

## ABSTRACT



WILEY

## EPOSTER SESSION 1

**EP001 | Improving diabetes care through population health studies: Insights from the largest U.S population based T1D cohort**

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**Introduction:** Population-based registries are proven tools for tracking outcomes and improving the quality of care delivery. The T1DX-QI is a population-based cohort with twelve national clinics (and growing) engaged in data sharing and quality improvement (QI) to improve outcomes. The T1D Exchange serves as the coordinating center for the T1DX-QI.

**Objectives:** The objective is to describe demographics and selected measures from the T1DX-QI (2014–2020), the largest cohort of T1D patients for population health studies in the United States. We also describe insights in relation to mobile technology use across different age groups.

**Methods:** Data were extracted from the T1DX QI Portal (n = 23,820, 7 clinics). The table reflects the selected demographic and other measures from two adult sites and five pediatric clinics. Mean HbA1c was calculated for each year of age for participants ≤25 years and at a two-year interval for participants >25 years. Linear regression models

were performed to assess the relationship between demographic characteristics and HbA1c.

**Results:** The participants age ranged from less than one to 95 years. The T1DX-QI cohort has a large, diverse and representative sample of minorities, patients on public insurance, patients on continuous glucose monitors (CGM) and insulin pumps compared to other US research registry cohorts. 51% of the cohort are male, 74% identify as white and non-Hispanic while 50% of the cohort are on public insurance. Data from the study have been used to advance ongoing quality improvement projects and advocacy nationally. The table below includes additional details the result from the cross-sectional cohort review.

**Conclusions:** The T1DX-QI has the potential to be a major resource in understanding the real-world impact of public policies, institutional practices, and the role of a learning health system in advancing T1D population health.

**EP002 | Age at diagnosis and anthropometry in two ethnically distinct cohorts of children with type 1 diabetes living in North-West England and Singapore**

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T1DX-QI	N (%)	<6	6 - < 13	13 - < 18	18 - < 26	26 - < 31	31 - < 50	50 - < 65	>65
Number of people	23,820	600	4065	6881	6912	1069	2532	1133	628
Male sex, n (%)	12,302 (51.6)	296 (2.4)	2123 (17.2)	3589 (19)	3589 (19)	547 (4)	1254 (10)	571 (5)	320 (2)
Minority status	6189 (26)	155 (2.5)	1141 (18)	2056 (33)	1768 (29)	256 (4)	559 (9)	165 (2.5)	89 (1)
Private Insurance, n (%) +	11,851 (49.7)	266 (2.3)	1775 (15.5)	3280 (29)	3390 (29)	593 (5)	1453 (13)	560 (5)	94 (1)
HbA1c (Mean [SD])	8.7 (1.6)	8.3 (1.1)	8.3 (1.5)	8.9 (1.9)	8.9 (1.9)	8 (1.6)	7 (1.5)	7.5 (1.1)	7.7 (1)
CGM use, n (%)	7285 (31)	224 (3)	1402 (19)	1725 (23)	1725 (23)	478 (6)	1222 (16)	443 (6)	239 (3)
Pump use, n (%)	12,604 (53)	349 (2.7)	2429 (19.2)	3371 (27)	3371 (27)	707 (6)	1602 (13)	549 (4)	267 (2)
Obesity, n (%)	2445				614 (25)	305 (13)	929 (38)	424 (17)	173 (7)

[Select Indicators in the T1D Exchange QI Collaborative Cohort]

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**Introduction:** Age at diagnosis (Dage) of type 1 diabetes (T1D) in ethnically and geographically distinct cohorts of children with T1D has not been compared and correlated with body size at birth and at T1D onset.

**Aims:** To compare children with T1D in UK and Singapore, and correlate Dage with birth weight (Bwt) and anthropometry at T1D onset.

**Methods:** We included 166 Caucasians in North-west England (uk-Cauc) and 185 Asians in Singapore (sg-Asian) who were all born at full-term and had recorded Bwt (n = 351), family history (FH) of T1D (n = 303) and type 2 diabetes (T2D) (n = 287). At 4–6 weeks after T1D onset, all 351 children had pubertal status (Dpub), height (Dht), and weight (Dwt) assessed; BMI (Dbmi) calculated; and the respective WHO standard deviation scores (sds) derived (Bwt-sds, Dht-sds, Dwt-sds, and Dbmids). Change in weight sds from birth to T1D onset (Cwt-sds) was calculated as (Dwt-sds minus Bwt-sds). Between-cohort comparisons of these anthropometry variables and within-cohort correlations with Dage were performed.

**Results:** The cohorts (uk-Cauc; sg-Asian) differed significantly in FH of T1D (21%; 6%, p < 0.001), FH of T2D (18%; 69%, p < 0.001), and Dpub (pre-pubertal in 82%; 70%, p = 0.01). Overall, uk-Cauc had significantly higher Bwt-sds, Dht-sds, Dwt-sds, and Dbmi-sds (all p < 0.001), but not Cwt-sds. Median(IQR) Dage was similar (7.7(4.6–10.3)y; 7.8(5.0–11.0)y, p = 0.50), but in the subgroup of 174 children ≥5y and pre-pubertal at T1D onset, median Dage in uk-Cauc was 10.8 months higher than sg-Asian (p = 0.02). Within either cohort, no correlation was found between Dage and Bwt-sds, Dht-sds, Dwt-sds, Dbmi-sds, and Cwt-sds, respectively.

**Conclusions:** In these cohorts with substantially different genetic and environmental backgrounds, age at diagnosis of T1D was similar and did not correlate with birth weight, body size at diagnosis, and postnatal weight change. Timing of puberty and other factors might influence how early T1D presents during childhood.

#### EP003 | Trends in incidence of type 1 diabetes in children and adolescents over 25 years in Nova Scotia Canada: 1994–2018

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**Aims:** Over the past 20 years, incidence of type 1 diabetes (T1D) increased in many regions but patterns of change vary. Some found ongoing increases while others show a recent plateau. From 2002–2013, T1D incidence was 27/100,000 among 0–19 year olds in the western Canadian province of British Columbia. We examined the incidence rate and trends over time in the eastern Canadian province of Nova Scotia (NS).

**Methods:** The Diabetes Care Program of NS Registry contains population-based records for all cases of diabetes in NS youth since 1992. Incidence of T1D with 95% confidence interval (CI) was calculated per 100,000 population for 5-year periods from 1994–1998 to 2014–2018 based on population estimates (0–19 yr) from the national census. Cases were analyzed by sex and 5-year age group.

**Results:** From 1994–2018, 1601 cases 0–19 yr were observed for an overall incidence per 100,000 of 29.94 (28.47, 31.41). Incidence was higher among males than females in both the 10–14 yr age group (M: 46.68 CI: 41.64, 51.72; F: 34.74 CI: 30.30, 39.18) and the 15–19 yr age group (M: 24.69 CI: 21.17, 28.21; F: 13.65 CI: 10.97, 16.32). Incidence among 15–19 yr olds did not change over time.

There was a 47% increase in incidence among 0–14 yr olds from 26.38 (23.04, 29.73) in 1994–1998 to 38.90 (34.42, 43.37) in 2004–2008, then an apparent plateau until 2014–2018 (37.93 CI: 33.27, 42.58). The increase was most pronounced among 10–14 yr olds, especially among males rising from 36.2 (26.9,45.6) to 59.6 (45.7,73.6) from the earliest to most recent period.

**Discussion:** The incidence of T1D in NS youth is high and has increased over the past 25 years, but appears to have plateaued since 2004–2008. Consistent with studies from several countries, a more rapid and ongoing rise in incidence was identified in males versus females, particularly among 10–14 year olds. Compared to the US SEARCH study, our population based study shows similar patterns of change over time and variations by age and sex.

#### EP004 | Association of high-affinity autoantibodies with high-risk HLA haplotypes

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**Introduction:** Electrochemiluminescence (ECL) assays are high-affinity autoantibodies (Abs) that are more specific than radioimmunoassay (RIA) Abs for the prediction of type 1 diabetes (T1D) in natural history studies screening for risk and progression to T1D.

**Objectives:** We sought to characterize ECL-GADA and ECL-IAA positivity and levels (z-scores) by HLA genotype and haplotypes.

**Methods:** We analyzed 603 subjects from the TrialNet Pathway to Prevention Study who were positive for at least one RIA diabetes related Ab and for whom ECL and HLA data were available. Mean age at initial visit was 19.4 +/- 13.7 years; 345 (57.2%) were female and 104 (17.2%) carried the high-risk HLA- DR3/4\*0302 genotype.

**Results:** At initial visit 425 (70%) of subjects were positive for either ECL-GADA or ECL-IAA, with 207 (34.3%) ECL-IAA positive subjects and 367 (60.9%) ECL-GADA positive subjects. For subjects with high-risk HLA-DR3/4 genotype (n = 104), 80 (76.9%) were positive for ECL-GADA, while 42 (40.4%) were positive for ECL-IAA. ECL and RIA-GADA z-scores were higher in subjects with HLA-DR3 haplotypes, while ECL-IAA (but not RIA-IAA) z-scores were associated with

HLA-DR3 present (N = 254)	HLA-DR3 absent (N = 349)	P value	HLA-DR4 present (N = 371)	HLA-DR4 absent (N = 232)	P value	
ECL-IAA positive n (%)	83 (32.7%)	124 (35.5%)	0.52	141 (38.0%)	66 (28.4%)	0.02
ECL-GADA positive n (%)	177 (69.7%)	190 (54.4%)	<0.001	246 (66.3%)	121 (52.2%)	0.001
ECL-IAA z-score mean +/- SD	0.01 +/- 0.50	0.07 +/- 0.66	0.18	0.08 +/- 0.65	-0.02 +/- 0.49	0.04
ECL-GADA z-score mean +/- SD	0.36 +/- 1.33	-0.01 +/- 0.91	<0.001	0.16 +/- 1.11	0.13 +/- 1.13	0.75
RIA-IAA positive n (%)	75 (29.5%)	131 (37.6%)	0.047	136 (36.7%)	70 (30.3%)	0.13
RIA-GADA positive n (%)	198 (78%)	235 (67.5%)	0.007	279 (75.2%)	154 (66.7)	0.03
RIA-IAA z-score mean +/- SD	-0.06 +/- 0.60	-0.02 +/- 0.44	0.31	-0.03 +/- 0.44	-0.04 +/- 0.62	0.99
RIA-GADA z-score mean +/- SD	0.19 +/- 1.09	-0.14 +/- 0.89	<0.001	0.03 +/- 1.00	-0.05 +/- 0.99	0.35

[Table 1]

HLA-DR4 haplotypes. Associations of ECL and RIA Abs with high-risk HLA haplotypes are shown in the Table.

**Conclusions:** ECL and RIA-GADA positivity are associated with both HLA-DR3 and DR4 haplotypes, whereas only ECL-IAA (but not RIA-IAA) positivity and levels are associated with HLA-DR4 haplotype.

EP005 | **Incidence rate of DT1 in Poland still increasing: New trend**

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**Introduction:** The increasing trend of new cases of DT1 is a phenomenon observed worldwide and should be expected in the future. Poland should currently be included in countries with medium incidence rate (IR) and the highest growth rates in recent decades.

**Aim:** The aim of the study is to summarize the 30-year observation of changes in the epidemiological status of the Upper Silesia region in children up to the age of 14.

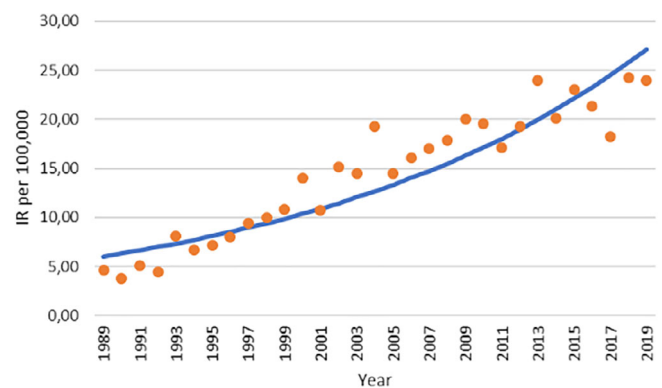
**Methods:** An analysis of the data of the scientific regional register DT1 of Upper Silesia, the largest and the only diabetes center for children representing EURODIAB in Poland was carried out. For a detailed analysis of the incidence trend, Siso univariate analysis was used with the R indicator. Then, two multifactorial models from 1989–2012 and 1989–2019 were compared taking into account: changes year to year, age, and gender.

**Results:** During the 30-year follow-up, the diagnosis was confirmed in 3222 children (1678 boys) aged 0–14 years. A constantly increasing trend of the IR was observed: from 4.68(1989) to 23.97/100000 (2019). In the analysis of three ten-year periods, a different dynamics of the trend was observed: in the first two decades the trend was

constant, the last one showed significant year-to-year fluctuations: adjusted R<sup>2</sup> = 0.47; R = 0.71; R<sup>2</sup> = 0.22 (Figure 1). The mean IR in the age groups were as follows:

0–4y:9.41; 5–9y:16.06; 10–14y:18.07; with the highest dynamics being found in the group of 5–9y. Comparison of multifactorial models has shown that in recent years the IR has been slowing down, and the differences observed previously related to age group and gender are increasingly less expressed.

**Conclusion:** A strong long-term upward trend in the incidence of DT1 in Silesian children is maintained, however, the dynamics of changes in the last decade is quite distinct - high year-to-year variability was observed. This probably indicates a significant impact of the environment.



[Incidence Rate of DT1 in Upper Silesia Region 1989–2019]

EP006 | **Preferred techniques in cataract surgery in children and adolescent with Type 1 DM with long term outcome**

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**Objectives:** There are no guidelines for Cataract surgery techniques in patients with Type1 DM. This study was done to understand the outcome of different Surgical techniques.

This study was focused on technique of cataract surgery, Post surgical visual outcome in immediate and long term duration. HbA1c, duration of diabetes, Age on onset of cataract, Ketoacidosis, nutritional deficiency were also considered in the study.

The study was conducted jointly by the department of Endocrinology and Ophthalmology between January 2005 to January 2019. We followed up our patients of T1DM operated for cataract surgery for last 14 years.

**Method:** Number of patients 10, Mean Age of surgery 13.7 years, Mean age of cataract detection after diagnosis of T1DM 3.7 years (1-8 years) Mean Current age 16.9 years and duration of diabetes 10.3 years, HbA1c 7.9, Ketoacidosis 6/10, Nephropathy 2/10, Retinopathy 4/10, low socio economic status 7/10. Operated both eyes in 9/10 (Total Surgeries 19), Type of cataract - cortical 6/10, posterior polar 3/10 and hypermature cataract 1/10. Out of 19 Cataract surgeries –7 were Small Incision cataract surgery (SICS), 10 underwent Phacoemulsification and Microincision cataract surgery (MICS) was done in 2.

**Result:** (1) In all cases Vision Improved in 1-2 weeks and remained good in 14 years followup. (2) Surgical outcome of phaco surgery and MICS were better in comparison to small Incision Cataract surgery - as we saw vision recovery in both the techniques within 3 to 7 days.

(3) Spectable Correction was minimal by MICS and phaco techniques for distant vision. (4) Usually bilateral, Majority had cataract after 10 years of age.

(5) Strongly associated with ketoacidosis.

(6) 4 Patients over 14 years of followup developed retinopathy.

(7) HbA1C - 50 percent <7.5%.

**Conclusion:** Phaco emulsification and MICS are recommended techniques for Cataract Surgery in people with Type 1 DM. A positive Correlation was observed with diabetic Ketoacidosis and nutritional deficiency .

EP007 | High HbA1c is not a reason not to fast during Ramadan in children, adolescents and young adults with type 1 diabetes: An observational study in Bangladesh

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**Objectives:** Patients with uncontrolled type 1 diabetes mellitus (T1DM) are at a high risk for Ramadan fasting and are exempted from fasting; however, most still insist on fasting. Our aim was to investigate the ability, safety, frequency of complications and impact on glycemic control in uncontrolled T1DM.

**Methods:** Seventy four Patients with T1D who insisted on fasting were enrolled 1 month prior to Ramadan. Patients with their caregivers were given intensive education and instructions by Diabetes team on insulin adjustment, home glucose monitoring and dietary adjustments. Patients were divided into two groups according to their glycemic control; group A- HbA1c < 9% and group B- HbA1c ≥ 9%. HbA1C, number of days fasted, number of hypoglycemia, DKA episodes, weight and insulin dose (before and after Ramadan) were compared in the two groups. Insulin was multiple daily doses with preprandial insulin (26 vs 36 units) and approximately 48% basal (24 vs 34 units).

**Results:** Median age of 20 [17–23] years, 38 (51%) were male; all were on multiple daily injections. Most of the patients fasted 58 (78.4%) for more than 15 days. There was no significant difference ( $p = 0.790$ ), while comparing the breaking the fast in the two groups. Hypoglycemia was common acute complications among them. There was no significant difference in the frequency of hypoglycemia between two groups ( $P = 0.448$ ). No diabetic ketoacidosis was reported in either group. Though there was no difference in weight gain but increased insulin dose requirement were observed in both groups during Ramadan ( $p = 0.00001$ ), with an increase in basal insulin in well controlled (from 24 to 34 units). There was significant reduction of Post Ramadan mean HbA1C in both groups [ $P = 0.0001$ ].

**Conclusion:** Children, adolescents and young adults with T1D with poor glycemic control can fast safely during Ramadan with proper education and intensive monitoring.

EP008 | “Puddles on the road”: Hurdles in the pathway from symptoms to diagnosis and treatment in children with type 1 diabetes

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**Objectives:** Majority of children with Type 1 diabetes (T1D) are diagnosed only after developing Diabetic Ketoacidosis (DKA). This study explores various factors behind delayed diagnosis and treatment-initiation among children with T1D.

**Methods:** An exploratory study was conducted over 1 year period (June, 2018 to June 2019) at a tertiary care hospital. A pretested questionnaire was used to collect data by direct interview of parents of children (6 months-13 years old) diagnosed with T1D within preceding 3 months.

**Results:** A total of 105 children were enrolled. The median age was 7 years (Range: 6 months to 13 years) and 56.1% were males. Most commonly reported symptoms were polydipsia (97.8%), polyuria (75.2%) and nocturia (75.2%). Parents explained these symptoms as

suspected diabetes, weather change, growing age, etc. The mean time taken by parents from onset of symptoms to decide to visit the health care professional (appraisal gap) was  $7.85 \pm 7.95$  days. The help seeking gap (time between decision making to actual visiting a health care professional) was  $3.01 \pm 8.31$  days, diagnostic gap (Time from first visit to diagnosis) was  $4.19 \pm 6.72$  days and the treatment gap (time between diagnosis and initiation of insulin) was  $2.12 \pm 6.87$  days. DKA at onset was present in 37.1%. This was significantly higher among children with lower per capita income ( $p < 0.017$ ) and where parents had no experience of diabetes among family /friends ( $p < 0.017$ ).

**Conclusion:** The most important factors leading to delayed diagnosis and development of DKA were unawareness and poverty. Increasing awareness regarding diabetes in children among the public and primary healthcare workers can help.

#### EP010 | Insulin requirement in children and adolescents live with T1DM

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**Background:** Insulin requirement, measured by the total daily dose (TDD) in patients with T1DM is known to increase during puberty. A study from a neighbor country indicated the daily requirement is  $1.02 \pm 0.33$  u/kg/day for 10-18-year age group. However it was less in a European study  $0.93$  u/kg/day for the 13 years age group. A significant association between insulin requirement and BMI SDS ( $r = 0.23$ ,  $p < 0.02$ ) and a significant association between insulin requirement and mean HbA1c ( $r = 0.59$ ,  $p < 0.01$ ) were reported recently.

**Objectives:** To evaluate the insulin requirement in our patients live with T1DM and to identify the association between TDD and BMI SDS, duration of diabetes, their home city, age and gender.

**Methods:** Retrospective cross sectional study conducted at pediatric diabetes unit -Sultan Qaboos University Hospital. Patients diagnosed with T1DM for more than a year and received care for the whole year were included. Transitioned patients, or patients with other types of diabetes were excluded.

**Results:** 125 (68F) patients fulfilled the criteria. TDD was higher in females peaking at age of 13, median TDD  $1.58$  u/Kg/d, followed by a drop at age of 16 reaching  $0.75$  u/kg/day. TDD of males was steadily increasing throughout age groups. Overall, the TDD for all of our patients was  $1.12 \pm 0.3$  u/Kg/day. Patients live in the capital city (Muscat) had relatively lower median TDD,  $1.08$  vs  $1.15$  u/Kg/day for people living elsewhere. Significant association between insulin requirement and duration of diabetes was observed ( $r = 0.36$ ,  $p < 0.001$ ) as well as TDD and average HbA1c ( $r = 0.29$ ,  $p < 0.001$ ). However there was no correlation or association with BMI SDS ( $r = 0.04$ ,  $p = 0.64$ ).

**Conclusion:** Insulin requirement in our cohort of patients was higher than reported in previous studies. Further studies are needed to explore the underlying reasons. Strong association was observed between insulin requirement and duration of diabetes as well as mean HbA1c.

#### EP011 | Clinical profile and outcome of type 1 diabetes mellitus in a tertiary care center of Nepal

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**Introduction:** There is paucity of data regarding the clinical profile and outcome of patient admitted with Type 1 Diabetes mellitus (DM) in children between 1–18 years of age in Nepal. We analyzed the data of children managed by us at a tertiary care center of Nepal, admitted with Type 1 DM with or without ketoacidosis.

**Objective:** To study the clinical profile and outcome of patients admitted with Type 1 DM at a tertiary care hospital of Nepal.

**Method:** This prospective observational study was carried out in the Department of pediatrics and Adolescent medicine, at BPKIHS, Dharan, which is a tertiary care teaching hospital in Eastern Nepal from January 2017 to February 2018. The details of sociodemographic, clinical, laboratory, treatment and outcome parameters of the 34 patients treated by us during this period were recorded using a pre-designed Performa. The data was analyzed using SPSS version 21.

**Results:** The median age at presentation was 11.5 years (ranged 4–18). Females were 58.3%. Among them 66.7% were admitted with DKA. Most patients were from lower socioeconomic status and rural background. The classical symptoms of polyuria, polydipsia and polyphagia were present in all cases. 46% were newly diagnosed cases while 37.5% presented with DKA at onset. Mild and moderate DKA were most common. On an average the glycemic control was poor and there was evidence of infection in most cases. The mean duration of hospital stay was 9.5 days. Two patients died because of cerebral edema arising out of DKA. On regular follow-up after discharge most of them achieve good glycemic control and there were very few recurrent DKA cases.

**Conclusion:** Type 1 DM though not curable is a treatable condition. Besides compliance to insulin, self-monitoring of blood glucose, dietary restrictions and regular follow-up, compassionate counseling plays a major role in achieving good glycemic control. Good glycemic control is important to avoid life threatening complications like DKA.

#### EP012 | Experience and challenges in managing type I diabetes at low resource setting - children and youth

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**Introduction:** Management of Diabetes is associated with different experiences and multiple challenges among children and youth. We demonstrate unique requirements in coordinating care for children and youth with diabetes. Managing diabetes in children and adolescents needs to be in the form of a collaborative work between health care professionals, children, adolescents, and their families.

**Aims and objectives:** To understand challenges and experiences of children and youth living with type 1 diabetes.

**Methods:** This, prospective cohort study conducted among type 1 diabetic patients in Pediatric diabetic clinic till the age of 26 years from 2017 to 2019 in department of Pediatrics and Adolescent Medicine.

**Result:** We analyzed 55 diabetic patients under follow up in our diabetic clinic. The mean age at diagnosis is 11.31 years $\pm$ 4.68 (1.5–21). Most (71%) of them were females. The most common presenting symptoms were polyuria (56.4%), significant weight loss (49.1%), polyphagia (47.3%) along with 30% patients presenting in DKA with shortness of breath and loss of consciousness being dominant symptoms. Maximum patients were taking mixtard (70/30) and only 7.28% were on basal bolus regime due to financial constraint. In terms of mixed split regime, symptomatic hypoglycemia was the most common complain. In total 86% of the patients had HBA1c > 7% and hypothyroidism was the common co-morbidity found among the patients (21.8%).

**Conclusion:** The problems experienced by children and youth with type 1 diabetes are multifactorial. The study population typically had limited glycemic control, which affects the occurrence of diabetes-related complications. There is inherent need to confirm disciplined lifestyle behavior (proper exercise, following diet charts) with regular blood sugar monitoring, insulin injection and awareness of hypoglycemic and its symptoms.

#### EP013 | Level of vitamin D and early cow's milk protein exposure as a risk factor of T1DM in children: an Indonesian study

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**Introductions:** Vitamin D deficiency is a health problem for Indonesian children that may be related to local food intake. Conversely, there is a trend of increasing consumption of formula milk in infants from 15% in 2003 to 79.8% in 2013. Studies on vitamin D level and cow's milk exposure as environmental risk factors of T1DM are still controversy.

**Objectives:** This study aimed to analyze vitamin D levels and cow's milk exposure in children with T1DM.

**Methods:** This is a case control study. Children with T1DM aged 4–18 years old and healthy controls were included in this study. Subject grouped by level of vitamin D according to the 2011 guidelines of the Task Force: deficiency ( $\leq 20$  ng/ml), insufficiency ( $>20$ – $30$  ng/mL), and sufficiency ( $>30$  ng/mL). The history of cow's milk exposure was

obtained. Statistics performed were independent t-test, Mann Whitney and logistic regression with significance at  $p < 0.05$ .

**Results:** Thirty-one T1DM cases and 24 healthy controls were included. Four of 31 subjects with T1DM had vitamin D deficiency ( $p < 0.001$ ). Vitamin D deficiency and insufficiency were detected in 77.41% T1DM cases and 25% controls ( $p < 0.001$ ). The risk of T1DM increased three times in patients with vitamin D deficiency or insufficiency ( $\leq 30$  ng/mL), compared to  $>30$  ng/mL (OR = 3.1; 95% CI = 1.5–6.3;  $p < 0.001$ ). The number of subjects exposed to cow's milk in the first 3 months was 51.16% in T1DM cases and 50% controls ( $p = 1$ ). The median duration of consuming cow's milk was 12 (1–60) months in patients with T1DM and 6 (0–24) months in controls ( $p = 0.1$ ). The median age at introduction to cow's milk was 3 (0–48) months in patients with T1DM and 2 (0–24) months in controls ( $p = 0.1$ ). There wasn't any difference in the risk of developing T1DM in infants who first received cow's milk at  $\leq 3$  or  $> 3$  months of age (OR = 1; 95% CI = 0.3–3;  $p = 1$ ).

**Conclusions:** Low vitamin D level is a risk factor of T1DM, whereas early exposure to cow's milk is not.

#### EP014 | Management of diabetic ketoacidosis (DKA) in children and adolescents at a single center in South India

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**Background:** Most pediatric hospitals in India follow ISPAD/BSPED guidelines for the management of DKA. Admitting teams infrequently refer early to the diabetes specialist team and it is not uncommon for the most junior member, who has the responsibility for the initial management.

**Objectives:** To evaluate the outcomes of adherence to the BSPED 2015 guideline, in the management of children with DKA.

**Methods:** A retrospective review of case-notes of children aged 19 months –17 yrs, admitted with DKA to our hospital between Mar 2018 - Mar 2020.

**Key findings:** 25 Cases were reviewed with mean age of 8.9 years and pH range from 6.87–7.25. Children with new onset diabetes with DKA were 88% and the rest 12% were known diabetics.

**Fluids:** 20% received 0.9% saline boluses for initial resuscitation as the child was in shock. 92% received potassium in their maintenance fluid from the outset.

Fluids administered correctly as per blood sugar values in 96%.

Insulin infusion started 1–2 hours after fluids and soluble insulin infusion started at a dose of 0.05Units/kg/hr in 100% of the children.

**Monitoring:** 100% children were cared in Paediatric Intensive Care Unit (PICU). Recording of neuro-observations was evident in all children. None of the children developed symptoms consistent with

cerebral edema, hypoglycemia, hyponatremia, hypokalemia and hyperkalemia.

**Outcome:** Effective and consistent use of the BSPED 2015 guideline helped the admitting junior clinicians to manage DKA safely.

The mean inpatient PICU stay was 32 hours (range 20–48). None of the children required readmission.

**Summary:** Overall, the review confirmed that in all cases the DKA guideline was followed upon diagnosis. This resulted in no cerebral edema and no mortality during this period.

BSPED 2015 recommended low fluid volumes compared to current protocol.

In one case the diagnosis of DKA (new onset) was delayed by the admitting team, affecting management. Later once the diagnosis was made, the case was managed appropriately.

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EP015 | **Acceptance and preferences of mobile health (mhealth) based intervention in patients and care giver of type 1 diabetes mellitus (T1DM) in Karachi, Pakistan**

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**Objectives:** Due to prevalent use of mobile phone in underdeveloped countries they can be used for the management of T1DM in resource limited settings. Most effective features for mhealth are still unknown. This study is conducted to assess the acceptance and preferences of mHealth based behavioral intervention in patients and care givers of T1DM children and adolescents followed at Aga Khan University Hospital Karachi. The information obtained can guide to formulate the best possible mobile phone-based intervention that can help patients belonging to resource limited countries to achieve better management of their diabetes.

**Methods:** This study was conducted in pediatric inpatient and outpatient units of Aga Khan University Hospital, Karachi. It is a cross sectional survey-based study. Data was collected after informed consent from 253 patients or care giver of T1DM patients on a structured questionnaire. The main emphasis was to find out the use of mobile phones and smart phones in our society and to understand acceptance and preferences for mobile phone-based interventions for management of T1DM.

**Results:** 152 fathers, 66 mothers of T1DM patients and 35 patients were interviewed. Accessibility to mobile phones was 94% in the studied population, 90% had smart phones. Majority suggested mother's mobile phone number for enrolment in mhealth-based intervention. Preference for type of intervention varied with people opting for mobile phone-based messaging (32%), calls (22.52%), application-based intervention (25.69%) and what's App (19.76%). Two-way (interactive), and informative communication was preferred. Urdu and roman Urdu were preferred for phone calls and messages, respectively.

**Conclusions:** Informative two-way messaging reminders in local language was preferred mhealth interventions. Parents specially mothers need to be involved in mobile health based behavioral intervention. Although studies on a large scale should be performed to confirm these findings.

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EP016 | **Experience about diabetes types 1 children in our country Nepal**

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In Nepal treatment of Diabetes is challenging issues. Children facing problem in our Country.

The following problem children are facing in our country.

Diagnosed late in our country.

1. Mostly large proportion of patients with diabetes are treated by donor agency donated Insulin that is giving free of cost to the Children.
2. Lack of awareness of people in our community about diabetes.
3. Diabetes disease affecting only a minority of people, it is largely ignored by governments and policy makers.
4. Lack of specific Laboratory test investigation mostly in Hospital.
5. Load shedding is problem to state Insulin and maintain temperature.

**Conclusion:** Ours children will get treatment and management benefit according to modern as following worldwide.

**Management challenges;**

**Insulin prescription:** Mostly in large proportion of patients with diabetes are treated by donor agency Insulin that is available FREE in most of center. Insulin is mixtard 30/70.

**Monitoring and therapy compliance:** Medication, compliance self-monitoring of blood glucose, healthy eating and following optimal exercise.

**Hypoglycemia:** Common and potentially dangerous side effect of insulin therapy.

**Behavioral and psychological issues:** Parents generally do not disclose the diseases state of their child to relatives due to certain degree of stigma attached to T1DM. This is particularly true for the female patients due to marital concerns.

The patients avoids going to social gathering as they are not comfortable with insulin administrations under such circumstances.

Parents restrict the excise and outings of the child due to fear of hypoglycemia.

**Storage problem:** Load shedding some days 16–18 hours also problem in storage of insulin.

**Cost therapy:** Patients mostly low income populations they are not able affords Insulin Pump, Sensor Pump.

**Lack of trained person:** endocrinologists.

### EP017 | Profile of standalone pediatric diabetes clinic in an Indian metropolis

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**Objective:** Baseline profile was analyzed of patients attending a fee-for-service pediatric endocrinologist's clinic in Delhi, registered in an Indian Government Young Diabetes registry started in 2000.

**Results:** Total patients 396. Age profile: 0-5y: 29%; 5-10y 35%; 10-15y 24%; 15-20y 8%; 20-25y 4%; half were females in each group. SES high 50%, middle 39%, low 11% (subsidized charity care). DKA at diagnosis: 1975-2010 61.4%; 2015-2019 58.3%. Diabetes diagnosed sans ketosis: 1975-2010: 22%; 2015-2019: 15%. Mean A1c at presentation 11.5%. 93.4% patients from Delhi & nearby areas; 6.4% non-local (50-1200 km). 39% had seen 2-4 doctors since diagnosis. Of those seen right from diagnosis, 13% are following up regularly. 4.4% hypothyroid, 2.3% had celiac disease. Insulin use: regular 56%, rapid analogs 62% (% high/middle/low SES- 52/30/16), NPH 27%, premixed conventional 21%; long-acting 88% (% high/middle/low SES-74/63/55). Overall 63% on MDI, 2.4% pumps; since 2015 this is 78% & 3%. Comparing the Mar-Jun quarter: 2017 saw 17 patients, 12 newly diagnosed; 2018: 15 & 10; 2019: 18 & 14; 2020 (Covid) just 3 & 2.

**Discussion:** Age distribution reflects referral bias. Gender is gratifyingly equal. DKA at presentation has not improved, but detection before ketosis develops has. Medical shopping and erratic followup are common - some looking for cure; some for better control; some opting out of intensive regimens. Expenses matter - conventional insulins continue to be widely used; unfortunately, 16% of low SES families were prescribed costly rapid analogs. More physiological regimens are now being used; but pump usage remains miniscule. The Covid pandemic has seen significantly fewer newly diagnosed patients.

**Conclusion:** In a developing country, over time, diagnosis and regimens have improved, but 2/3 still present with DKA, 20% are on unphysiological regimens; costly insulin is used; medical shopping remains common. The Covid pandemic has not worsened the situation.

### EP018 | Association of macronutrients intake with glycemic variability in children with T1D

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**Objectives:** To evaluate the association between glycemic variability and macronutrients intake in children with T1D.

**Methods:** A multi-center cross-sectional study consecutively recruited children with T1D, aged 2-17 y, with HbA1c was <86 mmol/mol, using CGM Dexcom G5 or G6, during Jan 2019-Jan 2020 in Italy. Three-day weighed food diaries were used to collect information on diet intake (proteins, P; saturated fatty acids, SFA; monounsaturated fatty acids, MUFA, polyunsaturated fatty acids, PUFA; carbohydrates, CHO). Nutrients were evaluated as percentages of total intake and summarized as median and (IQR). Clinical data and glucose metrics were collected in the same time of dietary measurement. Glycemic variability was estimated as median percentage coefficient of variation (%CV) and 90% confidence interval (90%CI). Clinical and nutritional factors associated to %CV≤36% were analyzed using multiple logistic regression, results were expressed as OR and 90%CI.

**Results:** Data were available for 197 children, 53% male, 47% using CSII, median age 11.6 y (8.6-14.3), HbA1c 55 mmol/mol (48-61). Median nutrients intake was P 16.9% (14.4-19), SFA 9.6% (7.8-10.9), PUFA 10.3% (7-14.9), MUFA 16.4% (13.8-19.4), CHO 45.9% (42.3-49.1). Target %CV≤36% was observed in 46.7% of participants; median %CV was 36.2% (32.2-40.5). Increasing age and use of CHO counting significantly increased the probability of %CV≤36% (OR = 1.1, 90%CI: 1.02-1.2; OR = 3.6, 90%CI: 2.1-6.1, respectively). The probability of %CV≤36% increases of about 20% for a reduction in 1% of SFA (OR = 0.81, 90%CI: 0.71-0.93), and of about 12% for a reduction of 1% in complex (OR = 0.88, 90%CI: 0.80-0.96) and simple CHO (OR = 0.87, 90%CI: 0.79-0.96).

**Conclusions:** Less than 50% of the observed population reached the %CV≤36% target. A slight reduction in the intake of SFA and CHO has been associated with reduced glycemic variability, emphasizing the role of nutrition in modulating glycemic variability in children and adolescents with T1D.

### EP019 | Fruit and vegetable consumption patterns and risk of chronic disease of lifestyle among Kenyatta University students, in Kenya

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**Introduction:** The nutrition transition in developing countries has contributed to the significant early onset of Chronic Diseases of Lifestyle



(CDLs) in the adult population at a younger age. CDLs including type 2 diabetes, accounts for 27% of deaths suffered by Kenyans, and the likelihood of dying too young from a CDL in Kenya is 18%.

**Objective:** This study assessed the fruit and vegetable consumption patterns and risk of CDLs in University students aged 19–30 years.

**Methods:** A cross-sectional design with an analytical approach was adopted randomly to recruit 423 students attending Kenyatta University. Fruit and Vegetable consumption patterns were measured by conducting a food frequency questionnaire. Physical and biochemical measures were used to assess the risk of chronic diseases of lifestyle among the participants. Data were analyzed by IBM SPSS Version 26.0.

**Results:** The proportion (95% CI) of respondents who met the WHO recommendation of <sup>3</sup> 5 servings of fruits and/or vegetables per day in a typical week was 21.5% (17.6–25.5). The mean intake of fruits was 1.72 (1.62–1.81) servings per day and for vegetables, 1.91 (1.82–2.02) servings/day. The prevalence of risk factors of CDLs: 28.1% (24.3–32.4) of the respondents are current consumers of alcohol; 4.5% (2.4–6.7) current tobacco users; 7.1% (4.9–9.9) are physically inactive; 18.2% (14.7–21.5) were overweight (BMI <sup>3</sup> 25.0); 16.5% (13.2–19.6) had abdominal obesity 9.5% (6.6–12.5); 8.3% (5.9–11.0) had raised blood pressure; and 39.5% (34.4–44.2) had raised cholesterol. A significant association between meeting the WHO recommendation (<sup>3</sup> 5 servings/day) and combined risk factors of CDLs ( $p = 0.0001$ ).

**Conclusions:** Over 78% of the study population consumed lower amounts of fruits and vegetables than recommended by the WHO. Eighty-five percent had at least 1 combined risk factors of CDLs. There is a need to develop and strengthen policies to address the observed inequities and prevent CDLs in young adulthood.

#### EP020 | The role of probiotics as an adjuvant therapy for children with type 1 diabetes: Effect on glycemic control and cytokine levels

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**Background:** Probiotics exerts an effect on immune homeostasis through influencing gut microbiota. The efficacy of probiotics in diabetes has been shown in preclinical settings as well as in human trials. Interleukin (IL)-21 a type1 cytokine, produced by activated T-lymphocytes, particularly inflammatory Th<sub>17</sub> subset, has been implicated in the pathogenesis of type 1 diabetes (T1DM).

IL-22 produced by immune cells present beneath the epithelium has diverse metabolic benefits.

It improves insulin sensitivity, preserves gut mucosal barrier, decreases chronic inflammation, and regulates lipid metabolism.

**Objectives:** To assess the effect of oral supplementation with probiotics on blood glucose and glycemic control as well as IL-21 and IL-22 in T1DM children.

**Methods:** This randomized-controlled trial included 70 children with T1DM aged 5-18 years, with disease-duration >1 year. T1DM children were randomly assigned into two groups; intervention group (group A) who received oral probiotics containing *Lactobacillus acidophilus* La-14 ( $10^8$ CFU) 0.5 mg once daily. The other group (group B) did not receive any supplementation and served as controls. Both groups were followed-up for 6 months with assessment of fasting-blood glucose (FBG), HbA1c, IL-21 and IL-22.

**Results:** Both groups were well-matched regarding baseline clinical characteristics and laboratory parameters ( $p > 0.05$ ). After 6 months, probiotics supplementation resulted in significant decrease of FBG, HbA1c, total cholesterol and IL-21 while IL-22 was increased compared with baseline levels ( $p < 0.001$ ) and to group B ( $p < 0.001$ ). No adverse reactions were reported. Baseline IL-21 was positively correlated to FBG, HbA1c and total cholesterol. Negative correlations were found between these variables and IL-22.

**Conclusion:** Probiotics supplementation improved blood glucose levels and glycemic control possibly through immune modulatory effects on IL-21 and IL-22. Thus, probiotics could be an effective adjuvant therapy in children with T1DM.

#### EP021 | A single center study of assessment of nutritional and health status of type 1 diabetic patients from Northern India

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#### Aims and Objectives:

- To measure the achievement of dietary and nutritional requirements by patients of type 1 diabetes mellitus, assess their nutritional status by using various anthropometric parameters.
- To compare the nutrient intake of patients in relation to recommended dietary allowances.

**Material and methods:** The study was carried out at Ramchandani diabetes centre, Kota. Type 1 diabetes mellitus patients who had been diagnosed for at least 1 year and were the age group of 06–25 years were chosen as subjects for this study. The data for the study was collected - General information, Socio-economic status, Anthropometric measurements, Routine blood investigations, BP, Dietary history and analyzed using the SPSS software.

**Results and discussion:** 50 patients of Type 1 DM were studied out of which 24 were males and 26 were females. Out of 50, 38 patients belong to the age group between 13 to 25 years. Most of the patients were from lower socio-economic status with about 50% of patients having monthly income of around Rs. 500–2000 per month

only. 98% of subjects were studying at present but among their parents the literacy rate was only 43%. HbA1c levels of 44% patients was in the range of 8–10%. The resulting parameters were found to be comparatively lower when compared with the corresponding WHO standards. Clinical examination revealed that about 70% of patients were having signs of malnutrition.

**Conclusions:** Regular nutritional education, particularly for early adolescents, along with behavioral adherence to the guidelines may prove crucial for maintenance of better glycemic control and prevention of future cardiovascular disease. Given that education alone is not always sufficient to produce changes in behavior, for optimal efficacy, nutrition counseling could include focus on individual and cultural preferences, motivation, and self-efficacy to make healthful choices, as well as familial financial considerations.

#### EP022 | Nutrition habits of children and adolescents with type 1 diabetes changed in a 10 years span

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**Introduction:** Diet plays a key role in the treatment of type 1 diabetes (T1D). Dietary habits changed rapidly in the last decades and few data are available on recent dietary changes in children and adolescents with type 1 diabetes.

**Objective:** To test the hypothesis that diet composition changed in a 10-year period in children and adolescents with T1D.

**Methods:** 229 T1D subjects (M/F:121/108) aged 6–16 years were recruited: 114 (group A) enrolled in 2009 and 115 (group B) enrolled in 2019. Anthropometric, biochemical (HbA1c, lipid profile), diet and insulin therapy parameters were compared between the two groups. Multiple logistic regression analysis was performed with HbA1c as dependent variable (HbA1c > 58 mmol/mol = 1) and nutritional variables and technology use as independent ones.

**Results:** Energy intake of group A was not statistically different from that of group B. Group B had a significantly ( $p < 0.001$ ) higher protein and lipids intake and lower total carbohydrate and fiber intake than group A. HbA1c was significantly ( $p < 0.01$ ) lower in group B than in group A. Logistic regression analysis showed that MUFA (OR 0.83, 95% CI:0.69–0.99), fiber intake (OR 0.82, 95% CI:0.70–0.97), and technology use (OR 0.15, 95% CI:0.03–0.68), adjusted for age, gender, BMI, energy intake and diabetes duration, were associated with a HbA1c higher than 58 mmol/mol). ( $R^2 = 0.27$ ,  $p < 0.05$ ).

**Conclusions:** In a 10-year period, diet composition of children and adolescents with T1D changed and glucometabolic control improved. Fiber and MUFA intake showed a positive effect on the HbA1c, independent from technology use, supporting the importance for children with T1D and their families to maintain healthy eating habits.

#### EP023 | Combined vitamin D, etanercept and GAD-alum treatment: An open pilot trial at onset of Type 1 diabetes

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**Objectives:** GAD-alum sc seems to preserve beta cell function in Type 1 diabetes (T1D). Etanercept (TNF- $\alpha$  inhibitor) sc or Vitamin D per os, each separately might preserve beta cell function. To see if the efficacy of GAD-alum can be improved, we combined the three components in an open label pilot trial to evaluate the tolerability.

**Patients, design and methods:** 20 T1D patients (7 girls) were enrolled, aged (mean + -SD):  $12.4 \pm 2.3$  (8.3–16.1) years, with a T1D duration of  $81.4 \pm 22.1$  (44–118) days. Baseline fasting C-peptide was  $0.24 + -0.1$  (0.10–0.35) nmol/l, C-peptide AUC after Mixed Meal Tolerance Test  $0.6 + -0.2$  (0.25–1.10) nmol/l. All patients were GADA positive. The patients got Day 1–450 Vitamin D (Calciferol) 2000 U/d per os, sc Etanercept (0.8 mg/kg) Day 1–90 once a week, and received GAD-alum sc injections (20  $\mu$ g, Diamyd) in Day 30 and 60. They were followed for 30 months.

**Results:** The treatment was well tolerated with no Serious Adverse Events. Compared to baseline 90-minute stimulated C-peptide improved in 8/20 patients after 6 months, and AUC after MMTT in 5 patients. After Month 6, an age-independent consistent decline in C-peptide values was seen. Decreases were observed in 16 patients, from Month 6 to 15, and in 17 patients from Month 15 to 30. Spontaneous IL-17a secretion increased after administration of Etanercept, and remained higher throughout the study. GAD<sub>65</sub>-induced cytokines and chemokines were also enhanced following 1 month of Etanercept administration, before receiving the first injection of GAD-alum, while GAD<sub>65</sub>-induced proliferation was not increased after treatment. Administration of Etanercept did not reduce TNF spontaneous secretion from PBMC, but rather GAD<sub>65</sub>-induced TNF- $\alpha$  increased after Etanercept treatment.

**Conclusions:** Combination therapy consisting of GAD-alum (Diamyd), Etanercept and vitamin D in children and adolescents with T1D was safe and tolerable, but the combination therapy did not improve the GAD-alum efficacy.

## EP024 | Service evaluation of the use of newer long acting insulins in the pediatric population

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**Aim:** To perform a service evaluation comparing the safety, efficacy and patient acceptability of insulin Degludec with insulin Glargine, in children with T1DM on a basal bolus regime.

**Objective:** To compare anonymized patient data regarding the outcomes of children with T1DM on basal bolus regime and on insulin Degludec or insulin Glargine, collected retrospectively for the year 2017.

**Methodology:** The data regarding outcome parameters of children with type 1 diabetes mellitus on basal bolus regime, was collected from an electronic data bases (Twinkle and Diasend). The outcome parameters measured were: hypoglycemia, DKA, HbA1C levels, blood glucose variability, fasting blood glucose levels, total daily dose of insulin and patient experiences.

**Results:** Total of 66 children included in study (30 in Degludec group and 36 in Glargine group).

In children with established type-1 DM, two in the Degludec group and three in the Glargine group developed DKA. 48% of children in the Degludec group compared to 47% in the Glargine group had more than 10% low blood glucose recorded (out of all recorded BMs). HbA1C recorded: Degludec group (< 48: 3%, 48–58: 10%, 58–75: 30%, >75: 57%); Glargine group (< 48: 3%, 48–58: 36%, 58–75: 36%, >75: 25%). Glucose variability: Degludec group (0–3: 16%, 3–6: 65%, > 6 19%), Glargine group (< 3: 3%, 3–6: 69%, >6: 28%). Pre-breakfast BMs: Degludec group.

(<5.9: 14%, 6–10: 67%, >10: 19%), Glargine group: (<5.9: 6%, 6–10: 75%, >10: 19%).

Data regarding total daily dose was poorly documented. Results also show that Degludec is more flexible and causes less pain as well as injection site complications.

**Conclusion:** DKA incidence was lower in children with established T1DM on Degludec. No reduction in incidence of hypoglycemia was found in this study. Glucose variability was found to be reduced in children on Degludec. However, this study did appear to show a higher average HbA1C and a higher percentage of low pre-breakfast BM in the Degludec group.

## EP025 | Effect of high strength oral probiotics supplementation on immune-regulatory markers in children with new onset type one diabetes mellitus: a randomized, double-blind placebo control pilot trial

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**Objectives:** To study the effects of high strength probiotics supplementation in children with Type 1 diabetes (T1D) on immune regulatory markers and glycemic control parameters.

**Methods:** This RCT was conducted over one-year on 60 children (2–12 years) with new-onset T1D (diagnosed in last 6 months). Children with Celiac disease, malabsorption or acute diarrhea were excluded. Children were randomized 1:1 into Probiotic and Placebo groups with 30 children each. Children in the Probiotics group received oral powder of Vivomixx<sup>®</sup> a highly concentrated mixture of 8 probiotic strains containing 2.25 billion CFU in once daily dose. Placebo group received the maltose powder in similar looking sachets as a single daily dose. The 2 groups were compared at the end of 6 months for percentage of regulatory T cells (Tregs) in blood, serum IL10 levels, serum titers of pancreatic autoantibodies and various glycemic control parameters using Student t test or Mann Whitney U test as applicable.

**Results:** The two groups were comparable at the baseline with regards to all demographic characteristics and various primary and secondary outcome parameters. At total of 27/30 and 23/30 patients, in Probiotic and Placebo groups respectively, completed follow up of 6 months. The primary and secondary outcome parameters compared at the end of 6 months follow up are shown in Table 1.

The profile of immune regulatory markers was better in Probiotic group with higher C-peptide levels and lower HbA1c values when compared to Placebo at the end of 6 months. However, the difference did not reach statistical significance.

**Conclusions:** The supplementation of high strength probiotics in new-onset T1D children shows a trend towards improved immunoregulatory milieu thereby preserving the beta cell function (better C peptide) and improving the glycemic control.

Outcome Parameters	Placebo Group (n = 23)	Probiotic Group (n = 27)	P-value
T regs percentage; Median (IQR)	2.66 (1.63)	3.99 (3.04)	0.186
Plasma IL-10; Median (IQR)	4.45 (6.78)	6.17 (8.17)	0.355
GAD 65 antibody; Median (IQR)	220.00 (345.33)	34.1 (240.29)	0.078
IA 2 antibody; Median (IQR)	4.00 (15.98)	4 (9.18)	0.503
IAA antibody; Median (IQR)	5.75 (20.64)	3.71 (8.11)	0.641
C-peptide (ng/ml); Median (IQR)	0.21 (1.37)	0.73 (1.11)	0.239
HbA1c (g%) (Mean ± SD)	7.99 ± 1.1	7.39 ± 1.3	0.083
Unit Change in HbA1c (g%) (Mean ± SD)	-5.05 ± 1.82	-5.64 ± 1.85	0.261

[Table 1. Comparison of outcome parameters at end of 6 months in two study groups.]

EP026 | Application of bee honey on the oral mucosa outside the row of teeth without swallowing does not increase blood or tissue glucose in children with T1D and should not be recommended as treatment of severe hypoglycemia

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**Objectives:** Severe hypoglycemia is the most common acute complication of type 1 diabetes (T1D), and urgent treatment is required. When glucagon is not available, administration of glucose gel or bee honey inside the cheek is advised in guidelines. Still, there is a lack of evidence whether glucose is absorbed through the oral mucosa. The objective of this study was to explore if application of bee honey on the oral mucosa outside the row of teeth without swallowing the honey would increase the blood glucose in children with T1D.

**Methods:** Ten children (5 boys, 5 girls); age 8.8–12.9 years, T1D 3–10 yrs participated. All were using CSII and CGM. HbA1c 41–53 mmol/mol, insulin doses last 14 days 0.48–1.12 U/kg/d. Bee honey containing 0.3 g carbohydrates/kg bodyweight was applied to the vestibular oral mucosa. As control, all children applied a similar quantity of coconut oil supplemented with artificial sweetener on a separate visit. Blood and tissue glucose were registered 10 minutes before, just before and 5, 10 and 15 minutes after application. To avoid swallowing, the children had a saliva extractor inside their mouth. The Regional Ethics Committee approved the study, and children and parents consented to participate.

**Results:** The amount of honey applied was 11–21 g (mean 14.3 g), containing 9–17 g (mean 11.5 g) carbohydrates. All children used the saliva extractor, and no one reported swallowing the bee honey/

coconut oil. None of the children experienced a clinically significant increase in blood or tissue glucose level after either application of bee honey or coconut oil (Figure 1). CGM trend arrows predicted stable glucose level in 9 of 10 children ten minutes before application and in 8 of 10 children 15 minutes after application of bee honey.

**Conclusions:** Bee honey application should not be recommended as treatment of severe hypoglycemia in T1D.

EP028 | A population health data platform to improve outcomes in the T1D Exchange Quality Improvement Collaborative (T1DX-QI)

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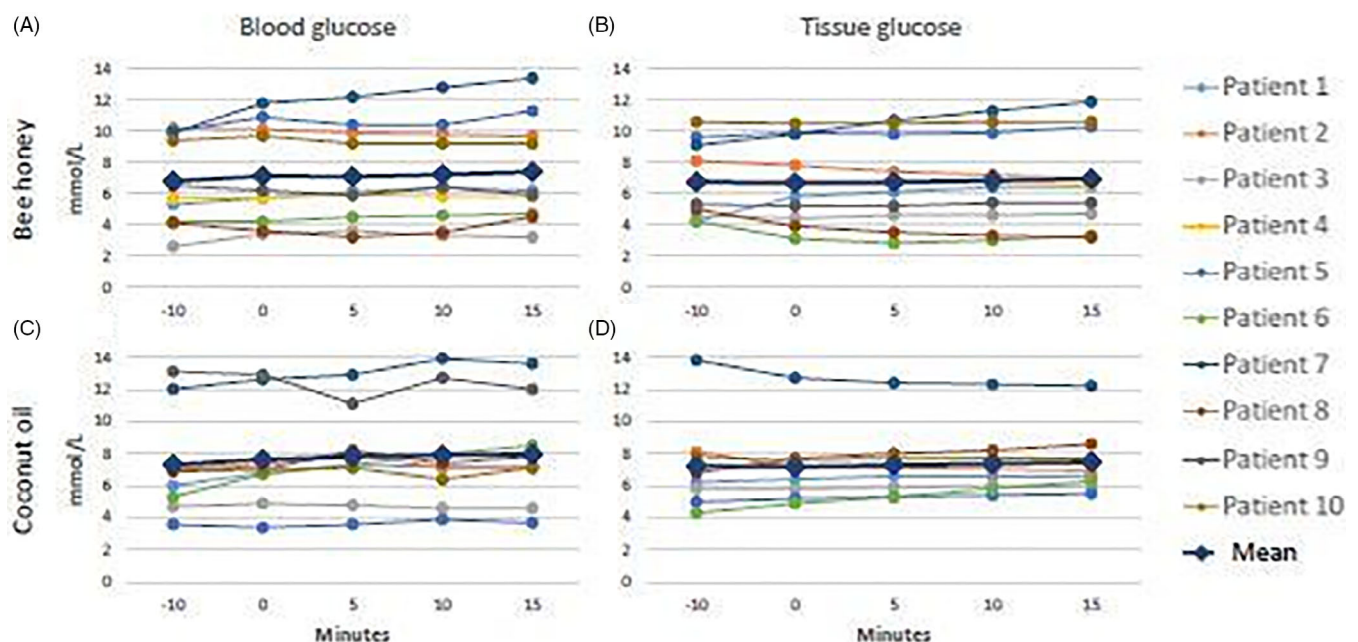
Endocrinology, Palo Alto, USA, <sup>9</sup>University of Pennsylvania,

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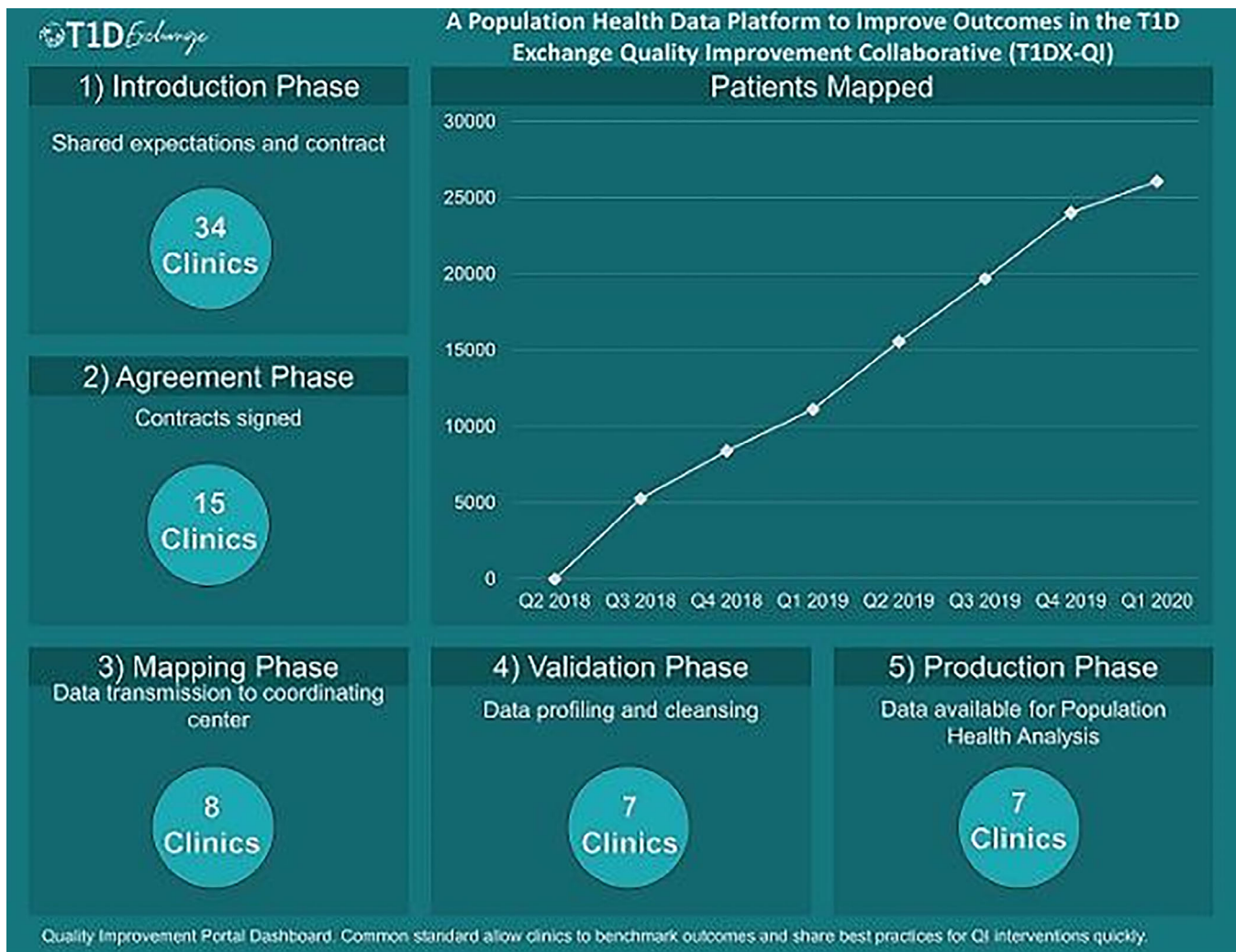
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A multidisciplinary group designed the T1DX-QI to improve type 1 diabetes (T1D) care by sharing QI tools and expertise among pediatric and adult diabetes clinics and by comparing real-world data from clinics' entire T1D populations. The QI Collaborative has implemented standardized processes, including common data definitions and a central database.



[Figure 1. Blood and tissue glucose after bee honey and coconut oil]



[(Figure) A Population Health Data Platform]

To participate, clinics must dedicate time from clinic leaders and IT support staff, obtain IRB exemption clearance, map clinical data to the standard, and receive QI coaching. The data standard contains 135 discrete fields between two sections. Fields specific to the care of people with T1D (insulin regimen and doses, blood glucose monitoring parameters, severe hypoglycemia and diabetic ketoacidosis events) are captured in the diabetes section. The core section contains general fields such as demographics, medical history, laboratory results, medications, and depression screening results. The coordinating center validates data quality and incorporates data into the production database after receiving data files transmitted via a secure connection every 1–4 weeks.

Thirty-four clinics are in 1 of 5 phases of onboarding (Figure). Eight clinics have transmitted data accounting for >26,000 individuals with T1D, seven of which have validated clinical data for population health analysis and portal use. The QI Portal provides population health reports, including run charts, case management tools, and business intelligence tools.

Clinics' entire T1D populations are included. Data standards allow clinics to benchmark outcomes, identify variation, and share best

practices for QI interventions quickly. Future enhancements will include outcomes predictions, population health management, self-management device data, and creation of a de-identified research repository.

EP029 | **Hybrid closed loop initiation using virtual pump training program in children and adolescents with type 1 diabetes previously treated with multiple daily injections**

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**Introduction:** Due to the COVID-19 restrictions in providing regular diabetes services at Sidra Medicine in Qatar, the traditional training and education was postponed, as the service was not considered critical in the current situation. Diabetes team developed an innovative “virtual pump training program”, using video conferencing Skype “Meet Now”.

**Aim:** The aim of this study was to evaluate effectiveness of this program on glycemic control patients transiting to HCL system.

**Methods:** Prospective observational study of children aged 7 to 18 years with Type 1 Diabetes (T1D) on Multiple Daily Injections (MDI), starting the MiniMed 670G system using Skype Meet Now with the following program: prerequisite technical session, patient's criteria for the program and pre-course requirements; pump training, one face to face practical session for sensor insertion and four consecutive online sessions: Day 1- Manual Mode, bolus wizard use, basal rates, Auto Mode and readiness; Day 2- Infusion set and reservoir change; Day 3- hypoglycemia, hyperglycemia, exercise and travel management; Day 4- Evaluation to initiate HCL system. Time in Range, Sensor Glucose, HCL system characteristics were analyzed in the first month of HCL initiation.

**Results:** A total of 12 patients (Age 7–18 years) and their parents commenced MiniMed 670G using the virtual program and used the system for one month. Sensor wear of  $91.2 \pm 4.5\%$  and Auto Mode usage of  $88.5 \pm 6.8\%$  was noted in the first month HCL initiation. Time in Range (70–180 mg/dL) increased from  $42.1 \pm 10.2\%$  at baseline to  $74.2 \pm 7.3\%$  at the end of the study ( $p < 0.001$ ). There was no severe hypoglycemia nor DKA during the study. The patients will be followed for the next 3 months.

**Conclusions:** Virtual Pump Training Program in people with T1D on MDI, can be an effective tool to initiate an HCL system and to improve glycemic control in a safe manner without severe hypoglycemia and hyperglycemia.

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#### EP030 | Text message support system in pediatric diabetes: qualitative feedback of a 12-month program

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**Introduction:** Empowering young patients to be involved in the management of their diabetes and to obtain good glycemic control is imperative in reducing the risk of microvascular and macrovascular complications of Type 1 Diabetes Mellitus. In the current digital era, it makes sense that we utilize simple interventions to improve diabetic control in both pediatric and adult populations.

**Objective:** To evaluate the perceived effectiveness and participant satisfaction of a text messaging service providing support to Children and Young People with Type 1 Diabetes Mellitus and their families.

**Study design:** Over a 12-month period, monthly text messages were sent to 95 type 1 diabetic patients in the pediatric diabetes service of a district general hospital. Content of the messages varied, providing general support and reminders, motivational facts and information on diabetes.

At the end of the program, participants completed evaluation questionnaires.

34 program evaluations were completed.

**Results:** 70.59% of the participants felt more supported when receiving the monthly messages.

64.71% of the participants felt more informed about their condition as a result of the monthly messages.

44.12% of participants felt they had better diabetic control as a result of the monthly messages.

38.24% of the participants felt that receiving the text messages had a direct effect on the reduction of their HbA1c over the period of the text-messaging program.

Over the 12-month period, the average HbA1c of the total cohort reduced from 64 mmol/mol to 62 mmol/mol,  $p = 0.4$  using paired t-test statistical analysis: not a statistically significant reduction.

**Conclusion:** While there was no direct correlation with improving diabetic control, a monthly text messaging service provides welcomed support and information to patients and their families and is a relatively simple intervention.

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#### EP031 | “It got likes, but I do not think people understood.” A qualitative study of adolescent experiences discussing type 1 diabetes on social media

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**Introduction:** The majority of adolescents with type 1 diabetes (T1D) integrate social media engagement into their daily lives. The social media experiences of adolescents with T1D has not been fully explored.

**Objectives:** The objective of this study was to explore adolescents' experiences and perspectives discussing their T1D on social media.

**Methods:** Semi-structured interviews with adolescents with type 1 diabetes were conducted in-person and via telephone. Questions focused on the participant's experiences utilizing social media to discuss T1D and factors that informed the nature of T1D-related social media engagement. Open coding and thematic content analysis were used to identify emergent themes that aligned with accepted domains of social media affordances.

**Results:** Participants included 35 adolescents with T1D. Adolescents' experiences related to discussing T1D on social media aligned with four affordances of social media: identity, cognitive, emotional, and social (Table 1). The identity affordances of social media platforms allowed adolescents to curate online personas that selectively included their diagnosis of T1D, while managing the potential negative emotional and social implications linked to the stigma of T1D. Adolescents who decided to discuss T1D on social media leveraged cognitive affordances by providing and receiving diabetes management advice, emotional affordances by obtaining affirmation from

Social Media Affordances Categories	Representative Adolescent Quotes
Identity Affordances	<p>Everyone in my grade knows [I have T1D] because I'm a loud person. I'm not anywhere close to an introvert. So, I talk about it [on social media]. - 13-year-old male</p> <p>[I post] lots of jokes about it so I can kinda make it seem like it's less of a big deal and kinda normalize it... I just have to eliminate that chance [of bullying] by like making fun of me before they do. -15-year-old male</p>
Cognitive Affordances	<p>I had a boy DM (direct message) me saying, "Hey, I saw you have diabetes. I was just diagnosed a little while ago. How do you feel about transitioning from shots to an insulin pump?" I got to explain that to him and my view on it. -17-year-old female</p> <p>It's nice hearing things from people who have lived it. Like my endocrinologist, she is going by the book. But bodies aren't the book. - 16-year-old female</p>
Emotional Affordances	<p>[When I post about T1D] it's more like, "Oh, you are so strong for going through this, you are an inspiration to people, you are really encouraging, thank you for sharing your story." -17-year-old female</p> <p>[Other social media users] would be like, "Do your best" or "You're doing wonderful!" But a lot of people do not know, and I feel like that makes you feel a little bit more alone. -16-year-old female</p>
Social Affordances	<p>[Other adolescents with T1D] know pretty much exactly what you are going through...They actually know that you know ironically, the bloody truth, it [is] a unification thing. -16-year-old female</p> <p>Snapchat has a feature where you can block people from seeing your story and stuff, so I am comfortable [discussing T1D] because I can control who sees what... Being diabetic, you [have] already lost so much of that control... so many of our life choices are just taken away. Having some power over it is really important for us. -18-year-old female</p>

[Affordances of Social Media and Representative Quotes from Adolescents Describing their Social Media Experiences]

peers, and social affordances through extending their network to include other individuals with T1D.

**Conclusions:** Adolescents with T1D flexibly leverage the affordances offered by social media to access emotional support, information, and identity affirmation resources while navigating stigma-based social consequences. Our findings highlight the value of developing tools to support adolescents with T1D in comfortably discussing and receiving appropriate support about T1D on social media.

EP032 | **Whose data is it anyway? Influences on technology use and interpretation among young people living with type 1 diabetes?**

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There are ~300 patients <20 with Type 1 Diabetes (T1D) in Southern HSC Trust, N Ireland. Until recently, HbA1c levels have been primary focus for patients+diabetes teams, however there's growing evidence that HbA1c alone does not provide sufficient information on diabetes control. In SHSCT, T1D teams are using '% time in range'. An audit was conducted to assess how patients+families use and interpret blood glucose (BG) data.

**Methods:** Results were gathered from questionnaires for T1Dpatients up to 16 years old. Focus groups were held throughout SHSCT where questions were discussed further by patients+parents.

**Results:** 68 patients completed questionnaire, 45.5% aged 13-16; 33.8% aged 9-12, remainder aged<8. When asked about BG results, 44% did not know their previous results. Despite this, 61.7% stated they contacted their Diabetes Specialist Nurse to review BG levels between clinics. 64.7% checked their BG levels at least once per day. Patients answered questions about BG data+using data softwares. 70.5% owned at least 3 devices, which they could check BG data on. 70.5% of people stated that they used diabetes programs with 47% stating they were beneficial to them/their child.

**Discussion:** Despite easy access to the BG monitoring softwares and majority having multiple devices to access data, only 30% review data > than once/month with only 36.7% finding this easy. Focus groups showed parents agreed pumps+devices were convenient+a 'gamechanger' in diabetes care. Often night-time were easier, parents got more sleep and anxiety around meal times reduced. Despite this, few looked at the data outside clinic. Many stated that there was 'information overload' and it was easy to overanalyse. They did not want to look at data after dealing with diabetes burden during the day.

**Implications:** Better understanding of patients' view on software systems+ how to interpret them should help to increase appropriate use of these which might lead to better long-term results.

EP033 | **Evaluation of a Control IQ follow-up program by diabetes educators**

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**Introduction:** Control-IQ (CIQ, Tandem Diabetes) is a new hybrid closed-loop system that patients initiate at home after completing a commercial, on-line training module. Best practices for clinical follow-up are not yet elucidated.

BENCHMARKS	Follow-up #1 (N = 107)	Follow-up #1 (N = 107)	Follow-up #2 (N = 16)	Follow-up #2 (N = 16)
	Median (IQR)	Percent patients meeting benchmarks	Median (IQR)	Percent patients meeting benchmarks
Percent time using CIQ	94 (88.3, 96.0)	93.5%	95 (92, 96)	93.8%
Percent time using CGM	97 (93.0, 99.0)	97.2%	96 (96, 98)	93.8%
Percent time in range (70–180 mg/dL)	71 (60.5, 79)	75.7%	66.5 (49, 75)	56.3%
Percent time < 70 mg/dL	2 (1, 3)	87.0%	1 (1, 3)	93.8%
Cumulative benchmarks passed	n/a	63.6%	n/a	56.3%

RECOMMENDATIONS	n (%) of patients receiving recommendation during 1st follow-up call	n (%) of patients receiving recommendation during 2nd follow-up call
Basal/carb ratio/sensitivity changes	34 (31.8%)..... 25 (24.3%)..... 14 (13.1%).....	6 (37.5%)..... 3 (18.8%)..... 3 (18.8%).....
Behavior changes (i.e. meal bolusing, hypo- treatment)	45 (42.1%)	10 (62.5%)

[Table: CIQ benchmarks and educator recommendations made during CIQ Follow-up Program phone calls.]

**Objective:** To evaluate the usefulness of a clinical follow-up program for CIQ users in a T1D pediatric clinic.

**Methods:** Patients were contacted by a diabetes educator 1–3 weeks after CIQ start. Educators reviewed device downloads to assess 4 benchmarks for success over the past 7 days: >5 days CIQ use, >5 days CGM use,  $\geq 60\%$  Time in Range (TIR, 70–180 mg/dL), < 5% below 70 mg/dL. If patients did not meet benchmarks, a second call was scheduled 1–3 weeks after the first contact. Patient and educator satisfaction were assessed by survey.

**Results:** One hundred and seven patients (mean age  $13 \pm 4$  y, T1D duration  $5 \pm 4$  y, 56% female, mean A1c  $7.5 \pm 0.5\%$ ) completed a follow-up call a median (IQR) of 18 (15, 20) days after starting CIQ. Sixty-eight patients (64%) met benchmarks. Of the 39 patients who did not meet benchmarks, 16 (41%) completed a second follow-up call; TIR improved by 12.5% ( $p = 0.03$ ) between the 1st and 2nd calls and 9 of the patients (56%) met benchmarks at the second follow-up. Patients rated follow-up calls as convenient and useful with high satisfaction overall [median 9 out of 10 (8, 9)]. Educators spent a median of 45 (36, 65) minutes per patient and rated the process 7 (6, 8) out of 10.

**Conclusions:** Our CIQ follow-up program received high satisfaction ratings from patients and educators and resulted in improved TIR for those initially not meeting benchmarks, suggesting that pediatric patients may benefit from early follow-up with a diabetes educator to improve CIQ use. Future work will clarify the clinical support necessary to optimize long-term use of CIQ.

**Objectives:** The t:slim X2 insulin pump with Control-IQ technology (an advanced hybrid closed-loop system) has shown promising glycemic outcomes for pediatric and adult T1D patients. To date, however, there is no real-world data evaluating the psychosocial impact of using Control-IQ technology in pediatric T1D patients.

**Methods:** We analyzed psychosocial outcomes in pediatric T1D individuals who had been using the t:slim X2 pump with Control-IQ technology (Tandem Diabetes Care) in a real-world setting. These pediatric participants (PPs) were part of a larger recruited sample that also included adults with T1D (not described here). Consenting PPs completed psychosocial measures online. Data was analyzed using inter-factor correlations and multiple-regression analysis. The study was approved by a research ethics board.

**Results:** In all, 137 PPs (14–18-year-olds) were included in the study. Most were female (51.1%), Caucasian (91%), and had been using an insulin pump prior to study start (92.7%). At study start, PPs had been using Control-IQ technology for 45 days (mean, SD = 8.8) and their self-reported total daily insulin use was 62 units (mean, SD = 27.7). Most recent HbA1c (self-reported) was 7.2% (mean, SD = 1.1). A positive correlation was observed between PPs psychological well-being and quality of sleep (self-report) ( $r = 0.45$ ,  $p < 0.001$ ). Device-related satisfaction (DS) and quality of sleep were positively correlated ( $r = 0.38$ ,  $p < 0.001$ ) while diabetes-related impact (DI) and quality of sleep were negatively correlated ( $r = -0.35$ ,  $p < 0.001$ ). Regression analysis revealed DI and DS as independent predictors of HbA1c ( $\beta = 0.30$ ,  $p < 0.01$ ,  $r_{a(b,c)} = 0.26$  and  $\beta = 0.26$ ,  $p < 0.01$ ,  $r_{a(c,b)} = 0.23$ , respectively).

**Conclusions:** Quality of sleep was an important consideration for determining both device-related satisfaction and impact of diabetes on quality of life in pediatric T1D patients. Pediatric T1D patients reporting low DS and high DI could potentially experience impaired glycemic outcomes.

EP034 | Psychosocial impact of Control-IQ technology in pediatric users with type 1 diabetes: Real-world insights from United States

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EP035 | Sleep mode use in pediatric patients with type 1 diabetes using Control-IQ

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**Objectives:** Sleep mode is a unique feature of the Tandem Control-IQ (CIQ) system which allows for a narrow glucose target range (112.5–120 mg/dL) during sleep. A minimum of 5 hours of use per day is recommended for benefit. Use of Sleep mode and the impact on glycemic outcomes including time in range, time hypo- and hyper-glycemic, and mean glucose value were examined within the first month of CIQ in a pediatric sample.

**Methods:** Youth and young adults with T1D using CIQ as part of routine care participated in an observational study. Data on device use and glycemic measures were collected. Participants were stratified by duration of Sleep mode use, < 5 hrs and ≥ 5 hrs. Two group t-tests or Wilcoxon rank-sum tests were used to detect a difference between the two groups.

**Results:** Ninety-nine youth (median age 13 yrs [IQR 10,15], T1D duration 3.9 yrs [2.1,7.1], HbA1c 7.4% [6.7,7.9]) using CIQ for a median of 19 days [16,28] were included. Fifty-nine youth (61%) used Sleep mode at least 5 hours per day. There were no differences in glycemic measures between those who used Sleep mode optimally (≥5 hrs) and those who did not (< 5 hrs) (Table). Baseline HbA1c and age were not predictors of optimal use. Sleep mode was not used more than 9 hrs in any patient.

**Conclusions:** The Sleep mode feature on the CIQ system was used adequately (≥5 hrs) by the majority of pediatric patients; however, use did not correlate with changes in glycemic measurements. Further evaluation is needed to determine outcomes from long term use of Sleep mode and use in patients with higher baseline HbA1c, reasons for inadequate use and ways to optimize device use among pediatric patients with T1D.

	Sleep Mode Use < 5 hrs (N = 39)	Sleep Mode Use ≥ 5 hrs (N = 60)	P value
% time sensor <70 mg/dL (Median [IQR])	1 [1,3]	1 [1,3]	0.81
% time sensor >180 mg/dL (Median [IQR])	28 [22,39]	25 [20,35]	0.22
% time sensor 70–180 mg/dL [Mean (SD)]	68 (13)	72 (10)	0.1
Mean sensor glucose value, mg/dL [Mean (SD)]	161 (22)	153 (18)	0.08
Baseline HbA1c % (Median [IQR])	7.4 [7.0,7.9]	7.4 [6.6,8.0]	0.39
Baseline Age, yrs (Median [IQR])	14 [10,15]	13 [10,15]	0.89

[Table: Impact of Sleep Mode Use on Glycemic Measures]

EP036 | Increased time in range in the first month of Control IQ use in a clinical sample of youth with T1D

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**Introduction:** The t:Slime X2 Control IQ system is the second Hybrid Closed Loop (HCL) system available for T1D care in the United States. Real-world studies of HCL use are needed to understand the clinical implications of HCL systems.

**Objective:** To describe system use and glycemic outcomes in a clinical sample of youth using the t:Slime X2 Control IQ Hybrid Closed Loop (HCL) system.

**Methods:** Youth with T1D starting the Control IQ HCL system for their diabetes care were enrolled in an observational study. Data on system use and glycemic outcomes were collected from device downloads up to 14 days prior to starting Control IQ and within the first month of Control IQ use. Descriptive statistics are reported as Mean ± SD or Median (IQR) and change in glycemic outcomes before and after starting Control IQ were analyzed by Wilcoxon sign rank test.

**Results:** Ninety-eight youth [13(10,15) yrs., 54% F, baseline A1c = 7.4% (6.7,7.9)] using Control IQ for 19 (16,28) days were included. Sensor use was 97% (93,99) and Control IQ use was 92% ± 9. Sensor time in range (70–180 mg/dL) increased from 56% (47,70) at baseline to 71% (63,77) after starting Control IQ (p < 0.001). Sensor time > 180 mg/dL decreased from 43% (27,53) at

	First month of Control IQ use ([19 (16,28)] days of use)		p-value
% Sensor glucose <54 mg/dL	0 (0,1)	0 (0,1)	0.45
% Sensor glucose <70 mg/dL	2 (1,4)	1 (1,3)	0.31
% Sensor glucose 70–180 mg/dL	56 (47,70)	71 (63,77)	<0.0001
% Sensor glucose >180 mg/dL	43 (27,53)	27 (20,35)	<0.0001
% Sensor glucose >250 mg/dL	13 (7,22)	7 (3,13)	<0.0001
Mean sensor glucose (mg/dL)	174 (153,192)	156 (143,168)	<0.0001
Average daily meal boluses	4 (3,6)	4 (3,6)	1.00
Average total daily dose (TDD) (units)	46 (30,64)	47 (30,66)	0.18
%TDD basal insulin / % TDD bolus insulin	43 (33,49) / 58 (51,67)	46 (39,54) / 54 (46,61)	<0.0001

[Change in glycemic outcomes for 98 youth using Control IQ HCL system for T1D care]

baseline to 27% (20/35) after starting Control IQ ( $p < 0.001$ ). There was no change in sensor time in hypoglycemia ranges. There was also no difference in outcomes by sex or when comparing youth  $\leq 13$ y to youth  $> 13$ y.

**Conclusion:** Control IQ HCL can improve glycemic control for youth in the first month of use. The high percent use of Control IQ in the early weeks is encouraging, though longitudinal data will be needed to determine sustainability of use. This study is ongoing to examine glycemic outcomes and Control IQ system use across time.

#### EP037 | Off label use of Tandem Control-IQ technology with diluted U10 insulin in a toddler with type 1 diabetes

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**Introduction:** Tandem's Control-IQ hybrid closed loop system is currently FDA approved for patients with type 1 diabetes (T1D) age 14 years and older who weigh at least 55 lb and require at least 10 units of insulin per day. To date, there are no published data evaluating Control-IQ in children who weigh less than 55 lb nor with diluted insulin.

**Objectives:** The purpose was to determine whether off label use of Control-IQ technology is feasible and efficacious in a toddler requiring diluted U10 insulin, who meets neither FDA weight nor age criteria.

**Methods:** A 2.5 year old, 25 lb boy with antibody positive T1D diagnosed at age 6 months, who is using a DexcomG6 CGM and Tandem T slim insulin pump with Basal-IQ technology with diluted U10 insulin, was transitioned to the Control-IQ hybrid closed loop system, after risks and benefits were reviewed in detail with his mother. Glycemic

Glycemic/Insulin Parameter	Before Control-IQ	After Control-IQ
Number of Days CGM in Use	26 days, 18:55 hrs	28 days, 14:15 hrs
Average Total Insulin (units/day)	9.48	9.22
Average Basal Insulin (units/day)	1.72 (18%)	1.42 (15%)
Average Bolus Insulin (units/day)	7.76 (82%)	7.8 (85%)
Average Boluses (# per day)	12.33	18.57
Average CGM Reading (mg/dL)	186 +/- 65.5 (Range 40–400)	161 +/- 61.2 (Range 40–400)
CGM Time-in-Range (70–179 mg/dL)	49%	67%
CGM Time Above Target (>179 mg/dL)	51%	32%
CGM Time Below Target (<70 mg/dL)	1%	1%

[Table: Glycemic parameters and insulin usage data 30 days before and 30 days after initiation of Control-IQ].

control was closely monitored by physician review of pump downloads, with pump setting adjustments made initially daily, then weekly to bi-weekly. Glycemic parameters and insulin usage data available on the pump downloads were compared for the periods 30 days prior to and 30 days after initiation of Control-IQ.

**Results:** In the 30 days after switching to Control-IQ, the technology was in use 92% of the time (CGM inactive 5%, pump inactive 3%). After Control-IQ was initiated, average CGM reading and time-in-range improved without an increase in hypoglycemia or total daily insulin usage (Table).

**Conclusions:** With close monitoring by his endocrinologist and parents, Control-IQ was successfully utilized in a toddler with T1D while using diluted U10 insulin, without any episodes of severe hypoglycemia or hyperglycemia with ketones thus far.

#### EP038 | Drivers for the reduction in hyperglycemia and hypoglycemia in children and adolescents switching from multiple daily injections to hybrid closed loop system

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**Aim:** To understand the drivers for improved glycemic control observed in children and adolescents transitioning from Multiple Daily Injection (MDI) to the MiniMed 670G Hybrid Closed Loop (HCL) system.

**Methods:** Participants (7–18 years) with T1D on MDI, who initiated the MiniMed 670G system using 10-Day initiation protocol were categorized per their HbA1c levels on MDI: HbA1c  $< 8\%$  and HbA1c  $> 8\%$ . Basal insulin, time in ranges, HbA1c and HCL characteristics were analyzed for both groups at three, six and nine months after HCL initiation.

**Results:** Fourteen participants with HbA1c  $< 8\%$  (age  $9.3 \pm 2.4$  years, HbA1c  $7.0 \pm 0.8\%$ ) and sixteen participants with HbA1c  $> 8\%$  (age  $11.1 \pm 2.7$  years,  $9.2 \pm 0.8\%$ ) were analyzed.

Basal insulin in participants (HbA1c  $< 8\%$ ) of  $48.5 \pm 8.9\%$  was significantly higher compared to  $32.1 \pm 9.1\%$  in participants (HbA1c  $< 8\%$ ) ( $P = 0.001$ ), and experienced more time in hypoglycemia ( $< 70$  mg/dL) of  $4.2 \pm 2.9\%$  versus  $1.4 \pm 0.9\%$  ( $p = 0.001$ ), accordingly.

Basal insulin (10 PM–6 AM) significantly decreased from  $94.1 \pm 7.2\%$  on MDI to  $82.9 \pm 7.2\%$  in the first 3 months of HCL use in participants (HbA1c  $< 8\%$ ). ICR significantly decreased from  $16.2 \pm 5.7$  g on MDI to  $12.8 \pm 4.8$  g in the first 3 months of HCL use ( $p = 0.678$ ), without significant difference between groups.

TIR (70–180 mg/dL) increased above 70% in both groups in the first three months and sustained in the following 9 months after HCL initiation. Time spent in hypoglycemia decreased in participants with HbA1c  $< 8\%$  while time spent in hyperglycemia decreased in participants with HbA1c  $> 8\%$ .

**Conclusion:** Strengthening the carb ratio, redistribution of basal insulin delivered during the night due to adaptability of HCL algorithm, structured initiation and training protocol are possible drivers for the reduction in hyperglycemia and hypoglycemia in children and adolescents switching from MDI to HCLSystem

	MDI, Baseline				HCL System, 3 months			
	ALL	A1c<8%	A1c>8%	P	ALL	A1c<8%	A1c>8%	P
HbA1c, %	8,2±1,4	6,9±0,8	9,2±0,8	0,001	6,7±0,8	6,6±0,7	6,8±0,9	0,498
SG (12am-12am), mg/dl	193±41	165±33	215±32	0,001	142±12	139±18	148±21	0,211
SG (10pm-06am), mg/dl	183±35	155±28	200±29	0,001	133±17	133±12	142±18	0,092
SG (06am-10pm), mg/dl	202±42	175±34	231±36	0,001	150±10	147±9	153±11	0,114
Time in Ranges, %								
< 50 mg/dl	0,4±0,3	0,4±0,3	0,4±0,2	0,369	0,3±0,2	0,3±0,2	0,3±0,2	0,412
51-70 mg/dl	2,7±1,2	4,2±2,9	1,4±0,9	0,001	2,5±1,8	2,5±1,8	2,5±1,9	0,456
71-180 mg/dl	46,9±12,8	60,7±17,4	34,8±15,9	0,001	74,8±7,9	76,1±7,5	74,3±8,7	0,602
181-250 mg/dl	25,8±7,4	22,1±9,8	29±6,5	0,018	16,9±7,0	16,1±7,2	17,1±5	0,449
> 251 mg/dl	24,1±13,3	12,5±12,1	34,4±15,9	0,001	5,5±3,7	5,1±3,8	5,8±3,4	0,532
Weight, kg	38,2±12,5	34,1±10,1	41,8±13,2	0,041	39,4±8,9	35,3±9,8	43,1±11,9	0,034
TDD, U/(kg/d)	0,8±0,3	0,8±0,3	0,8±0,3	0,415	0,9±0,2	0,9±0,3	0,9±0,3	0,708
Basal insulin, (12am-12am), %	36,5±7,2	48,5±8,9	32,1±9,1	0,001	42,2±6,7	41,55±8,12	43,7±7,2	0,559
Basal insulin (10pm-6am), %	89,2±8,8	94,1±7,2	83,4±8,4	0,001	84,4±8,1	82,9±7,2	86,7±8,1	0,207
Basal insulin (6am-10pm), %	30,1±4,2	32,6±5,4	29,1±3,8	0,054	32,8±5,9	33,4±5,4	31,3±6,2	0,334
Sensor wear, %	89,8±7,5	88,9±8,9	90,2±7,4	0,655	92,4±6,2	90,2±8,8	93,3±4,6	0,435
Auto Mode usage, %	84,8±11,9	85,9±10,1	84,2±9,4	0,636	89,8±7,4	89,9±4,5	89,2±9,7	0,806
Carbohydrates, gr per day	213±50	211±45	218±72	0,77	219±48	212±57	224±34	0,483
Carb ratio, gr	16,2±5,7	17,2±3,2	15,4±6,1	0,216	12,8±4,8	13,2±3,9	11,3±5,2	0,236
Active insulin time, h	3,6±0,4	3,7±0,3	3,4±0,4	0,148	3,5±0,4	3,7±0,4	3,3±0,5	0,212

	HCL System, 6 months				HCL System, 9 months			
	ALL	A1c<8%	A1c>8%	P	ALL	A1c<8%	A1c>8%	P
HbA1c, %	6,9±0,7	7,1±0,9	6,8±0,6	0,286	6,8±0,5	6,7±0,9	6,91±0,7	0,523
SG (12am-12am), mg/dl	146±20	149±22	141±19	0,292	141±14	139±15	142±13	0,562
SG (10pm-06am), mg/dl	138±16	142±18	135±15	0,067	132±15	132±12	133±14	0,789
SG (06am-10pm), mg/dl	145±17	154±13	146±14	0,071	149±12	146±11	150±17	0,127
Time in Ranges, %								
< 50 mg/dl	0,3±0,2	0,3±0,1	0,3±0,2	0,258	0,3±0,2	0,3±0,1	0,3±0,2	0,452
51-70 mg/dl	2,5±1,5	2,6±1,2	2,1±1,8	0,385	2,3±1,4	2,4±1,6	2,2±1,1	0,679
71-180 mg/dl	73,4±8,2	72,9±9,8	73,6±7,1	0,822	74,1±9,5	74,5±8,6	74±10,1	0,855
181-250 mg/dl	17,3±6,9	17,8±7,1	17,1±6,2	0,775	16,6±6,1	15,9±6,9	16,9±5,8	0,669
> 251 mg/dl	6,5±3,7	6,4±2,9	6,9±4,8	0,721	6,7±3,4	6,9±3,1	6,6±3,8	0,816
Weight, kg	40,2±8,1	35,9±7,2	43,3±9,4	0,024	41,7±7,2	37,3±6,3	44,2±8,2	0,014
TDD, U/(kg/d)	0,9±0,3	0,9±0,3	0,9±0,2	0,591	0,9±0,3	0,9±0,2	0,9±0,4	0,087
Basal insulin, (12am-12am), %	43,3±8,8	42,8±8,4	43,6±9,1	0,805	42,5±10,2	41,4±9,6	42,8±11,5	0,704
Basal insulin (10pm-6am), %	85,1±9,2	83,8±8,8	86,7±9,7	0,382	84,8±6,1	83,7±3,8	85,1±8,4	0,564
Basal insulin (6am-10pm), %	33,2±6,1	38,4±5,4	31,9±7,1	0,068	32,7±7,9	34,8±6,8	31,1±9,7	0,065
Sensor wear, %	90,8±4,9	89,2±6,8	91,1±7,1	0,462	89,7±8,2	89,1±9,2	90,4±6,1	0,648
Auto Mode usage, %	89,6±5,8	88,5±4,3	90,2±8,7	0,566	88,9±9,1	88±10,2	89,4±7,8	0,638
Carbohydrates, gr per day	232±37	228±22	234±76	0,788	244±58	234±34	253±87	0,451
Carb ratio, gr	11,9±5,1	12,5±3,4	11,2±7,8	0,575	10,8±4,2	11,9±2,8	10,4±5,9	0,393
Active insulin time, h	3,5±0,5	3,6±0,3	3,4±0,9	0,436	3,5±0,9	3,6±0,9	3,4±0,6	0,475

\* MDI presents HbA1c performed before HCL system initiation and SG average and TIRs present the 7 days CGM data on MDI during the pump training  
MDI, Multiple Daily Injections; HCL, Hybrid Closed Loop; SG, Sensor Glucose

[Table 1. Glycemic control and HCL characteristics in participants during the study]

EP039 | Qualitative analysis of subjectively perceived glycemic variations and therapy adjustments with respect to the menstrual cycle in girls and women using an open source automated insulin delivery system

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**Introduction:** In state-of-the-art diabetes therapy with automated insulin delivery (AID) systems changes in glucose levels and insulin

demands can be displayed precisely. For many women and girls living with type 1 diabetes (T1D) managing diabetes can be particularly demanding due to the impact of different hormones during the menstrual cycle and throughout different phases of life. Open-source AID systems provide full customization of target settings and further features to counteract these irregularities.

**Objectives:** The aim of this study was the qualitative analysis of subjectively perceived glycemic variations, insulin demands and manual workarounds of adjusting AID settings accordingly.

**Methods:** Semi-structured interviews with girls and women in different phases of life and using open-source AID (OpenAPS, AndroidAPS, Loop) were conducted via video chat. Participants were recruited through topic related discussion groups on social media. Thematic analysis with focus on perceived changes, therapy adjustments and suggestions for AID optimization was performed.

**Results:** Of 11 participants, 5 were in life stages with particular hormonal changes such as puberty (1), pregnancy (1) and menopause (3). All probands reported notable glycemic variability correlating with their menstrual cycle, while not all observed regular patterns and adjusted their therapy. APS specific ways of adjustments were profile switching and manual overrides. All women expressed the need for automated therapy adjustments based on anticipated glycemic variability instead of having to manually adjust them. Some expressed concerns whether algorithms could provide good strategies for every user regarding the highly individual nature of hormonal activity in women.

**Conclusions:** This study yields hypotheses on how to expand AID algorithms in order to increase comfort and safety for female users. Manual workarounds provide implications on how open-source and commercial AID systems can be further improved.

#### EP040 | Survey of awareness and knowledge regarding different aspects in type 1 diabetic patients in Southern Rajasthan, India

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**Background:** Awareness of various aspects of Type 1 Diabetes Mellitus (DM) is essential for the management, prevention of DKA and Hypoglycemia and good control of the disease. India has the second highest number of Type 1 Diabetes Mellitus. In this study, we assessed the awareness of DM among Type 1 Diabetic attending in the Ramchandani Diabetic Care and Research Centre Kota partner of LFAC and Member of SWEET Pediatric Diabetes Benchmarking (Center ID 10388).

**Methods:** A cross-sectional study conducted in Kota city from December 2018 to December 2019. An attached questionnaire was filled after a personal interview, having 11 items. The correct answers were marked as aware and incorrect as unaware and made conversions to a percentage. Total 183 Type 1 diabetic Children were assessed.

**Results:** The 183 participants interviewed included 99 females and 84 males. Out of 183 children 5 (2.8%) children developed severe hypoglycemia and 7 (3.9%) children developed DKA. Median duration of Diabetes was 4.7 years, Median age (years) 15.60, Median Height

(cm) 144.5, Median weight (kg) 39.87 and total dose of Insulin (units per day) 20.84. Approximately 84% of participants have previously counseled (Diabetes education), 2% of them have a family history of diabetes, Overall sufficient awareness regarding diabetes mellitus was reported among the majority of the participants with a significant effect of gender and type in some specific items.

**Conclusions:** This is the first study examining the knowledge and awareness of diabetes among the only diabetic population in Southern part of Rajasthan. Our data conducted that the Type 1 Diabetic Children at Kota city have enough general awareness of type 1 DM regarding sugar monitoring, Insulin Injection Technique, life style modifications, Hypoglycemia and Management during Sick days which correspond very well with the health care services provided at Kota City.

#### EP041 | To assess the knowledge and perceptions of type 1 diabetes (T1D) among University of Mauritius students in Mauritius

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**Aim:** To assess the knowledge and perceptions of Type 1 Diabetes (T1D) among students attending the University Of Mauritius (UOM).

**Methods:** An online questionnaire was used in a group of students. They answered questions pertaining to perceptions by choosing whether they strongly agree, agree, neutral, disagree or strongly disagree.

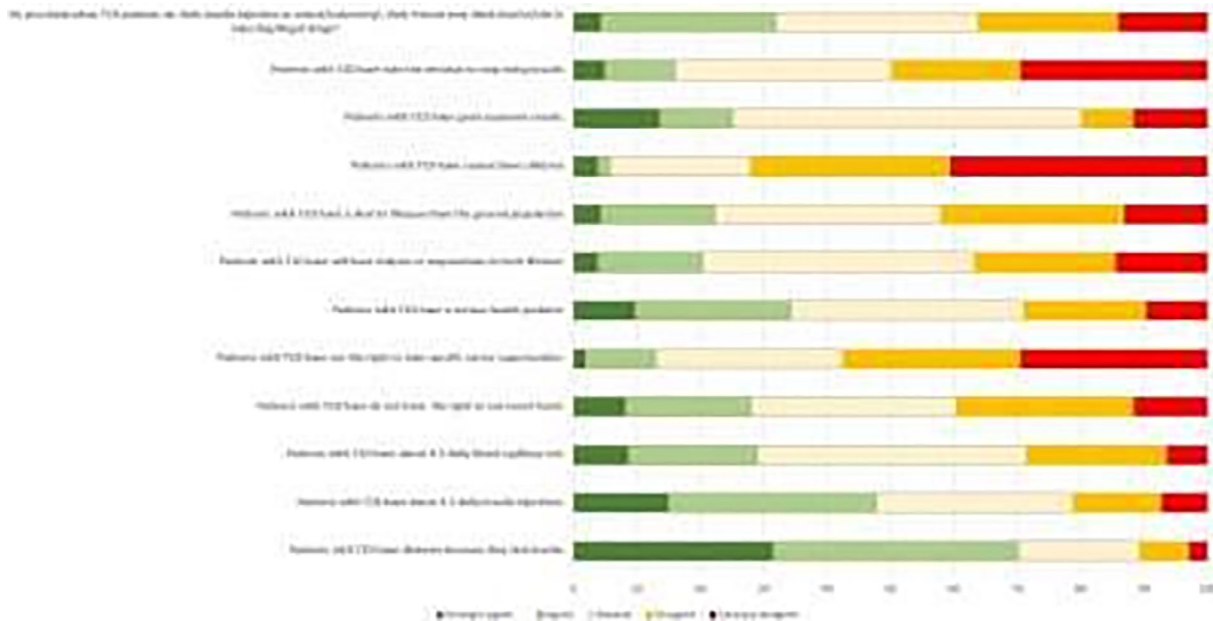
Data collected was analyzed on Epi Info TM.

**Results:** 207 students (62 males and 145 females) participated in the study. Mean age 22.4 years (18-40). The students were from different departments (Agriculture 5.8%, Health science and Social Studies 0%, Law and Management 25.1%, Science Technology 24.2%, Language and Art 0.0%, Engineering 10.6%, Social Studies and Humanities 20.3% and others 14%).

The outcome demonstrated that 55% knew someone diagnosed with T1D. 54.5% responded that the cause of T1D was unknown (40.1% excess sugar and 5.4% lack of exercise). 6.2% did not consider that T1D is contagious. Most of the participant responded that the disease will last for a lifetime (82.6%). 50.2% responded that T1D can be prevented and that the treatment is as follows (insulin 66%, nutritional support 64.3%, physical exercise 54.6%, psychological support 27.5%, therapeutic education 17.9% and others 1.5%). Furthermore, 82.6% consider the treatment will last for a life time.

Perceptions on T1D (not the right to eat sweet foods, not the right to take specific career opportunities, a serious health problem, will have dialysis or amputation, have a shorter lifespan, cannot have children, will have good academic results, can stop insulin and insulin injection in public) were illustrated in the Figure 1.

**Conclusions:** Our study revealed that despite national campaign on diabetes, the participants' level of T1D-related knowledge was not adequate. More campaigns must be carried out to enhance health-related knowledge in students to remove misconceptions on T1D.



[Figure 1 showing the perceptions of the participants on Type 1 Diabetes]

EP042 | Shared medical appointments as a valuable diabetes consultation for children with type-1 diabetes and their parents

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**Objectives:** To investigate experiences of and expectations for shared medical appointments (SMAs) in children with type-1 diabetes mellitus (T1D) and their parents. SMAs are consultations where 4–6 children and their parents separately receive counseling and clinical support in a group setting four times a year. Between SMAs individualized counseling is possible.

**Methods:** Participants were recruited at two pediatric units. Group interviews (n = 8) were conducted including 6 boys and 3 girls (8–12 yrs) with T1D and their parents (9 mothers, 3 fathers). Interviews were made with children and parents, who already participated in SMAs, and families, who in the future would be scheduled to SMAs. Interviews were recorded, transcribed and content analyzed.

**Results:** Parents planning to participate in SMAs were looking forward to discussion of diabetes-related issues with other parents. In particular, sensitive topics of psychosocial character were addressed as difficult to discuss in the presence of the child. This was in concordance with the experiences of parents participating in SMAs, who reported value in exchanging experiences and discussing problems with other parents without the presence of the children. In general, both groups of parents acknowledged that children could benefit from SMAs, enabling them to meet with peers facing the same challenges and everyday situations.

The children were looking forward to having fun and be with other children with T1D in the SMAs. This was in agreement with experiences from children participating in SMAs, who pointed out that SMAs contributed to having fun without having to explain about T1D.

**Conclusion:** Expectations for SMAs are in line with experiences of SMAs in children with T1D and their parents. Parents emphasize the value of discussing difficult issues without the children, while children benefit from being with like-minded.

EP043 | The Ormskirk Model: A new HbA1c-‘Time in Range’ solution focused model approach

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**Introduction:** The Language Matters (2018) by NHS England highlights how important the use of understanding and emphatic language is when caring for people living with diabetes. The new model, called the Ormskirk Model takes guidance from the document and was created to approach HbA1c and Time-In-Range (TIR) discussions in an emphatic, positive and compassionate way, utilizing concepts from solution focused therapy.

**Methods:** Within the Pediatric Diabetes Team at Ormskirk, HbA1c results were previously discussed using a visually represented thermometer image where colors corresponded to high or low HbA1c using the ‘traffic light system’ with words such as ‘serious complications’, ‘very poor’ or ‘high risk’ (Figure 1). In comparison, ‘The Ormskirk Model’ (Figure 2) was developed using color neutral scales and avoids language such as complications/risks and assumes that

people are trying their best with prompts for discussion along the scale. A qualitative study was undertaken with patients and healthcare professionals comparing 'The Ormskirk Model' with the traditional model used to discuss HbA1c in outpatient clinics.

**Results:** Unanimously, all participants were in favor of 'The Ormskirk Model' which was described as utilizing more empathic and positive language and that the image facilitates people to identify what has worked well for them and what matters to them through the use of rhetorical questions. It asserts that it is time to move away from the words 'control' 'risks' or 'complications' and with the use of neutral colors, and there is a lack of immediate judgment of the person with diabetes.

**Conclusions:** The Ormskirk Model is free for all diabetes teams to use and we hope that it will replace current medical models and images of HbA1c scales for the reasons that *language and image truly matters* when these are used within a clinical setting.

#### EP044 | Variations in diabetes transition care for children and young people: A national survey

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**Introduction:** Poorly planned transition care to adult services is associated with increased risk of non-adherence to treatment and loss to follow-up, leading to serious long-term consequences. We write to report on the Association of Children's Diabetes Clinicians' (ACDC) national survey on current national diabetes transition care in the United Kingdom.

**Methodology:** All diabetes units caring for children and young people in England, Wales, Scotland and Northern Ireland and those submitting data to the National Pediatric Diabetes Audit (NPDA) during 2018–2019 (n = 175) were invited to complete a short questionnaire relating to their current diabetes transition care service between January to March 2020.

**Results:** Responses were received from 125 units from England and Wales, 5 from Scotland and

4 from Northern Ireland. There were 72% returns from those submitting data to NPDA (for England and Wales) in 2018/19 (n = 175). Variations in transition care service are shown in Table 1 and 2 for England and Wales. The report showed that 92% of units have joint transition clinics, but only 22% had a transition nurse and 46% had a clinical psychologist within the diabetes teams. Only 58% of units provided written information about the transition process and 53% had a

structured transition education program. There was significant variability across diabetes services in terms of how transition is planned.

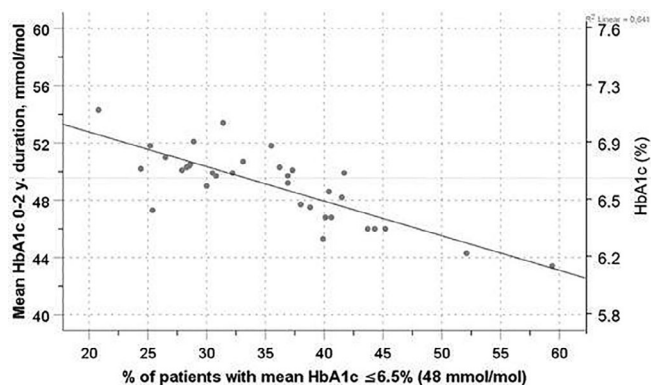
**Conclusions:** Transition from pediatrics to adult services is a critical period and the results of the survey show that almost every region had reported a higher incidence rate of non-attendance following completion of transition to adult-oriented services. Variations in access to mental health care is highly variable within pediatric diabetes units as reported. It is clear that inequalities still exist for the children and young people with type 1 diabetes in the UK and a national mandate should be implemented for transition services in diabetes.

EP045 | A low HbA1c during the first 2 years correlates with a higher percentage of HbA1c  $\leq 6.5\%$  (48 mmol/mol) and lower percentage  $> 8.0\%$  (64 mmol/mol) on a clinic level

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**Background:** The mean HbA1c in children and adolescents varies between countries, but there is a considerable variation also between clinics within a country. The Swedish HbA1c target in children and adolescents is  $\leq 6.5\%$  (48 mmol/mol). Our aim was to compare early metabolic control with percentage of patients with HbA1c  $\leq 6.5\%$  (A1c6.5) and  $> 8.0\%$  (64 mmol/mol) (A1c8) for all clinics in Sweden.



[Mean clinic HbA1c during the first 2 years vs. percentage of children with HbA1c  $\leq 6.5\%$ ]

**Methods:** In this register-based nationwide cohort with type 1 diabetes, 98% of children and adolescents <18 years in Sweden were covered. We captured HbA1c for all patients (last value recorded in 2019) and calculated the mean. We then compared the mean HbA1c of all patients with up to 2 years duration with the percentage of patients with A1c6.5 and A1c8.

**Results:** Mean overall HbA1c was 7.0% (95% CI 7.0–7.1) (53.3 mmol/mol, 95% CI 52.6–54.0) (n = 7433) and for those with 0–2 years' duration 6.6% (95% CI 6.5–6.7) (49.1 mmol/mol, (95% CI 48.2–50.0) (n = 1911). The mean overall percentage of patients with A1c6.5 was 35.3% (95% CI 32.4–38.2) (n = 2575) and A1c8 was 13.2 (95% CI 11.5–14.8) (n = 958). The correlation between mean HbA1c 0–2 y. and A1c6.5 was  $-0.80$  ( $p < 0.001$ ) and A1c8  $0.48$  ( $p = 0.004$ ).

**Conclusions:** An intensive treatment program at the onset of diabetes resulting in a low HbA1c early on is a good investment to increase HbA1c values within target and to minimize high HbA1c values.

EP046 | A targeted high HbA1c clinic successfully improves glycemic control by lowering HbA1c in attenders and lowering high HbA1c threshold reduces overall clinic HbA1c

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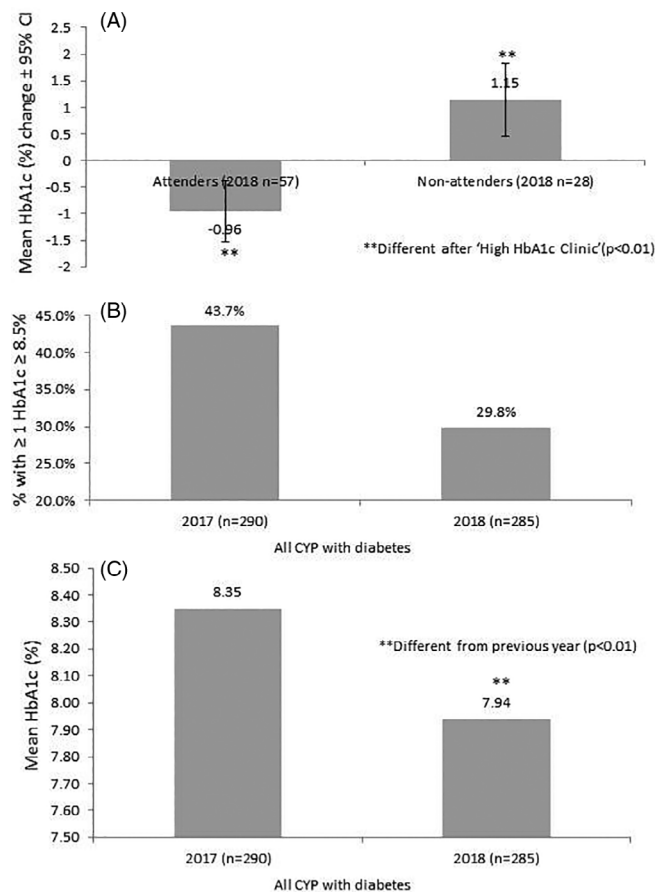
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**Introduction:** Before 2018, our high HbA1c policy was for children and young people (CYP) with a clinic HbA1c  $\geq 9.0\%$  to be invited to a Consultant appointment six weeks after clinic and receive unscheduled phone calls. In 2018 our service introduced a high HbA1c clinic (HHC) to provide targeted support for CYP with a clinic HbA1c  $\geq 8.5\%$ . Follow-up with a nurse or dietitian was booked after two weeks as face to face or virtual clinic (patient's choice) and CYP had at least one further appointment dependent on improvements. The new HHC and lower threshold of  $\geq 8.5\%$  were communicated to all CYP before its introduction by clinic leaflet.

**Objectives:** To evaluate the effectiveness of the HHC by assessing change in HbA1c for 'Attenders' and 'Non-attenders' and assess its impact on overall clinic HbA1c.

**Methods:** Retrospective data analysis of the TWINKLE clinical database to assess change in HbA1c for Attenders and Non-attenders of the HHC in 2018 by paired T-test. Change in overall clinic HbA1c from 2017 to 2018 was assessed by unpaired T-test. HbA1c % was used as mmol/mol was not adopted until 2019.

**Results:** In 2018, the 85 CYP with a clinic HbA1c  $\geq 8.5\%$  were invited to attend the HHC, 57 (67%) were 'attenders' and 28 (33%) were 'non-attenders'. Attenders reduced HbA1c from 9.87% to 8.91%, a drop of 0.96% [95% CI  $(-0.39, -1.53)$ ,  $p < 0.01$ ]. Non-attenders



[A] HHC Attenders & Non-attenders 2018 B) % CYP  $\geq 1$  HbA1c  $\geq 8.5\%$  C) Clinic mean HbA1c

increased HbA1c from 10.52% to 11.67%, an increase of 1.15% [95% CI (0.46, 1.84),  $p < 0.01$ ], **Figure A**. Percentage of CYP with one or more HbA1c's  $\geq 8.5\%$  reduced from 43.7% in 2017 to 29.8% in 2018, **Figure B**. Mean HbA1c( $\pm$ SD) of all CYP in our service reduced from 8.35( $\pm$ 1.76) in 2017 to 7.94( $\pm$ 1.67) in 2018 ( $p < 0.01$ ), **Figure C**.

**Conclusion:** A dedicated HHC is highly effective in improving HbA1c of attenders. An alternative strategy is needed for non-attenders. Advanced communication of a drop in high HbA1c threshold to  $\geq 8.5\%$  contributes to overall clinic HbA1c reduction.

EP047 | Estimation and factors of variation of the initial weight loss in type 1 diabetes in children and adolescents

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**Objective:** Weight loss is an integral part of the cardinal signs of T1D in children and adolescents, without having been quantified precisely in the various series published. We wanted to know what was the situation with the recruitment of children under 15 with T1D registered from 1978 to 2017.

**Methods:** Monocentric study. The children come from a region where the annual incidence under 15 years reaches 30 per 100,000 and 10% annual increase. The children included in the study were those who started their treatment in the department and those who were referred to us in the week following the initiation of insulin therapy. The weight was taken during hospitalization, at weekly check in the first month, and then at each subsequent check. The weight loss is deducted from the weight gain before returning to the original weight corridor.

**Results:** The study included 1145 children, 584 boys and 561 girls. The annual mean of incident cases recruited under 15 years old was  $76 \pm 16$  (min. 48-max. 112; 95% CI, 68–84). The average weight loss, all ages and sexes combined, was  $9.77 \pm 6.20\%$  (median 10; min. 0-max. 36; 95% CI, 9.41–10.13). There was no difference between boys and girls ( $9.71 \pm 6.10$  vs  $9.84 \pm 6.31\%$ ,  $p = 0.72$ ). By age group, the average deficit was  $9.94 \pm 6.58$  between 0 and 4,  $9.19 \pm 5.96$  between 5 and 9 ( $p = 0.10$ ) and  $10.16 \pm 6.08$  between 10 and 14 years of age ( $p < 0.03$ ). Chronologically, the weight deficit was established at  $12.60 \pm 5.98\%$  the first twenty years of recording, at  $11.48 \pm 5.14$  the following ten years ( $p < 0.04$ ) and at  $8.51 \pm 6.18$  the last ten ( $p < 10^{-9}$ ). No relationship has been established between weight loss, time duration before onset, and initial HbA1c level.

**Conclusion:** Our work made it possible to estimate more closely the importance of the initial weight loss in children with T1D, its relationship with the age at onset and with the periods considered.

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EP048 | **Evolution profile and results of the care of children, adolescents and young adults with T1D in a pediatric unit from 1975 to 2019**

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**Objective:** The global incidence of T1D in children is increasing. The purpose of this work is to take stock of the recruitment of a pediatric department draining patients with T1D from a region of more than 12 million inhabitants.

**Methods:** Monocentric retrospective analysis of files of patients with T1D recruited before the age of 15 from 1975 to 2019.

**Results:** The analysis covers 4452 incident cases, whose annual number increased from 4 in 1975 to 280 in 2019, equally between boys and girl. The average age at onset of  $8.47 \pm 3.91$  years old has dropped significantly by more than one year in the past 20 years, inaugural ketoacidosis is around 20% and partial remission is 19%. Initial and continuous patient education is supported by camps, functional insulin therapy workshops and the training of auxiliaries. The regularly followed up cohort is 1455 in December 2019 with 32% aged over 18. The basal-bolus regimen with analogs is 100%, with 25 pumps installed and the pediatric target of HbA1c of 7.5% reached in 49% at last record. Puberty and final height are normal. Celiac disease is associated in 8.61%, thyroiditis in 2.06%, nephropathy in 14.8% and retinopathy in 4.86%. The transition process shows reluctance.

**Conclusion:** Our recruitment reflects the increasing incidence and rejuvenation of the age at onset of T1D and the emergence of complications and pathological associations in pediatric settings posing new challenges for patients, families and their caregivers.

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EP049 | **An uncertain significant missense variant in a 4 month old patient with neonatal diabetes**

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**Objectives:** Mutations in the ABCC8 and KCNJ11 genes are the most common causes of neonatal diabetes (ND). Patients can be transitioned from insulin to oral therapy with sulfonylureas. Previous studies have shown the use of continuous glucose monitoring (CGM) as informative for control of ND. We are reporting a case of an infant with a newly described missense mutation in the ABCC8 gene and his transition to oral therapy using CGM.

**Methods:** He was diagnosed with ND at 3 months of life. He presented with polyuria, polydipsia, fussiness, fever for 1 day, and poor weight gain over 3 weeks. Urine dipstick showed 3+ glucose and 3+ ketones. Serum glucose was 465. He did not have ketoacidosis. He was initially treated with basal insulin and diluted rapid acting insulin. Genetic testing showed compound heterozygosity for two ABCC8 missense variants of uncertain significance a heterozygous paternally-inherited NM\_001287174.1:c.751G > A, p.(Gly251Arg) and a heterozygous maternally-inherited NM\_001287174.1:c.4138C > A, p.(Arg1380Ser). His twin brother is heterozygous for the maternal variant. The parents and brother are healthy.

**Results:** We transitioned the patient at 5 months of age from insulin to sulfonylurea at a starting dose of 0.05 mg/kg/day. The dose was increased to 0.12 mg/kg/day as insulin was decreased and eventually stopped over a period of 4 weeks. Glyburide dose was then lowered to 0.096 mg/kg/day (doses given 4 times a day) and solid foods were started. Two weeks after stopping insulin, he became infected with RSV and required low dose basal insulin for 3 days. His blood sugars were monitored by Dexcom G6 CGM. The CGM provided us with information about glucose response to medication, milk, food, and activity.

**Conclusions:** The discovery of this new ABCC8 gene mutation gives us further insights into the mechanism of inheritance of neonatal diabetes. This case also demonstrates the usefulness of CGM to monitor response to sulfonylureas allowing for safer transition.

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EP050 | **Sexual health behavior in adolescents with type 1 diabetes compared to a representative reference population**

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**Objective:** To assess sexual activity (SA) in adolescents with type 1 diabetes and compare rates of SA in type 1 diabetes with national census data.

**Methods:** Sexual health data and participant characteristics on 103 adolescents with type 1 diabetes, aged 10–16 years, were retrospectively assessed from a clinical trial. Participants were repeatedly interviewed over a 2–4-year period by trained study staff to report SA and review contraceptive counseling. Variables assessed included demographics, clinical data and social determinants of health (SDH). Canadian census data from the 2015 Canadian Community Health Survey was used to determine differences in SA with the Canadian population.

**Results:** Mean age was  $17.0 \pm 2.4$  years. Overall, 34% of adolescents with type 1 diabetes were SA, with SA reported at an older age (18.2 years vs. 16.5 years,  $p < 0.01$ ). No differences in HbA1c (8.9% vs. 8.7%,  $p = 0.44$ ), gender or smoking were seen between groups. SDH measures were similar, although SA adolescents lived in more ethnically diverse neighborhoods (4th quintile SA vs. 3rd quintile not-SA,  $p = 0.038$ ). Canadian census data showed similar rates of SA among healthy adolescents when compared to our study population in the 15 to 17 age group (Males: 23.0% vs. 20.93%,  $p = 0.74$  & Females: 23.6% vs. 23.08%,  $p = 0.95$ ).

**Conclusions:** Adolescents with type 1 diabetes reported similar rates of reported SA and older age of sexual debut during late adolescence. These prospective data are consistent with secular trends in SA described in other adolescent populations and highlight the importance of standardized reproductive health evaluations.

#### EP051 | Increasing initial follow-up after diagnosis improves the long-term glycaemic control in pediatric patients with type 1 diabetes

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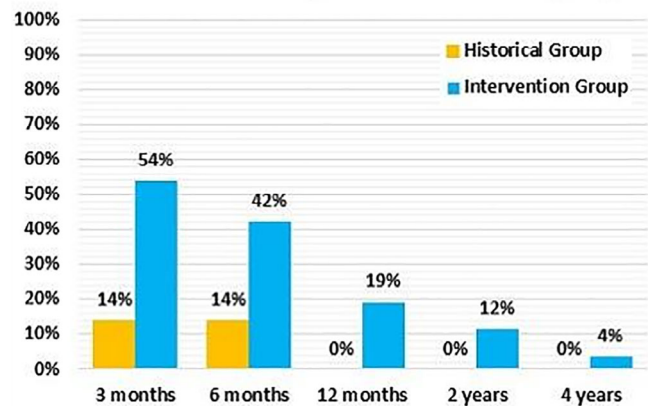
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**Objective:** The pediatric diabetes multidisciplinary team in Gloucestershire, UK wanted to improve education following diagnosis of type 1 diabetes with an aim to improve glycaemic control.

**Method:** The intervention in November 2013, was for all patients with newly diagnosed type 1 diabetes to have at least four face-to-face contacts in the first sixty days following diagnosis, and after discharge from their initial inpatient stay. This was a retrospective study analyzing the HbA1c. A total of 64 patients were analyzed who had presented to Gloucestershire Royal Hospital.

**Results:** 10 patients were excluded, leaving 28 patients in the historical group and 26 in the intervention group. In the historical group, patients had a mean of two contacts and in the intervention group patients had a mean of five contacts. The number of patients achieving an HbA1c of  $\leq 48$  mmol/mol was higher at all time points in the intervention group compared to the historical group. At 3 months

#### Percentage of patients achieving HbA1c $\leq 48$ mmol/mol at increasing time intervals following diagnosis



[Percentage of patients achieving HbA1c less than or equal to 48 at increasing time intervals follow]

following diagnosis 54% of patients in the intervention group achieved an HbA1c  $\leq 48$  mmol/mol compared to 14% in the historical group ( $P = 0.003$ ). At 6 months, 42% of patients in the intervention group achieved an HbA1c  $\leq 48$  mmol/mol compared to 14% in the historical group ( $p = 0.033$ ). In the intervention group 19% achieved an HbA1c  $\leq 48$  mmol/mol at 12 months ( $p = 0.021$ ), 12% at 2 years ( $p = 0.105$ ) and 4% at 4 years ( $p = 0.481$ ) following diagnosis. At 12 months, 2 years and 4 years no patients in the historical group achieved an HbA1c  $\leq 48$  mmol/mol. National HbA1c target at the time of diagnosis for these patients was  $\leq 58$  mmol/mol; results for this target also demonstrate that the number of patients achieving this was higher at all time points in the intervention group.

**Conclusion:** Increasing the frequency of initial follow-up after diagnosis of type 1 diabetes in children helps improve the long-term glycaemic control.

#### EP052 | Diabetes care: An analysis of a local Paediatric Diabetes Network in the UK using data from the National Paediatric Diabetes Audit (NPDA) 2018/2019

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**Objectives:** The 2018/2019 NPDA compares the care provided to children and young people (CYP) in 175 Pediatric Diabetes Units across England and Wales covering 30,155 CYP. The report also addresses the proportion of CYP receiving key age specific processes of diabetic care & treatment targets, recommended by NICE. Development of microvascular and macrovascular complications are monitored as well as screening for autoimmune diseases.

**Methods:** 6 hospitals in the North-West London (NWL) network saw 1038 diabetes patients in 2018/2019. Data was collected & compared using the RCPCH NPDA 2018/19 resources online. Demographic factors-age, ethnicity, diabetes type & patient deprivation

profile were compared. 7 Key care processes; HbA1c, BMI, blood pressure, urinary albumin, autoimmune screen, eye screen and foot examination were analyzed. Emergency admissions and treatment methods were recorded. Graphs were used to illustrate & compare results across hospitals & with national standards.

**Results:** Most common age bracket is 10–14 years. 91% of patients are Type 1 Diabetics. 94.4% of CYP met the 3 care processes (HbA1C, Thyroid and BMI). 85% of young people age 12+ years met 4 care processes—BP, Albuminuria, eye screening and foot examination. Median HbA1c was 64.98 mmol/mol. Microvascular and macrovascular complications range from 5–30% and 15–36% respectively. 55–82% of patients use multiple injections a day, national average 59.7%. Insulin pump treatment between 14–36%, national 36.7%. The gap between pump usage among Type 1 diabetics living in the most & least deprived areas has widened with time. Continuous glucose monitoring (CGM) is used in 0–13.9%, national 12.6%.

**Conclusions:** Each hospital sees patients with different ethnicities & demographics which affect overall care and outcomes. Real time CGM was found to help in lowering HbA1C. Those living in more deprived areas were found to have a higher risk of retinopathy, albuminuria, needing additional psychological support and higher HbA1C level.

#### EP053 | Improvements in Pediatric Diabetes Service using Kaizen: A process of continuous improvement using lean tools

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**Objective:** Evaluate the impact of Kaizen based ‘lean’ approach in Pediatric Diabetes Unit (PDU).

**Methods:** Our PDU is in a district general hospital in the UK for 243 Children and Young person with Diabetes (CYPD). HbA1c results for all type 1 CYPD (n = 218 in 2017/18, n = 224 in 18/19) and Health check completion of 7 key care processes: HbA1c, BMI, thyroid function, retinopathy screening, urine albumin creatinine ratio, blood pressure and foot examination for those >12 years (n = 124 in 2017/18, n = 101 in 18/19) were submitted to National Pediatrics Diabetes Audit (NPDA) as performance indicators. Following Kaizen interventions without increase in staffing or PDU funding were implemented: *Age specific education sessions at secondary school and university entry. Diabetes Nurse led review for CYPD with suboptimal control between clinic appointments.*

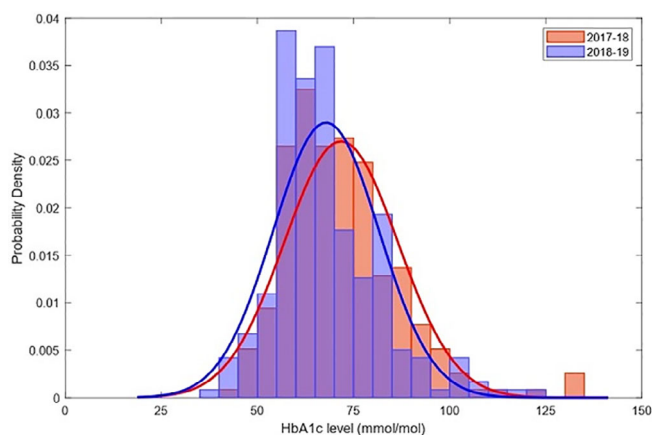
*Negotiated availability of Flash Glucose Monitoring on National Health Service.*

*Design and use of an electronic proforma at annual review appointments for care processes.*

*Pre-clinic multidisciplinary team huddle.*

*Streamlined process for obtaining retinopathy screening results.*

*Use of ‘live’ improvement board.*



Probability density function for average HbA1c levels of each type 1 diabetes patient in the cohort for the years 2017/18 (red) and 2018/19 (blue). The median HbA1c level in 2018/19 is lower than in 2017/18

[HbA1c levels Probability density function for 2017/18 and 2018/19].

Median and mean HbA1c results for 2017/18 and 18/19 were evaluated using Two-Tailed Wilcoxon Rank Sum Test and Two-tail Z-test respectively. Health check completion rate were obtained by dividing the total number of key processes for CYPD done, by the total ‘expected’ (7 X n) health checks.

**Results:** Median HbA1c levels in 2018/19 (63.5 mmol/mol) reduced compared to 17/18 (67.2 mmol/mol) with p-value of 0.0018, a statistically significant decrease. Mean HbA1c (71.8 vs 67.8 mmol/mol) showed a statistically significant decrease with p-value of 0.003. The health check completion rate improved from 78% to 88.3%.

**Conclusions:** Kaizen ‘lean’ interventions improved HbA1c and health check completion for our PDU.

**References:** <https://npda-results.rcpch.ac.uk/default.aspx>  
<https://doi.org/10.12968/hmed.2019.80.3.168>

## EPOSTER SESSION 2

#### EP054 | Progression of prediabetes in Indian children and adolescents: Is CGM a way forward in monitoring of dysglycemia?

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**Background:** Prediabetes in Indian children and adolescents has not been studied. Progression of prediabetes into type 2 diabetes is not predictable.

**Aim:** To evaluate progression of prediabetic adolescents with the help of continuous glucose monitoring (CGM).

**Methods:** Children and adolescents with prediabetes (according to ADA criteria) were included in the study. Anthropometric data (BMI, waist circumference and waist to height ratio) was collected along with CGM using Freestyle Libre Pro within 72 hours of oral glucose tolerance test and HbA1c. Anthropometric parameters and CGM are being measured six monthly. Various parameters of CGM system (average sensor glucose, mean amplitude of glucose excursion and %

time > 200 mg/dL) correlated with anthropometric parameters, OGT results, HbA1c and body composition parameters.

**Results:** Thirty-one subjects (24 boys, age  $14.6 \pm 3.6$ , 12.1–17.2 years) included in the study. Twenty-four subjects at least two CGM recordings while 14 has at least 3 recordings. Out of 24 subjects with at least 2 recordings, two had glucose excursions above 200 mg/dL for more than 2 times at baseline. Four subjects with no glucose excursion above 200 mg% at baseline showed at least one excursion above 200 mg% after 6 months with follow up OGT in prediabetic range. All 4 subjects had increase in BMI SDS more than 5% as compared to baseline. Six subjects has reversal of prediabetes to normal OGT on follow up with BMI SDS loss of at least ten percent in all. Initial BMI, waist circumference, waist to height ratio, DXA derived fat percentage and baseline OGT results did not predicted the progression of glycemic control.

**Conclusion:** Prediabetes in Indian children and adolescents progresses rapidly. Subjects with prediabetes might need continuous glucose monitoring at frequent intervals along with OGT. Aggressive lifestyle intervention is necessary at prediabetes level to halt the progression.

#### EP055 | Cardiac MRI findings in young adults with childhood-onset type 2 diabetes

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Left ventricular (LV) hypertrophy and left atrial dilation are present at echocardiography in youth with T2D, limited cardiac MRI data exist.

We compared cardiac MRI findings in young adults with childhood-onset T2D (n = 10) age 19–24 years, with published references.

Physical exam and HbA1c were obtained. Hemodynamics were evaluated from cine imaging. For myocardial fibrosis, extracellular volume (ECV) fraction and native T1 relaxation times were assessed using a Modified Look-Locker Imaging sequence.

Subjects were 8 females and 2 males, 7 black, 1 white, 1 mixed race and 1 Hispanic. Median (interquartile range IQR) age, diabetes duration, SBP, BMI and HbA1c were 19.9 (1.39) years, 7.8 (4.7) years, 121.5 (25) mmHg, 32.7 (9.5) kg/m<sup>2</sup> and 10.3 (3.04)%, respectively. Subjects had a higher median (IQR) end systolic volume (ESV) index than published mean (SD) for healthy 20–29 year olds: 40.81 (5.74) ml/m<sup>2</sup> vs. 29 (5.1) ml/m<sup>2</sup> (p = 0.007). They had lower LV mass index: 54.61 (9.01) g/m<sup>2</sup> vs. 69 (8.1) g/m<sup>2</sup> (p = 0.01) and ejection fraction (EF): 50 (2.8)% vs. 66 (4.6)% (p = 0.0049). Higher median (IQR) myocardial T1 of 1030.35 (44.6) msec vs. 965.6 (30.2) msec (p = 0.005) and ECV fraction of 27.5 (1.5)% vs. 25 (3)% (p = 0.012) were present. LV mass index correlated with HbA1c (rs = 0.69, p = 0.03). Females had a higher median (IQR) ESV index of 40.81 (4.08) ml/m<sup>2</sup> than published mean (SD) for females age 16–20 years of 29 (7.5) ml/m<sup>2</sup> (p = 0.01), but lower EF of 50 (2.65)% vs. 64.3 (7.3)% (p = 0.01) and cardiac index of 3.08 (0.425) L/min/m<sup>2</sup> vs. 3.85 (0.86) L/min/m<sup>2</sup>

(p = 0.01). ESV index correlated with HbA1c (rs = 0.762, p = 0.03). Males had a median (IQR) ESV index of 39.94 (25.7) ml/m<sup>2</sup>, LV mass index of 67.46 (13.9) g/m<sup>2</sup> and EF of 54.95 (9.9)%.

In this pilot study, young adults with youth-onset T2D had a different myocardial phenotype compared to controls, characterized by under-sized hearts relative to larger body size, poorer systolic performance and evidence for early onset myocardial fibrosis.

#### EP056 | Trends and impact of diabetes in pediatric hospitalization outcomes: Analysis of a national database

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The purpose of this study is to identify trends and outcomes of hospitalizations of pediatric patients with diabetes using a US national database.

The Kids' Inpatient Database was queried for all hospitalizations of patients with diabetes from the years 2003 to 2016. Data demographics, comorbidities, and complications were collected for each of the hospitalizations. This data was analyzed using SPSS to determine associations and trends in outcomes of diabetic hospitalizations.

A total of 87,236 cases of DM were identified within the population. 48.0% of patients were over the age of 18, 53.3% of patients were Caucasian, and 64.6% of patients were female (p < 0.001). Length of stay (LOS) and total inpatient charges were significantly higher in patients with DM as compared to non-DM patients (p < 0.001). On multivariate regression, these patients were more likely to have complications including nephrotic syndrome, DKA, and sepsis (p < 0.001). These patients were also more likely to have comorbidities including hypertension, hypothyroidism, and obesity (p < 0.001). During the 13-year period, the rate of DM increased from 0.42% to 0.63% (p < 0.001). There was a significant rise of depression, fluid/electrolyte disorders, chronic pulmonary disease, obesity, and hypothyroidism in DM patients (p < 0.001), and a nonsignificant rise of non-alcoholic fatty liver disease. Complications including sepsis, acute kidney injury, infections, DKA, and neuropathy significantly increases over this time period (p < 0.001). Average inpatient charges for DM patients increased by \$3821.01 and LOS increased by 0.179 days (p < 0.001).

Diabetes continues to grow in the pediatric population and affect inpatient hospitalization outcomes, which has led to an increase in hospital LOS and costs over the last decade. These changes should be recognized by providers to better manage and optimize patients for disposition planning as well as alert providers about the rising problem of pediatric diabetes.

**EP057 | Type 2 diabetes in diploid/triploid mosaicism**

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**Introduction:** Diploid/triploid mosaicism (DTM) is a rare chromosomal abnormality which has been reported in less than 40 patients to date. There is a wide spectrum of clinical manifestations of DTM, including characteristic dysmorphism (which may resemble Russel-Silver Syndrome), hypotonia and cognitive impairment. Reported endocrine features include genital abnormalities (cryptorchidism and microphallus), early growth delay, precocious puberty and later truncal obesity. Skin pigmentation abnormalities, asymmetry and hyperinsulinism have also been reported in patients with DTM and it has been suggested that the manifestations may have overlap with genetic imprinting syndromes. Aberrant glucose metabolism in patients with DTM is not well described in the literature.

**Methods:** The clinical case of a young girl with DTM and Type 2 Diabetes is described.

**Results:** An 11 year old girl with a confirmed genetic diagnosis of DTM presented with a history of polyuria and polydipsia. Family history was negative. Clinical examination was remarkable for an elevated BMI (32 kg/m<sup>2</sup>), truncal obesity, abdominal striae, plethora and candidiasis. There was no acanthosis nigricans apparent. Blood glucose was elevated, ketones were negative, blood gas was normal, HbA1C was elevated (78 mmol/mol ref 20–42), diabetic autoantibodies were negative and urinary c-peptide:creatinine ratio was elevated (10.84 nmol/mmol). She was normotensive and subsequently had a normal response to dexamethasone suppression test. She was initially commenced on subcutaneous insulin and metformin was increased slowly. She is now nine months post diagnosis and well controlled with diet, exercise and metformin (1 g od). Her weight has increased 2 kg from diagnosis (72 kg to 74 kg) and remains a challenge.

**Conclusions:** DTM is associated with truncal obesity and impaired glucose homeostasis. Patients should be monitored for Type 2 Diabetes and weight carefully managed to reduce long-term cardiovascular risk.

**EP058 | Oral glucose tolerance response curve predicts disposition index but not other cardiometabolic risk factors in nondiabetic adolescents**

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**Objective:** In obese adolescents the shape of the glucose response curve following an oral glucose tolerance test (OGTT) predicts future type 2 diabetes. Patients with an incessant increase or monophasic curve have increased risk compared to those with a biphasic curve. Since type 2 diabetes is associated with increased cardiometabolic risk, we studied whether differences in the OGTT response curve are

associated with differences in cardiometabolic risk factors in healthy adolescents across a wide body mass index (BMI) range.

**Methods:** Sixty nine (33F), white, non-diabetic adolescents (age: 15.2 ± 1.7 yrs; BMI: 21.5 ± 4.7 kg/m<sup>2</sup>; mean ± SD) were studied. Risk factors measured included percent body fat (%BF), blood pressure (BP), lipids, augmentation index (AI), reactive hyperemia (RH), endothelin 1 (E1), plasminogen activator 1 (PAI1), inflammatory markers (interleukin 6, c-reactive protein), insulin secretion (SEC), insulin sensitivity (Matusda index, MAT), and disposition index (DI).

**Results:** Thirty-eight subjects had biphasic responses; 29 subjects had monophasic responses and 2 males had incessant increases. Sex did not affect the frequency of responses. Glucose area under the curve following OGTT was greater in those with a mono vs biphasic curves (17,700 ± 3300 vs 15,100 ± 2700 min mg/dl, p < 0.001). There were no differences in age, BMI, %BF, BP, lipids, AI, RH, E1, PAI1 or inflammatory markers between subjects with bi- or monophasic curves. MAT did not differ between subjects with bi- or monophasic curves. SEC was significantly lower in subjects with a mono- versus biphasic curve (1.1 ± 0.7 versus 1.6 ± 1.0 μU dl/mg ml, p = 0.048) and DI was markedly lower (3.6 ± 2 versus 6.0 ± 3.9, p = 0.003).

**Conclusion:** The decreased DI indicates that in healthy adolescents a monophasic response to OGTT is due to decreased insulin secretion relative to the degree of insulin resistance present. Interestingly, this was not associated with differences in other cardiometabolic risk markers.

**EP059 | Idiopathic intracranial hypertension is a serious comorbidity associated with obesity in children and young people**

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**Introduction:** Childhood obesity is a major public health concern with a steady increase in prevalence throughout the world. Raised intracranial pressure (ICP) is a serious condition that if left untreated could result in vision loss. Although raised ICP is a recognized complication of obesity in adults, it is under-recognized and under-reported in children and young people with obesity.

**Methods:** We undertook a retrospective study on patients diagnosed with idiopathic intracranial hypertension (IIH) at a pediatric tertiary center over a 2-year period. The body mass index (BMI) standard deviation scores (SDS) of patients with IIH were calculated using Growth XP software.

**Results:** 18 patients (11 female) with IIH with a mean age of 11 years (range 6–15) were analyzed. The mean BMI SDS was +2.5 (range – 1.24 to +4.46). 87.5% of patients aged over 12 years had a BMI SDS of over 2. Whilst the majority of patients presented with headaches or visual disturbances, 3 patients were asymptomatic, with papilloedema identified on routine optician review. All 3 of these patients had a BMI SDS of over 2. 11 patients were treated with Acetazolamide or Topiramate. 2 required short-term neurosurgical

intervention (EVD and lumbar drain) and 2 required shunts (VP and VA). Undertaking lumbar punctures were challenging, due to the high BMI, often requiring repeated attempts.

**Conclusion:** 72.2% of IIH patients are associated with obesity in our cohort. All patients required invasive interventions with the majority requiring medical treatment and a small number requiring surgical treatment. Raised ICP must be identified and managed early in patients with obesity to avoid visual loss. Intense weight management program could potentially ameliorate the IIH due to obesity.

#### EP060 | Liraglutide for weight loss in adolescents with severe obesity

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**Introduction:** Childhood obesity is associated with serious complications like type 2 diabetes mellitus (T2DM), idiopathic intracranial hypertension (IIH) and non-alcoholic fatty liver disease (NAFLD). Liraglutide, a glucagon-like peptide-1 (GLP-1) therapy, is licensed for children aged 10 years or over with T2DM and has been shown to have a positive effect on weight loss in clinical trials in adolescents.

**Methods:** 6 patients over 12 years of age (mean age 15.2 years, range 13–16 years) with significant complications secondary to obesity [including hepatic fibrosis, IIH, insulin resistance, depression, and obstructive sleep apnoea] were treated with once daily subcutaneous Liraglutide injections over a period of 3 months. The starting dose of 0.6 mg once daily was gradually increased based on assessment by a dedicated multi-disciplinary team (MDT) once every 2 weeks, up to a maximum dose of 3 mg if needed.

**Results:** Liraglutide was well tolerated by all patients who demonstrated a mean percentage weight loss of 4.6%, ranging from 1.2 to 9.7%, over a 3-month period (Table 1). The mean weight was 5.8 kg (95% CI 1.863–9.837,  $p = 0.013$ ). The drop in body mass index (BMI) was significant with an average reduction of 2.3 kg/m<sup>2</sup> (95% CI 0.997–3.536,  $p = 0.006$ ). 50% of patients achieved over 5% weight loss.

**Conclusion:** A significant reduction in BMI in adolescents was noted following 3 months of Liraglutide therapy combined with an intense lifestyle program offered by a dedicated MDT weight management team. Larger clinical trials are required to establish the long-term benefits.

#### EP061 | TCF20 mutation leading to overgrowth and Diabetes mellitus in an adolescent girl managed with GLP-1 agonist therapy

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**Introduction:** TCF20 is found in the human chromosome 22q13 region and shown to be involved in neurodevelopment and is expressed in the developing brain of mice. Evidence has shown that TCF20 variants can present with features such as learning difficulties (LD), autistic spectrum disorder (ASD), overgrowth and developmental delay.

**Case report:** A 16-year-old female presented initially at the age of 8 years with issues related to excessive weight gain. She was born at 38 weeks gestation with a birth weight of 2.7 kg (−1.54 SDS). The patient was known to have LD and ASD, leading to difficulty adhering to lifestyle interventions to aid weight loss. She has always been tall with a final adult height of 182 cm (+2.86 SDS). She had gained 32.5 kg over the previous 3 years [weight rising from +8.97 to +11.49 SDS]. She suffers from primary amenorrhoea, steatohepatitis, dyslipidemia, obstructive sleep apnea and noted to have significant acanthosis Nigricans. The whole exome sequencing has revealed a missense variant in TCF20. She did not tolerate metformin therapy. The oral glucose tolerance test confirmed diabetes mellitus [fasting glucose of 5.9 mmol/L and 2 hrs post glucose of 11.1 mmol/L]. She was commenced on glucagon-like peptide-1 (GLP-1) agonist (Liraglutide) therapy with intense support from the multidisciplinary weight management clinic following which she lost 2.4% of bodyweight at the end of 3 months.

Patient	Weight kg (SDS) Pre-treatment	Weight kg (SDS) Post-treatment	BMI kg/m <sup>2</sup> (SDS) Pre-treatment	BMI kg/m <sup>2</sup> (SDS) Post-treatment	% weight loss
1	115.2 (+6.07)	107.9 (+5.30)	57.9 (+4.48)	54.3 (+4.33)	6.3
2	140.2 (+8.58)	130.9 (+7.62)	42.9 (+3.64)	40.0 (+3.39)	6.6
3	110.5 (+6.05)	99.8 (+4.83)	36.1 (+3.18)	32.9 (+2.81)	9.7
4	149.3 (+9.51)	147.5 (+9.31)	49.6 (+4.11)	48.2 (+4.04)	1.2
5	147.2 (+9.34)	145.2 (+9.12)	57.1 (+4.44)	56.7 (+4.44)	1.4
6	168.4 (+11.48)	164.4 (+11.06)	51.7 (+4.21)	49.6 (+4.1)	2.4

[Table 1: The weight and BMI measurements pre and post Liraglutide treatment]

**Conclusion:** We present a 16-year-old female who has been identified to have a missense variant in *TCF20* leading to overgrowth and obesity. She has developed multiple complications secondary to obesity and attempts at weight loss have been complicated by underlying LD and ASD. She has demonstrated a reasonable response to GLP-1 agonist therapy which would help to mitigate the complications secondary to morbid obesity.

#### EP062 | Association between feeding practices and overweight and obesity in children

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**Introduction:** Childhood obesity has emerged as one of the most important public health problems. Socio-demographic factors, early life nutrition, and improper eating behaviors were shown to be associated with overweight and obesity in children and adolescents.

**Objectives:** To investigate the association between different feeding practices and overweight and obesity in primary school children.

**Methods:** 403 primary school children were included. Data was collected about the child breast feeding duration and timing of solid food introduction. Children's Eating behavior questionnaire (CEBQ) Weight, height, body mass index (BMI), waist and hip circumferences, and blood pressure were measured. Children were examined for the presence of Acanthosis Nigerians. BMI percentiles were used to categorize participants into underweight, healthy weight, overweight and obese groups.

**Results:** Among the studied group, 3.2% of children were underweight, 50.1% healthy weight, 24.1% were overweight and 22.6% were obese. Obesity was more common in females (59.3%). Higher means of blood pressure were detect among overweight and obese groups. Acanthosis Nigerians was detected only among overweight (9.2%) and obese (42.8%) children. Higher levels of food approach subscales were associated with higher BMI, while food avoidant subscales were negatively related with children's BMI. There was a statistically significant difference between different weight groups and all eight subscales of CEBQ, obese and overweight children showed a statistically significant higher food approach subscales [enjoyment of food (EF) ( $p = 0.000$ ), emotional overeating (EOE)<sub>(p = 0.001)</sub>, desire to drink (DD)<sub>(p = 0.001)</sub>, and food responsiveness (FR)<sub>(p = 0.000)</sub>]. On examining CEBQ subscales along with other socio-demographic and nutritional variables to predict high BMI, only FR, SR, slowness in eating, and child's age were retained.

**Conclusion:** Eating behaviors have a great impact in developing obesity.

#### EP063 | A case of Bardel Beidl syndrome presenting as DKA: A rare presentation of a rare disorder

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**Background:** Bardet-Biedl syndrome (BBS) is a rare autosomal recessive disorder characterized by pigmentary retinopathy, postaxial polydactyly, learning disability and renal anomalies. Besides this, the prevalence of metabolic abnormalities like obesity (72–96%) and type 2 diabetes (15.6–48%) have been found to high. We report a rare presentation of a normal weight patient of BBS presented as diabetic ketoacidosis (DKA).

**Case:** 18-year male, born of consanguineous marriage, presented with osmotic symptoms for 2 weeks. There was a history of progressive loss of vision starting at 8 years of age with light perception only for 5 years. Examination revealed grade 3 acanthosis, skin tags, bilateral feet postaxial polydactyly. Vitals and Systemic examination was normal except increased tone in all four limbs. SMR: testicular volume 20 mL bilaterally, SPL 11cms. Fundus- pigmentary retinopathy. Investigations revealed- RBS- 528 mg/dL, Serum ketones: 3.5 mmol/L, urine ketones: 16 mmol/L (3+), ph -7.28, S. HCO<sub>3</sub><sup>-</sup>-11.7 mmol/L HbA1c-16.2%, normal CBC, KFT, LFT. USG abdomen- horseshoe kidneys, 2DECHO-normal, Patient was managed as DKA. Fasting C- peptide level – 1.26 ng/mL, (after recovery from DKA), anti-GAD 65 antibodies- negative. There was no obvious stressor precipitating DKA. The patient was discharged on insulin and was planned to start oral antidiabetic drugs on follow up.

**Conclusion:** Obesity and insulin resistance are the main pathogenic factors contributing to diabetes in BBS, however, if diabetes is not diagnosed on time they may present as DKA, though not reported earlier. Hence by reporting this case we emphasize the importance of annual screening of diabetes starting at 12 years of age in BBS to prevent the occurrence of DKA, a life-threatening complication.

#### EP064 | Intensive lifestyle management and type 2 diabetes in Prader Willi syndrome

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**Background:** Prader Willi Syndrome (PWS) is a genetic condition characterized in infancy by hypotonia and failure to thrive, followed by hyperphagia, extreme obesity and learning disability in later childhood. Untreated obesity leads to co-morbidities including type 2 diabetes (T2D). The management of T2D with lifestyle modification of diet and exercise can be extremely challenging in the typically developing population and data are limited regarding the management of established T2D in a child with Prader Willi syndrome with profound hyperphagia and an insatiable drive to eat. Established diabetes is a contraindication to growth hormone (GH) therapy which has transformed the clinical outcomes of those with PWS due to its metabolic effects, positive impact on muscle strength, obesity and body composition.

**Objectives:** To examine the case of a 10 year old girl with PWS, who presented to our national tertiary referral service with obesity and newly diagnosed T2D. To explore how her condition was managed both acutely as an inpatient and over months as an outpatient, and if it is possible to reverse type 2 diabetes in children with PWS to facilitate GH therapy.

**Methods:** A review of clinical records.

**Results:** Baseline BMI was 35.8 kg/m<sup>2</sup>, and fell to 19.9 kg/m<sup>2</sup> over the course of seven months, due to a total weight loss of 27 kg (43% of her body weight). Her HbA1c fell 61 mmol/mol, from 94 mmol/mol (10.7%) to 33 mmol/mol (5.1%) over the same seven month period, and blood glucose readings stabilized. The complexity of this case was increased due to challenging social circumstances. These improvements were maintained at follow up beyond 1 year.

**Conclusion:** This case demonstrate that through intensive lifestyle modification with education and dedicated multiple disciplinary team input - in both inpatient and outpatient settings associated with frequent telephone contact, family support and commitment - type 2 diabetes can be reversed even in those with Prader Willi Syndrome.

#### EP065 | Incidence trends of type 2 diabetes in Nova Scotia Youth

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**Objective:** Type 2 diabetes (T2D) in youth is rising with annual increases in incidence of 4.8% between 2002 and 2012 (US population). Canadian surveillance data reported a minimum annual incidence of 1.54/100,000 < 18 years, with 0.7/100,000 in the Atlantic Provinces. We aimed to examine incidence of T2D in Nova Scotia (NS) youth, from 1994 to 2018 and to describe demographics and treatment regimes in this population.

**Methods:** The Diabetes Care Program of NS Registry contains population-based records for all pediatric cases of diabetes (Dx < 20 yr) in NS since 1992. Incidence of T2D with 95% confidence intervals was calculated per 100,000 population for 5-year periods from 1994-1998 to 2014-2018 based on population estimates (0-19 yr) from the national census. Descriptive statistics were calculated for demographic and treatment variables.

**Results:** 249 cases of T2D occurred among NS youth between 1994 and 2018 (incidence = 4.66/100,000). Incidence increased between 1994-1998 and 1999-2003 (1.55 and 5.92 respectively) after which it stabilized. Overall incidence was slightly higher in females compared to males (5.28 vs 4.06). Mean age at diagnosis was 15.94 yr with no difference between the sexes. 67% were diagnosed between age 15 and 19, 31% between 10 and 14 and 2% less than 10. 75% of patients did not require insulin within a year of diagnosis. This decreased to 45% as patients were followed over time.

**Conclusion:** The incidence of T2D in NS youth is higher than past reports for our region likely owing to missed cases in the past surveillance methodology and our inclusion of cases up to age 20. Similar to US trends, we found a marked rise in incidence (2.9-4.5 times higher) after 1999. Consistent with the literature, there is a higher representation of females in pediatric T2D. Many progressed to insulin therapy suggesting worse control over time. The sustained increase accents the need for more targeted prevention programs for the pediatric population.

#### EP066 | A retrospective cohort study investigating the extent to which the presence of acanthosis Nigricans (AN) confers additional risk for insulin resistance (IR) and type 2 diabetes mellitus (T2DM), within a young, overweight, UK population

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**Background:** The skin discoloration associated with AN typically affects the neck and axillae. AN is a consequence of hyperinsulinism, and is associated with T2DM and obesity. It is a highly visible marker for T2DM, potentially enabling early disease detection and prevention in young, high-risk patients who typically present late and with evidence of complications. However, the relationship between AN and IR, has not been investigated within a UK population, and it is unclear whether the presence of AN confers additional diabetes risk beyond that associated with obesity alone.

**Methods:** Retrospective data was collected to compare the degree of IR within a sample of 100 young people with AN, and a matched cohort of 100 participants with obesity alone. IR was assessed by fasting glucose, fasting insulin and HOMA-IR score (a mathematical model derived to measure IR).

**Results:** The AN-positive and control group were well matched for median BMI (33.5 kg/m<sup>2</sup> and 33.4 kg/m<sup>2</sup>), mean BMI SDS (3.2 and 3.3), and median age (14.1 and 13.6). The AN-positive group showed a significantly greater ( $p < 0.01$ ) median fasting insulin (208 pmol/L) and median HOMA-IR score (6.3) compared to the control group (138 pmol/L and 4.2). The presence of AN as an indicator of IR was found to have a positive predictive value of 76%. In a subset of 43 subjects the relationship between the severity of AN (graded as mild/moderate/severe) was investigated. Although not reaching significance, a positive trend in median fasting insulin (mild = 169 pmol/L; severe = 237 pmol/L) and median HOMA-IR score (mild = 4.8; severe = 6.5) with the severity of AN was evident.

**Conclusion:** Individuals with both AN and obesity had significantly greater degrees of IR than individuals with obesity alone. The study provides the first investigation into the extent of the relationship between AN and IR within a young, overweight, UK population. The findings support the potential for AN as a screening tool for T2DM in young people.

## EP067 | First case report of euglycemic diabetic ketoacidosis with an automated insulin pump in a 12-year-old patient with type 1 diabetes mellitus

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**Introduction:** Diabetic ketoacidosis (DKA) occurring with only modest elevations in blood glucose levels is defined as euglycemic DKA. It can be challenging to diagnose because euglycemia conceals the underlying DKA.

**Objectives:** We present the first reported case of euglycemic DKA in a pediatric patient using an automated insulin pump.

**Methods and results:** We describe a 12-year-old girl with well-controlled type 1 diabetes, using a closed loop insulin pump and treated for a recent diagnosis of Grave's disease. The patient presented to the emergency room with vomiting in the context of an influenza infection. She had had severe anorexia due to her illness. Given that her blood glucose levels were all <14 mmol/L, she did not verify serum ketones. The pump, in auto mode, administered uninterrupted, but lower doses of basal insulin than her baseline requirements. On presentation, her capillary glucose was 7.7 mmol/L. She was in moderate DKA, with a pH of 7.183, bicarbonate concentration of 12.1 mEq/L, and an anion gap of 28 mEq/L. Serum ketones were measured at 3.5 mmol/L. The metabolic acidosis resolved with rehydration and intravenous insulin therapy. In this case, a significant decrease in carbohydrate intake due to anorexia led to ketone body formation. While continuous basal insulin delivery through the insulin pump was sufficient to maintain euglycemia, it was insufficient to stop ongoing ketosis, with a relative insulin deficiency and consequent euglycemic DKA. The auto mode does not account for states of increased insulin resistance and requirements.

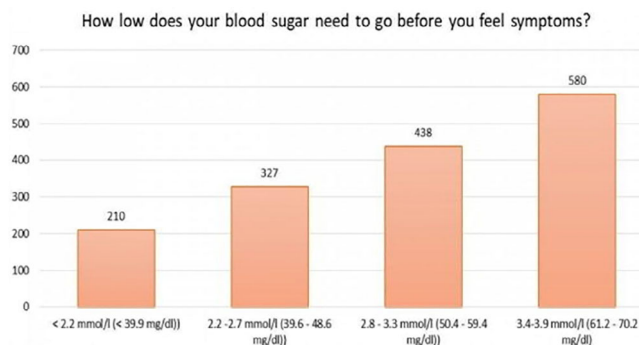
**Conclusions:** An awareness of euglycemic DKA is important to avoid diagnostic delay by assessing acid-base status and ketone levels in patients presenting with symptoms compatible with DKA, even if normoglycemic. For automated insulin pumps' users, emphasis should also be put on reverting to manual mode during periods of illness to avoid inadequate computed insulin adjustments and to ensure adequate insulin delivery.

## EP068 | Assessing impaired awareness of hypoglycemia (IAH) among patients with type 1 diabetes in an online group of support using the Clark and Gold questionnaires

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**Objective:** To assess impaired awareness of hypoglycemia (IAH) among patients with type 1 diabetes in an online psychological and medical support group using the Clark and Gold questionnaires.



[Frequency of how low does your blood sugar need to go before you feel symptoms].

**Methods:** This study was applied to patients having type 1 diabetes in the view of assessing the extent of IAH using the Gold and Clarke questionnaires assessing awareness of hypoglycemia. The population selected was from an online group of support on Facebook<sup>®</sup>. Response to each question was determined as either aware (A) or reduced aware (R). Patients who reported  $\geq 4$  R responses were classified as having IAH while patients who reported  $\leq 3$  R responses were classified as hypoglycemic aware. Age, gender, age at diagnosis, latest HbA1c and the psychometric properties of the questionnaires were evaluated. Data was captured using an online Google Forms<sup>®</sup>. All statistical analysis was performed using SPSS v.18.0 (IBM Corp., Armonk, NY, USA).

**Results:** In total, 1555 patients participated (22% male) with mean age 36.2  $\pm$  16.2 years. The mean Type 1 diabetes duration was 20.2 (1-71) years with a mean HbA1c 7.2%  $\pm$  1.6.

IAH was present in 11.1% of the cohort.

Recurrent hypoglycemia (reporting blood glucose measurements below 70 mg/dL more than once per month in the previous 6 months) was reported by 19.1% of participants.

264 patients reported having at least 1 episode of severe hypoglycemia (needed glucagon or intravenous glucose) in the past year.

The level of hypoglycemic episodes in the last 6 months was only significantly associated with the frequency of severe hypoglycemia during the previous year (p-value < 0.01).

**Conclusions:** The present survey has confirmed that a significant proportion of people with Type 1 diabetes (11.1%) continue to have IAH. Despite advances in treatment of Type 1 diabetes, the prevalence of IAH remains high in Type 1 diabetes.

Awareness of when hypoglycemia is commencing using Gold's Questionnaire	Percentage
1 always aware	9.1
2	19.5
3	15.0
4	20.1
5	15.1
6	12.7
7 never aware	8.4

[Frequency of patients aware when hypoglycemia is commencing using Gold's Questionnaire]



EP069 | **Diabetic ketoacidosis as an onset of diabetes mellitus type I in children: analysis of incidence and diagnostic mistakes during 2010–2013 and 2016–2018**

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**Objective:** Perform an analysis of the incidence of DKA and diagnostic mistakes in DM1 onset in children in pre-hospital settings.

**Materials and methods:** An analysis of 648 inpatient medical records of children hospitalized in the Z.A. Bashlyaeva Children's Hospital was performed, with an onset of DM1, Group 1 (n = 269) included patients hospitalized during 2010–2013, Group 2 (n = 379)-during 2016–2018.

**Results:** DKA was diagnosed in 50.9% (137/269) children in Group 1 and 37% (140/379, p = 0.002) in Group 2.

The incidence of DKA in children under the age of 5 in Group 1 was 60.8% (56/92) and was higher compared to children over 5 years old: 45.7% (81/177, p = 0.019). The incidence of DKA in children under the age of 5 in Group 2 was 45.4% (60/132) and was higher compared to children over 5 years old: 32.3% (80/247, p = 0.013).

The total frequency of diagnostic mistakes in pre-hospital settings was 12.6% (35/277). Mistakes in DKA diagnostic in Group 1 occurred in 17.5% cases (24/137), they were less frequent in Group 2: 8.5% (12/140, p = 0.027).

Diagnostic mistakes in Group 1 patients included the following: abdominal syndrome-54% (13/24), respiratory syndrome-21% (5/24), cerebral syndrome-21% (5/24), dysuric syndrome-4% (1/24). Diagnostic mistakes in Group 2 patients included the following: abdominal syndrome-63.6% (7/11), respiratory syndrome-27.3% (3/11), cerebral syndrome-9.1% (1/11).

There were differences in mistakes frequency between groups in patients under 5 years of age: Group 1: 25% (14/56) vs Group 2: 12.3% (8/60, p = 0.09).

**Conclusions:** The incidence of DKA as DM1 onset in children has decreased 1.5-fold in 2016–2018 compared to 2010–2013, but was 2 times higher in children under 5 years of age. The number of diagnostic mistakes in pre-hospital settings has decreased 2-fold, including the age group under 5 years old. Abdominal syndrome still prevailed in their structure, confirming the need to test blood glucose level in each patient with abdominal pain.

EP070 | **Outcomes of babies born to diabetic mothers and admitted to the neonatal unit at East Surrey Hospital, UK**

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As part of the National Pregnancy in Diabetes (NPID) audit that takes place annually in the United Kingdom, East Surrey Hospital obtained

data from every livebirth that occurred in the hospital from 1st October 2018 to 31st October 2019 from pregnant women with diabetes (either type 1, 2 or gestational diabetes).

From this data, we were able to see which of those babies were admitted to the neonatal unit. We analyzed the causes of admission to the neonatal unit from these babies born to diabetic mothers, finding that a high proportion was due to diabetes-related complications, specifically neonatal hypoglycemia. The majority of these babies would not have been admitted to the neonatal unit otherwise (for example, due to prematurity).

We are now in the phase of analyzing the glycemic control of the mothers that these babies were born to. If these babies, that were admitted to the neonatal unit with hypoglycemia and other diabetes-related complications, were born to mothers with particularly difficult glycemic control or with poor compliance to diabetes treatment and monitoring, then this would suggest that there is scope to actively reduce admissions to the neonatal unit for diabetes-related complications by optimizing the diabetic treatment of the mothers.

Due to the unprecedented effects of COVID-19, leading to redeployment of staff and cancellation of non-urgent procedures and teaching sessions, we have unfortunately not been able to analyze the data from the diabetic mothers yet - which we would have done otherwise. However, we are confident that by the time of the conference, this analysis will be complete.

EP071 | **Comparison of low and standard dose of insulin effects in the treatment of diabetic ketoacidosis (DKA) in children with newly diagnosed type 1 diabetes mellitus (T1DM)**

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**Objectives:** New ISPAD guidelines for DKA recommend the use of insulin dose in a range of 0.05–0.1 U/kg/h. We speculate that the lower dose could prolong the duration of the acidosis.

**Methods:** This was the retrospective study conducted at University Children's Hospital in Belgrade. We have analyzed the age, initial pH, blood glucose(BG), duration of acidosis in patients, divided into two groups based on the initial insulin therapy dose, low dose(LD) 0.05 and standard dose(SD) 0.1 U/kg/h. The primary outcome was the time to resolution of acidosis, rate of decrease in BG in the first 4 hours, hypokalemia and hypoglycemia were secondary outcomes.

**Results:** 93 patients (35LD/58SD) aged 7.0 ± 4.1 years, with newly diagnosed T1DM with DKA were included. The clinical characteristics and the biochemical parameters of the children did not differ significantly between the groups. After the first hour of insulin infusion a BG drop >5 mmol/L was more common in SD group (20.7% vs 8.6%). The mean time to reach BG of 14 mmol/L, hypoglycemia and hypoglycemia episodes were similar in the two groups. The mean time for the resolution of acidosis in a LD group was 14 ± 10.2, while in the

SD was  $13 \pm 7$  h,  $p = 0.591$ . When we compared the mean time for resolution of acidosis in two groups, it was slightly longer in children <10 years in the LD(25) than in the SD(40) group ( $13.4 \pm 7.3$  vs  $12 \pm 6.3$ ,  $p = 0.454$ ). Regarding to the initial grade of acidosis there was no difference between groups in time needed to resolve the moderate-grade acidosis (LD  $13.4 \pm 6.5$  vs SD  $11.3 \pm 6.1$ ), but in severe-grade acidosis ( $\text{ph} < 7.0$ ) was significantly less in SD (16) group compared to LD(9) group ( $17.8 \pm 7.4$  vs  $22.9 \pm 12.7$ ,  $p = 0.038$ ).

**Conclusions:** Our results show that LD of insulin was safer in reducing BG within desired range, in children with new onset diabetes. Importantly, in our study LD did not appear inferior in resolving acidosis. Based on our study results, the SD should be a therapy of choice in treating severe grade DKA.

#### EP072 | Does a delay in diagnosis of type 1 diabetes mellitus (T1DM) increase the incidence of Diabetic Ketoacidosis (DKA) in the United Kingdom (UK)?

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**Introduction:** DKA is a life threatening complication of T1DM. If T1DM is left untreated then DKA is inevitable, so prompt recognition and treatment is crucial. The 4 T campaign (Toilet, Thirst, Tired, Thinner) aims to raise awareness of the presenting features. NPDA 2018/19 data showed incidence of DKA at diagnosis was 20.8% increased from 19.8% and 16.6% in the preceding two years. Incidence of DKA at diagnosis varies from 15–70% across Europe and North America.

Previous work locally has shown that about 10% of patients with T1DM had a delayed diagnosis, with half presenting in DKA which is higher than that quoted in the literature.

#### Objectives:

1. To find the percentage of children who have a delayed diagnosis of T1DM and if DKA at diagnosis is higher in this group.
2. To improve understanding of reasons for the delay and address these to reduce mortality and morbidity associated with DKA.

Variables	Delayed (n = 23)	Not delayed (n = 99)	p value
Age (years)	11.28 +/- 3.99	10.04 +/- 4.29	0.13
Gender (male)	13 (56)	46 (46)	0.38
Present in DKA	13 (56)	40 (40)	0.16
Duration of symptoms (weeks)	4.06 +/- 3.21	2.93 +/- 2.73	0.036

[Comparison of delay vs non delayed diagnosis, data are n (%) or mean +/- SD]

**Method:** A region wide retrospective cases series analysis of patients diagnosed with T1DM between April 2018–2019. Delay defined as number of days from review by healthcare professional (HCP) to diagnosis.

**Results:** Data collected across 6 centres in the East Midlands (population of 1.1 million aged 0–19 years). 122 patients (59 male) were diagnosed with T1DM-delay in diagnosis seen in 23%.

2 patients had evidence of cerebral edema, 1 had a delayed diagnosis. Reasons for the delay included.

1. Diagnosis not considered by HCP.
2. Delay in blood tests.

**Conclusions:** There was no difference in DKA incidence between those who had a delayed diagnosis and those who had not. The reasons for this are unclear. It could be the delay was reduced by parental insistence for further review and collecting information from families for a future project may shed light on this. We continue to report cases of delay through hospital governance mechanisms and to primary care practices to inform and educate.

#### EP073 | Previous diabetic ketoacidosis as independent risk factor for recurrent diabetic ketoacidosis in a large prospective contemporary pediatric cohort: Results from the DPV initiative

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**Objective:** To assess the role of previous episodes of diabetic ketoacidosis (DKA) and their time-lag as independent risk factors for recurring DKA in pediatric patients with type 1 diabetes (T1D).

**Study design:** In a population-based analysis, data from 26,722 children and adolescents with T1D and at least five years of continuous follow-up were retrieved from the “Diabetes Prospective Follow-up” (DPV) multi-center registry in September 2019. Statistical analyses included unadjusted comparisons and negative binomial regression models.

**Results:** Among 26,722 patients with T1D, 86.78% ( $n = 23,190$ ) reported no DKA, 9.41% ( $n = 2514$ ) experienced one, and 3.81% ( $n = 1018$ ) more than one episode, corresponding to a DKA rate of 4.00 [95% CI: 3.85–4.15] per 100 patient-years. Female sex, migratory background, higher HbA1c values, higher daily insulin doses, and

a lower glucose monitoring frequency were associated with DKA. In patients with a previous episode, the DKA rate in the most recent year was significantly higher than in patients with no recent DKA (14.83 [13.07–16.82] vs. 2.94 [2.73–3.17] per 100 patient-years;  $p < 0.001$ ). Multiple DKAs further increased the recurrence rate. The risk for DKA in the most recent year was higher in patients with an episode in the preceding year than in patients with no previous DKA (OR: 9.0 [95% CI: 7.6–10.8]) and decreased with each year, but remained significantly elevated four years after an episode (OR: 2.1 [1.5–3.0];  $p < 0.001$ ).

**Conclusions:** Each episode of DKA is an independent risk factor for recurrence, even four years after an event, underlining the importance of a close follow-up after each episode.

#### EP074 | Severe hypertriglyceridemia in children with newly diagnosed type 1 diabetes

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**Background:** Significant hyperlipidemia in uncontrolled diabetes is under-reported in children. We present 2 cases with newly-diagnosed type 1 diabetes who presented with diabetic ketoacidosis, and were found to have severe hypertriglyceridemia.

#### Methods:

Case 1: A 2.5-year-old girl presented with DKA. Blood samples were lipemic. Lipid profile showed significant hyperlipidemia. Patient was treated with fluids and insulin. Dramatic improvement in lipid profile was noticed and it normalized within 10 days.

Case 2: A 12-year-old girl, admitted as a case of DKA. She had papular rash on extensor surfaces. Lipid profile showed severe hypertriglyceridemia. She was treated with fluids and insulin. Skin rash which we diagnose as xanthoma disappeared completely within one month. Lipid profile normalized within 2 weeks.

**Results:** Severe hypertriglyceridemia is rarely reported in children with type 1 diabetes. We present 2 cases presented with DKA as first manifestation of type 1 diabetes and were found to have severe hypertriglyceridemia.

Insulin inhibits lipolysis and stimulates lipoprotein lipase enzyme resulting in clearance of triglyceride from circulation. In uncontrolled type 1 diabetes, lipolysis is increased with resultant excess of free fatty acids supply to liver.

Severe hypertriglyceridemia was manifested in both of our patients by lipemic blood samples, in addition, case 2 had xanthoma which appeared one month prior to DKA, but was misdiagnosed initially as viral infection. Obviously if she was diagnosed earlier she would not have suffered from DKA which developed later. Unfortunately, delay in diagnosis is partly due to the rarity of this association in children with diabetes.

**Conclusions:** Severe hypertriglyceridemia can be seen in children with type 1 diabetes especially during the dramatic presentation namely DKA. Physicians should be aware of this complication, for earlier identification and earlier management with resultant decrease in morbidity and mortality.

#### EP075 | Hyperlactatemia in a case of glycogenic hepatopathy and poorly controlled type 1 diabetes

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**Introduction:** Glycogenic hepatopathy is a feature of Mauriac syndrome, a rare complication of poorly controlled Type 1 Diabetes (T1D), and is characterized by hepatic glycogen deposits and elevated liver transaminases. Lactate elevation is a rarely described feature of glycogenic hepatopathy.

**Objective:** To report a case of hyperlactatemia in glycogenic hepatopathy in an adolescent with poorly controlled T1D.

**Methods:** Medical chart review was performed to obtain details of patient's case. Histological liver sections stained with hematoxylin and eosin (H&E) and Periodic-acid-Schiff (PAS) were reviewed by a pediatric pathologist.

**Results:** This patient case is a 13-year-old adolescent with poorly controlled T1D. She had risk factors for the development of Mauriac syndrome with hemoglobin A1c ranging 9.9–11% over the prior year, recurrent episodes of diabetic ketoacidosis (DKA), and high doses of insulin therapy. Following a DKA episode, this patient had persistent elevation of plasma lactate concentration up to 13.8 mmol/L, elevated liver transaminases (aspartate aminotransferase 248–1482 U/L, alanine aminotransferase 224–516 U/L) and a liver mass identified as T2 hyper intensity on abdominal MRI prompting additional work-up. A liver biopsy demonstrated abundant hepatocyte glycogen deposits, scattered hepatocyte apoptosis and moderate steatosis consistent with glycogenic hepatopathy. In the two years since diagnosis of glycogenic hepatopathy, the patient's plasma lactate elevation has persisted (3.2–8.4 mmol/L), even in between DKA episodes. Metabolic and mitochondrial evaluations were negative.

**Conclusions:** This case illustrates an atypical presentation of glycogenic hepatopathy in an adolescent with poorly controlled diabetes. Persistent metabolic acidosis and elevation of liver enzymes in the setting of resolving DKA should prompt an evaluation for glycogenic hepatopathy because it has been shown to be reversible with improved glycemic control.

#### EP076 | Comparing myocardial structure, arterial stiffness and endothelial function in youth with type 1 diabetes and healthy controls: Preliminary findings from the CARDEA study

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#### Objectives:

- 1) Assess the impact of T1D on myocardial structure, arterial stiffness and endothelial function in youth;
- 2) Verify whether these associations are modified by sex and by adiposity.

**Methods:** Cross-sectional study of 100 youth with T1D (14–18 yrs) and 97 age- and sex-matched controls. BMI and blood pressure (zBP) z-scores were calculated. HbA1c and lipids were measured fasted. Carotid-femoral pulse-wave velocity estimated arterial stiffness. Brachial artery flow-mediated dilatation (FMD) estimated endothelial function with % of FMD, post-occlusion release velocity time integral (VTI) and acceleration. Cardiac magnetic resonance measured left ventricular (LV) mass, papillary mass and average wall thickness during diastole. Linear regressions of CVD outcomes and T1D status were adjusted for age, sex, ethnicity, pubertal stage, zBMI, sleep, tobacco, parental CVD history, income, and additionally for systolic zBP and heart rate in models with LV wall thickness and FMD indices. Effect modification in the models was tested using interaction terms.

**Results:** Groups had similar ethnicity, sex, age and pubertal stage distributions. Median T1D duration was 6.1 (IQR = 3.3–10.5) yrs; average HbA1c was 8.5% (SD = 1.5). Youth with T1D had a higher zBMI (0.75 vs 0.15,  $p < 0.001$ ) on average. Having T1D was associated with a higher LV wall thickness and endothelial dysfunction (Table). Having

T1D was also associated with a higher zDBP and higher triglycerides levels, the latter remaining significant in fully adjusted models. zBMI was associated with an increased LV wall thickness (beta = 0.30, 95% CI: 0.11, 0.48) in youth with T1D, but not in controls. No effect modification for sex was found.

**Conclusions:** Our preliminary findings report that LV mass and endothelial function is already altered in youth with T1D, and potentially aggravated by adiposity. This supports the need for early cardiovascular prevention in this population.

#### EP077 | The role of muscle strength in the definition on joint mobility in young subjects with type 1 diabetes mellitus

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**Introduction:** It is known that young patients with Type 1 Diabetes Mellitus (T1DM) can show by limited joint mobility, a dreaded complication that can affect the quality of posture and movement.

**Objectives:** The aim of this study was to investigate the role of muscle strength in the definition of ankle joint mobility (AJM) of young patients with T1DM in order to better understand the causes of limited joint mobility.

**Methods:** In 31 young male patients with T1DM mean age  $12.9 \pm 3.3$  yrs, T1DM duration  $6.1 \pm 3.7$  yrs, HbA1c  $7.4 \pm 0.8\%$ , body mass index (BMI)  $19.7 \pm 3.9$  Kg/m<sup>2</sup>, and in 65 subjects matched for age BMI and sex, the AJM in both plantar flexion and dorsiflexion (inclinometer: Fabrication Enterprises Inc., USA), the handgrip strength (HGS; Jamar hydraulic hand dynamometer: model 5030 J1) in addition to the trunk flexibility (Sit and Reach Test) were evaluated. Multiple regression analysis was performed using AJM as dependent variables and HGS, BMI as independent variables.

**Results:** The AJM value detected in the patient group compared to that of the controls was lower without reaching statistical significance ( $132.0 \pm 20.3^\circ$  vs  $136.4 \pm 21.3^\circ$ ). Multivariate analysis showed a significant effect of HGS on AJM ( $p < 0.05$ ). However, only in the control group HGS significantly affects the Total AJM ( $p = 0.013$ ) and ankle dorsiflexion ( $p < 0.08$ ) but not the plantar flexion. In the control group Spearman's correlation analysis showed an inverse correlation between HGS and ankle dorsiflexion ( $p = 0.013$ ) and total AJM ( $p = 0.027$ ), no correlation between AJM and HGS was found in the group of subjects with diabetes. Patients and control groups showed HGS values similar and directly correlated with age, and BMI ( $p < 0.001$ ).

**Conclusions:** A significant relationship between HGS and ankle mobility was found only in the control group. The presence of diabetes seems to modify the normal relationship between the development of muscle strength and ankle joint mobility.

	Univariable models ( $\beta$ [95% CI])	Multivariable models ( $\beta$ [95% CI])
<b>Myocardial structure</b>		
Left ventricular mass / height (g/m)	-0.50 [-4.66, 3.65]	-3.36 [-6.74, 0.01]
Papillary mass (g)	0.17 [-0.25, 0.58]	0.11 [-0.38, 0.60]
Average wall thickness (mm)	<b>0.33 [0.07, 0.59]</b>	0.22 [-0.04, 0.47]
<b>Arterial stiffness and endothelial function</b>		
Pulse wave velocity (m/s)	0.19 [-0.03, 0.40]	0.15 [-0.09, 0.39]
%FMD	<b>1.41 [0.11, 2.71]</b>	0.76 [-0.91, 2.44]
VTI (cm)	-2.49 [-5.03, 0.04]	-1.70 [-4.79, 1.39]
Acceleration (cm/s <sup>2</sup> )	<b>-68.80 [-119.83, -17.78]</b>	<b>-91.87 [-155.91, -27.82]</b>

[Linear regression models for the association between having T1D and myocardial structure, arterial stiffness and endothelial function]

### EP078 | Role of serum galectin-3 in prediction of coronary heart disease in subjects with childhood-onset type 1 diabetes

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**Introduction:** Subjects with type 1 diabetes have increased risk of acute myocardial infarction and heart failure compared to the background population. There are few studies among subjects with childhood-onset type 1 diabetes with long-term follow-up assessing CHD and biomarkers.

**Objective:** To study whether serum galectin-3 and other biomarkers of inflammation predict coronary heart disease (CHD) in subjects with longstanding childhood-onset type 1 diabetes.

**Methods:** A population-based nation-wide cohort of 299 subjects with type 1 diabetes diagnosed in Norway at age < 15 years during 1973–1982 were examined in 2002–2003 (baseline) at a mean age of 33 years (range 21–44), with mean diabetes duration of 24 years (range 19–30). Subjects were followed to December 31, 2017 for their first CHD event registered by a hospitalization or cause of death using nation-wide registries. Stored serum were available for 296 subjects and were in 2018 analyzed for interleukin (IL)-6, interleukin-6 receptor, interleukin-18, high sensitivity-C-reactive protein, matrix metalloproteinases-9, tissue inhibitor of metalloproteinase-1, galectin-3 and high sensitivity troponin T (hs-TNT). Adjusted hazard ratios (aHR) per standard deviation increase in biomarkers were estimated using Cox regression.

**Results:** Of 296 subjects, 41 (14%) were identified with CHD during mean follow-up of 14.6 years (range 0.5–16). IL-6 (aHR 1.32, 95% CI: 1.07–1.64), galectin-3 (aHR 1.45, 95% CI: 1.14–1.85) and hs-TNT (aHR 1.22, 95% CI: 1.01–1.48) were significant predictor of CHD after adjustment for conventional risk factors. Improvement in ROC AUC for prediction of CHD after adding galectin-3 to a model with HbA1c showed increase in ROC area from 0.67 to 0.74 (95% CI 0.66–0.83).

**Conclusion:** Galectin-3 was significantly associated with future CHD in subjects with type 1 diabetes, and may aid in prediction together with conventional risk factors for CHD.

### EP079 | Sex-hormone binding globulin (SHBG) as an obesity-related metabolic marker among long-duration type 1 diabetes patients without significant diabetic complications

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Obesity increases world-wide and among type 1 diabetes mellitus (T1DM) patients. Usefulness of SHBG as a metabolic risk marker is not enough elucidated in T1DM.

**Aim:** To assess SHBG in T1DM patients with long disease duration.

**Methods:** A total of 110 participants were studied, 79 (50.6% men) with T1DM without significant chronic diabetes complications, mean age 40.68 ± 10.5 years, mean diabetes duration 25.45 ± 8.5 years, and 31 age, sex and BMI matched healthy control subjects (35.5% men) aged 40.87 ± 9.5 years. Mean HbA1c was 8.29 ± 1.8% (67.1 ± 11.8 mmol/mol). All participants answered a questionnaire. Standard anthropometric measurements were performed. Normal weight (NW) was defined as BMI < 25 kg/m<sup>2</sup>; overweight (OW) 25–29 kg/m<sup>2</sup> and obese (Ob) >30 kg/m<sup>2</sup>. Waist circumference (WC) was defined as “metabolic” if >94 cm for men and > 80 cm for women. SHBG, adiponectin (ADN), and other biochemical metabolic risk markers were measured at morning fast.

**Results:** SHBG was higher in women (80.7 ± 38.7 vs. 43.7 ± 17.5 nmol/L, p < 0.0001). T1DM patients showed similar SHBG levels to controls (68.2 ± 38.0 vs. 51.5 ± 26.5 nmol/L, p = 0.09). SHBG levels in control subjects decreased with BMI increments and WC category (Ob vs. NW p = 0.002, and metabolic vs. normal WC p = 0.021, resp.). Among T1DM, SHBG association with BMI was similar (p = 0.003). SHBG correlated negatively and significantly with WC (p = 0.001) after adjusting for the presence of T1DM and for sex but not with CRP, leptin and IL-6. It correlated strongly positively with ADN, especially in T1DM patients (p < 0.0001). SHBG associated negatively with the mean daily insulin dose (p = 0.001) but not with HbA1c, even after adding WC to the model. Multifactorial linear regression analysis confirmed the independent associations between SHBG and sex (p < 0.0001), BMI (p = 0.001), T1DM/control status (p = 0.001) and WC (p = 0.002).

**Conclusions:** In T1DM patients with long-standing disease SHBG behaves as a metabolic risk factor regardless of diabetes control.

### EP080 | Prevalence and risk factors of diabetic retinopathy and nephropathy in children and adolescents: 10 years of SWEET Benchmarking

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**Objectives:** To determine the actual prevalence of diabetic retinopathy and nephropathy in the SWEET Cohort and its possible main risk factors.

**Methods:** A longitudinal study was built on the SWEET database. Inclusion criteria: T1D onset <18y, follow up until December 2018. Cases without information on retinopathy and nephropathy, on anti-hypertensive or lipid lowering drugs were excluded. Collected variables: sex, age, age at onset, duration, treatment, glycemic control, BMI, hypertension, dyslipidemia. Risk factors over all visits before the occurrence of the outcomes were aggregated, and multivariable logistic regression analysis was used.

**Results:** There were 19,080 cases, 52% males, followed in 65 centers from all continents (75% Europeans). Median age at onset was 8.1 (4.6–11.3)y, and median duration was 5.4(2.6–9.0)y. In 2018, 42% were on CSII, 32% had CGM, 22% had hypertension, and 41% had dyslipidemia. Retinopathy was present in 1.2%: the ones with longer T1D [8.2(4.9–11.4)y vs 5.8(3.0–9.2)y], more non-intensive treatment (16.5% vs 8.1%), less daily SGM pricks [3.0(2.0–5.0) vs 4.5(3.0–5.7)], and less CGM (15.6% vs 28.2%). Nephropathy was diagnosed in 2.7%: they were less on CSII (33.1% vs 44.2%) and did less daily SGM pricks [4.0(2.5–5.0) vs 4.5(3.0–6.0)]. For both conditions, there were no significant differences in BMI, blood pressure or lipid profile. When regression models were adjusted for sex, age at onset and duration, long-term HbA1c  $\geq 9\%$  increased the risk of both retinopathy (OR 3.0;  $p < 0.0001$ ) and nephropathy (OR 1.5;  $p < 0.0001$ ). However, when BMI, hypertension and dyslipidemia were included in the model, it remained a risk only for retinopathy (OR 3.2;  $p 0.0001$ ).

**Discussion:** Retinopathy seems to be more dependent of glycemic control than nephropathy. This last condition is probably linked to a constellation of other interdependent factors like BMI, hypertension, and dyslipidemia, where none of them per se looks to be able to explain its occurrence.

#### EP081 | The association between obesity-related metabolic markers and early kidney injury markers among long-duration type 1 diabetes patients

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The adipokines' roles are not enough studied among type 1 diabetes (T1DM) patients as well as their associations with the development of diabetes complications.

**Aim:** to assess the associations between fat tissue adipokines and diabetes renal complications related factors in T1DM patients with long disease duration compared with age, sex and body mass matched healthy controls.

**Methods:** A total of 110 participants were studied, 79 (50.6% men) with T1DM, mean age  $40.68 \pm 10.5$  years, mean diabetes duration  $25.45 \pm 8.5$  years, and 31 control subjects (35.5% men) aged  $40.87 \pm 9.5$  years. Standard anthropometric measurements and laboratory investigations at morning fast were performed. WC was defined as "metabolic" if  $>94$  cm for men and  $>80$  cm for women. Laboratory investigations included basic biochemical parameters (creatinine, uric acid) and specific risk markers (CRP, adiponectin, irisin). MAU/macrolbuminuria was measured from overnight urine sample. Three groups based on albumin excretion rate were defined: normal albumin excretion (NAE), microalbuminuria (MAU) and macroalbuminuria (MA).

**Results:** Creatinine increased with the category of proteinuria in all participants (NAE vs. MAU. vs. MA  $70.2 \pm 12.5$ ,  $85.4 \pm 50.7$ ,  $88.3 \pm 26.3$  mmol/L,  $p = 0.009$ ). Uric acid increased marginally significantly with proteinuria ( $p = 0.075$ ). Adiponectin (ADN) increased similarly ( $p = 0.043$ ) and correlated moderately negatively with uric acid ( $r = -0.383$ ,  $p = 0.001$ ). The association remained significant ( $p = 0.005$ ) after adjustment for T1DM. In T1DM only, linear regression found positive influence of sex ( $p = 0.001$ ), creatinine level ( $p = 0.017$ ), and WC ( $p = 0.023$ ) on ADN. Irisin was significantly lower in T1DM ( $p = 0.046$ ), and associated weakly positively with the established CV risk factor CRP ( $r = 29.8$ ,  $p = 0.008$ ). It did not differ by sex, BMI and self-reported physical activity.

**Conclusions:** Fat tissue related adipokines deserve further studies elucidating their roles in T1DM long-term complications.

#### EP082 | Ambulatory blood pressure monitoring in pediatric patients with type-1 diabetes mellitus with normal blood pressure in the clinical office

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**Introduction:** nocturnal arterial hypertension (HTN) and changes in blood pressure circadian rhythm could be early predictors of kidney disease and target organ damage.

**Objectives:** to determine the prevalence of blood pressure(BP) alterations using 24 hours ambulatory blood pressure monitoring(ABPM) in pediatric patients with type 1 diabetes(DM1) with normal BP in the office and correlate it with the alterations in the anthropometric and biochemical parameters (annual average of HbA1c,glomerular filtration rate, albuminuria).

**Methods:** retrospective descriptive observational study, included patients with diagnosis of DM1 of at least 1 year, with normal BP in the office, who performed the ABPM. Statistical analysis: Student's t-test or Mann-Whitney and Chi-square.

**Results:** 80 patients (F:36, M:44), mean age at the time of ABPM: 10.98 ± 2.23 years, median DM1 duration: 2.72 years(1.54,4.85), mean HbA1c: 8.54 ± 1.25. Ten percentage showed positive albuminuria, 26% had familiar history of HTN and 38.8% showed overweight. With the use of ABPM, alterations in BP were found in 92.5% of patients. 2.5% of the patients showed systolic and diastolic daytime HTN, 11.3%nocturnal systolic HTN and 13.8% nocturnal diastolic HTN. Pathological daytime systolic pressure load was detected in 8.8%, nocturnal in 31.3% and pathological daytime diastolic pressure load in 11.3% and nocturnal in 35%. The “non-dipper” pattern was found in 73.8% of patients for systolic BP and in 13.8% for diastolic BP. Significant differences were found in time of diabetes, it was longer in patients with pathological nocturnal pressure loads. Alterations were more frequent in patients who presented higher urinary excretion of albumin even within the normal range.

**Conclusions:** through the implementation of the study of BP by ABPM, a high prevalence of alterations. This suggests that ABPM could be a valuable resource of monitoring pediatric patients with DM1, and prevent cardiovascular and kidney complications.

**Background:** Non-alcoholic fatty liver disease (NAFLD) is increasingly recognized as a complication in type 1 diabetes (T1D). Recommended screening for NAFLD is serum or plasma ALT (alanine transaminase) levels, however a diagnostic threshold is not established. We investigated associations between changes in ALT levels, which may reflect early liver dysfunction, and retinal vascular caliber changes in adolescents with T1D.

**Methods:** A 3-year longitudinal study of 102 adolescents with T1D with ≥2 repeated retinal vascular caliber assessments and serum liver function tests (ALT, AST and GGT). Retinal vascular calibers from retinal photographs were assessed using the Singapore I Vessel Assessment (SIVA): “Standard zone” retinal vessel calibers were summarized as central retinal arteriolar (CRAE) and venular equivalents (CRVE); “extended zone” vessels (>two disc diameters from the optic disc margin) as mean width of arterioles and venules (MWa and MWv respectively). Associations between early changes in ALT levels and retinal vascular calibers were examined using generalized estimating equations, with putative cofactors: HbA1c, duration, BMI, systolic BP and triglycerides.

**Results:** At baseline mean ± SD age was 14.6 ± 1.9 yrs, HbA1c 8.2 ± 1.4%, BMI 23 ± 4.1 and median [IQR] duration 7.2 [4.8] yrs. There was a progressive increase in mean ALT over time: from 16.4 IU/L to 26.1 IU/L, p < 0.001. Higher ALT was consistently associated with wider central and extended zone retinal calibers (Table 1) but AST and GGT did not change and were not associated with retinal calibers.

**Conclusion:** Higher ALT levels are associated with wider retinal vascular calibers, higher BP and triglycerides. In adolescents with T1D and NAFLD, retinal vascular changes may reflect underlying systemic inflammation, endothelial dysfunction and oxidative stress in the diabetes milieu.

EP083 | **Retinal vascular calibers and changes in liver function tests in adolescents with type 1 diabetes**

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EP084 | **Growth of children and adolescents live with T1DM**

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**Background:** Linear growth that determines the adult height has been reported to be negatively correlating with mean HbA1c and duration of diabetes. However, other researchers could not correlate the HbA1c with any growth pattern.

	Univariate	p	Multivariate*	p
Mean Width of arterioles (MWa)	1.3(1.2,1.5)	<0.001	1.3(1.2,1.5)	<0.001
Mean Width of Venules (MWv)	1.2(1.1,1.4)	<0.001	1.2(1.1,1.37)	<0.001
Central Retinal arteriolar equivalent (CRAE)	1.1(1.1,1.2)	<0.001	1.2(1.1,1.3)	<0.001
Central Retinal Venular equivalent (CRVE)	1.1(1.1,1.2)	<0.001	1.1(1.1,1.2)	<0.001

Outcome - ALT; \*Model includes HbA1C, Duration, Systolic Blood pressure SDS, BMI and Triglyceride

[Table 1. Higher ALT (IU/L)level is associated with wider retinal vessel calibers]

**Objectives:** To describe the growth parameters of our cohort of patients with type 1 diabetes mellitus. Moreover, studying the correlation between mean HbA1c or duration of diabetes and growth.

**Methods:** Retrospective cross sectional study. The Data obtained from database of pediatric diabetes team at Sultan Qaboos University Hospital. Patients diagnosed with T1DM for more than a year and received care for the whole year (2019) were included. Transitioned patients or patients with other types of diabetes or having other diseases like thyroid or coeliac diseases were excluded.

**Results:** 105 (55 F) patients fulfilled the inclusion and exclusion criteria, aged between 2.8 to 17.3 years, mean  $\pm$  standard deviation (SD) was (11.7  $\pm$  2.9 years). Duration of diabetes for this cohort ranged between 1.2 to 12.6 years with median of 5.7 years. Median HbA1c was 9%, mean  $\pm$  SD (9.2  $\pm$  1.7%). Median of standard deviation score (SDS) (Mean  $\pm$  SD) of height, weight and BMI for the age were -0.37 (-0.6  $\pm$  1.34), -0.07 (-0.21  $\pm$  1.4) and 0.09 (0.21  $\pm$  1.2) SDS respectively. Correlation coefficients (R) between the duration of diabetes and height, weight and BMI were 0.1, 0.08 and 0.04. Correlation coefficients between median HbA1c and height, weight and BMI were 0.1, 0.1 and 0.03 respectively.

**Conclusion:** No correlation observed in this cohort of patients between their growth parameters and median HbA1c or their growth parameters and the duration of diabetes.

#### EP085 | Prevalence of coeliac disease in children with type 1 diabetes during and after the “Swedish epidemic of coeliac disease”

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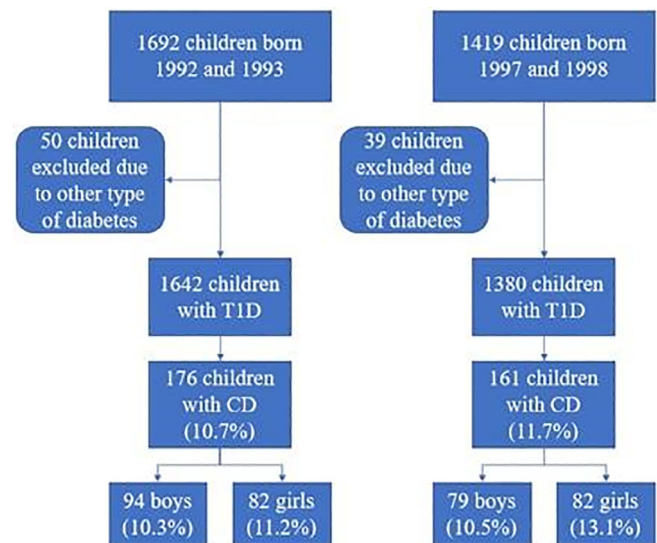
**Objectives:** Between 1986–1996 there was a fourfold increase of coeliac disease (CD) diagnosis in Sweden among young children, called the “Swedish epidemic of coeliac disease”. Children diagnosed with type 1 diabetes (T1D) have an increased risk to develop CD due to the shared linked to the HLA-alleles DQ2 and DQ8. Our aim was to investigate the prevalence of CD diagnosis in children with T1D born during and after “the epidemic”.

**Methods:** Two different birth cohorts were included, one born 1992–1993, during the “epidemic” (containing 1642 children), and one born 1997–1998, after the “epidemic” (containing 1380 children). Children diagnosed with T1D respectively CD were identified through merging five national registers.

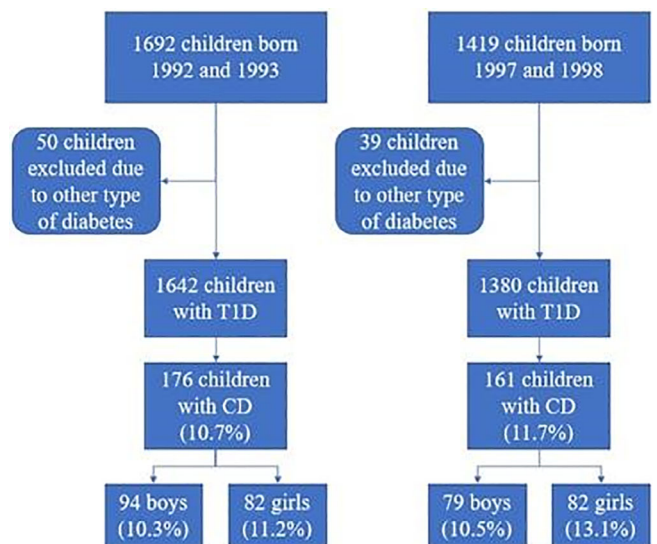
**Results:** In total 3022 children with T1D were included, with an overall CD prevalence of 11.1 (10.0–12.3 confidence interval (CI) 95%).

We found no significant disparity in CD prevalence among the two birth cohorts: 10.6% (9.2–12.2 CI 95%) in 1992–1993 birth cohort (n = 1642) versus 11.7% (10.0–13.5 CI 95%) in 1997–1998 birth cohort (n = 1380). Children in the later cohort were diagnosed with CD at a significant younger age (11.0 versus 9.4 years, p = 0.002).

**Conclusion:** The prevalence of CD did not differ among the cohorts even though it was altered in the general population. This supports a stronger genetic disposition in children who develop both T1D and CD, which may have overruled environmental factors. The younger age at CD diagnosis in the cohort born 1997–1998 may be due better diagnostic tools in this younger cohort.



[Selection of children < 17 years with type 1 diabetes during and after the “epidemic”].



[Selection of children < 17 years with type 1 diabetes during and after the “epidemic”]



EP087 | **Reducing severe hypoglycemia: a way forward for people with diabetes on insulin**

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**Objectives:** Examine glucagon use for those on insulin to determine potential to reduce severe hypoglycemia (SH) among adults and children with type 1 diabetes (T1D and T1Dk) and adults with type 2 diabetes on insulin (T2D).

**Methods:** 3642 adults and children on insulin were surveyed by dQ&A in on their use of glucagon and opinions on next-generation glucagon; 52% were adults with T1D, 42% were adults with T2D, and 6% were T1Dk. Response rate was 52%.

**Results:** Of those surveyed, T1D adults are most likely to have experienced SH (42%). This is significantly higher than the 15% of those with T2D and 8% of T1Dk with hypoglycemia experience. Of those who have experienced SH, 24% of adults with T1D and 45% of those with T2D on insulin have had a SH episode **within the last year**. The majority of adults with both T1D and T2D report **not having an emergency glucagon kit** with them when they experienced SH.

Regardless of hypoglycemia experience, the majority of those with T1D have emergency glucagon (64%), while only 11% of those with T2D on insulin own a kit.

Among adults who own emergency glucagon, over 20% have only **expired kits**. Regardless of SH experience, the majority of those with T1D have emergency glucagon (64%), while only 11% of those with T2D on insulin own a kit. In the car, at sleepovers, and at sports practice, kids with T1D would be more likely to always have glucagon with them if it is in nasal or pen form.

While traveling, kids with **T1D** would be more likely to always carry **nasal glucagon** than an injection kit.

Kids with **T1D** are most likely to **never** have glucagon with them in the car, at sleepovers, at sports practice, and while traveling if it is the standard injectable kit.

**Conclusions:** People with diabetes can be safer. Traditional glucagon owners are least likely to be extremely confident in their kit. More education and awareness about severe hypoglycemia is encouraged as well as better ways to address it, through nasal glucagon and glucagon pens.

EP088 | **Relation of sleep disorder among type 1 diabetic adolescent to insulin resistance and diabetic control**

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**Background:** Sleep is a complex, highly organized biological and behavioral process that is crucial for the body homeostasis. Disturbed

sleep pattern is associated with dys-regulation in glucose metabolism, insulin resistance and  $\beta$ -cell dysfunction. However, the effect of sleep disruption on type1 diabetes-mellitus(T1DM) have not been thoroughly explored.

**Aim:** To compare sleep architecture among T1DM adolescents and healthy controls, and correlate it to glycemic control and insulin resistance.

**Methodology:** Sixty adolescents with T1DM were compared to 60 matched healthy controls. Medical history included age of onset and duration of diabetes, type and dose of insulin therapy and history of chronic diabetic complications. Examination included anthropometric measurements with calculation of Z-score. Mean random blood glucose, fasting lipid profile and fraction-C of glycosylated hemoglobin(HbA1c%) were assessed with calculation of the insulin sensitivity score (ISS). Overnight polysomnography was done with analysis of sleep latency, continuity measures, sleep architecture, apnea hypopnea index(AHI) and periodic limb movement(PLM)index.

**Results:** Adolescents with T1DM having insulin resistance had significantly lower sleep efficiency ( $P < 0.001$ ) than those without insulin resistance and controls. Moreover, a significant positive correlation was found between ISS and sleep efficiency ( $P < 0.001$ ), with a significant negative correlation between ISS and stage 2 sleep ( $P = 0.022$ ) and PLM index ( $P = 0.004$ ). On the other hand, HbA1C% was positively correlated to sleep onset latency ( $P = 0.005$ ) and stage 2 sleep ( $P = 0.037$ ), and negatively correlated to sleep efficiency % and REM % ( $P < 0.001$  and  $P = 0.003$ , respectively).

**Conclusions:** Sleep disorders are common among children with T1DM. Sleep efficiency is negatively correlated with HbA1C and insulin resistance. Therefore, routine evaluation of sleep timing and symptoms of sleep disorders is recommended in children with T1DM.

EP089 | **Pediatric renal transplantation complicated by new onset diabetes after transplantation (NODAT)**

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**Background:** New Onset Diabetes After Transplantation (NODAT) is a serious metabolic complication of solid organ transplantation, that is associated with significant morbidity and increased mortality. It is less common in the pediatric population, but its reported incidence is rising. The diagnosis of NODAT may be delayed by a paucity of osmotic symptoms, particularly in children with a history of previous fluid restriction and adipsia. It has been suggested that NODAT is underdiagnosed and it is recommended that recipients of transplants have close monitoring for impaired glucose tolerance.

**Methods:** The case of a young girl who developed NODAT post renal transplantation is described.

**Results:** A 10 year old girl received a living related donor kidney transplant due to hemolytic uremic syndrome. She initially presented

6 months post-transplant, with glycosuria and a random blood glucose of 10.8 mmol/L (3.3–5.6). Ketones were negative. There was no history of impaired glucose tolerance pre-transplant and she had no convincing osmotic symptoms. Her paternal grandfather had Type 2 Diabetes and required insulin. Medications included prednisolone (5 mg on alternate days), mycophenolate mofetil and tacrolimus. An oral glucose tolerance test confirmed a diagnosis of diabetes; fasting blood glucose was 6.8 mmol/L (3.3–5.6), 2 hour post-prandial was 12.3 mmol/L, HbA1c was 52 mmol/mol (20–42), c-peptide was measurable at 392 pmol/L, insulin was 19.6 pmol/L (17.8–173), anti-GAD, IA2 and ZNT8 antibodies were negative. She was commenced on low dose insulin and achieved blood glucose control.

**Conclusions:** Increased awareness of NODAT in the pediatric population is necessary to expedite diagnosis and reduce the risk of complications arising from glucose impairment. The management of NODAT is challenging, as pharmacological therapies to prevent graft rejection and other treatments including growth hormone therapy may negatively impact glucose control.

#### EP090 | Adiponectin and lean mass in relation to endothelial function, arterial elasticity and arterial stiffness in 9-11-year-old-the ALSPAC study

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**Introduction:** It remains unknown how adiponectin relates to pre-clinical signs of atherosclerosis in childhood. The association of lean mass (LM) with arterial function and structure is conflicting.

**Objective:** To examine the associations of adiponectin and LM with endothelial function, arterial elasticity and arterial stiffness in children.

**Methods:** We studied 5566 children (51% girls) aged 9–11 years. Total plasma adiponectin was determined by enzyme assay; LM was assessed by dual-energy X-ray absorptiometry; brachial artery endothelial function determined using flow-mediated dilation (FMD), expressed as percentage change in diameter from baseline after reactive hyperemia; arterial elasticity as distensibility coefficient (DC) expressed in mean percentage change in cross-sectional area relative to blood pressure (BP); arterial stiffness by carotid to radial pulse wave velocity (PWV). We conducted multivariable linear regressions adjusted for age, sex, total fat mass, pubertal status, brachial artery diameter, systolic BP, low density lipoprotein cholesterol, mother's social-economic class and time (years) between measurement of predictors and outcomes.

**Results:** Adiponectin was not related to FMD and DC. Adiponectin was directly associated with PWV ( $\beta = 0.10$ , 95% confidence interval [CI] 0.012–0.189,  $p = 0.026$ ) when adjusted for age and sex but was statistically non-significant with adjustments for other covariates. LM was directly related to FMD ( $\beta = 0.047$ , [0.011–0.084],  $p = 0.011$ ) and

DC ( $\beta = 0.009$ , [0.004–0.014],  $p = 0.001$ ) after adjusting for all covariates. LM was inversely associated with PWV ( $\beta = -0.040$ , [–0.051 – –0.030],  $p < 0.0001$ ) when adjusted for age and sex but was statistically non-significant after adjustment for other covariates.

**Conclusion:** Among children, adiponectin was not related to arterial function and structure. However, LM was directly associated with endothelial function and arterial elasticity, independent of adiposity, but not with arterial stiffness.

#### EP091 | Glycated albumin as early detection of hyperglycemia in children aged 9–18 years old with thalassemia- $\beta$ major

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**Introduction:** Hyperglycemia is one of the most common endocrine complications in children with thalassemia- $\beta$  major. The exact mechanism of how hyperglycemia condition develops in patients with thalassemia- $\beta$  major is still controversial. Also, a monitoring marker for glycemic control in patients with thalassemia is still being debated. Glycated albumin (GA) is a quick and easy alternative for hyperglycemia detection and monitoring glycemic control.

**Aim:** This study analyzes the value of GA as an alternative screening test for detection of prediabetes and diabetes mellitus in children with thalassemia- $\beta$  major, as determined by oral glucose tolerance test (OGTT) as the gold standard.

**Method:** A single-blinded prospective diagnostic test in children with thalassemia- $\beta$  major aged 9–18 years old who were treated at RSUD dr. Moewardi Surakarta from 1 October 2018 to 31 December 2019. Patients who met the inclusion criteria were examined for fasting blood glucose, OGTT, and glycated albumin. The area under curve receiver operating characteristic (ROC-AUC) is used to determine the cut-off value to predict hyperglycemia (OGTT >140 mg / dL) with optimal sensitivity and specificity.

**Result:** There were 53 children with thalassemia- $\beta$  major included (female 56.6%, median age 12 [9–17 years], stunted 56.6%, duration of transfusion longer than 5 years 60.4%, deferasirox 77.4%, mean ferritin  $3831.15 \pm 2225.78$  ng/mL, pretransfusion HB less than 9 mg/dL 60.4%). Based on the OGTT value, there is 1 child (1.9%) with diabetes mellitus and 4 children (7.5%) with prediabetes. The median GA value in this study is 10.9% (min-max, 7.6%–12.4%). GA has a low AUC (0.646,  $p = 0.287$ ), for detecting hyperglycemia in pediatric patients with thalassemia- $\beta$  major. At a cut off 11.45%, GA had 60% sensitivity, 60.4% specificity, 13.6%.

**Conclusion:** The GA value cannot be used as an alternative for the detection of hyperglycemia in children with thalassemia- $\beta$  major.

### EP092 | Cystic fibrosis related diabetes: Case series from a tertiary care center in North India

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**Objective:** To study the clinical profile of children with Cystic Fibrosis Related Diabetes (CFRD) at a tertiary care Pediatrics hospital in northern India.

**Methods:** Medical records of children with Cystic fibrosis (CF) attending the Pediatric Pulmonology services were assessed retrospectively to identify children with CFRD. Screening for CFRD done with oral glucose tolerance test (OGTT), plasma HbA1c, and fasting C-peptide levels.

**Results:** Seventeen children (mean age 8.9 years; M: F-10:7) with CF were screened for CFRD. Three patients had abnormal OGTT. However, HbA1c > 6.5% percent in 5 (3 males) patients and thus diagnosed with CFRD. Four patients were diagnosed with CF in their infancy and CFRD was diagnosed at 3.5 years in one. Patients with CFRD were started on basal bolus insulin regimen. Titration of insulin dose was done as per self-monitoring of blood glucose. The treatment of CF was continued as per standard guidelines and antibiotics given to treat organisms isolated. All patients with CFRD had pseudomonas colonization and increased IgE levels. Mutations for CF were positive in three patients and sweat chloride test was positive in all five patients. Three patients died after prolonged and multiple hospitalizations due to repeated exacerbations of CF, prolonged oxygen requirement and complications arising due to CF within two years of diagnosis of CFRD, whereas one patient was lost to follow up. Two patients continue to be in follow-up with frequent respiratory exacerbations.

**Conclusions:** The management of CFRD is complex and challenging as hyperglycemia is a risk factor which exacerbates bacterial colonization. CFRD may worsen the CF progression and impacts the survival of affected patients. As two of our patients were diagnosed before

10 years of age, we may have to start screening for CFRD by OGTT and HbA1c earlier than 10 years.

### EP093 | Transient renal tubular acidosis in a patient of type 1 diabetes mellitus

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A 16-year-old female adolescent with previously well controlled Type 1 diabetes mellitus for the last 8 years was admitted with abdominal pain and high blood glucose. On further evaluation, she was found to have severe metabolic acidosis (pH 6.9, HCO<sub>3</sub><sup>-</sup> 5 mEq/L, potassium; 2.6 mmol/L) with marked ketonuria +++. The patient was diagnosed as diabetic ketoacidosis (DKA) was given Intravenous fluids followed by insulin drip, bicarbonate compensation and potassium replacement for several days. However, metabolic acidosis persists with marked low serum bicarbonate and hypokalemia. The patient was considered a case of refractory DKA and was reassessed. Urinary pH was alkaline so renal tubular acidosis (RTA) was diagnosed and patient was managed by alkali and potassium replacement till pH became 7.4, HCO<sub>3</sub><sup>-</sup> 18.4 mEq/L. The patient was discharged and followed up by pediatric nephrologist and has improved completely after 2 months when her pH become 7.35, HCO<sub>3</sub><sup>-</sup> 22 mEq/L, potassium 4.7 mmol/L and has stopped alkali completely but maintained on oral potassium replacement. The association of transient RTA with Type 1 diabetes mellitus has been rarely reported in the literature. This association needs special attention as the management of DKA in such cases is difficult.

### EP094 | Glucose homeostasis in transfusion dependent hematological disorders

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Parameters	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
Age at Dx of CF /CFRD (years)	16/20	1/7.5	0.5/12	1/12	0.5/3.5
Hospitalizations/year (Acute respiratory exacerbations)	3	4	4	3	3
FEV1/FVC	0.4	0.54	0.46	0.61	Not done
HbA1c (gm%)	6.6	8	7.2	7.1	6.8
Fasting C-peptide (ng/ml)	0.6	0.3	0.7	0.5	0.9
Insulin dose required (U/Kg/Day)	0.3	0.5	0.2	0.3	0.2
Osmotic Symptoms	+	+	none	none	none
BMI Z score at Diagnosis of CFRD	-4.8	-4.99	-3.9	-4.74	-0.49
OGTT (O/1//2 hours sugars; mg/dl)	81/190/101	120/170/276	84/236/211	114/168/230	122/128/136

[Table 1. Clinical and Lab Profile of children at diagnosis of CFRD (n = 5)].

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**Objectives:** Impaired Glucose homeostasis and diabetes are known consequences of iron overload in patients with transfusion-dependent hematological disorders (TDHD). There is a lack of consensus regarding the role of oral glucose tolerance test (OGTT) as a screening tool in the pediatric population with TDHD. We evaluated the prevalence and factors associated with abnormal glucose homeostasis in adolescents with TDHD.

**Methods:** Retrospective chart review of 43 youth (23 males) with TDHD from 1989 to 2020. Those who did not receive monthly transfusions or had undergone bone marrow transplant were excluded. Impaired fasting glucose (IFG), impaired glucose tolerance (IGT) at 120 mins and diabetes were defined according to American Diabetes Association (ADA) criteria. The relationship between fasting blood glucose (FBG) and 2-hr blood glucose (BG) was analyzed using multivariable generalized estimating equations (GEE); explanatory variables examined were transfusion duration, serum ferritin, hematological diagnosis, gender, ethnicity, chelation therapy, family history of diabetes, body mass index, growth hormone therapy, and pubertal stage.

**Results:** A total of 168 OGTTs were performed. Mean ( $\pm$  SD) age at last visit was  $19 \pm 4.4$  years. IFG was present in 38% of tests, IGT in 8% and 1% ( $n = 1$  patient) in the diabetic range. Using GEE, FBG was associated with the diagnosis of B-Thalassemia major (0.219, 95% CI,  $p = 0.005$ ), transfusion duration (0.028, 95% CI,  $p = 0.01$ ), mean ferritin level (0.00, 95% CI,  $p = 0.025$ ), fasting insulin level (0.002, 95% CI,  $p = 0.018$ ) and 2-hr BG (0.197, 95% CI,  $p < 0.001$ ). 2-hr BG was only associated with a family history of diabetes ( $-0.837$ , 95% CI,  $p = 0.002$ ).

**Conclusion:** Youth with TDHD have a high prevalence of IFG, while IGT is less common. Our findings suggest OGTTs may be useful for detecting IFG and IGT in youth with beta thalassemia, particularly with prolonged transfusion duration, high ferritin levels and family history of Diabetes.

#### EP095 | Hyperglycemic emergencies in Down's syndrome

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**Introduction:** Patients with Down syndrome (DS) have an increased risk of developing autoimmune diabetes mellitus. This is a rare series of 2 cases of adolescent patients with DS with an initial clinical profile of diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic non-ketotic syndrome (HHNK).

**Case presentation:** First case: 13 year old girl, with history of delayed motor, social and language milestones, studying in 4th standard, presented with polyuria, polydipsia for 15 days followed by vomiting and breathlessness, in our hospital. She was conscious but dehydrated with phenotype suggestive of DS. Investigations revealed blood sugar: 628 mg/dL, pH:6.9, HCO<sub>3</sub>:3.4 mmol/L, urine ketones (3+). In addition

her TSH was 16 mIU/ml, TPO Ab and GAD-65 strongly positive and karyotype revealed trisomy 21. She was managed as DKA according to hospital protocol. She presented with one more episode of DKA 1 year later.

Second case: 17 year old male, with history of delayed achievement of milestones and subnormal intelligence, presented with multiple boils over thighs and buttocks off and on, and fever and altered sensorium for 2 days. Examination revealed patient in altered sensorium (GCS = 11/15), hemodynamically stable, presence of acanthosis Nigricans, skin tags, flat occiput, and wide space between 1st and 2nd toes. Investigations revealed severe hyperglycemia (blood sugar 1294 mg/dL), pH = 7.22, HCO<sub>3</sub> = 18 mmol/L, Na = 154 meq/L, urea = 156 mg/dL and creatinine = 3.1 mg/dL, urine ketones absent and calculated serum osmolality of 412 mosm/l. He was managed as HHNK with insulin infusion, i.v. fluids and antibiotics. Karyotype revealed trisomy 21, GAD-65 antibody were negative. Presently he is on metformin and two doses of mixed split insulin.

**Conclusions:** This case series highlights the importance of monitoring possible autoimmune as well as non-autoimmune diabetes mellitus in patients with DS, since the risk of developing them is 4.2 times higher than in the general population.

#### EP096 | Type 1 diabetes in a limited resource context:

Challenges and management: DOST Model in Kota, Southern Rajasthan India

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**Objective:** Diabetes Organization Supporting Type-1 Diabetic Children (DOST) is a charitable organization that offers free insulin, education and healthcare to children and youth with type 1 diabetes (T1D) in Southern part of Rajasthan, India. Rajasthan has an overall literacy rate of 67% and the country's lowest female literacy rate (52.66%), according to Census 2011. We systematically describe DOST Model of care and evaluate medical and socio demographic factors influencing anthropometric measurement and glycemic control in this resource-poor setting.

**Methods:** Study of DOST Model patients diagnosed with Type 1 Diabetes Mellitus conducted from December 2018 to December 2019. Participants completed an interview, retrospective chart review and prospective hemoglobin A1c (HbA1c) measurements.

**Results:** A total of 183 T1D patients (54% female and 46% male) completed the interview and chart review. Median duration of Diabetes was 4.7 years and total dose of Insulin (units per day) 20.84. The mean weight (kg), mean height (cms), mean head circumference (cms), mean

chest circumference (cms), mean upper arm circumference (cms) and mean BMI (kg/m<sup>2</sup>) for the male subjects were 35.1 kg,142.4 cms, 52.7 cms, 66.6 cms, 21.0 cms, and 15.9 kg/m<sup>2</sup> respectively and in female subjects were 34.9 kg, 140.8 cms, 52.4 cms, 67.9 cms, 21.4 cms, and 17.0 kg/m<sup>2</sup> respectively. Median HbA1c was 9.6 Clinical examinations revealed that about 70% of patients were having signs of malnutrition. However, the psychosocial burden of T1D (expressed as concern about others learning about the diagnosis, and worry about the future), and experience of stigma were substantial.

**Conclusions:** The DOST charitable program overcomes, gender inequalities, social status and experience of social stigma to provide life-saving treatment to children with T1D in Southern part of Rajasthan, India. However Glycemic control remains inadequate and children living in extreme poverty are most at risk.

EP097 | **To assess the knowledge and perceptions of type 1 diabetes (T1D) among Université de La Reunion students in Reunion Island**

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To assess the knowledge and perceptions of Type 1 Diabetes (T1D) among students attending the Université de La Reunion.

**Methods:** An online questionnaire was used. Participants answered questions pertaining to perceptions by choosing whether they strongly agree, agree, neutral, disagree or strongly disagree.

Data collected were analyzed on Epi Info TM and analyzed.

**Results:** Overall, 265 students (59 males and 206 females) participated in the study. Mean age 20.1 years (18–40). The students were from different departments (Agriculture 0.0%, Health science and Social Studies 18.1%, Law and Management 26.8%, Science

Technology 25.7%, Language and Art 21.5%, Engineering 0.0%, Social Studies and Humanities 0.0% and others 7.9%).

54.7% acquainted knowing someone diagnosed with T1D. 38.1% responded that the cause of T1D was unknown (61.5% excess sugar and 29.1% lack of exercise). 95.5% did not consider that T1D is contagious. Most of the participant responded that the disease will last for a lifetime (86.8%). 66.0% responded that T1D can be prevented and that the treatment is as follows (insulin 66%, nutritional support 60.0%, physical exercise 49.00%, psychological support 38.5%, therapeutic education 26.8% and others 2.0%). Furthermore, 82.8% consider the treatment will last for a life time.

Perceptions on T1D (not the right to eat sweet foods, not the right to take specific career opportunities, a serious health problem, will have dialysis or amputation, have a shorter lifespan, cannot have children, will have good academic results, can stop insulin and insulin injection in public) were illustrated in the Figure 1.

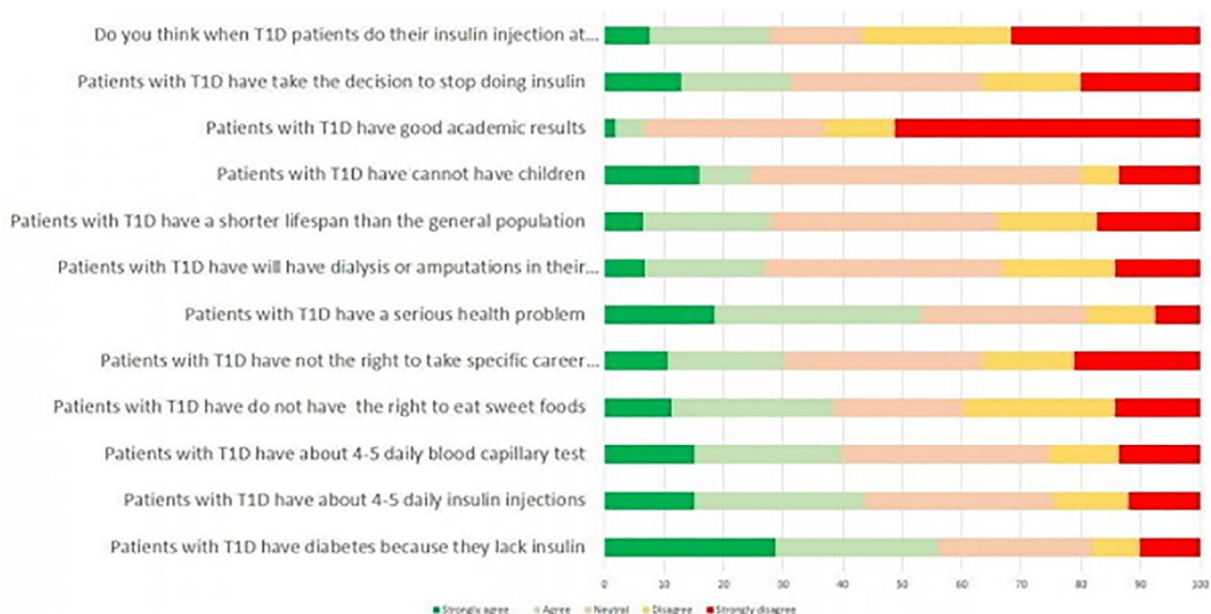
**Conclusions:** Our study revealed that despite national campaign on diabetes, the participants' level of T1D-related knowledge was not adequate. More campaigns must be carried out to enhance health-related knowledge in students to remove misconceptions on T1D.

EP098 | **Evaluation of early home education for families and social network related to children with newly diagnosed type-1-diabetes**

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**Introduction:** In a pediatric diabetes unit in Denmark, all families of children with newly diagnosed T1D are offered a diabetes education



[Figure 1 showing the perception on Type 1 Diabetes]

visit in their home from the diabetologist and dietician. The family can include social network like grandparents and friends. However, little is known about the value of this type of intervention.

**Objective:** To evaluate the participants' perceived need for and experiences with home education.

**Method:** We conducted five focus group interviews with 21 home education attendants (children with T1D 1–15 years), two individual interviews with the home education team, and two telephone interviews with families who had declined home education. Focus group and team member interviews were transcribed verbatim. We analyzed interviews using content analysis.

**Results:** The focus group described that the social network have a number of prejudices and misconceptions about T1D. Lack of knowledge among social network, adhere to the anxiety of *doing something wrong* in relation to diabetes care. Parents experience a lot of obstacles in the attempt to educate the social network about diabetes care and feel relieved when health professionals take over education. The social network reports that home education increases knowledge about diabetes and how to take care of the child with T1D; hereby, empowering the network and offers a way to strengthen and maintain close social relations for the child in the first period after diagnosis. It is also clear that future home education could put more emphasis on the participation of the child with diabetes, their friends and siblings.

**Conclusion:** Existing prejudices and lack of knowledge among the social network of children with T1D leads to insecurity for all parties

involved. Home education improves knowledge and feeling of security concerning diabetes care among family and social network, with the potential to strengthen and maintain close social relations in the first period after diagnosis.

EP099 | Improving care for high-risk patients: Lessons from the T1D Exchange Quality Improvement Collaborative (T1DX-QI)

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**Introduction:** The T1DX-QI is a Type 1 diabetes learning health system with thirteen endocrinology centers working collaboratively on the goal of improving outcomes for people with type 1 diabetes. The program is coordinated by the T1D Exchange in Boston, Massachusetts.

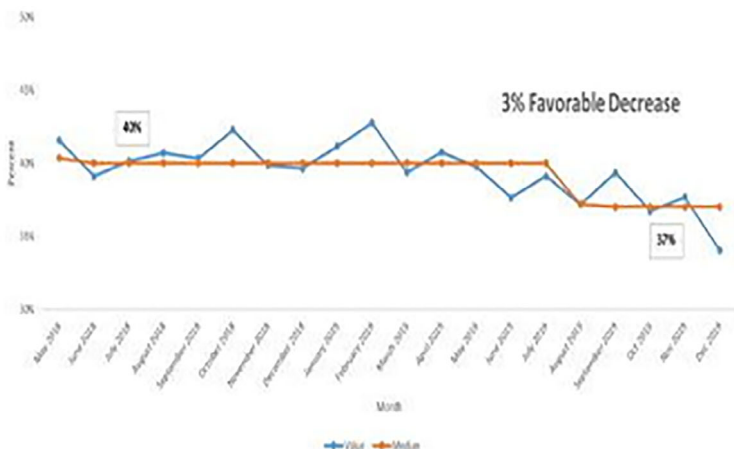
**Objectives:** For this project, “high-risk” is defined as having the two most recent HbA1c above 9% and at least two clinic visits in the preceding 12 months. There is an increased risk of acute and chronic

Percent of High-Risk Patients (12 – 26 Years)

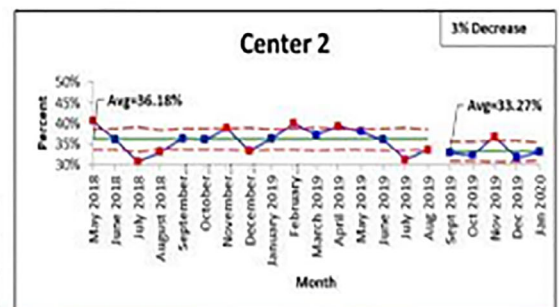
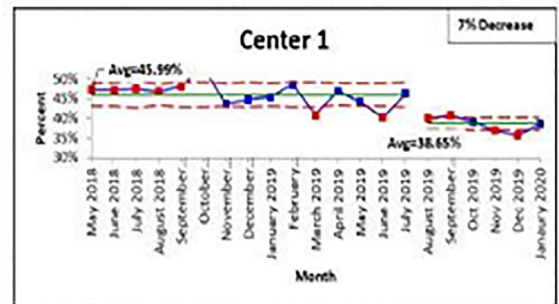
Charts Favorable direction



Collaborative-wide Run Chart



Control Chart Examples (P – Chart)



	May 18	Jun 18	Jul 18	Aug 18	Sep 18	Oct 18	Nov 18	Dec 18	Jan 19	Feb 19	Mar 19	Apr 19	May 19	Jun 19	Jul 19	Aug 19	Sep 19	Oct 19	Nov 19	Dec 19
Cases	2335	2144	1923	2688	2944	2256	2143	2112	2211	1876	2989	2674	2331	2935	1849	2173	2003	2063	1723	2804
Visits	982	833	772	1094	784	953	854	837	920	802	783	845	847	721	782	808	788	739	649	625



[Figure 1 High Risk Improvement Charts].

complications among high-risk patients. Social, racial, and economic factors significantly contribute to further complicate the difficulty in reducing HbA1c levels among these patients.

This abstract describes how ten centers in the T1DX-QI used QI principles to test and expand different interventions in their clinic to reduce the proportion of high-risk patients. Some of the successful efforts include the increased engagement with a navigator, workflow redesign, developed mobile technology classes for insulin pump and CGM use, screening for depression, and addressing social determinants of health.

**Methods:** The centers shared data monthly with the coordinating office that used statistical process control charts to evaluate the effectiveness of the interventions (Figure 1).

**Results:** There was a collaborative-wide significant change of 3% from baseline. Six of ten centers met the collaborative goal of 35% that directly impacts over 200 patients in the piloted 12–26 year age group.

**Conclusion:** Quality Improvement principles are an effective set of tools to improve outcomes for high risk patients.

EP100 | Care empowerment peace of mind (CEPOM): A biopsychosocial approach project for people living with type 1 diabetes in Mauritius

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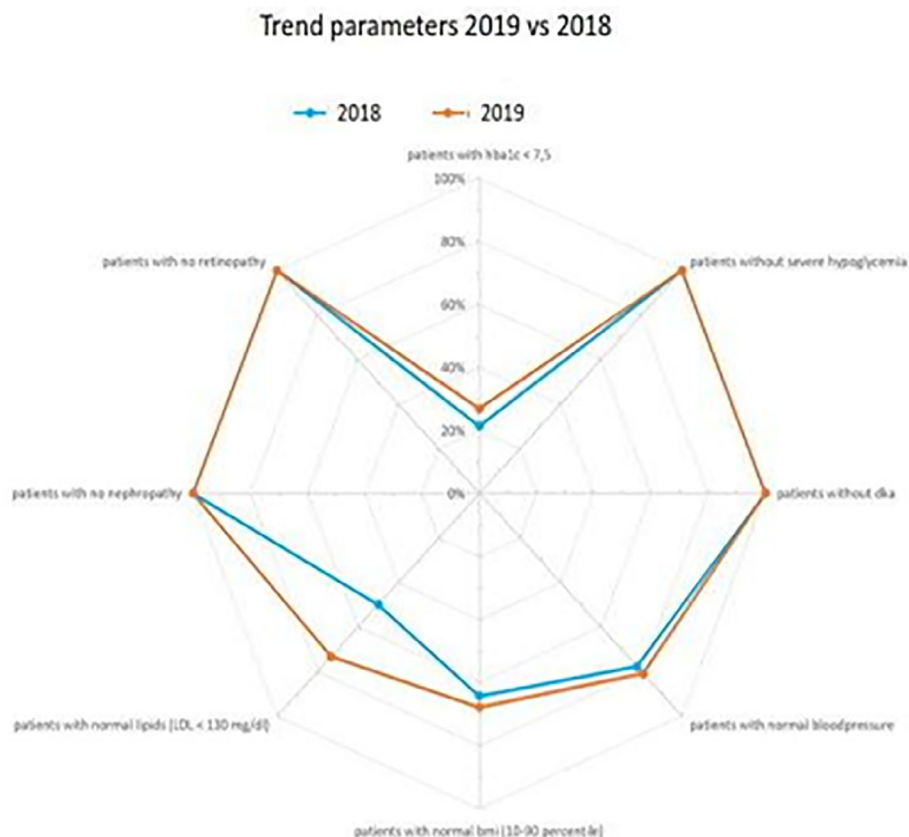
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T1Diams, a non-profit organization (NPO) based in Mauritius, committed to providing care and support in the self-management of Type 1 Diabetes (T1DM) Bio-psychosocial (BPS) lenses in providing care emphasizing on aspects Biological, Psychological and Social factor rendering support therapeutic.

Previous multi-disciplinary influenced project has brought positive results. CEPOM laid emphasis on the BPS as a synergy in every contact with its beneficiaries whilst working therapeutically in empowering individual in self-managing their T1DM. The rationale for this study is to provide findings on CEPOM project.

**Methods:** In 2019, participants were beneficiaries having HbA1C > 7.5% and experiencing psychosocial issues impeding their adherence to treatment. Monthly BPS thermalized sessions i.e. Therapeutic Education (TE) and Psychosocial reviews both during Home visits, office appointment and community activities involving parents with community connectivity using social media. Moreover, routine consultation with eye specialist, a medical practitioner, a dietician was included. Beneficiaries were informed about the aim and purpose of CEPOM to which they agreed. Therefore, staff and beneficiaries agreed on the goal treatment individually. All data recorded ethically.

**Results:** 108 (60.6% female) was involved with a mean age of 18.22 +/- 1.41 years. All of them had follow up session with the



[Figure 1 showing the pattern trend between 2018 and 2019]

multidisciplinary team. Mean HbA1c was lower in 2019 (7.51%, 58.6 mmol/mol) vs. 2018 (10.%, 58.9 mmol/mol).

**Conclusion:** This study has shown that T1DM is better cared for and understood when care acknowledge psychosocial realities. Thus multi-disciplinary support in holistic care. With recurrent BPS care, there is a positive outcome of metabolic control and attitudes towards self-care. This study lays the foundation for the second phase of the project.

#### EP101 | Pediatric Diabetes School: A new way of delivering structured education

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**Objective:** Structured education is important part of diabetes care. Our team previously ran four short educational workshops across the year (covering carbohydrate counting, diabetes management and transitions to secondary school). However, despite positive feedback about the sessions, we experienced poor attendance. We wanted to rethink our way of delivering our diabetes education sessions in order to improve attendance, and improve our young people's relationship towards their diabetes.

**Methods:** We piloted two 'Diabetes School' days, for ages 9–11 years (last years of primary school) and 12–14 years (secondary school). These were age-appropriate, day long sessions, combining our previous workshops and adding in additional topics. The days covered physiology, diabetes management, nutrition, exercise and emotional wellbeing. Educational games and fun activities were incorporated within each session. The team changed their approach by emphasizing the importance of the session as part of routine care, regularly throughout the year. We also ran the sessions during school hours, with consent from school teachers.

**Results:** There was an improvement in attendance in this new format, with 38 young people attending the two 'diabetes school' sessions in 2019, compared to our previous yearly average of 17 young people attending the previous four structured education workshops. Spending the entire school day with other young people with diabetes appeared to be a very positive experience of the young people which was reflected in their feedback, and they reported having a positive change to their diabetes outlook afterwards.

**Conclusions:** The changes we made to our structure education program has a positive effect on young people's attendance at session. Their feedback showed that young people enjoyed learning in the larger group setting, meeting other children with diabetes, perhaps as this normalized Diabetes care.

#### EP102 | Source of information on reproductive health (RH) knowledge in young women with type 1 diabetes (T1D): Comparing Chile to USA

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**Introduction:** Prevention of unplanned pregnancy is an important aspect in caring for young women with T1D to prevent complications. The health team has an important role providing education and pre-conception counseling (PC) to these patients; however, the patients' source of RH information is not clear.

**Objectives:** To report the primary sources of reproductive information in young women with T1D in a clinic in Chile and in USA.

**Methods:** We recruited young women (age = 18–25 years, n = 79) with T1D from Santiago, Chile (n = 43) and Pittsburgh, USA (n = 36), who completed a written standardized questionnaire that asked about primary sources of information for RH. They chose all that applied. Results are shown as proportion of the total responded that reported a source as relevant. Statistical analysis used  $\chi^2$  test.

**Results:** The proportion of the source of the primary RH differed in Chile and USA. Young women from USA selected their health team (69.4%) as a primary source, unlike the Chilean women who rarely obtain this knowledge from the team (18.6%) ( $p < 0.001$ ). More Chilean than American women considered formal sexual education (48.8 vs 6%;  $p < 0.001$ ) and friends (30.2 vs 0%;  $p < 0.001$ ) as the primary source. Parents were considered an important source of information in one third of the young women in both groups. Internet, sibling and sexual partner were little considered in both groups.

**Conclusions:** Young women with T1D from Chile and the USA differ in their sources for RH/PC information related to their diabetes. While the health team was the primary source for RH/PC education for the young women in the USA, health care professionals in Chile could increase their efforts to improve RH/PC education within this group. Since both groups indicated parental communication as a source of information for RH/PC, exploring the development of evidence based RH/PC programs for parental delivery to the young women with T1D is warranted. (FONDECYT Grant 1,170,895)

#### EP103 | Engaging stakeholders: Can we measure the impact on pediatric diabetes research?

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**Objectives:** Stakeholder engagement (SE) research is an emerging field, and the impact in pediatric diabetes research is not well described. We evaluated the processes and outcomes of SE occurring in parallel to a qualitative study exploring school nurse perspectives of modern diabetes devices in the school setting.

**Methods:** We recruited parents of children with type 1 diabetes who use devices (n = 2), school nurses (n = 2), and diabetes providers (n = 3) through personal networks to garner input on research materials (e.g. interview guide), interpret findings, and plan for future research. Stakeholders convened virtually every 2–3 months for 2 years and were surveyed midway and at completion of the study about their experience. A log of suggestions was recorded at each meeting. Research efficiency (time to publication) and value (acceptance by school nursing organizations) were reported.

**Results:** Each role was represented and contributed input at every meeting. Five (71%) and 6 (86%) of 7 stakeholders completed the survey at midway and end of study, respectively. At both times, 100% of those surveyed indicated that they had received all the information they wished about the research, were able to provide all desired feedback, and felt the research team responded to feedback. Stakeholders were satisfied with meeting frequency. Participants described their role as “consultant” or “stakeholder,” appreciated learning from others' perspectives, and expressed enthusiasm for continued participation in research. SE resulted in 5 additional questions to the interview guide. Close to 70 comments were provided in discussion and interpretation of emerging and major themes from the research. Time to publication was 12 months following the first interview, and findings were recognized by two local school nursing organizations.

**Conclusions:** A systematic approach to conducting, evaluating, and reporting SE in pediatric diabetes studies can strengthen patient-centered outcomes research.

#### EP104 | Innovative pedagogical methods of delivering regular pediatrics online education within a hospital setting during COVID-19 pandemic

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**Introduction:** The current COVID19 pandemic has resulted in significant disruption to hospital-based teaching as social distancing measures have placed us in a challenging position where education can no longer occur conventionally. Innovative pedagogical methods such as webinars, virtual simulations, webcasting and online chatrooms are growing rapidly within medical education.

**Methods:** PADLET is an online virtual learning platform that allows students and teachers to collaborate, reflect, share links, videos and presentations within a secure location. MS Teams is a chat-based

collaboration platform that allows document sharing and online meetings. The aim of this study was to assess the feedback on feasibility and impact of effectiveness via a survey with all participants involved in using PADLET and MS Teams.

**Results:** A total of 52 PADLET and MS Team sessions were held between 1st March 2020 to 20th June 2020. Responses were received from 30 members of the pediatric clinical team. 11 Consultants; 6 GP trainees; 5 pediatric trainees; 4 APNPs, 1 foundation trainee; 1 clinical fellow; 1 physician associate and 1 ED trainee. 96% surveyed found both the PADLET and MS Teams easy to use. The main benefit of the sessions were ability to access education remotely either whilst shielding, at home or when in hospital due to rota patterns. Technical difficulties e.g. poor audio and lack of social interactions were the most commonly stated disadvantages. 86% of those surveyed accessed PADLET and MS Teams for education and learning with 47% accessing for CPD education points. 30% also accessed the material for guidance on a specific topic.

**Conclusions:** PADLET and MS Teams are shown to be effective in mitigating the disruption of pediatric education due to COVID19 pandemic. Online and virtual learning technologies may provide a solution to current challenges faced in the era of COVID19 and should be considered as an educational strategy transferable to all medical disciplines.

#### EP105 | Health care provider perspectives to inform a gestational diabetes risk reduction and preconception counseling program for at-risk native Hawaiian adolescents

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**Objectives:** Gestational diabetes (GDM) is associated with severe complications for both mother and baby and is a significant risk factor for both later developing type 2 diabetes. Indigenous women have greater risk of developing GDM than non-Hispanic white women. Yet no evidence-based programs exist to reduce GDM risk among high risk Native Hawaiian (NH) adolescents. We examined perspectives of health care providers (HCP) who care for NH adolescents to inform the cultural transformation of an existing American Indian and Alaska Native GDM risk reduction and preconception counseling program, Stopping GDM, for NH adolescents.

**Methods:** Hawaiian-based HCP (registered dietitians, nurses, and physicians [OB/GYNs, pediatricians]) (n = 14) who care for NH adolescent females participated in a series of focus groups using Zoom technology. Our trained qualitative researcher used a semi-structured moderator guide with probes to understand HCP experiences caring for NH adolescents and providing them with family planning, and HCP perspectives regarding GDM risk reduction, GDM resources, gaps in GDM resources for at-risk NH adolescents. Focus groups were recorded, transcribed verbatim, and analyzed by two qualitative researchers using the constant-comparison coding method.

**Results:** Key themes include:

- 1) importance of multi-generational family involvement and support in a successful GDM risk reduction program for NH adolescents;
- 2) need to address social determinants of health (i.e., food insecurity) in a GDM risk reduction program;
- 3) vast gaps in existing GDM risk reduction and preconception counseling resources and practices among Hawaiian HCP;
- 4) key strategies and recommendations to engage, recruit, and retain adolescents in a health-related education program.

**Conclusions:** Findings will inform the cultural transformation of Stopping GDM into a more holistic, family and strength-based intervention that fosters empowerment and builds on the resilience of Indigenous communities.

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**EP106 | ECHO model for type 1 diabetes (T1D) in Latin America: an Ecuadorian experience during COVID-19**

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**Objectives:** Morbidity and mortality due to T1D in Ecuador is unacceptable. Underlying factors for this inconvenient truth include the lack of diabetes specialists, the lack of focus on diabetes management in medical education, and the lack of confidence among primary care providers (PCPs) in managing T1D. In this context, UTE collaborated with Stanford University to implement a Project ECHO<sup>®</sup> (Extension for Community Healthcare Outcomes) model for T1D in Ecuador. The goal was to empower PCPs in Ecuador to provide enhanced T1D care management in the primary care setting in the context of limited resources.

**Methods:** Using the ECHO hub-and-spoke model and Zoom platform, we recruited and trained 55 spokes from 8 different primary care centers affiliated with the largest Ecuadorian public health system, Instituto Ecuatoriano de Seguridad Social (IESS). Participation was free and included pediatricians, family doctors, internists, psychologists, nurses, social workers, nutritionists, and laboratory workers. UTE served as the coordinating hub site, and faculty consisted of adult and pediatric endocrinologists, diabetes educators, behavior health specialists, nutritionists, and community support representatives from diabetes associations.

**Results:** The program launched in December 2019, and spoke attendance rates were 75% during the first trimester of 2020. Then, in March, attendance fell to 20% due to COVID-19, and the program went on hiatus. The program was resumed with increased attendance in June after pivoting to address diabetes concerns related to COVID-19.

**Conclusions:** This program marks the first implementation of an ECHO T1D program outside of the US. Our program is a proof-of-concept for implementation of the model in both a middle-income and Latin American country. The model is a tool to reach medically

vulnerable and underserved patients with T1D who would not otherwise have access to diabetes specialists.

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**EP107 | Parental experience and opinion on the delivery of care for the children and young people with a dual diagnosis of type 1 diabetes and coeliac disease**

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**Introduction:** A common link between the dual diagnosis (DD) of type1 diabetes (T1D) and coeliac disease (CD) is the autoimmune pathophysiology. The successful outcome of DD requires life-long adherence to dietary management and close cooperation between the carers and healthcare professionals.

**Objectives:** This single-center study evaluated the efficiency of the existing service for children with DD and also explored the key recommendations to improve the management of children with DD.

**Methods:** This project used the 'Participatory Action Research' model combined with an interpretative phenomenological analysis of the data collected through the focus group discussion involving 11 participants (five parents and six healthcare professionals). The focus group discussed the difficulties in managing the children with DD and how to improve the service delivery to meet the need of these children.

**Results:** The results highlighted that the current model of care, education and support for T1D was better structured compared to a bit fragmented service for CD. The families with early life DD cope better compared to older age at diagnosis. Most parents report full control and a better understanding of T1D. However, lack of parental control outside the home environment, poor understanding of CD in the general population & unknown long-term adverse effects of unsuspected gluten contamination were major factors contributing to parental anxiety. The focus group suggested more peer group support, personalized dietetic education for CD and universal availability of subsidized low-cost gluten-free food to improve the quality of care for children with DD.

**Conclusions:** The current service model for the children with DD was better equipped to deal with the management of T1D compared to CD. The parents were mainly anxious about effective CD management. We concluded that a robust model to improve the quality of care and support for CD alongside T1D for children with DD was strongly recommended.

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**EP108 | Relationship between parent resilience and negative emotions and adolescent glycemic control in type 1 diabetes**

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Block 1 R2 = 0.033*	$\beta$	t	P value
Parental diabetes distress	0.181	2.360	0.019
Block 2 R2 $\Delta$ = 0.002			
Parental diabetes distress	0.151	1.672	0.096
Parental depressive symptoms	0.058	0.645	0.520
Block 3 R2 $\Delta$ = 0.039**			
Parental diabetes distress	0.089	0.966	0.336
Parental depressive symptoms	-0.030	-0.320	0.749
Parental resilience	-0.237	-2.596	0.010
Model R2 = 0.074**			

[Table 1 Regression Analyses Testing Parent Resilience, Distress and Depressive Symptoms as Predictors of HbA1c]

**Objectives:** To examine relationships between parent resilience and negative emotions (diabetes distress and depression) and adolescent glycemic control.

**Methods:** The sample comprised 166 dyads of adolescent with type 1 diabetes and their parents. Parents completed measures of resilience, diabetes distress, depression, and provided their sociodemographic information. Adolescents' HbA1c were obtained from medical records. A step-wise linear regression analysis was used to determine significant predictors of adolescents' HbA1c.

**Results:** Parent resilience was negatively related to parent depressive symptoms ( $r = -0.512$ ,  $P = 0.000$ ) and diabetes distress ( $r = -0.458$ ,  $P = 0.000$ ). Better parent resilience was significantly associated with lower adolescent HbA1c ( $r = -0.262$ ,  $P = 0.001$ ). In multivariate analyses, parent resilience was the only significant predictor of adolescent glycemic control ( $\beta = -0.237$ ,  $t = -2.596$ ,  $P = 0.010$ ).

**Conclusions:** Given the links between parent resilience, negative emotions, and adolescent glycemic control, parent resilience may be important to consider when targeting both parents' and adolescents' adaptation to type 1 diabetes.

#### EP110 | Disruption, worries, and autonomy in the everyday lives of adolescents with type 1 diabetes and their family members: A qualitative study of intra-familial challenges

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**Background and objectives:** Research has shown that T1D causes significant disruption of family life, but the specific experiences and challenges of adolescents with T1D, their siblings, and their parents are not well-explored. Specifically, research is lacking on the sibling experience of adolescents with T1D.

**Methods:** A qualitative design using participatory workshops. A sample of 21 families comprising adolescents with T1D (aged 8–18) ( $N = 20$ ), their parents ( $N = 29$ ), and siblings ( $N = 10$ ) participated in four workshops exploring everyday life in families with adolescent

diabetes from the perspective of all individual family members. Data were analyzed using systematic text condensation.

**Results:** Family life with T1D was characterized by three overarching themes:

- 1) the perpetual challenges and disruptive nature of life with diabetes,
- 2) different ways of worrying about diabetes, and
- 3) diabetes autonomy and emancipation from parents.

All family members' lives were marked by these aspects, however in different ways and to varying degrees.

**Conclusions:** Our findings emphasize that T1D is indeed a family illness affecting all family members. The study provides insight into the unique experiences of adolescents with diabetes, their parents and siblings, all of whom encounter diabetes-related challenges in their daily lives. The findings call for the inclusion of all family members of adolescents with T1D in both research and healthcare practice.

#### EP111 | Growing up with technology: How diabetes technology impacts the everyday lives of pre-teens (aged 9–12 years) with type 1 diabetes

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**Introduction:** Diabetes technology is an integral part of the lives of children with type 1 diabetes. However, children's experiences with these technologies are often overlooked. Furthermore, little is known about the challenges and opportunities that the technologies introduce when children with type 1 diabetes transition to adolescence.

**Objectives:** The aim of this study is to explore how pre-teens (aged 9–12 years) with type 1 diabetes perceive and handle diabetes technology in their everyday lives.

**Methods:** Data were obtained from interviews with 18 pre-teens with type 1 diabetes. Photos were used as probes to facilitate discussion and reflection about issues that pre-teens found important. Data were analyzed using radical hermeneutics.

**Results:** The analysis resulted in four themes.

- 1) Attention through technology: pre-teens resented insulin pump alarms during school time as they prompted unwanted attention from classmates. However, they appreciated that their parents and friends were attentive to diabetes.
- 2) Making sense of numbers: interpreting data was central to using technology. Pre-teens used the data to understand their mood and body, but the data did not always correspond with their body sensations.
- 3) Sharing data with others: according to pre-teens, sharing blood glucose data with their parents allowed for flexibility and independence in their everyday lives. However, they found it annoying to be checked up on all the time.

4) Adapting to new technology: learning to use technologies placed practical and psychological demands on pre-teens as well as their family members and friends.

The learning process provided pre-teens with a sense of mastery.

**Conclusions:** While allowing for flexibility in the everyday lives of pre-teens, the technologies also raised issues about unwanted attention, data interpretation and data sharing. We suggest that these issues are considered in the design and use of technologies for pre-teens with type 1 diabetes.

#### EP112 | Psychosocial functioning of adolescents and young adults with type 1 diabetes transitioning from pediatric to adult care

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**Introduction:** Transition from pediatric to adult care for adolescents and young adults (AYAs) with type 1 diabetes (T1D) is fraught with medical and psychosocial challenges, which are often associated with poorer diabetes outcomes. A novel, multidisciplinary and cross-institutional clinic was developed to address the unique challenges related to transition.

**Objectives:** The current study examines psychosocial functioning and glycemic control in AYAs with T1D transitioning to adult care.

**Methods:** Participants included AYAs with T1D seen for their first AYA Diabetes Transition Clinic appointment between 9/2017 and 8/2019. Participants completed questionnaires assessing symptoms of depression (Patient Health Questionnaire-9), anxiety (Generalized Anxiety Disorder-7), diabetes-related distress (Problem Areas in Diabetes-Teens), and eating behaviors (Diabetes Eating Problem Survey-Revised). Metabolic control (HbA1C) was measured at the same visit.

**Results:** Participants included 119 AYAs ages 16–22 (M = 19.43, SD = 1.26; 52.9% male). Average HbA1c was 8.54% (SD = 1.82). Nearly 18% of the participants reported moderate to severe symptoms of depression (M = 5.05, SD = 5.13) with 5% reporting recent suicidal ideation. Nearly 14% reported moderate to severe symptoms of anxiety (M = 5.03, SD = 5.15). With regard to diabetes-related functioning, 21.5% reported problematic eating behaviors (M = 13.46, SD = 8.95) and 15.4% reported elevated diabetes-related distress (M = 30.97, SD = 13.38). Greater symptoms of depression ( $r = 0.22$ ,  $p < 0.05$ ), disordered eating behaviors ( $r = 0.36$ ,  $p < 0.001$ ) and diabetes-related distress ( $r = 0.47$ ,  $p < 0.001$ ) were associated with poorer HbA1C.

**Conclusions:** Psychosocial comorbidities are common in AYAs with T1D; those with poorer psychosocial functioning are at risk for worse glycemic control. This study reinforces the value of having an embedded pediatric psychologist as a part of a multidisciplinary care team to address the needs of this unique and vulnerable population.

#### EP113 | CGM ameliorates the adverse effects of fear of hypoglycemia on sleep duration and sleep disturbances in adolescents with T1D

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**Background:** Individuals with Type 1 Diabetes (T1D) are susceptible to impaired sleep, which may be exacerbated by fear of hypoglycemia (FOH). Although parental FOH has been associated with poor sleep quality in children with T1D, little is known about the effects of FOH on sleep in adolescents.

**Objective:** To examine the association of adolescent FOH with.

(1) sleep duration and.

(2) sleep disturbances and.

(3) to assess if continuous glucose monitor (CGM) use influences these relationships.

**Methods:** Adolescents ages 14–18 years with T1D completed questionnaires evaluating FOH (Child Hypoglycemia Fear Survey, comprised of Worry and Behavior subscales) and sleep parameters (Pittsburgh Sleep Quality Index). Analyses included multi-variate linear regression and Student's t-tests.

**Results:** Adolescents (n = 100; 56 female) with a median (IQR) age of 16.3 (15.3–17.6) years and diabetes duration of 5.7 (2.5–9.5) years completed surveys, and 45 were using CGM. After controlling for age, gender and BMI z-score, the total FOH score was inversely related to sleep duration ( $\beta = -0.22$ ,  $p = 0.03$ ) and associated with greater sleep disturbance ( $\beta = 0.22$ ,  $p = 0.03$ ). The FOH-worry score was associated with reduced sleep duration ( $\beta = -0.28$ ,  $p < 0.01$ ) and increased sleep disturbance ( $\beta = 0.27$ ,  $p < 0.01$ ), whereas the behavior subscale was not associated with these parameters. Stratified analyses show that the relationships between FOH and sleep duration ( $\beta = -0.30$ ,  $p = 0.03$ ) as well as sleep disturbance ( $\beta = 0.30$ ,  $p = 0.03$ ) were only significant among those not using CGM. Average sleep duration was also longer in those using CGM [7.5 hours with CGM vs. 6.8 hours without,  $p = 0.02$ ].

**Conclusions:** Among adolescents with T1D, FOH is associated with reduced sleep duration and increased sleep disturbances. These sleep parameters are primarily affected by worry about FOH rather than behaviors to reduce hypoglycemia. Our findings suggest that CGM use mitigates the negative contribution of FOH on these sleep outcomes.

#### EP114 | Supporting young people with type 1 diabetes in transition from primary to secondary school: A Co-Design project

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**Introduction:** In the UK, young people move from primary to secondary school when they are 11 years old. This is a major life event for all young people as they have to adapt to a new social and learning environment. Young people with Type 1 diabetes (T1DM) have the additional challenge of managing diabetes at this time. In the absence of a consensus on how best to support them, this study set out to co-design an intervention for young people with T1DM in transition to secondary school.

**Objectives:**

- 1) To explore the experiences and views of young people, parents, school staff and healthcare professionals (HCPs) related to transition to secondary school with T1DM; and.
- 2) to identify intervention strategies for supporting young people with T1DM at this time.

**Methods:** The study followed an adapted Experience-Based Co-Design (EBCD) process involving young people with T1DM (11–13 years,  $n = 11$ ), parents ( $n = 16$ ), school staff ( $n = 11$ ) and HCPs ( $n = 9$ ). Participants engaged in a collaborative, experience-based, solution-focused approach to identifying strategies for supporting young people with T1DM during this school transition. The data from focus groups and interviews were analyzed using Framework Analysis.

**Results:** Identified areas for intervention were: preparing young people and parents for the school transition; increasing the understanding of teaching staff in relation to the needs of students with T1DM; providing individualized support for young people with T1DM in secondary school (including emotional and social support); and increasing awareness and dispelling myths about T1DM among school staff and peers.

**Conclusion:** EBCD generated important insights and creative ideas that will inform modeling of strategies to improve experiences and support diabetes management for young people with T1DM during this transition. The young people taking part also produced an animated film setting out some key messages they want to communicate to others in relation to these issues.

EP115 | “Risky business:” Self-management in young adults with type 1 diabetes (T1D)

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**Objective:** Young adults (YA) are often in risky environments (eg, living independently for the first time) and may engage in risk-taking

behaviors (eg, substance use); but for YA with T1D these situations and behaviors can carry additional health risks (eg, alcohol lowering blood glucose levels). We aimed to explore perspectives of YA with T1D, to identify situations or behaviors that they identify as risky.

**Methods:** 30 YA (18–25 yrs, 60% Female, 63% Non-Hispanic White, 17% Hispanic/Latino, 13% Non-Hispanic Black, 6% other race/ethnicity) participated in an on-line focus group. YA commented on 1 topic a week for 7 weeks (eg, Alcohol Use, Ups & Downs of Diabetes, Relationships). We coded responses to identify “risk-taking behaviors (RB),” “risky situations (RS),” “safety behaviors” and “safe situations.” We then created and refined a list of RB and RS. We asked YA to review our list to verify that we captured their lived experiences correctly.

**Results:** YA weekly participation rates ranged from 53%–70%. We initially identified 49 RB and 21 RS from YA responses to forum prompts, and presented a list of these items back to the YA focus group. YA voted as to whether or not to “keep” an item based on whether it was relevant to them. This feedback reduced the list to 37 RB and 21 RS. RB and RS fell within the following themes: routine T1D management (e.g., tried to “push through” low [blood glucose] symptoms without treating); relationships (e.g., worked at a job without the supervisor knowing that you have T1D); substances (e.g., gotten high to the point where you could not take care of your T1D); and healthcare system (e.g., felt your insurance company was working against you).

**Conclusions:** T1D self-management occurs within the context of everyday life, and for YA that can include RS and developmentally typical RB. More research is needed to understand the frequency with which RB occur in YA and their effect on T1D self-management and health outcomes.

EP116 | Depression, diabetes distress and body mass index in adolescents with type 1 diabetes: effects of sex and race

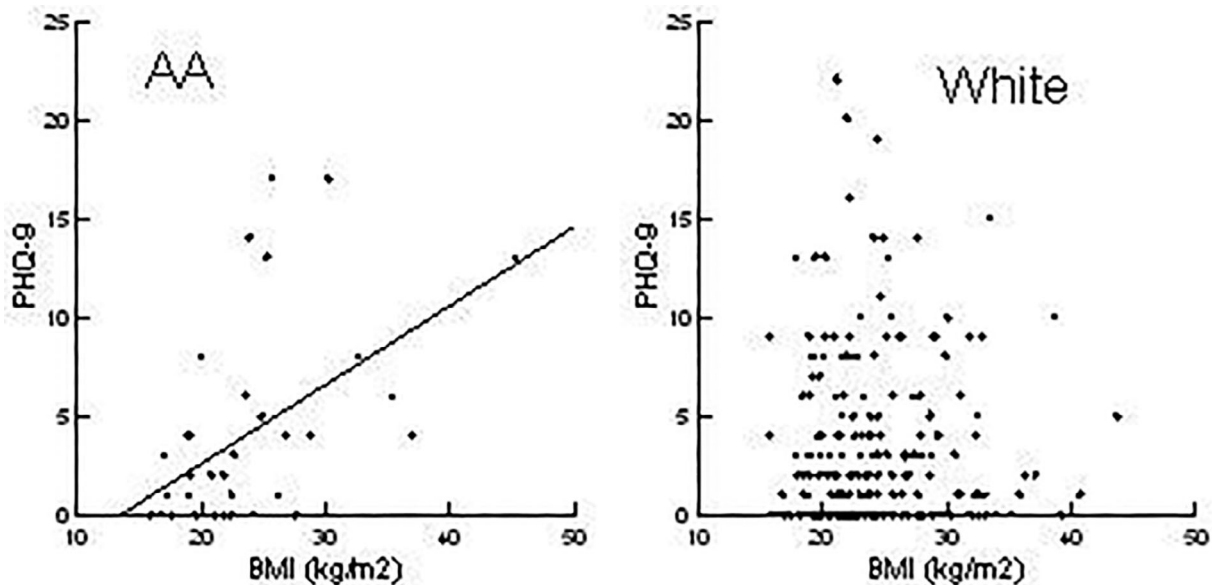
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**Objective:** Depression is a significant problem in adolescents with type 1 diabetes (AT1D) and with obesity. Depression is also associated with increased diabetes distress related to the management tasks and stresses of the diabetes. How body size relates to depression and diabetes distress is unclear.

**Methods:** We studied depression (PHQ-9) and distress screening (PAID-T) scores and their relationship to body mass index (BMI) in 293 AT1D (age:  $15.2 \pm 1.4$  yrs; duration:  $5.1 \pm 3.9$  years; BMI:  $25.0 \pm 6.2$  kg/m<sup>2</sup>; mean  $\pm$  SD) collected over 1 year in the Pediatric Diabetes Clinic at Nationwide Children's Hospital.

**Results:** Overall PHQ-9 and PAID-t scores were closely related to each other ( $r = 0.65$ ,  $p < 0.001$ ). PHQ9 scores increased ( $r = 0.15$ ,  $p = 0.009$ ) and PAID-T scores tended to increase ( $r = 0.11$ ,  $p = 0.054$ ) as BMI increased. There were no relationships to age or duration of diabetes. Because sex and race can affect depression and diabetes distress we also assessed these relationships in each sex and race. For



[PHQ-9 relationship to BMI].

both males ( $n = 146$ ) and females ( $n = 147$ ) PHQ-9 and PAID-T scores were closely related but the relationships to BMI were no longer significant. PHQ-9 and PAID-T scores were, also, closely related in both African Americans (AA,  $n = 52$ ) and whites ( $n = 241$ ). Interestingly, in AA PHQ-9 ( $r = 0.32$ ,  $p = 0.020$ ) increased with increasing BMI. This relationship was not seen in whites ( $r = 0.035$ ).

PAID-T was not related to BMI in either race. BMI was significantly greater in AA than whites ( $28.8 \pm 8.9$  vs  $24.1 \pm 5.0$ ,  $p < 0.001$ ).

**Conclusion:** These results demonstrate the increasing body weight plays a role in the development of depression in AT1D particularly in AA. Attention should be focused on appropriate nutrition and physical activity in these patients.

#### EP117 | Hypoglycemia fear and diabetes distress in parents of 5-9-year-olds with recent-onset type 1 diabetes (T1D)

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**Objective:** We examined the association between hypoglycemia fear (FH) and diabetes distress (DD) in parents of 5-9-year-olds with recent-onset T1D using a prospective, longitudinal design. We hypothesized that increases in FH would predict higher levels of DD in parents across 12-months.

**Methods:** In the TACKLE-T1D study, parents of 5-9 year-olds completed the Hypoglycemia Fear Survey- Parents (HFS-P) to assess FH and the Problem Areas in Diabetes Survey- Parent Revised (PAID-PR) to assess DD every six months. We used multiple regressions to predict parents' PAID-PR scores at 6- and 12-months post-baseline. Our

predictor was change in parents' HFS-P Total scores from baseline to 6-months and from 6-months to 12-months.

**Results:** Our sample included 111 families (parent age =  $36.6 \pm 6.4$  years, 89% mothers; child age  $7.4 \pm 1.3$  years, T1D duration  $4.6 \pm 3.3$  months, HbA1c  $7.6 \pm 1.4\%$  at baseline). Parents' mean HFS-P Total scores at baseline, 6-, and 12-months were  $66.1 \pm 14.0$ ,  $70.1 \pm 14.6$ , and  $69.7 \pm 15.6$ , respectively, suggesting moderate FH. Parents' mean PAID-PR scores at baseline, 6-, and 12-months were  $1.44 \pm 0.85$ ,  $1.46 \pm 0.84$ , and  $1.54 \pm 0.90$ , respectively ( $\geq 2.0$  indicates clinically significant DD). Regressions showed that increasing HFS-P Total scores between baseline and 6-months predicted greater PAID-PR scores at 6-months ( $p = 0.049$ ). Similarly, increasing HFS-P Total scores between 6- and 12-months predicted greater PAID-PR scores at 12-months ( $p = 0.013$ ).

**Conclusions:** In parents of kids with recent-onset T1D, increasing FH appears to predict higher levels of DD. FH is treatable with cognitive-behavior therapy (CBT) and treating FH could indirectly reduce DD. Screening parents for FH in the recent-onset period of T1D may help to identify the parents who could benefit from CBT. Whether early parent exposure to CBT can also improve child glycemic levels remains to be tested.

#### EP118 | Intolerance of uncertainty is associated with lower time in hyperglycemia in adolescents with type 1 diabetes treated with continuous subcutaneous insulin infusion

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**Objectives:** CSII helps patients managing illness, and it positively impacts their quality of life (QoL). Nevertheless no study has explored whether Intolerance of Uncertainty (IU) might play any role in CSII treatment to date.

The aim of this pilot study was exploring whether IU is related to illness management and acceptance, anxiety, depression, and QoL in a sample of adolescents with T1D after 6 months of CSII treatment.

**Methods:** Twelve participants (M: F = 1:1.4), aged 14.83 ( $\pm 2.21$ ; 11–18), entered the study. Data about illness management and acceptance, anxiety, depression, QoL, and IU were collected at two different time points: T0 (baseline assessment, before CSII treatment) and T1 (6 months later). Measures include self-report about IU (Intolerance of Uncertainty Scale-Revised; IUS-R), anxiety, depression, QoL, and adjustment to T1D. The following glucose metrics were registered: glycated hemoglobin (HbA1c), time in range (%), time in hypoglycemia (%), time in hyperglycemia (%); then, differences ( $\Delta$ ) between T1 and T0 values with regard to these 4 variables were computed.

**Results:** Within group comparisons showed no changes in any of the self-report measures from T0 to T1. Correlational findings outlined a negative relationship between IUS-R scores at T0 and time in hyperglycemia ( $\Delta$ ) (Spearman  $\rho = -0.603$ ;  $p = 0.038$ ). No significant associations between IUS-R scores at T0 and all the other study variables emerged.

**Conclusions:** Our analyze demonstrated that higher IU levels before CSII are associated with smaller changes in time in hyperglycemia after 6 months. Patients with higher IU recorded less time in hyperglycemia also at the baseline, before using a device alerting high values. A possible explanation is that people perceiving their illness as unpredictable are more likely involved in intensive blood glucose monitoring and health behaviors. However, we are aware that a small sample size limits the extension of these findings.

#### EP119 | Diabetes distress 1-year following diagnosis is associated with long term A1C outcomes in adolescents with type 1 diabetes mellitus

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**Objectives:** Adolescents with newly diagnosed T1D are at risk for poor physical and psychosocial outcomes. Our aim was to understand if diabetes distress assessed at 1-year post diagnosis was associated with A1C up to 5 years following diagnosis.

**Methods:** Adolescents (age 10–17) with newly diagnosed T1D completed diabetes distress (Problem Area in Diabetes Scale - Teen) and an acute diabetes stress-o-meter that asked “What is your overall stress level about diabetes right now?” on a Likert scale ranging from 1 to 10, where 1 = “I'm not at all stressed” and 10 = “I'm extremely stressed.” A1C was extracted from patient charts up to 5 years post-diagnosis and averaged for each year. We ran two Hierarchical Linear Models to assess if general and acute diabetes distress predicted changes in A1C up to 5 years following diagnosis. At level 1, patients' A1C scores were

modeled by each year. At level 2, we included the distress measure (acute or general), patient age at diagnosis and patient sex.

**Results:** At one year post-diagnosis, N = 35 adolescents (M = 13.22 years, SD = 2.09 years) completed diabetes distress (M = 40.35, SD = 17.10) and an acute diabetes distress stress-o-meter (M = 3.7, SD = 2.46). Average A1C was 7.73 (SD = 1.57). Higher patient general diabetes distress was associated with higher A1C for the following four years ( $B = 0.05$ , SE = 0.01,  $p < 0.001$ ). Patient age at diagnosis, but not sex, was also a significant predictor of A1C. Higher acute diabetes distress was associated with higher A1C at the subsequent yearly time points ( $B = 0.26$ , SE = 0.09,  $p = 0.007$ ). Similarly, patient age was also significant.

**Conclusions:** Diabetes distress (measured generally and acutely) levels shortly following diagnosis (at 1-year) predicts glycemic control up to 5 years later. Thus, targeted psychosocial interventions to decrease diabetes distress more broadly and in acutely stressful moments in the first year following diagnosis should be explored to improve long term outcomes in this high-risk population.

## EPOSTER SESSION 3

#### EP120 | Acute diabetic ketoacidosis in a patient with 17q12 deletion syndrome

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The 17q12 recurrent deletion syndrome is a rare chromosomal aberration with a 1.4 Mb deletion on the long arm of chromosome 17. This syndrome is characterized by a variable combination of kidney or urinary tract malformations, diabetes mellitus (DM), and neurodevelopmental or neuropsychiatric disorders. Hepatocyte nuclear factor-1 homeobox  $\beta$  (HNF1B) gene deletions are virtually always part of 17q12 deletion syndrome. Deletion of the HNF1 $\beta$  gene causes maturity-onset diabetes of the young type 5 (MODY5), a rare MODY subgroup (2% to 6% of MODY diagnoses).

We report a 12-year-old male who presented with new onset DM in diabetic ketoacidosis (DKA). At age 10 years he was diagnosed with a 1.46 MB interstitial deletion at 17q12 which included deletion of the HNF1 $\beta$  gene. The patient had typical facial dysmorphism with a long face, high forehead, chubby cheeks, and highly arched eyebrows. He showed multi-systemic symptoms, including autism, intellectual/learning difficulties, anxiety, atrophic right kidney, and hyperuricemia. Family history included DM diagnosed as type 2 in three generations, although genetic testing had not been performed. Laboratory studies were remarkable for blood glucose of 749 mg/dL, elevated anion gap, elevated beta-hydroxybutyrate, and hemoglobin A1C of 11.8%. DM type 1 was excluded by negative antibody testing including anti-islet cell antigen 2, anti-glutamic acid decarboxylase, anti-insulin, and anti-zinc transporter 8 antibodies. The patient was initially treated with an IV insulin infusion and then converted to a subcutaneous basal-bolus insulin regimen (insulin glargine and lispro) during hospitalization.

This report of 17q12 deletion syndrome/MODY5 supports the concept that a presentation of DKA does not exclude MODY. Identifying syndromal features and thorough laboratory and genetic evaluation are vital for establishing correct diagnosis and ongoing care.

#### EP121 | Favorable clinical course of neonatal diabetes due to *GLIS3* mutation

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**Background:** Neonatal diabetes mellitus (NDM) is related to gene defects, that compromise pancreas development or insulin secretion during the first 6 months of life. Mutations in *GLI-similar 3 gene (GLIS3)* cause rare permanent NDM with 14 reported patients up to date.

**Case report:** Two-year-old boy born at 39th g. w. by Cesarean delivery from pregnancy with fetal, intrauterine growth retardation and oligohydramnios. Birth weight 2240 gr, length 46 cm. At age of 40 days he revealed irritability, fever and convulsions, severe dehydration, and somnolence. Hyperglycemia of 48 mmol/L (864 mg/dL), Na<sup>+</sup> 124 mmol/L, mild ketosis with beta-OH-B 4 mmol/L, but pH 7.48, HCO<sub>3</sub><sup>-</sup> 23 mmol/L and transient prerenal insufficiency were initially detected, as well as HbA1c 8.8%, normal lipids and liver function, TSH 6.5 mIU/L (0.72–11), FT4 12.8 pmol/L, C-peptide 0.277 ng/mL, negative β-cell autoantibodies. Renal function resolved after intensive treatment with i.v. insulin and fluid replacement therapy. Insulin pump treatment ensured stable blood glucose with HbA1c 6–5.2%. L-Thyroxin replacement therapy was given at age of 10 months when TSH reached 15.0 μIU/ml. The genetic analysis at Exeter laboratory revealed compound heterozygosity - a paternal likely pathogenic *GLIS3* nonsense variant, as well as a maternal missense variant with currently uncertain clinical significance. The child has normal physical and psychological development. By the age of 2 years (height 89.5 cm, weight 12.2 kg) insulin needs were so minimal allowing only small meal boluses without basal insulin at level of C-peptide 0.182 ng/mL. Euthyroid state was achieved with L-thyroxin 37.5 μgr/day.

**Conclusions:** We describe a case of NDM due to *GLIS3* compound heterozygosity, corresponding with main clinical characteristics described at present. Unclear maternal gene variant possibly contributes to minimal pancreas and thyroid dysfunction with no other organ damage and seems to give good prognosis.

#### EP122 | Broadening the clinical spectrum of *SLC29A3* spectrum disorder: a rare cause of syndromic Type 1 diabetes

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**Introduction:** *SLC29A3* spectrum disorder also called histiocytosis-lymphadenopathy plus syndrome is a rare multisystemic disorder caused by mutations in the *SLC29A3* gene. Typical features include skin hyperpigmentation, hypertrichosis, hepatosplenomegaly, cardiac abnormalities, sensorineural hearing loss, short stature, hypogonadism and diabetes mellitus.

**Objectives:** We describe a family of three children with Type 1 diabetes mellitus (T1D) and *SLC29A3* spectrum disorder born of first-cousin parents of Pakistani origin with novel features not previously reported. All three siblings have a pathogenic missense variant in the *SLC29A3* gene.

**Results:** The index patient was diagnosed with T1D at 4 years of age. She later developed nephrotic syndrome and autoimmune thyroid disease. Clinically she displayed mild clinodactyly, syndactyly of the second and third toes and short stature. The sister developed sensorineural deafness at 10 years of age and T1D at 17 years of age. She also displayed clinodactyly, syndactyl of the second and third toes and short stature. The brother underwent hypospadias surgery as an infant and was diagnosed with T1D at 6 years of age. He also exhibited short stature. In addition, he is known to have a pathogenic *CDH1* gene mutation, associated with hereditary gastric cancer. The mother exhibited clinodactyly and short stature but did not have T1D. She was heterozygous for the pathogenic *SLC29A3* missense variant. She also has a pathogenic *CDH1* gene mutation and underwent a prophylactic gastrectomy. The father died at 38 years of age due to gastric cancer associated with *CDH1* gene mutation and therefore his *SLC29A3* status is unknown.

**Conclusion:** This case report further contributes to the body of literature concerning *SLC29A3* spectrum disorder. The manifestations in this family, including nephrotic syndrome and the coexistence of *CDH1* gene mutation, may be additional characteristics of histiocytosis-lymphadenopathy plus syndrome.

#### EP123 | Coexistence of hyperinsulinaemic hypoglycaemia and type 1 diabetes

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Type 1 diabetes (T1DM) is characterized by four stages with Stage 3 defined by presence of 2 or more islet auto-antibodies, typical symptoms and hyperglycaemia. Hypoglycemia is expected following diagnosis with insulin administration and counter regulatory hormonal response. Hypoglycaemia prior to diagnosis is not well described. However fasting hypoglycaemia and postprandial hyperinsulinaemic hypoglycaemia have been described in the earlier asymptomatic stages as a potential prodrome. This case describes new onset (stage 3) T1DM and hyperinsulinaemic hypoglycaemia.

**Case report:** 8 yr old girl was referred from primary care with secondary nocturnal enuresis, polydipsia, polyphagia, lethargy, elevated HbA1c (52 mmol/mol) and no evidence of dehydration, obesity or insulin resistance. Random blood glucose (BG) was 9 mmol/L but oral glucose tolerance test demonstrated a fasting BG of 3.8 mmol/L and a



2-hour post-prandial BG of 11.6 mmol/L. She has positive islet cell auto-antibodies. Prior to insulin therapy, her BG was mainly in target with several episodes of hypoglycaemia. CGM showed 63% time in range, 17% time below target and 11% Time above target (fig1). Hypoglycaemia screen confirmed hyperinsulinemia (Table 1) with BG of 1.7 mmol/L, C-peptide of 518 and Insulin level of 41 pmol/L. Four months after presentation, she has been commenced on multiple daily dose insulin injections.

**Conclusion:** Dysregulation of insulin secretion from pancreatic  $\beta$ -cell leading to hyperinsulinism as part of the phase 3 prodrome is suggested by the finding of hyperinsulinemia in our patient.

Table 1

BG 1.7 mmol/L
C-Peptide 518 pmol/L
Insulin 41 pmol/L
Cortisol 613 nmol/l
Growth hormone 6.3 $\mu$ g/L
3-Hydroxybutyrate 58 $\mu$ mol/L
Free fatty acid 652 $\mu$ mol/L
Anti-GAD antibodies <5 U/ml
Islet Antigen-2 Antibody >4000 IU/mL (0.0–10)
Znt8 Antibodies >500 U/mL (0.0–14)
Sulphonylurea Screen NEGATIVE
Liver function test Normal
Genetic Analysis of the known monogenic diabetes genes did not identify a pathogenic variant.

#### EP124 | Monogenic diabetes in a country with a low incidence of type 1 diabetes

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Monogenic diabetes (MD) occurs as a result of mutations in gene/s involved in the pathways of pancreas development,  $\beta$ -cell function, or insulin secretion. It affects 1–6% of the diabetic children. Three forms of MD are established: neonatal diabetes, familial dominant diabetes (MODY), and syndromic diabetes.

**Objectives:** To present patients with MD in the country with the lowest incidence of type 1 diabetes in Europe.

**Material and methods:** Detailed family history was assessed. All patients with diabetes negative for  $\beta$ -cell autoimmunity antibodies (GAD, IA, IAA2 and ICA) underwent genetic testing.

**Results:** 7 patients with MD were detected during a period of 20 years. In a newborn with diabetes, KCN11 gene mutation Kir6.2 V59M was detected, confirming iDEND syndrome. Continuous intravenous insulin therapy was initiated, then switched to a therapy with sulphonylurea with an optimal control and long-term stability of HbA1c and improvement of his neurodevelopment. In a 6 months old child the deletion of insulin gene was detected [G32S c.94(G > A)], and she

was treated with insulin. A girl at 9 months was diagnosed with mitochondrial diabetes associated with deafness [p. 3243(A > G)]. In a 2.5 years old child with unexpected hyperglycemia after surgery and a typical family history, a novel GKC mutation gene was detected [c.45 + 1G > A]. No treatment was applied. One girl at the age 12 years with a suggestive family history was diagnosed with MODY3 [HNF1A c.714-1G > A], the other with MODY1 [HNF4A c.56\_57delCC] and they are stable on Amaryl tablets. Finally, familial Wolfram syndrome was diagnosed in two children at the age 5 and 7 years of age respectively with a compound heterozygosity [W648X, P885L]. Multi-disciplinary therapy and surveillance were applied.

**Conclusion:** MD should be searched for in all patients with a specific family history and negative  $\beta$ -cell antibodies. It provides individualized therapy and optimal outcome.

#### EP125 | Transition from insulin to sulphonylurea in three diabetic infants with KCNJ11 mutation: A success story

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**Background:** Neonatal diabetes mellitus (NDM) presenting within the first 6 months of life is extremely rare with an incidence of approximately 1 in 90,000–160,000 live birth. It is a monogenic form of diabetes having over 20 known genetic causes for neonatal diabetes including permanent and transient forms. Most permanent types of NDM were being clinically managed with life long insulin treatment. However now it is known that mutations in the genes forming ATP sensitive K channels KCNJ11 and ABCC8- which have a key role in insulin secretion, are responsive to oral Sulphonylurea treatment. This acts through restoring insulin secretion in these patients so insulin therapy can be effectively replaced by oral sulphonylureas which offer both improvement in glycemic control and better quality of life.

**Case summary:** We are reporting three infants who presented at our center with Diabetes and their genetic analysis revealed KCNJ11 mutations. All of them were successfully transitioned from insulin to oral sulphonylureas. Two babies were diagnosed with diabetes within the first month of life after presenting with DKA. Both of them were initially started on insulin which was later on transitioned to oral glibenclamide at seven weeks and four months of age respectively. The third child came to us at eleven months of age with failure to thrive and recently diagnosed diabetes on no treatment. Her initial therapy was also insulin which was changed to Glibenclamide at fourteen months of age after positive genetic testing. All three children are being followed in our pediatric endocrinology clinic, and are thriving, effectively being managed on oral sulphonylureas, with good glycemic control and no neurologic manifestations.

**Conclusion:** Genetic testing should be sought in all patients with neonatal diabetes as oral Sulphonylureas are a useful and effective treatment option in patients with specific genetic mutations.

**Key Words:** Sulphonylureas, neonatal diabetes mellitus NDM, Diabetic Ketoacidosis DKA

### EP126 | Optical coherence tomography and C-peptide follow-up in a child with Wolfram's syndrome treated with Liraglutide for 16 Months

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**Introduction:** A child with sensorineural deafness was diagnosed with antibody-negative DM at the age of 6 years. New generation sequencing showed a double heterozygous mutation of the WFS1 gene. Screening showed optic nerve involvement at magnetic resonance imaging (MRI) and optical coherence tomography (OCT).

**Objectives:** To assess the effect of Liraglutide (LG) on C-peptide levels and optic atrophy.

**Methods:** An evaluation of drug candidates in literature was performed. LG was identified as the most promising disease-modifying and safe candidate was started at age 10 years.

**Results:** The child was evaluated after 6 and 16 months treatment with LG 1.2 mg/day for the first 6 months and 1.8 mg/day thereafter. Basal and peak C-peptide (ng/mL) at the mixed meal tolerance: 0.37 and 1.45 at baseline; 0.67 and 1.39 at 6 months; 0.75 and 1 at 16 months. Glucose time in range at baseline, 6 months and 16 months were 45% (TBR 4%), 72% (TBR 9%), and to 63% (time in hypoglycemia 8%). Daily insulin at the same time points were 0.7 U/kg, 0.6 U/kg and 0.8 U/kg respectively. Baseline and follow-up OCT did not show significant progression in retinal nerve fiber layer (right 36–47–51 micron, left 35–45–50 micron) and ganglion cell-inner plexiform layer thickness (right 53–66 micron, left 68–55 micron only measured at 6 and 16 months). BMI z-score remained between 1–1.3 SDS and no significant gastrointestinal symptoms were reported.

**Conclusion:** WS is an orphan disease. GLP-1R agonists are potential drugs in WS because of their role in decreasing ER stress in both beta-cells and neurons. Only one LG-treated WS patient has been reported in literature and improvement in C-peptide has been shown. This is, to our knowledge, the first reported pediatric cases of WS treated with LG for 16 months with apparent stabilization of C-peptide and OCT parameters and no adverse events. Longer and larger population RCT studies are warranted prior to it becoming used in routine care for WS.

### EP127 | Safe use of a ketogenic diet in an infant with microcephaly, epilepsy and diabetes syndrome

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**Background:** Microcephaly, epilepsy, and diabetes syndrome (MEDS) is a rare syndromic form of monogenic diabetes caused by homozygous or compound heterozygous loss of function mutations in *IER3IP1*. In vitro studies have shown that loss of *IER3IP1* leads to apoptosis in both neurons and b-cells. Simultaneous management of the seizures and diabetes is challenging in patients with MEDS.

**Case presentation:** The patient is a female born at 37 weeks gestation with no complications at birth, although the head circumference was in the 8th percentile. At 2 months she presented with seizures and spasms which coupled with the small head circumference prompted genetic testing. Sequencing of an epilepsy gene panel identified 2 novel variants, c.239.T > G (p.Leu80\*) and c.2 T > A (initiator codon), which were demonstrated to be inherited in trans. Following initiation of steroid therapy for seizures and infantile spasms (IS) the patient developed insulin dependent diabetes.

**Management:** We report the successful initiation of a ketogenic diet (KD) to treat intractable IS refractory to multiple medications. Steady-state ketosis is an effective means of treating intractable IS and can be achieved using a KD but with insulinopenic diabetes the development of diabetic ketoacidosis (DKA) is a concern. We demonstrate the successful titration to a therapeutic KD ratio of 3:1 and maintenance of a ketotic state without DKA in our patient during her baseline health. With any intercurrent illness, however, the patient had rapid decompensation and mild DKA due to delays in treatment, and for this reason, KD was discontinued after five months.

**Conclusion:** We report two novel mutations in *IER3IP1* in a patient with MEDS. We also report successful management of the cooccurring conditions of IS and insulinopenic diabetes with a KD. Finally, we underscore the importance of careful monitoring during KD in our patient as she did have DKA more easily when on the KD.

### EP128 | Transitory neonatal diabetes: First case reported in Peru

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**Introduction:** Hyperglycemia in the newborn is a metabolic disorder that requires attention due to the tissue damage that its persistence produces and the increase in morbidity and mortality that it causes. If this hyperglycemia is severe and sustained, diabetes mellitus should be suspected, a reason of great concern to the doctor due to the difficult management and future comorbidity for the child.

**Objectives:** The first case reported in Peru of a newborn with transient neonatal diabetes treated at the National Institute of Child Health (INSN), a pediatric reference center throughout the country, is presented, due to the importance of knowing this entity, clarify the etiological diagnosis and be able to provide timely treatment and adequate follow-up.

**Clinical case:** Male patient with a history of intrauterine growth retardation and sustained hyperglycemia from the second day of life, who required intensive insulin therapy from two weeks. At one month of age, a genetic study was carried out at the University of Exeter, in England, and no abnormal variant was detected in the sequence of analysis of the ABCC8, KCNJ11 gene or the insulin gene. The sample continued to be analyzed and after three months the result was received, detecting a loss of PLAGL1 DMR methylation. This result confirmed the diagnosis of transient neonatal diabetes most likely due to paternal uniparental disomy at the 6q24 locus. The patient was discharged with NPH and crystalline insulin that was suspended before 5 months. He is currently 2 years old and has a favorable evolution, maintaining euglycemia without receiving insulin treatment.

**Conclusions:** Transient neonatal diabetes is a rare entity in neonates and infants that evolves favorably over time without the need to maintain insulin treatment, however control and follow-up should continue as a large percentage of these patients (30%) return to have diabetes in adulthood.

#### EP129 | Wolcott-Rallison syndrome: A case series of 3 patients

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**Back ground:** Neonatal diabetes is a rare disease with an estimated incidence of 1 in 90,000–160,000 live births.. Wolcott - Rallison syndrome has been identified as the most common cause of permanent neonatal diabetes in consanguineous families caused by mutations in eukaryotic translation initiation factor 2- $\alpha$  kinase 3 (*EIF2AK3*), characterized by permanent neonatal or early-infancy insulin-dependent diabetes and associated with liver dysfunction, multiple epiphyseal dysplasia, developmental delay and other variable multisystem clinical manifestations.

**Keyword:** Wolcott-Rallison syndrome (WRS), Permanent neonatal diabetes mellitus (PNDM), Skeletal dysplasia.

**Case series:** We herein report 3 cases with Wolcott -Rallison syndrome. Case one was a girl and, case two and three were boys diagnosed at seven weeks, eleven weeks and seven months respectively. All presented with high glucose levels and were commenced on insulin. *EIF2AK3* Homozygous mutation identified in all three cases when their genetic analysis were sent. Liver function test, renal function test were normal. Growth and developmental milestones were unremarkable in all, for continuous developmental assessment neurology follow up had been advised. Case one and case two both were lost to follow up and were later found to have expired. Case three is now two year old on regular follow up in pediatric Endocrine and neurology clinics and doing well.

**Conclusion:** Morbidity, as well as mortality, is high among children with WRS Neonatal diabetes is, it is important to perform screening gene mutation for patients with diabetes diagnosed before 6 months. In most cases, the presenting symptom of Wolkot rollison syndrome diabetes. However, the phenotype is variable both with regard to organs involved and clinical severity. Close therapeutic monitoring is recommended because of the risk of acute episodes of hypoglycemia and ketoacidosis.

#### EP130 | Diet therapy in patients with lipodystrophy syndromes: Perspectives and challenges

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**Background:** Generalized lipodystrophy (GL) syndromes form a heterogeneous group of orphan disorders characterized by total deficiency of adipose tissue in the absence of nutritional deprivation or catabolic state. Major causes of mortality in GL include heart disease, liver disease, acute pancreatitis, sepsis and kidney failure.

According to the Practice Guideline, metreleptin with the diet is a first-line treatment for metabolic complications in patients with GL. In consideration of the unavailability of metreleptin therapy in Russia, the well-balanced diet remains the most effective way to correct metabolic abnormalities, however no specific clinical recommendations on a diet in lipodystrophy syndromes have been established yet.

**Aim:** We present our clinical experience in four Russian adolescents with congenital generalized LD (CGL) during a four-year follow-up to show perspectives and challenges of such therapy.

**Results:** All patients with CGL were prescribed with a normal calorie low-fat diet with restriction of simple sugar and moderate physical activity. All of them showed a remarkable metabolic response (glucose and triglycerides reduction) while staying in the endocrinology department for 10–14 days and worsening after the discharge.

The main difficulties in achieving metabolic control at home were associated with hyperphagia, high cost of healthy food, difficulties in complying with the diet at school, psychological problems (being bullied by other kids at school) and a low compliance in children and adolescents due to the lack of understanding of the possible complications.

**Conclusion:** Our experience supports the results of previous investigations and highlights the necessity of the multisociety practice guideline on a diet in lipodystrophy syndromes.

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#### EP131 | Description of presenting symptoms and outcomes among patients with type 1 diabetes and confirmed or suspected COVID-19 in the United States

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**Introduction:** While there is rapidly emerging information describing characteristics of patients hospitalized with confirmed COVID-19, no such data is available for people with type 1 diabetes (T1D).

**Objective:** This U.S. based, multi-center surveillance study aimed to investigate characteristics, presenting symptoms, and adverse outcomes of patients with T1D who tested positive for SARS CoV-2 (N = 26). As a secondary objective, this study also reports patient attributes and clinical outcomes among T1D patients with COVID-like symptoms (N = 24) who tested negative or were unable to get tested.

**Methods:** De-identified patient data was collected through T1D Exchange's Type 1 Diabetes-COVID-19 Registry. Patient information for people who tested positive for SARS CoV-2, as well as patients suspected to have COVID-19 were reported by healthcare providers from Endocrinology clinics at participating sites in the US. Statistical analysis was completed using SAS Studio software (version 3.8).

**Results:** We analyzed 50 patients with T1D, of which 26 tested positive for SARS CoV-2 by nasopharyngeal sample PCR, and 24 were reported to have COVID-19-like symptoms but no positive test. In the group that tested positive for SARS CoV-2 (N = 26), mean age was 25.5 years (SD = 17.98, range = 7.0–79.0, IQR = 14.0–28.0), 61.5% (16 of 26) were female, and 38.46% (10 of 26) were Non-Hispanic White. Among T1D patients who tested positive for SARS CoV-2, the most prevalent adverse type 1 diabetes outcome was diabetic ketoacidosis (42.3%). The highest level of care at the time of reporting was hospitalization (23.1% [6 of 26]) or ICU ((30.8% [8 of 26]) in this population. One patient with confirmed with COVID-19 and one patient with a suspected case (4.1%) died.

**Conclusions:** This study provides patient characteristics and clinical outcomes of patients with type 1 diabetes who had either confirmed or suspected COVID-19 in the United States.

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EP132 | **Race/Ethnicity Disparities of presenting symptoms and outcomes among patients with type 1 diabetes with confirmed or suspected COVID-19 in the United States**

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**Introduction:** While there is rapidly emerging information describing race or ethnicity outcome disparities of patients hospitalized with COVID-19, no such data is available for people with type 1 diabetes (T1D).

**Objectives:** This U.S. based, multi-center surveillance study aimed to investigate racial disparities among presenting symptoms, and adverse outcomes of patients with T1D who tested positive for SARS CoV-2 (N = 26) or are suspected to have COVID-19. As a secondary objective, this study also reports differences in access to SARS CoV-2 testing by racial group (Non-Hispanic White versus Minority) by analyzing data among T1D patients with COVID-like symptoms (N = 24) who were unable to get tested.

**Methods:** De-identified patient data was collected through T1D Exchange's Type 1 Diabetes-COVID-19 Registry. Patient information for people who tested positive for SARS CoV-2, and patients suspected to have COVID-19 were reported by healthcare providers from U.S. Endocrinology clinics. Racial groups were classified as Non-Hispanic White (NH White) or minority (all other races).

**Results:** We analyzed 50 patients with T1D, of which 25 (50%) were reported NH White, 10 (20.0%) Hispanic, 10 (20.0%) Non-Hispanic Black, 1 (2%) Asian, and 2 (4.0%) other. The mean age of the NH White population was 19.2 years (SD = 12.25, Range = 6.0–61.0), and 44% were female. Among the NH White population (N = 25), the reported highest level of care at the time of reporting was ICU at 16.6%, compared to 26.1% of the minority population (N = 23). Of the NH White population, 60% were tested for SARS CoV-2, compared to 36% of the minority population. The most prevalent adverse T1D outcome was diabetic ketoacidosis in both NH White (16.67%) and minority (34.78%) populations. Two patient deaths were recorded, one with confirmed COVID-19, both of Hispanic origin.

**Conclusions:** This study provides racial differences in clinical outcomes of patients with T1D with confirmed or suspected COVID-19 in the United States.

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EP133 | **Ketoacidosis in children and adolescents with newly diagnosed type 1 diabetes during the COVID-19 pandemic in Germany - results from a nationwide registry**

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**Objectives:** During the COVID-19 pandemic, a significantly lower rate of health care usage was reported, potentially leading to delayed medical care. Diabetic ketoacidosis is an acute life-threatening complication of a delayed diagnosis in type 1 diabetes.

**Methods:** We conducted a nationwide retrospective survey to investigate the frequency of diabetic ketoacidosis in children and adolescents with newly diagnosed type 1 diabetes in Germany from March 13, when most federal states closed kindergartens and schools in order to reduce interpersonal contacts, through May 13, 2020. The

estimated frequencies of diabetic ketoacidosis and severe diabetic ketoacidosis observed during the COVID-19 period and during the same periods in 2018 and 2019 were adjusted for age, sex, and migration background, and were compared by multivariable logistic regression analysis.

**Results:** We obtained and analyzed data of 532 children and adolescents with newly diagnosed type 1 diabetes from March 13 through May 13, 2020, from 217 diabetes centers participating in the German DPV register. Compared with the pre-COVID-19 periods, the mean estimated proportion of diabetic ketoacidosis and severe diabetic ketoacidosis increased during the COVID-19 period by 84.7% (95% confidence interval (CI), 59.6% to 113.8%;  $p < 0.0001$ ) and 45.3% (95% CI, 14.5% to 84.3%;  $p = 0.002$ ), respectively. Young children showed the highest risk for diabetic ketoacidosis and severe diabetic ketoacidosis during the COVID-19 pandemic.

**Conclusions:** Delayed access to health care in Germany during the COVID-19 pandemic might explain the significant increase in ketoacidosis at diabetes diagnosis in children. Our results raise the question whether delayed diagnosis during the COVID-19 pandemic may also have harmed patients with other diseases.

#### EP134 | Anxiety, depression and glycemic control during COVID-19 pandemic: A cross sectional study in youths with type 1 diabetes

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**Objectives:** In order to contain Covid 19 pandemic, a lockdown was established in several countries, including Italy, with a great impact on the daily routine of children and teenagers. As a consequence, healthcare professionals were encouraged to follow patients through telemedicine. Our center, in line with ISPAD recommendations, continued to follow patients and families through a telehomecare program which included video interviews, analysis of diabetes data through CGM metrics, psychological and nutritional assessments. The aim of our study was understanding how Covid-19 pandemic can impact on glycemic control in youths with type 1 diabetes.

**Methods:** 117 subjects (F/M = 52/65) with T1DM were recruited from 8 to 24 April 2020. The mean age was  $15.9 \pm 2.3$  years, mean duration of T1DM was  $7.9 \pm 4.6$  years and mean BMI was  $22.18 \pm 3.6$ . The majority of participants were treated with MDI (87%), the others with CSII (13%). The mean A1c level was  $7.6 \pm 1.2\%$ . We analyzed standardized CGM metrics: mean glucose, glycemic variability, TIR, time below range and GMI of two weeks during the lockdown, comparing data with those reported in the same weeks of the previous year. The psychological wellbeing was evaluated using TAD (Test of Anxiety and Depression).

**Results:** In our population, during the lockdown, there was an increase of TIR compared to the same period of the previous year ( $P = 0.02$ ). As regards psychological evaluation, 5% reached a score for anxiety and 12% for depression. However no significant correlation was identified between TIR and TAD scores.

**Conclusions:** This study provides pointers to the impact of quarantine on diabetes management in a pediatric population. Adolescents with T1DM improved their glycemic control during the restrictions due to COVID-19 pandemic. One of the hypotheses could be related to a more regular daily routine and nutritional pattern.

#### EP135 | Use of telemedicine to evaluate the adherence of treatment of patients with type 1 diabetes in context in the context of COVID-19 Lima - Peru

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**Introduction:** During COVID19 Dm1 patients without receiving medical assistance, in this context, the use of telemedicine became necessary to maintain continuity of treatment and to cope with the situation.

**Objective:** To evaluate the utility of telemedicine in the adherence of the treatment of patients with DM1 in Peru, during COVID19.

**Method:** A prospective study was conducted in 25 patients with DM1 in the context of COVID19. The patients came from hospitals, and private clinics in Lima Peru. Patients received clinical evaluation by a pediatric endocrinologist through the zoom platform, messages by whatsapp weekly with parental consent. Monitoring of blood glucose levels, HbA1c, insulin regimens, carbohydrate control, and warning signs during COVID19 was evaluated.

**Results:** there were 17 girls and 8 boys, an average age of 12 years, an average debut age of 9 years, an average time of illness of 4 years and the average insulin dose was 1UI/kg/day. The average HbA1c was 7.45%. 36% had proteinuria. Before the start of the intervention, the mean of glycemic controls was 4 v/day, achieving that 90% reach an average of 6v/day glycemic controls at the cut of the data analysis. 8% had poor metabolic control despite follow-up, we observed changes in attitudes and control of the disease by COVID19, Mental health issues were addressed in the context of a pandemic, as part of the comprehensive package provided. Due to COVID19, not all the patients included in the study had HbA1c values subsequent to controls and telemedicine follow-up. 20% of the patients were carbohydrate-free and 76% of the patients had suboptimal glycemic control.

**Conclusion:** From the teleconsultation strategy, better adherence to treatment was obtained, achieving 90% had glycemic control at an average of 6v/day. The patients presented greater commitment to disease management despite the limitations of COVID19. Telemedicine has proven to be a useful intervention to improve adherence and metabolic control of with DM1 patients.

**EP136 | Underlying principles of a proactive team quality improvement drive towards web based platforms for remote nurse and dietitian data review in 2018, was used to inform a rapid response to the Covid pandemic, ensuring safety and support for families and continuation of medical and team input remotely**

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A team quality improvement drive in 2018 to enable families to upload blood glucose data from home, encouraging self-review, independent management, and frequent proactive insulin adjustment, led to provision of a new nurse and dietitian led email clinic. The popularity and demand increased by 2019, and the service expanded in response to patient voice.

Only a handful of families were able to review their data remotely, but within a few months of the initiative, an estimated 98% had this facility either at home, or via extended family, school or college. A remote email clinic was provided to review uploaded data. This proved so popular that the provision increased from 2 hrs a week for 4 days, to a 6 day a week service. It was well evaluated by families, and almost every review led to an insulin adjustment. The PDSA cycles for this work diminished the level of risk with each cycle by producing and adapting robust proformas to record baseline information and adjustments in a consistent format, and to encourage independent decision making from the outset. This wealth of experience was subsequently drawn upon by the medical team during Covid lockdown and the abrupt halt of face to face consultations. A rapid transition to telephone appointments could easily be made. Uploading and remote data review was already well practiced, and families felt this to be a normal way of support and reassurance.

A diabetes team mobile app was provided free of charge to families at the start of lockdown to provide an immediately accessible means to share public health alerts regarding shielding, school closures, emergency advice, information about changes to hospital services, and support for well being.

Communication between the multidisciplinary team for peer review and support and vulnerable patient handover was maintained by moving to Microsoft Teams and WhatsApp. Youth team support was delivered by Zoom.

Families have been grateful for continuity of care in the face of other uncertainty.

**EP137 | Influence of COVID 19 on patients/parents fears, schooling after lock down and use of telemedicine in a German pediatric diabetes center**

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**Objectives:** To analyze the influence of COVID 19 Pandemia on fear of patients and parents, schooling after lock down and use of telemedicine.

**Methods:** The abstract presents preliminary data of an ongoing survey because late bracking abstracts are not planned for the meeting. The questionnaire includes 6 questions of general aspects (age, treatment, kind of school, who answers the questions) 7 items regarding fears of infection, fears of problems in supply with material and insulin, 2 items regarding problems with restarting school or kindergarden, and 5 items regarding telemedicine in pandemia. All data were analyzed as descriptive data. At least 250 questionnaires will be analyzed finally.

**Results:** Till now 99 participants (62 parents and 37 adolescents answered) were analyzed. The mean age of the group was 12 years, 53% used CSII 46%injection therapy. 28 participants were afraid of getting a corona infection. Even more (40%) were afraid of problems with a corona infection because of diabetes. Information about potential problems were drawn from press (19%), www (13%), social networks (4%), experts (3%). One quarter was afraid of shortness in supply with material, these families increased their stock at home. Even more (35%) were afraid of problems with insulin supply, half of them increased the stock of insulin. Only a few families reported problems with going back to school (15%), many because of fears of the school due to higher risk with diabetes. 60% used a telemedicine offer especially to reduce contact. However only 35% would use a permanent offer for telemedicine. Most families appreciate personal outpatient contact (86%).

**Conclusions:** Many families report fears of COVID infection especially in the light of having diabetes. Even more are afraid of shortage in supply for diabetes treatment. Telemedicine was well accepted in the time of lock down, after this patients however prefer personal contact in the outpatient clinic.

**EP138 | Study of presentation of new cases of childhood diabetes mellitus during the COVID pandemic at a tertiary University UK hospital**

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**Introduction & objectives:** The COVID pandemic has stimulated profound change in health care with societal restraint to control the spread of the virus through reduced human contact balanced with encouragement to seek appropriate advice in case of medical emergency. Delayed diagnosis of Type 1 diabetes can lead to Diabetic Ketoacidosis (DKA) with significant morbidity and mortality. We obtained base line referral and disease grading data for new presentations of diabetes for the first half of 2019 and 2020 to compare changes in referral pathways if any.

**Methods:** Information regarding demographics, COVID-19 self-isolation status, and time to diagnosis were extracted from medical notes. Descriptive analyses, t test, ANOVA,  $\chi^2$  test, Mann-Whitney U

	Jan-Mar 2019 (n = 13) n %	Apr-Jun 2019 (n = 13) n %	Jan-Mar 2020 (n = 9) n %	Apr-Jun 2020 (n = 16) n %	P value Overall	P value Q1 vs 22,020
Number of cases	4.33(1.53)	4.33(0.58)	3.00(1.00)	5.33(2.31)	0.363	0.184
Age at diagnosis Mean(SD)	10.62(4.50)	7.77(5.12)	10.89(3.44)	9.69(3.65)	0.278	0.428
Gender Female	4 31%	6 46%	4 44%	11 69%	0.238	0.392
Male	9 69%	7 54%	5 56%	5 31%		
Time to diagnosis in days*(median, P25- P75)						
Total diagnostic interval	25(4-30)	14(10-18)	22(16-25)	18(7-22)	0.728	0.439
Patient interval	22.5(4-29)	14(10-18)	21(15-25)	18(7-22)	0.799	0.557
System interval	0(0-0)	0(0-0)	0(0-0)	0(0-0)	0.282	0.477
DKA at presentation	5 38%	5 38%	4 44%	5 31%	0.939	0.671

[Table showing numbers of newly diagnosed T1DM, Age range, time to diagnosis and DKA incidence over the 4 quarters].

or Kruskal-Wallis tests were used to describe patterns of service utilization, and compare the differences of key measures.

**Result:** 26 new cases of T1DM in the first half of 2019 versus 27 cases in 2020.

\* Total diagnostic interval: time from symptom onset to diagnosis

Patient interval: interval between symptom onset to first presentation to healthcare.

System interval: interval between first presentation to health care and diagnosis.

Route to diagnosis was through primary care in the majority of cases. In the last quarter (covering the period of lockdown), 2/16 of families were shielding and 4/16 parents reported that they would have sought advice sooner in normal times on direct questioning.

**Conclusion:** While the COVID pandemic has created a unique situation with ED and GP attendances reduced by over half across the UK, locally at our Children's hospital, this has not led to delays in seeking treatment or an increased incidence of DKA in children presenting with newly diagnosed diabetes.

#### EP139 | Impact of school closure and lockdown during COVID-19 emergency on glucose metrics of children and adolescents with type 1 diabetes in Piedmont region, Italy

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**Objectives:** From 23rd February 2020, to limit viral spreading during Coronavirus Disease (COVID-19) outbreak in Piedmont (one of the most affected area in Italy), schools were shut down for every age group. Likewise, recreational activities such as gyms and pools, as well as outpatients' clinics, were closed. From the same day, children were

forced to stay at home and school lessons were provide remotely. We sought to determine the impact of school closure and lockdown on children with type 1 diabetes (T1D), measuring metrics from continuous glucose monitoring (CGM).

**Methods:** The Regional Pediatric Diabetes network randomly selected patients (0-18 years) with T1D from every age group in Piedmont, between those using a CGM from at least 6 months. Time spent in range 70-180 mg/dL (TIR), below range (TBR), above range (TAR) as well as coefficient of variation (CV) and glucose management index (GMI) were measured during 90 days of lockdown and compared (paired t-test, 95%) with 90 days before. Patients also reported physical activity and total daily insulin dose (TDD) in the same study period.

**Results:** Data of our study population are showed in Table. Mean TIR from 90 days before was 59.7%, while during lockdown was 62.5% (p = 0.018). To the same extent, TBR went from 2.6% to 2.4% (p = 0.152), and TAR went from 39.5% to 36.7% (p = 0.004), respectively. CV moved from 35.9% to 34.9% during lockdown (p = 0.003), and GMI decreased from 7.5% to 7.4% (p = 0.05). Physical activity dropped from 6.1 to 2.7 hours per week (p < 0.001), while TDD increased from 36.4 to 40.3 UI/day (p = 0.005). Sensor usage increased from 86.5% to 91.5% of time.

**Conclusions:** The presented data on children and adolescents with T1D show an improvement of glucose metrics (especially TIR and TAR) with less variability during lockdown. An increased CGM use might have helped families in adjusting insulin therapy despite lifestyle changes and decreased physical activity.

	n = 66
Age (years), median [IQR]	12.5 [8.0-15.4]
Sex, number of males, %	46 (65%)
BMI, median [IQR]	18.7 [16.5-20.6]
Waist circumference (cm), median [IQR]	67.0 [58.0-70.6]
Hip circumference (cm), median [IQR]	75.5 [64.0-83.0]
Disease duration, (years), median [IQR]	3.5 [2.4-5.8]
HbA1c (%), median [IQR]	7.3 [6.6-7.7]

[Table. Data of our study population]

#### EP140 | Delivering diabetes care to children and young people during the coronavirus pandemic: Sheffield, UK experience

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**Introduction:** The current Covid-19 pandemic has created unprecedented difficulties in delivering diabetes care and the decision to suspend all non-essential face-to-face patient contacts was made nationally with immediate effect and no specific prior planning.

**Objectives:** To ensure the best possible care to our service users during the pandemic and assess the effect of "lockdown" on HBA1c.

**Methods:** Families were contacted and urged to download their devices and share data wherever possible. For those unable to download, recently diagnosed or requiring an interpreter, face-to-face appointments were offered on our non-acute site with a maximum of one carer per patient using PPE. We also offered "drive-by" device downloading and HBA1c sample collection via an open car window. For those downloading at home we offered the option of returning postal HBA1c samples. Newly diagnosed patients have been admitted and the usual package of in-patient care delivered with subsequent face-to-face and virtual education after discharge. Psychology and Dietetic sessions have continued virtually throughout. Transition of young people to the Young Persons Clinic we share with adult colleagues in an adult setting has been suspended until face-to-face consultations are available in that service

Results April–June: 2019 v 2020

Clinic population: 225 v 232

No. with HBA1c result: 197\* v 150\*\*

Median 58 v 59

Mean 60 v 60

\*Point of care test samples n = 197

\*\*Point of care test n = 30; Drive by n = 52; Postal samples n = 68.

**Conclusions:** Our data so far shows no significant worsening of HBA1c during the first 3 months of the pandemic and we continue to accumulate data and service user feedback on the new ways of working.

#### EP141 | Time in range and glucose variability were not similar between children, adolescents and adults with type 1 diabetes during lockdown due to CoVid-19 pandemic

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**Objectives:** Lockdown period may have influenced the metabolic control of patients with type 1 diabetes mellitus (T1D) of any age group. The aims of our study were (I) to compare continuous glucose monitoring (CGM)-derived parameters in children, adolescents and adults with T1D before and during lockdown period in Italy and (II) to identify factors potentially contributing to glucose control.

**Methods:** We enrolled 130 consecutive patients with T1D (30 children [1–12 years], 24 adolescents [13–17 years], and 76 adults [>18 years]), using either Dexcom<sup>®</sup> or FreeStyle Libre<sup>®</sup> monitoring systems >70% during study period, not wearing hybrid closed loop insulin pump. We calculated several CGM-derived metrics during the 20 days before and the 20 days after lockdown. By phone interview, we retrieved data on adult working activity and performed validated physical activity and perceived stress questionnaires.

**Results:** In children, significantly lower standard deviation of glucose (SDglu) (P = 0.029) and time below range < 54 mg/dL (TBR2) (P = 0.029) were detected after lockdown, when compared to pre-lockdown. In adolescents, all CGM-derived metrics were comparable between pre- and post-lockdown. In adults, significant improvement of time in range 70–180 mg/dL (TIR) (P < 0.001) and all remaining metrics, apart from % coefficient of variation and TBR2, was detected after lockdown. In adults, considering pre- and post-lockdown changes in SDglu and TIR, we identified a group of patients with improved TIR and SDglu, who has performed more physical activity, a group with improved glucose variability, younger than other patients, and a group with worsened glucose variability, who had higher perceived stress than others.

**Conclusions:** CGM glucose-metrics mostly improved in children and adults with T1D after lockdown, whereas it remained unchanged in adolescents. Age, physical activity, and perceived stress may be relevant factors contributing to metabolic control of T1D in adults.

#### EP142 | Shaping workflows in digital and remote diabetes care during the COVID-19 pandemic: A service design approach

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**Introduction:** The COVID-19 pandemic poses new challenges to healthcare providers to deliver continuous care for people with diabetes and has made remote care increasingly popular. Diabetes technology such as insulin pumps and CGM systems are established in most industrialized countries today. However, digital care has not been sufficiently integrated into clinical workflows.

**Objectives:** The Digital Diabetes Clinic (DDC) study sought to.

- 1) remotely support families with children with diabetes in their daily diabetes management,
- 2) engage all stakeholders through a participatory project design involving patients, caregivers, and care teams,



- 3) test and further develop an interoperable platform for data sharing, analysis and visualization,
- 4) investigate quality of care using this platform as part of remote care in a feasibility study, and.
- 5) analyze success factors and barriers for HCPs on their journey from conventional to digital care.

**Methods:** The DDC project is a mixed-methods study comprising a qualitative analysis of stakeholder workshops with a prospective longitudinal open-label feasibility and efficacy trial. The web-based open-source platform “Tidepool” was used to collect and review device data. Clinical and patient-reported outcomes were assessed before and during the COVID-19 pandemic, comparing digital to standard care.

**Results:** A total of 29 patients enrolled, and all successfully completed 6 months of video visits. In addition, 16 participants opted to perform at least one of their regular clinic visits remotely. After 3 months of video visits, Time-in-Range had significantly improved whilst Time-in-Hypoglycemia was decreased.

**Conclusions:** We sought to deliver an interoperable, comprehensive and holistic solution to deliver remote care during the COVID-19 pandemic. The findings can serve as a blueprint for other areas in chronic care, and will allow a sustainable integration of digital tools into existing workflows during the pandemic and beyond.

#### EP143 | Nationwide digital/virtual diabetes care of children, adolescents and young adults with type 1 diabetes during a lockdown due to COVID-19 pandemic in Slovenia

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**Objectives:** During coronavirus disease 2019 (COVID-19) pandemic the Government of the Republic of Slovenia inflicted a series of restrictive measures to contain and manage the possible spread, including outpatient clinics closure and a cessation of all non-urgent healthcare visits. To sustain uninterrupted diabetes care, all scheduled appointments for individuals with type 1 diabetes were transitioned to video digital/virtual visits.

**Methods:** In this prospective observational study, we compared glycaemic control of children, adolescents and young adults with type 1 diabetes from the Slovenian National Childhood Type 1 Diabetes Registry during the pre-lockdown and lockdown periods. We have approached all individuals with type 1 diabetes, who had a scheduled visit during a national lockdown period between 15th of March and 20th of May 2020.

**Results:** 313 out of 326 families contacted (96%) attended a video digital/virtual visit. Glycaemic control was not impaired during the lockdown period in individuals with type 1 diabetes. Mean glucose was 9.2 mmol/L (IQR 8.3–10.2) during the lockdown, compared to 9.5 mmol/L (IQR 8.2–11),

$p = 0.040$  during the pre-lockdown period. There were no severe hypoglycemic events, DKA, SARS-CoV-2 infections or any other severe adverse events requiring hospitalization during the lockdown among individuals included in our registry.

**Conclusions:** We demonstrated that a digital/virtual visit is a feasible alternative in specific clinical circumstances, like COVID-19 pandemic and could complement face-to-face visits in the future. There was no worsening of glycaemic control in individuals with type 1 diabetes during the lockdown period.

#### EP144 | Presentation of pediatric type 1 diabetes in Melbourne, Australia during the initial stages of the COVID-19 pandemic

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**Introduction:** Since the commencement of social isolation in the COVID-19 pandemic, pediatric diabetes centres across Australia have voiced concerns about an apparent reduction in new presentations of Type 1 Diabetes Mellitus (T1DM).

**Objectives:** We aimed to assess new presentations of T1DM across the 2 largest treating centers in Melbourne between February–May (inclusive) in 2020, compared to the last 3 years.

**Methods:** Data was collected on new presentations of T1DM and severity (including presentation in diabetic ketoacidosis [DKA] and admission to intensive care [ICU]) from February–May from 2017–2020 (inclusive).

**Results:** The absolute number of new presentations of T1DM in 2020 was similar to previous years. DKA severity and ICU admissions were similar for all years.

**Conclusions:** Concerns regarding increased severity at presentation with pediatric T1DM (due a perceived reduction in access to health care services and broader community fear in the setting of the pandemic) have not been borne out in this data.

#### EP145 | Increased pediatric presentations of severe diabetic ketoacidosis during COVID-19 pandemic

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**Aims:** To determine if the rate of severe diabetic ketoacidosis (DKA) at presentation of new-onset type 1 diabetes increased during the COVID-19 pandemic.

**Methods:** Data was collected on presentations of newly diagnosed type 1 diabetes as well as all presentations to the emergency department of a tertiary center between 2015 and 2020. Data from the pandemic period (March–May 2020) was compared to March to May of the previous 5 years (pre-pandemic periods).

**Results:** The number of new diagnoses of type 1 diabetes was comparable in the pandemic period and pre-pandemic periods (11 in 2020, range 6–10 in 2015–2019). The rate of severe DKA was significantly higher in the pandemic period compared to pre-pandemic periods. (45% versus 5%;  $p < 0.003$ ), odds ratio 16.7 (95% CI 2.0, 194.7). The overall rate of DKA was also significantly higher during the pandemic period (73% versus 26%;  $p < 0.007$ ), odds ratio 7.5. (95% CI 1.7, 33.5). None of the cases tested positive for COVID-19. Presentations of people aged.

< 18 years to the Emergency Department decreased by 27% in the pandemic period compared to the average of the pre-pandemic periods (4799 vs 6550).

**Conclusions:** A significant increase in the rate of severe DKA at presentation of type 1 diabetes was seen during the initial period of COVID-19 restrictions. We hypothesize that concern about presenting to hospital during a pandemic led to a delay in diagnosis. These data have important implications for advocacy of seeking healthcare for non-pandemic related conditions during a global pandemic.

#### EP146 | Exploring the role of peer support group in patients of type 1 diabetes during the times of COVID-19

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**Objective:** To study the utility of peer support group in a resource limited setting during COVID19 pandemic.

**Methodology:** This observational study was conducted in Pediatric Endocrine Clinic in a teaching hospital over a 3 months period. With the closure of routine outpatients department during the pandemic, a social media group was formed by the treating physician group with parents of children with type 1 diabetes. Consenting parents were enrolled on a common platform where they could discuss concerns regarding their children's diabetes.

**Results:** Of all the type 1 diabetics enrolled in the clinic, about 40% families could not be enrolled as they did not have any internet access. Initially, only 20% of the parents consented to be a part of the group which increased to 80% by the end of 1st month. The mean age of children with diabetes was  $8.2 \pm 1.4$  years. All the children were on basal-bolus insulin with regular SMBG. Most common concern was regarding maintaining uninterrupted supply of insulin; other concerns were relating to diet and decreased physical activity due to ongoing lockdown. After 3 months, it was observed that the number of distress call to the treating team was reduced by about 60%. All the

participating families felt more confident and satisfied after being a part of the group. Two children presented to the A&E in diabetic ketoacidosis after being diagnosed by the physician over the phone call. Both families had not consented to be a part of the peer support group and had stopped insulin due to supply related issues. About 30% children reported blood sugars in the hyperglycemic range based on SMBG monitoring, which was addressed through telemedicine. The reasons could be decreased physical activity, bingeing and increased stress levels.

**Conclusion:** Peer support group in current scenario of limited healthcare access can help in addressing the concerns of patients and their caregivers.

#### EP147 | COVID-19 among Italian children and adolescents with type 1 diabetes (T1D)

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**Introduction:** On February 2020, so-called Italian Patient 1 was admitted to the ICU of his local hospital due to a deteriorating clinical condition from SARS-CoV-2/COVID-19 infection. As of June 26th, 239,961 COVID-19 cases have been confirmed in Italy (children = 3805), including deaths ( $n = 34,708$ ) and who have recovered ( $n = 187,615$ ). Although children are generally less prone to COVID-19 and have a milder disease course, children with existing comorbidities could remain at higher risk of complications.

**Objective:** Aim of this study is to document clinical characteristics of children and adolescents with T1D affected with COVID-19.

**Methods:** Starting from the week after lockdown was initiated (March 9th), ISPED started a weekly surveillance for COVID-19 infection on all children with diabetes. Cases with suspected symptoms ( $n = 1$ ) or children living with positive tested relatives ( $n = 7$ ), or because hospitalized ( $n = 3$ ) were undergone to swab test. The surveillance is still ongoing.

**Results:** Eleven patients were diagnosed with COVID-19 (range 6–17 years of age, 7 females); two at T1D onset and nine in patients

with established diabetes (diabetes for 1–11 years), all of whom were asymptomatic (n = 7) or had only mild symptoms (n = 4). All had nasopharyngeal swabs positive for SARS-CoV-2 by RT-PCR. Three had mild hyperglycemia, 1 had mild DKA and 2 were admitted for T1D onset, 1 with DKA and 1 without. The remnant children had no disglycemia.

**Conclusions:** In Italy, overall 11 children with T1D had laboratory COVID-19 confirmation. These patients were tested due to having mild COVID-19 symptoms or because they lived close to a known positive patient. These data seem to support the hypothesis that children with T1D are not at higher risk for COVID-19 than general population and have a mild disease course. As the pandemic continues, further work is necessary to assess how this disease affects children and to develop best-evidence-based guidelines for our vulnerable patients.

#### EP148 | Reactive education for children with diabetic ketoacidosis during COVID-19

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**Objective:** The COVID-19 pandemic has brought many challenges to pediatrics including diabetes care. In our district general pediatric unit during COVID-19 we have experienced ten new type 1 diabetes with 50% presenting in severe diabetic ketoacidosis (DKA). 40% of all DKAs were complicated with hypokalemia and 70% with acute kidney injury. Due to the severity of the presentations and frequency of complications, a dynamic education program was introduced to improve DKA management and patient outcomes.

**Methods:** A DKA education week was introduced which was organized and implemented by the clinical registrar team. The week consisted of didactic consultant teaching on the DKA guideline, registrar led multi-disciplinary team (MDT) simulation sessions of a severe DKA in ED and cerebral edema developing in the ward setting, including nursing staff and general pediatric consultants. This was complimented with a practical skills session for prescribing in DKA, a focused session on the important aspects for reviewing a child with DKA and a journal club session on the evidence behind the DKA guideline. Reiterating the MDT approach, there was a specific teaching session for nurses. Remote teaching was incorporated for all sessions, via ZOOM, to ensure maximal impact.

**Results:** 94% of the junior team participated in at least one aspect of the teaching program, feedback rated it as 5/5 for useful content. 100% of DKA management adhered to the DKA guideline following the education week with a significant improvement in junior trainee efficiency and competences. Individual peer feedback demonstrated improved confidence with prescribing and reviewing patients in particular for the junior members of the medical team.

**Conclusion:** It is crucial that education in diabetes is reactive and dynamic to adapt to the challenges from COVID-19. Themed MDT education weeks in response to emerging trends is important for patient care and it can be junior led by an engaged registrar team.

#### EP149 | Did the SARS-CoV-2 lockdown affect the incidence of pediatric type 1 diabetes in Germany?

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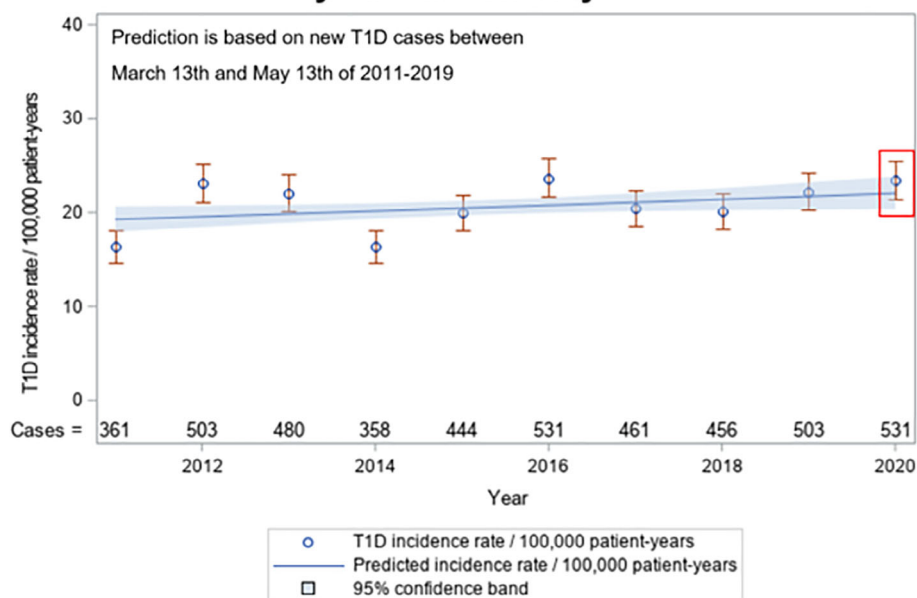
**Objectives:** To analyze a possible change in pediatric type 1 diabetes (T1D) incidence rate (IR) following the SARS-CoV-2 outbreak in comparison with the IRs of the last decade in Germany. Viral infections are known to be associated with T1D risk. Thus the SARS-CoV-2 pandemic may have increased the risk of T1D onset. Additionally, social separation in the SARS-CoV-2 lockdown may have set stress on families also possibly increasing the risk of T1D onset. On the other hand, social separation during lockdown may have decreased the frequency of common infections in children possibly reducing the T1D onset risk.

**Methods:** We included T1D patients registered in the “Diabetes-Prospective Follow-up” registry (DPV) with onset age between 6 months and < 18 years diagnosed in the years 2011–2020 each between March 13th and May 13th, corresponding to the lockdown-period in Germany in 2020. In each year, the number of cases was related to the respective patient-years at risk to estimate the IR (per 100,000 person-years [95% confidence intervals]) obtained from the Federal Statistical Office. Using a Poisson regression model, we predicted the IR for 2020 based on data from 2011–2019 in the whole cohort, and stratified by sex and age groups (< 6, 6- < 12, 12- < 18 years).

**Results:** T1D IRs increased from 16.4 [14.7–18.2] in 2011 to 22.2 [20.3–24.2] in 2019 (p = 0.04). The IR in 2020, based on 532 cases among 13 million subjects <18 years, was 23.4 [21.5–25.5] and did not differ significantly from the predicted IR (22.1 [20.4–23.9]) (Figure 1). We found no significant deviation of T1D IRs in 2020 from the predicted IRs after stratifying by age and sex.

**Conclusions:** The T1D IR in 2020 follows the increasing trend in the past decade without up- or downwards deviation, indicating no short-term influence of the SARS-CoV-2 situation on T1D IR. SARS-CoV-2

## Incidence rate of T1D in children and adolescents <18 years in Germany



[Figure 1: T1D incidence rate of patients < 18 years between 2011 and 2020]

infection rates in Germany were relatively low, so direct diabetogenic effects are unlikely.

### EP150 | The expansion of CoYoT1: Virtual diabetes care for the COVID-19 pandemic

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Before the COVID-19 pandemic, young adults (YA) with type 1 diabetes faced frequent socioeconomic obstacles to receiving adequate care, as competing demands from work, school, and social life make glycemic control and attending quarterly care appointments difficult. To reengage and support YA, we developed and then modified a collaborative, patient-centered, virtual diabetes care model, Colorado Young Adults with Type 1 Diabetes (CoYoT1) for our patients at an urban California pediatric hospital. CoYoT1 utilizes video conferencing technology for one-on-one visits with care providers as well as peer-led group visits where YA learn from each other how to best navigate life with diabetes. The ease of CoYoT1 increased YA engagement in their medical care and improved psychosocial outcomes, without increasing cost<sup>1-4</sup>.

COVID-19, which increases risk of death from 0.9% to 7.3% for patients with diabetes<sup>5</sup>, has made physical distancing critical for patient safety. In response, we rapidly expanded CoYoT1 to our entire endocrinology division, allowing for continual care during uncertain times. Over three weeks, we trained 19 providers, practiced virtual visits, and reorganized in-person medical team roles to virtual ones.

We increased our appointments from ~10 virtual visits per week during our study trial to >300 virtual visits per week, with over 90% of our appointments now virtual. Additionally, one in-person support group has been converted to a virtual group.

The expansion of CoYoT1 was successful, but also highlighted inadequacies in our model, inequity in care and access, and deficiencies in diabetes data collection and electronic medical record integration. To sustain CoYoT1 during COVID-19 and beyond, critical areas will require attention, including.

- 1) consistency in virtual care reimbursement;
- 2) improving diabetes data processing technology; and
- 3) ensuring equal access to virtual care for all patients, regardless of socioeconomic status, language, or culture.

### EP151 | Delivering of group telehealth intervention models for teens and young adults with T1D during a pandemic

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**Objective:** With COVID-19, many have had shelter-in-place (SIP) or physical distancing directives. Given the importance of peer support for youth with type 1 diabetes (T1D), telehealth (TH) group interventions have been beneficial. This proposal examines two TH models of group intervention for youth with T1D. The method of delivery for these interventions will be discussed.

**Methods:** Two research teams delivered TH groups while SIP guidelines were in place. CoYoT1 to California (CTC) is a randomized control study examining an intervention for youth with T1D. It is designed to increase access to care and strengthen patient/provider satisfaction. Teen Power<sup>®</sup> is a 10-week curriculum-based group intervention for youth with T1D and their caregivers. It aims to reduce psychosocial barriers that negatively impact T1D management for youth and their families. Pre-SIP in-person and TH visits were compared including recruitment and consent methods, training requirements, and data collection. Limitations were also examined.

**Results:** In-person and TH group process similarities/difference were identified. Broadly, the CTC team identified strengths including participants' increased familiarity downloading their diabetes data and attendance improved. For TeenPower<sup>®</sup>, a strength was the ability to offer simultaneous interpretation via chat. This allowed group co-facilitators to offer a nearly seamlessly discussion for monolingual and bilingual participants. Both teams identified needs to provide additional support to families around the use of technology.

**Conclusions:** TH allows group interventions to be delivered to youth with T1D during a pandemic when minimal physical contact is desired. There are many benefits. Common lessons learned across groups include allowing for time to train families on technology and anticipating the need for ongoing login support for the first few sessions. Challenges included lack of privacy, as well as issues with broadband or Wi-Fi connection.

#### EP152 | The impact of COVID-19 on type 1 diabetes and ketoacidosis incidence in pediatric age

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**Introduction:** The COVID-19 pandemic has had a significant impact the region of Lombardy, causing more than 16,000 deaths. Fortunately, children, including those with type 1 diabetes (T1DM), were only slightly affected. It is debated as to whether COVID-19 infection may increase the incidence of T1DM in children and whether the conditions during and following lockdown may have led to an increased number of diabetic ketoacidosis (DKA) at onset.

**Objectives:** To assess the impact of COVID-19 on T1DM and DKA incidence.

**Methods:** A network of 11 regional pediatric T1DM clinics collected data in children of ages 0–18 years during the time period between March 1–May 31 in the years 2017–2020. Given that all T1DM children are hospitalized at onset and rarely escape this network of regional clinics, it was possible to define a minimal incidence of T1DM without a secondary source,

**Results:** Number of onsets was stable (2017: 206 cases/year, 2018: 199 cases/year, 2019: 233 cases/year, 2020: 105 cases/5 months). DKA at onset varied between 36 and 40% of new onsets. By comparing the cases in the period March 1–May 30, 2017–2020, an increase in DKA incidence at onset from 11 to 24/1.7 million ( $p < .003$ ) was found. The minimum regional incidence of T1DM showed a slight increase from 11.7 to 13.7 cases/100,000 (0–18 years of age), comparable to previously collected regional data from 2008.

**Conclusion:** These data suggest that COVID-19 infection in Lombardy was not correlated with an increased T1DM incidence. Furthermore, the minimum regional incidence of T1DM in ages 0–18 years seems stable in the last 10 years. However, a significant increase in the number of DKA at onset was found, many of which were reported to be severe and probably consequent to delayed hospital presentation due to lockdown restrictions and fear of infection, emphasizing the indirect deleterious impact of pandemics on potentially life-threatening conditions such as DKA.

#### EP153 | Self-efficacy (SE), stress and perceived threat among caregivers of type 1 diabetes (T1D) youth during the COVID-19 pandemic

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**Objectives:** To investigate SE, stress, and perceived threat during and related to the COVID-19 pandemic for caregivers of T1D youth (< 18 years) and: 1) determine pandemic effects for caregivers using a self-administered health survey; and 2) compare T1D-care SE to a validated measure of general SE.

**Methods:** A 49 item survey on a 5-point Likert scale was designed for this study and was distributed via email and posted to T1D related social media platforms from May 4–June 2, 2020. We used the Patient-Reported Outcomes Measurement Information System (PROMIS) SE short form as a measure of general SE. 262 caregivers completed the surveys (Mean caregiver respondent age was  $42.3 \pm 7.7$  yrs, 94.3% female, 68.3% college degree or higher; 53.8% annual income >\$90,000, 77.5% privately insured). Mean child age was  $11.0 \pm 4.1$  yrs with mean T1D duration of  $4.2 \pm 3.4$  yrs.

**Results:** Twenty four percent reported having or knowing someone with COVID-19; 9.5% reported job loss; 26.0% reported financial difficulty due to the pandemic. Caregivers reported increased stress

	Much less than before	Less than before	The same	More than before	Much more than before
How would you compare your stress level during the COVID-19 pandemic to your stress level before the pandemic started?	1.1% (n = 2)	5.7% (n = 15)	20.6% (n = 54)	55.0% (n = 144)	16.8% (n = 44)
	Not at all	A little	Somewhat	Quite a bit	Very much
How much does COVID-19 affect your life?	1.9% (n = 5)	6.9% (n = 18)	17.2% (n = 45)	50.4% (n = 132)	23.7% (n = 62)
Does COVID-19 make you feel anxious?	11.1% (n = 29)	26.7% (n = 70)	28.2% (n = 74)	20.2% (n = 53)	13.7% (n = 36)
Do you think your child is at increased risk of getting COVID-19	24.8% (n = 65)	24.4% (n = 64)	24.8% (n = 65)	13.4% (n = 35)	12.6% (n = 33)
If your child were to get COVID-19, how sick would your child get?	0.4% (n = 1)	7.3% (n = 19)	38.2% (n = 100)	40.8% (n = 107)	13.4% (n = 35)
I believe my child is at risk for getting COVID-19.	8.0% (n = 21)	31.7% (n = 83)	33.2% (n = 87)	18.7% (n = 49)	8.4% (n = 22)
I believe we are all at risk for getting COVID-19.	1.5% (n = 4)	22.5% (n = 59)	36.6% (n = 96)	26.3% (n = 69)	13.0% (n = 34)

[Responses to measures of stress and perceived threat during the pandemic]

levels due to the pandemic. Table 1 shows stress and perceived COVID-19 threat data. General SE levels were high and were significantly correlated with COVID-19-related SE ( $r = 0.400$ ,  $p < 0.001$ ); there was no association between general SE and T1D care-SE during the pandemic ( $r = -0.035$ ,  $p = 0.573$ ).

**Conclusions:** The COVID-19 pandemic is associated with higher caregiver stress and perceived sense of threat. Levels of general SE and COVID-19 SE were high, but diabetes specific SE levels were low. Results from this survey suggest that T1D care teams should focus efforts on providing additional support and education tools to caregivers on how to improve stress management and confidence related to diabetes care during the pandemic.

#### EP154 | The early impact of the COVID-19 pandemic on the emotional well-being and treatment of Belgian pediatric patients with type 1 diabetes

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**Background:** Little is known about the COVID-19 pandemic on pediatric patients with type 1 diabetes (T1D). The aim of this study was to explore the early impact of COVID-19 on emotional well-being of pediatric patients and their parents and self-reported changes in treatment since the COVID-19 pandemic.

**Methods:** Pediatric patients with T1D (12–18 years old) and parents of children with T1D.

(1–18 years old) in follow-up in the University Hospital of Leuven, completed an online questionnaire, securely attached to their medical files. The questionnaire covered the emotional impact of the COVID-19 pandemic, changes in diabetes treatment, health-protective behaviors, diabetes-related worries and respondents' perception of their COVID-19 status. Frequencies were calculated for all questions.

**Results:** In total, 33 adolescents and 96 parents of 84 children completed the questionnaire. We documented an impact on emotional well-being, with respondents reporting stress and fear associated with the pandemic. Changes in treatment were mostly positive, including extra glycemia measurements, better adaptation of insulin dosage, healthier eating, and improved glyceemic control. Respondents indicated that they followed social distancing rules strictly, worried more about their diabetes and discussed more with each other about the diabetes.

**Conclusions:** The psychological impact of the COVID-19 pandemic in patients and parents was clear, mostly resulting in symptoms of stress and anxiety. This knowledge shows that there is a crucial role for multidisciplinary teams to screen for mental health problems and a need for psychosocial support to reduce levels of stress and anxiety. Self-reported changes in treatment were overall positive, indicating to resilience in self-management in patients with type 1 diabetes and their parents in the early stage of the international pandemic.

#### EP155 | The role of continuous blood glucose monitoring with periodic scanning/ reading (flash monitoring) in compensation of carbohydrates metabolism in children with diabetes mellitus type 1

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**Objective:** To assess the effect of continuous blood glucose monitoring with periodic scanning/reading (Flash monitoring) on carbohydrates metabolism compensation.

**Materials and methods:** The study included 30 patients with diabetes mellitus type 1: the mean age of the patients was  $10.3 \pm 4.2$  years; duration of disease  $3.0 \pm 2.4$  years, boys/girls ratio 13/17 (43/57%), duration of Flash monitoring usage  $1.2 \pm 0.7$  years.

The patients were divided into two groups based on the number of data obtained from the continuous monitor sensor: group one - over 70%, group two - under 70% of assessment time.

Group one included 24 patients  $9.5 \pm 4.3$  years of age with a disease duration of  $2.8 \pm 2.3$  years, the number of data obtained from the sensor was  $92.9 \pm 8.1\%$ .

Group two included 6 patients  $13.5 \pm 1.9$  years of age with a disease duration of  $3.9 \pm 2.7$  years, the number of data obtained from the sensor was  $44.2 \pm 2.9\%$ .

Glycosylated hemoglobin assay (by HPLC standardized by DCCT) was performed before and after Flash monitoring use; the time of blood glucose values within the target range ( $3.9\text{--}10$  mmol/L) was assessed.

**Results:** Glycosylated hemoglobin assay in the first group showed a significant difference ( $8.4 \pm 1.9\%$  vs  $7.0 \pm 1\%$ ,  $p < 0.05$ ). In the second group, no significant difference in glycosylated hemoglobin level was revealed ( $9.1 \pm 2.0\%$  vs  $9.3 \pm 2.2\%$ ,  $p > 0.05$ ).

It appeared that the time of blood glucose values within the target range in the first group was significantly higher as compared to this parameter in the second group ( $63.7 \pm 15.8\%$  vs  $38.8 \pm 8.6\%$ ,  $p < 0.05$ ).

**Conclusions:** Thus, scanning frequency (number of data obtained from the sensor) determines the compensation of carbohydrates metabolism, which is reflected by parameters such as glycosylated hemoglobin value and time of blood glucose within the target range.

#### EP156 | Significance of CBM-derived glycemc markers in Japanese children and adolescents with type 1 diabetes

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**Objective:** To evaluate the significance of the consensus recommendations from the ATTD on CGM-derived metrics in Japanese children and adolescents with type 1 diabetes.

**Methods:** Eighty-five patients (age,  $13.5 \pm 4.7$  years) who wore the FreeStyle Libre for a 28-day period were enrolled in this study. Seventy-three patients were treated with MDI and 12 with insulin pump therapy without using a sensor-augmented pump or closed-loop therapy. We assessed the association between CGM-derived metrics: time in range (TIR: 70–180 mg/dL), time below range (TBR:  $< 70$  mg/dL), and time above range (TAR:  $> 180$  mg/dL), and laboratory-measured HbA1c and estimated HbA1c (eA1c) levels calculated from the mean glucose values.

**Results:** The mean TIR was  $50.7 \pm 12.2\%$  (23–75%), TBR  $11.8 \pm 5.8\%$  (2–27%), and TAR  $37.5 \pm 13.5\%$  (9–69%). The TIR was highly correlated with HbA1c level, eA1c level, and TAR, but not with TBR. An HbA1c level of 7.0% corresponded to a TIR of 55.1% (95% CI: 53.7–56.5%), whereas a TIR of 70% corresponded to an HbA1c level of 6.1% (95% CI: 5.9–6.3%). The results of eA1c levels were similar to those observed for HbA1c levels.

**Conclusions:** Low rates of a recommended TIR of 70% may be due to less use of advanced technology, such as a sensor-augmented pump or closed-loop therapy, and insufficient comprehensive diabetes care.

Ethnic characteristics including lifestyle and eating customs may have contributed to the result. CGM-derived targets must be individualized based on ethnic characteristics, insulin treatment and diabetes care, and needs of individuals with diabetes.

#### EP157 | Association between scanning frequency and CGM-derived glycemc makers in children and adolescents with type 1 diabetes

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**Objective:** To evaluate the association between scanning frequency of flash glucose monitoring (FGM) and CGM-derived glycemc markers in children and adolescents with type 1 diabetes.

**Methods:** Subjects consisted of 85 children and adolescents with type 1 diabetes using FGM. We assessed the association between scanning frequencies of FGM and CGM-derived metrics: time in range (TIR) (70–180 mg/dL), time below range (TBR) ( $< 70$  mg/dL), and time above range (TAR) ( $> 180$  mg/dL), and other glycemc markers: laboratory-measured HbA1c and CGM-estimated glucose and HbA1c (eA1c) levels in the subjects. We also examined the scanning patterns across the day: i.e., at 0–6, 6–12, 12–18, and 18–24 h.

**Results:** The mean number of scans was  $11.5 \pm 3.5$  (5–20) times per day. Mean number of scans according to the four time zones were  $1.2 \pm 1.2$  for 0–6 h,  $2.8 \pm 0.9$  for 6–12 h,  $3.0 \pm 1.4$  for 12–18 h, and  $4.6 \pm 1.8$  for 18–24 h, respectively. The number of scans for 0–6 h was significantly lower than those for any other period ( $P < 0.0001$ ). Scanning frequency showed significant positive correlation with TIR ( $r = 0.719$ ,  $P < 0.0001$ ) and inverse correlation with TAR ( $r = -0.743$ ,  $P < 0.0001$ ), but did not correlate with TBR. Additionally, there were significant inverse correlations between scanning frequency and glucose, HbA1c, and eA1c levels ( $r = -0.765$ ,  $-0.815$ , and  $-0.793$ , respectively,  $P < 0.0001$ ).

**Conclusions:** Frequent glucose testing with FGM decreased hyperglycemia with increased TIR, but did not reduce TBR. Coping with a rapid fall of glucose and unexpected hypoglycemia with other forms of technology such as use of alarm-system, insulin pump, and closed-loop therapy might contribute to reduced hypoglycemia and TBR.

#### EP158 | Measuring the impact of flash glucose monitoring in a pediatric population in Saudi Arabia: A prospective cohort study

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HbA1c (%)	Mean (SD)	Paired T-test P-value
Baseline	10.8 (2.2)	
3-month	9.8 (1.9)	< 0.001*
6-month	9.2 (1.7)	< 0.001*
9-month	9.1 (1.9)	< 0.001*

[Changes in HbA1c following FSL sensor insertion]

**Introduction:** Measurement of glucose levels is the mainstay method to ensure good glycemic control and prevent complications associated with uncontrolled diabetes. FreeStyle Libre Flash Glucose Monitoring System (FSL, Abbott Diabetes Care), an intermittently scanned continuous glucose monitoring device approved by the Conformite Europeenne in 2014, enables easy and effective monitoring of interstitial glucose around the clock.

**Objectives:** This study aimed to measure the effect of FSL on HbA1c at 3, 6 and 9 months following sensor insertion.

**Methods:** A prospective cohort study of pediatric and adolescent type 1 diabetes mellitus patients randomly sampled from 32 Ministry of Health diabetes centers across Saudi Arabia. Patients were first-time users of FSL, aged 4–18 years and receiving insulin via multiple dose injection or continuous subcutaneous insulin infusion for at least 6 months prior to study start. Patients were excluded if they had prior use of FSL or other interstitial glucose monitoring systems in the past 3 months, were pregnant or had existing hemoglobinopathies. The FSL sensor was attached to the back of the upper arm at baseline visit. HbA1c (%) was measured at baseline, 3, 6 and 9 months. Patient demographics were collected from electronic health records.

**Results:** 1307 patients were included with a mean age of 11.1 years (SD 3.6 years). Where specified, 51.4% were female. Mean HbA1c significantly reduced from baseline (10.8%) to 3-months (9.8%,  $p < 0.001$ ), 6-months (9.2%,  $p < 0.001$ ) and 9-months (9.1%,  $p < 0.001$ ) (Table). For individuals with baseline HbA1c  $>9\%$ , mean HbA1c was significantly reduced from baseline (11.7%) to 3-months (10.3%,  $p < 0.001$ ), 6-months (9.6%,  $p < 0.001$ ) and 9-months (9.5%,  $p < 0.001$ ).

**Conclusions:** FSL significantly reduced HbA1c levels at 3-, 6- and 9-months following sensor insertion. This reduction was greatest in those patients with higher HbA1c at baseline ( $>9\%$ ).

#### EP159 | Viewpoints of health-care professionals on recommending type-1 diabetes technologies in children and adolescents: A worldwide survey

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**Objective:** To assess health-care professionals (HCP)'s perceptions on the decision-making to recommend/start a patient with type 1 diabetes on technological devices.

**Methods:** An electronic, anonymous survey containing 33 questions was disseminated through an open weblink within a calendar month. The survey was structured in four topics:

- (i) HCP's sociodemographic and work profile;
- (ii) perceptions about indication and contraindication for insulin pumps;
- (iii) for continuous glucose monitoring (CGM) systems; and
- (iv) their decision-making on different case scenarios.

Data were analyzed descriptively.

**Results:** A total of 270 responses were received from 49 countries, of which 247 were considered in the analyses, with an average completion rate of 78%. Most of the participants were women between thirty and forty years-old, who practice as pediatric endocrinologist for more than ten years at university or academic hospitals/clinics and follow more than five hundred patients with type 1 diabetes. Nearly 12% of the participants considered themselves to belong to a minority racial/ethnic group. Insulin pumps and CGM systems are available for more than 95% of the respondents. HCP highly recommend pumps and CGMs, regardless of circumstance. Devices are also consented by patients, though nearly half of them cannot count on this therapy due to health-care system coverage or lack of insurance reimbursement. Among socioeconomic factors, parental educational level (50%), family/patient first language being different than that of the diabetes team (46%), parental ability to afford to maintain treatment (39.5%), and family income (32%) were mostly relevant to influence decision-making.

**Conclusions:** We highlight a comprehensive picture of reasons why HCP prescribe or not recommend diabetes technology. HCP seem to be markedly flexible when to start a patient on pumps and CGM, but some socioeconomic factors are considered before recommending it.

#### EP160 | Successes and challenges with CGM in children and adolescents with T1D

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**Aims:** To describe CGM use in children and adolescents, describe patient questions about CGM, and determine how much time providers spent addressing CGM questions during clinic visits at a large Type 1 Diabetes (T1D) center.

**Methods:** Nine clinical providers completed surveys describing 104 patients' CGM questions and time spent addressing concerns. Two weeks of CGM downloads were collected from each clinic visit. Research staff coded patient questions into themes. Optimal CGM use was defined as use  $>6$  d/wk, use of alerts, and use of remote monitoring (if applicable). Data for children (ages 0–13 years) and



	CHILD (ages 0-13) (n = 42)	ADOLESCENT (ages 14-24) (n = 41)	p
CGM questions for providers			
% of CGM users with CGM-Specific questions	66.6%	78%	0.33
Minutes spent on CGM questions during visit [Median (IQR)]	5 (0, 10)	10 (5, 15)	0.03*
Themes of CGM questions and % of CGM users endorsing each theme (totals ≠ 100% as some CGM users did not have questions, others had multiple questions)			
CGM use and optimization	28.5%	46.3%	
Upgrading device or new technology	16.6%	19.5%	
How to interpret CGM data	16.6%	9.8%	
Behavioral adherence concerns	7.1%	9.8%	
Cost/insurance	7.1%	9.8%	

[Provider Surveys on Pediatric CGM Users]

adolescents (14-24 years) were compared using Mann-Whitney U and chi-squared tests. P-value significance was determined at 0.05.

**Results:** Data from 50 children (median age 10.5 y, 56% female, median A1c 8.3%) and 54 adolescents (age 17 y, 33% female, A1c 8.2%) were analyzed. Children wore CGM more consistently than adolescents (median 93% [IQR 79.3, 93] use vs. 79% [43, 93], p = 0.006), and were more likely to use CGM optimally (47.8% of children vs 24.4% of adolescents p = 0.02). Most patients (72%) had questions about CGM (table).

**Conclusion:** Many youth are not using CGM optimally and require ongoing clinical support, which should be an important focus of clinical visits. Adolescents may require frequent review of CGM basics and device optimization to achieve success with CGM.

EP161 | Multi-site quality improvement project: Improving Continuous Glucose Monitor (CGM) uptake across ten U.S Centers

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**Introduction:** The T1DX-QI is a national Type 1 diabetes learning health system with thirteen endocrinology centers. The program is coordinated by the T1D Exchange in Boston, Massachusetts.

Many studies that has demonstrated the clinical benefit of Continuous Glucose Monitors (CGM) and sensors. Although favorable insurance policy changes have gradually increased the adoption of CGM devices nationally, widespread uptake has been slow.

**Objective:** This abstract describes how ten clinics in the T1DX-QI used QI principles including the Model for improvement including Plan - Do - Study - Act (PDSA) cycles to test and expand different initiatives in their respective centers across the United States. The interventions that were tested include the redesign of relevant workflows, assessed and removed barriers to adoption, expanding CGM educational programs.

**Methods:** The centers tested and reported the results of the interventions for patients in the 12-26 age cohort. The coordinating center (T1D Exchange) used Quality Improvement control and run charts rules to evaluate the effectiveness of the interventions (Figure 1 - Collaborative Wide Improvement Run Chart).

**Results:** Eight of ten participating centers improved their CGM uptake significantly. The increase ranged from 7% - 34%, three sites were able to improve their CGM uptake by more than 20% from baseline over the

Collaborative CGM/Sensor Use 12 - 26 years



Run Chart Favorable direction



[T1Dx QI Collaborative Improvement Run Chart].

duration of the project. There was a 12% significant improvement from baseline in 20 months across the entire cohort of centers. Over 900 patients in the 12–26 years cohort were directly positively impacted by this project. **Conclusion:** This project demonstrates that by using QI principles to test interventions and cross-learning, clinical providers can improve access to CGM devices and real-world improvement in outcomes.

EP162 | Analyses of the accuracy of Dexcom G4 in children with type1 diabetes

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**Introduction:** Time in target range (TIR) is a newly parameter to evaluate overall blood glucose control in patients with diabetes and is expected as a substitute for or above HbA1c. rt CGM is also requires the sensor accuracy for evaluation of TIR.

**Objectives:** We investigated the association between SMBG levels (SMBGLs) and sensor glucose levels (SGLs) with Dexcom G4 in Japanese children with T1DM.

**Methods:** Study subjects included 6 children with T1DM admitted to our hospital in order to improve glycemic control during 1st April-30th September in 2019. They used Dexcom G4 as rt CGM during the admission period, and measured SMBGLs and SGLs simultaneously at the same time before and after each meal, at bedtime, at wake-up time, at midnight, and when the patients recognized symptoms of hypoglycemia. We evaluated the correlation between SMBGLs and SGLs throughout the day. In addition, we evaluated those association according to the 4 SGL-groups:

- (1) 70 mg/dL >
- (2) 70 - 180 mg/dL,
- (3) 181–250 mg/dL,
- (4) > 251 mg/dL.

The correlations were also examined in the 3 trend-arrows: parallel: (→), ascending (↗ or ↑ or ↗↗), and descending (↘ or ↓ or ↘↘). These correlations were analyzed by Pearson's product moment correlation coefficient. MARD from 1st day to 7th day were evaluated by ANOVA.

**Results:** In total, SMBGLs and SGLs were measure at 375 times at the same time. SGLs were significantly correlated to SMBGLs during the entire study period. SGLs and SMBGLs were strongly correlated to TIR and TAR, but were not correlated to TBR except for the parallel of trend arrows. SGLs was significantly lower than SMBGLs when the trend arrows with SGLs showed ascending, whereas significantly higher than SMBGLs when the trend arrows with SGLs showed descending. The MARD was 11.3% during the entire period, and the accuracy did not change over time.

**Conclusion:** We considered that Dexcom G4 can be useful as an auxiliary technique for blood glucose control even in Japanese children with T1DM.

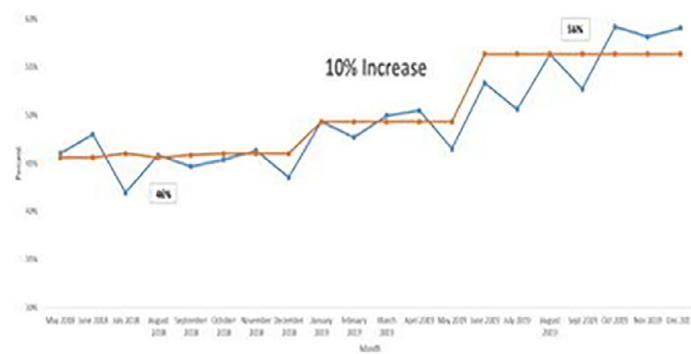
EP163 | Multi-center quality improvement collaborative: improving insulin pumps for patients with type 1 diabetes in the U.S

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Percent of Patients on Insulin Pump/Pod (12 – 26 years)

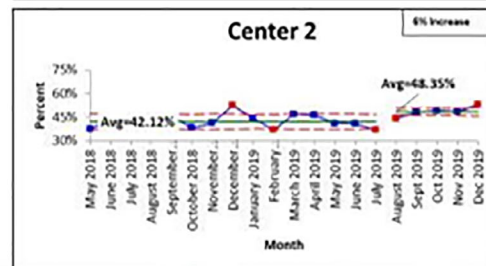
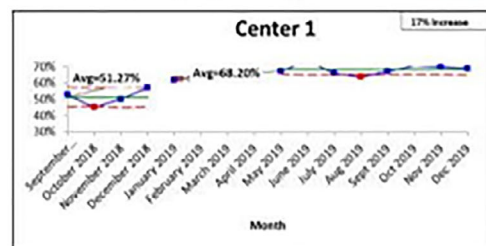
Collaborative-wide Run Chart



	May 18	Jun 18	Jul 18	Aug 18	Sep 18	Oct 18	Nov 18	Dec 18	Jan 19	Feb 19	Mar 19	Apr 19	May 19	Jun 19	Jul 19	Aug 19	Sep 19	Oct 19	Nov 19	Dec 19
Days	993	915	785	1150	1067	1156	1102	1284	1149	1147	1248	1267	1007	964	1127	1005	997	910	828	
Months	457	439	329	527	472	524	538	484	633	540	573	630	589	505	410	635	572	590	529	489



Control Chart Examples (P – Chart)



[Figure 1 Improving Insulin Pump Run and Control Charts]

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**Introduction:** The T1DX-QI is a Type 1 diabetes learning health system with fifteen endocrinology centers in the United States. The program is coordinated by the T1D Exchange in Boston, Massachusetts.

**Objectives:** There have been several studies on the impact and benefit of insulin pumps and the impact of frequent insulin bolusing on clinical outcomes. This work describes how five centers in the T1DX-QI used QI methods including the Plan - Do- Study - Act (PDSA) cycles to test and expand different interventions at their respective centers. Some of the successful efforts include developing mobile technology classes, redesigning workflow, coaching patients to bolus for meals and corrections, and removing barriers to adoption. The centers piloted changes among patients aged 12–26 years.

**Methods:** The centers shared data monthly with the coordinating office. These data were used for ongoing QI coaching and to promote the cross-sharing of best practices. Statistical Process Control charts with the relevant rules for fundamental shifts (improvements) were used to evaluate the effectiveness of the project. (Figure 1). Factors that lead to improvement were identified as well as challenges to the implementation and scaling of different interventions.

**Results:** Three of the five participating centers had substantial improvement in this process. The increase ranged from 6% - 17%. There was a 10% significant change among the participating collaborative cohort in 20 months.

**Conclusions:** This project demonstrates the value of multi-center sharing, learning and using quality improvement principles to improve clinical systems.

#### EP164 | Patient demographics and clinical outcomes among type 1 diabetes (T1D) patients using Continuous Glucose Monitors (CGMs): Real world evidence from a large U.S. collaborative

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CGM devices have been shown to improve glycemic control in patients with T1D. Despite existing clinical evidence and improved performance of CGM devices, only a small proportion of patients are using CGM.

The T1D Exchange QI Collaborative (T1DX-QI) is a large cohort with twelve national clinics engaged in data sharing and quality improvement to improve outcomes. This analysis used the T1DX-QI database to examine patient attributes associated with CGM device use. Patients with one or more completed clinic encounters during the years 2017–2019 were included (N = 16,414) and classified as CGM

users if they indicated information on a device start date, model or company within the past one year of their most recent diabetes clinic visit. We examined the frequency of CGM device use and distribution of socio-demographic factors, as well as clinical outcomes, among CGM users versus non-users.

In this cohort, 5486 (33.4%) of T1D patients were CGM users, with patients aged  $\leq 26$  years being more likely to use CGM (48%). Among CGM users, about 60% used a real-time device, 2% used an intermittent scanning device, whereas for 38% device type was unknown. CGM use was more likely among Non-Hispanic Whites (75%) and patients on private health insurance (77%) relative to Non-Hispanic Black patients (2%) and those on public health insurance (20%) [ $p < 0.001$ ]. HbA1c levels among CGM users were lower relative to non-users after adjusting for age, race/ethnicity and insurance status ( $8.0\% \pm 1.7\%$  vs.  $8.8\% \pm 1.9\%$ ) [ $p < 0.001$ ].

This study highlights real world evidence of patient factors and clinical outcomes among CGM users in the T1DX-QI Collaborative. This distribution of patient attributes comes from one of the largest T1D cohort's available to-date and sheds light on sociodemographic variability in CGM uptake with implications for targeted interventions to promote device used in this subset of the T1D population.

#### EP165 | Temporal trends in diabetes technology use among children and adolescents with type 1 diabetes between 1995 and 2019: Results from the DPV registry

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**Objective:** To investigate temporal trends in the use of insulin pumps and continuous glucose monitoring (CGM) in children and adolescents with type 1 diabetes from 1995 to 2019. Furthermore, to describe sensor profile data from CGM users documented in a prospective, multicentre diabetes patient follow-up registry (DPV).

**Methods:** Individuals with type 1 diabetes  $< 21$  years and a diabetes duration  $\geq 1$  year, which were registered in DPV from 1995 to 2019, were included. Analyses were stratified by sex and age. ( $< 5$ ,  $5 - < 10$ ,  $10 - < 15$ ,  $\geq 15$  years). Moreover, we show a description of the most recent year of CGM users providing sensor profile data.

**Results:** Among 78,290 children and adolescents with type 1 diabetes (median age 16.5 years, diabetes duration 6.1 years, 53% males), use of insulin pumps increased consistently from 1995 (0.9%) to 2019 (59.5%). Use of CGM was shown to be constantly <5% until 2015, while a consistent increase was observed from 17.4% in 2016 to 69.8% in 2019. Increases were most significant in very young children <5 years (2019: insulin pump 92.3% vs 48.1%–75.8% in  $\geq 15$  and 5- < 10 age groups, CGM 77.6% vs. 63.2%–76.5.0% in  $\geq 15$  and 5- < 10 age groups). Insulin pump use was more frequent in females (2019 62.6%) compared to males (2019 56.7%), whereas no differences were observed in CGM. Up to date, 3036 CGM profiles of children and adolescents are documented in DPV (median age 13.4 years, diabetes duration 4.6 years, HbA1c 7.5%, 52% males). The individuals provided an average number of 132 sensor glucose values per day. Mean Time-in-Range (70–180 mg/dL) was 48.3%.

**Conclusions:** Consistent increases in insulin pump and CGM use might reflect stepwise approval and insurance coverage as well as technological literacy and readiness of individuals with type 1 diabetes, their families and diabetes care teams. A description of sensor profile data gives insight into new clinical parameters (Time-in-Range) and might indicate further potential treatment benefits.

#### EP166 | Intermittently scanned continuous glucose monitoring is associated with high satisfaction but increased HbA1c and weight in well-controlled youth with type 1 diabetes

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**Objectives:** In 2016, full reimbursement of intermittently scanned continuous glucose monitoring (isCGM) was introduced in Belgium. We undertook a 24-month prospective observational single-center real-world trial to study the impact of isCGM on quality of life (QOL) and glycemic control of youth with type 1 diabetes (T1D).

**Methods:** Between September 2016 and November 2017, 138 children and adolescents with T1D were recruited. Demographic, metabolic, and QOL data (Diabetes Quality of Life for Youth and Hypoglycemia Fear Survey for children) were collected at start, 6, 12, and 24 months of routine follow-up. Primary endpoint was evolution of QOL, with secondary outcomes change in HbA1c, occurrence of acute diabetes complications, and school absence. Data are mean  $\pm$  SD or (95% confidence interval).

**Results:** Ninety-two percent found isCGM more convenient than finger sticks and had high treatment satisfaction after 24 months ( $8.0 \pm 1.4$  on a scale of 10), without a change in diabetes-specific QOL. HbA1c significantly increased from 7.2% (7.0–7.3) (55 mmol/mol [53–56]) at baseline to 7.6% (7.4–7.8) (60 mmol/mol [57–62]) at 12 months ( $P < 0.0001$ ) and was unchanged up to 24 months. This

overall increase was mainly driven by children with baseline HbA1c < 7.0% (< 53 mmol/mol) ( $n = 64$ , 46%). Additionally, BMI adjusted for age was higher at study end. There was no change in severe hypoglycemia. In year before isCGM, 228 days per 100 patient-years of school absenteeism were reported, which dramatically decreased to 13 days per 100 patient-years ( $P = 0.016$ ) after 24 months. Parents of children also reported less work absenteeism ( $P = 0.011$ ).

**Conclusions:** Use of isCGM by a T1D pediatric population is associated with high treatment satisfaction and less days off school. However, increased HbA1c and weight may reflect a looser lifestyle, with less attention to diet and more avoidance of hypoglycemia. Intensive education specifically focusing on these points may mitigate these issues.

#### EP167 | Evaluation of the SPECTRUM training program for real-time continuous glucose monitoring: a multicenter prospective study in parents of 60 young children with type 1 diabetes

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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 pediatric modules (à 90 minutes) of face-to-face group sessions.

Efficacy of SPECTRUM was evaluated longitudinally among parents of young children with type 1 diabetes (T1D) from 7 diabetes centers. Outcome parameters were rtCGM-knowledge and -skills (rtCGM-Profi-Check), satisfaction with the course, technology acceptance and metabolic control. Initially 65 parents of 60 children with T1D were recruited (mean age  $7.4 \pm 3.6$  yrs, diabetes duration  $2.7 \pm 2.5$  yrs, 57% female). Data were collected at study entry, after the final group session, and at 6 months follow-up.

The study was completed by 58 parents of 55 children (11% dropped out). After training rtCGM knowledge (scale 0–40) improved by 67% (from  $17.7 \pm 8.3$  to  $29.5 \pm 4.8$ ;  $p > 0.001$ ) and persisted until 6 months follow-up ( $30.1 \pm 4.5$ ). Satisfaction with SPECTRUM was  $1.4 \pm 0.6$  (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 ± 0.7 (1–7 low-high) after the training and 4.1 ± 0.5 and 6.1 ± 0.8 respectively at follow-up. This indicates a high acceptance, positive attitude, and intention to use rtCGM continuously. Parents reported of 4 severe hypoglycemic events during the six months before study entry, until follow-up there was no severe event. Children's mean HbA<sub>1c</sub> remained stable on a good level at study entry of 7.3 ± 0.8% and after six months of 7.4 ± 0.7% (p = 0.172).

SPECTRUM was shown to be effective in increasing the knowledge and skills about rtCGM in parents of young children with T1D. The effect was sustainable and independent from diabetes center and rtCGM-system used. Parents reported of high satisfaction and acceptance of rtCGM.

#### EP168 | Early versus delayed insulin pump therapy in children with newly diagnosed type 1 diabetes - results from the DPV registry

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**Objective:** Insulin pump therapy (CSII) is associated with improved metabolic control in children with type 1 diabetes. However, it is not known whether an early or delayed start of CSII is beneficial.

**Methods:** Multicenter (German/Austrian/Swiss/Luxembourgian) study from the Prospective Diabetes Follow-up Registry DPV. We analyzed data from 8546 patients aged <16 years with type 1 diabetes diagnosed between 2004 and 2014 who started CSII within the first three years of diabetes duration. Four years after diagnosis we compared the outcome including HbA<sub>1c</sub>, rates of acute complication and hospitalization between patients who started CSII during the first year (n = 4698) or in the second to third year (n = 3848) after diagnosis. All models were adjusted for age at diabetes diagnosis, year of diagnosis, sex, migration background, CGM use, and center size.

**Results:** Early CSII initiation was associated with lower rates of hypoglycemic coma (incidence risk ratio (IRR) (95% CI): 0.32 (0.14–0.73), p = 0.0074) and hospitalization (IRR: 0.83 [0.74–0.94], p = 0.0030) in children aged six to ten years, lower rates of diabetic ketoacidosis (IRR: 0.40 [0.16–0.96], p = 0.041) in children aged 11 to 15 years, and fewer clinic days (IRR 0.69 [0.67–0.71], p < 0.0001) in children of all ages. Mean estimated HbA<sub>1c</sub> levels did not differ between both groups (both 7.6% [59.6 vs. 59.7 mmol/mol], p = 0.81).

**Conclusions:** These findings provide evidence for improved clinical outcomes associated with the early initiation of CSII in children with newly diagnosed type 1 diabetes.

#### EP169 | Diabetes technology and glycemic control of preschool children with type 1 diabetes in South East Scotland

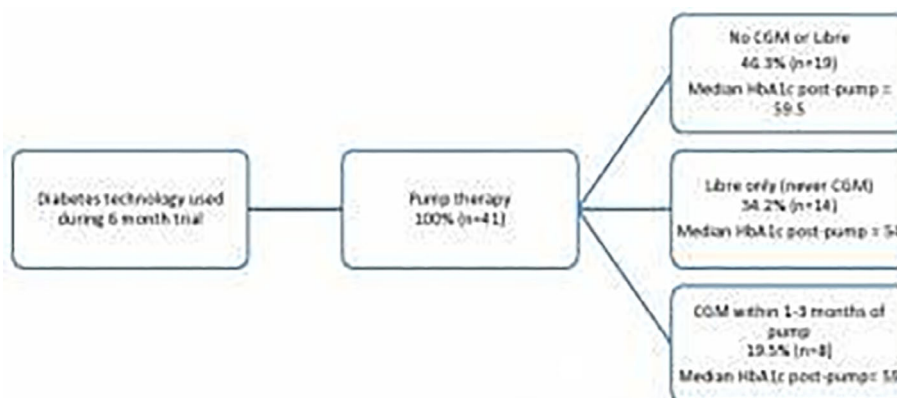
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##### Objectives:

1. Characterize the patient population of under 5 s in South East Scotland with type 1 diabetes (T1D).
2. Evaluate the efficacy of diabetes technology on glycemic control in preschool aged children.
3. Discuss the results of this study in relation to current literature.

**Methods:** All children diagnosed with T1D under 5 years old between 01/01/2014 and 31/07/2019 in NHS Lothian were identified from the electronic database. Retrospective data was collected which



[Figure 1 - Diabetes technology used during the 6-month trial period and the median HbA<sub>1c</sub> post-pump]

included patient demographics, presentation of T1D, the type of diabetes technology offered and its initiation and an evaluation of HbA1c pre and 6 months post-pump. Demographics were summarized using mean and range. A paired samples t-test ( $p = 0.05$ ) was used to statistically analyze HbA1c values.

**Results:** Fifty-two preschool children were diagnosed with T1D in the timeframe. The range of age at diagnosis was 1.2–5 years. 47.1% of patients presented in DKA.

Figure 1 displays technology used during the 6-month period and median HbA1c of each group. Eleven patients did not have data available thus were excluded from analysis (8 children on the pump waiting list or initiated pump therapy too recently, 1 child did not wanting a pump, 1 child diagnosed abroad with no data available and 1 child not suitable for pump therapy due to welfare concerns)

There was an overall decrease in HbA1c across the 6-month trial period with the mean HbA1c being 60 mmol/mol pre-pump compared to 57.7 mmol/mol post-pump. However, this was not statistically significant. One patient stopped pump therapy after the study.

**Conclusion:** NHS Lothian provides the recommended gold standard treatment for T1D in pre-school children. Whilst no statistical significance was found, it may be important to increase patient number to increase statistical power. Pump therapy may also provide other benefits not quantified in this study. Preschool children are more likely to present in DKA than other ages.

#### EP170 | Minimum continuous glucose monitoring record and active time for reliable clinical long- and short-term interpretation

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**Introduction:** Continuous Glucose Monitoring (CGM) provides high-resolution data on interstitial glucose concentration. These records can be used to investigate short- and long-term glycemic variability (GV) in patients with diabetes. However, CGM is prone to data loss. The impact of data loss on calculated GV indices in short- or long-term assessment remains unknown.

**Objectives:** To determine the minimum length and active time of CGM records necessary for reliable short and long-term GV assessment.

**Methods:** We analyzed routinely-collected CGM records from pediatric patients with type 1 diabetes. Calculated GV indices included: mean, median, standard deviation, coefficient of variation (CV), times: below, in, and above range (TBR, TIR, TAR respectively). First, we used >80% complete 180-day CGM records to determine the minimal duration needed to calculate GV indices corresponding with short-term and

global GV parameters. Next, we assessed the effect of data loss on GV indices using stepwise data removal from >90% records. Removal algorithm imitated data loss patterns from real CGM traces. For each GV and period, minimum CGM active time was defined as one for which GV remained within 5% of the one calculated for >90% record.

**Results:** Data from 451 patients were collected (median CGM record time 202 [98–368] days), total 331.96 years of data. Using 21 records, lengths for short and long-term GV assessment were determined as 7 and 35 days respectively. We selected 25,810 of 7-day and 5047 of 35-day records with >90% active time. The most robust GV indices were mean and CV, and the least robust were TBR < 54 mg/dL and TAR >250 mg/dL. Minimum CGM active time for which GVs were within 5% from the source were 70% for 7-days and 30% for 35-days records.

**Conclusions:** Short and long-term GV may be reliably investigated using CGM records that are missing fragments of data but such recordings should contain at least 70% or 30% active time for 7 and 35-day records respectively.

#### EP171 | Long term metabolic outcomes in children and adolescents with type 1 diabetes (T1D) using Freestyle Libre Flash Glucose Monitoring system

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**Background:** The Freestyle Libre Flash Glucose Monitoring system was introduced to the pediatric population in Europe in 2016 and is now available on prescription across the UK for every child with T1D who meets the NHS criteria.

**Objective:** To evaluate the 2- year HbA1c metabolic outcome in children and adolescents with T1D using the Freestyle Libre system.

**Methods:** A retrospective observational study of children and adolescents with T1D using the Freestyle Libre was undertaken. Children and adolescents with T1D were started on the Freestyle Libre system and followed up for 2 years. All patients had their Mean HbA1c evaluated before starting the Freestyle Libre, and at 1 and 2 years after.

**Results:** Data from 52 children (33 F, 19 M) with a mean age of 11.7 years and mean diabetes duration of 4.4 years were analyzed. 20 children (38%) were on multiple daily injections (MDI) and 32 (62%) on insulin pump. 2 patients (4%) stopped using the Libre after 3 months, 24 (46%) after 6 months, 10 (19%) used it intermittently and 16 (31%) continuously. Mean HbA1c levels pre commencement of Libre, and at 1 and 2 yrs after were respectively 7.6% (60 mmol/mol), 7.7% (61 mmol/mol; p-value 0.97) and 7.6% (60 mmol/mol; p-value 0.81) in children who used the Freestyle Libre continuously; 8.5% (69 mmol/mol), 7.9% (63 mmol/mol; p-value 0.37) and 8% (64 mmol/mol; p-value 0.33) in children who used it intermittently.

**Conclusions:** The use of the Freestyle Libre Flash Glucose monitoring system is not associated with significant improvement in long term

glycemic control. A greater understanding of the different factors affecting sustained glycemic control and continuous use of the Freestyle Libre will enable optimization of the glycemic control in the long term.

**EP172 | Assessment of the quality of life in patients with diabetes type 1 (DT1) under the age of 7, treated with the continuous glucose monitoring (CGM) system. The pilot study**

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**Introduction:** The CGM system use in young children can be associated with practical difficulties. Quality of life (QoL) is an important parameter that affects the choice of therapy, thereby, long-term use of therapy and the final effects of treatment.

**Aim:** Assessment of QoL and satisfaction with therapy using the CGM system in children with DT1 in pre-pubertal age (< 7 years).

**Method:** The study included 38 children with DT1 under the age of 7 (34% aged 2–4, 66% aged 5–7 years) with HbA1c:  $6.53 \pm 0.63\%$  and duration of diabetes:  $2.6 \pm 1.6$  years, treated with an insulin pump using CGM system for  $1.92 \pm 1.15$  years.

Two anonymous surveys were conducted:

- PedsQL 3.0 diabetes standardized questionnaire - QoL assessment among 2 age groups: 2–4 and 5–7 years.
- An original survey assessing the CGM use satisfaction.

**Results:** The mean scores in PedsQL 3.0 in individual categories were: communication 75%, worries 30%, treatment 70% and problems associated with diabetes 65%. The QoL scale is: 0–19% very low, 20–39% low, 40–59% moderate, 60–79% high, 80–100% very high. The most frequently reported concerns were long-term diabetes complications - almost always (33%) and often (43%), and prick pain - almost always (30%).

Satisfaction with CGM use is reported by 68% of parents of children aged 5–7 and 92% 2–4 years, although the metabolic control in the youngest children was slightly worsen (HbA1c < 7% among children aged 2–4 - 69%, 5–7 years - 88%). 27 (71%) caregivers confirm the positive effect of CGM on sleep (“I sleep better, I am less worried”). Significantly more often the improved comfort of sleep was reported in caregivers with good metabolic control (12% vs. 88%,  $p = 0.031$ ).

**Conclusions:** High QoL and increased quality of caregivers sleep strengthen the profits of using the CGM system. The CGM system enables to reduce amount of pricks and improve diabetes control.

**EP173 | Self-management among pre-teen and adolescent diabetes device users**

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**Objective:** Despite increased diabetes device use, few adolescents with type 1 diabetes (T1D) meet glycemic targets. We examine associations between utilization of insulin pumps and continuous glucose monitoring (CGM) and glycemic control.

**Research design and methods:** This mixed method retrospective cohort study included 80 youth (10–18 years of age) with T1D. Multiple linear regression and linear mixed models (LMM) were used to estimate the effects of device self-management on HbA1c and daily time in target (70–180 mg/dL), respectively. In Phase 2, youth ( $n = 10$ ) participated in semi-structured interviews analyzed using a qualitative descriptive approach.

**Results:** Every blood glucose (BG) input/day was associated with a 0.2% decrease in HbA1c (95% CI:  $-0.297, -0.013$ ), each bolus/day was associated with a 0.2% decrease ( $-0.327, -0.057$ ), and use of CGM was associated with a 0.5% decrease ( $-1.00, -0.075$ ). Among CGM users ( $n = 45$ ) every 10% increase in CGM use was associated with a 0.3% decrease in HbA1c ( $-0.390, -0.180$ ). In LMM accounting for within subject and between subject variability, there was a negative association between BG input/day frequency (coefficient =  $-1.880, [-2.640, -1.117]$ ) and time in target. Residual random effects for CGM users were large showing time in target varied between youth with a SD of 15.0% (3 hours and 36 minutes) (SE 2.029, [11.484, 19.530]). Time in target varied significantly from day-to-day with SD of 18.6% (4 hours and 40 minutes) (SE 0.455, [17.690, 19.473]). Phase 2 analysis produced four major themes, *Bad Day, Expect the Unexpected, Night-time, It's Really a Team*. Youth characterized “Bad days” as those requiring increased diabetes focus and effort.

**Conclusions:** Device self-management behaviors among youth are significantly associated with both HbA1c and time in target. Findings indicate that reduced time in target is associated with an increase in pump self-management behaviors, a novel finding that deserves further study.

**EP174 | Open-source technology in the NICU: A case study on real-time continuous glucose monitoring in a neonate with transient congenital hyperinsulinism**

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**Introduction:** Real-time continuous glucose monitoring (rtCGM) systems have shown to be a low-pain, safe and effective method in

preventing hypo- and hyperglycemia in people with diabetes of various age groups. Evidence on rtCGM use in infants, and in patients with conditions other than diabetes, remains limited.

**Objectives:** This case study describes the off-label use of rtCGM, and the use of an open-source app for glucose monitoring, in a newborn with prolonged hypoglycemia secondary to transient congenital hyperinsulinism during the perinatal period.

**Methods:** rtCGM was introduced at 39 h of age. To benefit from customizable alert settings and include sensor glucose levels below 40 mg/dL, the open-source app xDrip+ was introduced at 9d of age.

**Results:** Time-in-Range (45–180 mg/dL) remained consistent above 90%, whereas Time-in-Hypoglycemia (< 45 mg/dL) decreased, and mean glucose was maintained above 70 mg/dL at 72 h of life and after. Daily sensor glucose profiles showed cyclic fluctuations that were less pronounced over time.

**Conclusions:** While off-label use of medication is both common practice and a necessity in newborn infants, there are few examples for off-label uses of medical devices, rtCGM being a notable exception. rtCGM allowed us to better understand glycemic patterns and to improve the quality of glycemic control accordingly. Severe hypoglycemia was prevented, measurement of insulin serum levels and further lab diagnostics were performed faster, whilst the patient's individual burden caused by invasive procedures has been reduced. A wider customizability of threshold and alert settings would be beneficial for user groups with glycemic instability other than people with diabetes, and hospitalized infants in particular. Further research in the field of personal and off-label open-source rtCGM use, differences between native and open-source algorithms in translating raw sensor data, as well as customization of commercially available rtCGM systems is needed.

#### EP175 | Off-label use of Tandem Basal-IQ in preschool children: A preliminary report

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**Introduction:** Pumps are the preferred method of insulin administration for preschoolers with type 1 diabetes (T1DM). However, only one pump with predictive low glucose suspend is currently available for preschoolers and it requires at least 2 daily calibrations a day (to optimize sensor accuracy, it is suggested to calibrate 3 to 4 times a day).

**Objectives:** To assess the feasibility of Tandem t:slim X2 with Basal-IQ (TBI) use in preschool in children with T1DM.

**Methods:** Two 3 year-old children (MM and DA) were diagnosed with T1DM. Since the first day of diabetes management they experienced needle phobia during both capillary blood glucose monitoring (SMBG) and injections. After having assessed daily insulin needs, a TBI was applied to both. However, TBI is currently approved for children

>6 years of age primarily due to the minimum basal infusion rate of 0.1 U/h.

**Results:** MM and DA had the following characteristics respectively: weight (Kg) of 13.5 and 15.1, basal C-peptide (ng/ml) of 0.53 and 0.2 ng, total daily insulin dose (U/kg/day) of 0.58 (68% bolus; 32% basal) and 0.39 (63% bolus; 37% basal). TBI was started on the third day of hospitalization and the patients were discharged after 14 days (MM) and 10 days (DA) after adequate patient education. Data were recorded from the first month of pump use with the Tidepool platform. During the first month of use, MM and DA respectively achieved TIR of 59% and 58%, TBR of 1.1% (0.1% < 54 mg/dL) and 1.1% (0.01% < 54 mg/dL), TAR of 40% and 41%, CV of 35% and 33%, average time suspended per day of 76 min and 60 min. The parents reported reduced burden of disease and no acute diabetic complications.

**Conclusions:** To our knowledge these are the first two pre-school children to have used TBI with promising results and no acute complications. The device appears to be safe and allows satisfying glucose control with reduced patient burden especially in a delicate moment such as the onset of T1DM.

#### EP176 | Embedded Continuous glucose monitor sensor wire: A case report

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**Introduction:** In Children with Type 1 diabetes mellitus, embedment of Continuous glucose monitor sensor wire is a rare complication.

**Case report:** We herein report a rare presentation of embedment of continuous glucose monitor sensor wire in a 5 year old girl known to have T1DM. She presented after 1 year 2 month of being on the CGM with a 2-days history of a lump under the skin of her anterior abdominal wall which was confirmed on ultrasound scan as embedded sensor wire in the subcutaneous tissue of anterior abdominal wall. She was discussed with surgeon due to parental anxiety who reviewed her with the images and offered surgical removal of the sensor wire. She was discharged following a day case removal of the sensor wire with no follow up arranged.

**Methods:** Information for the report was retrieved from medical records after obtaining informed consent from the parents.

**Discussion:** The definitive management of embedded CGM sensor is often conservative. Surgical retrieval of the sensor is recommended if suspicious of infection or portion of the sensor that is visible above the skin. In our case it was decided to remove the sensor wire surgically because of parental anxiety and choice.

**Conclusion:** Continuous glucose monitoring sensor break and imbedded under the skin is a rare condition and management is often conservative. It worth being aware of the indications for investigation and possible surgical intervention such as overlie infection, visible part of the sensor above the skin, painful lump or patient's choice.



EP177 | **Establishing a class to promote early initiation of continuous glucose monitoring results in improved glycemic control in pediatric patients**

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**Objective:** Initiation of a continuous glucose monitor (CGM) within the first year after type 1 diabetes (T1D) diagnosis results in improved glycemic control, yet a standardized approach to early initiation of CGM therapy has not been reported. We aimed to establish a process for CGM initiation one week after T1D diagnosis in our pediatric patients at the Barbara Davis Center for Diabetes. Furthermore, we investigated whether early initiation of CGM therapy resulted in improved glycemic control.

**Methods:** We developed a CGM class to offer after our one-week educational class and follow-up visit. Basic information and benefits of CGM therapy are discussed, and information on approved pediatric CGMs is disseminated in a non-biased manner. Patients can receive

immediate in person training and trial a CGM (10 day Dexcom G6 or 30 day Medtronic Guardian Connect). We tracked which patients attended CGM class and extracted device use patterns and glycemic control from the medical record. HbA1c was compared between CGM and non-CGM users with a t-test. A regression analysis was completed with age at diagnosis and duration of T1D at time of HbA1c as independent variables.

**Results:** From October 2018 to March 2020, 65% (215/329) of patients attending the one-week class also attended CGM class. Of the patients attending CGM class, 92% (198/215) started CGM therapy vs 73% (83/114) who did not attend. Of all patients on a CGM, 81% (267/329) were using a CGM by their one-month post diagnosis follow-up visit with the vast majority using a Dexcom CGM (97%). CGM users had a significantly lower HbA1c (7.8%) than non-CGM users (8.4%) regardless of age of diagnosis and duration of T1D ( $p = 0.017$ ).

**Conclusions:** We were able to establish a system to initiate early CGM use in a majority of our pediatric patients. We also confirmed that CGM use in children results in improved glycemic control. Providing proper education and initiating CGM therapy soon after diagnosis is feasible and important.