

ABSTRACT**ACCESS TO DIABETES MANAGEMENT (IDF)**

001 | DYNAMIC: DYNAMIC glucose Management strategies delivered through a structured education program improves time in range in a socioeconomically deprived cohort of children and young people with type 1 diabetes with a history of hypoglycemia

J. Pemberton¹, M. Kershaw¹, R. Dias^{1,2}, J. Idkowiak^{1,3}, Z. Mohamed¹, V. Saraff¹, T.G. Barrett^{1,2}, R. Krone¹, S. Uday^{1,3}

¹Birmingham Women's and Children's Foundation Trust, Diabetes, Birmingham, UK, ²University of Birmingham, Institute of Cancer and Genomic Sciences, Birmingham, UK, ³University of Birmingham, Institute of Metabolism and System's Research, Birmingham, UK

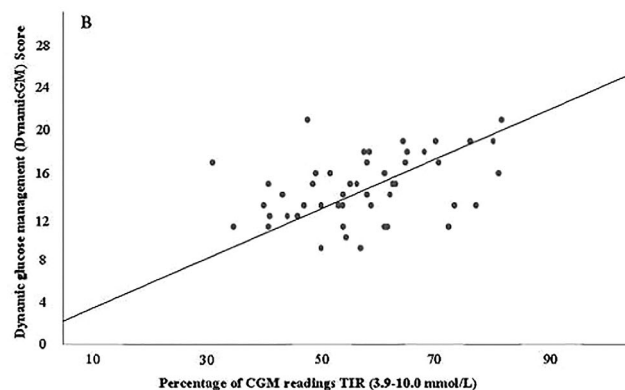
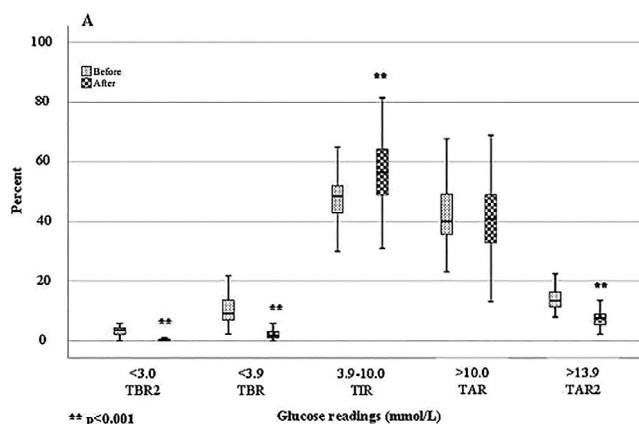
Introduction: Reimbursement for continuous glucose monitoring (CGM) was obtained in 2019 for children and young people (CYP) with type 1 diabetes with problematic hypoglycemia.

Objectives: Create and evaluate the effectiveness of a structured education program in CYP with type 1 diabetes using CGM.

Methods: Step1: CGM devices were evaluated by pre-determined criteria using a composite score. Step2: The education program was developed following review of international structured education guidance, dynamic glucose management (DynamicGM) literature, award winning diabetes educators' work and user feedback. Step3: Program effectiveness was assessed at six months by change in time below range (TBR) (<3.9 mmol/L), time in range (TIR) (3.9–10.0 mmol/L), time above range level 2 (TAR2) (>13.9 mmol/L), severe hypoglycemia and HbA1c; using a paired T-test. A DynamicGM score was developed to assess proactive glucose management. Factors predicting TBR & TIR were assessed using regression analysis.

Results: Dexcom G6 was chosen for integrated CGM (iCGM) status and the highest composite score (29/30). Progressive DynamicGM strategies were taught through 5 sessions delivered over 2 months. Fifty (23 male) CYP with a mean (\pm SD) age and diabetes duration of 10.2(\pm 4.8) and 5.2(\pm 3.7) years, with 60% from the two most deprived socioeconomic quintiles, who completed the education program were prospectively evaluated. At six months, there was a significant reduction in TBR (10.4% to 2.1%, $p < 0.001$), TAR2 (14.1% to 7.3%, $p < 0.001$), **Figure A**, HbA1c [7.4 to 7.1% (57.7 to 53.8 mmol/mol), $p < 0.001$] and severe hypoglycemic episodes (10 to 1, $p < 0.05$); TIR increased (47.4% to 57.0%, $p < 0.001$). Number of Dexcom followers ($p < 0.05$) predicted reduction in TBR and DynamicGM score ($p < 0.001$) predicted increased TIR, **Figure B**.

Conclusion: Our structured education program successfully teaches DynamicGM strategies to improve TIR & reduces hypoglycemia.



[A] Change in glucose ranges from baseline to six months B) Relation between DynamicGM score and TIR].

002 | Racial disparities in rates of initiation and continued use of continuous glucose monitors in children with type 1 diabetes

C. Lai¹, T. Lipman^{1,2}, S. Willi¹, C. Hawkes¹

¹Children's Hospital of Philadelphia, Endocrinology, Philadelphia, USA,

²University of Pennsylvania, School of Nursing, Philadelphia, USA

Introduction: Recent cross-sectional studies have shown lower rates of continuous glucose monitor (CGM) use among non-Hispanic black (NHB) versus non-Hispanic white (NHW) children with type 1 diabetes (T1D) in the US.

Objectives: We sought to determine if racial disparities in CGM use are related to prescribing practices or fidelity of CGM use in a large tertiary pediatric center.

Methods: Participants in this retrospective chart review of children and young adults.

(age < 21 years) were diagnosed with T1D before 9/30/18 and initiated CGM at The Children's Hospital of Philadelphia between 1/1/15 and 12/31/18. Using government insurance as a surrogate for low SES, we examined trends in CGM initiation with regard to race/ethnicity and SES. In those.

< 17 years old at CGM start, we compared rates of continued use at 1 year according to race using Kruskal-Wallis test.

Results: Of 1629 eligible subjects, 852 (52%) started CGM during this timeframe. A higher proportion of participants with high versus low SES started CGM (55% vs 34%, $p < 0.001$). Initiation rates for NHB (33%) and Hispanics (33%) were similar, but much lower than in NHW (54%).

($p < 0.001$). Similar disparities were seen in high (57% NHW, 37% NHB, 42% Hispanic, $p < 0.001$) and low SES (43% NHW, 27% NHB, 28% Hispanic, $p = 0.001$) individuals. In those who started the device, rates of persistent use were lower in NHB individuals (61% NHB, 86% NHW, 85% Hispanic, $p < 0.001$) and these trends were similar without regard to SES.

Conclusions: In a large pediatric diabetes center, CGM was initiated less often in NHB and Hispanic than NHW patients. While CGM initiations were higher in children with private insurance, this racial disparity existed without regard to SES. Although Hispanics initiated CGM less frequently, the continued use of CGM was comparable to NHW subjects. We recommend uniform policies for CGM initiation and increased support directed at reducing attrition in NHB children during the year after starting CGM.

003 | "Telemedicine" in children and adolescents with type 1 diabetes: A systematic review and meta-analysis of randomized controlled trials

M. Chettyarammel¹

¹University of Warwick, Warwick, UK

Introduction: Children and adolescents with type 1 diabetes who have reduced access to healthcare have an increased risk of complications

- The SEARCH for Diabetes in Youth Study has shown that 17% of youth with type 1 diabetes have poor glycemic control (HbA1c >9.5%)
- Alternative care models need to be considered to improve

provision of healthcare to this group

The Agency for Health care Research and Quality has encouraged the use of telemedicine (TM) to facilitate health care access and health care services.

Objective: To systematically review the published randomized controlled trials (RCT) that evaluate the effectiveness of telemedicine

(TM) in terms of glycemic control primarily and other clinical outcomes such as quality of life, patient satisfaction and severe hypoglycemic episodes in children and adolescents with type 1 diabetes.

Design and method: The randomized controlled trials are extracted from data sources including Medline/PubMed, EMBASE, Web of Science, PsycINFO, Cochrane Library and CINAHL using the PICO model.

Results:

- The search identified 1199 records and 16 trials were eligible The meta-analysis showed a marginal improvement in glycemic control at three months follow up which did not reach statistical significance and was not sustained at six months follow up.
- Only few studies evaluated the effect on patient satisfaction, DQoL (Diabetes-related quality of life) and occurrence of severe hypoglycaemic episodes which also showed no significant difference between the intervention and control groups.

Conclusion:

- Limited evidence to support the use of TM in children and adolescents with type 1 Diabetes.
- No increase in significant adverse effects such as frequency of severe hypoglycemic episodes or DKA .
- Subgroup analysis indicated a small improvement in HbA1c at three months.
- Not sustained at six months follow up.
- Improved by using sustained re-enforcement strategies.

ADVANCES IN DIABETES TECHNOLOGY (ATTD)

004 | Day and night outcomes in adolescents with type 1 diabetes (T1D) during the MiniMed advanced hybrid closed-loop (AHCL) system pivotal trial

D. Shulman¹, M. Kipnes², A. Tsimikas³, D. Liljenquist⁴, R. Slover⁵, R. Brazg⁶, J. Sherr⁷, J. Thrasher⁸, A. Carlson⁹, J. Reed¹⁰, K. Kaiserman¹¹, B. Buckingham¹², R. Pop-Busui¹³, S. Garg⁵, B. Bode¹⁴, J. Shin¹⁵, F. Peng¹⁵, X. Chen¹⁵, M. Liu¹⁵, A. Rhinehart¹⁵, T. Cordero¹⁵, R. Vigersky¹⁵

¹University of South Florida, Tampa, USA, ²Diabetes & Glandular Disease Clinic, San Antonio, USA, ³Scripps Whittier Diabetes Institute, San Diego, USA, ⁴Rocky Mountain Diabetes and Osteoporosis Center, Idaho Falls, USA, ⁵Barbara Davis Center for Childhood Diabetes, Aurora, USA, ⁶Rainier Clinical Research Center, Renton, USA, ⁷Yale University School of Medicine, New Haven, USA, ⁸Medical Investigations Inc., Little Rock, USA, ⁹Park Nicollet Clinic, International Diabetes Center at Park Nicollet, Minneapolis, USA, ¹⁰Endocrine Research Solutions, Roswell, USA, ¹¹SoCal Diabetes, Torrance, USA, ¹²Stanford University, Stanford, USA, ¹³University of Michigan Health System, Ann Arbor, USA, ¹⁴Atlanta Diabetes Associates, Atlanta, USA, ¹⁵Medtronic, Northridge, USA

Objectives: Adolescents with T1D often have difficulty managing diabetes because of hormonal changes that cause insulin resistance, problematic nocturnal glycemic control, and variable adherence to

parental and medical provider advice. Effects of a next-generation HCL system with automated basal insulin delivery and correction boluses were investigated in adolescents with T1D.

Methods: The MiniMed AHCL system provides an Auto Basal target of 100 mg/dL or 120 mg/dL. In addition, the new algorithm has an Auto Bolus correction targeted to 120 mg/dL every 5 min and fewer closed-loop exits. The AHCL pivotal trial was a 16-site, single-arm, in-home study that included 39 adolescents (14–21 years, 16.2 ± 2.1 years). The system was initiated without Auto Bolus correction (per protocol) during a baseline period (~14 days), followed by a 90-day study period with Auto Basal and Auto Bolus correction enabled. The Auto Basal target was set at either 100 mg/dL or 120 mg/dL for the first 45 days, and then at the other target for the remaining 45 days. Study endpoints included safety events and mean changes in HbA1c, sensor glucose (SG), and percentage of time spent within (%TIR), below (%TBR) and above (%TBR) range.

Results: From baseline to end of study, mean HbA1c improved from $7.6 \pm 0.8\%$ to $7.1 \pm 0.6\%$. Mean SG for the overall 24-hour, 6 AM–12 AM, and 12 AM–6 AM periods was reduced from 162 mg/dL to 150 mg/dL, 164 mg/dL to 154 mg/dL, and 156 mg/dL to 140 mg/dL, respectively. The %TIR (70–180 mg/dL) increased by 10.3%, 8.9%, and 14.3%, respectively (Figure). There were no severe hypoglycemia or DKA events during the study phase.

Conclusion: These data demonstrate that the MiniMed™ AHCL system is safe in adolescents, reduced HbA1c, and can improve both day and night time glycemic control in a challenging T1D population. The impact of basal target will be explored in future analyses.

O05 | First home evaluation of the Omnipod Horizon automated glucose control system in children with type 1 diabetes

A. Criego¹, B. Buckingham², G. Forlenza³, S. Brown⁴, B. Bode⁵, C. Levy⁶, T. Ly⁷, Omnipod Horizon Study Group

¹Park Nicollet Clinic, International Diabetes Center at Park Nicollet, Department of Pediatric Endocrinology, Minneapolis, USA, ²Stanford University, Department of Pediatrics, Division of Pediatric Endocrinology, Stanford, USA, ³University of Colorado School of Medicine, Barbara

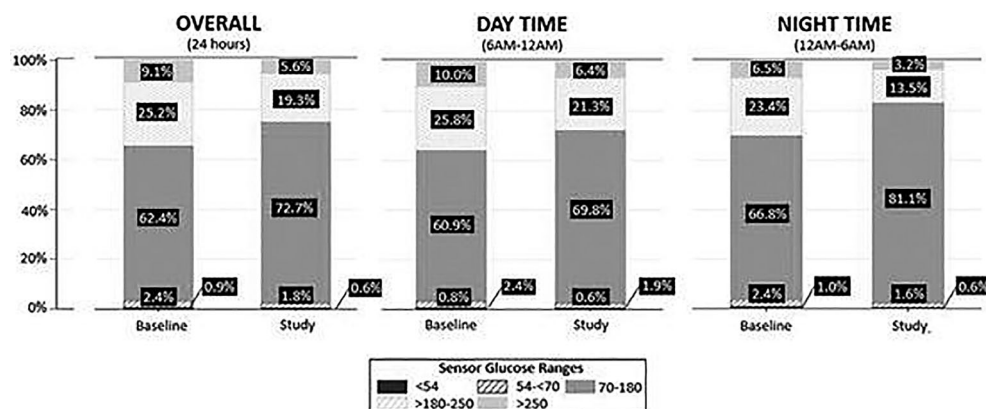
Davis Center for Diabetes, Aurora, USA, ⁴University of Virginia, Division of Endocrinology and Medicine, Charlottesville, USA, ⁵Atlanta Diabetes Associates, Atlanta, USA, ⁶Icahn School of Medicine at Mount Sinai, New York, USA, ⁷Insulet Corporation, Acton, USA

Objectives: The Omnipod Horizon System is a hybrid closed-loop (HCL) system consisting of a tubeless insulin pump with a control algorithm linked to a Dexcom G6 sensor. The system provides automated insulin delivery with customizable glucose targets, adjustable by time of day to allow therapy personalization. This study is the first outpatient safety and effectiveness evaluation of the system.

Methods: Participants aged 6–13.9y with T1D > 6mo and A1C < 10.0% used the HCL system at home for 14 days over winter holidays with unrestricted eating and exercise (n = 8 spent first 2 days in hotel). Participants set protocol-determined higher targets of 130, 140, and 150 mg/dL for 3 days each, then could freely choose their targets from 110–150 mg/dL for the last 5 days. Primary outcomes were safety measures and percent time 70–180 mg/dL for the 5 days with free choice of target, as well as for the first 9 days stratified by target glucose.

Results: Participants thus far (n = 15) had a mean \pm SD age of $11 \pm 2y$, T1D duration $5 \pm 3y$, and A1C $7.7 \pm 0.9\%$. Glycemic outcomes are shown in the Table. During the free choice period, participants primarily chose the 110 mg/dL (69% of study time), 120 mg/dL (10%), and 130 mg/dL (21%) targets. For 72 patient-days of HCL use during the free choice period, percent time from 70–180 mg/dL was $64.1 \pm 10.0\%$. Percent time < 70 mg/dL was low: $0.9 \pm 1.2\%$ overall and $0.5 \pm 0.5\%$ overnight. At the 130, 140, and 150 mg/dL targets, percent time from 70–180 mg/dL was $63.4 \pm 7.9\%$, $64.2 \pm 11.6\%$, and $52.1 \pm 11.7\%$, respectively. Percent time < 54 and < 70 mg/dL was low and tended to decrease with increased target. There were no severe adverse events.

Conclusion: The HCL system was safe and performed well in children with T1D when used at home for 5 days with free choice of target glucose, as well as when used with higher glucose targets. Participants were invited to continue in a 3mo outpatient study of the system, which is currently underway.



[Overall, day, and night percentages of time spent across sensor glucose ranges.]

Glycemic outcomes	Target Glucose 130 mg/dL	Target Glucose 140 mg/dL	Target Glucose 150 mg/dL	Free Choice
N	15	15	15	15
Mean glucose (mg/dL)	171 ± 11	174 ± 18	185 ± 17	168 ± 18
Percentage of time (%)				
<54 mg/dL	0.2 ± 0.5	0.01 ± 0.03	0.03 ± 0.10	0.1 ± 0.3
<70 mg/dL	1.0 ± 1.2	0.6 ± 1.2	0.6 ± 0.9	0.9 ± 1.2
70–180 mg/dL	63.4 ± 7.9	64.2 ± 11.6	52.1 ± 11.7	64.1 ± 10.0
>180 mg/dL	35.6 ± 8.0	35.3 ± 12.1	47.3 ± 11.7	34.9 ± 10.9
≥250 mg/dL	11.6 ± 5.5	10.8 ± 7.7	13.7 ± 9.4	11.3 ± 7.1
Time in Automated Mode (%)	97.2 ± 4.7			97.9 ± 1.7

[Glycemic outcomes per target glucose and free choice during HCL for children with type 1 diabetes].

006 | Significant improvement in sensor time in range and hyperglycemia outcomes in 6 to 13-year-old children with type 1 diabetes using Control-IQ technology in the real-world

A. Constantin¹, S. Habif¹, H. Singh¹

¹Tandem Diabetes Care, San Diego, USA

Objectives: Recent real-world studies have demonstrated notable improvements in glycemic outcomes in people with diabetes age ≥ 14 years using the t:slim X2 insulin pump with Control-IQ technology (advanced hybrid closed-loop system). In June 2020, this technology was cleared for use in the US by children age ≥ 6 years. To-date, no real-world data has been presented showing glycemic outcomes in 6 to 13-year-old pediatric users of Control-IQ technology.

Methods: A retrospective analysis of CGM data from 6 to 13-year-old users (N = 1428) was conducted to compare outcomes before and after initiation of Control-IQ technology. Participants uploaded at least 30 days of pre and 30 days post Control-IQ feature usage data to Tandem's t:connect web application and had $\geq 75\%$ CGM use during this time. Outcomes included sensor glucose values during open and closed-loop use of Control-IQ technology. Changes in glycemic outcomes were analyzed using the Wilcoxon signed-rank test.

Results: Participants had type 1 diabetes, mean age = 11 years (SD = 1.9), female = 51%. Use of Control-IQ feature led to a median change of +13% ($p < 0.001$) in sensor time in range (TIR) 70–180 mg/dL from pre (53%, IQR = 42%–64%). Median sensor TIR after Control-IQ feature initiation was 67% (IQR = 60%–74%). A median reduction of 13% was noted in sensor time > 180 mg/dL at post (31%, IQR = 24%–39%) from pre (45%, IQR = 34%–57%). Although, not clinically significant, median change in sensor time < 70 mg/dL post 30-days of Control-IQ feature use was 0.06% (1.19%, IQR = 0.60%–2.1%) from pre (1.04%, IQR = 0.47%–2.2%). Median time in closed-loop was 95% (IQR = 92%–97%).

Conclusions: Use of Control-IQ technology demonstrated valuable improvements in sensor time in range and hyperglycemia in this sample of 6–13-year-old patients. These are significant advancements considering previous research indicating that young children are especially vulnerable to hyperglycemia and its complications.

DIABETES PREVENTION

007 | α -Difluoromethylornithine (DFMO) is safe and well tolerated in adults and children with type 1 diabetes

E. Sims¹, A. Hull¹, S. Woerner¹, S. Cabrera², L. Mastrandrea³, S. Perkins¹, E. Gerner⁴, R. Mirmira⁵, L. Di Meglio¹

¹Indiana University School of Medicine, Indianapolis, USA, ²Medical College of Wisconsin, Milwaukee, USA, ³University at Buffalo, State University of New York, Buffalo, USA, ⁴Cancer Prevention Pharmaceuticals, Tucson, USA, ⁵University of Chicago, Chicago, USA

Objectives: Intrinsic β cell stress appears to exacerbate both initiation and progression of Type 1 Diabetes (T1D). Thus, therapeutics targeting β cell stress have potential to delay the progression of β cell loss. Ornithine decarboxylase, an enzyme in arginine metabolism, contributes to β cell stress; its inhibition by α -difluoromethylornithine (DFMO) reduces β cell endoplasmic reticulum stress and T1D incidence in non-obese diabetic mice. With an ultimate goal of using DFMO as part of a combination regimen in T1D prevention studies, we examined if DFMO is well-tolerated in children and adults with new-onset T1D.

Methods: We performed a 3-site randomized controlled, double-masked dose-ranging study to test the safety of oral DFMO in persons with recent-onset T1D (>2 but <8 months at randomization).

Results: Adverse event (AE) profiles were determined over 3 months of daily oral doses of 125, 250, 500, 750, and 1000 mg/m² in 41 participants, with 6–7 participants treated with each dose of drug and 10 treated with placebo. Participants were a median of 15.3 yrs old (range 12–34), 58.5% male, and 93% Caucasian, with a mean T1D duration of 3.8 ± 2.1 months and baseline hemoglobin A1c of $7.3 \pm 1.6\%$. Only mild and moderate AEs were observed. Two individuals withdrew from the study; one due to an allergic reaction (diffuse urticaria) to study drug, and another due to poor IV access. Expected possibly drug-related AEs included mild-moderate nausea/vomiting, abdominal pain, and diarrhea, moderate headache, upper respiratory infections, a pump site infection, and mild anemia. No hearing loss occurred over the study. No unexpected AEs judged related to drug occurred in those actively taking drug.

Conclusions: A 3-month course of oral DFMO was well tolerated at 4 different doses with a favorable AE profile in children and adults with recent onset T1D. Analyses of treatment effects on β cell function are ongoing.

Funding: JDRF.

008 | Glycemic control 1 year post diagnosis of type 1 diabetes: Role of socioeconomic status

S. Ojukwu¹, T.H. Lipman¹, E. Lowenthal², C.P. Hawkes¹

¹Children's Hospital of Philadelphia, Division of Endocrinology and Diabetes, Philadelphia, USA, ²Children's Hospital of Philadelphia, Division of Infectious Disease, Philadelphia, USA

Objective: To determine the association between socioeconomic status (SES) and control of type 1 diabetes mellitus (T1DM) 1-year post diagnosis.

Methods: We retrospectively analyzed records of patients with T1DM followed at the Diabetes Center at the Children's Hospital of Philadelphia from January 2009 to December 2018. Included subjects were < 19 years old, positive for at least one diabetes-related autoantibody, and had a hemoglobin A1c (HbA1C) recorded 10–15 months post diagnosis. Socioeconomic status (SES) was defined by census block according to the 2013 US census bureau's median household income community data. Linear regression evaluated the association between SES and T1DM control.

Results: 1373 patients met inclusion criteria; 45% (n = 620) female, 17% (n = 232) Non-Hispanic Black (NHB), 72% (n = 1000) Non-Hispanic White (NHW). Median age at diagnosis was 10.4 years (IQR 6.4). The median household income was \$75,213 (IQR \$56,294, \$96,528). In multivariate analysis, median household income within census tract of patient's residence was independently associated with 12 month diabetes control as measured by HbA1C after controlling for sex, race, age, gender and insurance type (p = 0.001). Higher HbA1C is seen in those in lower SES communities. This association was seen in all age groups, 0–5 years (p = 0.011), 6–13 years (p = 0.001) and > 14 years (p = 0.020).

Conclusions: Community SES defined by census tract median household income is associated with T1DM control 1 year after diagnosis. These findings can be used to identify at risk patients and implement strategies including increased support in targeted low SES communities.

009 | High incidence of type 1 diabetes among children of North African migrants in Emilia-Romagna Region, Italy

G. Maltoni¹, M. Zioutas¹, L. Iughetti², B. Predieri², B. Iovane³, P. Lazzeroni³, M.E. Street⁴, A. Lasagni⁴, V. Graziani⁵, T. Suprani⁶, F. De Luca⁷, S. Riboni⁸, P. Sogno Valin⁹, B. Mainetti¹⁰, F. Libertucci¹¹, S. Zucchini¹

¹S.Orsola-Malpighi Hospital, Bologna, Italy, ²Modena and Reggio Emilia University, Modena, Italy, ³Azienda ospedaliero-universitaria of Parma, Parma, Italy, ⁴Arcispedale S Maria Nuova, Reggio Emilia, Italy, ⁵Santa Maria Delle Croci Hospital, Ravenna, Italy, ⁶Bufalini Hospital, Cesena, Italy, ⁷Arcispedale Sant'Anna, Ferrara, Italy, ⁸Guglielmo da Saliceto Hospital, Piacenza, Italy, ⁹S.Maria della Scaletta Hospital, Imola, Italy, ¹⁰G.B. Morgagni - L. Pierantoni Hospital, Forlì, Italy, ¹¹Infermi Hospital, Rimini, Italy

In the last few decades, many studies have reported an increasing global incidence of Type 1 Diabetes (T1D), especially in younger children. The differences between different ethnic and age groups have underlined both the importance of environmental and genetic factors in the development of the pathology, as studies on migrant populations have already demonstrated.

Objectives: Evaluate the incidence of T1D and DKA prevalence in North African vs Italian children aged 0 to 14 years from 1st January 2015 to 31st December 2018, in Emilia Romagna Region, Italy.

Methods: Clinical and epidemiological data about childhood onset T1D in E-R region were retrospectively collected and matched using 3 different data sources (Clinical registries, hospital discharge records and regional lists of exemptions for pathology). T1D cumulative incidence was calculated basing on the number of inhabitants in the region as a whole and subdividing the Italian and North African groups.

Results: 365 new T1D onset were diagnosed (M 50.1%). DKA was present in 33% of cases (severe DKA 10.4%). Median age at T1D onset was 8.2 ± 3.7 yrs. Total cumulative incidence was 15.4/100.000/year and no increasing trend was recorded in the incidence of diabetes in the study period. In particular, North African cases were 52 with a cumulative incidence of 62.2/100.000/year, statistically significant compared to cumulative incidence of the Italian cases alone 13.1/100.000/year (p value <0.001). The annual incidence did not differ in the 4 years for both groups. No difference as for DKA cases and median age at T1D onset between the groups.

Conclusions: The incidence of T1D in the pediatric age was significantly higher in the North African population than in the Italian one. Surprisingly, the incidence was much higher than not only that of the host country, but also of the country of origin, suggesting an explosive mix of genetic and environmental factors causing the increase in newly diagnosed cases.

FOOD & FAT

010 | Postprandial exogenous carbohydrate oxidation after meal ingestion is a surrogate marker of insulin resistance and insulin sensitivity in children and adolescents with type 1 diabetes

M. Marigliano¹, Y. Schutz², C. Piona¹, M. Tommasi¹, M. Corradi¹, F. Olivieri¹, E. Fornari¹, A. Sabbion¹, G. Contreas¹, A. Morandi¹, C. Maffei¹

¹Pediatric Diabetes and Metabolic Disorders Unit, University of Verona, Department of Surgery, Dentistry, Pediatrics and Gynecology, Verona, Italy, ²Faculty of Sciences and Medicine, University of Fribourg, Department of Endocrinology, Metabolism and Cardiovascular System, Fribourg, Switzerland

Introduction: Clinical and experimental evidence suggests that higher insulin resistance (IR) and impaired insulin sensitivity (IS) can be present in pediatric patients with Type 1 Diabetes (T1D) and this can

affect postprandial glucose profile. Measurement of IR and IS is not simple and practical in the clinical field.

Objectives: To test the hypothesis that exogenous carbohydrate oxidation, after the administration of a mixed meal containing naturally enriched [13C]carbohydrates, plays a role in postprandial glycemic profile and is a marker of IR and IS.

Methods: Non-randomized, cross-sectional study for repeated measures. 15 patients (11–15 years) with T1D treated with insulin pump were enrolled. Respiratory exchanges were measured by indirect calorimetry before and after the ingestion of a mixed meal [(13% protein, 29% fat and 58% carbohydrate (CHO)]; CHO were naturally enriched with [13C]carbohydrates (corn). Total CHO oxidation was calculated by indirect calorimetry and breath test. IR and IS were calculated using surrogate models [estimated Glucose Disposal Rate (eGDR) and Insulin Sensitivity Score (ISS)].

Results: Blood glucose AUC was significantly associated with the amount of exogenous CHO oxidized [ExCHOOx (gr)] ($r = -0.67$, $p < 0.02$) when adjusting for CHO intake and fat mass. A direct correlation between eGDR and ISS and exogenous CHO oxidized [ExCHOOx (gr)] ($r = 0.70$, $p < 0.02$; $r = 0.61$, $p < 0.05$) as well as the differential of 13C/12C enrichment in the expired air, between time 0' and time 180' [DeltaBreathTest (APE)].

($r = 0.59$, $p < 0.05$; $r = 0.62$, $p < 0.05$) was found (Figure 1).

Conclusions: Assessing the capacity to oxidize the exogenous CHO introduced with a mixed meal (measuring the differential of 13C/12C enrichment in the expired air collected with the breath test) could be used as a simple and non-invasive surrogate measures of IR and IS in youths with T1D.

O11 | Associations between hypoglycemia and longitudinal adiposity among youth with type 1 diabetes in the Flexible Lifestyle Empowering Change (FLEX) Intervention

A. Cristello Sarreau¹, A.R. Kahkoska¹, J. Crandell¹, D. Igudesman¹, J. Kichler², D.M. Maahs³, M. Seid², E. Mayer-Davis¹

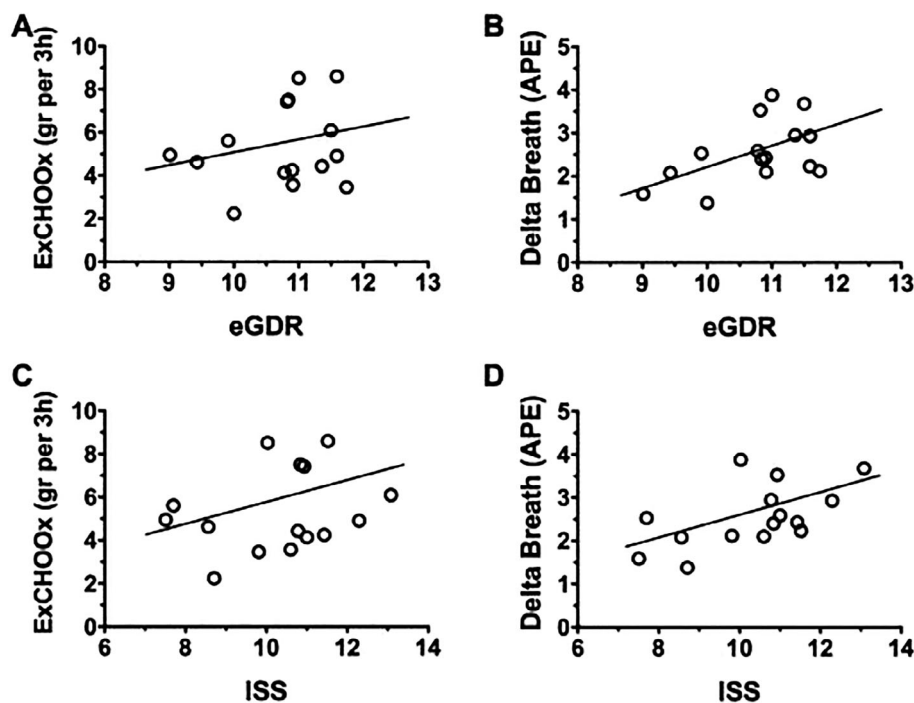
¹University of North Carolina at Chapel Hill, Chapel Hill, USA, ²Cincinnati Children's Hospital Medical Center, Cincinnati, USA, ³Stanford University, Stanford, USA

Introduction: Behaviors directed at preventing or responding to hypoglycemia may challenge weight management in adolescents with type 1 diabetes (T1D) but data is lacking to support this hypothesis.

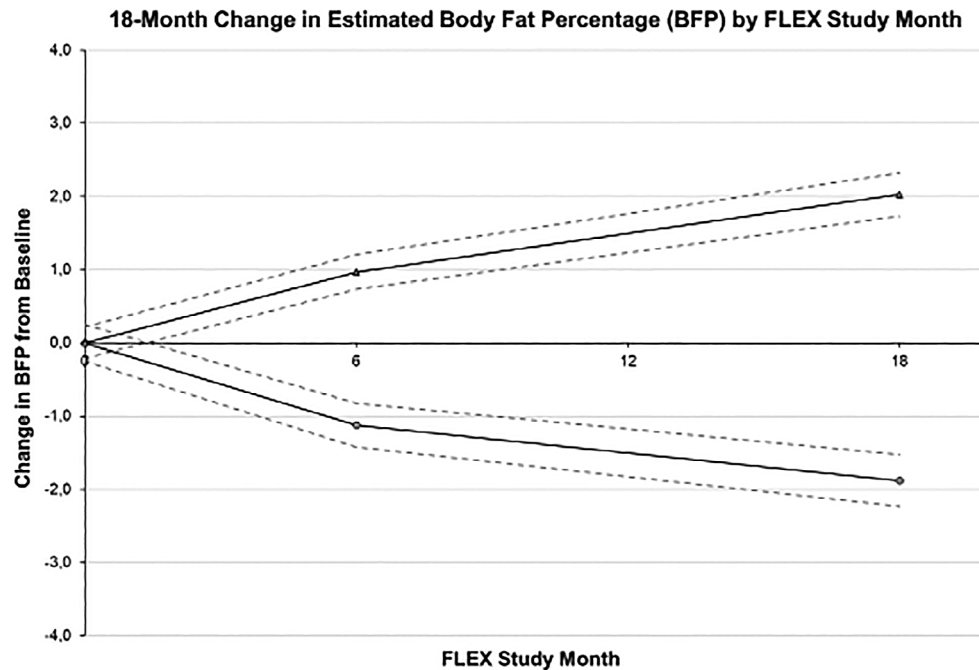
Objectives: We aimed to model longitudinal patterns of adolescent adiposity and explore associations with hypoglycemia.

Methods: Data were analyzed from 234 youth (13–16 years, T1D duration >1 year, HbA1c 8–13%) in the 18-month FLEX trial. Estimated body fat percentage (BFP) was calculated with validated sex and race specific equations using anthropometry at baseline, 6, and 18 months. Hypoglycemia was assessed by 7-day blinded continuous glucose monitoring (CGM) at baseline. We used group-based trajectory modeling to specify 18-month BFP trajectories and logistic regression to assess the relationship between hypoglycemia and BFP trajectory membership, adjusted for age, sex, intervention group, study site, and baseline BFP.

Results: Most adolescents (50.4% female, mean age 14.9 ± 1.1 years, T1D duration 6.3 ± 3.7 years) followed an increasing ($n = 136$, 58.1%) vs. decreasing BFP trajectory (Figure). Greater time spent in hypoglycemia (above vs. below median) during the day was



[Correlations of eGDR and ISS with exogenous CHOOx and 13C/12C enrichment differential in expired air].



—○— Decreasing BFP Trajectory (n=98, 41.9%); mean baseline BFP = 25.6%±7.7%, 6-mo BFP = 24.4±8.0%, 18-mo BFP = 23.7±7.9%

—△— Increasing BFP Trajectory (n=136, 58.1%); mean baseline BFP = 28.0±7.9%, 6-mo BFP = 29.0±7.8%, 18-mo BFP = 30.1±8.2%

[18-Month Change in Estimated Body Fat Percentage (BFP) by FLEX Study Month].

associated with higher odds of membership in the decreasing vs. increasing BFP group (< 70 mg/dL OR = 2.04; 95% CI: 1.05, 3.97), particularly clinical hypoglycemia [54–69 mg/dL OR = 2.5 (95% CI: 1.28, 4.92); < 54 mg/dL OR = 1.81 (95% CI: 0.93, 3.51)]. No differences in insulin regimen ($p = 0.68$), glucose self-monitoring ($p = 0.72$), CGM use ($p = 0.47$), or disordered eating ($p = 0.28$) were noted between groups, but there was trend towards higher insulin dose/kilogram in the decreasing group (1.0 ± 0.37 vs. 0.92 ± 0.31 , $p = 0.06$).

Conclusions: Unexpectedly, time in hypoglycemia was associated with a decreasing adiposity trajectory over 18 months. More research is needed to better understand the hypoglycemia-related drivers of adiposity change in adolescents with T1D.

O12 | In children and adults with type 1 diabetes using multiple daily injections giving 125% of the insulin to carbohydrate ratio using aspart insulin improves postprandial glycemia following a high fat, high protein meal

T. Smith^{1,2}, C. Smart^{2,3,4}, P. Howley⁵, B. King^{1,2,3}

¹University of Newcastle, School of Medicine and Public Health, Callaghan, Australia, ²Hunter Medical Research Institute, New Lambton Heights, Australia, ³John Hunter Children's Hospital, Department of Pediatric Endocrinology, Newcastle, Australia, ⁴University of Newcastle, School of Health Sciences, Callaghan, Australia, ⁵University of Newcastle,

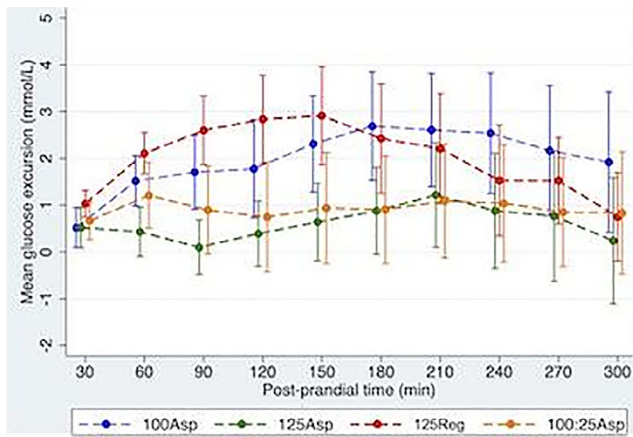
School of Mathematical and Physical Sciences/Statistics, Callaghan, Australia

Objective: To identify an insulin strategy for a high fat, high protein (HFHP) meal that addresses insulin dose, timing of delivery and type to optimize postprandial glycemia in children and adults with Type 1 Diabetes (T1D) using multiple daily injection (MDI) therapy.

Methods: This was a randomized controlled trial conducted at 2 centers in Australia. Participants (n = 24) had a mean age of 18.5 ± 8.5 yrs and HbA1c 49 mmol/mol ($6.7 \pm 0.7\%$). Participants were given the same HF (40 g), HP (50 g), moderate carbohydrate (30 g) meal on 4 days. Each day, a different insulin strategy was allocated. Insulin was calculated using the insulin to carbohydrate ratio (ICR), given as a standard bolus (SB)/ split bolus (SpB) using aspart (Asp)/ regular (Reg) insulin; 1. 100%ICR, SB, Asp (100Asp) 2. 125%ICR, SB, Asp (125Asp) 3. 125%ICR, SB, Reg (125Reg) 4. 125%ICR, SpB, Asp (100:25Asp). Insulin was given 15 min before the meal, for 100:25Asp the second dose was given 60 min post-meal. Postprandial sensor glucose was measured for 5 h.

Results: Compared to control (100Asp), 125Asp and 100:25Asp resulted in lower mean postprandial glucose excursions (PPGE) from 60–270 min ($p < 0.044$) and 150–240 min ($p < 0.043$) resp, while 125Reg resulted in higher mean PPGE at 90 min ($p < 0.05$). Mean PPGE for 125Asp were lower than 100:25Asp from 60–90 min ($p < 0.043$). In total, there was 1 episode of hypoglycemia (capillary glucose ≤ 3.5 mmol/L) in 125Reg (176 min).

Conclusion: In children and adults with T1D using MDI therapy giving 125% ICR as a SB 15 min before a HFHP meal using aspart insulin significantly improved postprandial glycemia without hypoglycemia. For HFHP meals, preprandial administration of 125% ICR is recommended with review of individual glucose profiles to assess hypoglycemia risk at 60–90 min. If problematic, giving 100% ICR 15 min before the meal then 25% ICR, 60 min post-meal may offer comparable glycemc control with reduced hypoglycemia risk.



[Figure 1. Mean postprandial glucose excursions from baseline to 300 min].

DIABETES AND BEHAVIORAL HEALTH/ PSYCHOLOGY

O13 | Maybe mom does not know best? Discrepancies in parent and young adult responses to diabetes-specific outcomes

J. Pierce^{1,2}, S. Patton³, R. Wasserman¹, A. Gannon⁴
¹Nemours Children's Hospital, Orlando, USA, ²University of Central Florida, College of Medicine, Orlando, USA, ³Nemours Children's Specialty Care, Orlando, USA, ⁴Nemours Children's Health System, Wilmington, USA

Objectives: In the context of decreasing parent involvement in type 1 diabetes (T1D) care and increasing young adult (YA) autonomy, the validity and value of parent-proxy report measures in research on YA with T1D is unclear. Here, we examined mean differences between YA and parent proxy-report versions of T1D-specific person-reported outcomes measures in a sample of YA and parent dyads.

Methods: Participants were 47 YA with T1D 19–25 yrs (M = 22.17 ± 1.90; 27.7% male, 87.2% Non-Hispanic White, 63.8% living independently from parents) who transitioned out of pediatric T1D care and their parent/caregiver (91.5% mothers; 85.1% married). Dyads reported on YA T1D-specific quality of life (PedsQL-Diabetes Module; PedsQL-DM; Varni et al, 2018) and the extent to which YA had a successful healthcare transition (Healthcare Transition Outcomes Inventory; HCTOI; Pierce et al, 2020). We conducted Pearson r correlations to examine the strength of the relation between YA self- and parent

proxy-report versions of the measures and paired sample t-tests to evaluate mean differences between versions of each measure.

Results: There were significant mean differences on nearly every scale and most scales were not significantly correlated (Table 1). Specifically, on the PedsQL-DM, parents tended to over-estimate YA perceptions of quality of life and correlations were weak, with the exception of T1D symptoms, which showed a significant positive association between parent and YA report. Similarly, for the HCTOI, parents over-estimated YA perceptions of successful healthcare transition for every subscale but Integration and Ownership.

Measure	Self M ± SD	Parent-PROXY M ± SD	Mean difference	r
PedsQL-DM total	65.03 ± 15.47	74.87 ± 14.41	-9.47*	-0.09
PedsQL-DM diabetes management	70.04 ± 16.03	80.21 ± 14.23	-10.17*	-0.16
PedsQL-DM diabetes symptoms	58.37 ± 18.90	67.78 ± 16.70	-9.41*	0.41*
HCTOI integration	37.21 ± 7.14	27.62 ± 4.86	9.59*	0.02
HCTOI ownership	15.18 ± 3.16	16.37 ± 3.37	-1.19	-0.15
HCTOI parental support	15.36 ± 3.07	17.04 ± 2.65	-1.68*	0.23
HCTOI collaborative relationship	16.62 ± 3.44	18.02 ± 2.99	-1.4**	0.16
HCTOI continuity of care	15.62 ± 3.62	18.09 ± 5.25	-2.47**	-0.07

*p < 0.01; **p < 0.05

[Mean differences and correlations between study measures].

Conclusions: Overall, the discrepancies observed between parent and YA responses suggest that parent-report of YA functioning may not be accurate or necessary to include in research on YA with T1D. These findings may have significant implications for study design and participant burden in YA research going forward.

O14 | Resilience outstrips the negative impact of diabetes distress on glycemc control and self-management among adolescents with type 1 diabetes

D. Luo¹, J. Xu², Y. Wang³, X. Cai¹, H. Wang⁴, M. Zhu², M. Li¹
¹Peking University, Beijing, China, ²The First Affiliated Hospital of Nanjing Medical University, Department of Endocrinology, Nanjing, China, ³Nanjing Children's Hospital, Department of Endocrinology, Nanjing, China, ⁴The First Affiliated Hospital of Nanjing Medical University, Nanjing, China

Objectives: To determine whether resilience buffers the deleterious consequences of diabetes distress on glycemc control (HbA1c) and self-management among adolescents with type 1 diabetes (T1D).

Methods: A convenience sample of 203 eligible adolescents (mean age: 14.60 years, mean diabetes duration: 4.81 years) was recruited from a national endocrine center from February 2019 to August 2019. Data were collected on sociodemographic and clinical characteristics, diabetes distress, resilience, self-management and glycemic control. We performed the simple slope and Johnson-Neyman analysis to probe moderating effects of resilience.

Results: A total of 42.4% of adolescents reported high diabetes distress, and it was associated with higher HbA1c and poorer self-management. Our results indicated that resilience moderated the association that diabetes distress had with glycemic control and self-management. The hazards of severe diabetes distress for higher HbA1c.

($\beta = 0.148, t = 4.156, p = 0.000$) and worse self-management ($\beta = -0.010, t = -3.000, p = 0.003$) were only apparent in the context of low resilience. Moreover, the results of Johnson-Neyman analysis showed that diabetes distress was associated with HbA1c only when the resilience score was lower than 45.784, and with glycemic control when the resilience score was less than 43.080.

Conclusions: The findings of this study highlight the interactive relationship between diabetes distress and resilience in relation to glycemic control and self-management. These findings suggest that resilience is promising intervention target for distressed T1D adolescents with unsatisfactory glycemic control and self-management behavior.

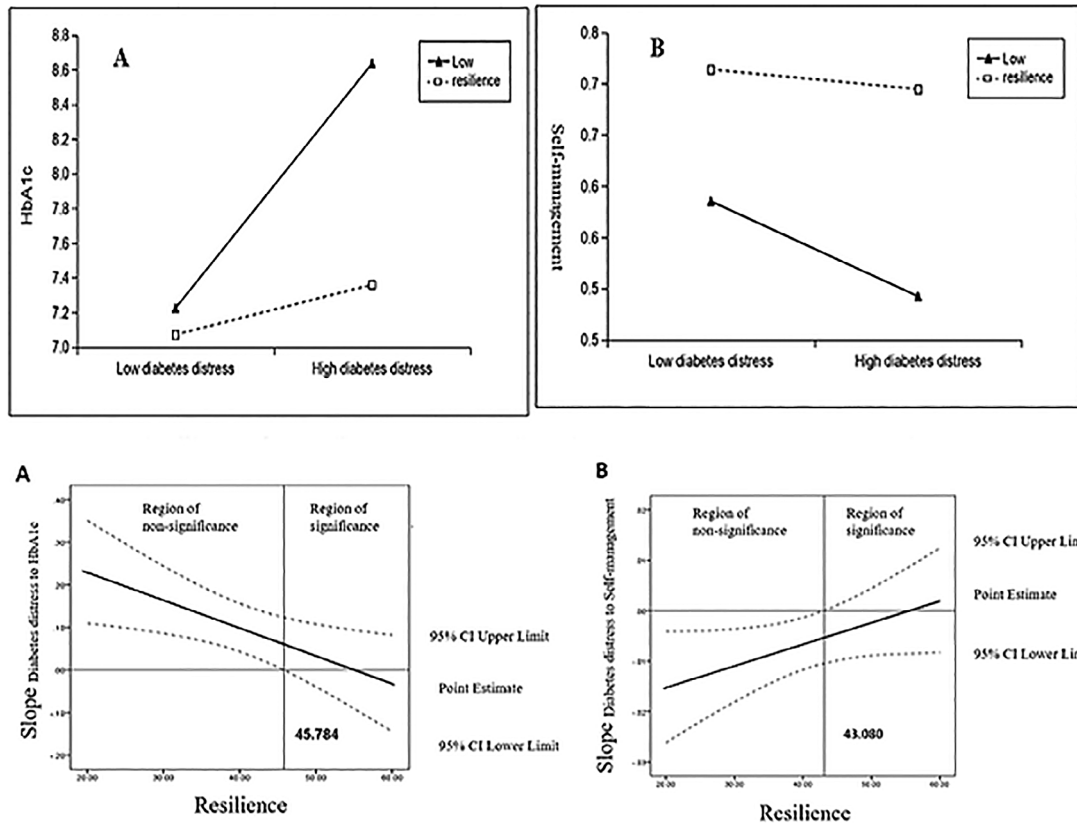
O15 | The clock is ticking: Parental stress around emerging adulthood for adolescents with type 1 diabetes

J. Yi-Frazier¹, K. Senturia¹, D. Wright², C. Lind¹, F. Malik^{1,3}
¹Seattle Children's Research Institute, Seattle, USA, ²Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, USA, ³University of Washington School of Medicine, Seattle, USA

Objective: The objective of this study is to describe the emotional and behavioral stressors that parents face as their adolescents with type 1 diabetes (T1D) prepare for the transition to adulthood. We also explore coping strategies parents employ to manage stressors.

Methods: Six focus groups with 39 parents of adolescents with T1D were conducted in the Seattle metropolitan area across ethnic and socioeconomic groups. Semi-structured questions addressed adolescents' self-care tasks, parental assistance with care, challenges to completing self-care, and stress/pressure around self-care. Qualitative data were analyzed and emergent themes identified.

Results: Three primary themes emerged: 1) Parental stress was heightened when adolescents were approaching common developmental milestones such as driving, moving out, and engaging in risky behaviors ("the clock is ticking"), all of which could be exacerbated by poor diabetes management (Table); 2) most parents reported providing extensive diabetes care assistance even into late adolescence (tasks included checking and treating blood glucose levels, managing



[Results of the simple slope and Johnson-Neyman analysis].

supplies and technology, and preparing and providing food and carbohydrate counts); 3) parents shared strategies for guiding adolescents' transitions from assisted care to self-care with an emphasis on active behaviors parents could continue, thereby lowering their own stress.

Conclusions: Parents of adolescents with T1DM experienced significant stress around their children's transition to independent diabetes self-care management. As part of overall preparation for transition, diabetes care providers should be encouraged to communicate with parents about these common stressors and promising avenues for nurturing a teen's independence.

Milestone	Example Quote
Driver's license	You're driving a thing that can kill other people and this is not a discussion that we are even willing to entertain. And if you cannot be responsible with your blood sugar, you will not drive the car because you are not only taking your own life into your hands, you are taking other people's lives into your hands. FG11
Alcohol use and other risk taking	My daughter was doing a lot better until she got... to high school, maybe the end of 8th grade, and now I have other things with taking care of herself, like drinking, which has been a huge, huge thing for me because it scares me to death. FG6
End of high school	She's gonna be a senior this year and so really it needs to be falling much more on her shoulders. FG11
College - especially out of town	I'm here because of her going off to college. ... We keep telling her, "Your control has to be really good for us to trust you to go out of state to college," which is what she wants. We said, "Otherwise, you are applying to [the local university] and you are staying at home." FG8
Legal independence at age 18	I feel like I'm losing him. Like each day that goes by is getting harder and harder and harder to manage him because he's out the door. FG5

[Fear of common developmental milestones coupled with poor control of diabetes: Examples of the "ticking clock"].

DIABETES COMPLICATIONS AND COMORBIDITY (APPES)

O16 | Reduced minimum rim width of optic nerve head: An early marker of retinal neurodegeneration in children and adolescents with type 1 diabetes

C. Piona¹, T. Cozzini², G. Marchini², T. Merz², T. Brighenti², U. Mazzo², M. Marigliano¹, F. Olivieri¹, E. Pedrotti², C. Maffei¹

¹University of Verona, Pediatric Diabetes and Metabolic Disorders Unit, Regional Center for Pediatric Diabetes, University City Hospital of Verona, Verona, Italy, ²University of Verona, Department of Neuroscience, Biomedicine and Movement Sciences, Eye Clinic, University City Hospital of Verona, Verona, Italy

Background: Spectral Domain-Optical coherence tomography (SD-OCT) is a high-resolution imaging technique of the retina. It showed a significant thinning of specific retinal layers in adults with T1D, indicative of neurodegeneration. Limited studies have been conducted in T1D pediatric patients.

Objective: To evaluate if T1D pediatric patients have early retinal neurodegenerative changes detectable with SD-OCT and these changes are associated with risk factors for T1D complications.

Methods: One hundred and forty-seven T1D children/adolescents and 51 healthy controls underwent complete ophthalmic examination and SD-OCT. Macular Total Retinal Thickness (TRT), Ganglion Cell Layer (GCL), Retinal Nerve Fiber Layer (RNFL) and Minimum Rim Width (MRW) of the Optic Nerve Head (ONH) were measured. Blood pressure (BP), anthropometric and biochemical (HbA1c, lipoproteins, urinary albumin-creatinine ratio) parameters were recorded at the time of SD-OCT and retrospectively until T1D onset. SD-OCT parameters were compared with unpaired *t*-test. Multiple regression models were calculated using SD-OCT parameters as dependent variables and risk factors as independent ones.

Results: MRW was significantly thinner in T1D patients, whereas RNFL and macular parameters were similar. MRW inversely correlated with mean HbA1c. Multiple regression models showed that the inter-individual variability of MRW was explained by HbA1c ($R^2 = 0.062$; $p = 0.007$), independently from age, diabetes duration, triglycerides, BMI and BP. Similar results were obtained using the mean values of risk factors measured from T1D onset.

Conclusions: MRW reduction is an early retinal neurodegeneration marker detectable in T1D pediatric patients. The association between MRW and mean HbA1c supports the importance of achieving a good metabolic control since childhood to prevent retinal neurodegeneration.

O17 | Nail fold capillaroscopy changes in children with type 1 diabetes mellitus: Relation to diabetic vascular complications

A. Saber¹, A. Abdelmaksoud², S. Daifallah², N. Salah²

¹Ain Shams University, Pediatrics, Cairo, Egypt, ²Ain Shams University, Cairo, Egypt

Background: Advanced glycation-end products, chronic inflammation and microangiopathy are implicated in the pathogenesis of diabetic vascular complications. Nail fold videocapillaroscopy (NVC) is an easy non invasive tool of microvasculature assessment. Scarce reports addressed its utility in early detection of diabetic vascular complications.

Aim: To compare the NVC changes in T1DM adolescents to healthy controls and correlate them to diabetes duration, glycemic control and diabetic vascular complications.

Methods: Hundred thirty-five T1DM adolescents were compared to 135 matched healthy controls. History included diabetes duration, insulin-therapy and symptoms of diabetic complications. Fundus examination and Toronto clinical scoring system (TCSS) were done. Fasting lipids, fraction-C of glycosylated hemoglobin(HbA1C%) and

Urinary albumin-excretion(UAE)were measured. Nerve conduction velocity and NVC were done.

Results: T1DM adolescents had more significant NVC changes than controls ($P < 0.001$). Moreover, T1DM adolescents with diabetic neuropathy, retinopathy, and nephropathy had significantly higher NVC changes than those without ($P = 0.003$, $P < 0.001$ and $P < 0.001$, respectively). Significant positive relation was found between NVC changes and TCSS ($P < 0.001$), diabetes duration ($P = 0.001$), HbA1C (0.004), diabetic-neuropathy (0.003), cholesterol ($P = 0.005$) and LDL (0.007). Multivariate logistic-regression for predictors of T1DM microvascular complications, revealed that insulin dose ($P = 0.001$), NVC ($P = 0.007$) and TCSS ($P = 0.005$) were the most important predictors of neuropathy, while insulin-dose ($P = 0.004$) and NVC ($P < 0.001$) were the most important predictors of nephropathy.

Conclusion: T1DM adolescents having nephropathy, neuropathy and retinopathy had significantly higher NVC changes than those without complications and controls. Thus, NVC can be a useful noninvasive tool for early assessment and follow up of the risk of vascular complications among T1DM adolescents.

O18 | Lower estimated bone strength and impaired bone microarchitecture in children with type 1 diabetes

G. Fuusager^{1,2,3}, N. Milandt^{3,4}, V.V. Shanbhogue⁵, A.P. Hermann⁵, A.J. Schou^{3,6,7}, H.T. Christesen^{3,6}

¹Odense University Hospital, HCA Research, Hans Christian Andersen Hospital for Children and adolescents, Odense, Denmark, ²Hospital Unit Jutland West, Department of Internal Medicine, Herning, Denmark, ³Faculty of Health Sciences, Department Of Clinical Research, Odense, Denmark, ⁴Odense University Hospital, Orthopedic Research Unit, Odense, Denmark, ⁵Odense University Hospital, Department of Endocrinology, Odense, Denmark, ⁶Odense University Hospital, Hans Christian Andersen Hospital for Children and adolescents, Odense, Denmark, ⁷Odense University Hospital, Steno Diabetes Center Odense, Odense, Denmark

Objective: To evaluate estimated bone strength in children and adolescents with type 1 diabetes and assess peripheral bone geometry, volumetric bone mineral density (vBMD) and microarchitecture.

Research design and methods: In a cross-sectional study, high resolution peripheral quantitative CT (HR-pQCT) was performed of the radius and tibia in 84 children with type 1 diabetes and 55 healthy sibling controls. Estimated bone strength was assessed using a micro-finite element analysis solver. Multivariate regression analyses were performed adjusting for age, sex, height and body mass index.

Results: The median age was 13.0 years in the diabetes group vs. 11.5 years in healthy sibling controls. The median (range) diabetes duration was 4.2 (0.4;15.9) years; median (range) latest year HbA1c was 7.8 (5.9;11.8) % (61.8 [41;106] mmol/mol).

In adjusted analyses, patients with type 1 diabetes had reduced estimated bone strength (failure load) in both radius, $\beta -390.6 (-621.2;-159.9)$ N, $p = 0.001$, and tibia, $\beta -891.9 (-1321;-462.9)$ N, $p < 0.001$.

In the radius and tibia, children with type 1 diabetes had significantly reduced cortical area, trabecular vBMD, trabecular number and trabecular bone volume fraction and increased trabecular inhomogeneity. Latest year HbA1c was negatively associated with bone microarchitecture (radius and tibia), trabecular vBMD and estimated bone strength (tibia).

Conclusion: Children with type 1 diabetes had reduced estimated bone strength. This reduced bone strength could partly be explained by reduced trabecular bone mineral density, adverse microarchitecture and reduced cortical area. Increasing latest year HbA1c was associated with several adverse changes in bone parameters.

HR-pQCT holds potential to identify early adverse bone changes and to explain the increased fracture risk in young type 1 diabetes patients.

MEET THE EXPERTS: MULTIDISCIPLINARY INSIGHTS

O19 | Development of a patient and parent reported experience measure (PREM) for children and young people with diabetes in England and Wales

H. Robinson¹, K. Green², S. Pons Perez¹, A. Attwood³, J. Warner⁴

¹Royal College of Pediatrics and Child Health, Research and Quality Improvement, London, UK, ²Royal College of Pediatrics and Child Health, London, UK, ³The Picker Institute, Oxford, UK, ⁴University Hospital of Wales, Cardiff, UK

Objectives: The National Pediatric Diabetes Audit (NPDA) developed a PREM survey to collect quantitative and qualitative information from children and young people with diabetes and their parents about their experience of care received.

Methods: The questionnaire was developed from desk-based research, workshops with groups of children and young people with diabetes and parents to generate relevant questions. Cognitive testing of those questions and psychometric analysis of a pilot was performed before a finalized questionnaire was launched. All patients attending 175 centers in England and Wales were invited to participate over six months from February 2019. Quantitative and qualitative analysis of responses were performed by the NPDA, with results presented at center, regional and national level.

Results: 13,178 responses to the survey were received; 7013 from parents and carers, 6165 from children and young people. Analysis showed high levels of satisfaction with advice and information provided at clinic visits, relationships with staff teams, and overall experience, with 79.6% of children and young people and 90.4% of parents agreeing 'a lot' that they would recommend their diabetes clinic to others. Positive responses to questions about family-centered care were predictive of overall positive feelings about clinic visits.

Variation in various measures of satisfaction was found at center and regional level. However, there was no correlation between overall satisfaction with a service and mean HbA1c for that center.

Conclusion: The NPDA PREM showed high levels of satisfaction among families with diabetes in England and Wales. Family centered

care was predictive of overall positive feelings about attending clinic, and respondents valued the information and advice provided by their staff teams, who were viewed positively. The PREM survey provides useful data for comparing and improving patient and parent satisfaction with care at local, regional and national level.

O20 | A novel mHealth application to educate and empower young people with type1 diabetes to exercise safely: A pilot study

V.B. Shetty^{1,2,3}, W.H.K. Soon², H.C. Roby², G.J. Smith², P.A. Fournier⁴, N. Paramalingam^{1,2}, T.W. Jones^{1,2,3}, E.A. Davis^{1,2,3}

¹Perth Children's Hospital, Endocrinology and Diabetes, Perth, Australia,

²Telethon Kids Institute, Children's Diabetes Centre, Perth, Australia,

³The University of Western Australia, Division of Pediatrics within the Medical School, Perth, Australia, ⁴The University of Western Australia,

School of Human Sciences, Perth, Australia

Introduction: Mobile health (mHealth) applications can provide real-time support to help people with type 1 diabetes (T1D) exercise safely. We have co-designed a novel mHealth App named "acT1ve" which incorporates the latest exercise guidelines.

Objectives: Our aim was to pilot acT1ve in a free-living setting to assess its acceptability and functionality, and gather feedback to improve the user experience of the App before testing it in a larger clinical trial. We hypothesize that acT1ve will be rated as acceptable and usable by young people with T1D.

Methods: The study design used a mixed method approach. Ten subjects with T1D (mean \pm SD age 17.7 \pm 4.2 y, HbA_{1c} 54 \pm 5.5 mmol/mol) were enrolled. Prior to installing acT1ve on their personal smartphone, each participant completed a semi-structured face to face interview about their current exercise management and expectations of acT1ve. Participants were then asked to use the App to guide their exercise management for 6 weeks. At the end of 6 weeks, participants completed a user Mobile Application Rating Scale (uMARS) and a second semi-structured interview. The uMARS data was assessed in its entirety and for each subscale (engagement, functionality, aesthetics, information, subjective quality and perceived impact), with scores presented as medians with interquartile ranges (IQRs). All semi-structured interviews were transcribed, and direct content analysis was used to summarize participant experiences.

Results: The major themes arising from the interview analysis were increased frequency and duration of exercise, decrease in fear of hypoglycemia and high satisfaction with using acT1ve. This was reflected in the uMARS analysis where acT1ve was rated high for its overall quality 4.3(4.2,4.6) [out of 5], functionality 4.7(4.4,4.8), information 4.6(4.5,4.8) and aesthetics 4.6(4.5,4.8).

Conclusions: The acT1ve app is functional and acceptable with high user satisfaction.

O21 | Impact of a curriculum-based group intervention for youth with T1D on diabetes-specific quality of life

C.E. Muñoz^{1,2,3}, O. Hsin^{1,3}, S. Gamez², J. Raymond^{1,2}, L.K. Fisher^{1,2}

¹USC Keck School of Medicine, Los Angeles, USA, ²Children's Hospital Los Angeles, Center for Endocrinology, Diabetes, and Metabolism, Los Angeles, USA, ³Children's Hospital Los Angeles, USC University Center for Excellence in Developmental Disabilities, Los Angeles, USA

Managing type 1 diabetes (T1D) is complex and affects quality of life (QoL) for youth and their caregivers. Lower QoL scores are linked with poorer diabetes management. **TEEN POWER**[®] is a 10-week curriculum-based group intervention for youth with T1D and their caregivers. This study examines the impact of **TEEN POWER**[®] on youth's diabetes-specific QoL through self- and caregiver reports.

Data for 83 youths and 71 caregivers were analyzed. Participants completed the Pediatric Quality of Life Inventory (PedsQL) 3.2 Diabetes Module. PedsQL consists of two main scores: Diabetes Symptoms Summary (DSS) and Diabetes Management Summary (DMS). All ratings were converted such that higher scores reflect better functioning. Paired t-tests examined potential differences between participants' DSS and DMS scores between baseline and end of treatment.

Overall, youth and caregiver responses on the DSS and youth ratings on the DMS scales did not change over time. However, among youth whose DSS Total Score was <75 at baseline, scores increased at the end of treatment. Scores also increased among youths whose DMS ratings

were < 75. Parent ratings of their child's DMS scores approached a similar pattern in that these scores were higher at end of treatment but not for DSS. However, among parents who rated their children's DSS scores <75 at the start, there was a trend towards improved DSS and DMS scores. Interestingly, youth and parent ratings were not initially correlated, but had some correlation at the end of treatment.

Results suggest participation in **TEEN POWER** can promote improved diabetes-specific QoL for youth with low self- or caregiver-reported QoL. These youth reported a decrease in symptoms and diabetes management problems. Caregivers also endorsed a decrease in problems associated with their child's diabetes management. Among caregivers who endorsed a greater number of symptoms at baseline, trends reflect a decrease in symptoms and diabetes management problems.

OBESITY & DYSLIPIDEMIA (ESPE)

O22 | The role of Spexin in childhood obesity related cardiovascular risk

N. Salah¹, D. Abuzeid², R. Sabry², R. Fahmy², M. Elabd², E. Awadallah², A. Omran³, Y. El Gendy¹

¹Ain Shams University, Cairo, Egypt, ²National Research Institute, Pediatrics, Cairo, Egypt, ³Ain Shams University, Cardiology, Cairo, Egypt

Background: Spexin (SPX), also called neuropeptide Q (NPQ), is a novel endogenous neuropeptide. Its role in energy metabolism, endocinal homeostasis, vasculopathy and neuropsychiatry is emerging. However,

scarce data are available about its role in childhood obesity and cardiovascular disease.

Aim: To compare SPX in obese and normal-weight children and to correlate it to various cardiometabolic parameters.

Methodology: Forty obese children were compared to forty age and sex matched normal-weight children. Weight, height and body mass index (BMI) Z-score were calculated. Mean blood-pressure (BI-Pr) on 3 different occasions was plotted on age and sex matched percentiles. Serum SPX, fasting triglycerides, cholesterol, low density (LDL) and high density lipoproteins (HDL) were measured. Internal aortic diameter was measured with calculation of aortic distensibility, strain and stiffness-index.

Results: Obese children had significantly lower SPX ($P = 0.004$), HDL ($P < 0.001$) and aortic distensibility ($P < 0.001$) and significantly higher systolic BI-Pr ($P < 0.001$), diastolic BI-Pr ($P < 0.001$), LDL ($P = 0.011$) and aortic stiffness-index ($P < 0.001$). Significant negative correlation was found between SPX and systolic BI-Pr ($r = -0.641$, $p < 0.001$), diastolic BI-Pr ($r = -0.427$, $p < 0.001$) and aortic stiffness index ($r = 0.389$, $p = 0.013$). SPX was not correlated to age ($r = -0.01$, $p = 0.953$), TG ($r = 0.048$, $p = 0.767$), cholesterol ($r = -0.023$, $p = 0.887$), LDL ($r = -0.299$, $p = 0.061$) and HDL ($r = 0.193$, $p = 0.232$). Receiver-operating characteristic (ROC) curve demonstrated that cut-off point of SPX of ≤ 0.4739 ng/mL could differentiate obese and normal-weighted children with a sensitivity of 70% and specificity of 90%.

Conclusion: Obese children have significantly lower SPX. SPX is correlated to BMI, BI-Pr and vasculopathy in obese children independent of their age and lipid profile. Further studies are needed to explore the patho-mechanism of SPX and to study its potential therapeutic role in the management of obesity and cardiovascular disease.

O23 | Higher prevalence of autonomic neuropathy in youth with type 2 vs type 1 diabetes

B.J. Varley^{1,2}, Y.H. Cho², P. Benitez-Aguirre², J. Cusumano², A. Pryke², A. Chan², V. Velayutham², M. Gow^{1,2}, K.C. Donaghue², M.E. Craig^{1,2}

¹Children's Hospital at Westmead Clinical School, University of Sydney, Sydney, Australia, ²Institute of Endocrinology and Diabetes, Children's Hospital at Westmead, Sydney, Australia

Objectives: Youth with type 2 diabetes (T2D) develop complications earlier than those with type 1 diabetes (T1D), particularly albuminuria and hypertension, despite lower HbA_{1c}. Cardiac autonomic neuropathy (CAN) is an independent risk factor for cardiovascular disease and may indicate subclinical complications risk in youth.

Methods: Retrospective analysis of youth aged <20 years with T1D ($n = 1153$) and T2D ($n = 66$), assessed between Jan 2009 and Mar 2020. CAN was assessed via measuring heart rate variability (HRV) from 10 min continuous ECG using Lab Chart Pro. Time (SD and root-mean squared difference of NN intervals and HR), geometric (Triangular index) and frequency (Low, high and LF:HF) domains were assessed. Multivariable generalized estimating equations were used to examine risk factors for CAN (T1D vs T2D, BMI, BP, HbA_{1c}, age and total cholesterol).

Results: At last assessment, mean age was 16.0 ± 2.2 (T1D) vs 15.3 ± 1.8 (T2D) and mean HbA_{1c} 9 ± 1.6 (T1D) vs 7.8 ± 2.6 (T2D). 1 or more HRV abnormalities were present in 37% of youth with T1D vs 58% with T2D ($p = 0.001$). T2D was associated with impaired CAN across all HRV domains, after adjusting for other risk factors (Table 1). When the analysis was stratified by diabetes type, only systolic BP and age were significantly associated with all HRV domains (except LF:HF and HR) in youth with T2D, while HbA_{1c}, systolic BP, age, cholesterol and obesity (except LF:HF) were significant for T1D. Youth with CAN had higher rates of albuminuria (63% vs 35%, $p < 0.001$) and retinopathy (55% vs 35% $p < 0.0001$), but not peripheral nerve abnormality.

Conclusions: T2D is an independent risk factor for CAN. Our findings highlight the importance of targeting modifiable risk factors in youth with diabetes (obesity and BP), as well as HbA_{1c} and cholesterol in T1D. Further research is needed to unravel the complex etiology of CAN in T2D.

Predictor	SDNN		RMSS		Low Frequency		High Frequency	
	β	95%CI	β	95%CI	β	95%CI	β	95%CI
T2D Vs T1D	-0.20	-0.33 to -0.08	-0.33	-0.50 to -0.15	-0.39	-0.65 to -0.13	-0.77	-1.12 to -0.42
Obesity vs OW/Normal WT	-0.10	-0.15 to -0.04	-0.11	-0.19 to -0.02	-0.20	-0.31 to -0.08	-0.24	-0.40 to -0.07
HbA _{1c} (%)	-0.04	-0.06 to -0.03	-0.06	-0.08 to -0.04	-0.08	-0.10 to -0.05	-0.12	-0.15 to -0.08
Male vs female	0.10	0.06 to 0.14	-	-	0.25	0.16 to 0.34	-	-
SBP SDS	-0.04	-0.05 to -0.02	-0.07	-0.09 to -0.05	-0.09	-0.13 to -0.06	-0.14	-0.18 to -0.09
DBP SDS	-0.03	-0.04 to -0.01	-0.04	-0.07 to -0.02	-0.05	-0.09 to -0.00	-0.08	-0.14 to -0.03
Total Cholesterol	-0.06	-0.09 to -0.04	-0.10	-0.13 to -0.07	-0.12	-0.16 to -0.08	-0.18	-0.24 to -0.12
Age (years)	0.02	-0.03 to -0.01	-0.04	-0.05 to -0.03	-0.04	-0.06 to -0.03	-0.08	-0.10 to -0.06

[Table 1. Multivariable analysis of CAN in youth with T1D and T2D ($n = 3028$ visits). LF:HF and HR not shown. Bold: $p < 0.001$, non-bold: $p < 0.05$].

DIABETES ETIOLOGY

O24 | Evaluation of the SPECTRUM training program for real-time continuous glucose monitoring: A multicenter prospective study in adolescents with type 1 diabetes

T. Biester¹, G. Buchal², D. Deiss³, G. Freckmann⁴, C. Freiberg⁵, A. Fürst-Burger⁶, L. Heinemann⁷, M. Holder⁸, K. Konrad⁹, C. Klinkert¹⁰, K. Remus¹, S. Schlueter¹¹, F. Thienel¹², L. van den Boom¹³, P. von Blanckenburg¹⁴, M. Wernsing¹², P. Wintergerst⁴, R. Ziegler¹⁵, K. Lange¹⁶

¹Kinder- und Jugendkrankenhaus AUF DER BULT, Hannover, Germany, ²DRK-Kinderklinik, Siegen, Germany, ³Medicover Berlin-Mitte MVZ, Berlin, Germany, ⁴Institut für Diabetes-Technologie Forschungs- und Entwicklungsgesellschaft mbH an der Universität Ulm, Ulm, Germany, ⁵Klinik für Kinder- und Jugendmedizin Universitätsmedizin, Göttingen, Germany, ⁶Praxis für Innere Medizin und Kinderheilkunde, Braunschweig, Germany, ⁷Science Consulting in Diabetes GmbH, Neuss, Germany, ⁸Klinikum Stuttgart, Olga Hospital, Stuttgart, Germany, ⁹Klinik für Kinder- und Jugendmedizin Elisabeth-Krankenhaus, Essen, Germany, ¹⁰Praxis für Kinder- und Jugendmedizin Diabetes Schwerpunktpraxis, Herford, Germany, ¹¹Diabetesschwerpunktpraxis Northeim, Northeim, Germany, ¹²Diabetes-Zentrum am CKQ, Quakenbrück, Germany, ¹³Diabetologische Ambulanz am Clementine Kinderhospital, Frankfurt am Main, Germany, ¹⁴Sana Klinikum Hameln-Pyrmont, Hameln, Germany, ¹⁵Kinderärzte Mondstraße, Münster, Germany, ¹⁶Hannover Medical School, Hannover, Germany

Comprehensive knowledge, specific skills, and data-analysis competences are prerequisites of successful use of continuous glucose monitoring systems (CGM). SPECTRUM is a structured and manufacturer-independent training-program for real time CGM (rtCGM) comprising one web-based introduction and five modules (à 90 minutes) of face-to-face group sessions tailored to the needs of adolescents with type 1 diabetes (T1D).

Efficacy of SPECTRUM was evaluated longitudinally among adolescents with T1D from 12 diabetes centers. Outcome parameters were rtCGM-knowledge and -skills (rtCGM-Profi-Check), satisfaction with the course, technology acceptance and metabolic control. Initially 60 adolescents (13–17 yrs.) were recruited (mean age 14.8 ± 1.4 yrs., diabetes duration 6.4 ± 4.2 yrs., 42% female). Data were collected at study entry, after the final group session, and at 6 months follow-up. The study was completed by 52 adolescents (13% dropped out). After training rtCGM knowledge (scale 0–40) improved by 53% (from 16.3 ± 7.8 to 25.5 ± 6.8 ; $p > 0.001$) and persisted until follow-up (27.0 ± 5.7). Satisfaction with SPECTRUM was 1.2 ± 0.3 (1–6 perfect-insufficient). Satisfaction with the rtCGM system was 4.2 ± 0.6 (1–5 low-high) and acceptance of the rtCGM system was 6.0 ± 0.9 (1–7 low-high) after the course and 6.1 ± 1.0 at follow-up. This indicates a high acceptance, and intension to use rtCGM continuously. Adolescents reported of 3 severe hypoglycemic events during the six months before study entry, until follow-up there was no severe hypoglycemic event. Adolescents' mean HbA1c remained stable between study

entry with $8.0 \pm 1.4\%$ and $7.8 \pm 1.4\%$ after six months ($p = 0.286$). Overall 57 of 60 adolescents decided to use rtCGM continuously. SPECTRUM proved to be effective in increasing the knowledge and skills about rtCGM in adolescents with T1D. The effect was sustainable and independent from diabetes center and rtCGM-system used. Adolescents reported of high satisfaction with and acceptance of rtCGM.

OBESITY & DYSLIPIDEMIA (ESPE)

O25 | Safety and efficacy of Sitagliptin (SITA) as initial oral therapy in youth with T2D

A. Deeb¹, P.S. Zeitler², M.Y. Jalaludin³, R. Garcia⁴, R.S. Newfield⁵, Y. Samoilo⁶, C.A. Rosario⁷, N. Shehadeh⁸, C.K. Saha⁹, Y. Zhang¹⁰, M. Zilli¹⁰, L.W. Scherer¹⁰, S.S. Engel¹⁰, K.D. Kaufman¹⁰, R.R. Shankar¹⁰
¹Al Mafraq Hospital, Abu Dhabi, United Arab Emirates, ²University of Colorado Anschutz Medical Campus, Aurora, USA, ³University Malaya Medical Centre, Kuala Lumpur, Malaysia, ⁴Centro de Estudios Clinicos y Especialidades Medicas, Nuevo Leon, Mexico, ⁵University of California San Diego, San Diego, USA, ⁶Siberian State Medical University, Tomsk, Russian Federation, ⁷Hospital General Plaza de la Salud, Santo Domingo, Dominican Republic, ⁸Rambam Medical Center, Haifa, Israel, ⁹Indiana University School of Medicine, Indianapolis, USA, ¹⁰Merck & Co., Inc., Kenilworth, USA

Objectives: To assess the safety and efficacy of DPP-4 inhibition with SITA in youth-onset T2D.

Methods: In a 54-week double-blind RCT, the safety and efficacy of SITA 100 mg qd as initial oral therapy was evaluated in 190 patients (pts) with T2D (10–17 yrs, A1C 6.5%–10% [7.0%–10% if on insulin], negative for pancreatic autoantibodies, overweight/obese at screening or at diagnosis). The RCT was placebo [PBO]-controlled for the first 20 weeks, after which metformin (MET) replaced PBO for 34 weeks. The primary efficacy endpoint was change from baseline (CFB) in A1C at Week 20, analyzed via a longitudinal data analysis model with terms for treatment, time, BMI percentile, insulin use, and interaction of time by treatment. Efficacy analyses included all randomized pts who received ≥ 1 dose of study medication and had ≥ 1 observation for the endpoint, excluding data after discontinuation of study medication or initiation of glycemic rescue. Safety analyses included all randomized pts who took ≥ 1 dose of study medication and, except for hypoglycemia, included data after initiation of glycemic rescue.

Results: Treatment groups were well-balanced at baseline (mean \pm SD A1C $7.5\% \pm 1.0$, BMI percentile 97.1 ± 6.8 , age 14.0 years ± 2.0 [57% < 15], 61% female). At Week 20, LS mean CFB in A1C was -0.01% (SITA) and 0.18% (PBO); between-group difference (95% CI) = -0.19% ($-0.68, 0.30$), $p = 0.45$. At Week 54, LS mean CFB in A1C was 0.42% (SITA) and -0.14% (PBO/MET). There were no notable between-group differences in the AE profile through Week 54.

Conclusions: These data indicate that DPP-4 inhibition with SITA did not provide significant improvement in glycemic control in youths with T2D. The difference in efficacy compared to previous studies in adults may be due to the more aggressive course of T2D, with more rapid β -cell deterioration, in youths than in adults (<https://doi.org/10.2337/db19-0299>). SITA was generally well-tolerated with a safety profile similar to that reported in adults.

CLINICAL USE OF CGM (ADA)

O26 | Optimization of data collection for accuracy of metrics used in continuous glucose monitoring to characterize glycemic outcomes

M.B. Abraham^{1,2,3}, G. Smith², M. deBock², J. Fairchild⁴, B. King⁵, G. Ambler⁶, F. Cameron⁷, E. Davis^{1,2,3}, T. Jones^{1,2,3}, HCL study group¹Perth Children's Hospital, Endocrinology and Diabetes, Perth, Australia, ²Telethon Kids Institute, Perth, Australia, ³The University of Western Australia, Perth, Australia, ⁴Women's and Children's Hospital, Adelaide, Australia, ⁵John Hunter Children's Hospital, Newcastle, Australia, ⁶The Children's Hospital at Westmead, Westmead, Australia, ⁷Royal Children's Hospital Melbourne, Endocrinology and Diabetes, Melbourne, Australia

Introduction: Ten days of continuous glucose monitoring (CGM) over a 14-day period can provide an accurate assessment of glucose control over 3 months. However, it remains unclear as to how many readings per day in this 2-week period are required to make this association.

Objectives: This study aims to explore the various patterns of missing data on the accuracy of CGM metrics.

Methods: The data set for this study was obtained from a trial¹ during which participants wore blinded CGM for 3 weeks and had at least 14 days' data with over 80% of readings ($n = 64$). Simulations were conducted to examine the effect of various patterns of missing data. The degree of agreement between simulated and actual glycemic measures (% time in range (3.9-10 mmol/L), % time < 3.9 mmol/L, % time > 10 mmol/L) was examined. The tested parameters included number of days (3, 7 and 10) and percent of observations of valid data (70% and 80%) over the observed days. The correlation coefficient and median absolute difference between simulated and actual scores were calculated.

Results: The table provides a summary of the correlation between simulated and actual scores of the CGM metrics. The highest correlation for time in range is seen with 10 days' data (0.96–0.97) while 7 days' data also provided a good correlation of 0.91. Correlation was similar across the 3, 7 and 10-day period for 70% and 80% readings. The median absolute difference between simulated and actual scores for time in range was 8.00 and 7.60 for 70% and 80% data over 3 days, 3.41 and 3.50 for 70% and 80% data over 7 days and 2.41 and 2.27 for 70% and 80% data over 10 days.

Conclusions: For clinical research trials, 70% of CGM data over 7 days can provide accurate representation of the 2-week CGM metrics although 10 days' data provide the best prediction.

Reference: 1. deBock et al *BMJ open*. 2018;8(8).

Correlation	3 days		7 days		10 days	
	70%	80%	70%	80%	70%	80%
% time < 3.9 mmol/L	0.72	0.75	0.91	0.92	0.96	0.96
% time in range 3.9-10 mmol/L	0.73	0.75	0.93	0.93	0.96	0.97
% time > 10 mmol/L	0.76	0.78	0.94	0.94	0.97	0.97

[Correlation between simulated and actual scores of the CGM metrics].

O27 | Improved estimation of glycated hemoglobin concentration using continuous glucose monitoring for clinical practice

J. Chrzanowski¹, A. Michalak^{1,2}, A. Łosiewicz², H. Kuśmierczyk², B. Mianowska², A. Szadkowska², W. Fendler^{1,3}

¹Medical University of Lodz, Department of Biostatistics and Translational Medicine, Lodz, Poland, ²Medical University of Lodz, Department of Pediatrics, Diabetology, Endocrinology and Nephrology, Lodz, Poland, ³Dana-Farber Cancer Institute, Department of Radiation Oncology, Boston, USA

Introduction: HbA1c remains the standard for the assessment of glycemic control and long-term prognosis in type 1 diabetes (T1D) but can be complemented with continuous glucose monitoring (CGM). Estimation of HbA1c from CGM data would benefit CGM-users and telemedicine. Currently, HbA1c may be estimated using the Glucose Management Indicator (GMI) but with a clinically-unsatisfactory 1-1.5% absolute error.

Objectives: To develop a tool for HbA1c estimation using CGM data and compare it with the GMI in real-life conditions.

Methods: We used routinely-collected data from patients with T1D from central Poland. CGM records were extracted from Medtronic/Abbott databases and cross-referenced with HbA1c; only 28-day periods preceding HbA1c measurement with >75% of sensor active time were analyzed. We developed three predictive tools: a mixed linear regression including glycemic variability indices and patient's ID (GV-PS), its extension using each patient's past clinical data (GV-PA) and linear regression based on the past patient-specific error of GMI (GI-PA). Models were assessed by bias, its 95% confidence interval (95%CI), coefficient of determination (R^2) and mean absolute relative difference (MARD).

Results: Final analysis included 723 HbA1c-CGM pairs from 174 patients (mean age 9.9 ± 4.4 years, duration of diabetes 3.7 ± 3.6 years). GMI yielded $R^2 = 0.58$, an overall bias with 95%CI -0.9% to +1%, different between Medtronic and Abbott devices [0.120% vs -0.152%, $p < 0.0001$] and a MARD = 5.8%. Models were tested against HbA1cs from previously unseen patients. GI-PA and GV-PA performed similarly ($R^2 = 0.76$, bias = -0.07%, 95%CI = -0.8% to 0.7%, MARD = 4.1% and $R^2 = 0.76$, bias = -0.08%, 95%CI = -0.8% to 0.6%, MARD = 5.9% respectively) with GV-PS performing significantly worse ($R^2 = 0.65$, bias = -0.14%, 95%CI = -0.9% to 0.9%, MARD = 7.3%).

Conclusions: Constructed models performed better than GMI. GI-PA model provided an accurate and clinically viable estimate of HbA1c with the most simplified input.

O28 | Comparing measurement accuracy of two generations of the FreeStyle Libre to glucometer during a summer camp for T1D youth

A. Łosiewicz¹, A. Michalak^{1,2}, H. Kuśmierczyk¹, J. Chrzanowski², K. Rusiecka³, A. Gawrecki⁴, D. Zozulińska-Ziółkiewicz⁴, W. Fendler^{2,5}, A. Szadkowska¹

¹Medical University of Lodz, Department of Pediatrics, Diabetology, Endocrinology and Nephrology, Łódź, Poland, ²Medical University of Lodz, Department of Biostatistics and Translational Medicine, Łódź, Poland, ³Polish Mother Memorial Research Institute, Łódź, Poland, ⁴Poznan University of Medical Sciences, Poznan, Poland, ⁵Dana-Farber Cancer Institute, Department of Radiation Oncology, Boston, USA

Introduction: FreeStyle Libre continuous glucose monitoring (FSL) has recently received an update in its glucose tracking algorithm, which allegedly improved its measurement accuracy. However, this needs to be tested in real-life conditions.

Objectives: To compare two generations of FSL systems (A, B) to self-monitored capillary blood glucose (SMBG) in children with type 1 diabetes (T1D) during a summer camp.

Methods: Youth with T1D participated in two summer camps in 2016 and 2019, during each using different FSL-A and FSL-B respectively. On scheduled days, they performed supervised 8-point glucose profiles with FSL and SMBG. The accuracy of FSL versus comparator glucose meter was assessed with mean absolute relative difference (MARD) and clinical surveillance error grid (SEG).

Results: We analyzed 1655 FSL-A/SMBG measurements and 1796 FSL-B/SMBG from 78 and 58 patients (mean age-FSL-A:13 ± 2.3 years; FSL-B:13.8 ± 2.3 years, $p = 0.0549$; mean HbA1c-FSL-A:7.6 ± 0.8%; FSL-B: 7.5 ± 1.1%, $p = 0.6371$). FSL-B displayed lower MARD than FSL-A (11.3 ± 3.1% vs 13.7 ± 4.6%, $p = 0.0003$) and lower standard deviation of errors (20.2 ± 6.7 mg/dL vs 24.1 ± 9/6 mg/dL, $p = 0.0090$) but similar bias (−7.6 ± 11.8 mg/dL vs −6.5 ± 8 mg/dL, $p = 0.5240$). Accuracy of both FSL-A and B depended on the current glucose trend ($p < 0.0001$), with higher MARD when glycemia was rapidly decreasing (>2 mg/dL/min; MARD for FSL-A: 22.3%; FSL-B:17.9%), and when the system could not define the trend of glycemic change (FSL-A:16.5%; FSL-B:15.2%). FSL-A and B demonstrated a high percentage of results in class A or B risk categories of SEG (FSL-A: 96.4%, FSL-B: 97.6%) however, a significant shift of measurements from B to A category was noted (FSL-A:16/84.4%; FSL-B:12.3/85.3%, $p = 0.0012$).

Conclusions: The second generation of FSL demonstrates higher accuracy of measurements in real-life conditions for T1D children when compared to the first generation. However, in some situations SMBG verification of FSL measurement might still be necessary.

DIABETES ETIOLOGY

O29 | The other face of type 1 diabetes mellitus and autoimmunity

Y. Abdelmeguid¹, H. Hassab¹, W. Shoman¹, A. Khalil¹, W. Zaghloul¹
¹Faculty of Medicine, Alexandria University, Pediatrics, Alexandria, Egypt

Introduction: Clustering of diabetes and early-onset autoimmune disease may be caused by a mutation within a single gene, leading to monogenic autoimmunity. Both polygenic type 1 diabetes mellitus (T1DM) and monogenic autoimmune diabetes share the presence of beta-cell autoantibodies, making it difficult to differentiate between them. These monogenic autoimmune syndromes present earlier, are more severe and their treatment differs.

Case summary: A 3.5-year-old girl, born to consanguineous parents, presented with jaundice, pallor, splenomegaly, & generalized lymphadenopathy. She was diagnosed with Evan's syndrome. ANA, anti-dsDNA, virology were negative. She received packed RBCs, methylprednisolone pulses then oral steroids. She developed recurrent attacks of hemolysis, despite continuing on steroid therapy. At the age of 5.5 years, she was diagnosed with T1DM. Her glycosylated hemoglobin was 8.4%, C-peptide was low, anti-GAD antibodies positive & she was started on insulin. Screening for thyroid & celiac disease were negative. Immunological profile was normal, double negative T-cells were negative. As regards her hematological condition, she improved on adding azathioprine & intravenous immunoglobulin. At the age of 6 years, she presented with clubbing, chronic bloody diarrhea, abdominal pain & hepatitis. A picture of colitis by laboratory investigations and endoscopy confirmed diagnosis of inflammatory bowel disease. Her genetic analysis finally revealed she was homozygous for a LPS-responsive beige-like anchor (LRBA) nonsense variant causing Common variable immunodeficiency-8 with autoimmunity, which can be successfully treated with abatacept. Unfortunately, she died with septicemia before starting therapy.

Conclusion: Diagnosing T1DM is not difficult. Yet, differentiating between monogenic and polygenic autoimmune diabetes is challenging and important to guide management and predict prognosis. Therefore, early recognition and genetic confirmation of the diagnosis is essential.

O30 | Changes in HbA1c between 2011–2017 in Austria/Germany, Sweden, and the United States: A lifespan perspective

A. Albanese-O'Neill¹, J. Grimsman^{2,3}, A.-M. Svensson^{4,5}, K. Miller⁶, K. Raile⁷, K. Akesson^{8,9}, P. Calhoun⁶, B. Biesenbach¹⁰, K. Eeg-Olofsson¹¹, D. Maahs¹², R. Holl^{2,3}, R. Hanas^{13,14}

¹University of Florida, Gainesville, USA, ²University of Ulm, Institute of Epidemiology and Medical Biometry, Ulm, Germany, ³German Center for Diabetes Research (DZD), Munich-Neuherberg, Germany, ⁴University of Gothenburg, Department of Molecular and Clinical Medicine, Gothenburg, Sweden, ⁵National Diabetes Register, Centre of Registers, Gothenburg, Sweden, ⁶JAEB Center for Health Research, Tampa, USA,

⁷Charité University Hospital Berlin, Department of Pediatric Endocrinology and Diabetes, Berlin, Germany, ⁸Linköping University, Department of Biomedical and Clinical Sciences, Linköping, Sweden, ⁹Ryhov County Hospital, Department of Pediatrics, Jönköping, Sweden, ¹⁰Kepler University Hospital, Linz, Austria, ¹¹University of Gothenburg, Department of Medicine, Gothenburg, Sweden, ¹²Stanford University, Palo Alto, USA, ¹³NU Hospital Group, Department of Pediatrics, Uddevalla, Sweden, ¹⁴Gothenburg University, Institute of Clinical Sciences, Gothenburg, Sweden

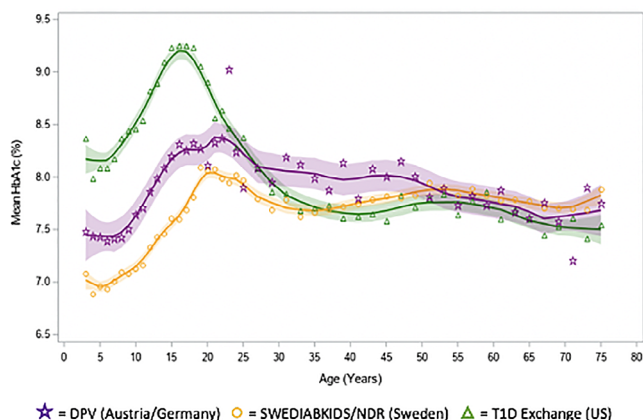
Introduction: Hemoglobin A1c (HbA1c) is widely used as a clinical marker for metabolic control. The use of HbA1c facilitates the ability to make international comparisons regarding outcomes.

Objectives: This study assessed HbA1c across the lifespan in people with T1D in Austria/Germany, Sweden, and the United States (U.S.) between 2011 and 2017.

Methods: Data extracted from the DPV, Austria/Germany (n = 25,651 in 2011, n = 29,442 in 2017); SWEDIABKIDS/NDR, Sweden (n = 44,474 in 2011, n = 53,690 in 2017); and T1D Exchange, U.S. (n = 16,198 in 2011, n = 17,087 in 2017) registries were included in the analysis.

Results: Mean HbA1c across the lifespan in 2017 and changes in mean HbA1c between 2011 and 2017 overall and by age cohorts were analyzed. In 2017 mean HbA1c for adults ≥ 45 years converged across registries; HbA1c levels for subjects < 25 years were highest in the U.S. (Figure). Controlling for age, sex, and T1D duration, overall HbA1c increased in the U.S. between 2011 and 2017 (2011 = 8.02%, 2017 = 8.26%, $p < 0.01$); decreased in Sweden (8.06%, 7.74%, $p < 0.01$); and did not change in Austria/Germany (7.84%, 7.84%, $p = 0.49$). Controlling for sex and T1D duration, mean HbA1c decreased between 2011 and 2017 in all age cohorts in Sweden (all $p < 0.01$). In the U.S., HbA1c increased in subjects < 45 years and ≥ 65 years (all $p < 0.05$) and did not change in subjects 45- < 65 years ($p = 0.06$). In Austria/Germany, HbA1c decreased in subjects 13- < 19 years ($p < 0.01$), did not change in subjects < 13 years ($p = 0.26$) and 19- < 25 years ($p = 0.88$), and increased in subjects ≥ 25 years (all $p < 0.05$).

Mean HbA1c by Age by Registry in 2017



[Mean HbA1c by Age by Registry in 2017].

Conclusions: Comparing international data provides the opportunity to learn from countries that are achieving better clinical outcomes and adopt effective processes. Further research is warranted to better understand causes of geographic disparities in glycemic control.

DIABETES IN DEVELOPING WORLD

O31 | Retinopathy Prevalence in Children with Type 1 Diabetes from 8 countries: Differences and Time-trends

N. Bratina^{1,2}, J.M. Grimsman^{3,4}, R. Holl^{3,4}, K.C. Donaghue^{5,6}, H. Veeze⁷, V. Cherubini⁸, S.E. Hofer⁹, K. Dovic^{1,2}, M. Craig^{5,6,10}, K. Nagl¹¹, L. Zagaroli⁸, C. de Beaufort¹², E.T. Jensen¹³, D. Dabelea¹⁴, U. Schierloh¹², D. Mul⁷, Australasian Diabetes Data Network (ADDN), Region Marche Registry for Diabetes, the Prospective Diabetes Follow-up Registry (DPV initiative, Diabeter Diabetes Database, Slovenian Childhood Diabetes Registry, SEARCH for Diabetes in Youth Study

¹UMC Ljubljana University Children's Hospital, Department of Pediatric Endocrinology, Diabetes and Metabolic Diseases, Ljubljana, Slovenia, ²Faculty of Medicine, University of Ljubljana, Ljubljana, Slovenia, ³Epidemiology and Medical Biometry, ZIBMT, University of Ulm, Ulm, Germany, ⁴German Center for Diabetes Research (DZD), Munich-Neuherberg, Germany, ⁵St. George Hospital and The Children's Hospital at Westmead, Sydney, Australia, ⁶University of Sydney, Sydney, Australia, ⁷Diabeter, Center for Pediatric and Adult Diabetes Care and Research, Rotterdam, Netherlands, ⁸Division of Pediatric Diabetology, Department of Women's and Children's Health, Salesi Hospital, Ancona, Italy, ⁹Medical University of Innsbruck, Department of Pediatric 1, Innsbruck, Austria, ¹⁰University of New South Wales, Sydney, Australia, ¹¹Medical University of Vienna, Department of Pediatrics and Adolescent Medicine, Vienna, Austria, ¹²Centre Hospitalier Luxembourg, Department of Pediatric Diabetes and Endocrinology, Luxembourg, Luxembourg, ¹³Wake Forest School of Medicine, Department of Epidemiology and Prevention, Winston-Salem, USA, ¹⁴Colorado School of Public Health, University of Colorado, Department of Epidemiology, Aurora, USA

Introduction: Recently a 3.4% yearly incidence increase in childhood onset type 1 diabetes (T1D) was reported.

Younger age at diagnosis makes more children and young people at risk of developing diabetic retinopathy and diabetes related visual impairment; however, this may be largely preventable.

While hyperglycemia reflected in increased glycated hemoglobin (HbA1c) remains the strongest risk factor for diabetic retinopathy progression, other risk factors may be important, and there could be secular changes over time.

Objectives and Methods: In this multicentric longitudinal study, data on prevalence of diabetic retinopathy in children and young people with T1D among 8 countries (Austria, Australia, Germany, Italy, Luxembourg, Netherland, Slovenia, USA,) were analyzed. Secondary aim was to investigate time trends and the association between the incidence of diabetic retinopathy and the most common known risk

	Number of visits (% male)	Age (years)	Type 1 Diabetes Duration (years)	HbA1c (mmol/mol(%))	Any retinopathy	Cholesterol/ LDL (mg/dl)	Hypertension >140/90 (%)	Risk factors last visit - estimates (p value)*
Australia	1931 (51)	14.8	6.83	72.25 (8.8)	0.112	172/97	1.0	Exam year: -1.622 (0.0010) Age: 0.092 (0.0480) Duration: 0.203 (<0.0001) HbA1c: 0.019 (0.0004)
Austria	8369 (53.8)	13.7	5.87	64.34 (8.0)	0.003	172.8/93.4	3.6	Duration: 0.099 (0.0438)
Germany	175,411 (52)	13.3	5.36	63.63 (8.0)	0.004	175/97.9	3.4	Exam Year: -0.094 (<0.0001) Duration: 0.130 (<0.0001) Female: 0.208 (0.0159) HbA1c: 0.017 (<0.0001)
Italy	409 (52.1)	13.2	5.58	61.55 (7.8)	0.005	159.5/84.9	0.2	/
Luxemburg	730 (53.3)	14.4	6.57	63.9 (8.0)	0.004	165/92	1.2	/
Netherlands	723 (49.1)	14.7	7.93	63.8 (8.0)	0.010	171.9/93.9	0.8	/
Slovenia	925 (51.2)	14.9	6.32	62.94 (7.9)	0.006	162.4/89	1.1	/
USA	1698 (48.4)	15.5	7.67	77.28 (9.2)	0.024	170.1/ND	0.4	Age: 0.332 (<0.0001) Duration: 0.466 (<0.0001)

[Prevalence and demographics and significant factors in logistic regression from last visit].

*Estimates and p values are derived from a logistic regression analysis related to the most recent eye examination, adjusted for age, duration of type 1 diabetes, gender, hypertension, HbA1c and minority status, stratified by country

factors (age at diagnosis, duration of diabetes, gender, HbA1c, blood pressure, cholesterol, smoking status).

Results: Data from 80,185 young people up to the age of 21 years with T1D having altogether 401,044 visits were included, their mean age at eye exam was 12.9 years, the duration of diabetes was 5.2 years and mean HbA1c was 64.36 mmol/mol (8.0%). In all centers the prevalence of retinopathy was low, being the highest in Australia (0.122%), severe retinopathy was rarely reported (0–0.004) (Table 1). Logistic regression demonstrated significant association with age (Australia, USA), duration of T1D (Australia, Austria, Germany and USA), female gender (Germany), and with HbA1c (Australia and Germany). Two countries (Australia and Germany) reported less retinopathy at last assessment over time ($p < 0.001$).

Conclusions: In conclusion, data from this large multicentric longitudinal observational study demonstrated low incidence of retinopathy in youth with T1D. A correlation with T1D duration, next to age at eye exam was shown.

O32 | Psychological screening and health related quality of life in children, adolescents and young adults with type 1 diabetes mellitus in Congo

S.V. Missambou Mandilou^{1,2}, L.C. Atipo Ibara Ollandzobo^{1,3}, F.L.G. Kitemo Mpolo¹, B.P.S. Ngoulou¹, C.L. Elenga Bongo^{3,4}, E. Bouénizabila^{2,3,5}, J.R. Mabilia Babela^{1,3}

¹Teaching Hospital of Brazzaville, Department of Pediatrics, Brazzaville, Congo, ²Institut du Diabète Maison Bleue, Brazzaville, Congo, ³Health Sciences Faculty, Marien Ngouabi University, Department of Medicine,

Brazzaville, Congo, ⁴General Hospital Adolph Sicé, Department of Metabolic and Endocrine Diseases, Pointe - Noire, Congo, ⁵Teaching Hospital of Brazzaville, Department of Metabolic and Endocrine Diseases, Brazzaville, Congo

Youth with type 1 diabetes endorse psychological disorders that are one of the factors contributing to poor glycemic control and health quality of life.

To assess the quality of life, to describe psychosocial disorders, and to identify factors of poor quality of life and poor psychosocial experiences among children, adolescents and young adults with T1DM in Congo.

A cross-sectional, descriptive and analytical study of 74 children, adolescents and young adults with type 1 diabetes. Information on anxiety, depression and quality of life was obtained using a semi-directed interview and questionnaires, and was assessed via the Beck's Anxiety and Depression Scales and the pedsQL score of the MAPI RESEARCH TRUST. The analysis of the results was based on the CSPRO.7 and SPSS 19 software.

A total of 74 patients were recruited, 44 girls (60%), a male to female ratio of 0.7. The mean age was 18 ± 4.1 years (extremes: 9 and 25 years). Minimal anxiety was noted in 51 (69%) patients, twenty-three (31%) had non-minimal anxiety, among whom 14 patients had mild anxiety, five patients moderate and four patients severe anxiety. Forty-three (58.1%) patients did not have depression. However, depression was present in thirty-one patients (41.9%) and was classified as mild in 19 cases and moderate in 12 cases. The mean overall patient quality of life score was 50. Higher socioeconomic status ($p = 0.03$) was the only protective factor against anxiety, while the age greater than 14 years ($p = 0.01$) was the only risk factor for

depression. The quality of life was found to be poor in patients from low socio-economic status ($p = 0.01$), those with poor glycemic control ($p = 0.01$ for the first test, $p = 0.03$ for the second), and when depression was present ($p = 0.02$).

Patients with type 1 diabetes in Congo experienced a mean quality of life, a poor psychosocial experience. Improving the prognosis of these patients involves integrating psychosocial aspects in the management of the disease.

O33 | Exclusive telemedicine during COVID-19 Pandemic: Impact on metabolic control, diabetes care and satisfaction of families in a Chilean little urban-rural diabetes center

J. Pelicand^{1,2}, T. Silva², H. Alcaino¹, M. Silva¹

¹Universidad de Valparaíso, Medicine School, San Felipe de Aconcagua, Chile, ²Hospital San Camilo, Pediatric Diabetes Program, San Felipe, Chile

Objective: Telemedicine (TM) is one more tool at modern medicine service at care and treatment of Type 1 Diabetes (DM1) moreover in remote areas. Since 2016, our Diabetes Care Program includes TM as a possible add-on care according to the families' realities and needs. Because of covid-19 pandemic, since March, we are providing regular care, education, and emergencies management through exclusive TM (ETM). The study objective is to evaluate the impact of 6 month ETM on metabolic control, diabetes care providing and families' satisfaction.

Methods: A descriptive and comparative study is conducted in our center from December 2019 to October 2020. The ETM impact will be evaluated and compared in 4 different times (February, May, August, October) on metabolic control outcomes, ETM indicators and families satisfaction.

Preliminary results: Our sample included 53 children 2–17 years aged (9,4 + – 3,8 years); treatment CSII (15,1%), CGM (24,5%). The first results are shown in the table. The main reasons of use respectively TM add-on care and ETM, are adjusting insulin doses (65,5%/89,2%), emergencies management (58,6%/45,9%) and improved diabetes education (13,8%/21,6%). The type of TM contact were: telephone

	Dec 2019-Feb 2020 (TM add-on care)	March–May 2020 (ETM)
regular visit number per patient	1,69 + – 0,74	3,30 + – 1,72
A1c average (%)	7,94 + – 1,71	Awaiting results
Glucose average /14 days (mg/dl)	169,62 + – 48,19	162,16 + – 34,17
Hypoglycemia episodios number	16,11 + – 17,11	11,96 + – 9,73
Acute complications number	2 (DKA 1, Severe Hypoglycemia 1)	0
Total daily insulin dose IU/kg/day	0,83 + – 0,23	Awaiting results
BMI	18,44 + – 3,7	Awaiting results
% families using TM	59,2	100

[first results].

(32,4%), Whatsapp (100%) and E-mail (18,9%). Only 33,1% of families use of upload platform. ETM satisfaction is optimal (4,95/5) principally because of a perception of better diabetes management, improved family motivation, responsibility and security, reinforced relationship with diabetes team, time saving and cost reduction. The principal limit is the cost of phone/internet connexion.

Conclusions: The first results indicate that ETM appears like a good diabetes care system for the families even if they do not have access to technology. It also seems to improve diabetes management. However, there are still many pending results until october, including clinic and biochemical data, to complete our comparison data.

INSIGHTS INTO DIVERSITY AND INCLUSION IN CARE AND DEBATE

O34 | Lower pediatric HbA1c in Sweden during recent years is associated with a lower HbA1c nadir during the first year after onset

R. Hanas^{1,2}, I. Steineck³, J. Anderzen⁴, K. Eeg-Olofsson⁵, J. Ekelund⁶, S. Gudbjörnsdottir⁷, J. Nåtman⁶, A.-L. Fureman^{8,9}, L. Hanberger¹⁰, A. Pundziute Lyckå^{2,11}, U. Samuelsson^{12,13}, S. Särnblad¹⁴, A.-M. Svensson⁷, K. Åkesson^{13,15}

¹NU Hospital Group, Dept. of Pediatrics, Uddevalla, Sweden, ²University of Gothenburg, Sahlgrenska Academy, Institute of Clinical Sciences, Gothenburg, Sweden, ³Steno Diabetes Center Copenhagen, Diabetes Technology, Copenhagen, Denmark, ⁴Ryhov Hospital, Department of Pediatrics, Jönköping, Sweden, ⁵University of Gothenburg, Sahlgrenska Academy, Department of Molecular and Clinical Medicine, Gothenburg, Sweden, ⁶Center of Registers Västra Götaland, Gothenburg, Sweden, ⁷University of Gothenburg, Institute of Medicine, Department of Molecular and Clinical Medicine, Gothenburg, Sweden, ⁸Östersund Hospital, Department of Pediatrics, Östersund, Sweden, ⁹Umeå University, Institute of Clinical Sciences, Umeå, Sweden, ¹⁰Linköping University, Department of Health, Medicine and Caring Sciences, Division of Nursing and Reproductive Health, Linköping, Sweden, ¹¹Sahlgrenska University Hospital, The Queen Silvia Children's Hospital, Gothenburg, Sweden, ¹²Linköping University, Department of Pediatrics, Linköping, Sweden, ¹³Linköping University, Department of Biomedical and Clinical Sciences, Linköping, Sweden, ¹⁴Örebro University, Department of Pediatrics, School of Medical Sciences, Örebro, Sweden, ¹⁵Ryhov County Hospital, Department of Pediatrics, Jönköping, Sweden

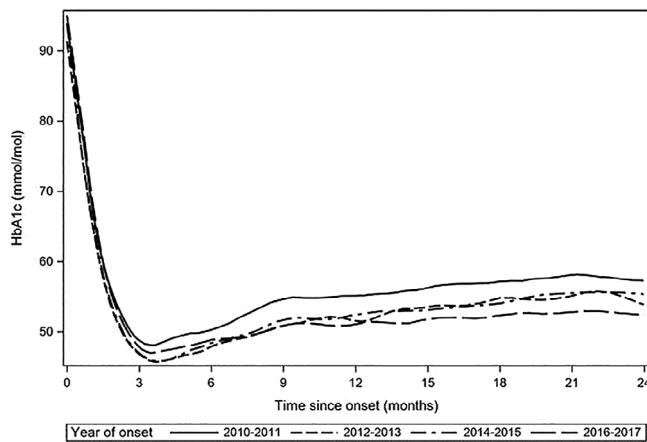
Background: There is a large variation in mean HbA1c levels even between high-income countries, with a decrease over time in HbA1c in some countries but an increase in others. Sweden has experienced a steady decrease in HbA1c over the past 10 years. The aim of this study was to illustrate how changes in HbA1c during the first two years after diagnosis in children and adolescents is related to calendar year for diagnosis of type 1 diabetes from 2010 to 2017.

Methods: The Swedish SWEDIABKIDS registry collects data every ~3 months and has >95% coverage up to age 18 years. We plotted all

available HbA1c data vs. diabetes duration, presented as separate Loess curves per 2 consecutive onset year groups.

Results: We followed 5102 patients over 2 years from diabetes onset who contributed with 51,550 HbA1c values in total. HbA1c at onset was similar 2010/11 and 2016/17 (93.9 vs. 95.0 mmol/mol, 10.7 vs. 10.8%), while mean age at onset had changed slightly from 8.8 ± 4.2 to 9.2 ± 4.0 years. The HbA1c nadir (lowest level during first year) is around 4 months, and has become lower over the years. Early HbA1c tracking is apparent and is established with a difference between the groups from 1 year's diabetes duration.

Conclusions: Intensification of early diabetes treatment, resulting in a lower HbA1c nadir at 4 months and lower HbA1c from 1 year onwards is related to HbA1c two years after diagnosis. Thus, a modifiable factor for a long-term improvement in metabolic control has been identified.



[Loess graph of HbA1c vs. time since onset of diabetes].

O35 | A tale of three Registries: HbA1c changes in DPV, NPDA and T1DX from 2010 to 2018

R.A. Lal¹, H. Robinson², J.M. Grimsman³, K.M. Miller⁴, S. Pons Perez², R. Kovacic⁵, P. Calhoun⁴, F. Campbell⁶, A. Naeke⁷, D.M. Maahs¹, R.W. Holl³, J. Warner⁸
¹Stanford University, Stanford, USA, ²Royal College of Pediatrics and Child Health, London, UK, ³Ulm University, Ulm, Germany, ⁴JAEB Center for Health Research, Tampa, USA, ⁵Bezirkskrankenhaus Lienz, Lienz, Austria, ⁶Leeds Children's Hospital, Leeds, UK, ⁷Universitätsklinikum Dresden, Dresden, Germany, ⁸University Hospital of Wales, Cardiff, UK

Introduction: Diabetes registries provide the opportunity to benchmark data, implement quality improvement projects, and track and improve outcomes. While no registry includes every person with type 1 diabetes, they reflect the performance of experienced diabetes centers in each region.

Objectives: To investigate the changes in pediatric hemoglobin A1c (HbA1c) against insulin pump use from 2010 to 2018 in the German/Austrian Diabetes-Patienten-Verlaufsdokumentation (DPV), National Pediatric Diabetes Audit (NPDA) in England/Wales, and the Type 1 Diabetes Exchange (T1DX) in the United States.

Methods: All pediatric registry data from visits during 2010 to 2018 (n = 1,196,444 visits in 108,217 participants) were analyzed for those with type 1 diabetes diagnosed after the age of 6 months who were < 18 years of age. Descriptive statistics were performed in SAS 9.4.

Results: Characteristics of participants in the registries were similar (age = 12.4 ± 3.9 years, T1D duration = 4.3 ± 3.6 years, 53% male, BMI = 20.7 ± 4.2 kg/m², 11.2 ± 13.0 visits/participant over 3.2 ± 3.8 years). In all registries, insulin pump use increased over time (Figure 1A) to 55% in DPV in 2018, 39% in NPDA in 2017 and 73% in T1DX in 2018. In contrast, HbA1c (Figure 1B) slightly decreased in DPV (7.7 to 7.6%), decreased in a clinically significant manner in NPDA (8.7 to 8.1%), and increased in a clinically significant manner in T1DX (8.1 to 8.5%).

Conclusions: These data indicate three different longitudinal patterns in HbA1c from 2010–2018 at the registry level. Further efforts should focus on how NPDA improved their population HbA1c, how DPV maintained and slightly decreased an even lower HbA1c, and T1DX should implement quality improvement programs to reverse HbA1c increases.

Fig 1A. Pediatric Pump Use

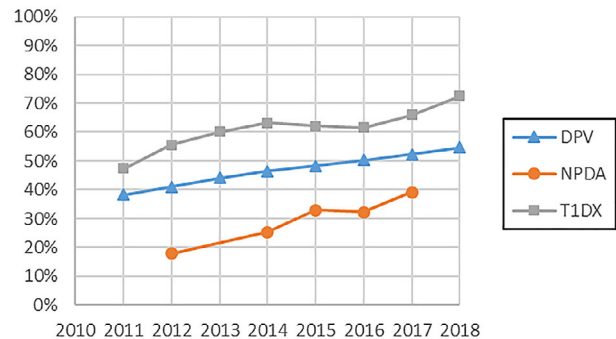
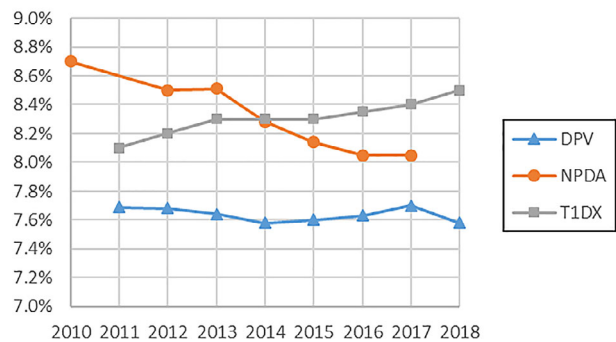


Fig 1B. Pediatric Longitudinal HbA1c



[Figure 1].

O36 | Outcomes over the first 18 months of diabetes diagnosis based on data from the multi-center SWEET pediatric diabetes registry

P. Prahalad^{1,2}, A. Schwandt^{3,4}, S. Besancon⁵, M. Kumari⁶, B. Obermannova⁷, M. Kershaw⁸, R. Bonfanti⁹, A. Lycka¹⁰, R. Hanas^{11,12}, K. Casteels^{13,14}, SWEET Study Group
¹Stanford University, Pediatric Endocrinology, Stanford, USA, ²Stanford Diabetes Research Center, Stanford, USA, ³Ulm University, Institute of

Epidemiology and Medical Biometry, ZIBMT, Ulm, Germany, ⁴German Centre for Diabetes Research (DZD), Munich-Neuherberg, Germany, ⁵NGO Sante Diabete, Grenoble, France, ⁶PSG Super Specialty Hospitals, Coimbatore, India, ⁷University Hospital Motol and 2nd Faculty of Medicine, Charles University, Pediatrics, Prague, Czech Republic, ⁸Birmingham Women and Childrens Hospital, Department of Endocrinology and Diabetes, Birmingham, UK, ⁹San Raffaele Diabetes Research Institute, IRCCS San Raffaele Scientific Institute, Milan, Italy, ¹⁰Umeå University, Department of Clinical Sciences, Pediatrics, Umeå, Sweden, ¹¹NU Hospital Group, Department of Pediatrics, Uddevalla, Sweden, ¹²University of Gothenburg, The Sahlgrenska Academy, Institute of Clinical Sciences, Gothenburg, Sweden, ¹³University Hospitals Leuven, Pediatrics, Leuven, Belgium, ¹⁴KU Leuven, Development and Regeneration, Leuven, Belgium

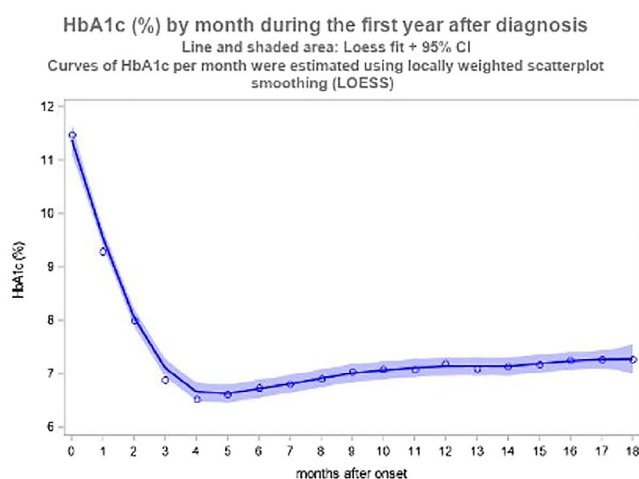
Objectives: A majority of youth with type 1 diabetes (T1D) do not achieve the ISPAD target hemoglobin A1c (HbA1c < 7% or < 53 mmol/mol). There are data to suggest that outcomes in the early course of diabetes can affect long-term outcomes, as measured by HbA1c. In this study, we evaluated the HbA1c course over the first 18 months after diabetes diagnosis in the SWEET diabetes registry.

Methods: The SWEET diabetes registry is an international consortium of pediatric diabetes centers which collects clinical outcomes data and shares best practices. This analysis was based on data collected through July 2019. Of the 101 SWEET centers present in this registry, HbA1c data over the first 18 months of diagnosis were available from 62 centers and 7044 patients. We used local regression scatter plot smoothing techniques (Loess) to visualize the data.

Results: The median age at diagnosis was 9.5 years (5.8, 12.6) and 53% were male. Presentation data were available in 3346 patients with 44% presenting with DKA. When examining the HbA1c curve of

the SWEET cohort (Figure 1), the HbA1c level peaks at diagnosis and reaches its lowest value 4 months post-diagnosis. At 5 months post-diabetes diagnosis, the HbA1c begins to rise and the mean HbA1c crosses the 7% threshold at 9 months post-diagnosis. The overall median HbA1c for each patient in this cohort is 7.3% (6.6, 8.1) or 56.5 mmol/mol (48.7,64.7). There is no difference based on biologic sex.

Conclusions: In the SWEET cohort, the majority of children with type 1 diabetes were unable to meet the HbA1c target (< 7%) from 9 months post-diabetes diagnosis. This suggests that focused interventions should begin early after diagnosis to prevent decline of control. Further analyses should be performed to identify variations in this trajectory and share learnings from centers that are able to maintain control for longer periods of time.



[Figure 1. HbA1c Trajectory in the first year after T1D diagnosis].