss directly with children on different ages during outpatient visits? Evaluation of parental wishes in contrast to physicians assumptions

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Introduction: Talking directly to children about diabetes related issues during out-patient visits is complicated by the age of the child, the expectation of the parents and the physicians assumption about the age-appropriateness of the topics.
Aims: To find out, what diabetes-related issues diabetologists and parents would prefer to be addressed to children during outpatient visits.
Methodology: A questionnaire with eight diabetes-related items was developed: 'food intake', 'blood glucose tests', 'recording blood glucose readings', 'hypoglycaemia', 'insulin injection', 'insulin pump', 'insulin dose adjustment', 'exercise'. The survey required parents and physicians to respond 'yes' or 'no' regarding the appropriateness of these topics for children in four different age-groups: 4–6; 6–8, 8–10, 10–12 years. Parental responses were compared with those of physicians who answered the same questionnaire. Statistics were processed with SPSS 12.01.
Results: Seventy-eight physicians (85% paediatricians) at the end of a course for certification as a diabetologist and 58 parents completed the survey. Among all age-groups diabetologists agreement to the topics was on average 26.3% upper than parents agreement. Especially in the age-group from 4–6 years, 60.1% of the diabetologists agreed to the topics in contrast to only 32.9% of the parents. As an exception, 23.3% of the parents in the younger age-group indicated that diabetologists should talk with their children about 'pump therapy' whereas only 9% of the physicians agreed with this topic ($p < 0.05$). In the age-group from 6–8 years 52.6% of the diabetologists agreed to talk about insulin adjustment but only 15.4% of the parents ($p < 0.01$). Maximum concordance between diabetologists and parental ratings (98.7% vs. 74.9%) was reached in the older age group from 10–12 years.
Conclusion: Parental and diabetologists beliefs about appropriate diabetes-related topics for different age-groups vary significantly. Further investigations about parental and professionals expectations concerning outpatient visits including psychosocial topics should follow.

P85

In-school support for diabetic children in nursery and primary school settings

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Introduction: With the increasing use of intensive insulin regimens in the UK, school staff may be required to participate actively in routine diabetes care and manage diabetic emergencies competently so that children with diabetes can achieve their full academic, social and physical potential in a safe environment.
Aim: To assess the support available in nursery and primary school settings for children with diabetes, and to compare parents' and head teachers' perceptions.
Method: Questionnaires were sent to the parents and head teachers of children with diabetes aged 3–11 years under our care attending school or nursery. Children who had been diagnosed for <2 months were excluded. Replies were anonymous. Ethical approval was obtained.
Results: 49/63 (78%) parents and 40/52 (77%) head teachers replied. 10/49 (20%) parents and 21/40 (53%) head teachers reported there were no staff available to perform blood glucose monitoring (BGM). Of seven children requiring insulin injections during the school day, three parents reported no staff were able to perform this role, requiring parents to inject. 34/40 (85%) head teachers stated no staff were able to give insulin injections. 13/49 (27%) parents stated that hypoglycaemic episodes were not always managed appropriately whereas 35/40 (87%) head teachers stated that staff could deal with hypoglycaemic episodes. Six children were inappropriately excluded from school trips and one child from sports day. Parents encountered a range of problems but 61% thought the overall level of support was good. 55% of head teachers stated that further training of staff would improve support.

Conclusions: This first study in the nursery and primary school settings shows that many children with diabetes have sub-optimal support during the school day, thus limiting the number of children able to use intensive insulin regimes. Education programmes need to target the management of hypoglycaemia, BGM and insulin administration. To target interventions in order to improve support in schools

P86

Parental concerns about children's diabetes care in the school setting

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Background: Limited data is available regarding diabetes management in the school setting.
Aims: The purpose of this study was to identify parental concerns, determine diabetes management issues, and assess parents' knowledge of US federal laws applicable to diabetic children in schools.
Methodology: The study sample consisted of parents of children with type 1 (88%) and type 2 (9%) diabetes, recruited at a university-based and hospital-based clinic. The sample comprised a wide range of socioeconomic status (SES) and was primarily of ethnic minority status (62% Hispanic and 13% African American). Of 334 families approached, 309 (92.5%) completed a survey, with 80% completed by the child's mother.
Results: Sixty-seven percent of parents were unfamiliar with Section 504, 63.3% were unfamiliar with the American Disabilities Act, and 87.3% were unfamiliar with the Individuals with Disabilities Education Act. Parental awareness of these laws was greater for parents of higher SES (p's < 0.03) and white, non-Hispanic ethnicity (p's < 0.001). 40% of parents reported they did not have a written care plan in their child's school and only 16.4% reported their child had an Individualized Education Plan. 47% indicated they were very worried about their child's health while at school; only 49% had a glucagon kit at school. Just 55% of parents reported a nurse on staff at their child's school. 58% indicated they were not confident in the school's ability to care for their child's diabetes. Only 47.6% of schools allowed blood glucose monitoring and just 19.6% allowed insulin injections in the classroom.
Conclusions: Parents are worried about their child's health care needs at school, are not aware of legal resources available to them, and many schools do not facilitate optimal diabetes care. Greater advocacy is needed in the school setting in order to optimize diabetic children's management and health care needs.

P87

Fasting intact proinsulin and IGFBP-1 as markers of diabetic deterioration

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Introduction: We need markers detecting progression to or improvement from the metabolic deterioration in the management of T2DM.
Aim: We investigated the differences of intact proinsulin/insulin (IPI/IRI) and IGFBP-1 between non-obese non-diabetics, simple obesity and T2DM with good and poor glycemic control of HbA1c, in relation with the degree of obesity and glycemic control.
Methodology: Four groups of subjects were tested for fasting blood glucose, IRI, IPI, IGFBP-1, leptin and adiponectin: 37 with non-obese non-diabetes (12.8 ± 2.0 years old), 50 with simple obesity (13.4 ± 2.1 years old), 30 with T2DM of HbA1c $<8\%$ (15.2 ± 3.0 years old) and 25 with T2DM of HbA1c $\geq 8\%$ (15.0 ± 1.8 years old). We compared these parameters between four groups according to obesity index (OI). In six diabetic patients, the changes of parameters were evaluated by the HbA1c.
Results: While IPI itself was not significantly different between obesity and two groups of T2DM, IPI/IRI significantly differentiated these three groups. In non-diabetic subjects IPI/IRI had negative correlation with OI, while IPI itself had no correlation with OI. In T2DM, there had no correlation between OI and IPI/IRI. IGFBP-1 in non-obese group was significantly higher than those in other three groups. Although IGFBP-1 had a negative correlation with OI in non-diabetic subjects, no correlation was noted in T2DM. In five of six diabetic patients, IPI and IPI/IRI increased along with worsening HbA1c. On the other hand, IGFBP-1 decreased along with HbA1c worsening without body weight gain. Adiponectin and leptin did not differ between non-diabetic subjects and T2DM groups, even after adjustment by OI.
Conclusion: IPI/IRI may reflect the metabolic deterioration to T2DM. However IGFBP-1 as a marker of diabetic deterioration remains yet to be clarified. Leptin or adiponectin may not be sensitive enough to detect any diabetic change except for the change in OI of non-diabetic subjects.

P88

Immunoregulatory populations of $CD4^+CD25^+$ T cells and NKT cells in siblings of type 1 diabetes patients

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Introduction: Patients with type 1 diabetes are suffering from defects in immunoregulatory cells.
Aim: We studied immunoregulatory populations of $CD4^+CD25^+$ T cells and NKT cells in siblings of type 1 diabetes patients who may be at increased risk of type 1 diabetes especially if they are carriers of certain HLA alleles.
Methodology: In a prospective non-randomized study we have evaluated 31 healthy siblings of paediatric patients with type 1 diabetes and described immunoregulatory populations of $CD4^+CD25^+$ T cells and NKT cells. Tested siblings of type1 diabetes patients were stratified according to the HLA-associated risk of possible diabetes development. Immunoregulatory function of $CD4^+CD25^+$ T cells was tested in vitro.
Results: Significant differences in $CD4^+CD25^+$ but not in NKT cells have been identified. Siblings of type 1 diabetes patients carrying high risk HLA alleles (DQA1*05, DQB1*0201, DQB1*0302) had significantly lower number of immunoregulatory $CD4^+CD25^+$ T cells than the age-matched healthy controls or siblings carrying low risk HLA alleles (DQB1*0301, DQB1*0603, DQB1*0602). Regulatory function of $CD4^+CD25^+$ T cells was also tested and demonstrated a dose escalation effect.
Conclusions: In siblings of type 1 diabetes patients the defect in immunoregulatory $CD4^+CD25^+$ T cells exists in association with genetic HLA-linked risk for diabetes.
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Increased frequency of $\alpha 4\beta 7$ integrin on T lymphocytes in children affected by type 1 diabetes.

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Introduction: The integrin $\alpha 4\beta 7$ binds to MadCAM-1 and contributes to the homing of lymphocytes to gut. In humans, the $\alpha 4\beta 7^{hi}$ subset of circulating T cells appear to have been primed in the intestinal mucosa. Accumulating data indicate that dysregulation of the gut immune system may play a role in the development of β cell autoimmunity and type 1 diabetes (T1D).
Aims: To study the possible link between the gut immune system and T1D, we tested the expression of the integrin $\alpha 4\beta 7$ on T lymphocytes.
Methods: Peripheral blood mononuclear cell (PBMC) were obtained from six children with T1D (aged from 7.9 to 19.7 years) negative for celiac disease (CD), thyroid disorders and atrophic gastritis, five children with CD (aged from 3.7 to 13.3 years) and six healthy children (aged from 7.2 to 20 years). PBMC were cultured with or without OKT3 and anti-CD28 for 18 h. Monoclonal antibodies to $\beta 7$-PE, CD3-APC, CD4-Fitc, CD8-Fitc, CD69-CyChrome, CD45RO-Fitc, CD4-Cy5 and CD8-Cy5 were added and cells were analysed by flow cytometry.
Results: Resting PBMC of patients with T1D showed, compared with healthy controls, an increased expression of $\alpha 4\beta 7$ as median fluorescence intensity (MFI) on memory T lymphocyte (CD3+CD4+CD45RO+, MFI: 142.2 ± 25.4 vs. controls 119.9 ± 12.9 $p = 0.07$). There were no differences in the other subtypes of T lymphocyte analysed (CD3+CD4+, CD3+CD8+, CD3+CD4+CD69+, CD3+CD8+CD69+, CD3+CD8+CD45RO+). After stimulation we found a statistically significant decrease of $\alpha 4\beta 7$ expression on memory T lymphocyte in patients with T1D and with CD than healthy controls (ΔMFI: CD 68 ± 0.2 vs. controls 40 ± 8.5, $p < 0.001$; T1D 56.5 ± 9.6 vs. controls 40 ± 8.5, $p = 0.03$).
Conclusions: Our data show an increased expression of the integrin $\alpha 4\beta 7$ on CD4 memory lymphocyte in children with T1D. The reduction of memory CD4+$\alpha 4\beta 7$+ cells after stimulation through T cell receptor, might indicate that a selective apoptosis occurs in gut primed T cells in T1D children.

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Abnormalities in serum markers of endothelial function in children with type 1 diabetes

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Subclinical vascular involvement in form of impaired endothelial function has been demonstrated in children with type 1 diabetes. The purpose of our study was to evaluate biochemical markers of endothelial function.
Methods: The study was performed in 20 children with type 1 diabetes, aged 8–18 years (mean 13.8 years). Mean duration of the diabetes was 5.0 ± 3.2 years. The control group consisted 20 sex-, age- and BMI- matched healthy controls. Blood pressure was measured and blood samples were obtained for lipid profile, homocysteine, intracellular adhesion molecule-1 (ICAM-1), asymmetric dimethylarginine (ADMA), high sensitive C-reactive protein (hs-CRV) in the morning, before breakfast and insulin.
Results: Diabetic patients had higher systolic and diastolic blood pressure (114.8 ± 7.3 vs. 108.6 ± 6.1 mmHg, $p < 0.01$; 62.4 ± 5.4 vs. 57.1 ± 4.0 mmHg, $p < 0.005$). Cholesterol levels were not significantly different between the groups. The levels of hs-CRV and ICAM-1 were significantly higher in diabetic patients than in controls (0.99 ± 0.6 vs. 0.72 ± 1.2 mg/l, $p < 0.05$ and 282.5 ± 40.6 vs. 225 ± 43.2 ng/ml, $p < 0.001$). Serum homocysteine and ADMA levels were significantly lower among diabetic group compared to controls (6.39 ± 1.5 vs. 8.84 ± 1.8 μmol/l, $p < 0.0001$ and 0.51 ± 0.1 vs. 0.6 ± 0.2 μmol/l, $p < 0.05$). Diastolic blood pressure was positively correlated to total cholesterol ($r = 0.55$, $p < 0.05$), LDL cholesterol ($r = 0.52$, $p < 0.05$), triglycerides ($r = 0.67$, $p < 0.01$) and hs-CRV ($r = 0.49$, $p < 0.05$) only in the diabetic group. There was no significant correlation between biochemical markers of endothelial function and HbA1 and duration of diabetes.
Conclusions: Children with type 1 diabetes have abnormalities in biochemical markers of endothelial function already after 5 years of duration of disease. There is a significant relationship between the lipid profile, hs-CRV and blood pressure.

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Effects of vitamin E supplementation in young patients with type 1 diabetes mellitus and persistent microalbuminuria

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Chronic hyperglycemia causes alteration in the oxidant/antioxidant status in patients with type 1 diabetes mellitus (T1DM), especially in those with overt vascular complications. The aim of this study was to evaluate the effects of high dose vitamin E supplementation (1200 mg/day) on reducing both microalbuminuria and oxidative stress. We performed a 12 months, randomized, placebo-controlled, double-blind cross-over trial, in 10 Caucasian young adults (7 m/3 f; mean age 18.87 ± 2.91 years) with T1DM and persistent microalbuminuria. At baseline and at end of the treatment period, determination of AER and HbA1c, and evaluation of the oxidant/antioxidant status was performed. At baseline AER and HbA1c were not significantly different between vitamin E and placebo group (25.06 ± 13.95 vs. 30.41 ± 19.44 μg/min, $p = 0.8$ and 8.48 ± 1.59 vs. 8.61 ± 1.99%, $p = 0.97$ respectively). No differences in term of oxidant (lag phase 25.10 ± 13.95 vs. 26.67 ± 14.61 min, $p = 0.68$ and MDA 0.84 ± 0.38 vs. 0.55 ± 0.23 nmol/mg, $p = 0.09$) and antioxidant status (plasma vitamin E 32.76 ± 15.54 vs. 35.47 ± 6.66 μmol/l, $p = 0.8$; and LDL-vitamin E 3.69 ± 1.97 vs. 3.63 ± 1.13 μmol/mg; $p = 0.97$) were found. After 6 months no significant differences in AER and HbA1c were observed between the two groups (23.35 ± 8.68 vs. 28.82 ± 11.07; $p = 0.538$, and 44 ± 1.32 vs. 8.59 ± 1.29 μg/min; $p = 0.74$ respectively). However, plasma and LDL vitamin E content were significantly higher in the vitamin E group compared to the placebo group (62.04 ± 14.31 vs. 26.52 ± 5.97 μmol/l; $p = 0.0001$ and 6.37 ± 2.29 vs. 2.58 ± 2.17 μmol/mg; $p = 0.002$ respectively). This was associated with a significant shorter lag phase (73.45 ± 35.49 vs. 36.74 ± 23.32 min; $p = 0.002$) and a significant lower MDA (0.48 ± 0.28 vs. 0.78 ± 0.31 nmol/mg; $p = 0.05$) in vitamin E group compared to the placebo. These data demonstrate that high dose vitamin E supplementation reduces markers of oxidative stress and improves antioxidant defense in young patients with T1DM. However, vitamin E supplementation does not reduce AER in patients with T1DM and persistent microalbuminuria

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Presentation of young diabetic patients with acute limb ischemia

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Introduction: Diabetes is a universal disease and its foot complications are well known. The majority of patients present with a chronic foot infection or a non healing wound. In this study we analyse our data on Saudi patients who presented to the Emergency Room (ER) with an acutely ischemic diabetic leg.
Methods: Data of 15 diabetic Saudi patients who presented to the ER with a cold diabetic leg were analysed. There were 14 males and 1 females. The age range was from 27–35. All patients presented to the ER with either complaints of severe leg pain, a blue or cyanotic leg, a cold leg or a foul smelling discharge.
Results: There were two patients with type 1 diabetes and 13 patients with type 2 diabetes who presented with an acutely ischemic cold leg/foot. Six patients had already refused all forms of surgical therapy at local hospitals. Emergent embolectomy was performed in two patients and lytic therapy was attempted in three patients. One patient required urgent below knee amputations, nine patients required radical debridement and three patients refused all types of surgical therapy. Four patients underwent a limb saving revascularization procedure. Salvage of the limb/foot was possible in only four patients.
Conclusion: Despite a limb/foot threatening condition, the majority of diabetic patients in Saudi Arabia present very late to the ER. Acute vascular occlusion was the major cause of the ischemic leg in all patients. A major reason for the delayed presentation was the fear of losing a limb, non-compliance with blood glucose control and continued smoking.

P94

Retinopathy status in young Danish persons with type 1 diabetes

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Background: In 1996 a nationwide Danish multi-center study demonstrated a high prevalence of retinopathy in young patients with type 1 diabetes. In the same year the Danish Registry for Diabetes in Childhood and Adolescence opened, and at present the registry contain data from 1900 children and adolescence with diabetes.
Methodology: The following parameters are registered annually, centrally measured HbA_{1c}, insulin regimen, height, weight, blood pressure, pubertal stage, the prevalence of severe hypoglycaemia and ketoacidosis, other diseases, other medicine and smoking. At 9, 12, 15 and 18 the patients are screened for retinopathy, microalbuminuria and elevated vibrations perception threshold.
Results: In the period 1996–2005 mean HbA_{1c} decreased from 9.2% to 8.4% and 31 patients were diagnosed with retinopathy (29 mild, one moderate and one proliferative retinopathy), corresponding to a prevalence of 2.2%. In the period 1998–2005 the data completeness on retinopathy increased from 25–57%, however with big variation among different counties (from 5% to 88%). There are however still 43% of the patients who are not properly screened. It is internationally recommended that retina photos should be used as a screening tool. However only 28.2% of the young Danish patients were screened by this method.
Conclusion: Presently there is a low prevalence of diabetic retinopathy in young patients with type 1 diabetes in Denmark. However the data demonstrate that Danish paediatricians and ophthalmologist need to develop common national guidelines for retinopathy screening of children and adolescents with type 1 diabetes.

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The impact of intensive insulin therapy on endothelial function in young people with type 1 diabetes

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Introduction: Macro-vascular disease is an important cause of the increased morbidity and mortality in Type 1 Diabetes (TID), and this vascular impairment begins in childhood.
Aims: The aim of this study was to determine whether introducing intensive diabetes management would produce measurable improvements in vascular function.
Methods: This investigation was undertaken as part of a RCT of a behavioural intervention delivered by mobile phone text messaging, the 'Sweet Talk' study. 126 patients fulfilled the eligibility criteria (T1D for >1 year; on conventional insulin therapy (CIT); aged between 8 and 18 years), of which 92 enrolled. Patients were randomised to Group 1; CIT only (n = 28), Group 2; CIT and 'Sweet Talk' (n = 33) or Group 3; IIT and 'Sweet Talk' (n = 31). Vascular assessments (including measures of endothelial damage, activation, dysfunction and oxidative stress) and HbA1c were performed at baseline and repeated after 12 months of the study.
Results: Glycaemic control deteriorated in patients on CIT, but improved significantly in patients allocated to IIT ($p = 0.007$). IIT was associated with significantly greater improvements in E-selectin ($p < 0.0001$) than CIT (Group 1; $p = 0.026$ and Group 2; $p = 0.053$). Conversely there was no significant change in VEGF levels in patients remaining on CIT, but deterioration in patients on IIT ($p = 0.017$). Thrombomodulin levels increased in all groups. Vascular responses to acetycholine improved in patients on IIT ($p = 0.017$), but not in patients receiving CIT. The improvements in vascular reactivity did not correlate with improvements in glycaemic control.
Conclusions: IIT appears to be associated with inconsistent changes in endothelial function. IIT was associated with a significant improvement in microvascular reactivity, which did not correlate to the improvements in glycaemic control, suggesting that delivering more physiological insulin profiles may confer additional vascular protection.

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To clarify the relation with clinical and laboratory parameters, we measured the level of adiponectin in T1DM

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Introduction: Serum adiponectin levels are decreased in patients with coronary artery diseases, obesity and patients with type 2 diabetes (T2DM). It was previously reported that adiponectin was associated with whole-body insulin sensitivity in humans and T2DM was complicated with atherosclerosis earlier than patients with type 1 diabetes (T1DM).
Aims: To clarify the relation with clinical and laboratory parameters, we measured the level of adiponectin in T1DM.
Methodology: Adiponectin was measured twice more than 1 year apart by ELISA in thirty eight subjects with child-onset T1DM (18 boys and 20 girls, age 16.0 ± 5.1 years), non-diabetic subjects (seven boys and nine girls, age 12.2 ± 2.1 years), and obese

subjects (12 boys and 6 girls, age 13.1 ± 2.6 years). Leptin, HbA1c, Total-cholesterol (TC), HDL-C, LDL-C, and high sensitive CRP (hs-CRP) were measured in the morning after an overnight fast. The association between adiponectin and the following clinical data, were investigated; gender, age, duration, stature, weight, obesity index (OI).

Results: Adiponectin in T1DM (10.1 ± 4.3 μg/ml) was not decreased than that in controls (11.5 ± 3.6 μg/ml), but significantly higher than that in obese groups (5.6 ± 2.4 μg/ml). Furthermore, adiponectin was negatively correlated with OI ($p < 0.05$), atherogenic index ($p < 0.01$) and positively correlated with HDL-C ($p < 0.05$). Adiponectin had no correlation with leptin, TC, LDL-C, hs-CRP and total daily dose of insulin per weight. There was no significant reinforcement factor in the progress in a few years, although adiponectin showed the trend that gradually decreases year by year.

Conclusion: We have demonstrated that adiponectin in T1DM was almost as the same as that in controls. The normal adiponectinemia among T1DM might protect the progress to atherosclerosis, unless getting obese and the other metabolic syndrome as seen in T2DM.

P97

Thrombocyting haemostasis in children with diabetes mellitus type 1

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Thrombocytes play important role in pathogenesis of diabetic vascular complications.

Aim: To study peculiarities of thrombocyting haemostasis in children with diabetes mellitus type 1 (T1DM).

Patients and methods: Hundred children (40 boys, 60 girls) 2–16 years old. with T1DM were examined. The duration of the disease was: <1 year in 17 patients (HbAc1 7.5 ± 0.3%) – group 1, from 1 to 5 years in 50 patients (HbAc1 8.8 ± 1.2%) – group 2, more than 5 years in 33 children (HbAc1 11.2 ± 2.1%) – group 3. Control group: 30 healthy children 2–16 years old. The indexes of thrombocyte aggregation (degree, speed and time of aggregation) measured by laser method with different inductors (ADP, adrenalin, kollagen) and intravascular aggregation were evaluated.

Results: Levels of ADP- and adrenalin-stimulating aggregation, speed of kollagen-stimulating aggregation and intravascular aggregation of thrombocytes were increased in group 1 in comparability of control group (< 0.05). Levels of ADP- and kollagen-stimulating aggregation (< 0.05) and intravascular aggregation (< 0.001) were also increased in group 2. Decrease of aggregation time was revealed in this group (< 0.05). Increase of all indexes of functional activity of thrombocytes (< 0.05) and increase of intravascular aggregation (< 0.001) were found in patients of group 3 in comparability of control group.

Conclusions: The changes of thrombocyting haemostasis in children with T1DM were revealed. Functional activity of thrombocytes in this children appeared to increase in correlation with duration of the disease and it may demand treatment with heparinoids.

P98

Apolipoprotein E polymorphism (alleles 2, 3, 4), lipid profile and type 1 diabetes mellitus

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Introduction: The apolipoprotein E polymorphism (Apo E– alleles *2, *3 and *4), has been associated with type 1 diabetes mellitus (DM1), with allele *4 related to elevated levels of cholesterol.

Aim: Evaluate the influence of Apo E polymorphism in the lipid profile of DM1 patients with or without familial history (FH) of hypercholesterolemia.

Methods: Forty-four DM1 patients, with ages between 2 and 20 years, distributed in two groups: G1 = 21 with FH and G2 = 23 without FH were evaluated. The Apo E polymorphism was analysed by PCR (polymerase chain reaction) and RFLP (restriction fragments length polymorphism) and the lipid profile by colorimetric assays and calculation by Friedewald formula. Student *t* and Fisher exact test were performed, with significance for $p < 0.05$.

Results:

	*3/*3		*_/*4	
Lipid Profile (mg/dl)	FH+	FH-	FH+	FH+
CT	178.8 ± 26.1	179.2 ± 31.6	173.6 ± 32.3	171.0 ± 32.8
HDLc	57.8 ± 10.1	52.0 ± 19.3	60.4 ± 16.3	54.4 ± 24.3
LDLc	107.6 ± 25.9	112.0 ± 39.7	101.0 ± 28.9	103.8 ± 39.5
VLDLc	13.3 ± 4.5	15.1 ± 6.1	12.2 ± 4.0	12.8 ± 3.0
TG	67.1 ± 22.4	75.0 ± 30.5	61.0 ± 19.7	64.6 ± 14.2

Conclusion: The Apo E polymorphism does not differentiate DM1 patients with or without FH of hypercholesterolemia and there were no association with lipid profile.

P99

Comparison of the metabolic effects of mixed meal and oral glucose tolerance tests in children and adolescents with cystic fibrosis

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Introduction: Cystic fibrosis-related diabetes is a common complication leading to clinical deterioration of these patients. Aiming an earlier diagnosis, we investigated the kinetics of the glucose-metabolism abnormalities by evaluating glucose, insulin, pro-insulin, C-peptide and glucagon responses after oral glucose (OGTT) and a mixed meal tolerance (MMTT) tests.

Methods: In a cross-sectional and controlled study, conducted from July/2004 till August/2005, 52 children and adolescents with cystic fibrosis, from 5 to 19 years old, underwent both tests in an interval of less than 10 weeks.

Results: Plasma glucose values were significantly lower ($p < 0.05$) during MMTT after time 60 min and insulin (422.8 ± 75.4 vs. 311.9 ± 54.7 pmol/l), C-peptide (2.6 ± 0.4 vs. 2.0 ± 0.2 nmol/l) and glucagon (69.7 ± 2.97 vs. 63.5 ± 2.53 pg/ml) were secreted earlier, being significantly higher at time 30 min. During OGTT, patients showed a time-delayed but higher peak insulin (387.9 ± 51.3 vs. 224.1 ± 35.1 pmol/l), C-peptide (3.7 ± 0.4 vs. 2.4 ± 0.2 nmol/l) and pro-insulin (49.9 ± 33.1 vs. 32.5 ± 25.1 pmol/l) secretion at time 120 min. Patients with Cystic Fibrosis-Related Diabetes (CFRD) 'without' Fasting Hyperglycemia presented insulin (568.5 ± 249.7 pmol/l), C-peptide (4.2 ± 0.4 nmol/l) and pro-insulin (72.8 ± 17.4 pmol/l) values significantly higher than those patients with normal glucose tolerance or pre-diabetes, at time 120 min, indicating increased peripheral insulin resistance. An overlap of insulin, C-peptide and pro-insulin levels was observed in normal and pre-diabetic patients as well as in people with CFRD 'with' Fasting Hyperglycemia, at time 120 min, suggesting beta cell dysfunction in the latter groups.

Conclusion: MMTT caused an earlier hormone secretion stimulated probably by nutrients different from glucose. Insulin

resistance besides beta cell dysfunction are involved in the pathogenesis of cystic fibrosis related glucose disturbances.

P100

Cystic fibrosis related diabetes: development, mechanisms and consequences

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Diabetes appear early and frequently in patients with cystic fibrosis (CF) and is associated with nutritional and respiratory deterioration.

Aims: To better describe the history, mechanisms and consequences of diabetes in CF patients, from childhood to early adulthood.

Methods: Five hundred seventeen OGTTs were performed in 237 CF children (109 boys, 128 girls; 18.5 ± 6.3 year), from 1988 to 2005, in a single hospital. Anthropometric, biological (HbA1c, blood cell count, sedimentation rate), immunological (ICA) and genetic (HLA, CFTR) data, and major events (transplantation, death) were recorded. Pancreatic β-cell function was estimated from the plasma insulin/glucose ratios (total AUC, ΔI/G at 30 min and HOMA-B). Peripheral insulin resistance (IR) was measured using the HOMA-IR. The progression of abnormalities of glucose metabolism (impaired tolerance, diabetes at OGTT, insulin treatment) were evaluated using analysis for censured data; rates of pulmonary transplantation and death by life-table analysis.

Results: Impaired glucose tolerance was found early (20% at 10 year), and the cumulated risk increased to 50% at 15 year, 75% at 20 year and 82% at 30 year. The risk for diabetes was >20% at 15 year, 45% at 20 year and 70% at 30 year; and for insulin treatment, 30% at 20 year, and 40% at 30 year. Abnormalities tended to be earlier in girls. Early appearance of impaired glucose metabolism was associated with lower survival ($p < 0.01$) and higher rate of pulmonary transplantation ($p = 0.02$). AUC glucose correlated with decreased BMI and height. Diabetes was associated with the decrease of all estimates of insulin secretion, and impaired glucose tolerance with decreased early insulin secretion (ΔI/G 30 min). There was no correlation with HOMA-IR, but increased inflammation was associated with insulin resistance and deterioration of glucose tolerance.

Conclusions: Cystic fibrosis-related diabetes is mainly due to β-cell deficiency. It is extremely frequent early in life and is associated with impairment of the nutritional state and growth, and with increased rates of terminal respiratory failure and death.

P101

Does epilepsy occur more frequently in children with type 1 diabetes?

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Background: Hypoglycaemic seizures occur in up to one third of children with diabetes. Electroencephalogram (EEG) abnormalities are also reported in association with diabetes. Despite these associations, it is not known whether children with diabetes are more prone to euglycaemic seizures or epilepsy, possibly as a result of lowered seizure threshold.

Aim: To determine the prevalence of epilepsy within a representative paediatric diabetes clinic.

Methods: Audit of the diabetes clinic using chart and database review. Epilepsy was diagnosed on the basis of two or more unprovoked euglycaemic seizures, with or without supporting EEG abnormalities. Patients with seizures only occurring in the context of hypoglycaemia (capillary blood glucose of ≤3.9 mmol/l) and those who did not document blood glucose at the time of seizure activity were therefore excluded. Clinical, demographic, biochemical, EEG and neuro-imaging data were recorded.

Results: Twelve children with active epilepsy were identified. At the time of the study, our diabetes clinic comprised 1384 patients (0–19 years) with type 1 diabetes, giving a prevalence of active epilepsy of 8.7/1000 in this group. All 12 patients had neuro-imaging with MRI or CT brain; one abnormality (watershed infarct) was identified. EEG abnormalities were documented in ten subjects (83%). Idiopathic generalised and partial epilepsies were most commonly encountered. Nine (75%) had a history of hypoglycaemic seizures prior to epilepsy diagnosis. Anti-epileptic drug (AED) therapy effectively controlled both euglycaemic and hypoglycaemic seizures in the majority of patients treated.

Conclusions: No increased prevalence of epilepsy relative to the general population (5–10/1000) was found in our large socio-demographically diverse diabetes clinic. Epilepsy syndromes identified were similar to those found in larger population studies. The importance of blood glucose monitoring at the time of seizure activity is highlighted, as unveiling euglycaemic seizures will help to identify children who may benefit from AED therapy.

P102

Low incidence of biopsy positive coeliac disease following screening in type 1 diabetes

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Background: Previous studies have suggested that there is a prevalence of coeliac disease (CD) of about 5% in children with type 1 diabetes (T1D). It is recommended that all children with T1D should be screened at diagnosis and three yearly thereafter.

Aims: To examine the results of our screening programme and refine the criteria for CD screening in T1D.

Methods: Since September 2004 we have been using tissue transglutaminase (TTG), as a sensitive marker for CD, together with IgG & IgA antigliadin (AGA) antibodies. If TTG antibodies were positive, more specific endomyseal (EMA) antibodies were also measured. All patients who were TTG positive have been referred for jejunal biopsy. We have examined the relationship between the autoantibodies and the biopsy results. Data were obtained from our diabetes database to determine what proportion of children have been screened and what the prevalence of coeliac disease is in our population.

Results: Of 244 patients (age 2–19 years), we have results on 207 patients so far. None had low total IgA concentrations. 13 were TTG positive. Of these, eight were EMA negative (six biopsy negative, two awaited) and five EMA positive (two biopsy positive, one normal, two awaited). The two who were biopsy positive also had positive IgG & IgA AGA. Both had been asymptomatic.

Conclusions: We have found a low incidence (2/207) of CD in our population compared with other studies. We suggest that screening is best undertaken using TTG antibodies alone. If these are positive EMA antibodies are more specific and indicate the need for biopsy. Positive IgG & IgA AGA antibodies in the presence of positive

TTG and EMA may be provide further indication of the presence of active CD. We are examining how these antibodies may help us to reduce the need for biopsy to a minimum.

P103

No effect of *Helicobacter pylori* (Hp) eradication on glycated haemoglobin levels (HbA1c) in young type 1 diabetic patients

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Introduction: Hp is a very frequent infection of the stomach in the world's population. In paediatric diabetes literature, the studies on the relationships between Hp and HbA1c are scarce and controversial.

Aims: This study aimed to investigate these relationships.

Methodology: A total of 100 seropositive young type 1 diabetic patients for Hp (European Caucasians: n = 49; Moghrabin Caucasians with a lower socio-economic status: n = 51) were enrolled. Hp infection was demonstrated by ^{13}C-urea breath test, histology and culture allowing to determine an antibiogram. HbA1c levels were measured during 1 year (mean: six measurements) before and after eradication of Hp proven by ^{13}C-urea breath test. The upper normal limit was 6.2%.

Results: Among 100 Hp-seropositive patients, 49 of them, infected by Hp, were treated. Mean age ± SD was 14.2 ± 2.8 years, and diabetes duration at the time of diagnosis was 6.2 ± 2.3 years. Eradication of Hp infection was obtained in 38/49 subjects (78%). Eleven patients (22%) remained infected and needed a second treatment. Age and diabetes duration, as well as HbA1c levels (7.3 ± 1.5% vs. 7.8 ± 0.8%; p = 0.16) before treatment, were not statistically different in the two subgroups. In the 49 infected subjects, mean HbA1c levels 1 year before, and 1 year after eradication were not statistically different (7.4 ± 1.3% vs. 7.9 ± 1.1%; p = 0.08). The prevalence of infection was higher in MC than in EC (47% vs. 22%; p < 0.001). However, HbA1c levels were not different (7.3 ± 1.5% vs. 7.7 ± 0.9%; p = 0.31). Moreover, age and duration of diabetes were similar. Among the 100 seropositive patients, 45 complained of vague abdominal pain, 24 being effectively infected.

Conclusion: Before treatment, no differences in HbA1c levels, as well as abdominal complaints, were seen between seropositive patients with active Hp infection or without. Hp infection was twice more frequent in ME than in CE, maybe because of a lower socio-economic status. HbA1c levels were similar in Hp-eradicated patients after one treatment than in Hp-non eradicated patients. Eradication of Hp did not significantly change the HbA1c levels till 1 year later.

P104

Preliminary data on prevalence of skin lesions in children and adolescents with type 1 diabetes mellitus

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Introduction: Skin lesions are frequently observed in patients with type 1 diabetes mellitus (DM). It is stated that about 30% of these patients have cutaneous manifestations. Although well known, systematic surveys of cutaneous findings in children and adolescents with type 1 diabetes are sparse.

Aim: The aim of our study is to assess the prevalence of skin manifestations, including the diabetc hand syndrome in young patients with type 1 DM.

Methodology: One hundred and sixty-six patients, consecutively attending the outpatient diabetes clinic at Mother and Child Health Care Institute of Serbia, underwent a complete dermatological examination. Mean age of patients is 12.4 years (4.1–17.9 years) and mean duration of diabetes is 3.6 years (1 month–11.3 years). Dermatological examination were always performed by the same three trained physicans during a routine visit at the oupatient clinic. When more than one skin lesion was found (as in 54 patients) the clinically most relevant one was considered.

Results: In the whole population 139/166 (79.5%) patients had skin disorders. The most frequent were xerosis (59.4%) and keratosis pilaris (11.8%). Other cutaneous manifestations were: rubeosis faciei (4.7%), cafe-au-lait macules (4.1%), viral warts (2.9%), necrobiosis lipoidica (2.3%), dermatitis seborrhoica, fungal infection, diabetic hand (1.8% each), lipoatrophy, psoriasis, alopecia areata (1.1% each) and striae dystensae (0.6%).

Conclusion: The prevalence of skin disorders in our group of young patients with type 1 DM is very high, whether or not considered related to the underlying disease. The most common finding is xerosis. We continue to recruite further DM patients and collect data on skin lesions in a matched control population. In the end it will enable us to compare the prevalence of cutaneous manifestations in children with type 1 DM with healthy children.

P105

Screening for celiac disease in childhood diabetes: is it enough to screen at the time of clinical diagnosis of diabetes?

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Introduction: The prevalence of Celiac Disease (CD) in Type 1 Diabetes Mellitus (T1DM) is known from several studies and varies from 2.3 to 10%. CD is often asymptomatic or atypical in children with T1DM. Few children have CD before T1DM is diagnosed. Longitudinal studies are needed to investigate the development of CD in T1DM patients.

Aims: To investigate the prevalence of CD in a cohort of children and adolescents at the onset of T1DM and the occurrence of CD during a 6 year follow up.

Methodology: Three hundred patients with T1DM were prospectively studied for CD. The study group was a cohort of children and youths under the age of 19 year at six clinical centers for pediatric diabetes in Scania (Skåne), Sweden. The children were diagnosed with diabetes between January 1, 1996 and December 31, 2000. We performed repeated serological analyses from the onset of diabetes and annually thereafter during 6 years. The Ig A-antiendomysium antibody (EMA) test was selected as the screening test and patients with a positive test were considered appropriate for a jejunal biopsy. Two patients had been diagnosed with CD before the onset of their diabetes.

Results: The prevalence of biopsy proven CD at the time of clinical diagnosis of T1DM was 4% (12/300). During the follow up a total of 17 patients developed CD as follows: 10 after 1 year, 5 after

2 years, 1 after 3 years and 1 after 5 years. The cumulative frequency of CD therefore represented 29/300 (9.7%) all confirmed by intestinal biopsies. The prevalence of CD in patients with T1DM is approximately 20 times higher than in the general population. It was noted that while 12/29 had CD at the time of clinical onset of T1DM the remaining group of 17 T1DM children developed CD without clinical symptoms.

Conclusions: Our study confirms a high prevalence of biopsy proven CD in children and youths with the overall prevalence of 9.7%. We suggest that children with T1DM should be screened for CD annually, at least for 3 years with a possible reduction in test thereafter unless the patient show symptoms.

P106

Adiponectin does not mediate obesity-related insulin resistance in young children – a longitudinal study

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Background and aim: Adiponectin, an adipokine with insulin sensitising properties, is thought to mediate insulin action in adults, and is inversely related to obesity. Limited data are available in young children. Our aim was to determine adiponectin levels in prepubertal children and their relationship to BMI, body fat and insulin resistance (IR) over time.

Method: Participants were healthy children (114 boys, 86 girls) from the EarlyBird Study measured at 5, 6, 7 and 8 years. Measures: adiponectin, HOMA-IR, BMI, body fat (sum of five skinfolds, SSF).

Results: (i) Both BMI and SSF rose progressively from age 5 to 8 years (+5% and +18%, both $p < 0.001$). (ii) HOMA-IR nevertheless fell progressively (-24%, $p < 0.001$). (iii) Adiponectin levels correlated strongly year-on-year ($r = 0.71–0.79$, $p < 0.001$). (iv) In boys, adiponectin fell 9.4% ($p < 0.001$) from 5 years to 8 years (13.8–12.9–12.7–12.5 μg/ml), and in girls it fell 8% ($p = 0.02$) (13.7–12.6–13.2–12.6 μg/ml). (v) HOMA-IR was directly related to both measures of body fat at all ages (BMI $r = 0.25–0.47$, $p < 0.001$; SSF $r = 0.17–0.46$, $p < 0.02$). (vi) Adiponectin did not correlate with BMI at any age, and with SSF only weakly 8 year old girls ($r = -0.22$, $p = 0.04$). (vii) There was no correlation of adiponectin with HOMA-IR in girls of any age, and in boys only at 5 and 6 years (both $r = -0.19$, $p = 0.04$).

Conclusion: Adiponectin rank order was maintained from year to year (suggesting the measure was precise and the levels systematic), and it fell (as expected) as adiposity rose. However, the trends in adiponectin and IR over time were unexpectedly parallel, rather than inverse. IR and body fat were correlated, as expected, but the relationships of adiponectin with body fat and IR were weak and inconsistent. We found little evidence that circulating adiponectin mediates obesity-related IR in young children.

P107

Evaluation of metabolic risk factors in adolescents treated for craniopharyngioma

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Introduction: Surgical removal of tumours arising in the hypothalamic-pituitary region, including craniopharyngioma (CR), may result in morbid obesity, due to alteration in appetite regulation and vagally-mediated hypersecretion of insulin following hypothalamic damage. Adult survivors of craniopharyngioma have enhanced cardiovascular mortality. Metabolic alterations in response to these events may be more severe than in exogenous obesity.

Aims: To characterize features of the metabolic syndrome, insulin sensitivity and insulin secretion (IS) in obese youth treated for CR compared to control youth (CO) with exogenous obesity and similar body mass index (BMI).

Methodology: 15 CR and 15 CO subjects underwent fasting lipid profile, free fatty acid (FFA), and 2 h 75 g oral glucose tolerance test. Whole body insulin sensitivity (WBISI), 1st and 2nd phase IS were calculated.

Results: Subjects (CR vs. CO) were similar (all $p > 0.05$) in age (15.2 ± 3.9 vs. 14.8 ± 2.9 years), gender (8 vs. 10 female) and BMI (35 ± 8.2 vs. 33.5 ± 5.0 kg/m^2). CR youth were in earlier stages of puberty. There was no difference in family history of T2DM, parental obesity or exposure to diabetes in utero. There was higher prevalence of glucose intolerance (40% vs. 0% $p = 0.02$) and metabolic syndrome (67% vs. 20% $p = 0.03$) in CR compared to CO. FFA were elevated in CR subjects (0.81 ± 0.47 vs. 0.49 ± 0.19, $p = 0.03$). WBISI was not significantly different between groups ($p = 0.4$); however CR youth exhibited increased first and second phase IS (4812 ± 1965 CR vs. 3028 ± 1335 CO and 1150 ± 450 CR vs. 737 ± 311 pmol/l CO; all $p < 0.05$).

Conclusion: Youth treated for CR exhibit exaggerated first and second phase IS and increased rates of glucose intolerance and metabolic syndrome compared to equally obese adolescents without hypothalamic damage. Further research is required to determine the natural history of these metabolic alterations and the impact of early treatment/prevention to improve associated morbidity.

P108

Insulin resistance in early onset obesity

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High insulin concentrations have been described in children with early onset obesity and mutations of melanocortin 4 receptor (MC4R), which is the most frequent monogenic cause of obesity. In the course of a screening design of MC4R mutations in a population of obese Neapolitan children at the Department of Pediatrics, Federico II University of Naples, we evaluated possible associations among early-onset obesity, insulin-resistance and MC4R mutations. We report on the preliminary data related to 73 children (28 male; mean age 5.7 years), divided into two groups: A ($n = 40$), age <6 years and B ($n = 33$), ages ≥6 years. In the whole population total cholesterol, triglycerides, alanine amino-transferase (ALT), plasma glucose and insulin were measured and MC4R mutations were searched. The HOMA index was calculated [insulin (μU/ml) (glucose (mM) divided by 22.5]. Group A patients had higher BMI z-score (3.3 ± 0.7 vs. 2.6 ± 0.3 $p < 0.0001$) and lower HOMA (1.9 ± 1.4 vs. 3.0 ± 2.6 $p = 0.02$) than group B patients. No differences were found in cholesterol, triglycerides and ALT levels. Insulin resistance (IR) (HOMA ≥2.5) was observed in seven children (17%) of group A and 14 (42%) of group B ($p < 0.04$); the frequence of children with hypercholesterolemia or hypertriglyceridemia was similar between the two groups. A significant correlation was found between HOMA and age ($r = 0.31$, $p = 0.01$) and ALT ($r = 0.36$, $p = 0.002$). ALT was significantly and independently associated with HOMA after adjustment for gender, age, and BMI z-score ($r^2 = 0.09$,

p = 0.012). No MC4R mutations were found; only three children with V103I polymorphism were identified. These findings suggest that advancing age plays an important role in determining IR more then the severity of obesity; no MC4R mutations were found. In early-onset obesity IR is an independent risk factor for elevated serum transaminase levels. Strategies for an early intervention should be implemented in obese children over 6 years of age.

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P109

Insulin resistance in subjects with type 1 diabetes is associated with accumulation of intramyocellular lipid

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Introduction: It has been shown in normal subjects and those with type 2 diabetes that insulin sensitivity is negatively correlated with intramyocellular lipid levels (IMCL) measured using magnetic resonance spectroscopy. Subjects with type 1 diabetes have insulin resistance when compared to healthy controls but evidence regarding IMCL levels in patients with type 1 diabetes remains controversial (Perseghin 2003, Bernroider 2005).

Aims: The aim of this study was to determine the relationship between insulin sensitivity and IMCL in young adults with type 1 diabetes and compare the results with values found in age matched controls.

Methodology: Subjects underwent a hyperinsulinaemic euglycaemic clamp following a 10 h overnight fast to assess insulin sensitivity. The subjects with type 1 diabetes were treated with an insulin infusion overnight to ensure a fasting glucose within the normal range prior to onset of the clamp. A DXA scan was carried out on all subjects to enable insulin sensitivity to be adjusted for lean body mass (m value). Magnetic resonance spectroscopy was used to measure IMCL in the soleus muscle and was quantified relative to creatine.

Results: We studied 10 subjects with type 1 diabetes and nine healthy controls. The subjects with type 1 diabetes were more insulin resistant than the controls and had higher IMCL values. Results shown are mean values (±SD). There was a moderate negative correlation between insulin sensitivity and IMCL.

	Controls	T1D subjects	P value
Age	16.9 (0.93)	18.0 (3.8)	0.6
M value	3.36 (1.41)	2.53 (0.93)	0.05
IMCL	4.58 (0.99)	8.43 (3.0)	0.001

Conclusion: This study confirms that subjects with type 1 diabetes have insulin resistance, as measured by the clamp and peripheral insulin resistance as measured by IMCL even in young adulthood.

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P110

Pre-diabetes in obese youth: what is the metabolic defect, insulin sensitivity (IS) or insulin secretion (ISC)?

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In adults the progression from normal glucose homeostasis to pre-diabetes or impaired glucose tolerance (IGT) and type 2 diabetes (T2DM) is associated with a deterioration in insulin secretion. The data in youth remain conflicting. Our past studies show impairment in first phase ISC in IGT compared with controls while others show worsening of IS. The aim of this study was to investigate the differences in IS and ISC not only between obese controls and pre-diabetes, but also between pre-diabetes and T2DM. Eleven obese adolescents with normal glucose tolerance (NGT), 6 with IGT and 15 with T2DM underwent evaluation of IS (3-h hyperinsulinemic-euglycemic clamp); 1st and 2nd phase insulin (1st PI, 2nd PI) secretion (2-h hyperglycemic clamp); and body composition (DEXA). Glucose disposition index (GDI) was calculated as 1st PI (IS. Results are Mean ± SEM.

	NGT (7F/4M)	IGT (5F/1M)	T2DM (11F/4M)	ANOVA p-value
Age (years)	14.0 ± 0.6	13.5 ± 0.9	15.6 ± 0.5	0.04
BMI (kg/m^2)	38.6 ± 1.2	38.1 ± 3.5	36.2 ± 1.7	Ns
% Body fat	45.9 ± 1.6	45.9 ± 1.5	42.0 ± 1.5	Ns
HbA1c (%)	5.4 ± 0.2	5.6 ± 0.2	6.7 ± 0.3	<0.001
Fasting Glucose (mg/dl)	98.7 ± 1.4	99.9 ± 4.3	135.6 ± 3.7	<0.001
Fasting Insulin (μu/ml)	48.7 ± 6.8	70.4 ± 13.1	48.7 ± 4.7	ns
IS (mg/kg/min per μu/ml)	1.8 ± 0.4	1.3 ± 0.4	1.1 ± 0.1	ns
1st PI (μu/ml)	308.6 ± 81.1	184.6 ± 45.7	61.1 ± 6.6	0.004
2nd PI (μu/ml)	304.7 ± 61.3	366.3 ± 104.1	107.5 ± 13.8	0.004
GDI	505.5 ± 124.7	209.2 ± 66.9	67.3 ± 10.1	0.001

These findings suggest that the distinguishing pathophysiological feature of pre-diabetes and T2DM in youth is impairment in first phase insulin secretion with no significant difference in insulin sensitivity. It remains to be determined which type of intervention(s) could reverse the impairment in ISC.

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Trends, associations and predictions of insulin resistance in contemporary pre-pubertal children.

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Background: With the rising prevalence of childhood obesity, paediatricians are encouraged to use clinical measures like BMI and waist circumference (WC) to identify those at risk of diabetes and cardiovascular disease. Cut-points have been applied to growth charts, though these are not related to known health risks.

Aims: We examined the trends, associations and predictions of insulin resistance (IR) from body composition in pre-pubertal children.

Methods: One hundred and thirty-one boys, 100 girls were examined annually at 5, 6, 7, 8 years. Clinical measures: BMI, sum of skinfold thickness at five sites (SSF), WC. Outcome measures: IR (using HOMA-IR), HDL-cholesterol (HDL-C), triglycerides (TG).

Results: (i) BMI, WC, SSF rose significantly from 5–8 years (BMI B +3.4%, G +5.7%, p = <0.001; WC B +10.4%, G +11.8%, p = <0.001; SSF B +23.3%, G +30.7%, p = <0.001). HOMA-IR unexpectedly fell (B -16.6% p = 0.01, G -32.5% p = <0.001), while HDL-C rose (B +17.8% p = <0.001, G +17.1% p = <0.001) and TG fell (B -4.8% p = 0.16, G -11.6%, p = 0.006). (ii) Cross-sectional correlations between HOMA-IR and BMI, WC and SSF were poor at 5 years but unexpectedly strengthened by 8 years. (BMI: B r = 0.20/0.38, G r = 0.28/0.49; WC: B r = 0.25/0.40, G r = 0.32/0.58), SSF: B r = 0.11/0.36, G r = 0.18/0.53). (iii) In girls, but not boys, adiposity at 5 years predicted HOMA-IR at 8 years (BMI: r^2 = 0.17, p = <0.001; WC: r^2 = 0.28, p = <0.001; SSF: r^2 = 0.17, p = <0.001) better than at 5 years. (BMI: r^2 = 0.08, p < 0.01; WC: r^2 = 0.10, p = 0.001; SSF: r^2 = 0.03, p = 0.07).

Conclusions: (i) Rising adiposity in this age group is associated with improving metabolic health.

(ii) In girls, body composition at 5 years predicts IR better at 8 years than 5 years.
(iii) Correlation is unrelated to trend or prediction, thus the need for longitudinal data.
(iv) Adiposity and IR appear to relate differently in children than adults.
(v) Until studies tracking metabolic variables from childhood into adulthood are complete, 'fat' young children should arguably not be targeted.

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Unexpected and severe altered insulin release in children under long term parenteral nutrition

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Introduction: Long-term parenteral nutrition (PN) in children is a special clinical situation associating sustained hyperinsulinemia induced by a high nutriment infusion flow 12 h/24 h a possible lipotoxicity induced by repeated infusion of lipids and an alteration of incretin hormones release induced by the enteral disease. Some children under PN have developed chronic hyperglycemia during infusion without any other risk factors.
Aims: To test whether long term and exclusive parenteral nutrition can lead to an alteration of β-cells function
Methodology: Thirteen children (four boys, nine girls, 6–17 years) under exclusive PN (>80% of daily caloric intake by PN) without obvious alteration of glucose tolerance (checked by a continuous glucose monitoring system CGMS™) were included. Peripheral insulin sensitivity was measured by a hyperinsulinemic euglycemic clamp. β-cells function was quantified by determining the insulin response to an intravenous glucose tolerance test (first phase insulin release) to graded infusions (4–30 mg/kg/mn) of glucose (sustained insulin release) and to arginine infusion. GLP-1 release was measured before and after an oral glucose load.
Results: CGMS didn't show prolonged hyperglycemias during PN. There was no secretion of GLP-1 in response to oral glucose load in all patients. One boy has an alteration of insulin sensitivity (M: 4.7 mg/kg/mn) compensated by a higher insulin secretion. Insulin sensitivity was normal in the remaining patients. First phase insulin release was very low (1 + 3 < 80 mUI/l) in five patients. Four of these patients demonstrated as well a low insulin release under graded glucose infusion although plasma glucose reached values as high as 14 mmol/l. However insulin secretion was stimulated by arginine shot.
Conclusion: These data emphasize that severely altered insulin secretion is visible early in life under PN induced by metabolic conditions. Thus these patients are at risk of developing glucose tolerance disorders if the dependence to PN is maintained.

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Anti-müllerian hormone (AMH), an index of early ovarian follicular development, is increased in women with type 1 diabetes mellitus (DM1) associated with polycystic ovary syndrome (PCOS)

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Introduction: Women with PCOS exhibit elevated AMH levels, associated with an increased number of small ovarian follicles. A higher prevalence of PCOS has been described in women with DM1, but it is not known whether follicular development and AMH levels are abnormal in this group of patients.
Aim: The purpose of this study was to evaluate AMH levels in pubertal and post-pubertal women with DM1 and determine its association with PCOS and follicle number.
Methods: Puberal and post-puberal women with DM1 (n = 95) and healthy controls (n = 98) were evaluated. A fasting blood sample was obtained during follicular phase. Circulating sex steroids, IGFBP-1, AMH, gonadotropins, SHBG, free androgen index and ultrasonography were performed. Women were classified according to their Tanner stage (T) and women with >2.5 year post-menarche were classified as 'adults' (A). Adult women were classified as PCOS or Polycystic ovary morphology (PCOM) according to the Rotterdam criteria.

	N	AMH (pmol/L)	IGFBP (ug/L)
C	98	14.8 ± 2.1	18 ± 2.1
DM1	95	15.5 ± 1.2	50.5 ± 6.1┼
Adult DM1 with PCOS	16	19.0 ± 1.6*	50.3 ± 11.0
Adult DM1 without PCOS	25	13.3 ± 1.6	50.7 ± 7.3

*:DM1+ PCOS vs PCOS, p=0.02; ┼: DM1 vs C, p<0.0001

Results: AMH levels were higher in A with DM1 and PCOS than in A with DM1 without PCOS. AMH levels correlated with follicle number (r = 0.4, p = 0.01). In addition, AMH levels decreased during puberty in DM1 (ANOVA, p = 0.01), but not in C. IGFBP-1 levels were higher in DM1 than C (p < 0.001), but did not correlate with sex steroids, ovarian volume or AMH levels.
Conclusions: Women with DM1 and PCOS exhibit increased AMH levels, which are related to ovarian follicle number, suggesting that folliculogenesis may be altered in these patients.
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Does the kind of therapy have an influence on abnormalities of growth hormone axis in children with IDDM?

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The abnormalities of growth hormone axis play a great role in IDDM patients: in pathogenesis, complications, insulin resistance, dawn phenomenon and fat disorders. The aim of the study was to estimate the influence of the type of therapy on growth hormone axis abnormalities in children with IDDM.
Materials and methods: Sixty-seven patients and 15 age matched healthy children were included into the study. All children were prepubertal (T < 2), suffering for IDDM for more than 2 years, without any coexisting diseases. All patients were divided into groups according to the type of therapy. 22 were treated with conventional insulin therapy (CIT), 21 with multiple injections

(MII) and 24 with continuous subcutaneous insulin infusion (CSII).There were no statistically significant differentials between groups as to the metabolic control, weight, height, BMI and age. Blood and urine samples were taken between 7.30 and 8.30 AM. In hospital in normoglycemia after the night without episodes of hyper or hypoglycemia. All analysis were made by RIA and ELISA commercial kits.

Results: Growth hormone levels were lower in diabetic children and did not depend on the kind of therapy, GHBP levels were lower in diabetic children and were rising with the intensity of the treatment. IGF-1 levels were higher in diabetic children (the highest MII), IGF-1BP1,2,3,6 were higher in diabetic children, although IGF-1BP2,3,6 were rising with the intensity of therapy and IGF-1BP1 was the lowest in CSII and the highest in CIT patients.

Conclusions: The type of treatment appears to have an influence on the levels of: GHBP, IGF-1and IGF-1BP2,3,6 but not have an influence on IGF-1BP1 and growth hormone levels.

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Economic prejudice of childhood type 1 diabetes on household budget

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Background: Childhood diabetes mellitus (DM) causes medical, psychological and financial burdens. The need to achieve optimal metabolic control and the availability of novel therapeutic tools create a situation of increased care. Concomitantly, basic insurance coverage tends to decrease in most industrialized countries.

Aims: To evaluate direct and indirect cost of paediatric DM among Swiss French families as a function of income.

Subjects and method: A fully anonymous detailed questionnaire was sent to families of DM families in order to obtain after tax income, compulsory and optional expenses. Three groups of families were analysed according to income: (i) low income (LI): < €3750/month (n = 11); (ii) middle income (MI): €3750–5850/month (n = 11); (iii) high income (HI); > €5850/month (n = 10). Detailed expenses are expressed as percentages of income and compared to the values recently published by the Swiss federal office for statistics. The average Swiss family (ASF) income is €4934/month.

Results: Out of 60 families, 32 (53%) returned a fully filled questionnaire. In four families out of 32 (12.5%) one parent stopped working because of DM. Expenses for direct DM costs constituted 17% of average monthly income in LI group compared to 4% for the ASF. Indirect DM costs added to another 5% in LI group. Food budget was dramatically increased in all three groups (25% in LI, 24% in MI, 17% in HI) as compared to 8% for the ASF. Budget for rent and energy represented 23–32% of income, higher than the ASF (18%). Accordingly, budget devoted to leisure activities (2–3%) was smaller than for the ASF (6%). Insurance costs (10–16%) were lower than for the ASF (22%).

Conclusion: Childhood DM can cause a dramatic loss of purchasing power, particularly in less privileged families. In some cases, it can generate a negative budget balance with potential counterproductive effects on diabetes balance (diminished access to new therapeutic tools, less care), hence on the early occurrence of DM complications.

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How often are alternative therapies (AT) used in children and adolescents? Is this usage dependent on social status, income or is there a difference between East and West Germany?

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Introduction: In adults with diabetes the use of alternative medicine is reported quite frequently. Data on children and adolescents are rare. In case reports diabetic ketoacidosis is reported due to omission of insulin in patients using alternative medicine.

Aims: How often are alternative therapies (AT) used in children and adolescents? Is this usage dependent on social status, income or is there a difference between East and West Germany?

Methods: A questionnaire that was developed from a study with asthmatic children. Families from Bonn, Berlin, Stuttgart, and Leipzig were invited to take part.

Results: A total of 347 questionnaires were released (Berlin 74, Bonn 52, Stuttgart 100, Leipzig 121). For analysis 220 were returned. The rate of return differed between the centers (50%–70%). AT was reported by 41 patients (19%). There was a significant difference between centers in East- and West-Germany. In (East) Berlin and Leipzig 11% and 15% of the patients used AT, while in Bonn the rate of users was 19%. In Stuttgart even 29% reported to use AT ($p < 0.05$). Vitamins and mineral supplements (n = 18) and special diets (n = 16) were most frequently used. Homeopathy (n = 16) and herbal medicines like Aloe Vera (n = 8) or cinnamon (n = 6) were also reported. Alternative Medicine, like anthroposophic medicine (n = 3), Ayur Veda (n = 2), and South American ethnic medicine were used in a lower frequency. Even miracle healing and reincarnation-therapy were reported. There was no correlation to severity of manifestation, nor to actual metabolic control.

Conclusions: Despite the common known origin of type 1 diabetes in this cohort 19% of patients report the use of uncertain, often unproven therapies that are frequently not covered by the insurances. Beneath the risk of developing complications due to insulin omission one should rise the question weather we don't catch these families with their problems and they have to look for AT.