Early-Stage Type 1 Diabetes: Education

BRIGITTE I. FROHNERT MD PHD
Outline

- Why is education important?
- Goals of patient education
- Content of education
Why educate at early-stage T1D?
DKA at T1D onset can be prevented

83% of DKA events could be prevented:
- Screen general population
- *Provide education and monitoring*

Prevalence of DKA

- Colorado 1998-2012, N=3,439
- n=3106
- DAISY, TEDDY, TrialNet n=133

Rewers A et al. JAMA 2015
Why educate at early-stage T1D? Address Disparities in Presentation

Risk factors for DKA at diagnosis:
- Young age
- Ethnic minority population
- Limited or lack of insurance
- Lower parent education
- Lower family income
- Rural address
- Public insurance
- Existing mental disorders

Initial symptoms may be nonspecific
25% were misdiagnosed at first visit
Misdiagnosis associated with 18% increased risk of DKA

Muñoz et al. *Clinical Diabetes, 2019*
Goals of Education

- Prevent DKA at stage 3
  - Encourage participation in monitoring
  - Recognizing changes in clinical status
- Inform about potential interventions
- Improve patient experience
  - Alleviate anxiety
  - Empower with knowledge before start of insulin
  - Promote healthy habits
Patient Education
Education Currently Directed at Stage 3 T1D
Pathophysiology of T1D

- Why did this happen?
- What happens next?
- Understanding of the stages of T1D?
- Ketosis, illness and avoidance of DKA
- Clearing confusion regarding T1D/T2D
Interventions

❖ Options
  ❖ Teplizumab
  ❖ TrialNet
  ❖ Other studies

❖ Eligibility criteria
Monitoring education

- Symptoms of highs and lows
- How to check glucose:
  - Glucometer
  - CGM
- When/how to check ketones
Education Materials for Monitoring

- Why are we checking blood sugar?
  - At baseline
  - During illness

- When should you check blood sugar?

- What should my child's blood sugar be?
  - When to call

- What else should I look for?
  - Review of symptoms

*Home Glucose Testing*

<table>
<thead>
<tr>
<th>TIME</th>
<th>NORMAL BG</th>
<th>ELEVATED BG</th>
<th>HIGH BG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td>Below 100</td>
<td>100 – 124</td>
<td>125 or higher</td>
</tr>
<tr>
<td>2 Hours after meals</td>
<td>Below 140</td>
<td>140 – 199</td>
<td>200 or higher</td>
</tr>
</tbody>
</table>

- Call: ASK Study Clinic at 303-724-1275 (8am-5pm M-F); or
- Call: ASK Clinician at 720-326-0430
- On evenings/weekends call: 303-724-2323 and identify your child as an ASK Study participant
- You should also call your primary care provider

**If the meter beeps once and displays "HI" (no number displayed) your blood sugar reading is over 600mg/dL. This is a life-threatening situation and a medical emergency.**

**Immediately call ASK or 303-724-2323 (if after hours)**
Monitoring by Unblinded CGM

- Practical CGM use
  - Troubleshooting problems
  - When to double-check with glucometer

- Check Patterns at least once per CGM wear

- Highs (alarm usually set to 200 mg/dL)
  - If >200 mg/dL or higher 2 hours after meal, wash hands and check fingerstick
  - If >300 mg/dL for more than 2 hours, check ketones
  - Call if confirmed >200 or if ketones are moderate or higher

- Lows (alert at or below 55mg/dL cannot be turned off)
  - Check finger-stick glucose if possible.
  - If 2 or more low alarms, call team
  - False lows: dehydration, compression of sensor
Diet and lifestyle education

- What foods have carbohydrates?
- Healthy diet choices / balanced diet
  - Carbs are important for growth/health
- Exercise for lifetime health
Emotional and Family impacts

- Family strengths/challenges
- Assessment for depression/anxiety
- Coping with uncertainty
- Resources
A Case Study
Boy screened at 1 yo; Father with T1D

<table>
<thead>
<tr>
<th>Age</th>
<th>GAD</th>
<th>IA-2</th>
<th>IAA</th>
<th>ZnT8</th>
<th>A1C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>++</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1.1</td>
<td>++</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4.9</td>
</tr>
<tr>
<td>1.3</td>
<td>++</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>5.2</td>
</tr>
<tr>
<td>1.5</td>
<td>++</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>5.2</td>
</tr>
<tr>
<td>1.8</td>
<td>++</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>5.1</td>
</tr>
<tr>
<td>2.1</td>
<td>++</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>5.1</td>
</tr>
<tr>
<td>2.5</td>
<td>++</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>5.3</td>
</tr>
<tr>
<td>2.8</td>
<td>++</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5.4</td>
</tr>
</tbody>
</table>
3 yo - at Stage 2 T1D entry into The Early Start Study

HbA1c: 5.1%

CGM:
- >140: 22%
- Time in range: 78%
- Avg SG (mg/dL): 123 ± 29

OGTT mg/dL:
- 0 min: 81
- Peak: 185
- 120 min: 143
One week later, has an illness with fever

**CGM**

- >140: 44%
- Time in range: 56%
- Avg SG (mg/dL): 149 ± 54
Two weeks later, illness resolved

**CGM**

- >140: 25%
- Time in range: 74%
- Avg SG (mg/dL): 123 ± 32
Two months later, diagnosed with Stage 3 T1D

**HbA1c** 6.0%

**CGM**
- >140: 56%
- Time in range: 43%
- Avg SG (mg/dL): 168 ± 59
One month later, Short-acting insulin at dinner

<table>
<thead>
<tr>
<th>CGM</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;140: 33%</td>
</tr>
<tr>
<td>Time in range: 65%</td>
</tr>
<tr>
<td>Avg SG (mg/dL): 127 ± 40</td>
</tr>
</tbody>
</table>

![Graph showing blood sugar levels over time]
Use of CGM-Guided Education

- Observation of patterns
  - Impact of diet and exercise on glycemic excursions
  - Trends with illness / hormones / changes in activity level
- Recognition of need for insulin
Excerpts from JDRF Consensus Guidance for Monitoring: Education Working Group

- **Why?**
  - Monitoring and education program can reduce DKA at stage 3

- **Who?**
  - Provided by all health professionals involved in monitoring and care

- **When?**
  - At diagnosis of each stage, annually for review and maintenance, during life transitions

- **What?**
  - Education should accompany all monitoring plans
  - Topics and intensity based on T1D stage and risk of progression

- **How?**
  - Culturally and linguistically congruent
  - Accessible, engaging and patient-centered (considering developmental, social, emotional needs of individual and/or family)
Acknowledgements

Marian Rewers, P.I.
Cristy Geno Rasmussen
Kim Bautista
Judy Baxter
Amber Corr
Fran Dong
Daniel Felipe-Morales
Isabel Flores Garcia
Brigitte Frohnert
Tricia Gesualdo
Michelle Hoffman
Xiaofan Jia
Rachel Karban
Maricela Munoz
Holly O’Donnell
Meghan Pauley
Flor Sepulveda
Crystal Silva
Kimber Simmons
Andrea Steck
Iman Taki
Kathy Waugh
Joey Wong
Liping Yu
Brett McQueen
Rick Bacher
David Roth
Laura Pyle
Jill Norris

Sponsors

Patten-Davis Foundation

Our ASK participants, their families, and ASK provider partners!

Partners

Children’s Hospital Colorado
Greenwood Pediatrics
PEDIATRICS 5280

Edwin Liu, Marisa Stahl
Michelle Corrado, Mary Shull, Pooja Mehta, Ed Hoffenberg, Monique Germone, Sadie Nagle, Erin Sandene, Kevin Carney, Amy Lewis, Chrisann Karr, Sondra Valdez, Chris Martin, Alison Brent
Dan Feiten
Tracy Brekken
Martha Middlemist
Rebekah Phillips
Holly Frost
Sonja O’Leary
Kathy Love-Osborne

Our ASK participants, their families, and ASK provider partners!