Diabetes Associates, Atlanta, GA, USA, [5]International Diabetes Center, Minneapolis, MN, USA, [6]University of Colorado, Aurora, CO, USA, [7]Sansum Diabetes Research Institute, Santa Barbara, CA, USA, [8]SUNY Upstate Medical Univ/Syracuse, Fayetteville, NY, USA, [9]Iowa Diabetes Research, Des Moines, IA, USA, [10]Joslin Diabetes Center, Boston, MA, USA, [11]East Coast Institute for Research at The Jones Center, Macon, GA, USA, [12]Yale University, New Haven, CT, USA, [13]Northwestern University, Chicago, IL, USA, [14]University of Colorado Denver, Aurora, CO, USA, [15]Insulet Corporation, Acton, MA, USA.

Advances in diabetes technology have transformed the treatment paradigm for type 1 diabetes (T1D), yet the burden of disease remains significant. The Omnipod 5 Automated Insulin Delivery System is a novel hybrid closed-loop (HCL) system with fully on-body operation. The system consists of a tubeless insulin pump (pod) containing a personalized Model Predictive Control algorithm which communicates directly with a Dexcom G6 continuous glucose monitor (CGM, or sensor) to automate insulin delivery. Therapy customization is enabled through glucose targets from 110-150 mg/dL, adjustable by time of day. The system adapts to changing insulin needs with each pod change. We report on the first, pivotal outpatient safety evaluation of the system in a large cohort of adults and adolescents with T1D.

Participants aged 14-70y with T1D≥6 months and A1C<10% used the HCL system for 3 months at home after a 14-day run-in phase of their standard therapy (ST). Prior therapy included both pump therapy and multiple daily injections. The primary safety and effectiveness endpoints, respectively, were occurrence of severe hypoglycemia (SH) and diabetic ketoacidosis (DKA), and change in A1C and sensor glucose percent time in target range (TIR) (70-180 mg/dL) during HCL compared with ST.

Participants (N=128) were aged (mean±SD) 37±14y with T1D duration 18±12y and baseline A1C 7.2±0.9% (range 5.2-9.8%). There was a significant increase in TIR from ST to HCL, from 64.7±16.6% to 73.9±11.0% (p<0.0001), corresponding to an additional 2.2 hours/day in target range. A1C at end of study was reduced by 0.4%, from 7.2±0.9% to 6.8±0.7% (p<0.0001). Glycemic outcomes for percent of time with CGM readings below and above target range were all reduced (p<0.0001): <54 mg/dL from 0.6±1.2% to 0.2±0.3% (a decrease of 6 minutes/day), <70 mg/dL from 2.9±3.1% to 1.3±1.1% (a decrease of 23 minutes/day), >180 mg/dL from 32.4±17.3% to 24.7±11.2% (a decrease of 1.8 hours/day), and ≥250 mg/dL from 10.1±10.5% to 5.8±5.5% (a decrease of 1.0 hours/day). The mean glucose also decreased from 161±28 to 154±17 mg/dL (p=0.0002). During the 3-month HCL phase there were 2 episodes of SH (both following user-initiated boluses) and no episodes of DKA reported. Most participants completing the pivotal study (92%) opted to continue using the system during an extension phase.

In this outpatient, multi-center pivotal study in a large cohort of adults and adolescents with T1D, the Omnipod 5 System was safe and effective when used for 3 months at home. There were significant improvements in both TIR and A1C with use of the system, while time in hypoglycemic ranges was also reduced. The current results and commitment to the extension phase highlight the safe and effective use of the HCL system, as well as the preference for the Omnipod 5 System over participants' previous therapy.

Pediatric Endocrinology

GROWTH AND GROWTH HORMONE

A Machine Learning Approach for Identifying Children at Risk of Suboptimal Adherence to Growth Hormone Therapy

Amalia Spataru, MSc[1], Paula van Dommelen, PhD[2], Lilian Arnaud, MSc[3], Quentin Le Masne, PhD[3], Silvia Quarteroni, PhD[4], Ekaterina B. Koledova, MD,PhD[5].

[1]Swiss Data Science Center, ETH Zurich and EPFL, Zrich, Switzerland, [2]TNO, Leiden, Netherlands, [3]Ares Trading SA, Eysins, Switzerland, [4]Swiss Data Science Center, ETH Zurich and EPFL, Zurich, Switzerland, [5]Merck KGaA, Germany, Darmstadt, Germany.

Background: Suboptimal adherence to recombinant human growth hormone (r-hGH) treatment can lead to suboptimal clinical outcomes. Being able to identify children who are at risk of suboptimal adherence in the near future, and take adequate measures to support adherence, may maximize clinical outcomes. Our aim was to develop a model based on data from the first 3 months of treatment to identify potential indicators of suboptimal adherence and predict adherence over the following 9 months using a machine learning approach.

Methods: We assessed adherence to r-hGH treatment in children with growth disorders in their first 12 months of treatment using a connected autoinjector and e-device (easypod™), which automatically transmits adherence data via an online portal (easypod™ connect). We selected children who started the use of the device before 18 years of age and who transmitted their injection data for at least 12 months. Adherence (mg injected/mg prescribed) between 4-12 months (outcome) was categorized as optimal (≥85%) versus suboptimal (<85%). In addition to adherence over the first 3 months, comfort settings (needle speed, injection depth, injection speed, injection time), number of transmissions, number of dose changes, age at start and sex were used as potential indicators of suboptimal adherence. Several machine learning models were optimized on a class-balanced training dataset using a 5-fold cross-validation scheme. On the best performing model, machine learning interpretation techniques and chi-squared statistical tests were applied to extract the statistically significant indicators of suboptimal and optimal adherence.

Results: Anonymized data were available for 10,943 children. The optimal prediction performances were achieved with the random forest algorithm. The mean adherence and the adherence standard deviation over the first 3 months were the two most important features for predicting adherence in the following 9 months. Not using the system's features (e.g. not transmitting data often and not changing some of the comfort settings, such as the needle speed setting), as well as starting treatment at an older age were significantly associated with an increased risk of suboptimal adherence (p<0.001). When tested on first-time seen data following the same class distribution as the original data, the model achieved a sensitivity of 80% and a specificity of 81%.

Conclusions: We developed a model predicting whether a child's adherence in the following 9 months will be below or above the optimal threshold (85%) based on early data from the first 3 months of treatment and we identified the

Downloaded from https://academic.oup.com/jes/article/5/Supplement_1/A672/6241894 by guest on 12 May 2021

indicators of suboptimal adherence. These results can be used to identify children needing additional medical or other support to reach optimal adherence and therefore optimal clinical outcomes.

Pediatric Endocrinology
GROWTH AND GROWTH HORMONE

Anastrozole Improves Near Adult Height in Boys With Compromised Height Potential, as Monotherapy or in Combination With a GnRH Analogue

Dimitrios T. Papadimitriou, MD,MSc(2),PhD[1], Eleni Dermitzaki, MD[2], Maria Papagianni, MD,PhD[3], Kleanthis Kleanthous, MD, PhD[1], Anastasios Papadimitriou, MD[4], George Mastorakos, MD, D(med)Sc[5].

[1]Pediatric Endocrine Clinics, Athens, Greece, [2]Pediatric Endocrine Clinics, Athens Medical Center, Greece, [3]University of Thessaly, Larissa, Greece, [4]Attikon Hospital, Athens, Greece, [5]Areteio Hospital, Athens, Greece.

Background: Bone maturation depends mainly on locally produced estrogens by aromatization. Third generation aromatase inhibitors (AIs) are being widely used off-label to improve predicted adult height (PAH) in boys as well as in girls, either as monotherapy or in combination with growth hormone and/or puberty inhibition. They induce reverse binding inhibiting the activity of aromatase (a cytochrome P450 enzyme), which catalyzes the conversion of androstenedione and testosterone to estrone and estradiol, respectively. While numerous studies have shown that AIs delay bone maturation and improve PAH, data on near-adult height (NAH) of children treated with AIs are lacking. **Aims:** To compare results on NAH of boys treated with anastrozole either as monotherapy or in combination with pubertal inhibition (for at least 1yr at onset). **Methods:** 159 boys with advanced bone age (BA) and PAH <170 cm that received anastrozole 1 mg/day p.o. either as monotherapy (n=76, group A) or as co-therapy with a GnRH analogue for at least 1yr and then as monotherapy (n=83, group B) until bone age of 15-16 yrs were included. Data on boys that reached NAH (BA at least 16 yrs with height velocity <2 cm/yr) were analyzed: group A, n=16 with PAH 167.3 and TH 170.9 and group B, n=10 with PAH 165.5 and TH 171.7 cm. Measurements were made on the same height meter by the same examiner. The choice of therapeutic intervention was made randomly. Groups A and B did not differ in terms of age at intervention onset, TH or PAH. During treatment, they underwent a 6-month follow-up that included clinical examination, BA, and laboratory tests at 8:00 hrs (general blood count, lipid chart, LH, FSH, testosterone, estradiol, estrone, and complete calcium metabolism), with lumbar spine DEXA (Dual Energy X-ray Absorptiometry) and X-ray performed annually. **Results:** The duration of anastrozole treatment was 3.9 yrs in group A, and 4.6 yrs in group B (where the GnRHa was administered for at least 1 yr) and the median age at intervention onset was 11.04 and 11.8 yrs, respectively. Both groups had a statistically significant gain in NAH with no difference between them: for group A 3.6 cm (+0.53 SD, p=0.002) and for group B 4.8 cm (+0.71 SD, p=0.0007). Thus, distance from TH was finally 0 cm for group A and -1.5 cm (0.19 SD) for group B. According to the definition of NAH, the adult height of the two groups is expected to be about 2% higher. Follow-up showed no side effects on their biochemical or lipid profile, bone density and vertebral architecture. **Conclusions:** Anastrozole therapy is safe and effective in improving adult height in boys with advanced puberty and poor height prediction, either as monotherapy or in combination with pubertal inhibition.

Pediatric Endocrinology
GROWTH AND GROWTH HORMONE

Characteristics Associated With Diabetes Device Use Among Youth With Type 1 Diabetes

Charlotte Chen, DO[1], Liane Tinsley, MPH[1], Lisa Volkening, MA[1], Barbara Anderson, TX[2], Lori M. Laffel, MD,MPH[1].

[1]Joslin Diabetes Center, Boston, MA, USA, [2]Baylor College of Medicine, Houston, TX, USA.

Type 1 diabetes (T1D) is a common illness of childhood, requiring lifelong, daily complex management to prevent acute and chronic complications. Studies have shown that use of insulin pumps and continuous glucose monitors (CGM) offers benefit for glycemic control. However, such device use is not universal in adolescents. We aimed to compare baseline socio-demographic and diabetes characteristics associated with diabetes technology (pump and CGM) uptake and continued use in 13-17 year old teens with T1D. Data were derived from a multicenter clinical trial aimed at optimizing self-care and glycemic control in teens with T1D. Socio-demographic and diabetes data were collected quarterly by parent-youth interview and electronic medical record review prospectively over 18 months. Chi-square and t-tests compared characteristics of device and non-device users (pump vs no pump; CGM vs no CGM). The study sample comprised 301 teens (41% male) with mean±SD age 15.0±1.3 years, T1D duration 6.5±3.7 years, and A1c 8.5±1.1%. Most (65%) used a pump at entry or initiated pump therapy during the study; 35% used injection therapy at entry or stopped pump therapy. In contrast, 27% used a CGM at entry or started a CGM during the study, while 73% never used or stopped using CGM. Device users at entry and those who began use had similar characteristics, as did those who never used and those who discontinued device use. Pump users were more likely to use CGM than non-pump users (36% vs 10%, p<.0001). Neither age, sex, nor T1D duration was related to pump or CGM use. Pump users (vs non-pump users) were less likely to have another medical condition (44% vs 59%, p=.01) and more likely to be non-Hispanic white (83% vs 61%, p=.0001); have family annual household income ≥$150,000 (34% vs 19%, p=.0003), private health insurance (92% vs 74%, p<.0001), a parent with college education or higher (67% vs 46%, p=.0005), and a 2-parent household (88% vs 78%, p=.03). Pump users also had lower z-BMI (0.73±0.80 vs 0.97±0.79, p=.01), performed more frequent daily BG monitoring (4.8±1.8 vs 3.9±2.0, p<.0001), and were less likely to have HbA1c ≥9% at initial and last visits (25% vs 43%, p=.005; 31% vs 49%, p=.01). CGM users (vs non-CGM users) were more likely to be non-Hispanic white (88% vs 70%, p=.009); have family annual household income ≥$150,000 (44% vs 23%, p=.0001), a parent with college education or higher (78% vs 53%, p=.0004), and private health insurance (95% vs 82%,

Downloaded from https://academic.oup.com/jes/article/5/Supplement_1/A672/6241894 by guest on 12 May 2021