# P-41

## Continous subcutaneous insulin therapy (CSII) in children and adolescents with type 1 diabetes

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**Background:** Continuous subcutaneous insulin infusion (CSII) is thought to be an alternative intensive treatment of type 1 diabetes (T1DM), in adults as well as in children. The aim of this study was to evaluate the clinical and metabolic features in a group of pediatric diabetic patients, before and after the beginning of CSII.

**Methods:** We evaluated 20 T1DM patients subdivided into two groups: group A (5 prepubertal children: 2 M, 3 F; mean age 8.9±0.9 yr; BMI 16.5±2.3); group B (15 pubertal patients: 3 M, 12 F; mean age 14.7±1.6 yr; BMI 21.8±2.5). Clinical, metabolic (HbA1c values) and insulin dose related data were evaluated before and 6 months after the beginning of CSII.

**Results:** No significant difference in total daily insulin requirement was observed in group A patients switching from multiple injection therapy to CSII. In this group basal insulin dose represented 60% of total insulin; maximal basal rate occurred late in the afternoon, in the evening and during the first part of the night (from 4.00 p.m. to 3.00 a.m.). Group B patients had a significant decrease of total insulin (-25%) when passed to pump therapy; the basal insulin dose represented 40% of the total and the maximal basal profile occurred from 4.00 p.m. to 8.00 p.m. and from 3.00 a.m. to 7.00 a.m. After 6 months of CSII no significant differences of BMI were observed in the two groups. Only group B patients showed a significant decrease of HbA1c levels (9.1±2.4 vs 7.9±1.5, $p<0.005$). The incidence of hypoglycemic events decreased in both groups (A: from 6.4±3/month to 3.6±3/month; B: from 4±3/month to 1.8±1/month).

**Conclusions:** CSII is an effective alternative to traditional intensive insulin treatment. Age-specific metabolic requirements should be taken into account when starting pump therapy.

# P-42

## Insulin pump therapy in adolescents in Scotland: Investigating health beliefs of patients and health professionals

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**Background:** The current use of insulin pumps is limited in the UK. A Centre of Excellence has been established in Dundee, Scotland in order to pilot continuous subcutaneous insulin injection (CSII) therapy in young people with type 1 diabetes. The aim of this research is to determine the cultural, social and behavioural influence on the uptake of CSII therapy in young people, by investigating perceptions of diabetes and its management by patients and health professionals.
**Methods:** Anthropological qualitative research involved extensive (1 year) observation of clinic consultations at the diabetes centre, observing health carer-patient interaction in CSII therapy. Health beliefs and cultural values were investigated through in-depth semi-structured interviews (bimonthly) with adolescent patients on CSII (n=12) and their health professionals (n=6).
**Results:** The uptake and implementation of CSII therapy is strongly influenced by cultural and social values. Moreover, a dynamic interaction exists between the ways in which health professionals and adolescents perceive diabetes and CSII therapy. Both health professionals and patients see diabetes as interfering with adolescents' lives. Both interpret CSII therapy as the 'herald of freedom' and a tool to give young people 'back their lives'. CSII therapy was thus not combined with intense management routines, as this would defy its pragmatically perceived and lived 'benefits'. The everyday quality of life took priority over the medical tight glycaemic control.
**Conclusions:** The dynamic relationship between health professionals' and adolescents' perceptions of diabetes, and the broader cultural values of their social community and everyday life, influence how CSII therapy is implemented. In order to improve the outcome of CSII management it is crucial to first investigate and determine these underlying health beliefs and cultural values.

# P-43

## Can continuous glucose monitoring improve long-term metabolic control and decrease hypoglycemic events in paediatric patients with type 1 diabetes and HbA1c >8%?

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**Background:** Recent studies have demonstrated a promising effect of the Minimed Continuous Glucose Monitoring System (CGMS) on lowering HbA1c values. Most of these results were however obtained after a short follow -up period. The objective of the present study was to examine whether CGMS could improve HbA1c levels and lower frequency of nocturnal hypoglycemic events after 3, 6, 9 and 12 months of follow-up.
**Methods:** Thirteen patients with type 1 diabetes were enrolled in this study. Patients were recruited if they had average HbA1c levels >8.0% during the previous year. Six of them were randomly assigned to the control group (regular ambulatory visit every 3 months and 4 finger-prick blood glucose measurements daily), seven to the CGMS group (conventional treatment and CGMS monitoring at 3, 6, 9 and 12 months). HbA1c values were obtained at 0, 3, 6, 9 and 12 months. There was also an evaluation of the CGMS data for frequency of nocturnal hypoglycemic events (glucose values <50 mg/dl) and the effect of CGMS on lowering this frequency.
**Results:** Results were available in 12 patients; one patient of the CGMS group dropped out of the study for psychosocial reasons. The mean age of the patients was 14.8 years. After 3 months there was a statistically significant reduction of HbA1c in the CGMS group but not in the control group ($p<0.05$). This beneficial effect was not confirmed after 6, 9 and 12 months. Although adjustments of insulin and dietary therapy were made after each monitoring period no decline in nocturnal hypoglycemia was seen in the CGMS group after 3, 6, 9 and 12 months.
**Conclusions:** In this study, the positive short-term effect of continuous subcutaneous glucose monitoring on HbA1c values was confirmed. After a longer follow-up period, however, no difference in HbA1c values between the CGMS and control group could be seen. Secondly, it was demonstrated that the frequency of nocturnal hypoglycemic episodes could not be diminished by repeated CGMS monitoring.

# P-44

## Evaluation of forearm blood glucose testing in children and adolescents with diabetes mellitus

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**Background:** Self monitoring of blood glucose levels plays a vital role in the treatment and management of diabetes. Barriers to frequent self monitoring include the pain and trauma associated with finger pricking. Non-compliance is common especially in adolescents. Using an alternate site for sampling, namely the forearm, may be beneficial.
**Objective:** To assess the accuracy of the SoftSense blood glucose monitoring system in comparison to a standard reference laboratory method and to determine the opinions of children and parents.
**Methods:** The study compared blood glucose measurements from samples taken from the forearm and the finger. 52 children and adolescents with diabetes were included aged 6-17 yr. Two devices were assigned to each participant; two forearm and two finger prick tests were performed. Finger prick capillary blood was analysed within 10 min using a Yellow Springs instrument. Prior to testing opinions were collected on finger prick and forearm testing from both the child and parents and opinions relating to pain and convenience of use were recorded after testing. Results were plotted on the Clarke Error Grid.
**Results:** 46 patients (20 boys and 26 girls) had a mean age of 13 yr. The mean duration of blood glucose monitoring was 5.0 yr (0.1-15.5). Using the Clarke Error Grid 100% of measurements were within zones A and B (93.5% within zone A). The mean paired replicate coefficient for SoftSense finger prick results was 3%. On forearm testing 100% of measurements were within zones A and B (84% within zone A). 57% of children indicated that problems associated with finger prick testing had a negative impact on their frequency of testing. 80% of children rated the SoftSense as less painful than their usual finger prick method. 55% of children said they would test more often.
**Conclusion:** The SoftSense system has been shown to have acceptable performance characteristics. The study demonstrated that forearm sampling is acceptable to children and adolescents and seems to be preferred.

# P-45

## Treatment of Mauriac syndrome with base-large dosage insulin therapy: A preliminary observation

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**Background:** Mauriac syndrome is a complication of type 1 diabetes mellitus in children leading to dwarfism and a glycogen-loaded, enlarged liver. It is related to underinsulinization. We observed the effect of base-large dosage insulin therapy in patients with Mauriac syndrome.
**Methods:** Five patients with Mauriac syndrome, aged 12.4-14.8 years, were treated with base-large dosage insulin therapy for a period of one year. The total daily insulin dose (1-1.2 U/kg) was divided into four injections: three injections of regular fast-acting insulin prior to each meal and an injection of an intermediate-acting insulin prior to sleep. Approximately two-thirds of the total dose was fast-acting insulin and one-third intermediate-acting insulin. The patients were matched for nutritional management and moderate exercise.
**Results:** With the four injection insulin regimen, hyperglycemic episodes were controlled gradually, both fasting plasma glucose (FPG) and 2-h postprandial plasma glucose (2hPG) values and $HbA_{1c}$ levels decreased in the five patients (FPG from 13.3±1.6 mmol/l to 7.6±0.3 mmol/l, 2hPG from 19.5±1.8 mmol/l to 12.3±0.5 mmol/l, and $HbA_{1c}$ from 13.7±0.9% to 7.6±0.5%). Incidence of ketoacidosis decreased. Growth velocity (GV) increased significantly (from 1.7±0.3 cm to 5.9±1.5 cm). The enlarged liver diminished gradually and creatinine values decreased to normal.
**Conclusion:** The improved control of plasma glucose levels by base-large dosage insulin therapy leads to improvement of early Mauriac syndrome.

# P-46

## Newly onset diabetic ketoacidotic children without elevation of HbA1c levels

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**Background:** In 2000, Imagawa and colleagues reported (N Engl J Med 342:1835) a novel subtype of type 1 diabetes, so-called fulminant type 1 diabetes, in Japan. All cases were adult onset. Here we present four children with fulminant type 1 diabetes in Japan.
**Patient reports:** All four patients were admitted with diabetic ketoacidosis and treated with continuous insulin therapy. DKA developed within two to four days. Their HbA1c levels were normal. GAD antibody was negative in all patients except one (Pt. 4). Pt. 1 was a 10 yr-old girl with 628 mg/dl BG, 2860 μM/l s-3OHBA and b-pH 7.35. IA-2 Ab was negative and HLA type was DR 4,9. Pt. 2 was a 15 yr-old girl. BG, s-3OHBA and b-pH were 1,134 mg/dl, 12,603 μM/l, and 7.24, respectively. IA-2 Ab was negative and HLA showed DR 4. Pt. 3 was a 12 yr-old boy. His BG was 791 mg/dl, s-3OHBA was 1,1640 μM/l and b-pH was 7.05. IA-2 Ab was negative and HLA type was DR 4,9. Pt. 4 was a 10 month-old boy. His laboratory data were: BG 1,102 mg/dl, s-3OHBA 10,504 μM/l and b-pH 6.96. GAD Ab titer was 1.7 U/ml (negative <1.5) and became normal after six months. ICA and insulin antibodies were negative.
**Conclusion:** In three patients, none of the autoantibodies such as ICA, GAD Ab, antibodies to insulin and IA-2 or IAA were detected. Therefore, they were classified as fulminant type 1 diabetes in Japan. The patient with a very low GAD Ab titer and negative ICA and IAA may also be classified as fulminant type 1 diabetes. Detailed examination of children with type 1 diabetes without autoantibodies may clarify the frequency of fulminant type 1 diabetes in children.

# P-47

## Treatment of diabetic ketoacidosis (DKA): Subcutaneous lispro versus continous intravenous regular insulin

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**Background:** Conventional treatment of DKA consists of parenteral hydration and i.v. regular insulin aiming at metabolic normality. To avoid the need for a second i.v. line and looking for a technical and economical simplification of DKA treatment in developing countries, we proposed the use of subcutaneous Lispro insulin instead of i.v. continuous regular insulin.

**Methods:** 0.15 U/kg was given every 2 hr in 15 patients with DKA and compared with regular 0.1 U/kg/h in 18 episodes of DKA, from June 2001 to April 2002. Volume deficit was treated with 10 ml/kg aliquots of 0.9% sodium chloride. Insulin was administered after the first hour of fluid replacement.

**Results (mean±SD):**

| Variables | | Initial | 6 h | 12 h |
|---|---|---|---|---|
| **Glucose** (plasma) | IV Regular | 469.06 ± 135.79 | 169.85 ± 82.11 | 199.31 ± 75.25 |
| mg/dL<br>Student's t-test | *SC Lispro* | *432.4 ± 104.25*<br>p = 0.40 | *242.73 ± 80.11*<br>**p = 0.03** | *242.73 ± 80.11*<br>p = 0.88 |
| **Bicarbonate** (serum) | IV Regular | 9.16 ± 3.43 | 15.86 ± 4.72 | 19.30 ± 3.69 |
| mEq/L<br>Student's t-test | *SC Lispro* | *9.52 ± 4.93*<br>p = 0.82 | *12.77 ± 6.68*<br>p = 0.32 | *13.0 ± 4.34*<br>**p = 0.02** |
| **β-Hydroxybutyrate** | IV Regular | 9.91 ± 2.91 | 2.61 ± 1.88 | 1.13 ± 2.09 |
| (plasma) mmol/L<br>Student's t-test | *SC Lispro* | *9.72 ± 1.35*<br>p = 0.88 | *2.78 ± 3.43*<br>p = 0.91 | *1.48 ± 1.93*<br>p = 0.50 |
| **Potassium** (serum) | IV Regular | 5.31 ± 0.68 | 4.32 ± 0.51 | 3.97 ± 0.25 |
| mEq/L<br>Student's t-test | *SC Lispro* | *5.11 ± 0.67*<br>p =0.62 | *3.94 ± 0.43*<br>p = 0.11 | *3.56 ± 0.44*<br>**p = 0.03** |
| **Phosphate** (serum) | IV Regular | 5.94 ± 1.32 | 2.99 ± 0.76 | 2.65 ± 1.20 |
| mg/dL<br>Student's t-test | *SC Lispro* | *5.09 ± 1.70*<br>p = 0.10 | *3.50 ± 1.19*<br>p = 0.30 | *3.03 ± 0.96*<br>p = 0.96 |
| **Osmolality** (plasma) | IV Regular | 319.75 ± 10.93 | 304.64 ± 4.55 | 300.2 ± 9.95 |
| mOsm/kg<br>Student's t-test | *SC Lispro* | *315.03 ± 12.45*<br>p = 0.28 | *301.75 ± 6.70*<br>p = 0.36 | *301.36 ± 5.41*<br>p = 0.76 |

**Conclusion:** Treatment of DKA with sc Lispro was very efficient with the advantage of avoiding a second i.v. line. To correct hyperglycemia and acidosis took longer, and was associated with lower serum potassium levels.

# P-48

## Diabetes management during day-case endoscopy

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**Background:** Children with type 1 diabetes mellitus (TIDM) are regularly screened for coeliac disease, and a proportion require duodenal biopsy to confirm the diagnosis. Guidelines for the management of the diabetes during surgical procedures are available, but there are no specific guidelines during endoscopy.
**Aim:** To compare current practices with existing guidelines for elective day case surgery in paediatric surgical patients with T1DM.
**Methods:** We reviewed the medical records of children and adolescents with TIDM who underwent early afternoon day-case duodenal biopsy (1994-2002). Data collected included dose and route of insulin, blood glucose (BG) levels throughout the day and rate/concentration of dextrose infusions.
**Results:** 16 patients underwent duodenal biopsy from 1994 to 2002. Mean age was 12.1 yrs (range 7.8-15.6), duration of diabetes 4.2 yrs. Guidelines for day-case surgery were not systematically followed: patients injected different insulin doses in the morning of endoscopy, BG values were not measured and recorded regularly, insulin infusions were not used consistently. Insulin regimens in the morning included: normal dose of short- and long-acting (n=4), normal dose of long-acting only (n=6), half dose of long-acting (n=1), increased dose of short-acting only (n=2), no insulin (n=1), unrecorded in 2. BG levels on admission were lower (mean 3.5; 3.1-4.0 mmol/l) in the 2 who had only short-acting insulin compared to the remainder (mean 13.8 mmol/l; 4.5-22 mmol/l). All patients had adequate BG levels during the endoscopy procedure but 10/16 experienced BG <4.0 mmol/l at some stage during admission. 15/16 patients started IV dextrose prior to endoscopy. Apart from 3 patients who received dextrose for acute hypoglycaemia, all other infusions were started with satisfactory BG levels. Although 12 patients had BG levels above 12 mmol/l at some point during the day, only 4 received IV insulin.
**Conclusions:** It is appropriate to give normal doses of insulin before admission for afternoon day-case endoscopy, if BG levels are monitored regularly, and 5% dextrose is started on admission. It is important to appreciate the downward trend in BG levels post endoscopy, to increase the concentration of dextrose if necessary and ensure that the child is eating well before stopping the IV dextrose.

# P-49

## The assessment of management for type 1 diabetes mellitus

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**Background:** Beijing Children's Hospital took part in the assessment of Diabcare of IDF-WPR 2001 (International Diabetes Federation, West Pacific Region), a benchmarking survey, with the aim to analyze factors affecting diabetic control.

**Methods:** Diabetic children less than 18 yr old who were registered in our hospital for management of diabetes for more than 12 months visited this center from Dec. 1st, 2001 to Mar. 22nd, 2002. Pediatricians filled in a standard ISPAD form for each patient. HbA1c of patients was determined by automatic HPLC in an appointed center laboratory. Patients were subdivided into 3 groups by HbA1c levels according to the "Consensus Guidelines 2000". Analysis of affecting factors included: chi-squared test, Fisher test, Avon test, t-test and regression analysis.

**Results:** The average HbA1c level of patients was 9.8%. Duration of diabetes was not the most important factor affecting glycemic control. Pre-school onset diabetic children had better control. Females had worse control than males ($p=0.03$). There was no significant difference in the insulin dose between males and females (0.78±0.25 U/kg/day in males vs 0.76±0.24 U/kg/day in females, $t=0.44$, $p=0.66$). Self-monitoring of blood glucose was carried out only twice a month, this was less than the average frequency reported in WPR data. The average insulin dose of these patients was 0.77 U/kg/day, which was less than the average dose of WPR. The proportion of two daily injections was high, 92%.

**Conclusion:** The main factors affecting diabetic control in this patient group were insufficient insulin treatment and deficiency of BG self-monitoring. Sex was an independent factor in affecting diabetes control. Management was very important for the glycemic control of diabetic children. Preschool children who are provided with special care attain better control.

# P-50

## Metabolic control in Siberian children and adolescents with type 1 diabetes mellitus

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**Objective:** To determine the current status of medical care of children and adolescents with type 1 diabetes mellitus and the level of glycemic control as assessed by hemoglobin A1c.
**Methods:** We investigated 94 diabetic patients, aged 8 to 16 years, at the regional pediatric hospital, representing 63% of all children and adolescents with type 1 diabetes mellitus in Krasnoyarsk territory. All diabetic patients received three or more daily insulin injections.
**Results:** The average HbA1c was 12.3%. In 88% of all diabetic patients the HbA1c levels were higher than 10%. Diabetic complications were found in 74% of the patients. Growth retardation was present in 15.6% of patients, Mauriac syndrome (growth and puberty retardation, hepatomegaly) in 12%. The prevalence of microalbuminuria was 12% (mean duration of diabetes: 8.1±1.5 yrs., average HbA1c: 12.8±0.6%.). Proteinuria (487 mg/day) was detected in one patient. Diabetic retinopathy was diagnosed in 24% (mean age: 12.8±0.5 yrs, mean duration of diabetes: 5.7±0.3 yrs). Retinopathy was present in 33% of children with 5-10 yrs duration of diabetes and in 50% of the patients with more than 10 yrs duration. A diabetic cataract was diagnosed in 4 patients. Limited joint mobility was found in 33% (mean duration of diabetes 6.7±0.2 yrs). Diabetic neuropathy was diagnosed in 16% of the patients (mean age 11.9±0.6 yrs, mean duration of diabetes 5.5±0.2 yrs.; mean HbA1c 14.5±4.3%).
**Conclusions:** These results confirm that diabetic complications are associated with poor metabolic control. Current treatment of childhood diabetes is inadequate in Krasnoyarsk territory.

# P-51

## Persistent differences in glycemic control among JSGIT centers in two cohorts over 4 years for the first and 2 years for the second

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**Background:** The Hvidøre study is well known as a study of the differences in glycemic control of children and adolescents with type 1 diabetes among international centers. JSGIT, established in 1994 to improve the quality of therapy for type 1 diabetes (T1DM) in children, was conducted on two nationwide cohorts: one started in 1995 and finished in 1999, and the other started in 2000. We compared glycemic control in each center of the two cohorts to determine the time trend and differences between centers.
**Methods:** The 1995 cohort recruited 546 children from 29 centers who were born from 1987 to 1988 and developed T1DM until 1995; the 2000 cohort recruited 796 children from 51 centers who were born from 1982 to 1999 and developed T1DM until 1999. The medical record including HbA1c was collected every 4 months.
**Results:** In addition to a decrease of 0.6% of mean HbA1c from 1995 to 1999, there were significant correlations of HbA1c at the starting and closing points in both 1995 and 2000 cohorts ($p=0.02$ and 0.001, respectively). The starting and closing HbA1c of each center in both cohorts also correlated significantly ($p=0.002$ and 0.0001, respectively). There were no correlations among HbA1c, insulin dose (U/kg), insulin regimens, sex, and the proportion of children aged 15-18 yr at each point of the two cohorts.
**Conclusion:** This study reveals significant correlations for the outcome of HbA1c in each center in the two cohorts. There may be other ways to use insulin therapy in order to lead to improved HbA1c.

# P-52

## Insulin resistance in type 1 diabetes mellitus

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**Background:** Changes in life style (more frequent obesity, decreasing physical activity) and increasing incidence of type 1 and type 2 diabetes mellitus have focused new interest on insulin resistance in children with diabetes. The aim of this study was to estimate insulin resistance in type 1 diabetic children, adolescents and young adults and to assess the relationship between insulin resistance and clinical course of diabetes.
**Methods:** 131 patients with type 1 diabetes mellitus (81 male, 50 female) aged 7.7-20 years (mean 13.7±3.3) were included in the study. Duration of diabetes was 0.5-15 years (median 2.7±2.4). Euglycemic-hyperinsulinemic clamp by de Fronzo was performed to estimate insulin resistance. Glucose disposal rate (GDR) was determined during the last 30 min of the test. Plasma cholesterol, HDL-C, triglycerides and HbA1c were examined. Height, weight, skinfold thickness, waist and hip circumference and blood pressure were measured. Body mass index and waist/hip ratio were calculated.
**Results:** In children and adolescents with type 1 diabetes mellitus the GDR ranged from 2.0 to 14.7 mg/kg/min (mean 6.7±2.6 mg/kg/min). The insulin resistance depended on the patients' age ($r = -0.4$, $p<0.001$). It was significantly greater in pubertal and post-pubertal individuals than in prepubertal children ($p<0.001$). Insulin sensitivity was better in males than females (7.3±2.8 vs 5.9±1.9 mg/kg/min, $p<0.005$). Correlations between GDR and BMI, skinfold thickness, WHR were found ($p<0.001$). There was a significant relationship between glucose infusion rate and insulin dose ($r = -0.24$, $p<0.05$). No correlation between GDR and duration of diabetes or HBA1c was observed.
**Conclusion:** Insulin resistance is observed in type 1 diabetic children, adolescents and young adults. Insulin resistance is greater during puberty and in the post-pubertal period and correlates with obesity. Children with insulin resistance need greater insulin doses to achieve good metabolic control.

# P-53

## The effects of a specific growth hormone antagonist (Somavert®) on insulin sensitivity and lipolysis in young adults with type 1 diabetes

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**Background:** Growth hormone (GH) hypersecretion in adolescents with type 1 diabetes mellitus (T1DM) may contribute to decreased insulin sensitivity. We have studied the effects of 2 doses (5 & 10 mg; S5 & S10, respectively) of a GH antagonist (B2036-PEG; Pegvisomant, Somavert®, Pharmacia Corporation) on overnight insulin sensitivity with respect to both lipid and glucose turnover.

**Methods:** Seven young adults (17-22 years, 3 M) with T1DM participated in an investigator blinded, crossover study of 3 weeks' treatment S5 & S10 in random order, separated by a 3-week washout. At baseline and following each treatment block, overnight (0300 to 0800 h) insulin requirements for euglycaemia (5 mmol/l) were determined using a variable rate insulin infusion, followed by assessment of insulin sensitivity using a 2 step hyperinsulinaemic euglycaemic glucose clamp (0800 to 1200 h, 0.75 mU/Kg/min and 1.5 mU/Kg/min). The stable isotopes [6,6 $^2H_2$]-glucose and $^2H_5$-glycerol were used to measure glucose and glycerol turnover respectively. Non-esterified fatty acid (NEFA) and β-hydroxybutyrate (βOHB) levels were measured hourly overnight and during the clamp.

**Results:** Compared to baseline, overnight insulin requirements decreased with both doses (mU/Kg/min, mean±SEM): 0.34±0.02 vs 0.25±0.01 (S5) (p=0.04) and 0.24±0.01 (S10), (p=0.004). IGF-I (ng/ml) decreased following S10: 223.5±23.9 vs 154.6±28.1 (p=0.005), but not S5. Mean overnight NEFA (mmol/l) decreased with S10: 0.51±0.04 vs 0.38±0.04 (p=0.03), as did βOHB (mmol/l): 0.31±0.04 vs 0.15±0.02 (p=0.004). Glycerol production rate, an index of lipolysis, was lower following S10 (p=0.04).

**Conclusion:** Treatment with both doses of B2036-PEG reduced overnight insulin requirements. S10 suppressed lipolysis and reduced IGF-I. Failure to demonstrate enhanced insulin sensitivity during the clamp with S10 may reflect opposing actions of GH and IGF-I.

# P-54

## Differences in demography and metabolic control between participants and non-participants in a research study

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**Background:** It is important to know whether participants in a research study are representative of the whole group. Hypothesis: Factors influencing non-participation in particular types of research may significantly affect results.

**Methods:** During one year 37 consecutively diagnosed children and adolescents in a single centre were given the opportunity of participating in a long term research study investigating the remission phase with respect to glycaemic control, insulin administration and residual endogenous insulin secretion. Over the first two years of the study the metabolic control, severe hypoglycaemic events and insulin dosages were analysed. In addition a simple scoring sheet was completed by the specialist nurses in an attempt to determine the influence of variables such as distance from hospital, single parenting, parental support and psychological or educational difficulties.

**Results:** Participants (n=20) in the study were more likely to be female (<0.01) and not from an ethnic minority. They were treated with similar insulin doses (U/kg/d) but had significantly lower HbA1c levels at 6 months ($p<0.01$) and at 24 months ($p<0.05$) and had fewer severe hypoglycaemic events recorded. The scoring system in individuals identified associations with metabolic control but the combined scores of the two groups did not differentiate between the participants and non-participants.

**Conclusion:** When non-participation in a research study is influenced by factors such as poor family support or psychological difficulties, this is likely to bias results. Reasons for non-participation should always be taken into consideration when analysing research results.

# P-55

## Physical education, physical activity and metabolic health in British primary school children (The EarlyBird Programme)

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**Background:** Physical activity is an independent determinant of insulin resistance in adults, but less is known of its impact in children. Opportunity for physical education in schools varies and our aim was to determine its impact on total physical activity levels and insulin resistance.
**Methods:** Cross-sectional study of 159 children, aged 7 to 10 yr, from three schools offering different opportunities for physical education (S1: 9 h/week, S2: 2.2 h/week, S3: 1.8 h/week). Main outcome measures: total physical activity (PA) over seven days by CSA accelerometer, anthropometry, insulin resistance (HOMA-IR), fasting lipids.
**Results:** 1) Despite four-fold differences in timetabled physical education, there were no corresponding differences in total PA (units/week) between schools. Indeed, total PA among the boys was higher in S2 (39.1) than in S1 (34.7, $p=0.02$). 2) There were no significant differences in insulin resistance between schools. 3) Girls recorded less total PA than boys ($p=0.007$), had higher insulin resistance ($p<0.001$) and higher triglyceride levels ($p=0.04$).
4) In girls, there were modest inverse relationships between total PA and insulin resistance ($r= -0.27$, $p=0.02$), triglycerides ($r= -0.24$, $p=0.04$) and cholesterol/HDL ratio ($r= -0.26$, $p=0.03$). In boys, total PA was related to fat percentage ($r= -0.29$, $p=0.008$), sum of five skinfolds ($r= -0.29$, $p=0.007$) and cholesterol/HDL ratio ($r= -0.23$, $p=0.04$). 5) Insulin resistance was clearly related to triglyceride levels in both sexes (girls: $r=0.41$, boys: $r=0.39$, $p<0.001$).
**Conclusions:** Physical activity clearly impacts on the metabolic health of primary school children and it is of concern that young girls are significantly less active and already more insulin resistant than boys. The amount of physical education provided *in* school, however, appears not to matter, as children will compensate *out* of school. These data may be important to the allocation of limited time and resources at school.

# P-56

## Long-term efficacy of physical activity on metabolic control in type 1 diabetes

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**Background:** Although physical activity is frequently recommended in the management of type 1 diabetes it is not yet established whether practising regular exercise could actually improve long-term outcome of metabolic control. In this follow-up study we assess the impact of long-term physical activity in patients with type 1 diabetes mellitus.
**Methods:** We studied 69 patients with type 1 diabetes mellitus, 43 boys and 26 girls, aged at onset of the disease 9.0±3.9 years with a mean duration of the disease of 97±63 months. The patients were classified according to the duration of the disease in 3 groups [A: 24-60 months (n=69); B: 61-120 months (n=41); C: ≥121 months (n=19)]. All patients were on intensive insulin regimen (3 shots of regular and 1-2 shots of long-acting insulin) and seen in our diabetic clinic every 2-3 months. Every time the patients were seen in our clinic they were asked how much time they spent doing physical activity every week and the type of physical activity performed. The average time spent weekly doing exercise was then calculated for each patient in the three duration periods taken into account. Moreover we recorded the number of hypoglycaemic events both symptomatic and non-symptomatic as reported in the personal diary and we measured HbA1c by DCA 2000 equipment.
**Results:** On average our patients reported 3.0±2.9 hours of physical activity per week. On the basis of the hours/week of physical activity we split the patients into 4 groups [G1: <2 hrs/week (46%); G2: 2-4 hrs/week (29%); G3 >4 hrs/week (22%); G4: >8 hrs/week (3%)]. The distribution of the four groups of patients was the same in the three groups of duration of the disease. The duration group B showed a significantly lower HbA1c and HbA1c adjusted for duration of the disease in G3 compared to G1 ($p<0.05$) and G2 ($p<0.01$). No differences were found for insulin requirement and weight excess between active and sedentary patients.
**Conclusion:** 4 hours/week of exercise can improve long-term metabolic control.

# P-57

## Dietary management for diabetic children and adolescents: Personal experience and recommendations

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Diet traditionally plays an important role in diabetic therapy. Various diets have been proposed without scientific evidence. One error was to speculate on a direct linear relationship between the injection of *x* units of insulin and the utilization of *y* grams of glucose. In this case, one should give more insulin to practice physical activity! In reality, the reverse is true! Dietary recommendations issued over the last few years are the same for diabetic and non-diabetic individuals in order to avoid degenerative diseases. In many countries, fat intake is too high and that of complex carbohydrates too low. The so-called "Mediterranean diet" seems optimal. It consists mainly of fiber-rich complex carbohydrates, vegetables, fruits, fish, and olive oil. Dietary education should focus on quality rather than quantity of food and should be given by a multidisciplinary team. Prescription of a highly rigid diet has proved ineffective in producing adequate metabolic control, and increases the risk of deviations from the diet. In our experience, the adequate use of the 2-injection regimen together with a correct meal schedule may lead to "intensive conventional therapy" and good metabolic control. It is inadequate to systematically assimilate the multiple-insulin injection regimen to intensified insulin therapy, and the "conventional" 2-injection regimen to a non-intensified insulin therapy. The use of the basal-bolus regimen, with increased flexibility in daily life and dietary freedom, is difficult to apply before adolescence. The adjustment of insulin dosage is more complicated because dose alterations cannot be done only according to sliding scales based on the glycemia measured immediately before the insulin injection. The use of fast-acting insulin analogues in the basal-prandial regimen improves post-prandial glycemia at the expense of an increase in pre-prandial glucose levels, if the time-period between 2 meals (i.e. 2 injections) exceeds 3 to 4 hours because of the short duration of action. In this case the use of a rapid-acting insulin is more appropriate.
No dogmatism! Only the objective results (good glycated hemoglobin and lipid levels, as well as good quality of life) are important.

# P-58

## Fruit, vegetable, dairy products and sweets consumption in 10 year-old European children

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**Background:** A healthy approach towards food intake from childhood onwards may prevent chronic disease in late childhood or adult life (obesity, NIDDM, CVD). To improve and guide nutritional education at school, food intake of healthy children attending primary school was analysed.
**Methods:** To determine the food choices of 4th grade primary school children of the European School Luxemburg, a questionnaire based on the food guide pyramid servings was elaborated and translated into the first language of the children. Children of 12 different nations participated. Filling out the questionnaires was part of the children's homework. A 2-day diet record (long day and a short day at school) of each child was obtained. The food guide pyramid was designed by the USDA to represent graphically dietary guidelines. The mean energy intake for 9 yr old children was fixed at 2000 kcal, using WHO tables and NCHS growth charts. Servings from each food group were fixed for this energy intake. Intake was compared to the food guide pyramid servings.
**Results:** In total, 436 questionnaires were analysed. 45% of children do not eat fruit; 43% do not eat vegetables at all. On a long day at school, 49% do not eat fruit, compared to 41% on a short day. On a long day, 43% do not eat vegetables, 41% on a short day. Only 24% of the children eat enough dairy products. 55% of the children eat more sweets than recommended. In the Spanish group, only 12% do not eat fruit compared to 75% in the German group. 67% of German children have an extremely poor vegetable intake (0 serving) compared to 15% of Spanish and 17% of Portugese children.
**Conclusion:** In normal healthy schoolchildren, more than 40% of the children eat no fruit and/or vegetables; in more than 50% sweet intake is increased. The Eurodiab IDDM studies confirm a further decrease of good dietary habits in adults. These observations stress the importance of nutritional (re)education from childhood onwards. Due to the same results on short day/long day, efforts need to be made both at home and in school. Improved canteens, fruit distributors instead of candy machines, adequate information for teachers, children and parents may be useful to improve eating habits.

# P-59

## Positive food choices in children and adolescents with diabetes

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**Background:** Cardiovascular mortality is 2-4 times higher in people with type 1 diabetes compared with the general UK population and atherosclerosis begins early in childhood. Therefore dietary education should include advice on reducing cardiovascular risk by decreasing saturated fat, raising mono-unsaturated fat and increasing the intake of antioxidants. Children in the UK rarely achieve these dietary recommendations. We wanted to compare the food choices of children with diabetes with children without diabetes to evaluate the effectiveness of dietary education.

**Methods:** A Food Intake Questionnaire was administered to 82 children and adolescents with diabetes. The questionnaire is a validated tool in this age group based upon 24-hour recall. It asks the question 'Did you eat yesterday any of the following foods/drinks?' The frequency for individual foods and drinks was analysed and scored. In addition foods were aggregated into nine marker food groups: fatty, altered fat products, snacks, sugar, low sugar, fibre (fruit & vegetables), salty, negative and positive marker foods. These scores were compared to national data from children without diabetes.

**Results:** More desirable food choices were demonstrated in children with diabetes. The following individual food items demonstrated better food choices: more low fat milks and PUFA margarines and less butter; fewer sweet foods and sugary soft drinks; less confectionery; less meat, meat pies and chips. An important negative food choice was the high consumption of (high fat) crisps. Eight of the nine groups of marker foods indicated food choices in the desirable direction (i.e. healthier options compared with national data). Only the fibre group showed no differences, indicating that the low intake of fruit and vegetables and high fibre cereals was similar to national averages.

**Conclusions:** In this group of children and adolescents healthier eating behaviour had been adopted compared with their non-diabetic peers. Both children with and without diabetes have an extremely poor intake of fruit and vegetables and this is an area that dietary education should target.

# P-60

## Home care for diabetic children

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**Background:** The aim of this study was to evaluate the impact of home care on diabetes management in a group of diabetics resident in Cesena, a small town of Emilia-Romagna, a region of Italy.
**Methods:** Cesena's area (28,000 children and adolescents <17 yr) is served by 26 primary paediatricians, 2 community paediatricians, 9 health visitor nurses and 11 hospital paediatricians. Since 1994, a paediatric staff specifically skilled in diabetes treatment (1 hosp. paediatrician, 2 hosp. nurses, 1 hosp. dietician, 1 hosp. psychologist, 1 diabetic health visitor nurse [DHVN]) has been operating within this group. The DHVN takes care of diabetic children from hospitalization at onset of the disease, and continues at the children's home and school. The DHVN visits the child at home every wk the 1st month, every 2 wk the 2nd month, every 2 months from 3-6 months and as needed subsequently. The DHVN evaluates: 1) suitability of the equipment for self-control and insulin therapy, 2) skill in capillary glycaemia and insulin injection, 3) correct keeping of the diary, 4) respect for the rules fixed by the dietician. The DHVN writes a report for the primary paediatrician and the diabetic staff, to highlight the problems emerging during her visit. Knowledge and skills concerning diabetes management and familial satisfaction were evaluated through a validated questionnaire in 26 patients assisted by home care from onset vs. a historical control group of 8 patients.
**Results:** The two groups did not differ in age, sex, ketoacidosis at onset and mean HbA1c during the first 2 yr of diabetes. Hospital admissions during the first 2 yr were significantly lower in the first group (4.6 ± 1.4 vs. 9.8 ± 4.1 days, $p<0.001$; 0 vs 6 admissions, $p<0.001$). The DHVN registered the most common mistakes in the determination of glycaemia, injection of insulin, maintenance of the reflectometer, conservation of insulin and glucagon, lack of glucagon and respect for dietary prescriptions. Knowledge, skills and familial satisfaction were significantly higher in the first group after 2 yr.
**Conclusion:** This study confirms that it is possible to treat safely the majority of children with newly diagnosed diabetes with less hospitalization, with the aid of this specialized team, and in particular of the DHVN.