

learning method, called SuperLearner, to model a binary classification for high vs. low insulin users. Features included in the algorithm were collected prior to prediction time, including weight, height, age, sex, race, insurance status, A1c categories (normal, high, panic high, and missing), creatinine, diet, steroid use in prior 48 hours, admission BG, summary statistics of BG, numerous counts of relevant lab values in quantiles, history of basal insulin use, and counts of major diagnosis code groups. Prior insulin doses were not considered to better simulate admission insulin dosing.

Compared to using only weight in the model, with an area under the receiver operating curve (AUROC) of 0.59, our machine learning algorithm showed excellent predictive ability, with an AUROC of 0.85 (95% CI: 0.84 - 0.87) and area under the precision recall curve (AUPRC) of .65 (95% CI: 0.64 - 0.68) vs 0.29 with the weight-only model. Although it will need to be validated prospectively, our algorithm could be used to emphasize basal-bolus insulin on admission in patients predicted to require more insulin, whereas those predicted to require less could be started on sliding scale insulin or considered for oral anti-hyperglycemics.

Diabetes Mellitus and Glucose Metabolism

DIABETES IN THE HOSPITAL

Serum Branch Chain Amino Acids (BCAAs) Are Elevated Due to Decreased Catabolism in Patients With Ketosis-Prone Diabetes at the Time of Presentation With DKA

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Patients with “A-β+” Ketosis-Prone Diabetes (KPD) develop diabetic ketoacidosis (DKA) despite lacking islet autoantibodies and a phenotype of T1D, have good beta cell function and can come off insulin therapy 4–8 weeks after the DKA episode. When near-normoglycemic and stable on metformin, they have accelerated BCAA catabolism which promotes ketogenesis (Patel SG et al, *Diabetes* 2013). Here we measured BCAAs, their metabolites and acylcarnitine esters (C5,C3) in blood samples obtained from adults with DKA (N=74) compared to those with non-ketotic hyperglycemic crisis (N=21) at the time of acute presentation to the emergency center, and to healthy controls (N=17). Of the DKA patients, 53 were classified as likely A-β+ KPD based on absence of GAD65Ab and C-peptide levels or clinical features, and the 21 patients with non-ketotic hyperglycemia were classified as T2D. Serum concentrations of leucine, isoleucine and valine and their respective branch chain keto acids (BCKA) were higher (p<0.05) in KPD patients compared to T2D and control. The ratio of each BCKA to its precursor BCAA was calculated as an index of its rate of transamination. Serum KIC/Leu, KMV/Ile and KIV/Val were significantly lower (p<0.05) in KPD

compared to T2D. The ratio of each acylcarnitine to its precursor BCKA was calculated as an index of its rate of entry and metabolism within mitochondria. Serum C5/KIC, C5/KMV and C5/KIC+KMV were lower (p<0.05) in KPD patients compared to T2D patients. Serum C3/KIV, C3/KMV and C3/KIV+KMV were significantly lower (p<0.05) in KPD patients compared to controls. Since KIC can be converted to acetoacetate and then reduced to β-hydroxybutyrate (BHOB), and KIC and KMV can be metabolized to acetyl CoA, the ratios of KIC+KMV/C2 and KIC/BHOB were calculated as indicators of their relative conversion to acetyl CoA and acetoacetate respectively. KIC+KMV/C2 was significantly lower (p<0.001) in KPD than T2D and control and KIC/BOHB was lower (p<0.001) in KPD than T2D. Acetyl carnitine was markedly elevated in the KPD group, indicating accelerated production of acetyl CoA from free fatty acids. During acute DKA, KPD patients have higher serum BCAAs because their catabolism is decreased, due to slower rate of transamination in the cytosol by BCAA transaminase 1 (BCAT1) and slower rate of entry into mitochondria and metabolism to acetyl CoA and acetoacetate by BCAT2, BCKA dehydrogenase and other catabolic enzymes. This is diametrically opposite to their profile in the stable, near-normoglycemic state, when BCAA catabolism is accelerated. We propose that during acute DKA, accelerated flux of fatty acids to acetyl CoA diminishes carnitine and NAD⁺ availability for mitochondrial transport and metabolism of BCAA catabolites in KPD patients, whereas in the near-normoglycemic state they have heightened dependence on BCAA catabolism for energy production through acetyl CoA and ketogenesis.

Diabetes Mellitus and Glucose Metabolism

DIABETES IN THE HOSPITAL

The Weight of Words: A Mixed Methods Study to Understand Indian Doctors' Perspectives and Experiences of Patient Communication

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Background: Effective doctor communication can lead to increased treatment adherence and improved self-management among individuals living with diabetes. Yet, there is limited research in India which examines how doctors communicate, especially in terms of verbal and nonverbal communication. **Aims:** (1) To examine communication in clinic (verbal, nonverbal and basic content) among Indian doctors specialized in diabetes and endocrine care, and (2) to explore doctors' styles of verbal and nonverbal communication. **Methods:** Using a mixed methods design, a survey containing quantitative (n=834) and qualitative (n=648) elements was filled out by doctors specialized in the fields of diabetes and endocrinology in India. Questions in the quantitative section included questions such as addressing

patients' illness-related concerns, acknowledging challenges of using insulin, and non-verbal behaviours. The qualitative section focussed on elaborating some responses made to the quantitative section, such as questions about explaining the cause of illness, listing words and phrases that may potentially impact patients, and explaining why the patients need to be initiated on insulin. The data was analysed using descriptive statistics and qualitative content analysis, respectively. **Results:** The findings of the quantitative study showed that the majority of the doctors (i) always greeted their patient as they entered the room (43.2%), (ii) addressed the risk of developing diabetes with patients' siblings/children (87.9%), (iii) always acknowledged the challenges of using insulin (42.8%), and (iv) never asked patients' experiences at the end of the consultation (31.9%). All common communication cues were rated as extremely important; eye contact (48.7%), tone of voice (41.5%), body language (39.6%), and words and phrases (41.8%). The qualitative findings revealed that doctors preferred to use verbal communication such as using authoritative language, educating patients using facts, analogies and behavioural information, employing empathetic language on occasion. Doctors also reported using negative words that portrayed fear, blame and disengagement in order to promote adherence. **Discussion and Conclusion:** The findings suggest that doctors rely on verbal rather than nonverbal communication when interacting with patients, with fear messages being a favoured means of ensuring adherence. It is possible that this may be because, while recognizing the value of nonverbal methods, doctors lack training in using these techniques in communication. Therefore, developing a communication skill training program for Indian doctors focussed on empathic and nonverbal communication can help to improve consultation and patient outcomes (e.g., adherence, patient satisfaction).

Diabetes Mellitus and Glucose Metabolism

DIABETES IN THE HOSPITAL

Trends of Diabetes-Related Hospital Admission in Emerging Adults in the State of California

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Background: As adolescents with diabetes transition to adulthood, they may demonstrate poorer adherence to treatment regimens and may be vulnerable to complications such as diabetic ketoacidosis (DKA) or severe hypoglycemia. A number of important factors have been identified as risk factors for these poor outcomes, including loss of health insurance coverage, increased risk-taking behaviors, and difficulty coping with added responsibility. National data may inform efforts to improve health outcomes and prevent complications for vulnerable young adults during this challenging transition to independence. **Objectives:** To estimate the incidence of diabetes-related admissions and to describe the characteristics among youth and young adults with type 1 (T1D) and type 2 diabetes (T2D) in the state of California. **Study design and method:** This is a retrospective cohort study using the inpatient database from the Office of Statewide Health Planning and

Development during the years 2014 to 2018. Individuals aged 13–24 years hospitalized with DKA, or hypoglycemia, were identified by ICD codes. **Results:** A total 28,754 admission encounters were recorded. Mean ages for T1D and T2D were 17.3±5.6 years and 17.9±4.6 years, respectively. Hospitalization rates increased with age with a significant rise during the transition to adulthood, from 70.3/100,000 population at age 17 to 132.2/100,000 population at age 19 in T1D. Among hospital admissions in T1D and T2D, 16.3% and 18.7% were Black young adults respectively ($p < .001$). More young adults were on public insurance when compared to youth (64.1% vs 45.1% in T1D; 68.4% vs 50.4% in T2D, $p < .001$), and approximately 48.8% and 41.6% were from the lowest income quartile in T1D and T2D respectively ($p < .001$). There was no difference in mean length of hospital stay, but hospital charges were higher among young adults with both types of diabetes when compared to youth (\$41,370 vs \$36,160 in T1D; \$37,218 vs \$30,991 in T2D, $p < .001$). More young adults were admitted for severe cases such as DKA or hypoglycemia with coma in T1D, with rates tripling from 0.3/100,000 population in youth to 1.0/100,000 population in young adults. **Conclusion:** We demonstrated a significant rise in admission rates during the transition to adulthood in individuals with T1D. Among admissions in both types of diabetes, there were significantly more Black young adults who were on public insurance with lower socioeconomic status. This population group had poorer health outcomes with higher incidence for moderate and severe complications, and they cost more hospital charges than the youth population with both types of diabetes. Our findings suggest that the US healthcare system fails many emerging adults with diabetes, particularly for people of color, and that improving the medical transition is crucial. More resources should be focused on this at-risk population from a healthcare system perspective.

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DIABETES IN THE HOSPITAL

Understanding Facilitators and Barriers in the Hospital Discharge Processes of Newly Prescribed Insulin: A Mixed-Methods Study

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Patients, newly prescribed insulin, being discharged from the hospital are at high risk of adverse outcomes. An electronic enterprise data warehouse (EDW) algorithm was created and validated to identify these inpatients electronically. Qualitative interviews were also conducted to assess barriers in the discharge process. The EDW algorithm to identify inpatients (09/01/18-08/31/19), newly prescribed insulin at discharge, was created by identifying screening indicators (e.g., admission/discharge medication lists, discharge summary). Iterative adjustments to the algorithm were made after chart review and included review of