

## LATE BREAKING ABSTRACTS

### Oral Session IV - Diabetes Care-Clinical Care Delivery

LBO01

#### Closed-loop control (CLC) in teens and young adults improves glycemic control: results from a 6-month multicenter Randomized Clinical Trial (RCT)

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**Objectives:** Glycemic control in adolescents and young adults with type 1 diabetes (T1D) remains suboptimal. Automated insulin delivery (AID) is a promising approach to improve glycemic outcomes. We assessed efficacy and safety of a closed-loop control (CLC) AID system in teens and young adults.

**Methods:** We conducted a post-hoc analysis of pediatric outcomes for 63 youth, ages 14 to < 25 years (n=48, 14 to < 18 years; n=15, 18 to < 25 years), enrolled in a 6-month multicenter RCT (total N=168). Participants were randomly assigned 2:1 to CLC (Tandem

Control IQ™) or a sensor-augmented pump (SAP, various pumps + Dexcom G6™ CGM). Outcomes included time in range 70-180 mg/dL [3.9-10 mM] (TIR), HbA1c, mean glucose, hyperglycemia (>180 mg/dL [10 mM]), and hypoglycemia (< 70 mg/dL [ $< 3.9$  mM] and < 54 mg/dL [ $< 3$  mM]).

**Results:** All 63 pediatric participants completed the RCT. Median T1D duration was 7 years and screening HbA1c was 8.1%; 37% were pump or CGM naïve at entry. CGM outcomes favored the CLC group (see Table). Time in range increased by 3.1 hours/day with CLC vs. decreasing by 0.3 hours/day with SAP. Time >180 mg/dL decreased by 2.8 hours/day with CLC, while it increased by 0.5 hours/day with SAP. Time < 70 mg/dL decreased by 23 minutes/day with CLC vs. 12 minutes/day with SAP. CLC use averaged 86% of the time over 6 months. There was one DKA episode in the CLC group and no severe hypoglycemia events in either group.

**Conclusions:** In teens and young adults with T1D, CLC use over 6 months was substantial and associated with significant improvements in time in range, mean glucose, and time spent in both hyper- and hypoglycemia. Given that youth spend ~½ the day with hyperglycemia, AID systems offer a promising opportunity to improve health outcomes.

	Baseline - CLC (N=40)	Baseline - SAP (N=23)	Post-randomization (26 wks) - CLC (N=40)	Post-randomization (26 wks) - SAP (N=23)	P-Value
Hours of Sensor Data - Median (IQR)	301 (263-315)	291 (268-319)	4,151 (4,070-4,281)	3,962 (3,648-4,279)	
% Time in Range - Mean±SD	51%±16%	53%±13%	64%±8%	52%±14%	<0.001
Mean Glucose - mg/dl - Mean±SD	183±31	179±25	167±15	183±28	<0.001
Coefficient of Variation - Mean±SD	39%±7%	38%±6%	37%±4%	38%±5%	0.02
Hyperglycemia % Time > 180 mg/dl - Mean±SD	46%±17%	44%±14%	34%±8%	46%±15%	<0.001
Hyperglycemia % Time > 300 mg/dl - Mean±SD	8.3%±8.2%	6.5%±6.6%	4.0%±3.8%	7.9%±7.9%	<0.001
Hypoglycemia % Time < 70 mg/dl - Mean ±SD	3.16%±2.71%	2.93%±2.54%	1.59%±1.02%	2.12%±1.48%	0.002
Hypoglycemia % Time < 54 mg/dl - Mean ±SD	0.90%±1.13%	0.67%±1.00%	0.31%±0.27%	0.36%±0.34%	0.21
HbA1c (%) - Mean±SD	7.97%±0.93%	7.66%±0.86%	7.51%±0.74%	7.66%±1.14%	0.13

[Glycemic outcomes at baseline and at 26 weeks in closed loop control (CLC) vs. sensor-augmented pump (SAP)]

## Oral Session I - Epidemiology, Genetics, Immunology and the Environment: T1D and T2D

LBO02

### Supporting teen problem-solving (STePS) intervention: reducing distress, preventing depression, and stabilizing glycemic control three years later

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**Objectives:** The RCT Supporting Teen Problem Solving study (STePS) compares depression-prevention and diabetes education interventions. Outcomes include diabetes-specific emotional distress, depressive symptoms, and HbA1c. We report results 3 years post-intervention.

**Methods:** Teens (N=264; M=15.78; 60% females; 35% ethnic minorities) reported on distress (PAID-T) and depressive symptoms (CDI), with lab-based A1c. Data was collected pre-and post-intervention, 8, 12, 16, 28 and 40 months post baseline. Intervention efficacy was investigated via latent growth curve modeling.

**Results:** Treatment exposure and retention rates: Mean sessions attended was 6.9; no differences between arms. Retention rates at one- and three-years was 92% and 88%. Diabetes Distress: Intervention group predicted distress 3-years post-intervention,  $b=-5.28$ ,  $SE=2.03$ ,  $p=.009$ ,  $\beta=-0.17$ . The depression-prevention arm reported significantly lower distress ( $M=31.70$ ,  $SD=15.16$ ) compared to the education arm ( $M=36.94$ ,  $SD=16.83$ ). Effect size increased over time showing significance at 28 ( $\beta = -0.15$ ,  $b = -4.16$ ,  $SE = 1.76$ ,  $p = .018$ ) and 40 months ( $\beta = -0.17$ ,  $b = -5.28$ ,  $SE = 2.03$ ,  $p = .009$ ).

**Depressive symptoms:** Prevention arm participants showed a rapid decline in depressive symptoms from 16 to 40 months post-baseline,  $b = -0.31$ ,  $SE = 0.11$ ,  $p = .005$ ,  $\beta = -0.31$ , but not the education arm,  $b = -0.01$ ,  $SE = 0.09$ ,  $p = .936$ ,  $\beta = -0.01$ . Glycemic control: HbA1c did not change for either arm (baseline  $M=9.14$ , 40 month  $M=9.44$ ).

**Conclusions:** Prevention arm participants showed significantly lower levels of diabetes-specific emotional distress and a significant decline in depressive symptoms. Effects for this study are longer lasting than prior intervention studies. HbA1c did not change during the study regardless of group assignment. There may be a protective effect for youth participating in this group-based intervention (regardless of group assignment) by preventing worsening glycemic control.

## Poster Tour 17 - Diabetes Acute and chronic complications and Late breakers

### LBP01

#### Weight status by body mass index percentile (BMI %ile) vs. percent body fat (%BF) in youth with type 1 diabetes (T1D)

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**Background:** BMI (kg/m<sup>2</sup>) cutoffs are used to assess weight status, but their inability to distinguish between fat and fat-free mass may not accurately reflect %BF in youth.

**Objective:** To assess concordance in classification of overweight and obesity in youth with T1D by BMI %ile and %BF.

**Methods:** We studied 115 youth with T1D (age 8-17 years, M±SD 12.9±2.5 years; 50% male; 33/41/26% prepubertal/pubertal[T2-4]/postpubertal; T1D duration 6.1±3.2 years; A1c 8.1±1.1%). At baseline and 12 months, height/weight were measured using calibrated stadiometer/scale and %BF was measured by dual energy X-ray absorptiometry (DXA). BMI %ile cutoffs were obtained from age/sex-adjusted 2000 CDC growth charts; %BF age/sex-specific cutoffs were derived from Taylor (Am J Clin Nutr 2002;76:1416).

**Results:** Higher BMI %ile was associated with higher %BF at baseline ( $r=0.52$ ,  $p<.0001$ ) and 12 months ( $r=0.56$ ,  $p<.0001$ ); correlations were similar for males and females. At baseline, 39% of youth had a weight status that was differentially classified by BMI %ile vs. %BF, with BMI mainly underdetecting adiposity: 31% of youth were classified as overweight/obese by BMI %ile, compared with 51% by %BF. After ~1 year, discordance in weight status by BMI %ile vs. %BF increased to 45%; the % of youth classified as overweight/obese by BMI %ile remained relatively stable at 32% while 63% were classified as overweight/obese by %BF. Underestimation of overweight/obesity by BMI %ile occurred mainly in prepubertal youth; overestimation occurred in some pubertal/postpubertal youth. **Conclusions:** While BMI %ile and %BF were correlated, BMI %ile substantially underestimated adiposity assessed by DXA (%BF) in youth with T1D. At baseline and after 1 year, more than half of the youth who were classified as overweight/obese by DXA were misclassified as normal weight by BMI %ile, suggesting a need to cautiously interpret BMI %ile when determining weight status.

Weight Status According to BMI %ile vs. % Body Fat at Baseline and 12 Months

		Baseline			12 Months		
		BMI %ile*			BMI %ile*		
		Normal weight (69%)	Over-weight (19%)	Obese (12%)	Normal weight (68%)	Over-weight (18%)	Obese (14%)
% Body Fat	Normal weight (49%)	42%	7%	0%	32%	4%	0%
	Overweight (43%)	26%	12%	5%	36%	12%	3%
	Obese (8%)	1%	0%	7%	0%	2%	10%
		% Body Fat			% Body Fat		
		Normal weight (37%)	Overweight (51%)	Obese (12%)	Normal weight (37%)	Overweight (51%)	Obese (12%)

\*BMI %ile: Normal weight: <85<sup>th</sup> %ile, Overweight: 85<sup>th</sup> to <95<sup>th</sup> %ile, Obese: ≥95<sup>th</sup> %ile. Gray shading represents concordant weight status by BMI %ile vs. % body fat.

[Weight Status According to BMI %ile vs. % Body Fat at Baseline and 12 Months]

### LBP02

#### Bone microarchitecture and estimated bone strength in children with type 1 diabetes mellitus

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**Objective:** To evaluate estimated bone strength as well as peripheral bone geometry, volumetric bone mineral density (vBMD) and microarchitecture in children with type 1 diabetes (T1D) using high resolution peripheral quantitative CT (HR-pQCT).

**Research design and methods:** In a cross-sectional study, bone geometry, vBMD and bone microarchitecture at the distal radius and tibia were assessed using HR-pQCT in 84 primarily Caucasian children with T1D and 55 healthy control siblings. Estimated bone strength was assessed using a micro-finite element (FE) analysis solver. Multivariate regression analyses were performed adjusting for age, sex, height and BMI.

**Results:** The median age was 13.2 y (T1D) vs. 11.5 y (controls). The median (range) T1D duration was 4.2 (0.4-15.9) years and HbA1c 7.8% (5.9; 11.8) % equaling 61.8 (41; 106) mmol/mol.

In adjusted analyses, T1D patients had reduced estimated bone strength (failure load) in both radius, -324.4 (-545.7;-103.1) kN,  $p=.004$ , and tibia, -753.3 (-1149;-357.7) kN,  $p<.001$ . In both radius and tibia, children with T1D had reduced cortical area, trabecular vBMD, trabecular number and trabecular bone volume fraction and increased trabecular inhomogeneity, adjusted  $p<.05$  for all. The average HbA1c in the previous year was negatively associated with bone microarchitecture, trabecular vBMD and estimated bone strength.

**Conclusion:** Children with T1D had reduced bone sizes, vBMD and estimated bone strength and adverse microarchitecture at the distal radius and tibia, inversely correlated to higher last year HbA1c levels. Further studies are needed to assess the potential role of HR-pQCT for early detection of increased fracture risk in T1D.

### LBP03

#### Five year cohort profile: the Environmental Determinants of Islet Autoimmunity (ENDIA) study

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**Objectives:** The Environmental Determinants of Islet Autoimmunity (ENDIA) is the first study to investigate gene-environment-omic interactions from pregnancy that drive the development of islet autoimmunity and type 1 diabetes (T1D) (ACTRN1261300794707). This prospective cohort recruits pregnant women whose unborn child has a first-degree relative with T1D.

**Methods:** Investigation is in each trimester, at birth, three-monthly until 2 years of age and six-monthly thereafter. Demographics, lifestyle, diet, clinical and growth data and samples of blood, urine, stool, saliva, breast milk and body swabs are collected. Preconception data are collected retrospectively.

**Results:** ENDIA has recruited 1400/1500 participants; 80% prenatally. Median cohort age is 27 (range 0-80) months. 61% have a mother with T1D, 27% a father, 12% a sibling and 2% two probands. Parent demographics are comparable to the general population: 79% born in Australia, age at consent mean±SD 32.2±4.8 (mothers), 34.2±5.4 (fathers) years, high prevalence of obesity (24% mothers, 26% fathers) and 34% live regionally. No ENDIA mothers achieved Australian nutrition recommendations for pregnancy. Birth weight was 3,502±675 g at 37.5±2.3 weeks in 1186 babies. Mothers with T1D had higher rates of perinatal intervention than mothers without T1D (Table). Initiation of breastfeeding was comparable to the general population (97%) and more ENDIA children continued breastfeeding. 40/859 (5%) children have developed persistent islet autoimmunity or T1D, at a median of 18 months, consistent with a predicted 6-8% seroconversion rate by 3 yrs. 13 children have developed T1D and 34 coeliac autoimmunity. Withdrawal rate is 8%.

**Conclusions:** As the world's first pregnancy-to-early childhood study of children at increased risk of T1D, ENDIA will provide unique insights into the role of early life factors in the development of islet autoimmunity and T1D.

#### LBPO4

### Early onset type 1 diabetes - is there a specific genetic architecture?

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**Introduction:** In type 1 diabetes (T1D), the interaction between genetics, environment and immunology leads to a selective beta-cell destruction. Known susceptibility alleles include Human Leucocyte Antigen (HLA) class II haplotypes and over 100 genetic variants in more than 50 non-HLA genetic loci. Previous work from our group showed that children with early onset (EO) T1D (age at T1D onset ≤5 years) have significantly more other autoimmune diseases, lower C-peptide at T1D onset and higher insulin needs one year later, when compared to children with later-onset (LaO) T1D (age at T1D onset >5 years).

	Mother with T1D	Mother without T1D	Australian population	P value
Caesarean Section	71%	39%	30%	<0.001
Level 3 - 6 intensive neonatal care	26%	6%	5%	<0.001
Breast feeding at 6 months	66%	76%	60%	0.03
Breast feeding at 12 months	35%	56%	42%	0.01

[Pre and post natal differences between mothers with and without type 1 diabetes]

**Objective:** To determine whether EOT1D and LaOT1D share the same genetic landscape or constitute distinct genetic entities.

**Methods:** A cohort of EOT1D children (N=102) was compared to a cohort of LaOT1D patients (N=100), and healthy controls (N=172). Clinical characterization was performed, and DNA samples were processed for high resolution HLA II haplotyping and Single Nucleotide Polymorphisms (SNP) genotyping.

**Results:** Age of onset was 3.0±1.5 and 15.8±5.7 years in the EOT1D and LaOT1D cohort, respectively. The clinical analysis evidenced that EOT1D patients present lower C-peptide at disease onset (p=0.0064), and higher HbA1C 1 year later (p=0.0074). The majority of EOT1D patients did not present increased risk provided by HLA II genotypes. Moreover, EOT1D and LaOT1D patients carry similar risk provided by non-HLA T1D susceptibility alleles.

**Conclusions:** These data suggest that EOT1D and LaOT1D present a similar genetic landscape and that the known T1D genetic susceptibility factors do not explain the earlier age of onset, decreased beta cell reservoir and worse metabolic control in EOT1D children. Further studies are needed to uncover novel genetic risk factors involved in the pathophysiology of EOT1D. Enlightening into the genetic risk and immune tolerance fields are required to improve patient stratification and find novel targets for therapeutic intervention.

#### LBPO5

### Immunological and molecular markers for the definition of type 1 diabetes endotypes in childhood and adolescence

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**Introduction:** Type 1 diabetes (T1D) is a chronic, immune-mediated disease. Heterogeneity in the rate of disease progression is a recognized obstacle in designing clinical trials.

**Objectives:** We aimed to define T1D endotypes, which are subtypes of disease characterized by precise functional mechanisms, based on

immunological and molecular markers that could predict disease course (partial remission phase onset and duration).

**Methods:** We evaluated 119 newly diagnosed patients, for whom we collected blood samples at diagnosis and clinical information since disease onset and for at least one year of follow-up. Blood samples were cryopreserved and analyzed by flow cytometry. For a subgroup of patients (N= 40), gene expression was also analyzed through a serum-induced transcription assay.

**Results:** We observed that patients with higher circulating activated T-regulatory cells at diagnosis were more likely to experience remission when compared to patients with lower levels ( $p= 0,035$ ). We hypothesized they could belong to an “early remission endotype”, characterized by a tendency to immune regulation. By means of a serum-based transcriptional assay, we further evaluated the inflammatory-regulatory balance at onset, which was found to be highly variable. Indeed, inflammatory and regulatory genes were differently expressed across patients (50% exhibited an inflammatory signature; 50% overexpressed regulatory genes while downregulating inflammatory genes). We observed that patients with a higher baseline innate inflammatory activity demonstrated significantly higher pancreatic exhaustion at 1 year from diagnosis (“fast progression” endotype) ( $p= 0,006$ ).

**Conclusions:** Our data support the hypothesis that T1D endotypes exist. The inflammatory-regulatory balance seems to play a central role in disease progression and, possibly, response to immunomodulating therapies. The use of markers in clinical practice could foster therapy personalization and better clinical trial stratification.

## LBP06

### Glycaemic responses to exercise with and without repeated sprints in a free-living setting in adolescents and young adults with Type 1 diabetes

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**Objectives:** Regular physical activity is recommended for people with Type 1 diabetes (T1D) for its clinical, physical and psychological benefits. However, the risk of hypoglycaemia is a major barrier to exercise participation in these individuals. Recent laboratory findings suggest that the inclusion of repeated sprints during moderate-intensity exercise reduces the rate of fall in blood glucose level in individuals with T1D. The aim of this study was to investigate whether these findings are translatable to a free-living setting.

**Methods:** Individuals with T1D (n=25, age 14-35 y) wearing a continuous glucose monitor and an activity-monitoring watch completed three different, two-week exercise treatments in a randomised order under free living conditions. For each treatment, participants completed at least three times per week and for a minimum of 30 min, bouts of either (i) continuous moderate-intensity exercise; (ii) moderate-intensity exercise interspersed with 4-sec sprints every 2 min (ending with a 10-sec sprint); or (iii) moderate-intensity exercise interspersed with 10-sec sprints every 20 min (ending with a 10-sec sprint), respectively. The primary outcome was the sensor glucose response during and shortly after exercise.

**Results:** No difference in glycaemic response during and after exercise was observed between continuous moderate-intensity exercise with or without 4-sec sprints. However, the inclusion of 10-sec sprints resulted in a reduced fall in mean sensor glucose from pre-exercise levels during the first 15 minutes of recovery [-2.0 (95% CI -2.5, -1.5) mmol/l vs -2.5 (95% CI -3.1, -2.0) mmol/l,  $P = 0.049$ ] and full one-hour recovery period [-1.7 (95% CI -2.3, -1.0) mmol/l vs -2.5 (95% CI -3.2, -1.8) mmol/l,  $P = 0.025$ ].

**Conclusion:** In a free-living setting, the inclusion of 10-sec sprints during moderate-intensity exercise reduces the early post-exercise fall in sensor glucose level, and may assist glycaemic management for individuals with Type 1 diabetes.

## Poster Tour 20 - Diabetes Care and New Therapeutics

LBP07

### Barriers to diabetes device uptake: examining adolescents' unique perspective

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**Introduction:** Insulin pumps and CGM are associated with improved type 1 diabetes outcomes and ease management burden. For the past 2 years, our team has collected data on barriers to starting and staying on these devices.

**Objectives:** This abstract seeks to share recent findings about the unique perspective of adolescents compared to their parents and other adults with type 1 diabetes.

**Methods:** Survey data were collected from 1,503 adults and 413 adolescents with type 1 diabetes and 471 parents of children with diabetes.

**Results:** The Table shows details about the demographic and clinical characteristics of the samples, in addition to data on barriers. Device cost, supply cost, and insurance coverage were frequently endorsed

barriers across all three groups; this is on the minds of adolescents as much as parents and adults. Of the person-focused barriers, hassle of wearing devices was the most frequently endorsed barrier by adolescents (38%), adults (47%), and parents (36%), followed closely by disliking wearing diabetes devices (33-35%). However, adolescents (20%) endorsed worrying about what others will think nearly twice as frequently as adults and nearly 7 times more frequently than parents. Approximately 1 in 5 adults and adolescents endorsed not wanting to allocate more time to managing diabetes as a barrier, which was rarely endorsed by parents (3%).

**Conclusions:** Results indicate that adolescents with type 1 diabetes perceive barriers to device use that are much more similar to adults with type 1 diabetes than parents. Although parental consent is required, perceived barriers among adolescents may be the most critical factor in their device readiness and may be best assessed prior to discussions with parents. Further, provider efforts to address modifiable barriers among adolescents may pave the way to increased overall receptivity toward diabetes technology as they age into adulthood.

	Adolescents (n=413)	Adults (n=1503)	Parents (n=471)
Mean age in years* (M ± SD)	16.3 ± 2.3	35.3 ± 14.8	12.0 ± 3.2
Gender (% female)	53	61	45
Diabetes duration in years (M ± SD)	9.4 ± 3.5	20.4 ± 12.5	7.0 ± 2.9
Most recent HbA1c % (M ± SD)	8.1 ± 1.2	7.5 ± 1.3	8.4 ± 1.3
Do not like how diabetes devices look on my body (%)	29	26	20
Nervous that the device might not work (%)	25	20	23
Nervous to rely on technology (%)	17	17	20
I do not like diabetes devices because people notice them and ask questions about them (%)	17	10	14
Too busy to learn how to use a new technology or device (%)	7	9	3
*Parents' children.			

[Table]

## Late Breaking Posters on Display

LBP08

### Use of text messaging to enhance BG monitoring and self-care in teens with type 1 diabetes: teens' perceptions predict outcomes

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**Objectives:** Text message (TM) reminders to check BG levels may be a means to improve self-care and maintain glycemic control in teens with T1D. However, studies have shown that TM response rates decline over time. As perceptions of TM systems may impact use, we assessed the relationship between teens' perceptions of TM reminders to check BG, TM response rate, and A1c over 18 months in a sample of teens with T1D.

**Methods:** Teens (N=135, ages 13-17) from 2 diabetes centers received TM reminders to check BG and respond with their BG level at self-selected times for 18 months, starting with 1 text per weekend day and increasing to 4 texts/day over 6 months. Every 3 months, teens reported their experience with TM reminders. Open-ended responses were independently coded by 3 reviewers as positive or negative. Teens were categorized by whether they expressed positive perceptions (POS), negative perceptions/no opinion (NEG), or both (POS/NEG) at the majority (≥67%) of visits. Teens were also categorized by responsiveness to TM reminders: those who sent 1+ BG on ≥50% vs. < 50% of days.

**Teens' Perceived Benefits and Challenges of TM Reminders**

Benefits	Challenges
<p><b>Receiving texts from a neutral source:</b></p> <ul style="list-style-type: none"> <li>"It was nice getting a reminder to check from a neutral source. It eliminated a source of conflict. One less time my mom had to text me. I am on my phone a lot so it was easy."</li> </ul>	<p><b>Burnout:</b></p> <ul style="list-style-type: none"> <li>"I don't like the messages because there are too many texts."</li> <li>"Sometimes texts build up. It was better when it felt new. Now it feels like something that gets in the way."</li> </ul>
<p><b>Helps recognize BG patterns:</b></p> <ul style="list-style-type: none"> <li>"Texts are really helpful. They also help to recognize patterns with blood glucose levels."</li> <li>"Texts are helpful because I notice when my blood sugar is high or low more than I did before."</li> </ul>	<p><b>Added obstacle:</b></p> <ul style="list-style-type: none"> <li>"It texts me at school and goes off and everyone looks at me. It's annoying."</li> <li>"There were times where it was awkward to check so I didn't send it in, like when I was on the bus and there were a lot of people around."</li> </ul>
<p><b>Helps to create a schedule:</b></p> <ul style="list-style-type: none"> <li>"Since the texts came at the same time every day, it became routine for me to remember to check on my own and I wouldn't forget as much."</li> <li>"Good reminders. Helps set a schedule so now I automatically check."</li> </ul>	<p><b>Schedule variability:</b></p> <ul style="list-style-type: none"> <li>"Text reminders are not helpful because I don't typically eat on schedule and I also wake up at different times, especially during the summer. The reminders might be more helpful for someone who is on a schedule throughout the day. I send in BGs if I happen to get the text when I am already checking."</li> </ul>

**Results:** At entry, mean age of teens (51% male) was 14.8±1.2 years and A1c was 8.5±1.1% (69±12 mmol/mol). The sample was 37% POS, 35% POS/NEG, and 28% NEG. TM responsiveness varied by TM perceptions, with 62% of POS, 57% of POS/NEG, and 26% of NEG sending 1+ BG on ≥50% of days (p=.002). Further, responsiveness to TM reminders significantly predicted glycemic benefit only in the POS

group (difference in 18-month ΔA1c for 1+ BG on ≥50% vs. < 50% of days=-0.64% [-7 mmol/mol], p=.02). The table highlights teens' TM perceptions.**Conclusions:** Despite near universal TM use by teens, a TM reminder system to enhance diabetes self-care received mixed reviews by teens with T1D. Teens with positive perceptions demonstrated benefit; however, many teens had negative perceptions and did not show benefit, suggesting a need to tailor future interventions. [Teens' Perceived Benefits and Challenges of TM Reminders]

LBP09

### Telemedicine as a supplement to regular visits - evaluation via a multicenter randomized controlled study

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**Introduction:** Telemedicine offers potential benefits if used correctly. **Objectives:** The aim in this study was to evaluate the effect of telemedicine as a supplement to regular visits by considering different outcome measures including health economy.

**Methods:** A multicenter rct was conducted during 12 months. 86 patients was initially included and 75 completed. Patient characteristics shown in table.

The control group came on return visits (45 min) every 3rd month. In the telemedicine group every second visit was replaced by 3 video-visits (15 min) including analyze of downloaded data.

Questionnaires were filled in at start, 6 and 12 months: Health (Promis), Quality of life (Diasbkids), Self-efficacy and health related locus of control, Diabetes treatment satisfaction (DTSQ), and questions for evaluation of health economy parameters. Downloads were conducted regularly. Glucose control, measured as time in range and HbA1c, were conducted at start, 6 and 12 months.

**Results:** The glucose control was significantly improved in both groups. Control 6 m: 51.8 ± 7.8 mmol/mol (p= 0.009), 12 m: 52.3 ± 8.4 mmol/mol (p=0.038), and Telemedicine 6 m: 50.0 ± 6.4 (p=0.000), 12 m 50.7 ± 6.2 mmol/mol (p= 0.004). However, there was no significant difference between the groups. Glucose control (HbA1c) illustrated in figure.

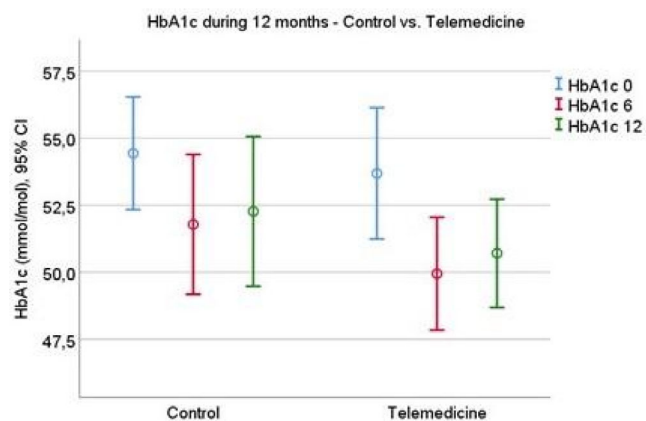
The Digital health group showed significant improvement in terms of health economy and environmental impact.

**Conclusion:** Telemedicine in the form of video-visits together with analyze of downloaded data, introduced as partial replacement, showed equally good glucose control as standardized visits during a 12 m rct study. Moreover, telemedicine visits offers benefits in the

Subject	Control (n=37)	Telemedicine (n=38)	Statistics
Age (mean ± sd)	11.1 ± 4.3	11.7 ± 3.1	ns
Duration (mean ± sd)	14.0 ± 3.5	14.4 ± 3.7	ns
Gender (female/male)	20 / 17	17 / 21	ns
Treatment (MDI/CSII)	7 / 30	7 / 31	ns
Glucose monitoring (BG/isCGM/rtCGM)	1 / 13 / 23	0 / 18 / 20	ns
BMI SDS (mean ± sd)	0.3 ± 1.0	0.7 ± 0.9	ns
HbA1c at start (mmol/mol)	54.4 ± 6.3	53.7 ± 7.4	ns

[Patient characteristics]

area of health economy and environmental impact. Analysis of other results is ongoing.



[Glucose control (HbA1c) Control vs Telemedicine]

## LBP10

### Investigation of appropriate timing of additional insulin dosing for fat and protein in children with type 1 diabetes using multiple daily injections

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**Aim:** To determine if additional rapid-acting insulin doses for the fat and protein content of a meal given 0, 1 or 2 hours after eating

optimise postprandial glycaemia (PPG) in children with Type 1 diabetes (T1D) using multiple daily injections.

**Methods:** An observational study of free-living participants (6-18 years) with T1D, duration over 1 year at 2 Paediatric Diabetes centres in the UK was conducted. We undertook a 3-period crossover trial in which additional insulin for a standard high fat high protein (HFHP) meal was given at 3 time intervals (0, 1, 2hr) in a randomised order. Insulin for carbohydrate was given pre-meal as per usual practice and an additional insulin dose, calculated using an algorithm adapted from current insulin pump fat protein recommendations was given at 0, 1 & 2 hrs after the initial dose. We used continuous glucose monitoring (CGM) to assess peak BG, time to peak BG, BG excursion and Area under Curve for 420 min after the initial dose. Data from participants who had hypoglycaemia were analysed separately.

**Results:** 27 participants were included: mean age 13yr (range 6.1-17.7yr); mean T1D duration 3.5yr; (1-14yr); 54% male. PPG parameters from CGM data are shown in Table 1.

There is unlikely to be any difference in the 3 groups of timing of additional insulin for HFHP meals on the parameters used to assess PPG, unless further analysis identifies it. Mild hypoglycaemia was common (55%) in all three groups and occurred between 181-196 minutes, with no difference seen between groups.

**Conclusion:** Splitting the dose of rapid acting insulin calculated using this algorithm for HFHP meals is not beneficial, and future studies would benefit from refinement of the insulin dose algorithm.

Time interval of additional insulin	0hr	1hr	2hr	P Value
Peak post-prandial BG (mmol/l) (SE)	10.931 (0.951)	11.491 (0.831)	11.491 (0.863)	0.877
Time to peak BG (mins) (SE)	82.34 (35.370)	113.617 (30.922)	95.106 (32.092)	0.771
Glucose excursion (mmol/l) (SE)	1.864 (0.716)	1.167 (0.72)	1.864 (0.716)	0.506
Area under curve (0-3hrs) (SE)	274.14 (105.279)	166.206 (92.038)	371.307 (95.521)	0.339
Area under curve (3-5hrs) (SE)	81.478 (17.644)	68.960 (23.234)	131.497 (20.068)	0.162
Time to first hypoglycaemic event (mins) (SE)	182.1 (24.2)	180.8 (26.4)	196.4 (29)	0.914
Incidence of hypoglycaemia	14/26	14/26	16/27	

[Table 1: Post Prandial Outcomes]



## LBP11

**Screening for diabetes distress among adolescents with diabetes: a better predictor for poor glycemic control**K.M.C. Hong<sup>1</sup>, B. Glick<sup>1</sup>, R. Hoffman<sup>2</sup><sup>1</sup>Nationwide Children's Hospital, Endocrinology, Columbus, United States, <sup>2</sup>Nationwide Children's Hospital / The Ohio State University, Endocrinology, Columbus, United States

**Objective:** Diabetes Distress (DD) is a negative emotional reaction to the diagnosis of diabetes, threat of complications, self-management demands, unresponsive providers, and/or poor interpersonal relationships. While American Diabetes Association guidelines recommend annual depression screening, studies suggest adolescents experience variable levels of DD which could be mistaken for symptoms of adjustment disorders. Depression is found to affect the adolescent's ability to complete diabetes self-care tasks and is associated with an increased risk of diabetes-related hospitalization and poorer glycemic control (HbA1c). The goal of the study is to add to literature regarding the validity of DD screening and compare it with the depression screen to identify which is a better predictor for poor HbA1c.

**Methods:** This was a cross-sectional observation study through the collection of scores from a medical chart review for diabetes patients (n=364, Type 1: n=313 f=157; Type 2 n=50 f=32; MODY n=1 f=1) between the ages of 13-17 who were annually screened at their diabetes follow-up visit by the Patient Health Questionnaire (PHQ9) and Problem Areas in Diabetes Questionnaire (PAID-T). Pearson correlations were used to assess relationships. Receiver operator curves (ROC) were constructed to see whether PAID or PHQ 9 scores better predicted poor HbA1c (HbA1c>9).

**Results:** HbA1c was more strongly correlated with PAID-T (r=0.33, p< 0.001) than PHQ9 (r=0.13, p=0.041) scores in the group as a whole and it remained true for type 1 diabetes (PAID: r=0.39, p< 0.001; PHQ9: r=0.20, p=0.002). In type 2 diabetes, HbA1c was not related to either (PAID: r=0.063; PHQ9 r=-0.032). Area under ROC curve for poor HbA1c in type 1 was 0.75 for PAID and 0.64 for PHQ9.

**Conclusion:** Assessing and intervening for positive depressive symptoms are important. It is equally or more important to routinely assess DD among adolescents so that interventions can target health management and improve HbA1c.

## LBP12

**Predictors of fear of hypoglycemia in a nationwide population-based pediatric type 1 diabetes population - the Norwegian Childhood Diabetes Registry (NCDR)**H. Hatle<sup>1,2</sup>, M.R. Bjørngaas<sup>1,3</sup>, T. Skrivarhaug<sup>4,5,6</sup>, T.B. Rø<sup>1,2</sup>

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**Objectives:** To determine the predictors of fear of hypoglycemia (FoH) in children and adolescents with type 1 diabetes (T1D).

**Methods:** In a nationwide population-based cross-sectional study we assessed FoH in children and adolescents aged ≥9 years of age using a validated quick two-item screening questionnaire. Multivariable linear regression was used to examine associations between FoH, impaired awareness of hypoglycemia (IAH), history of hypoglycemia with cognitive impairment requiring external assistance with or without loss of consciousness (as collected by self-reported recall in the Clarke questionnaire assessing hypoglycemia awareness), and clinical data registered in the NCDR.

**Results:** In 2016 we included 1095 (53% males) participants with mean (SD) age 14.0 (2.8) years, T1D duration 5.9 (3.7) years, and HbA1c 8.2 (1.2)% (66 mmol/mol). Insulin pump therapy was used by 75%, and real-time continuous glucose monitoring (RT-CGM) by 35% of the participants. By self-report, 40% had experienced hypoglycemia requiring external assistance the preceding 6 months and 7% hypoglycemia with loss of consciousness the preceding 12 months. Prevalence of IAH was 17%. Increased FoH score was associated with female sex, higher HbA1c, presence of IAH and history of recent episode(s) of hypoglycemia requiring external assistance. Age, diabetes duration, insulin regimen (pump vs. injections) or use of RT-CGM were not associated with FoH.

**Conclusions:** In a nationwide T1D population with children and adolescents ≥9 years of age, a recent history of hypoglycemia requiring external assistance, IAH, female sex and poorer metabolic control were associated with increased FoH.

## LBP13

**Glycemic control and quality of life in immigrant and Italian children and adolescents with type 1 diabetes and in their parents**L. Iughetti<sup>1,2</sup>, A. Boncompagni<sup>2</sup>, P. Bruzzi<sup>1</sup>, V. Cenciarelli<sup>2</sup>, S.F. Madeo<sup>1</sup>, M. Pugliese<sup>1</sup>, C. Toffoli<sup>2</sup>, F. Bocchi<sup>1</sup>, B. Predieri<sup>1,2</sup>

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**Objectives:** Aim of this cross-sectional observational study was to assess the role of migrant status on glycemic control and health-related quality of life for diabetes (D-HRQOL).

**Methods:** One hundred twenty-five children and adolescents with type 1 diabetes (T1D) (12.4±3.55 years; males 53.6%; T1D duration 5.61±3.50 yrs) and their parents (102 mothers and 37 fathers) were enrolled. The Italian translation of the PedsQL™ 3.0 Diabetes Module was used to evaluate the D-HRQOL.

**Results:** Group A (immigrant - at least one foreign parent; n=40), respect to Group B (Italian; n=85), had higher frequency of DKA at T1D onset (55.0 vs. 22.3%; Chi-Square=13.1; p< 0.001) and a lower use of SAP (5.0 vs. 22.3%; Chi-Square=5.86; p=0.015). HbA1c values were higher in Group A respect to Group B (72.7±17.6 vs. 62.6 ±12.9 mmol/mol; p< 0.001). Patients' D-HRQOL scores were

significantly lower in Group A than in Group B in the following scales: "Diabetes self-symptoms" (57.9±14.6 vs. 66.9±12.8;  $p=0.004$ ), "Treatment barriers" (68.1±23.6 vs. 82.9±13.0;  $p=0.001$ ), and "Worry" (52.9±26.9 vs. 66.9±23.7;  $p=0.009$ ). Mothers' D-HRQOL scores were significantly lower in Group A than in Group B in the following scales: "Diabetes self-symptoms" (56.7±18.1 vs. 65.8±15.7;  $p=0.030$ ), "Treatment barriers" (55.9±19.8 vs. 71.3±19.7;  $p<0.001$ ), "Treatment adherence" (71.2±18.1 vs. 80.6±11.2;  $p=0.018$ ), "Communication" (58.9±31.4 vs. 75.9±23.3;  $p=0.009$ ) scales, and total score (57.2±17.1 vs. 68.8±12.6;  $p=0.011$ ). No differences were found in fathers' data.

**Conclusions:** Our results strongly suggest that migrant status confers significant disadvantages in terms of T1D treatment, glycemic control, and D-HRQOL in children and adolescents with T1D. Moreover, parents' D-HRQOL data suggest that daily T1D management is usually supervised by mothers rather than fathers. Specific challenges and educational interventions should be considered in clinical care of patients with distinct migration background.

#### LBP14

### Development of comorbid autoimmune diseases in children with type 1 diabetes

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**Objectives:** Individuals with type 1 diabetes (T1D) are at increased risk for comorbid autoimmune disease (CAID), with autoimmune thyroid disease (AIT) and celiac disease (CD) being most common. The time to development of CAID and associated factors are not well defined in the pediatric population. We aimed to define the natural history of CAID in T1D patients and to identify factors that increase likelihood of CAID development.

**Methods:** Patients < 18 years old who were diagnosed with T1D between June 2011 and June 2019 and had islet autoantibody labs within 90 days of diagnosis were identified from electronic medical records at the Barbara Davis Center. Diagnosis codes and screening labs were examined to identify patients with CAID. Kaplan Meier curves were created for time from T1D onset to CAID. Patients with CAID at T1D onset were excluded for the survival analysis. Age was compared across groups using two sample independent t-tests, and gender and race/ethnicity were compared using Chi-Square tests or Fisher's exact tests.

**Results:** Among the 2250 patients, 33 had preexisting diagnoses of a CAID, and 238 went on to develop CAID during the study period with an average onset of 13.6 months following T1D diagnosis. At 8-years post T1D onset, 7.9% had developed CD, and 9.9% had developed AIT. Female, Hispanic patients, and children who were >10 years of age were more likely to develop AIT ( $p=0.0003$ ,  $p=0.0006$ ,  $p=0.01$ , respectively). Children < 10 years old were more likely to develop CD ( $p=0.009$ ).

**Conclusion:** Close clinical and laboratory follow-up after T1D diagnosis is important due to the high rate of CAID soon after T1D diagnosis. Female gender and older age are important factors in AIT

development. Non-Hispanic whites and young children are at highest risk for celiac disease. Conversely, Hispanic patients are at highest risk for AIT indicating that overall autoimmunity may be increasing among Hispanics. Continued study will inform CAID screening guidelines.

#### LBP15

### Noonan Syndrome mutation related metabolic profile, lean phenotype, unfavorable lipid and insulin profile

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**Background:** Noonan syndrome (NS) patients have a typical phenotype (short stature, facial dysmorphisms, and heart defects). It is a frequent autosomal dominant disorder, and mutations in genes within the RAS/MAPK signaling pathway are identified in 75% of patients (50% *PTPN11*). This pathway participates in signal transduction of growth hormone, insulin, body homeostasis, carbohydrate, and lipid metabolism. This study aimed to describe metabolic profile in children with NS. **Subjects and Methods:**  $n=116$  prepubertal NS patients (69 males), 51 with *PTPN11* mutation (*PTPN11+*) and 64 without *PTPN11* mutation (*PTPN11-*). Data collected: height, body mass index (BMI); fasting glycemia, insulinemia (FI), HOMA-IR, HDL-cholesterol, LDL-cholesterol, and triglycerides levels. All data were compared among NS groups (*PTPN11+* vs. *PTPN11-*) and with a prepubertal control group. We excluded patients with parents with hypertension, obesity, and diabetes mellitus.

**Results:** NS group were shorter than the control group, with similar BMI-SDS. NS had a low frequency of overweight and obesity, 8% and 1%, respectively (Brazilian population (5 to 9 years are 33.4% and 14.3%). *PTPN11+* had higher FI than *PTPN11-* and controls, *PTPN11+* [median 4.6; (3.2 to 6.9)], *PTPN11-* [2.9; (2.3 to 5.0)], control [3.3; (2.5 to 4.4  $\mu\text{U/mL}$ );  $p<0.001$ ]; higher HOMA-IR, *PTPN11+* [0.6;(0.4 to 1.0)], *PTPN11-* [0.4;(0.4 to 0.7)], control [0.4; (0.4 to 0.6);  $p=0.008$ ]. Both NS groups presented higher low HDL-C (66% in *PTPN11+* and 54% in *PTPN11-*) than the control 16%;  $p<0.001$ ; and elevated triglyceride levels (27% in *PTPN11+* and 18.3% *PTPN11-*) than control group (2%);  $p=0.007$ . The LDL-C levels were similar.

**Conclusions:** NS patients have thin phenotype; a typical impaired metabolic profile (low HDL, increased triglycerides levels), and worst insulin resistance in *PTPN11+* patients (higher insulin levels, and HOMA-IR). More studies are necessary to complement knowledge about cardiovascular risk in NS patients.

## LBP16

**Using a culturally and linguistically competent health promotion approach to adapt and validate the preconception counseling READY-girls program for Spanish-speaking teens with diabetes**A.M. Escobar<sup>1</sup>, E. Codner<sup>2</sup>, F. Giraud<sup>2,3</sup>, I. Libman<sup>4</sup>, D. Charron-Prochownik<sup>5</sup><sup>1</sup>University of Pittsburgh, School of Medicine, Pittsburgh, United States,<sup>2</sup>University of Chile, Institute of Maternal and Child Research (IDIMI),Santiago, Chile, <sup>3</sup>Juvenile Diabetes Foundation of Chile, Santiago, Chile,<sup>4</sup>Children's Hospital of Pittsburgh, Pediatric Endocrinology, Pittsburgh,United States, <sup>5</sup>University of Pittsburgh, School of Nursing, Pittsburgh,

United States

**Introduction:** In our U.S. studies, teens with diabetes (DM) were found to be unaware of the effects of uncontrolled DM on reproductive health, the risks and complications with unplanned pregnancies, and the importance of preconception counseling (PC). READY-Girls is a validated evidence-based PC program for teens with DM endorsed by the ADA. To adapt this for Spanish-speaking communities, we selected a Culturally and Linguistically Competent Health Promotion Approach (CLCHP Approach). This requires a community level focus reflecting cultural values, beliefs and practices of the intended audience and health care providers.

**Objective:** We describe the process and results of cultural adaptation and validation of READY-Girls (English) for a population of monolingual Spanish-speaking female Chilean adolescents with DM using the CLCHP Approach.

**Methods:** Forward-backward translation (inter-rater reliability, % agreement) of the READY-Girls program evaluation measures for health literacy and program satisfaction. Content and representation validity by a panel of experts of the READY-girls book and measures.

**Results:** Inter-rater reliability of measures: 71% agreement, discussion with community partners ensued to reach 100% agreement accounting for differences in linguistics and cultural values and practices (e.g., family centered). Content /Representation validity: inclusion of culturally appropriate Chilean themes (e.g., prescriptive language) and images in book.

**Conclusion:** This work highlights the importance of collaborating with community partners in target populations in efforts to create materials that are not only linguistically tailored but also culturally sensitive and developmentally appropriate. This is essential for meeting the needs of a Spanish-speaking population as reflected by the agreement achieved after the CLCHP approach. Future input from target audience (health literacy /satisfaction measures) will be assessed to strengthen the competency of our program.

## LBP17

**Open hybrid closed loop insulin delivery systems in children and adults with type 1 diabetes - Polish experience**A. Szybowska<sup>1,1</sup>, A. Szybowska<sup>sup</sup>, L. Groele<sup>2</sup>, K. Dzygał<sup>2</sup><sup>1</sup>Medical University of Warsaw, Warszawa, Poland, <sup>2</sup>Medical University of Warsaw, Warsaw, Poland

**Background:** Open Hybrid Closed Loops Insulin Delivery Systems are designed to automatically deliver basal insulin to keep blood glucose in target. We noted an expansion of unofficial Open Hybrid Closed-Loops systems (HCL) among patients. The aim of this study was to investigate metabolic control in children and adults using automated insulin delivery systems.

**Material and methods:** There were enrolled 14 patients, with the mean duration of diabetes 8,8 years (2-27 years): 10 children with the mean age 10.04 years (4.7 -18 years) and 4 adults with the mean age 30 years. Patients used the Open Hybrid Closed-Loops systems composed by insulin pump (Paradigme 722 Medtronic MiniMed, AccuCheckCombo Roche), continuous glucose monitoring (Dexcom G4/G6, Guardian Connect or Enlite Medtronic Minimed, FreeStyleLibre + transmitter), applications (OpenAps, AndroidAps or Loop) combined with Nightscout (a web based, real-time, data management system). Patients used these systems on average for 0.8 year. We analyzed data recorded in the Nightscout system during the last months.

**Results:** The mean overall glycemia was 135.2 SD 11.4mg/dl, the mean overall Standard Deviation (SD) was 46.7 SD 8.9 mg/dl, the mean coefficient of variation (CV) was 34%, the mean % time-in-range between 70-180mg/dl was 79,6% and between 70-140mg/dl was 58,8%, the mean %high glucose over 180mg/dl was 16.7%, and %low glucose below 70mg/dl was 3.7%, the mean HbA1c was 6.4%. There were no episodes of severe hypoglycemia and ketoacidosis. The mean basal insulin was 41.8% of total daily dose. Patients used 0.68 units insulin per kg of body weight.

**Conclusions:** Children and adults with T1D using Open Hybrid Closed Loops Insulin Delivery Systems achieved very good glycemic control with low glucose fluctuations and low time spend in hypoglycemia. Further randomized controlled trials are required to confirm efficacy and safety of the Open Hybrid Closed-Loops systems.

## LBP18

**Cystatin C in children and adolescents with type 1 diabetes: a new early marker of cardiovascular disease and heart failure**B. Predieri<sup>1,2</sup>, F. Lami<sup>1</sup>, E. Bigi<sup>1</sup>, P. Bruzzi<sup>1</sup>, V. Cenciarelli<sup>2</sup>, B. Prampolini<sup>1</sup>, T. Trenti<sup>3</sup>, M. Varani<sup>3</sup>, S. Vandelli<sup>1</sup>, L. Iughetti<sup>1,2</sup><sup>1</sup>University of Modena and Reggio Emilia, Department of Medical and Surgical Sciences of the Mother, Children and Adults - Pediatric Unit, Modena, Italy, <sup>2</sup>University of Modena and Reggio Emilia, Department of Medical and Surgical Sciences of the Mother, Children and Adults - Post-Graduate School of Pediatrics, Modena, Italy, <sup>3</sup>OCSAE, Local Unit Health of Modena, Department of Laboratory Medicine, Modena, Italy

**Objectives:** Aims of this study were to measure cystatin C (CysC) serum levels in children and adolescents with type 1 diabetes (T1D) and to evaluate its role as early marker for cardiovascular risk.

**Methods:** Ultrasound [carotid intima-media thickness (cIMT), ejection fraction (EF), E/A ratio], anthropometric (Ht, Wt, BMI, pubertal status, WC, SBP/DBP), and laboratory (HbA1c, TC, LDL-C, HDL-C, TG, CysC) data were collected.

**Results:** One hundred and eighteen patients with T1D (12.8±3.59 yrs; males 59.3%; duration T1D 6.08±3.66 yrs) were enrolled into

the study. CysC levels were significantly higher in: males vs. females ( $0.75 \pm 0.13$  vs.  $0.67 \pm 0.13$  mg/l;  $p=0.001$ ), Caucasians vs. non-Caucasians ( $0.75 \pm 0.13$  vs.  $0.64 \pm 0.12$  mg/l;  $p < 0.001$ ), subjects without DKA at T1D onset vs. those with DKA ( $0.75 \pm 0.13$  vs.  $0.69 \pm 0.13$  mg/l;  $p=0.043$ ), patients with HbA1c  $\leq 58$  mmol/mol vs. those with a worse glycemic control ( $0.76 \pm 0.12$  vs.  $0.70 \pm 0.13$  mg/l;  $p=0.013$ ), and subjects using SAP vs. those in MDI ( $0.77 \pm 0.11$  vs.  $0.71 \pm 0.13$  mg/l;  $p=0.048$ ). CysC levels were negatively correlated with EF ( $R=-0.236$ ,  $p=0.010$ ), mean HbA1c in the first 5 years of T1D ( $R=-0.198$ ,  $p=0.033$ ), and mean HbA1c in the last year ( $R=-0.206$ ,  $p=0.025$ ) and positively correlated with WC ( $R=0.261$ ,  $p=0.004$ ), and SBP ( $R=0.247$ ,  $p=0.007$ ). The multiple regression model identified CysC as predictor factor for EF ( $\beta=-0.240$ ;  $p=0.042$ ).

**Conclusions:** In our children and adolescents with T1D ultrasound data and CysC levels resulted in the normal range published for healthy subjects. According to literature, our patients' CysC levels were higher in males and in Caucasian and inversely correlated with HbA1c values. Furthermore, CysC was demonstrated to be a predictive factor for systolic dysfunction. Further studies are needed to better understand the clinical relevance of our results, considering the recent emphasis on the usefulness of CysC as new early marker for progression of cardiovascular disease and heart failure in subjects with T1D.

### LBP19

#### Would patients on Multiple Daily Injection (MDI) insulin regimens administer an extra injection for high-fat, high-protein (HFHP) meals?

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**Objectives:** Advice to split rapid-acting insulin doses for HFHP meals to improve post-prandial glycaemia (PPG) is increasing. We aimed to determine whether patients using MDI are willing to give an additional injection following HFHP meals.

**Methods:** During an observational study at 2 Paediatric Diabetes centres in the UK, 27 free-living 6-18 year olds with T1D and on MDI, injected additional insulin for a standard HFHP meal on 3 separate evenings (0, 1 or 2 hrs after an initial dose). At the end of the study, participants and parents completed an age-appropriate questionnaire to determine whether they would be willing to undertake split insulin doses as part of their usual insulin regimen.

**Results:** 26 questionnaires were returned on study completion (mean age 13yr (6.1-17.7yr); mean T1D duration 3.5yr; (1-14yr); 54% male) 42% participants and 35% parents reported that they would be happy to continue giving an extra injection for similar meals in future. Reasons for not want to give extra insulin included hypoglycaemia worry, inconvenience, risk of forgetting the second bolus and dislike of injections.

74% participants and 62% parents subjectively reported a reduction in impact of the meal on PPG with the extra injection.

31% participants and 54% parents felt others with T1D should be taught to give insulin for HFHP meals.

**Conclusions:** Children and young people with T1D on MDI and their parents see the benefit of giving an extra injection after HFHP meals on PPG, however only the minority would use it regularly in insulin dose adjustment due to multiple lifestyle factors. More research is needed to optimise insulin dose algorithms for HFHP foods, with tools and bolus calculators that support families to give extra doses for HFHP meals.

### LBP20

#### Endothelial and heart dysfunction in children and adolescents with type 1 diabetes

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**Objectives:** Aim of this study was to determine early ultrasound signs of atherosclerosis and systolic/diastolic dysfunction in children and adolescents with T1D.

**Methods:** One hundred and eighteen patients with T1D ( $12.8 \pm 3.59$  yrs; males 59.3%; duration T1D  $6.08 \pm 3.66$  yrs) were enrolled into the study. Ultrasound [carotid intima-media thickness (cIMT), E/A ratio], anthropometric (Ht, Wt, BMI, pubertal status, WC, SBP/DBP), and laboratory (HbA1c, TC, LDL-C, HDL-C, TG) data were collected.

**Results:** cIMT was higher in subjects with a poor glycemic control (mean HbA1c  $>58$  mmol/mol) in the first 5 years of T1D ( $0.57 \pm 0.10$  vs.  $0.53 \pm 0.10$  mm;  $p=0.043$ ) and with hypertension ( $0.60 \pm 0.12$  vs.  $0.54 \pm 0.09$  mm;  $p=0.027$ ). It was positively correlated with age ( $R=0.41$ ,  $p < 0.001$ ), WC ( $R=0.38$ ,  $p < 0.001$ ), SBP ( $R=0.39$ ,  $p < 0.001$ ), TG ( $R=0.26$ ,  $p=0.004$ ), TG/HDL-C ratio ( $R=0.19$ ,  $p=0.036$ ), and TG/HDL-C ratio ( $R=0.26$ ,  $p=0.004$ ). E/A ratio was lower in subjects with T1D for many years ( $\geq 10$  yrs and 5-10 yrs) compared to those with T1D for less time ( $\leq 5$  yrs) (Chi-Square=6.88;  $p=0.032$ ), with a poor glycemic control (mean HbA1c  $>58$  mmol/mol) in the first 5 years of T1D ( $1.79 \pm 0.43$  vs.  $1.96 \pm 0.41$ ;  $p=0.032$ ), and with a worse glycemic control in the last year (mean HbA1c  $\geq 75$  mmol/mol) compared to those with a better control (58-75 and  $\leq 75$  mmol/mol) (Chi-Square=10.4;  $p=0.005$ ). E/A ratio was negatively correlated with T1D time disease ( $R=-0.20$ ,  $p=0.029$ ), mean HbA1c values in the first 5 years of T1D ( $R=-0.19$ ,  $p=0.043$ ) and in the last year ( $R=-0.29$ ,  $p=0.001$ ).

**Conclusions:** cIMT and E/A ratio values were within normal range. However, our data confirm that the worse good glycemic control, mainly during the first years of T1D, the longer time disease, and the hypertension have a role in the development of endothelial and heart dysfunction already in childhood. Ultrasound is useful for early detection of subjects with a greater cardiovascular risk who can benefit from targeted therapeutic interventions.

## LBP21

**Teaching patients with diabetes and their family to manage emergencies: integrating simulation session into insulin pump curriculum**M. Buithieu<sup>1</sup>, A. Levy<sup>2</sup>, S. Veillette<sup>3</sup>, P. Olivier<sup>4</sup>, Y. Shayan<sup>2</sup>

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Type 1 diabetes is the leading childhood metabolic disorder, affecting nearly 1/400 children in Canada. Learning adequate care of daily routine insulin therapy and managing acute complications is part of the usual diabetes curriculum. With the support of the Quebec government, access to insulin pump was made possible to all children and adolescents and the teaching program was adapted accordingly. Formal teaching is provided, including the theory of hypo and hyperglycemia. However, families report lack of confidence in identifying these complications in practice. This contribute to major knowledge gaps in recognizing and managing basic diabetic emergencies by patients and their families.

Simulation using actors and mannequin, is a teaching method known to enhance the transfer of theory to practice, This is why we develop an innovative project to integrate simulation sessions into the current teaching curriculum for diabetic patients newly on insulin pumps.

Following a needs analysis consisting of audits of calls to the diabetes clinic and patient questionnaires, four scenarios were elaborated accordingly :

- (1) Hypoglycemic patient needing assistance;
- (2) Severe hypoglycemia evolving from altered level of consciousness (ALOC) to seizures requiring glucagon;
- (3) Vomiting patient with hyperglycemia and ketones;
- (4) Pump programming workshop covering basic pump functions.

Between May 2017 and June 2018, a total of 70 families were involved in the new 6-week diabetes insulin pump curriculum integrating mandatory simulation training. Performances were rated for each family using the evaluation grid for each scenario. Simulation sessions were evaluated by all families involved. Families reported a high level of satisfaction. They suggested introducing simulation early, even before the pump program.

The simulation program proved safe and based on actual needs. This could lead to optimization of patient self-care. A research study is currently ongoing to evaluate its validity.

## LBP22

**25OHD in T1D children and adolescents in Finland (T1DD)**J. Nurmi-Lawton<sup>1</sup>, R. Jussila<sup>2</sup>, M. Pulkkinen<sup>2</sup>

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**Introduction:** Low vitamin D levels have been associated with a number of diseases including cancer, skeletal diseases, infections and cardiovascular diseases as well as T1D.

**Objectives:** The aim of this study was to investigate 25OHD levels and associations in paediatric and adolescent T1D patients in Southern Finland.

**Methods:** In a retrospective, document research, 25OHD results and other descriptive data were collected from patient records of 341 T1D patients treated at a paediatric and adolescent T1D clinic in Helsinki University Hospital Area. Patients were 2-16 years old (mean 10,7±3,2 y), 45% were girls and 55% boys. SPSS Statistics 25 was used (mean±sd, M-W, Spearman).

**Results:** 25OHD average was 74±25 nmol/l with no difference between sexes. Only 35% of the patients had 25OHD values above recommended 80 nmol/l, 87% had above 50 nmol/l and 13% had under 50 nmol/l (deficiency). When analysed by age groups, only children before school age (2-6 y) reached the recommended 80-120 nmol/l.

As expected, there was some seasonal variation in 25OHD levels with highest levels during summer months (June-August 82±21 nmol/l, rest of the year 72±25, p< 0,01).

Patients, who were not taking vitamin D supplements, had vitamin D deficiency (48±14 nmol/l).

There was a significant negative correlation between 25OHD and HbA1c (r -0,26, p< 0,01) and also between 25OHD and BMI (r -0,29, p< 0,01).

**Conclusions:** The average 25OHD within the study population was below the recommended level. Recent research suggests that vitamin D deficiency is a metabolic consequence of T1D, rather than a causal factor<sup>1</sup>. Our finding indicating better metabolic control in patients with better 25OHD levels, may reflect improved adherence to self-management guidelines in terms of glycemic control and dietary advice, including daily vitamin D supplements throughout the year.

<sup>1</sup>Aatsinki et al. Diabetes 2019 May; 68(5): 918-931.

## LBP23

**Health care transition in youth with poorly controlled type 1 diabetes (T1D): qualitative analysis of pre-transition perspectives**E. Schlissel Tremblay<sup>1</sup>, J. Ruiz<sup>2</sup>, T. Buccigrosso<sup>2</sup>, T. Dean<sup>2</sup>, K. Garvey<sup>1</sup>

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**Objective:** To explore expectations for transition to adult care and experiences with transition planning among poorly controlled adolescent/young adults with T1D at a tertiary U.S. pediatric center.

**Methods:** We conducted semi-structured interviews in a purposive sample of patients 14-23 years with T1D ≥1 year and HbA1c >9%. A multidisciplinary team conducted iterative thematic analysis with deductive and inductive coding aided by NVivo software.

**Results:** Fourteen subjects (9 adolescents/5 young adults, mean age 17.1 ± 3.2 years, 57% male, 79% Caucasian; 14% Hispanic), T1D duration 8.2 ± 4.6 years, HbA1c A1c 10.0% ± 0.8 for adolescents and

10.1%  $\pm$  0.7 for young adults participated. Qualitative analysis yielded 4 key themes. 1) *Lack of formal preparation*: participants of all ages demonstrated a lack of preparation for transition and ignorance about the process, describing it as coming “out of the blue.” 2) *Desire for delayed and gradual transition*: participants wanted to defer being “serious” about transition to a later/uncertain date, with a preference to “wait until I’m older” among all ages. Participants described ideal transition as a gradual, “a little at a time” process. 3) *Attachment to pediatric providers*: participants demonstrated a nearly universal attachment to and “familiarity” with their pediatric T1D providers, with worries about an “uncomfortable” transition to adult providers. 4) *Concern about an impersonal adult care setting*: participants perceived adult care as “formal,” “scarier,” and “tougher,” with increased criticism about poor control; they expressed fear that adult providers would not “know me” or appreciate “my diabetes journey.”

**Conclusions:** We demonstrate a lack of transition preparation and anxiety about transition and adult care among poorly controlled youth with type 1 diabetes. Our results may help guide early, iterative pediatric transition counseling, with special focus on addressing attachment and fears about adult diabetes care.

## LBP24

### MyDiaText™: texting the way to better diabetes care

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**Background:** Adolescence is associated with suboptimal diabetes control; mean HbA1C exceeds 9%. Text messaging(TM) is the most commonly used technology in adolescents with Type 1 Diabetes(T1D). Pilot studies have shown TM to be a useful tool in diabetes education. Financial incentives have been used successfully to promote healthy behaviors. MyDiaText™ is a website and TM platform supporting behavior change in adolescents with T1D.

**Objective:** To show whether financial incentive for engagement in TM’s is associated with significant improvement in Self-Care Inventory(SCI) score and HbA1C.

**Methods:** Subjects were recruited from diabetes clinic. Enrollment criteria included: 12-18 years, >1 year from diagnosis and point-of-care HbA1C > 8%. AADE7™ Self-Care Behavior goal and SCI score (14 questions scored 1-5) were obtained at baseline. Characteristics including concern for depression were extracted from the medical record. Intervention group received daily educational/motivational TM’s, and responded via TM. One participant with most consecutive responses bi-weekly received a financial incentive. Engagement (% response to TM) was calculated by MyDiaText™. Chi-square, t-test and linear regression were used for analysis.

**Results:** 162 subjects(51.9% male; 40.2% non-white) were randomized to control or intervention and followed for 3 months. Mean age

was 15.6 years; duration of T1D 7.1 years; HbA1C 10%; and SCI score 47.5. There was more depression(provider-reported) in the intervention arm( $p=0.01$ ). In those who completed both SCI, there was a greater increase in SCI in the intervention arm(4.56 vs. -0.59,  $p=0.02$ ). There was no difference in mean change in HbA1C between groups (-0.44 vs. -0.43,  $p=0.97$ ). Mean engagement was 59% (SD 24.7%), and was negatively correlated with male gender ( $r=-0.17$ ,  $p<0.01$ ).

**Conclusion:** A combined TM and financial incentive intervention using MyDiaText™ showed increase in SCI score over 3 months. Further analyses will determine effects on diabetes outcomes.

## LBP25

### Experiences of young professionals with type 1 diabetes mellitus launching into the workplace

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Every year 1.5 million individuals are diagnosed with type 1 diabetes mellitus (T1DM), with an expected increase of 1.8% each year. Independent diabetes management may present unique challenges for young adults with T1DM transitioning to the workplace. In this qualitative study, we explore the experiences of young professionals living with T1DM (20-30 years old) as they launch their professional careers and transition to adulthood while living with a chronic condition. We conducted two in-person focus groups with subjects at the College Diabetes Network in Boston, MA during a weekend retreat. After obtaining informed consent, the 12 participants (5 males, 7 females) attending were randomly selected into each focus group that lasted approximately 60 minutes. Subjects were 24+2.24 years old on average with a mean hemoglobin A1c of 7.9+2.65. Time since T1DM diagnosis ranged from 3 to 20 years with a mean of 9 +5.68 years. All but one subject used a pump and continuous glucose monitor for T1DM management. Four subjects were current students (2 undergraduate, 2 graduate) and 8 were employed after completing their Bachelor’s degrees. Four researchers conducted a thematic analysis of the verbatim transcripts. We followed Merriam’s (2009) qualitative analysis process of open coding, axial coding, and establishing consensus among coders. Five main themes emerged from the focus groups including

- (1) challenges around disclosure of T1DM in professional settings,
- (2) support from family, friends, and workplace,
- (3) accommodations for T1DM in college and the workplace,
- (4) benefits and challenges associated with diabetes management technology, and
- (5) having a sense of ownership of T1DM.

The theme of T1DM management ownership in the current study goes beyond illness management behaviors to being part of the person’s identity and body image. Results have important implications for young professionals with T1DM launching professional careers.

LBP26

### Continuous glucose monitoring and continuous insulin infusion via pump decrease diabetes related distress (DRD) and depression screening score in adolescents with type 1 diabetes

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**Introduction:** Type 1 diabetes has been linked with depression in adolescents living with diabetes. Recently, diabetes related distress (DRD) also came to limelight where emotional distress in diabetes management does not meet the criteria for major depression. Little is known about the impact technology augmented diabetes management on DRD and depression.

**Objectives:** to assess the impact of continuous insulin infusion (CII) and continuous glucose monitoring (CGM) use on DRD and depression in pediatric population.

**Methods:** Retrospectively, we reviewed electronic medical records (EMS) from 2018 to 2019 in a single tertiary center. A total of 312 subjects were included who participated in the Patient Health Questionnaire-9 (PHQ-9) questioners to identify depressive symptoms and Problem Areas in Diabetes Scale (PAID) questioners to identify DRD scale. EMS also reviewed for clinical characteristics and treatment methods (self-monitoring of blood glucose [SMBG], CGM, multiple daily injections [MDI] or CII).

**Results:** Total 312 subjects: 156 males (avg 15.17 years) and 156 females (avg 15.07 years) were screened. A total of 86 subjects were managed by CII; whereas 226 subjects by MDI. 86 subjects also on CGM and 226 without. A total of 187 subjects were on MDI only; 39 subjects were with CGM with MDI. 39 subjects were on CII without CGM, and 47 were using combined CII and CGM. 12 subjects are excluded due to lack of data.

Use of CGM strongly correlated with reducing PHQ-9 and PAID scores compared to those who have been using SMBG ( $P=0.000$  and  $P=0.013$  respectively). Use of CII also significantly reduced DRD ( $p=0.014$ ) over MDI; however, did not reach a statistically significant score in PHQ-9 ( $P=0.064$ ).

**Conclusions:** We have shown that CGM can significantly reduce DRD and depression screening scores. We also demonstrated that use of CII can also reduce DRD, however, even though there is a clear trend of lower PHQ-9 score with CII, but was not statistically significant.

LBP27

### Acquired lipodystrophy among children and adolescents attending a diabetes camp

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**Introduction:** Acquired lipodystrophy (AL) remains a common complication of insulin therapy. We assessed a group of children and adolescents with type 1 diabetes (T1D) to relate scores of AL with glycemic outcomes.

**Methods:** During a T1D camp in Ecuador, a group of children and adolescents were examined on ten injection sites (IS) for AL (Figure 1). Data on anthropometrics, types and dosage of insulin were collected. Glycemic outcomes were the value of glycated hemoglobin (%HbA1c), the coefficient of variation for glucose (%CV) and the frequency of hypoglycemia episodes ( $\leq 70$  mg/dL) regards of the week before the camp. Results were assessed globally and by groups of age (younger and older than 12yo) and time of disease (more and less than 2 years).

**Results:** Eighty-three diabetes campers were assessed; 44 (53%) boys. Median age and mean time of disease were 12.9 (range min-max: 5.3-23.9) and 5.9 (0.15-20.0) years. Most patients used glargine (80%) and lispro (56%) as basal/bolus insulin types. Average total dose of insulin/kg was  $0.76 (\pm 0.3; 0.19-1.64)$  UI. Mean HbA1c was  $8.7 \pm 1.9\%$ . Data for AL were assessed in 65 campers; 49 (75%) presented it. The ratio AL/IS was greater for the right and left periumbilical (0.65 and 0.63) and left upper-arm (0.28) sites. There was found a tendency of reduced values of HbA1c in campers without AL ( $7.7 \pm 1.6$  vs.  $8.6 \pm 1.9\%$ ,  $p=0.08$ ), markedly in older campers ( $7.2 \pm 1.5$  vs.  $9.0 \pm 1.8\%$ ,  $p=0.01$ ). The %CV was globally higher in those with AL (44 [15-82] vs. 36 [16-54],  $p=0.03$ ), especially for those with less than 2 years of T1D (48 [33-58] vs. 32 [16-43],  $p=0.002$ ). The frequency of hypoglycemia was higher in those with AL and 2 years of T1D (11 [0-32] vs. 0.5 [0-3] %,  $p=0.01$ ).

**Conclusion:** The findings of AL in pediatric age seem to be high and are associated with a worsening of the diabetes control. Educational measurements need to be employed to mitigate glycemic outcomes.

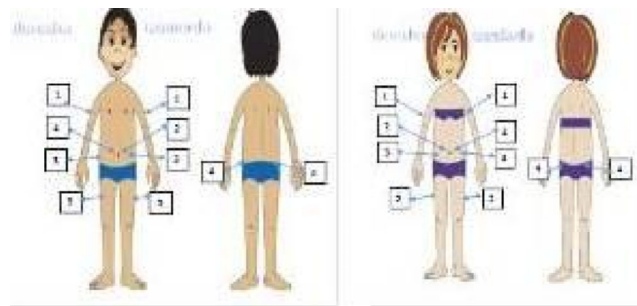


Figure 1: Assessment of lipodystrophy according to ten specific injections sites: 1R (right upper-arm), 2R (right periumbilical), 3R (right flank), 4R (right bottom), 5R (right thigh), 1L (left upper-arm), 2L (left periumbilical), 3L (left flank), 4L (left bottom), 5L (left thigh).

[Assessment of lipodystrophy according to ten specific injections sites]

## LBP28

### Prevalence and risk factors of thyroid dysfunction and thyroid autoimmunity in children with newly developed type 1 diabetes mellitus

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**Introduction:** Thyroid dysfunction and autoimmune thyroiditis are frequently reported in type 1 diabetes mellitus (T1DM). This study was performed to evaluate the prevalence and risk factors of thyroid dysfunction and autoimmune thyroiditis in children with newly developed T1DM.

**Subjects and Methods:** The subjects with T1DM and followed for more than 6 months between 2002 and 2018 in a single tertiary center were included in the study. Medical records were reviewed. Sex, onset age, HbA1c, presentation of diabetic ketoacidosis (DKA), thyroid function, positivity of T1DM-associated antibody (Ab) such as anti-GAD, anti-insulin, and anti-IA2 Ab as well as anti-thyroid peroxidase (TPO) and anti-thyroglobulin (TG) Ab were analyzed to find the prevalence and risk factors of thyroid dysfunction and thyroid autoimmunity at the onset of T1DM. Chi-square, Fisher's exact test, t-test, and logistic regression were used for statistics.

**Results:** A total of 74 subjects were diagnosed as T1DM. Forty six were males. Initial presentation as DKA was found in 57%. Mean onset age of T1DM was 9.89 years. Anti-GAD, IA2, and insulin Ab were positive in 84.9%, 79.7%, and 27.4%, respectively. Thyroid dysfunction and thyroid autoimmunity at the onset of T1DM were evaluated in 57 subjects and low T3 and low T4 were found in 61.4% and 24.6%, respectively. The presence of DKA was associated with low T3 and low T4 ( $P < 0.05$ ). Autoantibodies related with T1DM or thyroid autoimmunity were not associated with low T3 or low T4. Anti-TPO Ab positivity and anti-TG Ab positivity at the onset of T1DM was 25% and 21%, respectively. Any autoantibody related with T1DM was not the risk factor of thyroid autoimmunity.

**Conclusion:** This study showed that low T3 or low T4 was frequently observed at the onset of T1DM and it was associated with the presence DKA. Anti-TPO Ab and anti-TG Ab were positive in 24% and 22%, but there was no correlation between the presence of anti-TPO Ab and anti-T1DM Ab.

## LBP29

### Role of pediatric diabetes team in providing safe fasting For type 1 diabetes during ramadan: Kuwait experience

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**Introduction:** Healthy pubertal adolescents are religiously obliged to fast during Ramadan. Although the sick and some chronic conditions such as diabetes are exempted, many of Type 1 Diabetes

patients(T1D) choose to fast Ramadan. Fasting Ramadan requires special care and comes with many challenges for Muslims with T1D.

**Objective:** To investigate the impact of conducting a workshop about Fasting Ramadan for T1D on knowledge in caring and management of pediatrics who are willing to fast during Ramadan, and to avoid possible risks. Additionally, to provide adequate knowledge on carbohydrate counting of Ramadan popular foods.

**Methods:** a pediatric diabetologist, a nutritionist and 2 diabetes educators, provided a workshop for 44 participants, for a duration of 4 hours. The workshop included 2 interactive lectures about physiology of fasting for T1D, eligible criteria for fasting and possible risks that may occur, followed by the protocol of fasting Ramadan. Then participants were divided into 2 groups for hands-on carbohydrate counting for all types of traditional foods that are mainly served during Ramadan. Pre- and post-knowledge assessment about T1D and fasting Ramadan management and carbohydrates counting was performed using a 26-item Knowledge Assessment Questionnaire(KAQ). The results were analyzed statistically.

**Results:** 44participants 2 males and 42 females aged 9-18 y.o.attended the workshop.Of 44 participants who completed the pre-KAQ 36 completed the post-KAQ.A significant difference in the mean knowledge score was detected( $p$ -value $< 0.001$ )with the pre-KAQ mean score being  $13.2 \pm 5$  compared to  $20 \pm 3.1$  for post-KAQ mean score.

**Conclusion:** Pre-assessment showed the lack of knowledge of T1D about fasting in Ramadan and the risk associated with it, protocol of fasting and traditional Ramadan food carbohydrate counting.The significant improvement in knowledge for the attendees confirm the effective role of pediatric diabetes team to provide safe fasting for T1D during Ramadan.

## LBP30

### Overview of research and recruitment methods of young adults with T1D

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Since 2016, the College Diabetes Network (CDN) has grown to include over 2,500 emerging adults between the ages of 17-26 across the United States and Canada. With nearly 150 campus-based Chapters and emerging adults at large, CDN is able to capture data including physical and mental health outcomes both quantitatively and qualitatively. Because of our large cohort, CDN is well positioned to partner with clinics, and serve as a reputable recruitment hub for surveys and research studies.

Electronic surveys and focus groups have allowed CDN to serve as a validated cohort for coordinating both on and offline research around type one diabetes (T1D) in the emerging adult population. CDN has partnered with over 47 expert clinicians, psychologists and institutions to better understand the physical and psychosocial outcomes and begin to share best practices and change the way that care is addressed for this vulnerable population. As the only T1D organization exclusively focusing on emerging adults and these outcomes,



CDN utilizes this continued proven efficacy of these research methods to better address the needs of this population through programs and resources.

This research has spanned multiple different facets of emerging adult care, including a publication in the *Diabetes Educator* focused on the impact of peer support on T1D outcomes for emerging adults. As part of a weekend program in spring 2019, CDN partnered with clinicians and researchers and hosted multiple focus groups with 12 emerging adults to understand the needs and challenges of young adults with T1D.

Our poster will display a collection of our research findings beginning in 2016, outline resources and implications for future research, and identify key recruitment strategies proven effective to solicit a large cohort for this often hard to recruit age group.

### LBP31

#### **Towards psycho-socio-economic (PSE) challenges: the Impact of patient-parents multi-sessional counseling approaches in type 1 diabetes ( T1DM)**

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**Objectives:** In spite of availability of treatment and diabetes education from health care providers, majority of T1DM patients couldn't achieve targeted glycemic goal and have poor quality of life (QOL) with PSE Challenges. Hence, identification, development and implementation of specific counseling approaches, to manage and meet healthcare challenges and needs, have been gaining interest and is emerging need found by Clinical Pharmacists.

**Methods:** A randomized, multi-sessional counseling study was conducted in a diabetes care clinic. The study consists of series of 6 sessional T1D-related counseling for patient-parents over 6 months (Sessions: 1: Parent/child communication, 2: Division of roles, 3: T1DM Understanding & Treatment Management in daily life, 4: SMBG, Diet, Exercise, Complications, Budget Management, 5: Role of School and Society, 6: General discussion). Demographic data, QOL, HbA1c, cost of treatment data were collected. QOL, HbA1c, Treatment cost data were collected pre-counseling at baseline (month 0) and post-counseling (month 6) at the end of study.

**Results:** A total of six counseling sessions were conducted with 37 participants (patient-parents groups, male & female, age 12-18, mean age, 14.6 years; 46% Female; mean duration of diabetes, 5.9 years). Psycho-social-economic issues data were collected at baseline & at 6 month. After 6 months, participants reported that specifically designed multi-sessional counselling program provided much positive effect on their QOL and economic burden. Also, psychological stress and social wellness was significantly improved along with appreciable metabolic control. The clinical pharmacist found that the multi-sessional counseling approach was useful for T1DM patients with their PSE challenges.

**Conclusions:** Multi-sessional counseling program showed marked reduction in HbA1c, significant improvement in QOL and less

economic burden in T1DM patients along with improvement in associated PSE challenges.

### LBP32

#### **The impact of type 1 diabetes on daily life: insights from caregivers of minors with type 1 diabetes**

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**Objectives:** Type 1 diabetes (T1D) significantly impacts multiple aspects of life for people living with the condition as well as caregivers of minors with T1D. The increasing healthcare costs of diabetes is often studied; however, limited research exists regarding the cost of time, missed opportunities, and sacrifices made due to diabetes. This study aimed to identify areas of impact beyond healthcare costs on the lives of families with T1D.

**Methods:** Focus groups were conducted using themes identified from patient, caregiver, and healthcare provider interviews to facilitate discussion. Fourteen caregivers, ages 34-55, of minors with T1D participated in the focus groups.

**Results:** Salient themes included impact on sleep, family, social lives, work and missed opportunities. Participants reported intentional and unintentional sleep disruptions such as setting nighttime alarms to check their child's blood sugar or adjust pump settings, as well as disruptions from diabetes-device alarms, respectively. Family impact included spousal arguments regarding their child's T1D care, and lack of support from extended family. Social impact involved exclusions of the child with T1D, including being unable to attend sleepovers, playdates, and sporting events. Caregivers reported impact on work and missed opportunities including income reduction and employment changes due to inadequate insurance coverage and lack of availability for child care. Families also missed travel and social events due to T1D management. The final theme was the time costs associated with T1D management, including troubleshooting diabetes devices and diabetes-related planning, such as weighing food and packing supplies.

**Conclusions:** T1D can impact the lives of the entire household and children with T1D can be excluded from other social events and activities due to T1D management. Caregivers reported ways T1D affects their sleep and time, in addition to introducing social, emotional, and financial hardships.

### LBP33

#### **Prevalence of coeliac disease in children and adolescents with type 1 diabetes mellitus in a tertiary hospital in South Africa**

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**Introduction:** International literature has shown the prevalence of coeliac disease in children and adolescents with diabetes to range from 1-10%. Prevalence rates in African countries are limited or unknown.

**Objectives:** The objective of this study is to describe the prevalence of coeliac disease in all children and adolescents with type 1 diabetes mellitus presenting to the paediatric and adult diabetic clinic at Steve Biko Academic Hospital.

**Methods:** A retrospective review of the files of all children and adolescents in the paediatric and adult diabetic clinic with type 1 diabetes mellitus between August 2016 and June 2019 was conducted. Children requiring screening and/or intestinal biopsies were also prospectively included during this period. The setting of this study was at Steve Biko Academic Hospital, a tertiary referral centre, in Pretoria, South Africa. A sample size of at least 139 patients was calculated to estimate the expected coeliac proportion of 0.10 (10%) to an accuracy within 0.05 (5%) with 95% confidence. All children and adolescents with type 1 diabetes mellitus who are part of the paediatric and adult diabetic clinic were included. Coeliac screening included anti-deaminated gliadin antibodies and anti-tissue transglutaminase antibodies (both IgA and IgG). All biopsies were obtained by paediatric gastroenterologists.

**Results:** A total of 184 files were screened, 132 met inclusion criteria however only 105 patients in total had coeliac screening. Positive antibody screening for coeliac disease was found in 11 out of 105 patients (10.5%). Nine of the 11 serology-positive patients had biopsies performed. Out of the 9 biopsies, 2 (22.2%) were positive for coeliac disease based on the Marsh-Oberhuber classification.

**Conclusions:** This study concluded a prevalence of serology-positive coeliac disease in South African children with type 1 diabetes mellitus of 10.5%, while the prevalence of biopsy-confirmed coeliac disease was found to be 1.9%.

### LBP34

#### Paediatric Type 2 diabetes in a single centre in East London in the period 2009-2018

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**Introduction:** The incidence of Paediatric Type 2 diabetes (T2D) is increasing.

**Objectives:** To describe Paediatric T2D in Royal London Hospital over the period 2009-2018.

**Methods:** Retrospective analysis of patient cohort.

**Results:** Number of new patients doubled from 2.6/yr in 2009-2013 to 5.3/yr in 2014-2018. Prevalence in our cohort is 7.5% (national average 2.5% in 2017-2018).

40 patients (25 female) were diagnosed in 2009-2018, mean age at diagnosis 13.9±1.7 yrs. Males had more frequently learning difficulties

compared to females (40% vs 20%). 60% of patients were Asian compared to 28% in our T1D cohort.

BMI at presentation was 31.5kg/m<sup>2</sup>(23 females) and 33.9kg/m<sup>2</sup>(13 males). BMI remained stable in females in the first year after diagnosis but increased in males to 34.6kg/m<sup>2</sup>(n=10, non significant (ns)).

At diagnosis, Metformin was started in 38/40 patients but 7 patients reduced the dose and 6 stopped due to side effects. 12/36 patients started also on long-acting insulin (0.28±0.17U/kg), in 6 combined with prandial insulin (0.42±0.20U/kg). 7 patients started long-acting insulin at a later stage and 6 required prandial insulin too. 1 patient was treated with Sitagliptin.

HbA1c at diagnosis was 75±20mmol/mol (n=27), similar for males and females.

HbA1c dropped to 55±17mmol/mol after 3 months (P< 0.0001), to increase again to 63±26 and 67±28 after 1 (n=25, ns) and 2 yrs (n=23, ns).

19 of 38 patients achieved an HbA1c < 48 at least once, but only 9 of 35 achieved an HbA1c < 48 for a year. Of these, 3 continued and 1 stopped insulin treatment. 2 patients relapsed.

Complications were as follows: 11/21 hypertension, 6/28 sleep apnoea, 10/30 raised ALT and 9/24 fatty liver.

**Conclusions:** Learning difficulties in our patients with T2D were frequent and complications of obesity/T2D common. Current treatment did not achieve permanent reduction in BMI and HbA1c in most patients although temporary reduction of HbA1c was possible. New treatment approaches are needed to improve outcomes.

### LBP35

#### Screening of cardiac autonomic neuropathy in children and adolescents with diabetes mellitus

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**Introduction:** Cardiac autonomic neuropathy (CAN) is a common complication in diabetes mellitus (DM) and associated with increased mortality. Early detection of CAN is helpful for better individual risk stratification.

**Objectives:** The aim of this study was to screen autonomic dysfunction in children and adolescents with DM.

**Methods:** We performed a retrospective study of the pediatric patients with DM, aged 10-19 year. Autonomic function was assessed using five cardiorespiratory reflexes (CRRs): heart rate, blood pressure response in standing position, hand gripping, deep breathing, and Valsalva maneuver.

**Results:** Total 29 children and adolescent patients (13 boys and 18 girls) with DM were included. 66% (N=19) of patients were diagnosed with type 1 DM. Pathologic CRRs at least one item were seen in 14 patients (46.7%). In five CRRs, the most frequent pathologic reflex was the response of heart rate in standing position (27.6%, n=8). Definite autonomic dysfunction (more than two pathologic

reflexes in parasympathetic function) was found in two patients and severe autonomic dysfunction (definite autonomic dysfunction with pathologic reflexes in sympathetic function) was found in one patient. The patients with pathologic CRRs were younger than the patients with normal CRRs; The median age at diagnosis with DM and assessment of CRRs was 11 and 18 year in the patients with pathologic CRRs, 14 and 19 year in the patients with normal CRRs ( $p < 0.05$ ). In patients with pathologic CRRs, median duration of treatment was 35 months, mean hemoglobin A1c (HbA1c) was  $11.7 \pm 2.5\%$  and the ratio of type 1 DM and type 2 DM 10:4. This was not significantly different from the value of patients with normal CRRs; duration of treatment 27 months, HbA1c level  $10.7 \pm 2.5\%$  and the ratio of type 1 DM and type 2 DM 11:4.

**Conclusions:** In conclusion, autonomic dysfunction was common in pediatric patients with DM and more frequent and close assessment of CAN is needed for early diagnosis.

### LBP36

#### To study the metabolic outcome in type 1 diabetic patients of different age group through DPV software

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**Method:** With the help of recent benchmarking report we evaluated HbA1c in patients of different age groups. The age of the patients were categorized into

0-6 years,

6- < 12 years,

12-< 18 years,

18-< 25 years,

$\geq 25$  years.

With number of patients in each group to be 23, 67, 94, 84, 51 making a total of 319 patients. The data analysis is based on SWEETbase data pool.

**Results:** We have total 1111 patients' data in DPV Software. This analysis is done on 319 newly added patients from 01/01/2018-31/12/2018 time period.

#### The Hba1c of age group

0-< 6y is found to be < 7.5%

13% of the patients,

7.5-9 % for 30.4 % and it

>9.0% for 56.5% of patients.

#### The Hba1c of age group

6-< 12y is found to be < 7.5%

9% of the patients,

7.5-9 % for 22.4 % and it

>9% for 68.7% of children.

#### The Hba1c of age group

12-< 18y is found to be < 7.5%

5.3%, between 7.5-9 % for 27.7% and >9% was found in 67% of adolescents.

#### The Hba1c of age group

18-< 25y is found to be < 7.5

22.6%, between 7.5-9% in 34.5%

>9% in 42.9% of adults.

#### The Hba1c of age group

$\geq 25$ y is found to be < 7.5

29.4%, between 7.5-9.0% in 33.3%

>9% in 37.3% of adults.

Out of 319, there are total 23 patients with duration < 1 year, with 13% having Hba1c < 7.5%. And 296 patients with duration >1 year and out of that 15.2% have Hba1c < 7.5.

**Conclusion:** Based on the SWEET data analysis and benchmarking report of our center, we found that Hba1c depends on age.

With the increasing age there is improvement in the value of average blood glucose. Maturity, acceptance and understanding of the disease being the most probable reasons.

Adolescence affects the Hba1c value, as only 5.3% had Hba1c < 7.5% and 67% had Hba1c above >9.0%.

### LBP37

#### Directed differentiation of human intestinal organoids into the enteroendocrine lineage and insulin-expressing cells via small molecules

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Enteroendocrine (EE) cells are vital for intestinal and pancreatic function. Although recent studies have identified multiple signaling pathways that can induce EE differentiation, the production of functional human EE cells *in vitro* remains challenging, making their study and therapeutic utilization difficult. To increase EE cell differentiation, we designed a novel protocol that induces expression of EE cell markers with a corresponding increase in the production of EE hormones, including GIP, serotonin and somatostatin. Further, we were also able to drive differentiation into non-intestinal endocrine cells, inducing expression of multiple beta-cell specific transcription factors and insulin. Taken together, these differentiation protocols allow for high yield generation of functional hormone-producing cells, as well as expression of beta-cell specific genes. This is a critical step towards understanding the role of EE cells in disease and the development of cell-based therapies from intestinal precursors.

### LBP38

#### Development of a guideline for education and use of CGM and FGS in primary schools

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**Objectives:** Real-time continuous glucose monitoring (CGM) and flash glucose sensing (FGS) are evolving technologies in the management of

Type 1 diabetes. In the UK, the National Institute for Clinical Excellence (NICE) has produced 2 guidelines relevant to the use of CGM. In May 2018 FGS (Freestyle Libre) was NHS funded with local criteria. In March 2019, NHS England standardised national criteria for FGS. For children not meeting criteria some parents choose to self-fund. The objective of the Oxfordshire Children's Diabetes Service was to produce a guideline for education and use of CGM and FGS in primary schools.

**Methods:** In February 2017, the multi-disciplinary team (MDT) reviewed the clinical guideline for children and young people under 18 years developed by the UK Association of Children's Diabetes Clinicians (ACDC). The first stage was to develop training sessions for families and to gain from families' own experience. This led to formal education sessions for users required by funding bodies and a guideline for use by school staff. A draft was disseminated to members of the MDT, parent representatives and schools with experience in CGM/FGS use. Experience was gained from diabetes teams across the regional network at an educational meeting. A second draft was produced from the feedback, sent to all MDT members and discussed before a final version was produced.

**Results:** The 2-page schools guideline was introduced at annual group training for school staff in June 2019 for use in the next academic year. The guideline incorporates dose adjustment of bolus insulin dependent on glucose level and directional arrows. It advises on frequency of glucose monitoring and prevention of hypoglycaemia.

**Conclusions:** Following implementation of the guideline for the academic year 2019-20 an audit of its efficacy, usability and acceptability by school staff and families will be required. Annual updates will be required to take account of feedback and evolving technologies.

### LBP39

#### PHQ and CDI before and after 10-week curriculum-based group intervention in adolescents with T1D

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**Introduction:** Adolescents with T1D are at significant risk for depression compared to same-age peers and depression has been shown to negatively impact diabetes management and health outcomes. Teen Power is a 10-week curriculum-based group intervention for T1D teens, caregivers, and siblings. This group was developed to promote a reduction in psychosocial barriers associated with T1D management for teens and the family. Multiple metrics including the CDI and PHQ were obtained for all participants to measure the impact of this group intervention on psychosocial functioning.

**Objective:** To compare CDI and PHQ measurements in T1D adolescents participating in Teen Power.

**Method:** Psychometric and other measures were administered prior to and after the 10-week sessions. CDI and PHQ pre and post data were analyzed and group means compared.

**Results:** Most adolescent t-scores on the CDI were within normal limits before (T=48.57(10.32)) and after (T=46.84(9.98)) the group intervention (t(76)=17.77, p=0.082). 18.2% of teens had elevated scores of 60 or more. In these teens, scores fell between the first (t=65.47) and the tenth group session (t=57.07) (t=3.79(14), p=0.002). Similarly, data from the PHQ indicated that most scores were not indicative of depression. However, among teens with moderate or higher PHQ scores (mean =13.025), scores decreased following the intervention (mean = 9.700), indicating lower levels of depression (t(19)=2.16; p=0.044).

**Conclusion:** This subset of data obtained for teens with T1D participating in the curriculum-based group intervention suggests CDI and PHQ scores are not elevated in the majority of teens. However, in teens whose responses yielded elevated CDI and PHQ scores, mean scores decreased following the intervention. Moreover, participation in this group did not yield an increase in mean scores for teens. This data suggests that this group intervention promotes a decrease in severity of depressive symptoms. The analysis of corresponding data for caregivers and siblings is pending.

### LBP40

#### Neonatal diabetes caused by RFX6 mutations: barriers to follow-up management

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**Introduction:** RFX6 mutation is a rare cause of neonatal diabetes. Management can be difficult as diabetes is associated to severe digestive disorders.

**Objective:** We report two cases of neonatal diabetes due to RFX6 mutation and its short-term follow-up.

**Method/Results:** case 1: female, born SGA at 36 weeks from Portuguese consanguineous parents. Prenatal diagnosis of duodenal atresia. Corrective surgery occurred in the first days of life but she presented soon after birth exocrine pancreatic insufficiency and neonatal diabetes requiring IV insulin. At the 21th day of life, she developed neonatal diarrhea with blood stool that resulted in a complete dependence on parenteral nutrition and in a failure of switching from IV insulin to CSII, which was only possible at 5 months. Extensive- hydrolyzed formula was partially tolerated and food diversification begins at 6 months old. Due to recurrent hypoglycemia during this period predictive hypo minimizer system was set successfully reducing these events. The genetic diagnosis of RFX6 homozygotic mutation c.541 C>T (p.Arg181Trp) was confirmed. At 7 months of age, she was discharged at home with sensor augmented insulin pump and nightly parenteral nutrition. The second case is a boy, born SGA at 37 weeks of gestation from unrelated parents. He has multiple duodenal atresia and requires surgery and exclusive parenteral nutrition. He also has a severe intrahepatic cholestasis unsuccessfully cured by biliogestive

surgery. As the other case, neonatal diabetes was well balanced by IV insulin followed by CSII associated to a predictive hypo minimizer started at 4 months old. Genetic test showed RFX6 mutation in heterozygosis, coming from different mutations of both parents.

**Conclusion:** Intestinal mal absorption in RFX6 mutation remains a great challenge for diabetes control in neonatal period, especially regarding hypoglycemia. Anyway, neonatal diabetes can be successfully balanced by sensor augmented pump therapy.

#### LBP41

### The relation among serum insulin-like growth factor-1 (IGF-I)/ IGF binding protein-3 (IGFBP-3) axis, glycemic control and lipid metabolism in adolescents with naïve type 2 diabetes

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**Objectives:** to investigate that serum insulin-like growth factor-1(IGF-I) and IGF binding protein-3 (IGFBP-3) levels are related with glycemic control and insulin resistance.

**Methods:** We included 187 adolescents aged 10 to 18 years (98 girls and 89 boys). They were classified into 3 groups according to the results of oral glucose tolerance test; normal glucose tolerance (NGT) group, n=115; impaired glucose tolerance (IGT) group, n=33; diabetes (DM) group, n=39. We performed laboratory tests.

**Results:** 1) Serum IGF-I and IGFBP-3 levels were significantly higher in DM group than in NGT group and IGT group. Serum IGF-I and IGFBP-3 had positive correlation with HbA1c, c-peptide, and HOMA-IR. Also serum IGFBP-3 level showed the positive correlation with BMI and lipid profile. IGF-I and IGFBP-3 levels were no significantly different between obese and non-obese groups in NGT and DM groups.

2) In NGT group, serum IGF-I level was correlated with serum IGFBP-3. Serum IGF-I and IGFBP-3 has positively associated with age, serum c-peptide/insulin, HOMA-IR and HbA1c. And obese normal subjects (n=49, 42.6%) showed significantly higher serum c-peptide, insulin, cholesterol, LDL and HOMA-IR than those of non-obese normal subjects (n=66, 57.4%).

3) In DM group, serum IGF-I level showed positive correlation with HbA1c. Serum IGFBP-3 level had positive correlation with HbA1c, c-peptide and total cholesterol. There were significant different in c-peptide/insulin and lipid profile between obese glucose intolerance subjects (n=37, 51.4%) and normal-BMI glucose intolerance subjects (n=35, 48.6%).

**Conclusion:** Serum IGF-I and IGFBP-3 levels were significantly elevated in adolescents with naïve type 2 diabetes and correlated with blood glucose related factors. Serum IGFBP-3 level was associated with lipid profile. These findings suggest that the alteration of serum IGF-I/IGFBP-3 axis is in type 2 diabetes and related with glucose metabolism and/or development of dyslipidemia.

#### LBP42

### Improving outcomes for young people with type 2 diabetes mellitus in East London

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**Background:** Our Paediatric Diabetes service in an area with a large South Asian and Afro-Caribbean population has a challenging rise in Type 2 Diabetes Mellitus (T2DM); accounting for 8.5% of our cohort; compared to 2.5% in England and Wales.

**Objectives:** Establish a T2DM New Diagnosis Pathway and T2DM clinics aiming to achieve HbA1c < 48 mmol/mol for all new patients at 3 and 12 months, with weight loss of 10%.

**Methods:** 6 patients diagnosed with T2DM since November 2018 are admitted for education/ treatment according to the new pathway with comorbidity screening, psychology and dietetic assessment at diagnosis. Patients have monthly MDT review for the first 3 months with adjustment of treatment, diet/activity prescriptions and agreed goals. Outcomes were compared with the preceding 6 patients.

**Results:** Mean HbA1c at diagnosis was higher in the new pathway group (78 mmol/mol vs 54 mmol/mol) and significantly improved at 3 months for both groups (44 and 42.5 mmol/mol), with no significant difference between groups. However, with the new pathway, a greater proportion achieved HbA1c < 48 mmol/mol compared to previous (80% vs 67%). Comorbidity screening increased at diagnosis, with improved profiling of lipids and sleep assessment (100% vs 67% and 83% vs 0% respectively).

10% weight loss in current group was greater from diagnosis (67% Vs 33%). Median BMI Z-score improved to +2.4 from +2.5 in current group whilst remaining unchanged in previous group (+2.8).

Additional outcomes included coordinated comorbidity screening, reducing appointment burden and increased recruitment to clinical trials.

**Conclusion:** The tailored T2DM pathway and clinics have improved the proportion of new patients achieving weight loss and the target HbA1c at 3 months with a more holistic and streamlined approach.

#### LBP43

### Epidemiology and clinical characteristics of Cystic Fibrosis Related Diabetes in pediatric patients treated at a single institution

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**Objectives:** Clinical and epidemiological characterization of patients with cystic fibrosis related diabetes (CFRD) treated at Pediatric Hospital Roberto del Río, Santiago, Chile, during January 2017 to June 2019.

**Methods:** We reviewed clinical history of 45 patients treated at Cystic Fibrosis (CF) Outpatient Clinic. Data regarding epidemiological and anthropometric features, screening with oral glucose tolerance test (OGTT) and presence or absence of hyperglycemia in acute

exacerbation and / or glucocorticoid therapy, was collected. Descriptive data analysis was made in Microsoft Excel. The study was approved by local ethics committee.

**Results:** Fourty five patients were enrolled. 23 were boys, median age was 9.9 years (1-23 yr). 69% were eutrophic. Six patients had CFRD (13%), 4 of them boys. Data of epidemiologic, antropometric, genetic study and CFRD diagnosis features of CFRD patients are shown in Table 1.

In 2017 screening with OGTT was made in 21% of patients without CFRD. In 2018 our study group began to perform active screening of CFRD with OGTT, measuring also mid-OGTT. With this intervention, of patients enrolled in 2017 screening increased to 68%. Of all the patients enrolled in 2018 till the end of our study 1 patient met the criteria and underwent screening.

Of all patients who underwent screening, OGTT was abnormal in 7 (47%), diagnosing CFRD in 3 of them (48%). Of all patients without CFRD, OTGG was done in 12 (63%) and was abnormal in 4 (33%). Hyperglycemia in acute exacerbation was present in 4 patients with CF and without CFRD (10%).

**Conclusions:** The prevalence of CFRD in our patients is similar as reported in literature. Abnormalities in glucose metabolism are present without overt diabetes. Active screening in CF patients with OGTT measuring mid-OGTT values allow

CFRD (+)	Gender M/F	Age of CF diagnosis (months)	Actual Z Score IMC (kg/m <sup>2</sup> )	Age of CFRD diagnosis (months, years)	Clinical characteristics at CFRD onset	Genetic study	Hyperglycemia in hospitalization	Pancreatic/ Hepatic insufficiency
1	M	3	+0.47	25 months 2.1 years	Hyperglycemia without ketosis	p.Phe508 del/-	Yes	Yes/No
2	M	5	-1.25	31 months 2.6 years	Hyperglycemia with ketosis	p.Phe508 del/-	No	Yes/No
3	M	7	-2.38	67 months 5.6 years	Hyperglycemia with ketosis	p.Phe508 del/-	No	Yes/Yes
4	F	21	+0.8	82 months 6.8 years	Impaired basal glucose OGTT	p.Phe508 del/-	Yes	Yes/Yes
5	F	2	-0.73	120 months 10 years	Indetermined OGTT BG>200 mg/dL hospitalization	p.Phe508 del/ p.Phe508 del	Yes	Yes/No
6	M	12	-1.17	150 months 12.5 years	Indetermined OGTT BG>200 mg/dL hospitalization	p.Phe508 del/ p.Phe508 del	Yes	Yes/No

[Table 1]

## LBP44

### Monogenic VS idiopathic type 1 DM

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**Introduction:** Antibody negative type 1 Diabetes Mellitus, Type 1 B DM, is an unusual form of phenotypic T1D with almost complete insulin deficiency, a strong hereditary component, and no evidence of autoimmunity.

The prevalence of T1B is 16.5%. At time of diagnosis, many show no evidence of autoimmunity but have an atypical clinical form of the disease.

**Objectives:** We should give attention to (T1BD), as it may be misdiagnosed as Maturity onset Type 1 diabetes (MODY)

**Methods:** 11 yr 3 month old, Lebanese, boy presented with accidentally discovered Hyperglycemia, HbA1C at diagnosis was 7.4 %, no polyuria, polydipsia or weight loss.

No Acanthosis Nigerians, BMI 18.5 KG/M2 (>85<sup>th</sup> centile).

Positive family history of T2DM in his 2 uncles at age of 33 yrs, Grandfather at age of 35 yrs, Grandfather sibling at age of 20 yr, his cousin has type T1D, Parents are free.

With follow up, diet plan he lost weight, BMI decreased to 12.5 kg/m<sup>2</sup>, HbA1C fall to 6 %, after 6 months he developed postprandial hyperglycemia, was started on Glucophage 250mg PO once daily, then 500 mg

so He was suspected to have MODY, genetic testing for MODY all done (ABCC8, AKT2, APPL1, CEL, CISD2, DCAF17, DNAJC3, DYRK1B, GATA4, GATA6, GCK, HNF1A, HNF4A, HNF1B, INS, INSR, KCNJ11, LMNA, NEUROD1, PAX6, PCBD1, PDX1, PIK3R1, PLIN1, POLD1, PPARG, PPP1R15B, RFX6, SLC29A3, TRMT10A, WFS1, ZBTB20, ZFPF7, THENC) all neagative

After 2 years (still persisting postprandial hyperglycemia). As he didn't act like typical T1D, c peptide 1.9 ng/ml (0.9 -7), GAD, ICA, IAA antibodies was done, Zinc transporter antibody, Anti A2 antibody all neagative

HbA1C go up 8.2 %, started Tresiba 5 IU, kept on Glucophage 2000 mg/day, c-peptide repeated 1.1 ng/ml (1.1-4.4)

**Conclusion:** we concluded that If patient have an atypical presentation for T1D, we should go through investigations (antibodies) to reach diagnosis,

Also even in a strong family history of DM type 1 B DM should be considered not only MODY or T1DM.

## LBP45

### Role of Acarbose in persons with type-1 diabetes: a multicentre study in India

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**Introduction:** Acarbose is an oral alpha-glucosidase inhibitor indicated as an adjunct to diet and exercise to improve glycemic control in adults with type 2 diabetes mellitus.

**Objective:** To investigate the role of Acarbose in person with Type 1 Diabetes for glycaemic control, tolerability and reduction in hypoglycaemia.

**Method:** A retrospective study was performed from the database of our centres from April 2018 to March 2019. A study includes type-1 diabetes mellitus patients insufficiently controlled with diet and insulin. Data were collected from patient records and analysed.

**Results:** Total 44 patients (23 male and 21 females, mean age 24 (range 18-48) years, median duration of diabetes 10 (range 5-20) years were studied. The median daily dose of Acarbose at the final assessment (i.e. after 16 weeks of active treatment) was 100 (range 75-150) mg.

After 12 and 14 weeks of acarbose treatment the mean level of HbA1c had decreased to 8.2 +/- 0.9 and 8.3 +/- 0.9%, respectively (both  $P < 0.001$ ). Seven-point blood glucose profiles showed significant less hypoglycaemia. Daily insulin dose was 52 (range 26-92) Units at the start of the study and reduced to 46. The most frequent reported adverse events were flatulence ( $n=8$ ), diarrhoea ( $n=2$ ), and abdominal pain ( $n=2$ ) and  $n=2$  patients were withdrawn from Acarbose because of diarrhoea and abdominal pain.

**Conclusions:** Acarbose is effective in Type 1 Diabetes Patients for control of Hyperglycaemia with reduced risk of hypoglycaemia with good tolerability. It can be a valuable adjunct to insulin in improving metabolic control in persons with type-1 diabetes.

#### LBP46

##### **User experience of flash glucose monitoring: a survey among Singaporean children with diabetes**

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**Introduction:** Flash glucose monitoring (FGM) is an advanced sensing technology for patients to monitor their own glucose levels. Following its approval for local use in May 2017, we introduced FGM to patients who were under the care of KKWCH Paediatric Diabetes Service.

**Objectives:** To survey the user experience of FGM among children and their caregivers.

**Methods:** A self-administered questionnaire was applied on 60 patients with diabetes who had tried FGM over a 2-week period. It used a 5-point Likert Scale to recount the experience from the application of FGM, its wear and how FGM compares with blood glucose monitoring. The children and their caregivers were given sets of questions to answer independently. Summary data on their answers were collated.

**Results:** We surveyed 22 boys and 38 girls, aged between 5 and 19 years, and their caregivers. 54 children have type 1 diabetes and 6 have type 2 diabetes. HbA1c ranged from 5.6-12.8%. 54 children were treated using multiple daily insulin injections and 6 were on insulin pump therapy. More than 90% of the children answered strongly agree or agree in 3 out of 17 questions. More than 90% of their caregivers answered strongly agree or agree in 6 out of 12 questions. More than 80% of children and their caregivers would recommend FGM to others. Almost all children (96.7%) and caregivers (98.3%) strongly agree or agree that it was easy to scan the sensor. 90% of caregivers strongly agree or agree that using FGM helped them understand how daily activities and food intake changed their child's glucose levels. 55% of children strongly agree or agree that it was comfortable to wear.

**Conclusions:** Our results suggest that FGM technology was well received by our patients, and caregivers were positive about using FGM on their children. The use of FGM also enhanced their understanding of how activities and food intake affected glucose levels of their children. Improvements can be made to provide a more comfortable wear.