



MANAGEMENT AND TREATMENT OF

Pediatric Type 1 Diabetes

2021 Update

This care process model (CPM) was developed by Intermountain Healthcare's Pediatric Clinical Specialties Program. It provides guidance for identifying and managing type 1 diabetes in children, educating and supporting patients and their families in every phase of development and treatment, and preparing our pediatric patients to transition successfully to adulthood and adult diabetes self-management. This CPM is based on guidelines from the American Diabetes Association (ADA), particularly the 2020 position statement *Type 1 Diabetes Through the Life Span*, as well as the opinion of local clinical experts in pediatric diabetes.^{ADA1, ADA2}

► Why Focus on PEDIATRIC TYPE 1 DIABETES?

Diabetes in childhood carries an enormous burden for patients and their families and represents a significant cost to our healthcare system. In 2008, Intermountain Healthcare published the first CPM on the management of pediatric diabetes with the overall goal of helping providers deliver the best clinical care in a consistent and integrated way.

What's new:

- **Separate CPMs for type 1 and type 2 pediatric diabetes** to promote more-accurate diagnosis and more-focused education and treatment.
- **Updated recommendations** for diagnostic testing, blood glucose control, and follow-up care specifically related to pediatric type 1 diabetes.
- **A more comprehensive view of treatment** for pediatric type 1 diabetes — one that emphasizes psychosocial wellness for patient and family and lays a foundation for better health over the lifespan.
- **Information and tools to support pediatric type 1 diabetes care by nonspecialist providers** — important for coping with the ongoing shortage of pediatric endocrinologists and the increasing number of pediatric diabetes patients as well as for responding to patient need for community-based care.
- An emphasis on **preparing pediatric type 1 patients for the transition to adult care**, as recommended by numerous organizations in the *Consensus Statement for Healthcare Transitions for Young Adults with Special Health Care Needs*.^{AAP}
- Brief answers to common provider questions about **insulin pump therapy and continuous glucose monitors**.

MEASUREMENT AND GOALS

The goal of this CPM is to promote appropriate diagnosis and treatment of diabetes in children and adolescents. To measure outcomes, Intermountain will track:

- Diagnostic criteria including age and confirmatory lab results and differentiation (correct diagnosis) of type 1 and type 2 diabetes
- Ongoing management of type 1 diabetes including management of intercurrent illness, prevention of DKA, and specialized education
- Diagnosis and management of DKA
- Referral and transition to an adult provider
- Hemoglobin A1c (< 7.5%)
- Mental health evaluation

 Indicates an Intermountain measure

► WHAT'S INSIDE?

MANAGEMENT ROAD MAP 2

ALGORITHMS:

- Algorithm 1: Diabetes screening 3
- Algorithm 2: DKA Management 4
- Algorithm 3: Initial insulin therapy 6
- Algorithm 4: Early adjustments to insulin therapy 7

INSULIN THERAPY 5

- Key issues 5
- Table 1: Insulin profiles 5
- Optimizing insulin regimens 8
- Table 2: Insulin adjustments 8

ROUTINE CARE & DIABETES MANAGEMENT 9

- Key goals and concerns 9
- Common comorbidities 10
- Table 3: Routine care and follow up . . . 11
- Insulin pump therapy: Provider FAQs . . 12

WELLNESS ACROSS THE LIFESPAN . . . 13

- Table 4: Wellness expectations and suggestions 14

PATIENT EDUCATION 15

- Survival education 15
- Table 5: Tools for Initial "Survival" Education 15
- Learning curriculum 15
- Continuing education 16
- Table 6: Recommended Education Materials 18

TEAM ROLES & RESOURCES 19

- Table 7: Key Roles & Responsibilities . . 19

REFERENCES 20

MANAGEMENT ROAD MAP: PEDIATRIC TYPE 1 DIABETES

Newly diagnosed diabetes

Provider tool
 • **Diabetes Screening, Diagnosis for patients with symptoms**

HOSPITAL

ADMIT to the hospital for initial management

Diabetes specialist and team provide care

Education	Medication & Monitoring	Wellness
<p>Focus</p> <ul style="list-style-type: none"> Teaching basic skills and information to prepare patient for safe self-management at home (around 12 to 20 hours) <p>Provider tools</p> <ul style="list-style-type: none"> Tools for Initial "Survival" Education: Lists all education tools in context (page 15) 	<p>Focus</p> <ul style="list-style-type: none"> Stabilizing patients in diabetic ketoacidosis (DKA) Initial management, especially insulin therapy <p>Provider tools</p> <ul style="list-style-type: none"> DKA Management (page 4) Initial Insulin Therapy (page 5) 	<p>Focus</p> <ul style="list-style-type: none"> Helping patient and family cope with stress of diagnosis Assessing family support and needs <p>Provider tools</p> <ul style="list-style-type: none"> Early Adjustments to Insulin Therapy (page 7)

...and for patients, these key tools:

- Diabetes Basics book
- Diabetes Nutrition module
- Diabetes Type 1 Home Care Plan handout



Most children with a new diabetes diagnosis can be discharged in 2 to 3 days if:

- They are medically stable
- They and their families have basic knowledge and skills
- Follow-up plans are in place or in process: Appointments, classes, and contact numbers

TRANSITION to outpatient care

Diabetes specialist and team continue care

Focus

- Supporting patient/family management at home (phone calls, visits)
- Providing follow-up education 2 to 4 weeks after hospital discharge
- Coordinating with patient's primary care provider (PCP)

Provider tools

- Early Adjustments to Insulin Therapy** (page 7)
- Continuing education:** Lists patient tools in context (page 16)
- Routine Care and Follow-up** across the lifespan (pages 11–14)

Ongoing FOLLOW-UP with provider and SELF-MANAGEMENT at home

Diabetes specialist and team continue management OR **PCP and team provide ongoing management with specialist consultation**

Education	Medication & Monitoring	Wellness
<p>Focus</p> <ul style="list-style-type: none"> Preparing patient for self-management of diabetes over time and as patient develops Making healthy choices and managing nutrition, activity, weight, symptoms, medication <p>Provider tools</p> <ul style="list-style-type: none"> Continuing education: Lists patient tools in context (page 16) 	<p>Focus</p> <ul style="list-style-type: none"> Optimizing medical management Monitoring for complications <p>Provider tools</p> <ul style="list-style-type: none"> Early Adjustments to Insulin Therapy (page 7) Routine Care and Follow-up (page 11) Wellness Across the Lifespan (page 13) Diabetes Technology Options: Provider FAQs (page 12) Insulin dosing cards 	<p>Focus</p> <ul style="list-style-type: none"> Getting regular emotional/mental health wellness checks Addressing challenges and issues that may create or underlie management problems <p>Provider tools</p> <ul style="list-style-type: none"> Wellness Across the Lifespan (page 13)

Child needs an ongoing relationship with someone who has expertise in pediatric diabetes management (CDCES, RDN, PCP, etc.). Consider these circumstances as you develop a care plan:

- Medical stability at follow-up visits
- Patient/family preference
- Availability of specialist and team
- PCP availability and team support

TRANSITION to adult care

Focus

- Referring patients to adult providers based upon location and insurance coverage
- Providing coordinated care supported by technology
- Identifying a suitable adult provider and provide portable summary of care

(a) Symptoms of diabetes

- Polyuria
- Polydipsia
- Bedwetting
- Weight loss
- Kussmaul respirations
- Fruity breath
- Lethargy and confusion

(b) Abnormal glucose values

Several circumstances can temporarily elevate a child's blood glucose (illness, steroid use, trauma, seizures). For a child with abnormal blood glucose without diabetes symptoms:

- Inform the family of the abnormal result and its likely cause.
- Encourage the family to follow up with a primary care or other physician.
- Repeat testing when health is stable.

(c) Diabetic ketoacidosis (DKA)

- A state of absolute or relative insulin deficiency resulting in hyperglycemia (blood glucose >200 mg/dL) and metabolic acidosis from accumulated ketoacids in the blood.
- The leading cause of morbidity and mortality in children with type 1 diabetes.
- Diagnosed if ANY of the following:
 - Serum pH < 7.35
 - HCO₃ < 18
 - Urine ketones

Note: A child or adolescent in DKA needs immediate medical attention.

(d) DKA management and obesity

If child is obese, consider additional labs to differentiate before starting insulin. See page 3 of the [Pediatric Type 2 Diabetes CPM](#).



(e) Risk factors for type 2

Differentiation between type 1 and type 2 diabetes is important because of differences in care and potential complications. Consider type 2 if the patients fits this profile:

- Overweight: BMI >85% for age, sex

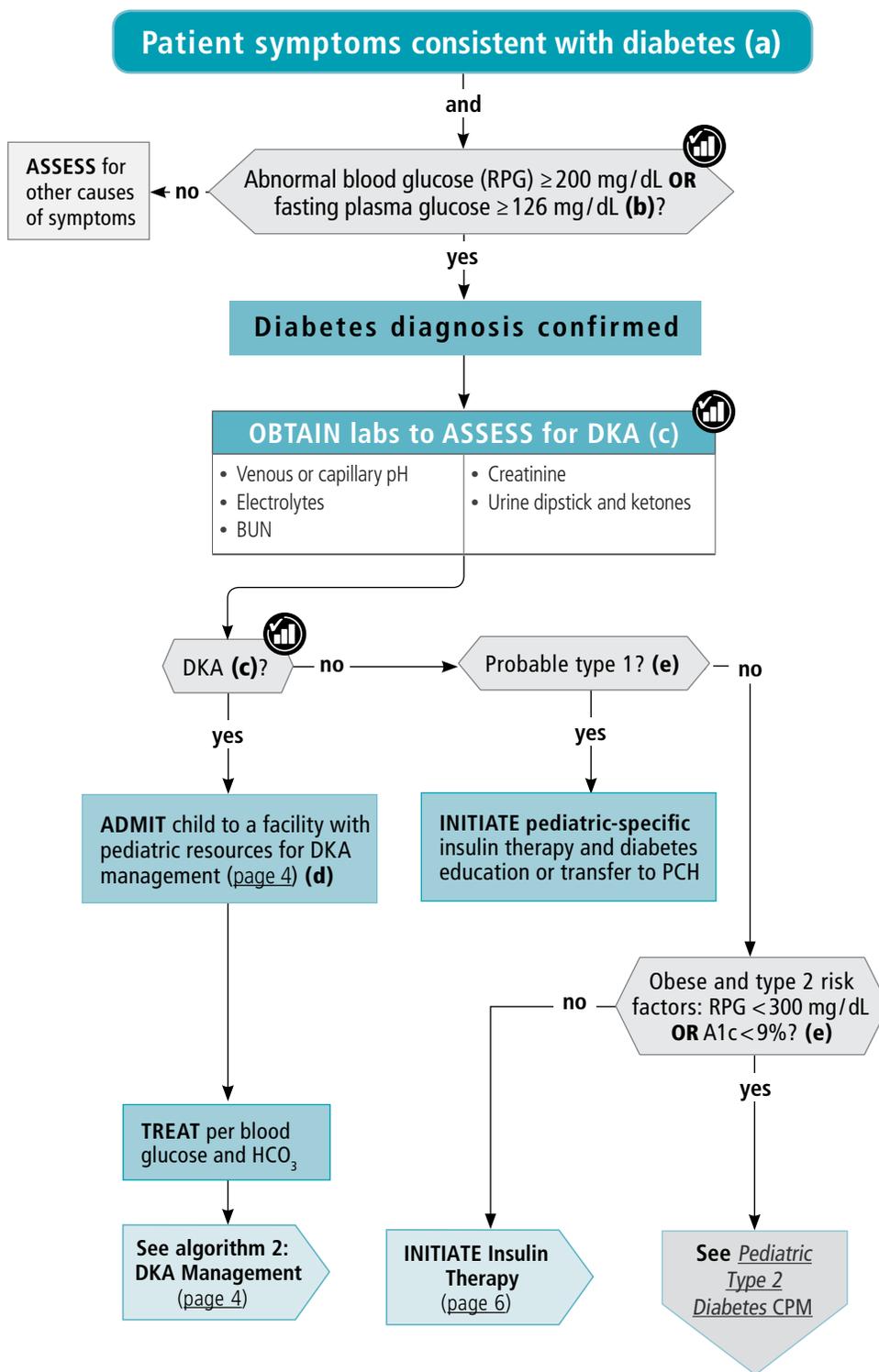
AND

- Age ≥ 10 (or pubescent)

AND

- Any 2 of these risk factors:
 - Family history of type 2 diabetes in 1st- or 2nd-degree relative
 - High-risk race/ethnicity (American Indian, African American, Hispanic, Asian, Pacific Islander)
 - Signs of insulin resistance or conditions associated with it (acanthosis nigricans, hypertension, dyslipidemia, or polycystic ovary syndrome)
 - Mother has diabetes or had gestational diabetes while pregnant with this child

▶ ALGORITHM 1: Diabetes Screening, Diagnosis



Abbreviations:

- DKA** = diabetic ketoacidosis
- FPG** = fasting plasma glucose
- HCO₃** = serum bicarb
- PPG** = postprandial plasma glucose
- RPG** = random plasma glucose

Indicates an Intermountain measure

▶ ALGORITHM 2: DKA Management

Does your patient have an insulin pump? If yes, **DISCONNECT** it. **MANAGE** DKA as below.

Note: A child or adolescent in DKA needs immediate medical attention.

DKA
pH ≤ 7.35 and/or $\text{HCO}_3 \leq 18$

Mild DKA
pH 7.3–7.35 and/or
 HCO_3 15–18

Moderate DKA
pH 7.2–7.3 and/or
 HCO_3 12–15

Severe DKA
pH < 7.2 and/or
 $\text{HCO}_3 < 12$

STABILIZE patient:
Outpatient or inpatient care

- Child with new DM diagnosis: Inpatient care always
- Child with established diagnosis: In/Outpatient depends on clinical situation

Care:

- **TEST PG** via fingerstick (per DKA order set).
- **CHECK urine ketones** with every void until negative.
- **ENCOURAGE** intake of clear fluids.
- If new-onset DM, **START** subcutaneous insulin (page 6).
- If established DM diagnosis, **USE** home dosing in conjunction with **sick day care** instructions.

Possible additional care:

- **GIVE IV fluids ONLY** if the patient fails to tolerate oral fluid resuscitation.
- **ORDER** additional labs if initial electrolytes were abnormal or child is unable to tolerate food.

Can child tolerate oral fluid resuscitation? (no nausea, vomiting)

iCentra Power Plans

- PED DKA Mild/Moderate Diabetic Ketoacidosis Admission
- PED DKA Severe Diabetic Ketoacidosis Admission Phased

DKA Order Set



Diabetes: Care on a sick day

After resolution of DKA...

MANAGE per DM type

See Algorithm 3: Insulin Therapy (page 6)

See Pediatric Type 2 Diabetes CPM

STABILIZE patient:
Inpatient care
with or without ICU care

- Intensive care recommended if child has any of the following:
- Altered mental status (**Note:** head CTs are generally not useful for determining severity of cerebral edema or changing treatment)
 - Shock
 - Intracranial pressure (ICP); monitoring needed

Care:

- **PROVIDE IV volume expansion.** This often results in substantial BG reduction. See DKA order set.
- After initial fluid bolus, **INITIATE IV insulin.** See DKA order set for specifics.
- **MONITOR** blood glucose and ketones per DKA order set.

Note: Patient's pH and HCO_3 may continue to decline for the first 2 to 4 hours after treatment is initiated.

If the patient has not improved by 6 to 8 hours after beginning treatment, **TRANSFER IMMEDIATELY** to a facility with a pediatric ICU.

ISOLATED OR RECURRENT DKA?

For a patient with an established diabetes diagnosis (not new-onset), investigate if DKA is an isolated episode or part of an ongoing pattern.

- **Isolated DKA episode:** In a child with known diabetes, common causes of an episode of DKA include:
 - Missed insulin injections
 - Insulin pump failure
 - Intercurrent illness, injury, or trauma leading to need for increased insulin

- **Recurrent DKA:** Repeated instances of DKA are almost always caused by missed insulin doses. A child or adolescent with recurring DKA should be referred for evaluation of psychosocial issues and additional education (with their families). Note that recurrent DKA may be a sign of psychiatric illness (particularly depression) or eating disorders in adolescence.

Children with frequent episodes of DKA are at higher risk for morbidity and mortality than those without recurrent DKA. There is some evidence to suggest that recurrent episodes of DKA result in neurologic damage including memory loss and loss of cognitive skills.

Note: It's rare, but not impossible, for a child with type 2 diabetes at diagnosis to present with DKA. DKA management is the same for type 1 and type 2.

Abbreviations:

- DKA** = diabetic ketoacidosis
- DM** = diabetes mellitus
- HCO_3** = serum bicarb
- PG** = plasma glucose

INSULIN IN THE ED?

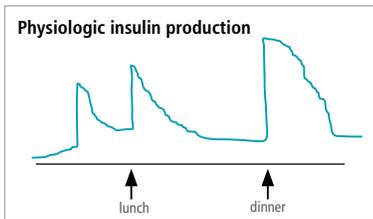
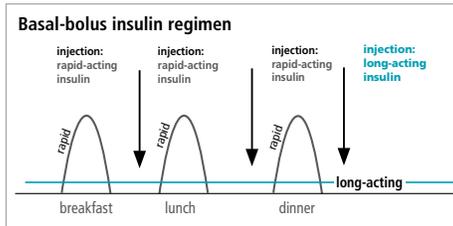
For a newly-diagnosed patient in the ED, it is sometimes easier to use a single, weight-based insulin dose as the first-time dose.

- If the patient is going to eat, use 0.2 units/kg of lispro to cover the carb-count dose and the blood glucose correction for hyperglycemia.
- If the patient is not going to eat, use 0.1 unit/kg of lispro as a blood glucose correction for hyperglycemia.

► INSULIN THERAPY^{ADA2}

Key issues:

- **Starting doses of insulin for children and adolescents are based on age and body weight and must be adjusted** based on individual response and glucose levels over the first several weeks.
- **Tight control must be carefully balanced with the risk of hypoglycemia.** The cognitive deficits that may occur with recurring hypoglycemia can impact normal learning and school performance.
- **Recognizing hypoglycemia in children can be difficult** and depends on the child’s age, cognitive abilities, and communication skills. Providers and families must be alert to behaviors and complaints that may signal hypoglycemia. Shakiness, irritability or tearfulness, hunger, headache, drowsiness, and dizziness are common.
- **Puberty can significantly alter insulin needs and participation in self-management.** Management must include developmentally appropriate education, an emphasis on transition to adult diabetes care, and screening for long-term complications.



Insulin profiles

A basal-bolus regimen is the standard of care for most pediatric patients with type 1 diabetes. The table below lists the types and brands of insulin commonly used with pediatric populations. On the first day after diagnosis and when admitted for inpatient care, **have the patient’s family call their insurance company** to determine their coverage (e.g., preferred insulin brand and method).

TABLE 1: INSULIN PROFILES FOR NEW-ONSET

Insulin type and notes on use	generic (Brand) name	Onset ¹	Peak ¹	Duration ¹
<p>Long-acting or “peakless”: Use as basal</p> <p>Long-acting insulin has a long duration of action, stable activity curve, and substantially less peak. Its duration of action is 12 to 24 hours (once to twice daily injections).</p> <ul style="list-style-type: none"> • Long-acting insulin should only be given subcutaneously, NOT intravenously. Degludec should be injected into the arm, leg, or stomach, not buttocks. • Long-acting insulin should NOT be diluted or mixed with any other insulin. • It’s important to be consistent with the timing of basal insulin. The time it is given shouldn’t vary by more than an hour from day to day. School-age children or adolescents generally take their basal insulin in the evening, ideally between the hours of 6:00 PM and 10:00 PM. 	<p>glargine (Lantus, Basaglar pen, Semglee)</p> <p>Alternatives:</p> <p>detemir (Levemir)²</p> <p>degludec (Tresiba pen)³</p>	<p>2 to 4 hours</p> <p>about 2 hours</p> <p>about 1 hour</p>	<p>none</p> <p>3 to 9 hours</p> <p>11 to 15 hours</p>	<p>20 to 24 hours</p> <p>6 to 24 hours</p> <p>36 to 48 hours</p>
<p>Rapid-acting: Use as bolus</p> <p>Rapid-acting insulin is used to cover carbohydrate intake and to correct high blood glucose.</p> <ul style="list-style-type: none"> • Carb-count dosing: Since the onset of action for rapid-acting insulin is 5 to 15 minutes, it should be given before eating. • Correction dosing: When using rapid-acting insulin to correct high blood glucose, beware of cumulative action. DO NOT give a correction dose of rapid-acting insulin more frequently than every 2.5 to 3 hours. Waiting for blood glucose levels to come down is safer than risking hypoglycemia. 	<p>Choice depends on insurance coverage</p> <ul style="list-style-type: none"> • lispro (Humalog, Admelog) • aspart (NovoLog) • glulisine (Apidra) 	<p>5 to 15 minutes</p>	<p>30 to 90 minutes</p>	<p>4 to 6 hours</p>
<p>Inhaled insulin: Not approved for use in children. Difficult to use in children as it only dispenses premeasured, standard doses.</p>				

1 The **course of action** of any insulin can vary considerably from person to person and may also vary based on such factors as dose, site of injection, temperature, and physical activity. In children and adolescents, absorption may be more rapid, and peak action shorter-lived, than the manufacturer’s literature suggests.

2 When prescribing **detemir** for a pediatric patient, note that it’s routinely dosed twice-daily. However, during the “honeymoon phase,” some children may only need 1 daily dose. Also, the duration of action is dose dependent: At lower doses, the mean duration of action is shorter and more variable. Follow the manufacturer’s instructions.

3 There are other basal insulins available, which are not typically used in new-onset. Please check dosing instructions if you are using a different long-acting insulin.

Humulin R, Novolin R, Humulin N, and Novolin N are older insulins and are not equivalent to these rapid-acting insulins. They have significantly different kinetics and should not be substituted without careful consideration.

COVERING SNACKS FOR TODDLERS AND PRESCHOOLERS: WHY AND WHEN?

Toddlers and pre-school age children tend to be “grazers”: They eat smaller meals and snacks more frequently than older children and adults. But, it’s still important to control glucose after eating. This can be difficult to do when a child is on small doses of insulin.

- Young children should have a schedule of **3 meals and 2 to 3 snacks per day** and not be allowed to eat randomly. Insulin doses should be given whenever the child eats enough carbohydrate to make it feasible. The dosing cards should be followed, but if the child is eating less than the lowest amount on the card, then no insulin is given (see [insulin dosing cards](#)).
- Ask about the family’s routine and their ability to manage the concepts. If the family is unable to manage the child’s plan, the provider will need to simplify the plan to meet their needs.

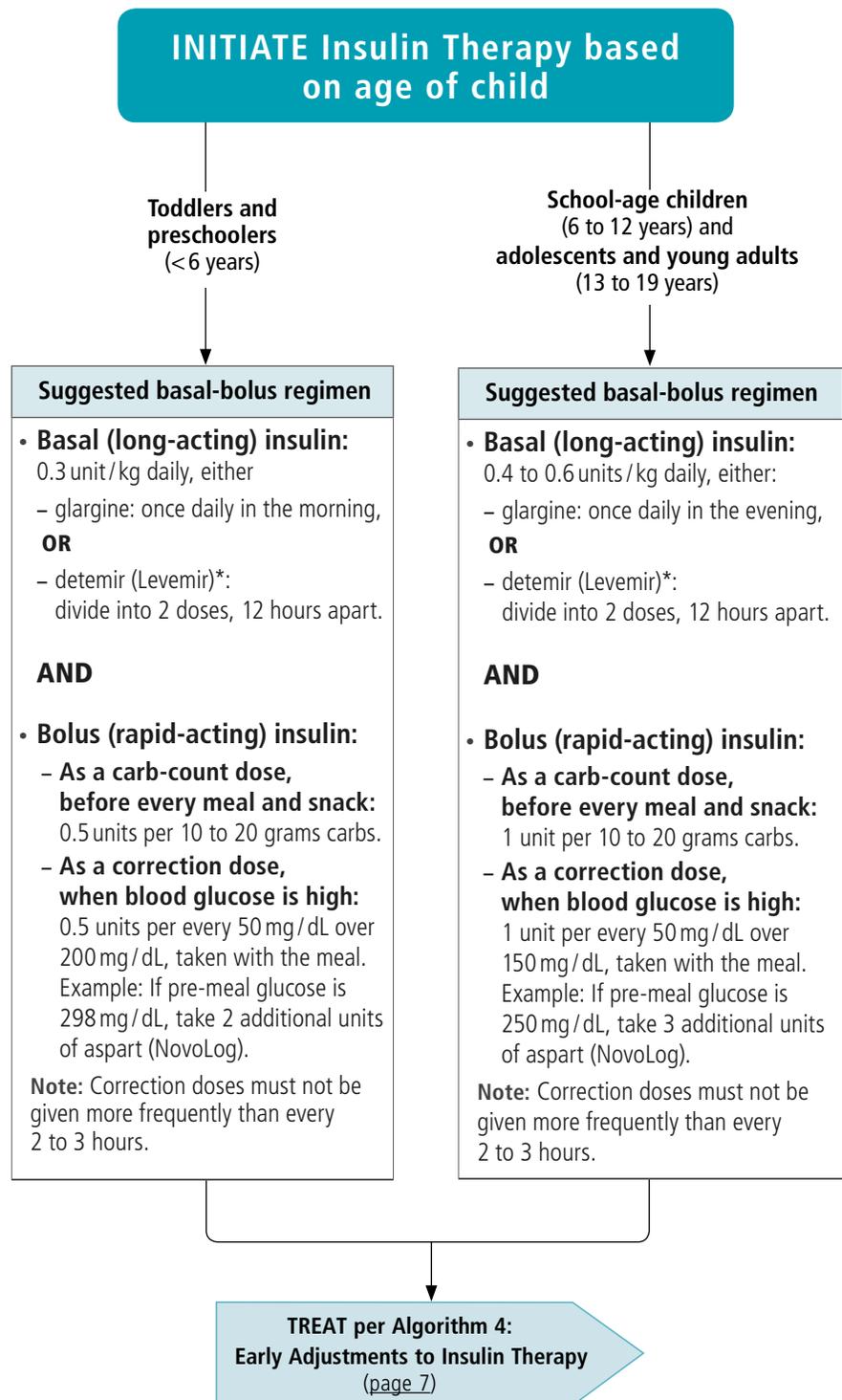
CARB-COUNT vs CORRECTION DOSE

Patients and families are often confused about the 2 uses of their short-acting insulin. To help them keep their child safe, **be consistent in how you refer to the doses — and use these terms:**

- **Carb-count dose.** This is the usual dose that a child takes before a meal or snack to cover the amount of carbs they’ll eat (per the prescribed insulin-to-carb ratio). A carb dose is given every time patient eats.
- **Correction dose.** A correction dose is given, often along with the meal dose, when BG tests high before eating. **At school, correction doses should only be given with breakfast or lunch, as needed.**

Note: A high BG correction dose should not be given more frequently than 2 to 3 hours after the last dose of rapid-acting insulin (either carb-dosing or high BG correction dosing).

▶ ALGORITHM 3: Initial Insulin Therapy ^{ADA1}



*The literature suggests detemir dosing is 15% to 30% higher than glargine, but you can start with the same dosing.

(a) “Honeymoon” phase

Frequently (but not always), endogenous insulin secretion temporarily improves within a few days to a few weeks of insulin therapy initiation. Clinically, this results in excellent control of blood glucose on a relatively low dose of insulin with little variability in day-to-day glucose values. This “honeymoon” phase can last from weeks to months; it ends gradually with increasing blood glucose and increasing insulin requirement.

(b) BG (blood glucose) monitoring frequency

- Before meals
- Before bedtime snack
- Before intense exercise (competition or athletic event)
- As needed, with symptoms of hyperglycemia or hypoglycemia (e.g., irritability, shakiness, sleepiness)
- As needed, per sick-day care instructions (about every 3 hours)
- For first 3–5 days after discharge, also monitor at 2:00 AM; discontinue if no nighttime lows

(c) Carbohydrates, per serving:

Bedtime snacks should contain about 15g carbohydrate PLUS protein. Examples:

- 6 ounces light yogurt, **OR**
- 1 small piece of fruit and cheese, **OR**
- 2 graham cracker squares and 4 ounces 2% milk

(d) Targets (type 1)

- Preprandial and pre-bedtime BG: 90–150 mg/dL (in children <3 years, consider targeting 100–200 mg/dL)

CARB-COUNT AND CORRECTION DOSE CARDS

Take the guesswork out of insulin dosing. Direct your patients to the [Primary Children’s Hospital website](#) for a complete list of carb-count dosing cards and correction dosing cards.

 Indicates an Intermountain measure

▶ ALGORITHM 4: Early Adjustments to Insulin Therapy ^{ADA1}

For the first several months of treatment, providers should expect to adjust initial therapy based on the patient’s response and changing needs, especially with respect to the “honeymoon” phase **(a)**. Therapy may also change based on the emerging picture of how the patient and family live with and manage diabetes.

▶ Diagnosis to 2 weeks: Monitor often, watch for nighttime lows**Blood glucose monitoring frequency (b)**

- ▶ **If BG before meals/snacks is <80 mg/dL:** Give 15 grams extra carbohydrate with the meal and cover the rest of the meal carbs. **(c)**
- ▶ **If BG before bedtime snack is:**
 - **<80 mg/dL:** Give 30 grams of carbohydrate snack WITHOUT insulin. Check again in 2 hours. If still low, give an additional 30 grams carbohydrate. **(c)**
 - **80 to 100 mg/dL:** Give 15 grams carbohydrate snack WITHOUT insulin. **(c)**
 - **>100 mg/dL:** No bedtime snack required.
 - If a snack is desired, give insulin for carbs, plus a high blood glucose correction dose IF NEEDED (according to correction dose card). **(c)**
 - If a snack is not wanted, give a high blood glucose correction dose, IF NEEDED (according to correction dose card).
- ▶ **If BG at 2:00 AM is consistently:**
 - **High (>200 mg/dL):** Increase the next day’s basal (long-acting) insulin dose by 10% to 20%.
 - **Low (<100 mg/dL):** Give 30 grams of carbohydrate. Check in 1 to 2 hours and continue to treat/re-check until BG is \geq 100 mg/dL. **(c)** Decrease next day’s basal (long-acting) insulin by 10% to 20%.

- **REVIEW patient BG records every 2 to 3 days.**
- **Diabetes educator should FOLLOW UP with patient and family within 14 days of diagnosis to reinforce basic DM education, skills (page 16).**

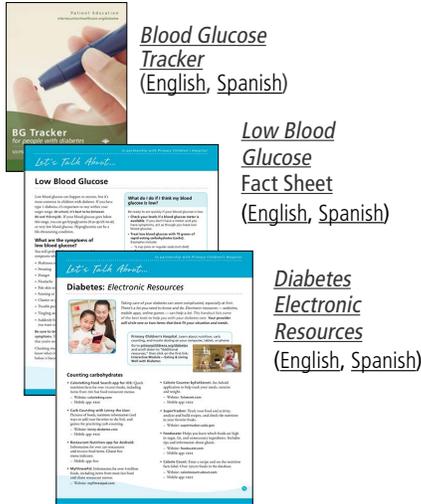
▶ 2 weeks to 2 months after diagnosis: Treat to target**ADJUST insulin, up or down 10%, to target BG (type 1) (d)** 

- **When adjusting, anticipate the “honeymoon” phase (a)** and consider the family’s skills and the patient’s ability to perceive blood glucose lows.
- **Review BG records** every 1 to 2 weeks by phone, or email over a 4- to 8-week period.
- **Basal (long-acting) insulin:**
 - **For toddlers:** Use late evening BG to adjust morning long-acting insulin. Adjust 10% to 20% once or twice in a week to reach target BG. **Note:** Because insulin must be drawn up in 0.5 unit increments in the syringe, the patient/family must round to the nearest 0.5 unit.
 - **For school-age children and adolescents:** Use breakfast fasting BG or middle-of-the-night BG to adjust evening long-acting insulin. Adjust 10% to 20%, once or twice in a week, to reach target BG.
- **Bolus (short-acting) insulin (insulin dose cards can be found on Intermountain.net)**
 - **Use post-breakfast (2 to 4 hours) BG** to adjust AM rapid-acting insulin; increase 5% to 10% to reach target BG.
 - **Use dinner or mid-afternoon BG** to adjust lunch rapid-acting insulin.
 - **Use bedtime BG** to adjust dinner rapid-acting insulin; increase 5% to 10% to reach target bedtime BG.

Note: Children <4 may not eat in a predictable way. Parents may dose rapid-acting insulin 20 minutes after child has started to eat based on carbohydrate intake to that point.

PATIENT RESOURCES

Point your patients to the following resources for optimal self-monitoring of blood glucose (SMBG):

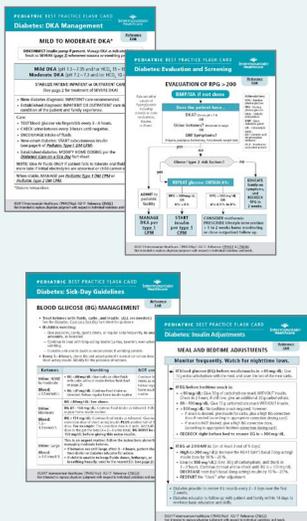


See page 17 for information on ordering patient education materials.

PROVIDER RESOURCES

Best Practice Flash Cards:

- [Diabetes: DKA Management](#)
- [Diabetes: Blood Glucose Evaluation and Screening](#)
- [Diabetes: Sick-Day Guidelines](#)
- [Diabetes: Insulin Adjustments](#)



Optimizing insulin regimens

In the first 2 months of insulin therapy, providers must regularly check blood glucose control and closely supervise any necessary insulin adjustments. After this time, work with a diabetes educator to help the patient and family optimize the patient’s insulin regimen further. Some suggestions:

- **Review glucose meter records every 1 to 2 weeks.** As you review the data, focus on **patterns and trends** rather than on individual numbers. For example, recognize if BG is always low after breakfast, always low after exercise, always high after pizza, etc. As needed, adjust insulin per these general principles:
 - **For hyperglycemia,** adjust insulin no more often than every 3 to 4 days (you want to see the full effect of the change before you make another). Remember, variations in daily activities can impact blood glucose levels, so take the time to find patterns. Raise insulin 10% to 20% at a time. This is generally a safe amount; however, be more conservative (raise insulin a smaller amount) when levels are close to target.
 - **For hypoglycemia with no known cause,** decrease the insulin daily until numbers are better; then, watch for a few days before the next adjustment. For mild lows, decrease insulin 5% to 10%. For severe lows, drop insulin 25%.
- **Use morning fasting glucose level** to adjust the nighttime dose of long-acting insulin. If morning (fasting) glucose is:
 - **Below target more than 3 days per week:** Decrease the nighttime dose of long-acting insulin by 10% to 20%. Check to see if the low morning glucose level was caused or influenced by a correction dose at bedtime. If so, address bedtime glucose first by adjusting dinnertime insulin; then, re-evaluate the morning glucose.
 - **Above target:** Increase the nighttime dose of long-acting insulin by 10%. (Adjust more slowly if there is a history of overnight hypoglycemia.) Instruct patient/family to test glucose between 12:00 midnight and 2:00 AM for 3 to 5 days to check for overnight hypoglycemia. The target for this middle-of-the-night reading is 100 mg/dL or higher.
- **Check glucose level every 4 hours if the child doesn’t eat regularly.** Glucose levels should be fairly stable while not eating during the day. If glucose consistently drops more than 30 mg/dL after going 4 hours or more without eating, consider decreasing the long-acting insulin by 10% to 20%.
- **Compare glucose levels from before a meal and from 2 to 4 hours after a meal** (postprandial blood glucose) to adjust the short-acting insulin dose.

TABLE 2: INSULIN ADJUSTMENTS

Relationship of BG Level to Target Range		Insulin adjustment	Example
BEFORE meal AND 2–4 hours AFTER meal*			
Within target	Above target	↑ for carb intake	1 unit: 15 g carbs instead of 1 unit: 20 g carbs
Within target	Below target	↓ per gram of carbohydrate	1 unit: 20 g carbs instead of 1 unit: 15 g carbs
Above target	Above target	↑ correction dosing	1 unit: 30 ml/dL above target instead of 1 unit: 50 mg/dL
Above target	Below target	↓ correction dosing	

*Before-meal and after-meal glucose readings should be within 50 mg/dL of each other.

KEY RECOMMENDATIONS

- **Know that “normal” childhood illnesses** (colds, flu, strep throat, and so on) can impact blood glucose. Teach patients and families to follow Intermountain’s *Diabetes: Care on a Sick Day*, which include frequent glucose monitoring and ketone testing plus adjustments to insulin, food, and fluid intake.
- **Carefully prepare for surgery or dental procedures.** Good glycemic control before, during, and after procedures is important to prevent infection and promote healing. Advise patients to:
 - Ask for the earliest possible slot for their surgery/procedure to shorten NPO time.
 - Call your endocrinologist at least 48 hours prior to surgery for recommendations.
 - Make any necessary monitoring, insulin, or dietary adjustments before surgery.
- **Treat other chronic illnesses without hesitation.** When initiating new medications, however, monitor the patient closely as some medications affect blood glucose levels.
- **Counsel young women on the high risks associated with pregnancy.** Discuss the use of contraception, especially for those taking metformin.
- **Know the impact of lifestyle decisions** on the risk for long-term complications. Emphasize that self-management isn’t just about daily medication. Daily choices and habits — physical inactivity, skipping insulin, smoking, recreational drug and alcohol use — profoundly impact long-term health.
- **Consider the increased risk for mental health conditions.** Watch for symptoms of anxiety, depression, and eating disorders in particular. Screen for mental health disorders at least annually.
- **Complete a medical evaluation and form attesting to the teen’s functional ability to drive.** (This is required in most states including Utah and Idaho.) As adolescents prepare to start driving, counsel patients and families about the risks of driving with low blood glucose. Regulations concerning diabetes and driving in all 50 states can be found on the [American Diabetes Association website](#).

▶ ROUTINE CARE AND DIABETES MANAGEMENT

A child or adolescent with diabetes needs ongoing medical care and monitoring, self-management education, and support. Numerous studies indicate that **children with chronic conditions, as compared with healthy children, carry about twice the risk of having significant behavioral or psychiatric problems.**^{NAB} Integrated wellness care — care that treats the whole child (including the caregivers) and responds to the changing circumstances of the family and child — can mitigate this risk and improve health outcomes.

Key goals and concerns

- **At annual well-child visits, screen for long-term complications.**  Reinforce to your patients with diabetes the importance of good diabetes control to lower their risk for long-term complications. See table 3 on [page 11](#) for more on comorbidity screening.
- **Two to 4 times each year, have a visit focused on diabetes.**  These visits should include HbA1c checks and review of BG records (as well as any other diabetes-related checks, per table 3 on [page 11](#)). Schedule education and wellness interventions to supplement with these diabetes-centered visits. The target is to **maintain a HbA1c goal of <7.5%** (or as close as possible) without episodes of severe hypoglycemia.
- **Continue to provide emotional and educational support to patient and family.** See [pages 13 and 14](#) for more information on developmental and wellness expectations.
- **Support the autonomy of the child.** The child must have guidance and supervision but also the freedom to assess options and make decisions concerning self-management tasks. The goal is to instill independence, responsibility, and competence in the patient. Some parents may need coaching to allow the child to develop a more autonomous relationship with healthcare providers.^{NAB}
- **Build and maintain a trusting relationship between adolescents and providers** to support transition to adult care.
 - Provide coaching to communicate concerns or questions.
 - Avoid threats concerning future health as this has not been shown to increase compliance.^{BEA}
 - Use motivational interviewing and a thorough assessment of what a patient is willing to do.
- **Facilitate a successful transition from pediatric to adult care.**  There is almost no scientific evidence as to the best means of making this transition. Anecdotal data from providers and families highlights the difficulty of this process. There is accumulating data nationally, and from Intermountain Healthcare, that suggests an unsuccessful transition results in increased utilization of healthcare resources and increased poor outcomes, largely due to lapses in health care, deteriorating control, increased frequency of acute complications, more behavioral health issues, and the emergence of chronic complications. The goal is to provide a seamless transition to independence and from pediatric care to an adult provider. Intermountain experts recommend beginning the conversation about transitioning to adult care while the patient is still an adolescent, focusing self-management skills on:
 - The child’s cognitive ability
 - Intellectual and emotional growth as well as development of autonomy as adulthood and the transition to adult care approaches



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CELIAC AND THYROID DISEASE

- **Celiac disease** is an autoimmune disorder that is more common in patients with type 1 diabetes (5% to 15%). Celiac disease can cause:

- Severe vitamin deficiencies, poor bone mineralization, joint pain, and anemia if not detected and treated
- Growth failure and delayed puberty due to malnutrition
- Weight loss
- Abdominal pain

Management. Patients need to follow a gluten-free diet, which can be a challenge. Nutritional counseling by a registered dietitian nutritionist (RDN) experienced in the management of celiac disease is necessary.

- **Autoimmune thyroid disease** is also more common in patients with type 1 diabetes (17–30%). Hypothyroidism is more common than hyperthyroidism. Children should be screened and followed longitudinally.
 - **Hypothyroidism** may be associated with increased risk of hypoglycemia and is associated with altered lipid metabolism and growth failure.
 - **Hyperthyroidism** alters glucose control and may be associated with worsening control.

Common comorbidities

Autoimmune diseases. Because these conditions tend to cluster together in families and in individuals, a child diagnosed with autoimmune diabetes (type 1) has an increased risk for other autoimmune disorders, most commonly **celiac disease** and **thyroid disease**. Since both of these can be silent early on, routine screening is recommended. Published recommendations range from testing annually to once every 5 years.^{ADA2} Intermountain pediatric experts recommend screening shortly after diagnosis (within 6 months when stable) and then every 2 to 3 years in asymptomatic individuals.

- **Celiac.** Screening is done with a TTG and IGA or deamidated gliadin peptides. There are false positives. If the TTG is positive, the child should be referred for a biopsy to confirm the diagnosis. Some experts feel that a very high level in these tests will preclude a biopsy. Consult with a pediatric gastroenterologist for guidance. Do not change the child's diet until a diagnosis is made.
- **Thyroid.** Current recommendations are for screening with free T4 and TSH, and/or thyroid antibodies (thyroid peroxidase antibody). If antibody-positive, the risk of developing clinically significant thyroid dysfunction is 5% per year. Those individuals may benefit from more frequent screening.

Cardiovascular risk factors. Historically, cardiovascular disease is increased in adults with type 1 diabetes. There is limited data available in children; the following recommendations are extrapolated from adult data:

- **High cholesterol.** Children >2 years should be screened at diagnosis once glycemia is controlled and then every 3 to 5 years if normal (LDL < 100). Consider more frequent monitoring if LDL > 100. In children > 10 years with an LDL > 160 (or > 130 with one or more risk factors present), pharmacologic intervention may be indicated. **Note:** There is no long-term safety or efficacy data available for children; short-term safety and efficacy data are equivalent to that seen in adults. Because statins are a category X medication for pregnancy, counsel young women accordingly.
- **High blood pressure.** Blood pressure should be measured accurately at each routine visit. Children with high normal (≥ 90 th percentile) or with hypertension (≥ 95 th percentile) should repeat measures on three separate occasions to confirm the diagnosis. Begin with dietary and lifestyle modification, and evaluate efficacy in three to six months. Pharmacologic intervention with an ACE inhibitor or ARB should be considered if hypertension is confirmed and does not respond to lifestyle intervention. These medications are category D medications for pregnancy, so young women should be counseled accordingly.

Microvascular complications. Historically, these complications have led to debilitating diseases in adulthood including renal failure and blindness. Screen for:

- **Kidney disease.** Annual screening (urine microalbumin/creatinine ratio) for albuminuria should start once the child has had diabetes for five years and is 10 years of age. If abnormal on a spot sample, confirm with a first-morning void. Intermountain policy is to obtain two to three, first-morning samples to confirm the diagnosis over one to three months. If confirmed, the child should be evaluated by a pediatric nephrologist. Treatment for diabetic nephropathy is with an ACE inhibitor.
- **Neuropathy.** Annual foot exams should be performed on children over 10 years or in puberty. This includes inspections, history of neuropathic pain, and vibration or monofilament sensation. Neuropathy rarely occurs in this age group.
- **Retinopathy.** A dilated eye exam is indicated for children who are 10 years of age or older and have had diabetes for three or more years. Repeat exams should occur every one to two years based on ophthalmologist recommendations and level of diabetes control. Adolescents who have been in very poor control and suddenly improve their control are at risk for acute changes in the retina and should be seen by the ophthalmologist within six months of improved control.

TABLE 3: ROUTINE CARE AND FOLLOW-UP FOR PEDIATRIC TYPE 1 DIABETES PATIENTS

Assess	Test(s)	When?			Targets & goals
		at DX	quarterly	frequency	
Blood glucose control 	<ul style="list-style-type: none"> HbA1c Review of SMBG records 		X		<ul style="list-style-type: none"> HbA1c (all ages): <7.5%* BG before meals and at bedtime/overnight: 90–150 mg/dL
*Do HbA1c testing at least twice a year if the patient is meeting set goals. Test quarterly if therapy changes or the patient fails to meet set goals.					
Appropriateness of pump therapy		As indicated, usually beginning 6 to 12 months after initial diagnosis.			Patient and family fit candidate profile described on page 12 .
Patient and family education	Ongoing education discussed on page 15–18	X	X		Patient and family demonstrates adequate proficiency at self-management.
Mental health conditions 	PHQ-2 depression screen: 1. Are you feeling down, depressed, or hopeless? 2. Have you lost interest or pleasure doing things?	X	X		If answer to either question is positive, or if you suspect a mental health disorder, assess further with MHI Child-Adolescent Baseline Packet
Physical activity	Physical activity vital sign (Pediatric PAVS) for pediatric patients assessment/score	X	X		<ul style="list-style-type: none"> Daily activity: 60 minutes, moderate to vigorous Screen time: <2 hours outside of school work
Normal growth	<ul style="list-style-type: none"> Height, weight plotted on a CDC or WHO growth chart Body mass index (BMI) 	X	X		<ul style="list-style-type: none"> Normal growth projection BMI <85% of normal for age (See pages 2 and 3 of the Lifestyle and Weight Management CPM for Children and Adolescents)
Hypertension 	Blood pressure	X	X		SBP or DBP <90th percentile for age, sex, and height
Dyslipidemia 	Fasting lipid profile	X once glycemia is stable		Beginning at age 10, then every 3 years if normal. Annually if abnormal.	LDL <100 mg/dL
Kidney disease 	Microalbumin/creatinine ratio			Annually, beginning at age 10 years, with diabetes duration of 5 years or greater	Microalbumin/creatinine ratio <30 mg/gm
Neuropathy, foot problems 	Neurology foot exam with 5.07 mono-filament or a tuning fork			Annually, beginning >10 years or at onset of puberty and 5 years after diagnosis	Normal
Retinopathy 	Dilated eye exam (refer to eye care specialist)			Every 1-2 years, beginning at age 10 OR at onset of puberty with diabetes duration of 3–5 years	Normal
Thyroid disease 	<ul style="list-style-type: none"> Thyroid stimulation hormone (TSH) Anti-thyroid antibodies 	X		Within 6 months of diagnosis and then every 3 years, as clinically indicated	Normal If antibodies present, screen more often.
Celiac disease 	Tissue transglutaminase antibody (TTA)	X		Within 6 months of diagnosis and then every 3 years, as clinically indicated	<4 U/mL (normal) If symptomatic, screen more often.
Adrenal antibodies	21-hydroxylase antibody			Consider if ≥1 autoimmune disorders (plus diabetes and symptoms)	Normal

► DIABETES TECHNOLOGY OPTIONS: PROVIDER FAQs

Continuous glucose monitor

A continuous glucose monitor (CGM) is a device that monitors glucose continuously in essentially real time. It can detect glucose rising or falling as well as rate of change. The CGM is worn continuously and the sensor lays just under the skin.

WHO'S A CANDIDATE FOR CGM USE?

Good candidates for CGM use include:

- All pediatric patients with diabetes, although some CGMs are not FDA-approved in very young children
- Those that have financial resources to cover CGM and ongoing supplies

CGMs can be used with multiple daily injection therapy or pump therapy (as reviewed below). If your patient is interested in CGM therapy, refer patient and family to meet with a diabetes educator.

A CHILD WITH AN CGM COMES TO THE HOSPITAL. WHAT DO I DO?

- Point of care testing is recommended but CGM data can be used in conjunction with this information.
- It is okay to continue to wear the CGM and use data, but must recognize:
 - CGM data are less reliable in acute illness (hypoxia, fluid/electrolyte imbalances, poor perfusion, edema, and vasoconstriction)
 - CGM technology is not FDA-approved for inpatient use

Note: In case of CGM error or other sensor issues, always use blood glucose meter to test.

Insulin Pump therapy

Insulin-pump therapy uses a small, computerized device to deliver rapid-acting insulin continuously throughout the day. This covers basal insulin needs and the patient-initiated bolus of insulin to cover meals and correction doses.

WHO'S A CANDIDATE FOR PUMP THERAPY?

Pump therapy is best initiated after diabetes treatment is well established, typically at least 6 months after diagnosis. Good candidates include patients who:

- Are motivated and engaged in self-management.
- Can habitually test BG at least four times daily or wear CGM consistently
- Demonstrate problem-solving skills (including correction doses, adjustments for exercise) and follow sick-day instructions.
- Want the pump and have good family support. (The parents' desire for a pump is not reason enough.)
- Have the financial resources to cover pump and supply costs.

If your patient is interested in pump therapy, refer patient and family to meet with an individual educator or attend pump preparation class.

Note: Successful pump therapy requires that the patient or family is engaged and directs the pump dosing. Insulin pumps do not automatically give insulin for high blood glucose and food.

SHOULD ALL TYPE 1 PATIENTS MOVE TO PUMP THERAPY?

Not necessarily. Because pumps allow for basal insulin adjustments throughout the day, they can help many patients achieve better, tighter control of their diabetes. However, pumps are not a good fit for every patient or family, and consideration is needed to choose appropriate candidates. The pump and supplies can also be cost prohibitive for some families. Some children with a pump may still have poorly controlled diabetes.

A CHILD WITH AN INSULIN PUMP COMES TO THE HOSPITAL. WHAT DO I DO?

Do NOT use the pump if the patient:

- Comes to the hospital in DKA. Remove the pump, and deliver insulin via IV or subcutaneously per the DKA order set.
- Is a suicide risk or is in the ICU.

Check to see if the criteria for inpatient pump use are met. If the child meets the criteria, follow the **Subcutaneous Insulin Pump, Patient Own** order set.

✓ KEY RECOMMENDATIONS

Children with type 1 diabetes need integrated care that responds to changing developmental and psychosocial needs.

Good care requires active management with the ultimate goal of good health and a safe transition to adult management. Care should include:

- Behavioral health screenings
- Anticipatory guidance
- Family-focused planning
- Increased autonomy of patient
- Smooth transition to adult care

WHAT IS MHI?

Mental health integration (MHI) is mental health care that is integrated into everyday primary care practice.

It's a team-based approach that promotes consultative and collaborative relationships between PCPs, care managers, and mental health specialists for appropriate patients.

The MHI approach reduces the burden on PCPs, improves clinical decisions, and allows patients and their families to receive an array of needed services within the primary care setting.

MHI's collaborative, team-based approach is well suited to the complexity of pediatric type 1 diabetes management.

Find MHI tools [here](#).



► WELLNESS ACROSS THE LIFESPAN

Like all chronic diseases, diabetes can have a profound psychological and emotional impact on a patient and their family.^{SCH} Numerous studies suggest that compared with healthy children, children with chronic conditions carry about twice the risk of developing significant behavioral or psychiatric problems.^{NAB} Adolescent patients with diabetes have a threefold increased risk of psychiatric disorders, primarily depression and eating disorders.^{LEV} Integrated wellness care — care that treats the whole child, includes the family and caregivers, and responds to changing needs and circumstances — can mitigate this increased risk and improve health outcomes.^{NAB}

Key mental/social goals of pediatric diabetes care:

- Help patients and families cope with the initial stress of diagnosis and the challenges of ongoing, lifelong care.
- Identify and respond to issues that affect diabetes management.
- Actively support good mental health. Teach coping skills and resilience; identify and treat mental health disorders.
- Prepare patient and family for expected developmental milestones, and eventually, the transition to adult care.

Specific recommendations for clinicians:^{LEV, ADA1}

- Refer to **care manager or social worker** for initial psychosocial assessments and interventions and to **mental health professionals** as indicated by screening.
- **Be alert and sensitive** to family style, situation, strengths, and challenges:
 - Lower socioeconomic status and chronic physical or mental health problems in a parent/guardian or other close family member are associated with poor diabetes control and increased hospitalizations.^{ADA1}
 - Particularly with adolescent patients, practice family-focused teamwork: establish a responsibility-sharing plan at the end of each patient visit.
- **Know the common “red-flag moments”** in the course of treatment when patients and caregivers are likely to need extra support such as when:
 - Dealing with fear, shock, and trauma of the diagnosis and its implications for change in the family's routine
 - Managing secondary emotional effects (one to six months after diagnosis) as patients/families experience the condition's impact on daily life
 - Entering new developmental stages (see table 4 on [page 14](#)) and dealing with related challenges
 - Changing schools or managing extended stays away from home
 - Initiating insulin-pump therapy
- **Regularly screen for mental health issues** per care guidelines, and refer patients and caregivers to mental health specialists, as needed.
- **Investigate diabetes management problems.** Psychosocial issues may underlie poor adherence and diabetes control. Note that eating disorders may take the form of intentional insulin misuse for weight control. Investigate any signs of disordered eating or intentional insulin misuse. Use the [Eating Disorders CPM](#) as appropriate.
- **Take an active role** in supporting the patient's transition to adult care by:
 - Begin preparing for the transition to adult care well before the actual move.
 - Creating a portable health summary for the patient to take to a new provider.
 - Being available for consults with a patient's new provider, when necessary.

Indicates an Intermountain measure

TABLE 4: DEVELOPMENTAL EXPECTATIONS AND SUGGESTIONS ADA1, LEV

Stages and ages	Normal developmental tasks	Diabetes management priorities	Common family issues	Provider tips: wellness care for the patient and family
Infancy (0 to 12 months)	Developing a trusting relationship or bond with primary caregiver(s)	<ul style="list-style-type: none"> Preventing and treating hypoglycemia 	<ul style="list-style-type: none"> Coping with stress Sharing the burden of care to avoid parent burnout 	<ul style="list-style-type: none"> Check in regularly with parents/caregivers: Implementing a safe daily-care regimen is extremely stressful. Refer caregivers as needed to mental health services, respite care, and self-help groups. Remind caregivers that episodes of hypoglycemia can resemble normal episodes of “oppositional behavior” (tantrums): Teach caregivers to measure blood glucose before ignoring a temper tantrum.
Toddler (13 to 36 months)	Developing a sense of mastery and autonomy	<ul style="list-style-type: none"> Preventing hypoglycemia Avoiding extreme fluctuations in blood glucose levels due to irregular food intake 	<ul style="list-style-type: none"> Establishing a schedule Managing the picky eater Coping with child’s lack of cooperation with regimen Sharing burden of care 	
Expected self-care tasks: Will need adult supervision for all tasks. Will need distraction to keep child still for insulin administration.				
Preschooler and early elementary school (3 to 7 years)	<ul style="list-style-type: none"> Developing initiative in activities and confidence in self Beginning early self-management skills 	<ul style="list-style-type: none"> Preventing hypoglycemia Coping with unpredictable appetite and activity Positively reinforcing cooperation with regimen 	<ul style="list-style-type: none"> Reassuring child that diabetes is no one’s fault Educating other caregivers about diabetes management Sharing the burden of care 	<ul style="list-style-type: none"> Continue regular “check-ins” with caregivers as mentioned above. As appropriate, encourage patient to begin sharing some responsibility for daily care; however, tell caregivers that it’s normal for children in this age to quickly lose interest in participating in care — caregivers should always supervise daily care.
Expected self-care tasks: Sitting still during treatment. Counting numbers on the dial. Repeating instructions and steps. Older children may show signs of wanting to take on more responsibility.				
Older elementary school (8 to 11 years)	<ul style="list-style-type: none"> Developing in athletic, cognitive, artistic, and social areas Consolidating self-esteem with respect to their peer group 	<ul style="list-style-type: none"> Finding flexible regimen to allow for participation in school or peer activities Teaching child short- and long-term benefits of optimal control Relying more on self-management skills 	<ul style="list-style-type: none"> Finding a balance between parental involvement and increased independent self-care Continuing education of school and other caregivers 	<ul style="list-style-type: none"> Teach and actively promote shared responsibility (child and caregiver) for daily management. Adult supervision still recommended for glucose testing and insulin administration. Encourage the child’s participation in sports and school activities. (May necessitate management changes.) Be alert to any emerging behavioral issues, social issues, learning difficulties, and depression.
Expected self-care tasks: Knows routine and may prompt caregivers. Can figure dosing, perform blood glucose testing, and self-administer insulin with adult supervision. Will need assistance with counting carbs. May initiate discussion about and request insulin pump.				
Early adolescence (12 to 15 years)	<ul style="list-style-type: none"> Managing body changes Developing a strong sense of self-identity Developing sexual identity 	<ul style="list-style-type: none"> Increasing insulin requirements during puberty Addressing more difficult diabetes management and blood glucose control Being sensitive to weight and body image concerns 	<ul style="list-style-type: none"> Renegotiating parent and teenager’s roles in diabetes management to be acceptable to both Learning coping skills to enhance ability to self-manage Preventing and intervening in diabetes-related family conflict 	<ul style="list-style-type: none"> Increase family-focused teamwork: Child should assume more responsibility for daily management, and family should provide supervision in an agreed-upon way that will lower chance of conflict. Explicitly address these topics with the patient: Puberty and contraception, lifestyle choices (nutrition and exercise, drugs and alcohol, smoking and other risky behaviors), healthy relationships, and good mental health. Monitor for mental health problems, especially eating disorders, depression, and anxiety. Continue to encourage participation in sports and extracurricular activities.
Expected self-care tasks: Can manage all SMBG tasks. Needs continued parental support to help them manage those tasks in context with a busy social schedule and extracurricular activities.				
Later adolescence (16 to 19 years)	Establishing a sense of purpose and identity after high school (decisions about location, social issues, work, and education)	<ul style="list-style-type: none"> Initiating discussion of transition to an adult diabetes team (begin discussion in adolescence) Integrating diabetes into new lifestyle 	<ul style="list-style-type: none"> Supporting the transition to independence Learning skills to enhance ability to self-manage Preventing and moderating diabetes-related family conflict 	<ul style="list-style-type: none"> Continue family-focused teamwork, screenings and discussions, and routine care recommendations as discussed above. Monitor for mental health problems, especially eating disorders, depression, and anxiety. Teach adolescents to test blood glucose before driving — emphasize the risks of driving while hypoglycemic (a common problem). Begin preparations for transitioning to an adult care provider.
Expected self-care tasks: All of the above, plus work with provider to create portable medical summary; attend transition appointments; complete associated tasks for transition to adult care.				

✓ KEY RECOMMENDATIONS

Survival education requires patients to master important technical skills and information in a short time. To help meet this challenge:

- **Keep it simple.** Offer basic, actionable information and hands-on skills training. Use “teach-back” to assess and enhance patient and family understanding.
- **Use professionals experienced in diabetes education.** Ideally, the team will consist of a physician or other licensed practitioner, Certified Diabetes Care and Education Specialist (CDCES), registered dietitian nutritionist (RDN), and a mental health professional.
- **Personalize and be sensitive to family dynamics.** Education should be tailored to patient’s age, needs, capacities, and interests. Be sensitive to the family’s culture and lifestyle.
- **Limit initial education to basic diabetes management for patient and family.** Provide additional materials for further learning over time, using technology resources when appropriate and possible for the family to access.

▶ PATIENT EDUCATION

“Survival” education

Initial “survival” education requires 12 to 20 hours of intense instruction and must begin immediately upon the diagnosis of diabetes while the patient is in the hospital. The goal is to ensure that the patient and family have the minimum level of knowledge and skills needed to assume responsibility for day-to-day diabetes management before the patient goes home. After discharge, “survival” topics will be reinforced, extended, and augmented as needed.

Learning curriculum

The list below presents the main topics of initial patient and family education. It outlines the **knowledge (K)** and **key skills (S)** to be acquired before the patient can be safely discharged. (Specific learning objectives and recommended patient resources appear in tools listed in table 5 below.)

- Pathophysiology of diabetes (**K**)
- Self-monitoring of blood glucose (SMBG) and ketone testing (**K, S**)
- Insulin therapy, glucagon, and/or other medication (**K, S**)
- Carbohydrate counting (**S**)
- Hypoglycemia and hyperglycemia (**K, S**)
- Diabetes management at home (**S**)
- Sick-day care (**K, S**)

TABLE 5: TOOLS FOR INITIAL “SURVIVAL” EDUCATION

For patients and families

<u><i>Diabetes Basics for kids, teens, parents, and families</i></u> (English, Spanish)	Comprehensive binder of all type 1 and type 2 diabetes basic education and resources
<u><i>Diabetes Nutrition</i></u>	Online learning module
<u><i>Diabetes: Care on a Sick Day</i></u> (English, Spanish)	Handout with instructions for sick-day care
<u><i>Insulin Carb-Count Dose cards</i></u> (English & Spanish)	Quick reference tools for patients and staff (carb-count dose, correction dose)
<u><i>Diabetes: Electronic Resources</i></u> (English, Spanish)	Handout that lists e-resources for diabetes management

KEY RECOMMENDATIONS

- **Make sure** patients and families have 24/7 phone access to the diabetes care team at discharge.
- **Schedule** a follow-up, face-to-face education session (consult or class) within two to four weeks of diagnosis.
- **Schedule** additional educational sessions should health literacy (page 17) and/or compliance be a concern.
- **Continue** education at least annually and with any change in therapy.
- **Focus** on increasing the patient's own responsibility and motivation for good diabetes self-management continuously over time.
- **Address** key psychosocial challenges and concerns as developmental milestones approach.
- **Focus** on skill development for a successful transition to adult care.

PATIENT RESOURCES

Point your patients to the following resources for optimal BG control:



Injection Site Rotation
(English, Spanish)



Diabetes, Exercise, and Sports
(English, Spanish)



Diabetes: Care on a Sick Day
(English, Spanish)

See page 17 for information on how to order patient education materials.

Continuing education

Patients and families coping with diabetes need support and education beyond the initial hospitalization.

- **In the first few weeks after discharge, have a team member available 24/7 to provide support to the family, as needed.** Arrange phone calls or clinic visits as the family learns to manage diabetes at home.
- **Schedule an in-depth diabetes education consult or class to take place within the first two to four weeks.** This education session should reinforce the key skills learned in survival education and introduce additional concepts that the patient and family needs to learn. This session should include discussion of:
 - **Emotional/social concerns.** Learn about and discuss common reactions of patients and their families. Offer coping strategies.
 - **Blood glucose.** Review and reinforce knowledge of targets, checks, and meter use. Answer typical questions on every aspect of BG self-management.
 - **Insulin and medications.** Emphasize injections and site rotation, correction doses, carb-count doses, sick-day care, and glucagon use.
 - **Diabetes technology.** This includes the continuous glucose monitor (CGM) insulin pumps. It should also provide information about technology and insurance requirements.
 - **Nutrition.** Coach on carb counting and meal preparation activities; address meals away from home; provide answers to typical questions concerning flexibility and variety in meals.
 - **Physical activity.** Stress importance of activity and need for caution; address insulin and carb needs during intense exercise; stress the need to educate coaches and instructors on hypoglycemia and BG management during activity.
 - **Diabetes management of school and daycare.** Set up individualized plans for school and daycare management; help families teach others how to implement plans; offer resources to help them learn more.

In addition, patients and families need ongoing education to meet the challenges of new schedules, environments, treatments, goals, and activities at different stages of development.

See the table on pages 18 and 19 for forms and tools addressing various aspects and phases of pediatric diabetes education.

KidsHealth, an online resource available through the Primary Children's website, hosts a [Diabetes Center](#) for three audiences: Parents, kids, and teens.

[Access videos, stories, recipes and self-care tips](#) for initial education and beyond.



HEALTH LITERACY: KEY CONCEPTS

Health literacy is not just the ability to read, but to understand concepts and act on instructions with confidence.

If the child and/or caregivers exhibit low-literacy skills, the child may have poor glycemic control.^{HAS} To ensure compliance with survival education and ongoing BG self-management, physicians and educators need to:

- **Understand barriers to readiness.** Language, education, financial, cultural, and mental health concerns may prevent adoption of necessary BG self-management goals.
- **Focus on “Teach me 3.”** Evidence suggests that it’s easier for a newly diagnosed patient and family to understand and comply with key education concepts when delivered in three smaller segments at a time.
- **Practice “teach-back” concepts.** Ask the patient and/or caregivers to repeat instructions as well as key goals and concepts of SMBG. This assures the provider that the patient and/or caregiver understand and can manage BG self-management techniques.

Key goals and concerns of continuing education

This CPM recommends education sessions at least once a year with a certified diabetes educator (CDCES) and as needed. Note that many education issues overlap with patient and family psychosocial concerns. See the section on wellness, [page 13](#). Key education activities for the provider and team include:

- **Assessing self-management** and updating treatment goals as needed. Increase patient independence for self-care as age and cognitively appropriate.
- **Anticipating issues that may affect self-management and treatment.** These may include beginning school and transitioning through the education continuum; starting a sport or other activity program; puberty, driving, smoking, alcohol and substance use, and sexual activity.
- **Addressing nutrition concerns** such as weight management, celiac disease, eating disorders, “diabulimia,” and lipid abnormalities.
- **Educating about ongoing changes in diabetes technology** including insulin pumps, CGMs, meters, apps, etc.
- **Reinforcing the importance of optimizing blood glucose control** to prevent microvascular and macrovascular complications.
- **Preparing for transition to adult care.** Remember that this transition is as much about patient and family readiness as it is about specific diabetes knowledge.

Locating education materials

Education materials are designed to support your efforts to educate and engage patients and families. They complement and reinforce diabetes team interventions by providing a means for patients to reflect and learn in another mode and at their own pace.

Table 6 on page 18 identifies Intermountain materials recommended for supporting pediatric type 1 diabetes education.

To access these materials:

- In **iCentra**, search for Intermountain items in the patient education module.
- **Log in to intermountainphysician.org.** Click on **Programs & Services** and select **Patient Education Network** to access the patient education library. Search the item number and title in the **Search** field.
- Use **Print It!**, Intermountain’s design and print services, for one-stop access and ordering for all Intermountain materials such as fact sheets, booklets, and trackers. If you need any assistance, call 801-442-2900.

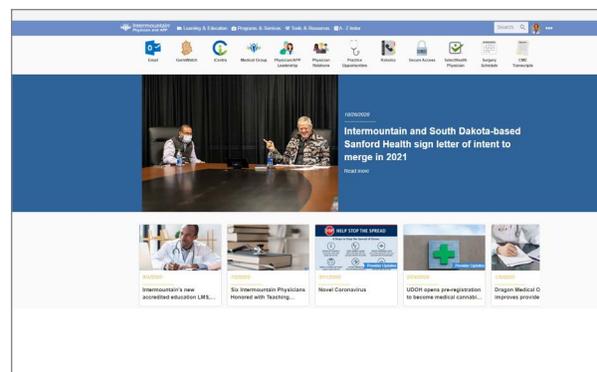
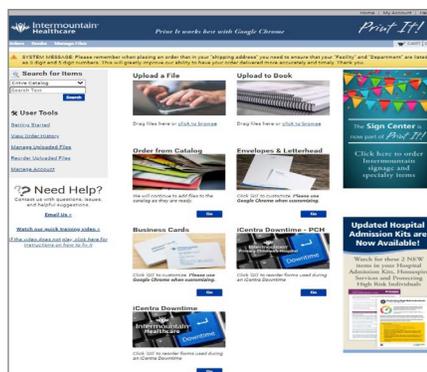


TABLE 6: RECOMMENDED PATIENT AND FAMILY EDUCATION MATERIALS FOR PEDIATRIC DIABETES

Topic and Education item	Type	Use*	Notes on content
GENERAL overview, and introductory topics or “survival” tools for patients			
<i>Diabetes Basics</i> (English, Spanish)	Book	1	Comprehensive (but brief) information on all survival topics
<i>Diabetes Nutrition</i> (English)	Learning module for electronic tablet or computer	1, 3	Nutrition education (carb counting)
<i>Diabetes: Electronic Resources</i> (English, Spanish)	Fact sheet/Handout	1, 3	Lists e-resources for DM management
<i>Diabetes: Care on a Sick Day</i> (English, Spanish)	Fact sheet/Handout	1, 3	Food and insulin management for sick-days
<i>Insulin Carb-Count Dose cards</i> (English & Spanish)	Quick reference tools for patients (online and print)	1, 3	Carb-counting, correction doses
<i>Low Blood Glucose</i> (English, Spanish)	Fact sheet/Handout	1, 3	Information on LBG and how to manage it
<i>Injection Site Rotation</i> (English, Spanish)	Fact sheet/Handout	1, 3	Explains site rotation and injection instructions
<i>Driving with Diabetes</i> (English)	Handout	2	Provides information about driving safely and getting a license
MONITORING BG			
<i>Your A1c Test</i> (English, Spanish)	Fact sheet/Handout	2	Encourages compliance to achieve healthy A1c
<i>Diabetes: HbA1c and Self-Testing</i> (English, Spanish)	Fact sheet/Handout	2	Explains A1c and correlates with SMBG readings
INSULIN ADMINISTRATION			
<i>Insulin Carb-Count Dose cards</i> (English & Spanish)	Quick reference tools for patients (online and print)	1, 2	Carb count dose, correction dose cheat sheet
<i>Injection Site Rotation</i> (English, Spanish)	Fact sheet/Handout	2	Explains importance of site rotation; includes injection instructions
<i>Diabetes Medications: Insulin</i> (English, Spanish)	Fact sheet/Handout	1, 2	Explains the various types of insulin used to treat diabetes
MONITORING BG			
<i>Diabetes: HbA1c and Self-Testing</i> (English, Spanish)	Fact sheet/Handout	2	Explains A1c and correlates with BG self-management readings
HYPOGLYCEMIA, GLUCAGON			
<i>Low Blood Glucose</i> (English, Spanish)	Fact sheet/Handout	1, 2	Explains low blood glucose and how to avoid/manage
<i>Diabetes Medicines: Glucagon</i> (English, Spanish)	Fact sheet/Handout	1, 2	Gives specific instructions for using glucagon
<i>Mini-dose glucagon</i> (English, Spanish)	Fact sheet/Handout	2	Gives specific instructions for using a small dose of glucagon
SICK DAYS, HYPERGLYCEMIA			
<i>Diabetes: Care on a Sick Day</i> (English, Spanish)	Fact sheet/Handout	1, 2	Handout; discusses food and insulin management on sick days
NUTRITION & MEAL PLANNING			
<i>The Traffic Light Eating Plan</i> (English, Spanish)	Fact sheet/Handout	3	Provides information about choosing healthy foods
<i>Diabetes Nutrition</i> (English)	Learning module for electronic tablet or computer	1, 2	Nutrition education (carb counting)
<i>Carb Counselor</i> (English, Spanish)	Pocket guide	1, 2	Advice and tools for counting carbs
<i>Meal Plan Basics</i> (English, Spanish)	Fact sheet / Handout	3	Serving and nutrition information
<i>Celiac Disease (Gluten Intolerance)</i> (English, Spanish)	Fact sheet/Handout	3	Explains celiac disease and how it is diagnosed and treated
<i>Living gluten-free</i>	Booklet	3	A guide for kids, adults, and families
<i>Meal Plan</i> (English, Spanish)	Fact sheet/Handout	3	Meal chart for tracking
EXERCISE & ACTIVITY			
<i>Diabetes, Exercise, and Sports</i> (English, Spanish)	Fact sheet/Handout	2	Monitoring and carb intake before, during, and after activity

*Use for: 1. Initial patient and family education 2. Continuing education 3. Only as needed

INTERNET RESOURCES

The *Diabetes Electronic Resources* handout has a list of websites and apps to help patients and families navigate the challenges of living with type 1 diabetes. Additional information can be found at the following locations online:

- [Primary Children’s Hospital](#)
- [Kid’sHealth](#)
- [American Diabetes Association](#)
- [American Academy of Pediatrics](#)
- [Juvenile Diabetes Research Foundation \(JDRF\)](#)
- [Joslin Diabetes Center](#)
- [Barbara Davis Center for Diabetes](#)
 - [A First Book for Understanding Diabetes, 12 edition \(The Pink Panther books\)](#)
 - [Understanding Insulin Pumps and Continuous Glucose Monitors](#)

▶ TEAM ROLES AND RESOURCES

Team-based, patient-centered management

Caring for pediatric diabetes patients and their families requires expertise, coordination, and effort from every member of a multidisciplinary care team, from diagnosis through the transition to adult care. Suggested roles and responsibilities appear in the table below.

TABLE 7: KEY ROLES AND RESPONSIBILITIES

Roles	Possible responsibilities
<ul style="list-style-type: none"> • Primary care physician (PCP) OR • ED or other hospital physician 	Diagnose type 1 or type 2
Diabetes specialist and medical team	Manage newly diagnosed DM and any DKA
All with expertise in pediatrics and DM: <ul style="list-style-type: none"> • Registered nurse (RN) • Registered dietitian nutritionist (RDN) • Certified Diabetes Care and Education Specialist (CDCES) • Social worker (LCSW) and/or MHI coordinator • Transition team 	<ul style="list-style-type: none"> • Conduct initial patient/family education • Support 24/7 transition to outpatient care • Provide routine follow-up education and wellness checks • Educate and guide during transition to adult care
<ul style="list-style-type: none"> • Diabetes specialist 	<ul style="list-style-type: none"> • Provide ongoing management of DM including monitoring and adjustment of therapy and oversight of patient/family education and wellness
<ul style="list-style-type: none"> • Primary care provider (PCP) 	<ul style="list-style-type: none"> • Make referrals as indicated (endocrinology, mental health, transition to adult care) • Provide routine care and wellness exams

Building your team

- Find a Certified Diabetes Care and Education Specialist (CDCES) with experience working with pediatric patients and their families here: <https://intermountainhealthcare.org/locations/primary-childrens-hospital/medical-services/diabetes/>.
- Contact the Primary Children’s Hospital Diabetes Clinic: 801-662-1640.

Related Care Process Models (CPMs):

- [Pediatric Type 2 Diabetes](#)
- [Management of Eating Disorders](#)
- [Lifestyle and Weight Management for Children and Adolescents](#)



CPM DEVELOPMENT TEAM

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This CPM presents a model of best care based on the best available scientific evidence at the time of publication. It is not a prescription for every physician or every patient, nor does it replace clinical judgment. All statements, protocols, and recommendations herein are viewed as transitory and iterative. Although physicians are encouraged to follow the CPM to help focus on and measure quality, deviations are a means for discovering improvements in patient care and expanding the knowledge base. Send feedback to Janet Sirstins, Manager, Primary Children's Hospital Diabetes Program, Intermountain Healthcare, Janet.Sirstins@imail.org.

▶ REFERENCES

- AAP Davis AM, Brown RF, Taylor JL, Epstein RA, McPheeters ML. Transition care for children with special health care needs. *Pediatrics*. 2014;134(5):900-908.
- ADA1 American Diabetes Association. *Diabetes Care: Standards of Medical Care in Diabetes*. (Supplement published every January).
- ADA2 Chiang JL, Kirkman MS, Laffel LM, Peters AL; Type 1 Diabetes Sourcebook Authors. Type 1 diabetes through the life span: A position statement of the American Diabetes Association. *Diabetes Care*. 2014;37(7):2034-2054.
- BEA Beacham BL, Deatrick JA. Health care autonomy in children with chronic conditions. *Nursing Clinics of America*. 2013;48(2):308-317.
- HAS Hassan K, Heptuila RA. Glycemic control in pediatric type 1 diabetes: Role of caregiver literacy. *Pediatrics*. 2010;125(5):e1104-e1108.
- LEV Levitsky LL, Misra M. Management of type 1 diabetes mellitus in children and adolescents. UpToDate. <https://www.uptodate.com/contents/management-of-type-1-diabetes-mellitus-in-children-and-adolescents>. Updated December 22, 2015. Accessed November 23, 2016.
- NAB Nabors LA, Lehmkuhl HD. Children with chronic medical conditions: Recommendation for school mental health clinicians. *J Dev Physl Disabil*. 2004;16(1):1-15.
- SCH Scholes C, Mandieco B, Roper S, Dearing K, Dyches T, Freeborn D. A qualitative study of young people's perspectives of living with type 1 diabetes: Do perceptions vary by levels of metabolic control? *J Adv Nurs*. 2013;69(6):1235-1247.