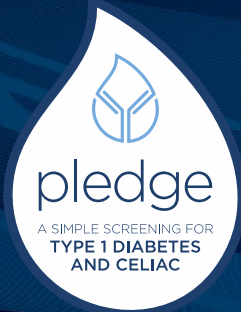


# Monitoring within a Healthcare System

## The Sanford PLEDGE Study

**Kurt J. Griffin PhD, MD**

Director of Clinical Trials  
Sanford Health  
Sioux Falls, South Dakota



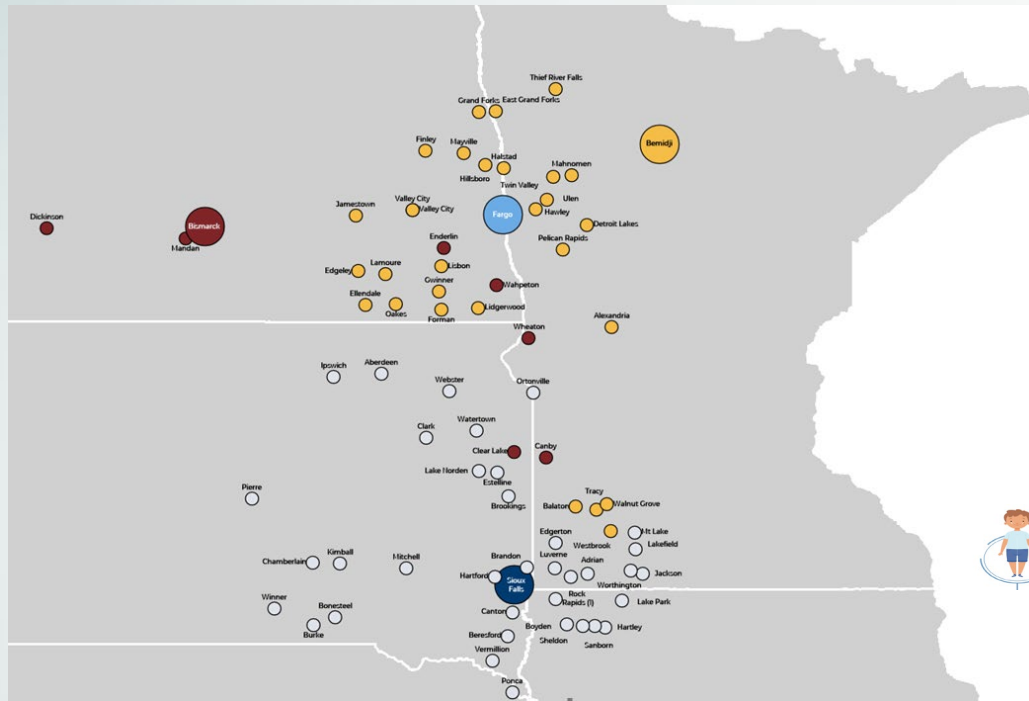
6<sup>th</sup> Childhood Diabetes Prevention Symposium  
Barbara Davis Center  
9 November 2023

In Partnership with



# PLEDGE Overview

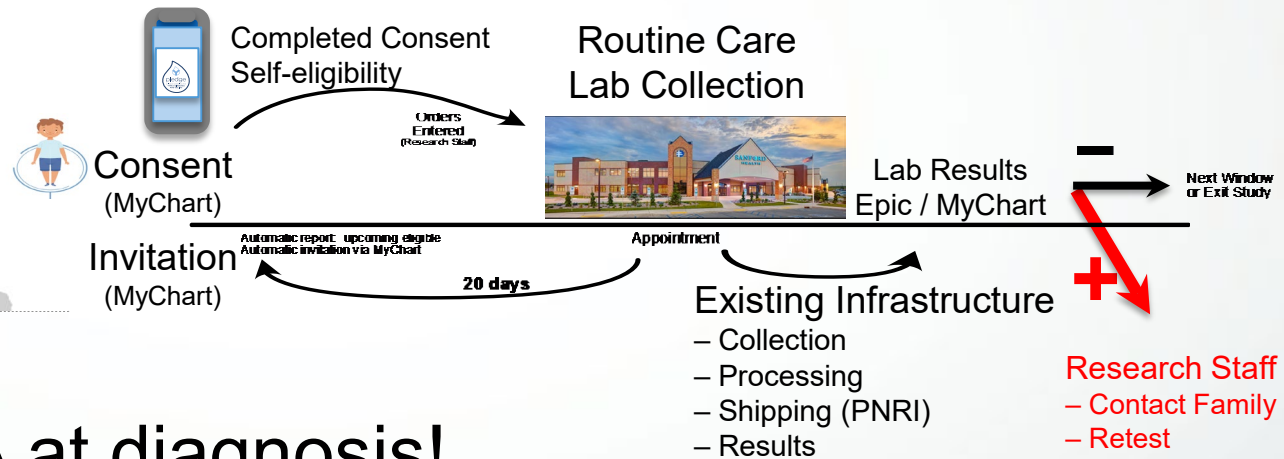
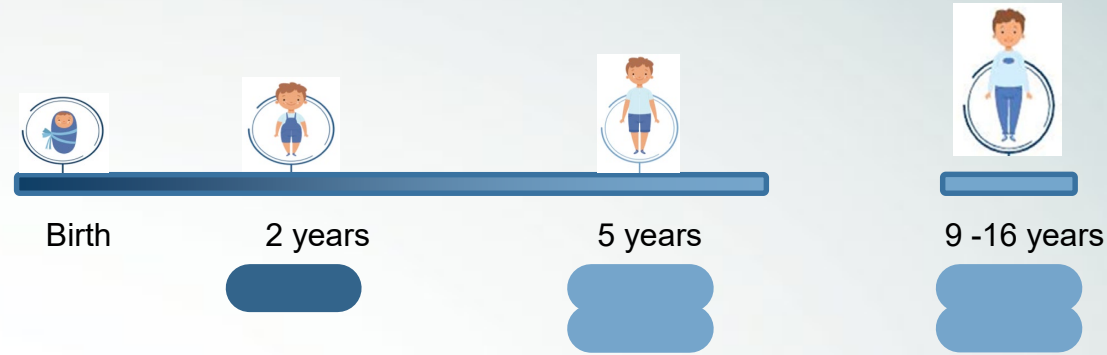
Enrolling at every primary care clinic across Sanford footprint



0 – 6 y OR once 9 -16 y.

Genetic Risk Score  
GRS2 Once at study entry  
(blood spot; can be with Newborn Screening)

T1D AutoAb  
Celiac Testing



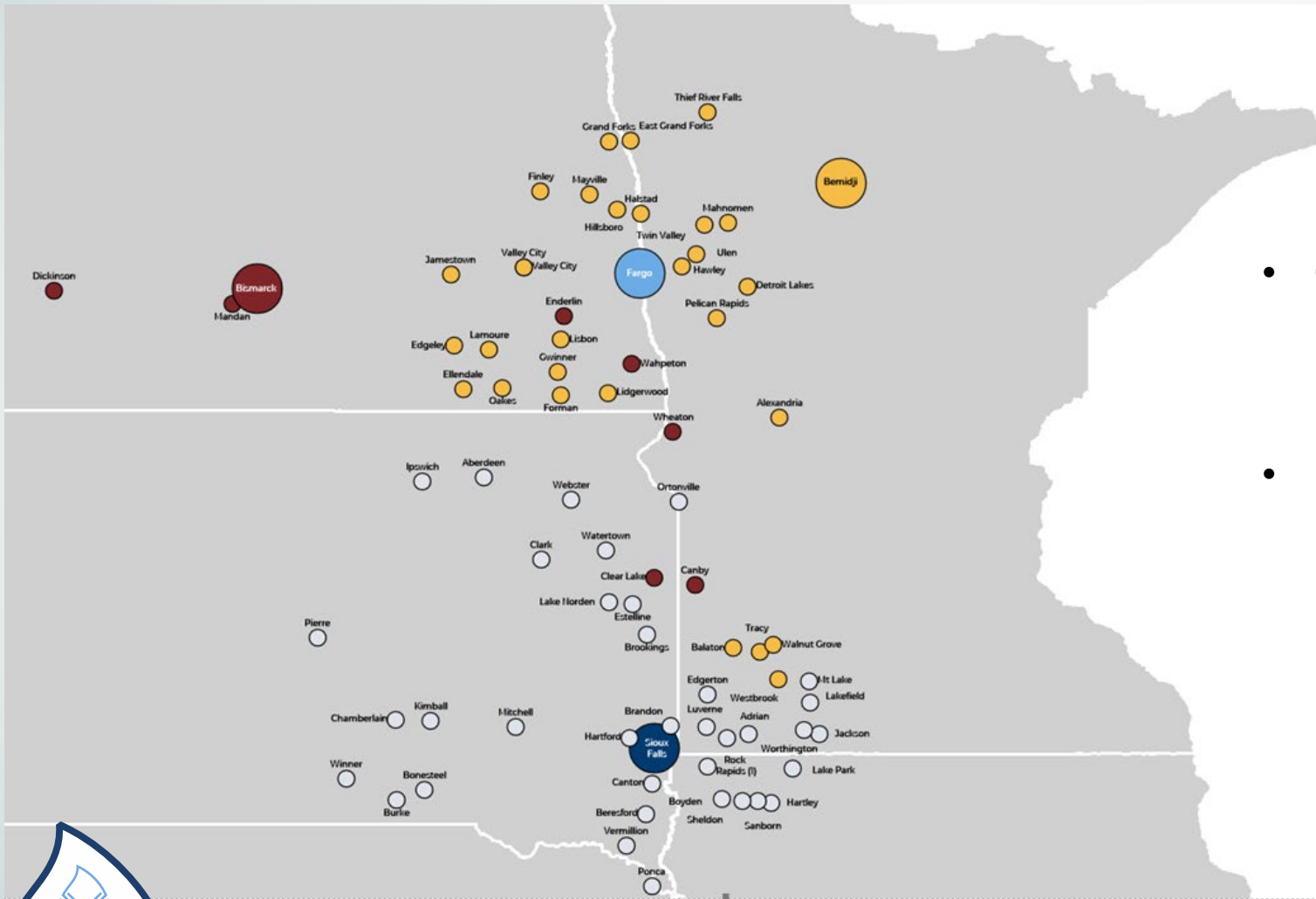
Goals: Prevent DKA at diagnosis!

Offer early interventions/trials

Referral to clinical care at appropriate time

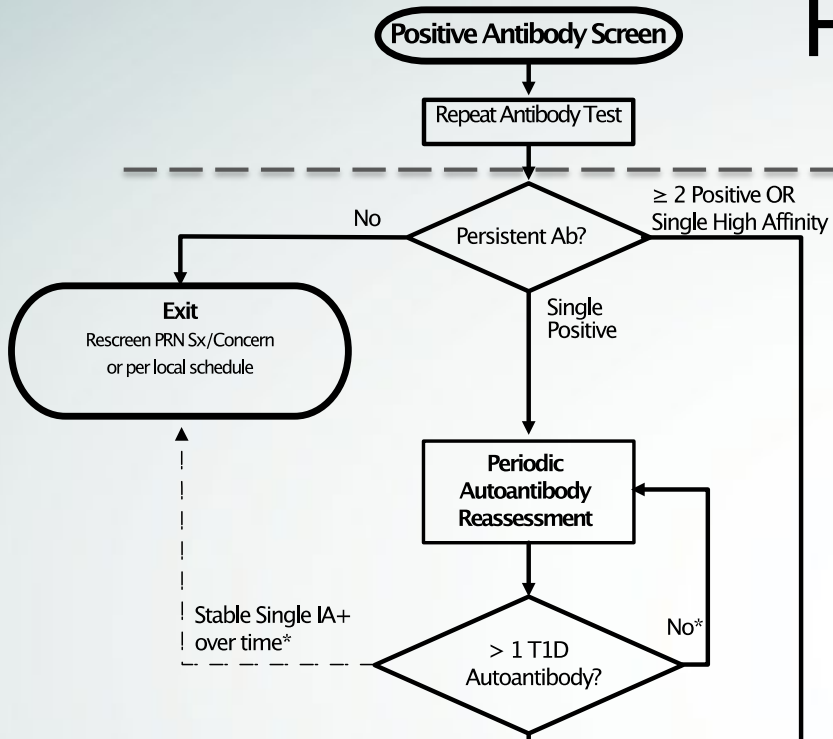


# PLEDGE Monitoring



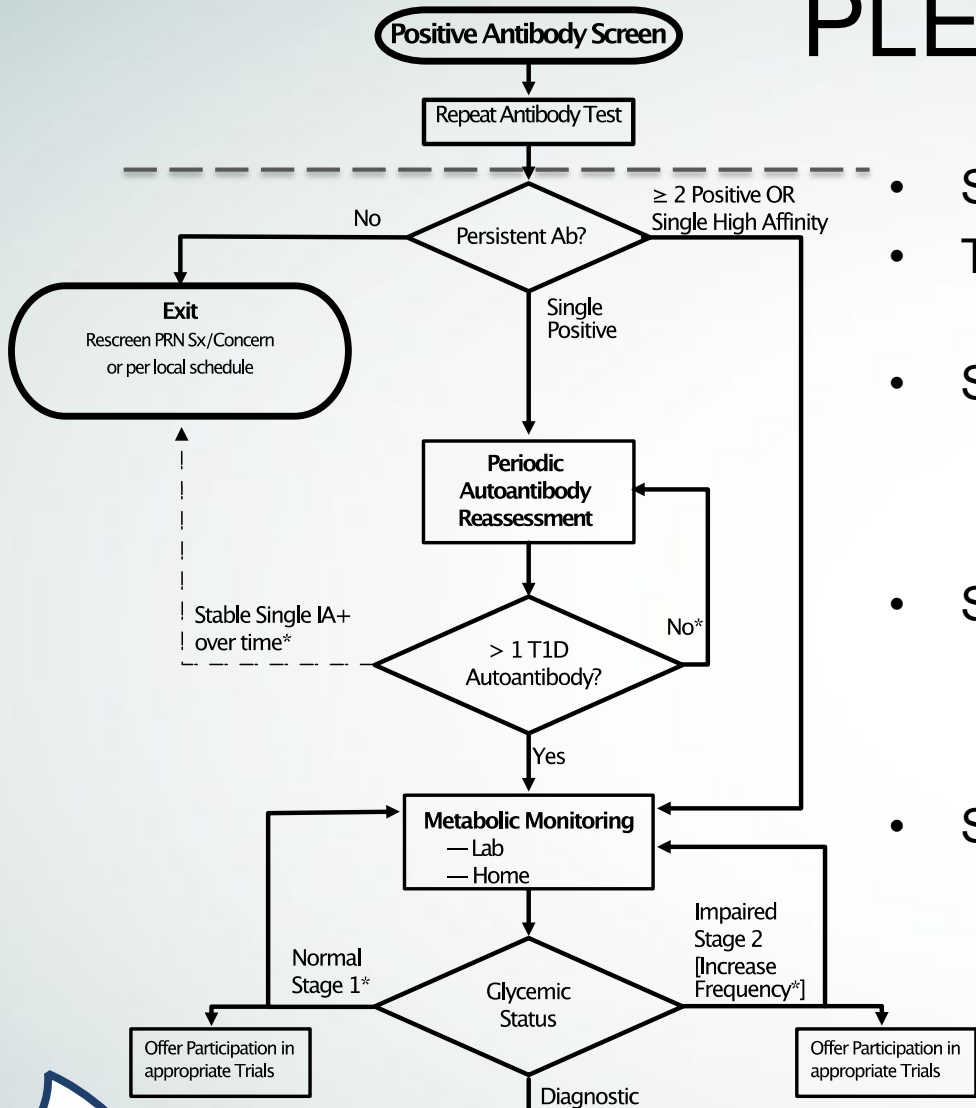
- Centralized management in Sioux Falls, SD
  - 1 program manager
  - 1 clinical coordinator
- Decentralized Procedures
  - 157 clinics screening
  - Monitoring visits performed in local clinics
    - Use in-clinic labs for OGTT
    - Local staff start CGM

# PLEDGE Monitoring



- Separate Protocol and Consent after confirmation of persistent antibody.
- Tailor extent and frequency to expected risk
- Single Islet antibodies:
  - Periodic reassessment of antibodies, Hemoglobin A1c
  - Home ketone testing PRN symptoms or illness

# PLEDGE Monitoring



- Separate Protocol and Consent after confirmation of persistent antibody.
- Tailor extent and frequency to expected risk
- Single Islet antibodies:
  - Periodic reassessment of antibodies, Hemoglobin A1c
  - Home ketone testing PRN symptoms or illness
- Stage 1: Multiple Islet Antibodies with *Normal* Glucose Regulation
  - Metabolic monitoring: Add OGTT, Hemoglobin A1c, Proinsulin:C-peptide ratio
  - Home testing: Ketones and Blood Glucose PRN Symptoms or illness
- Stage 2: Multiple Islet Antibodies with *Impaired* Glucose Regulation
  - Monitoring visits at least q 6 months.
  - Home testing:
    - Blood glucose 2 points monthly
    - Ketones and Blood Glucose PRN Symptoms or illness

# Education

- Ongoing education at every contact with families
  - Signs/Symptoms of clinical T1D
  - Whom to contact for questions
- Additional teaching & materials at specific events
  - First Antibodies
  - Entry to stage 1
  - Entry to stage 2
  - Stage 3 & transition to clinical care

## Home Monitoring for Stage 1 T1D

Children with at least 2 antibodies and normal glucose tolerance testing



When your child gets sick or if they have signs of T1D:  
Test blood sugar levels and urine ketones daily  
Next steps depend on the blood sugar level:

Fasting: over 125 mg/dL At any time: over 200 mg/dL or HI		Go to <b>HIGH</b> Blood Sugar
Fasting: 100-125 mg/dL 2 hours after meal: 140-199 mg/dL		Go to <b>IMPAIRED</b> Blood Sugar
Fasting: 60-99 mg/dL 2 hours after meal: 60-139 mg/dL		Go to <b>NORMAL</b> Blood Sugar
At any time: Under 60 mg/dL or LO		Go to <b>LOW</b> Blood Sugar

If you get help from a provider, please  
• Share with them that your child is at risk for Type 1 Diabetes  
• Notify the PLEDGE Study team afterwards (605) 312-3309

### For HIGH Blood Sugar

Fasting: over 125 mg/dL  
At any time: over 200 mg/dL or HI

**Wash Hands and Recheck Blood Sugar**  
If recheck is lower, go back to the table above and follow the relevant steps

**Check Blood Sugar**  
Continue checking blood sugar twice daily (fasting and 2 hours after a meal) while your child is still sick or having signs of T1D.

**Check Urine Ketones**  
Check urine ketones every 4 to 6 hours until you are seen by a healthcare provider.

<b>Negative, Trace, or Small Ketones</b> See a healthcare provider within 24 hours. This may be Primary Care, Urgent Care, or Emergency Department.	<b>Moderate or Large Ketones</b> Go to emergency department immediately or call 911
--	--



### For IMPAIRED Blood Sugar

Fasting: 100-125 mg/dL  
2 hours after meal: 140-199 mg/dL

**Wash Hands and Recheck Blood Sugar**  
If recheck is lower, go back to the table above and follow the relevant steps

**Check Blood Sugar**  
Continue checking blood sugar twice daily (fasting and 2 hours after a meal) until you discuss with the study team. If blood sugar goes outside the impaired range, please go to the section that matches that result.

**Check Urine Ketones**  
Check urine ketones daily when blood sugar is impaired

<b>Negative, Trace, or Small Ketones</b> Continue to check urine ketones each day whenever blood sugar is impaired. Please call study team within 3 days. (605) 312-3309	<b>Moderate or Large Ketones</b> Go to emergency department immediately or call 911
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### For NORMAL Blood Sugar

Fasting: 60-99 mg/dL  
2 hours after meal: 60-139 mg/dL

**Check Blood Sugar**  
Continue checking blood sugar while your child is still sick or having signs of T1D (fasting and 2 hours after meal, daily).  
If blood sugar goes outside the normal range, please go to the section that matches that result.

**Check Urine Ketones**  
Check urine ketones at start of illness. If urine ketones are:

<b>Negative, Trace, or Small Ketones</b> Check urine ketones each day until symptoms go away or you have discussed with a healthcare provider.	<b>Moderate or Large Ketones</b> See a provider within 4 hours. (Primary Care, Urgent Care, or the Emergency Department)
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### For LOW Blood Sugar

At any time: Under 60 mg/dL or LO

**Treat Low Blood Sugar**  
Give 2 ounces of juice, non-diet soda, or milk  
Recheck blood sugar after 15 minutes  
If blood sugar is still under 60 mg/dL, treat again  
If blood sugar remains under 60 mg/dL 15 minutes after re-treatment, call your medical provider

If your child is not awake, cannot swallow, or has other emergency conditions, call 911



## Home Monitoring for Stage 2 T1D

Children with at least 2 antibodies and abnormal glucose tolerance testing



Test blood sugar levels monthly (fasting and 2 hours after a meal)  
Test blood sugar and urine ketones when your child gets sick or if they have signs of T1D  
Next steps depend on the blood sugar level:

Fasting: over 156 mg/dL At any time: over 250 mg/dL or HI		Go to <b>HIGH</b> Blood Sugar
Fasting: 115-155 mg/dL 2 hours after meal: 200-250 mg/dL		Go to <b>INCREASING</b> Blood Sugar
Fasting: 60-114 mg/dL 2 hours after meal: 60-199 mg/dL		Go to <b>BASELINE</b> Blood Sugar
At any time: Under 60 mg/dL or LO		Go to <b>LOW</b> Blood Sugar

If you get help from a provider, please  
• Share with them that your child is at risk for Type 1 Diabetes  
• Notify the PLEDGE Study team afterwards (605) 312-3309

### For HIGH Blood Sugar

Fasting: over 156 mg/dL  
At any time: over 250 mg/dL or HI

**Wash Hands and Recheck Blood Sugar**  
If recheck is lower, go back to the table above and follow the relevant steps

**Check Blood Sugar**  
Continue checking blood sugar twice daily (fasting and 2 hours after a meal) while your child is still sick or having signs of T1D.

**Check Urine Ketones**  
Check urine ketones every 4 to 6 hours until you are seen by a healthcare provider.

<b>Negative, Trace, or Small Ketones</b> See a healthcare provider within 24 hours. This may be Primary Care, Urgent Care, or Emergency Department.	<b>Moderate or Large Ketones</b> Go to emergency department immediately or call 911
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### For INCREASING Blood Sugar

Fasting: 115-155 mg/dL  
2 hours after meal: 200-250 mg/dL

**Wash Hands and Recheck Blood Sugar**  
If recheck is lower, go back to the table above and follow the relevant steps

**Check Blood Sugar**  
Continue checking blood sugar twice daily (fasting and 2 hours after a meal) until you discuss with the study team. If blood sugar goes outside the increasing range, please go to the section that matches that result.

**Check Urine Ketones**  
Check urine ketones daily when blood sugar is in the increasing range

<b>Negative, Trace, or Small Ketones</b> Continue to check urine ketones each day whenever blood sugar is impaired. Please call study team within 3 days. (605) 312-3309	<b>Moderate or Large Ketones</b> Go to emergency department immediately or call 911
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### For BASELINE Blood Sugar

Fasting: 60-114 mg/dL  
2 hours after meal: 60-199 mg/dL

**Check Blood Sugar**  
Continue checking blood sugar (fasting and 2 hours after a meal) - monthly or - twice daily while your child is still sick or having signs of T1D.  
If blood sugar goes outside the normal range, please go to the section that matches that result.

**Check Urine Ketones**  
Check urine ketones at start of illness. If urine ketones are:

<b>Negative, Trace, or Small Ketones</b> Check urine ketones each day until symptoms go away or you have discussed with a healthcare provider.	<b>Moderate or Large Ketones</b> See a provider within 4 hours. (Primary Care, Urgent Care, or the Emergency Department)
---	---

### For LOW Blood Sugar

Under 60 mg/dL or LO at any time

**Treat Low Blood Sugar**  
Give 2 ounces of juice, non-diet soda, or milk  
Recheck blood sugar after 15 minutes  
If blood sugar is still under 60 mg/dL, treat again  
If blood sugar remains under 60 mg/dL 15 minutes after re-treatment, call your medical provider

If your child is not awake, cannot swallow, or has other emergency conditions, call 911



# Alert for Clinicians

- How help providers recognize a child at risk for T1D when they present with relevant symptoms?

## – “Patient Chart Advisory”

- Appears on opening chart
- Reminder to consider T1D
- Provides guidance
- Does not slow work
- Less intrusive than BPA

The screenshot displays the Epic EMR interface for a patient named Claudia Raven. The patient's information is shown on the left side of the screen, including her name, gender, age, date of birth, MRN, and legal guardian. The main area of the screen is titled "Patient Chart Advisories" and contains a red warning box with the following text:

**WARNING! Please see important patient care note in comments below: Special Patient Care Info**

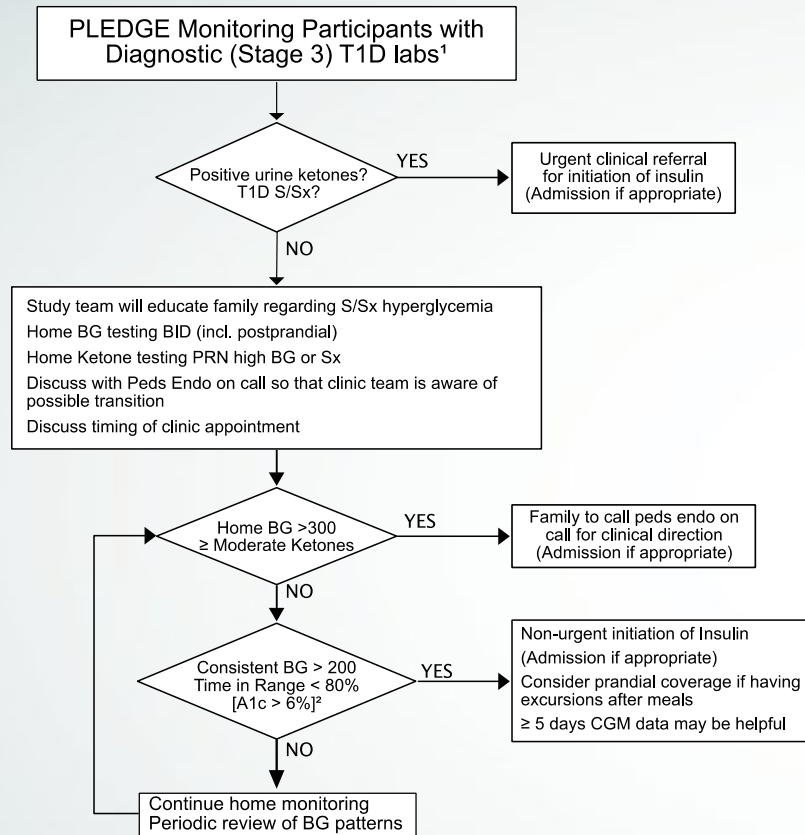
This patient has pre-symptomatic TYPE 1 DIABETES (Stage 1- multiple T1D auto-antibodies with normal glucose tolerance) NOT yet requiring insulin, and is a participant in the PLEDGE Monitoring study.

PROVIDERS: If acutely ill or T1D symptoms present, consider screening for hyperglycemia & ketosis

Clinical Questions: Follow your clinic's policy for consultation with Pediatric Endocrinology  
Non-Urgent Study Questions: Contact the Sanford diabetes research team: (605) 312- 3309, M-F 0800am-4:30pm.

Interface © 2022 Epic Systems Corporation

# Transition to Clinical Care



- When meet standard ADA diagnostic criteria
- Close communication with pediatric endocrine clinic
- Assessment of urgency may be aided by CGM data
- Goal: start insulin when necessary to keep within treatment targets
  - Start with mealtime rapid insulin if there are postprandial spikes
  - Basal insulin if fasting blood glucose is elevated

<sup>1</sup>Child may have blinded CGM in place after PLEDGE monitoring visit  
CGM may be downloaded at any interval

<sup>2</sup>Hemoglobin A1c is a lagging indicator and BG may be well above target before A1c becomes abnormal.



# A work in Progress

- Multiple refinements already implemented based on new information
  - “high affinity” antibodies
  - Frequency of monitoring
  - Educational materials
  - Timing of reminders
- Feedback has been very helpful
  - External advisors and collaborators
  - Participating providers and staff
  - Laboratory staff and leadership
  - Participating families

# Thank you!

All the families who participate

## **The Sanford Project Team**

Ann Mays  
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Lana Baerenwald  
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Connie Hoffman  
Staci Schwingler

## **Clinical Providers**

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Holly McMahon

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Emily Griese

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Faculty Positions Available