FUTURE OF PEDIATRICS TALKS!
A VIRTUAL SUMMER SERIES

Pediatric Health Network
Children's National
A few notes about today’s Webinar

• All lines are muted throughout the webinar.
• Please use the Q&A box to ask questions or make comments.
• Today’s Webinar recording and slides will be posted to the PHN website following the presentation. You can find past FOP presentations on our website at https://pediatrichealthnetwork.org/future-of-pediatrics/
Speakers

Elizabeth Estrada, MD

Conflicts to disclose:

• Consultant for Rhythm Pharmaceuticals
# Upcoming FOP Talks!

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<th>DATE</th>
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<td>Abnormal Thyroid Labs in the Primary Care Setting</td>
<td>Priya Vaidyanathan, MD</td>
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<td>A Pediatrician's Approach to a Young Child With Joint Effusion</td>
<td>Bita Arabshahi, MD</td>
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<td>July 29</td>
<td>Allergic Reactions: When to Refer?</td>
<td>Amaziah Coleman, MD</td>
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<td>Claire Boogaard, MD</td>
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<td>Dermatologic Manifestations of COVID-19</td>
<td>Anna Kirkorian, MD</td>
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<td>August 12</td>
<td>Obstructive Sleep Apnea: Primary Care Management and When to Refer</td>
<td>Claire Lawlor, MD</td>
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<td>Neuropsychological Evaluations: What are they, when are they needed and how can I get them for my patients?</td>
<td>Kristina Hardy, PhD</td>
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<td>Laura Kenealy, PhD</td>
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<td>August 26</td>
<td>Meeting Teens Where They Are: the Contraception Discussion</td>
<td>Brooke Bokor, MD, MPH</td>
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<td>School’s Out: Supporting School Attendance and Distance Learning Engagement</td>
<td>Natasha Ramsey, MD</td>
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<td>Asad Bandealy, MD, Heidi Schumacher, MD</td>
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PHN Webinars

July 7<sup>th</sup> – 12PM PCP Town Hall: Back to School Guidance featuring Nathaniel Beers, MD
https://childrensnational.org/healthcare-providers/refer-a-patient/covid/covid-19-webinars

July 8<sup>th</sup> – 12PM: PHN Office Manager and Practice Administrator Steering committee presents *Practice Management: Road to Recovery Series*
Link to register: https://cvent.me/mq8XxD or email PHN@childrensnational.org if you are interested in attending.

<table>
<thead>
<tr>
<th>Date</th>
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<tr>
<td>July 8</td>
<td>Reports and Recalls</td>
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<td>July 22</td>
<td>Payment Collection</td>
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<td>August 5</td>
<td>Best Practices: New Initiatives and Implementing Change</td>
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<tr>
<td>August 19</td>
<td>Managing a COVID-19 positive Employee and Wellness In Your Workplace</td>
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</table>
Prediabetes and Type 2 Diabetes: Diagnosis and Management

Elizabeth Estrada, MD
Endocrinology
Objectives

• Discuss the epidemiology of type 2 diabetes and prediabetes in childhood

• Review the pathophysiology

• Discuss the screening guidelines, evaluation, and treatment of type 2 diabetes and prediabetes in childhood

• Review referral guidelines to type 2 diabetes clinic
Percent Obesity in Children 2-19y
1971-2016

Obesity Comorbidities: Direct correlation with Severity of Obesity

Type 2 diabetes
Pre-diabetes
PCOS
Metabolic syndrome
Hypertension
Hyperlipidemia
Non-alcoholic fatty liver disease
Sleep apnea
GERD

Asthma
Orthopedic complications:
• Joint pain
• SCFE, Blount’s disease
Gallstones
Depression, body image
Eating disorders
Cancer
Incidence of Type 2 Diabetes in Youth

More than 4-fold increase projected in the next decades

*More than 4-fold increase projected in the next decades*
Prevalence Prediabetes

Cross-sectional analysis NHANES 2005-2016

• About 1 of 5 adolescents have prediabetes
  • Increase from 1.8% in 1988-1994
  • Higher in males and non-Hispanic Blacks

Increased risk for diabetes and CVD

Pathophysiology

Insulin Resistance

+ 

β-cell Failure
• Loss of beta cell function is much faster in children than adults
• Require insulin treatment sooner
Diabetes Complications: Earlier than Adults

Prevalence of Complications at Age 21

![Graph showing prevalence of complications at age 21, including diabetic kidney disease, retinopathy, peripheral neuropathy, cardiovascular autonomic neuropathy, arterial stiffness, and hypertension.](JAMA. 2017;317(8):825-835)
Prediabetes

**Adults:**
- 5%-10% will progress to diabetes within a year
- Risk factor for CVD
- 50-60% increased 5-year mortality
- DPP and other studies show lifestyle modifications and weight loss prevent progression of prediabetes to diabetes

- Similar studies have not been conducted in adolescents
Screening Guidelines: Risk-based BMI ≥85%

One or more additional risk factors

- Maternal diabetes during the child's gestation
- Family history of type 2 diabetes in first- or second-degree relative
- High risk race/ethnicity: Native American, African American, Latino, Asian American, Pacific Islander)

- Signs or conditions associated with insulin resistance
  - Acanthosis nigricans
  - HTN
  - Dyslipidemia
  - PCOS
  - SGA

ADA Position Statement. Diab Care 2018; 41(12)
## Screening Labs: Interpretation

<table>
<thead>
<tr>
<th>Test</th>
<th>Pre-Diabetes</th>
<th>Diabetes</th>
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<tbody>
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<td>Impaired fasting glucose (IFG)</td>
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<tr>
<td>Fasting Glucose</td>
<td>100-126 mg/dl</td>
<td>≥126 mg/dl</td>
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<tr>
<td>2-hr OGTT</td>
<td>140-200 mg/dl</td>
<td>≥200 mg/dl</td>
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<tr>
<td>Random Glucose</td>
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<td>&gt;200 mg/dl plus symptoms</td>
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<tr>
<td>HbA1C</td>
<td>5.7-6.4%</td>
<td>≥6.5%</td>
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Diabetes Care 2018 Jan; 41(Supplement 1): S13-S27
Type 2 Diabetes in Children: Presentation

- Asymptomatic
- Vaginitis, UTI
- Polyuria, polydipsia, weight loss
- DKA or HHS, more frequent in blacks
- Obesity/overweight
- Acanthosis nigricans
Treatment

Challenge for the pediatric endocrinologist
Insulin Resistance

Pre-diabetes

Lifestyle changes
Weight management

Weight loss goal
7-10%

Diabetes

? Metformin

Metformin, GLP-1 analogs, insulin
Other oral meds
Bariatric surgery

FUTURE OF PEDIATRICS
Metformin

- First line therapy
- GI side effects
- 50% treatment failure within 1 year

Increase dose by 500 mg increments:
- 1000 mg po BID
- 2,000 mg extended release QD or

Monitor yearly:
- CBC, ALT, AST, creatinine
- Stop metformin:
  - Macrocytic anemia
  - AST/ALT >2.5 x upper normal
  - Creatinine >1.0
GLP-1 Analogs
(Victoza, Trulicity, Ozempic)

- Enhance glucose-dependent insulin secretion
- Slow gastric emptying
- Weight loss
- Side effects: nausea, vomiting, pancreatitis
Liraglutide in Children and Adolescents with Type 2 Diabetes

GLP-1 analog
(Victoza, daily SC injection)
SGLT-2 Inhibitors

• SGLT2: sodium-glucose transporter kidney
  • Glucose reabsorption

• Induce glycosuria
Other Medications

- Sulfonylurea
- Dipeptidyl peptidase 4 (DPP-4) inhibitors
- Colesevelam (Welchol)
- Thiazolidinediones (TZDs)
- Alpha-glucosidase inhibitors
Bariatric Surgery – Metabolic Surgery

• **TODAY:**
  Lifestyle and oral medications

• **Teen-LABS:**
  Bariatric surgery

*Figure 1. Mean Percent Change in Body Mass Index (BMI) Over Time*
Changes in HbA$_1$c

![Graph showing changes in HbA$_1$c over time.

HbA$_1$c range:
- Normal (<5.7%)
- Prediabetes (5.7-6.5%)
- Diabetes (≥6.5%)

JAMA Pediatr. 2018;172(5):452
Weight Change and Remission of Diabetes and Hypertension
Gastric Bypass Surgery - 5-Year Outcomes

Prediabetes and Type 2 Diabetes Referrals

These categories are for scheduling purposes only, not diagnostic criteria

**HbA1c 5.7-6%**
- Lifestyle intervention
- If the fasting glucose is >100 mg/dL or post-prandial >140 mg/dL → prediabetes clinic

**HbA1c 6%-7.0%**
- Lifestyle intervention
- Refer to prediabetes clinic

**HbA1c > 7.0%**
- Refer to type 2 diabetes clinic

**Significantly elevated blood glucose or HbA1c**
- Urgent referral, on-call physician at 202-476-5000
Conclusions

- Type 2 diabetes and prediabetes are increasing in children
  - Parallel to obesity
  - Non-Hispanic Blacks, Hispanics and Native Americans are most affected

- Risk-based screening indicated in overweight and obese youth

- Prediabetes increases risk for diabetes and CVD in adults

- Recommended treatment of prediabetes is lifestyle modification

- Rapid β-cells loss leads to high therapeutic failure in youth with type 2 diabetes

- Type 2 diabetes complications appear earlier than adults

- More research is needed to understand the role of bariatric surgery
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