This care process model (CPM) was developed by Intermountain Healthcare’s Pediatric Clinical Program. It provides guidance for identifying and managing diabetes in children, educating and supporting patients and their families in every phase of treatment and development, and preparing our pediatric patients to successfully manage their diabetes and transition to adulthood. This CPM is based on several guidelines from the American Diabetes Association (ADA), particularly the 2020 position statement Standards of Medical Care in Diabetes, as well as the opinion of local clinical experts in pediatric diabetes.

Why Focus on Pediatric Type 2 Diabetes?
Diabetes has long been one of the most common chronic diseases among children in the United States, and reports suggest increasing frequency of both type 1 and type 2 diabetes in youth. The growing prevalence of obesity in youth populations may make it difficult to differentiate between type 1 and type 2 diabetes. In fact, up to one-third of type 2 patients may have ketonuria present with DKA. Care must be taken to adequately test and differentiate at the time of diagnosis.

Diabetes in childhood carries an enormous burden for patients and their families and represents 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. This update aims to build on the success of the initial model by providing:

• Updated recommendations for diagnostic testing, blood glucose control, and follow-up care.

• A more comprehensive view of treatment that emphasizes lifestyle management and psychosocial wellness for patient and family and lays a foundation for better health over the lifespan of the patient.

• Information and tools to support diabetes care by nonspecialist providers, which is key for coping with the increasing number of pediatric diabetes patients as well as for responding to patient need for community-based care.

• An emphasis on preparing pediatric 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.

Key messages
• Distinguishing between type 1 and type 2 at diagnosis is critical.
• Individualized medical therapy is key to successful management.
• Ongoing emphasis on healthy diet and lifestyle, including RDN referral and ongoing nutrition counseling, is also important for successful management.

What’s Inside?

Type 2 Management Road Map
Algorithms:
Algorithm 1: Differential diagnosis
Algorithm 2: Monitoring and management
Medical Management
Treatment Goals for Preventing Complications
Routine Care and Wellness Expectations
Ongoing Follow Up
Patient Education
References

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

• Diagnostic criteria including age, BMI, number of risk factors, and confirmatory lab results (fasting plasma glucose and fasting peptide)
• Hemoglobin A1c < 7.0% (<6.5% in select populations and <7.5% if there is an increased risk of hypoglycemia)
• Regular screening for comorbidities including blood pressure, lipid profile, nephropathy screening, and an eye exam

• Referral to lifestyle therapy
• Mental health evaluation

Indicates an Intermountain measure
MANAGEMENT ROAD MAP: PEDIATRIC TYPE 2 DIABETES

**NEWLY DIAGNOSED TYPE 2 DIABETES**

**ADMIT to the hospital for INITIAL MANAGEMENT**
**TREAT in clinic as OUTPATIENT (medically stable, no DKA, no insulin)**

**Education**
- Focus: Teaching basic skills and information to prepare patient for safe self-management at home (approx. 8 – 12 hours of learning)

**Medication & Monitoring**
- Focus: Stabilizing patients in diabetic ketoacidosis (DKA)
- Initial management, especially if insulin therapy needed
- Provider tools:
  - In the Pediatric Type 1 Diabetes CPM: Management of DKA (page 4)
  - Initial Insulin Therapy (page 6)
  - In this CPM: Medical Management (page 4)

**Wellness**
- Focus: Helping patient and family cope with stress of diagnosis
- Assessing family support and needs
- Integrating lifestyle management

**Provider tools**
- Lifestyle and Weight Management for Children and Adolescents CPM
- Treatment Goals for Preventing Complications (page 6)

**PCP and care team provide ongoing management**

**Education**
- Focus: Support for patient/family management at home (phone calls, visits)
- Follow-up education 2 – 4 weeks after diagnosis
- Support for patient and family for self-management of diabetes
- Healthy choices & management: nutrition, activity, weight, symptoms, medication

**Medication & Monitoring**
- Focus: Optimized medical management
- Complications monitoring

**Wellness**
- Focus: Regular emotional/mental health wellness checks
- Challenges and issues addressed that may create or underlie management problems
- Common comorbidities addressed such as PCOS, high BP, eye conditions, dyslipidemia, and renal disease

**Provider tools**
- Routine Care and Wellness (page 7)
- Lifestyle and Weight Management for Children and Adolescents CPM

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**TRANSITION to Adult Care**

- Focus: Ensure patient has portable health record to share with adult care team
- Work with adult care team to facilitate a smooth transition
**ALGORITHM 1: DIFFERENTIAL DIAGNOSIS**

**Meets type 2 screening criteria**

1. Age ≥ 10 years (or at onset of puberty if it occurs at a younger age) **AND**
2. Overweight: BMI > 85th percentile **AND**
3. Any 2 of the risk factors listed at right

<table>
<thead>
<tr>
<th>Type 2 risk factors:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family history of type 2 diabetes in 1st or 2nd degree relative <strong>(a)</strong></td>
</tr>
<tr>
<td>High-risk race/ethnicity (American Indian/Alaska Native, African American, Hispanic, Asian/Pacific Islander)</td>
</tr>
<tr>
<td>Signs of insulin resistance or conditions associated with it (acanthosis nigricans, hypertension, dyslipidemia, or PCOS)</td>
</tr>
<tr>
<td>Mother has diabetes or had gestational diabetes when pregnant with this child</td>
</tr>
</tbody>
</table>

**Note:** Value must be confirmed on a second day before a diagnosis can be made.

**Additional tests to CONFIRM within 1–2 days (do all) **(b)**

- FPG > 126 mg/dL
- HbA1c > 6.5%
- Fasting c-peptide > 3 ng/mL
- Electrolytes
- BUN
- Creatinine
- Urine dipstick and ketones
- Venous or capillary pH

**Consistent with type 2 diabetes**

**ADMIT** child to a facility with pediatric resources for DKA management.

**CONSIDER** additional labs to CONFIRM type if previous tests inconclusive

- GAD AB ≥ 1.45 units/mL
- IA-2 ≥ 0.8 units/mL
- Insulin AB > 0.4 units/mL
- ZnT8 AB > 15 units/L

**Type 1 Management**

(See Pediatric Type 1 Diabetes CPM)

**Type 2 Management**

(See Pediatric Type 1 Diabetes CPM)

**Abbreviations:**

- DKA = diabetic ketoacidosis
- FPG = fasting plasma glucose
- GAD AB = glutamic acid decarboxylase antibody
- HbA1c = glycated hemoglobin
- IA-2 = insulinoma antigen 2
- PPG = postprandial plasma glucose
- RPG = random plasma glucose

**Note:** If test results are inconsistent, consult with pediatric endocrinologist for help identifying type. Note that 5–10% of type 1 patients test negative for these antibodies and may require additional testing. However, it is safe to begin treatment while awaiting test results.

**RISK FACTORS**

- 1st degree relative: Parent, sibling, or child
- 2nd degree relative: Uncle, aunt, nephew, niece, grandparents, half-sibling

**ADDITIONAL TESTING**

Recent studies question the validity of HbA1c as a diagnostic test in pediatric populations. Testing should be confirmed by FPG or a 2-hour OGTT. When repeating FPG, it’s a good idea to order a fasting c-peptide at the same time.

Several circumstances can temporarily elevate a child’s blood glucose including intercurrent illness, steroid use, trauma, seizures, and genetic syndromes.

Medications, such as glucocorticoids, thiazide diuretics, and atypical antipsychotics, can increase the risk of diabetes.

For a child with abnormal blood glucose without diabetes symptoms (polyuria, polydypsia, blurry vision, weight loss):

- Inform the family of the abnormal result and its likely cause.
- Encourage the family to follow up with their primary care or other physician.

**PREDIABETES**

The data surrounding prediabetes is less well known in the pediatric population. Adults with this profile usually go on to develop type 2 diabetes in 5 years’ time. Address risk factors with early interventions.

**OTHER CAUSES OF NON-TYPE 1 DIABETES**

- Neonatal diabetes can be transient or permanent and occurs in infants < 6 months. Genetic testing can identify gene defects and direct management.
- Maturity onset diabetes of youth (MODY) is a group of disorders of monogenic defect in beta cell function. Diagnostic criteria:
  - Dominant inheritance of up to 2 (preferably 3) affected generations
  - At least 6 genetic defects can be tested
  - Onset is subtle and generally occurs < 25 to 30 years
  - May be clinically apparent only with illness or pregnancy
  - Type 1 antibodies are negative
- Monogenic diabetes syndrome represents < 5% of diabetes cases. It is characterized by onset of hyperglycemia at an early age (< 25 years).
**TYPE 2 MEDICAL MANAGEMENT**

Management of type 2 diabetes typically includes these three strategies:

1. **Lifestyle modification.** Diet, exercise, and weight maintenance are central components of self-management for children and adolescents with type 2 diabetes. Education materials and other support required for lifestyle changes must be tailored to younger patients, include their families, and be customized to the family’s cultural considerations to achieve success. Note that type 2 diabetes seems to be more aggressive in children and adolescents as compared to adults.

2. **Oral medications.** Metformin (oral only) and liraglutide (injection only) are the only hypoglycemic agents that have been reliably studied and used in children and adolescents and are FDA-approved for use in this population. FLI (Per labeling, metformin is not recommended for use in patients under age 10 years.) FLI There are indications for use of other oral hypoglycemic agents (sulfonylureas, thiazolidinediones) in pediatric populations for less common or rare types of diabetes. Consultation with a pediatric endocrinologist is recommended before prescribing. Adolescent patients often need to be followed more frequently and are more likely to need insulin earlier in treatment than adults. Recent literature suggests that responsiveness to therapy is often influenced by ethnicity and gender. TOD Care management and access to community support is essential.

Metformin does have some side effects that can be particularly troubling in adolescent patients and may limit compliance. At the beginning of therapy, metformin is frequently associated with some gastrointestinal discomfort and/or diarrhea. This can be managed by adjusting the dose and ensuring that the metformin is taken with food. Metformin can also increase ovulation in young women. This can increase the likelihood of pregnancy with unprotected sex. Young women with diabetes who are taking metformin should be counseled on contraception use.

3. **Insulin therapy.** For patients who cannot achieve glycemic control with lifestyle modification and oral medication, insulin may be appropriate. Insulin is also needed at diagnosis in children with very high BG or A1c > 9%. Eventually, insulin is likely to be needed to maintain glucose control. When prescribing insulin, tailor the regimen to the individual, taking into consideration family support, cultural considerations, and the family’s ability to comply with a complex regimen. See the algorithm on page 5 for the recommended approach for medical management of type 2 diabetes in children and adolescents.

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**TABLE 1: Non-insulin medication for pediatric type 2 diabetes**

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Brand Name</th>
<th>Usual Dosing</th>
<th>AWP Cost*</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
</table>
| metformin/metformin ER | Glucophage/Glucophage XR | **Starting dose:** 500 mg once a day  
**Titration:** To a maximum of 1,000 mg twice a day | **Generic:** $10–90 per month | • Minimizes weight gain (preferred for obese patients)  
• Favorable lipid effects  
• No hypoglycemia  
• Maximum BG effect 3 to 4 weeks after initiation | • May cause GI distress (nausea/diarrhea)  
• Increases risk of acidosis (very rare but serious):  
  – Use with caution in patients with chronic heart failure, chronic liver disease, history of alcohol abuse, or renal failure.  
  – Monitor renal function regularly; Risk increases with age.  
• Increases pregnancy risk  
• MUST NOT be used during pregnancy |
| liraglutide | Victoza | **Starting dose:** 0.6 mg SQ daily  
**Titration goal:** To a maximum of 1.8 mg SQ daily | | • Some weight loss | • GI upset (nausea/vomiting/diarrhea)  
• Contraindicated in patients with history (or family history) of medullary thyroid carcinoma (MTC) or multiple endocrine neoplasia syndrome type 2 (MEN2) |

Note: *AWP = Average Wholesale Pricing; subject to change.*
**ALGORITHM 2: MONITORING AND MANAGEMENT**

**CONFIRMED type 2 diabetes**

- **(A1c < 9%)**
- **(A1c > 9%)**

**REFER** to Pediatric Type 1 Diabetes CPM for basal/bolus insulin initiation

**INCLUDE in initial treatment**

- PROVIDE education and referrals (a) (page 11)
- INITIATE metformin therapy:
  - Starting dose: 500 mg by mouth once a day with meals for 7 to 14 days
  - If tolerated, increase dose to 500 mg twice daily
- FOLLOW UP in 4 weeks to assess glucose control

**PERFORM AT 4-week visit**

- PROVIDE follow-up education (a) (page 11)
- CHECK compliance with oral medications and REINFORCE lifestyle self-management as necessary
- TITRATE metformin dose every 1–2 weeks to a maximum dose of 1,000 mg twice daily as needed to achieve glucose control
- REASSESS in 2–4 months

- Is HbA1c < 7.5% AND BG 90 – 150 mg/dL before bedtime/overnight?
  - yes
  - no

**ADDRESS at 2- to 4-month visit**

- CONSIDER adding basal insulin or liraglutide to metformin (b)
- CONSULT with a pediatric endocrinologist before trying other oral antiglycemic agents (c)
- REASSESS 4–6 weeks after insulin initiation

- Is HbA1c < 7.5% AND BG 90 – 150 mg/dL before bedtime/overnight?
  - yes
  - no

**MAINTAIN ongoing follow-up**

- MONITOR HbA1c, and REVIEW BG data (from self-monitoring of blood glucose or SMBG) at least quarterly
- FOLLOW other routine care guidelines summarized on pages 7–10

**REFER** to pediatric endocrinologist (c)

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(a) **EDUCATION FOR TYPE 2**

Education for type 2 is focused on lifestyle and self-management. In addition to teaching the standard diabetes education curriculum, make sure education includes:

- A personal exercise plan.
- Appropriate nutrition education. See page 11 in this CPM, and/or the Lifestyle and Weight Management for Children and Adolescents CPM as needed.

(b) **GUIDELINES FOR ADDING INSULIN TO METFORMIN**

Initially, the addition of basal (long-acting) insulin to metformin may provide improved control. Follow these guidelines:

- For glargine (Lantus) or detemir (Levemir), a starting dose of 5 to 10 units subcutaneously at bedtime can be used (0.5 units/kg/day).
- The dose should be titrated up every three to four days based on the fasting glucose value, with a target of < 120 mg/dL, but > 70 mg/dL.
- If the fasting glucose is in target and the rest of the glucose values during the day are high, then pre-meal bolus (rapid-acting) insulin should be added next.

(c) **CONSULT WITH OR REFER TO PEDIATRIC ENDOCRINOLOGIST**

- Refer to a pediatric endocrinologist if the patient fails to respond to these outlined therapy guidelines.
- Only metformin, insulin, and liraglutide have been reliably studied and used in children and adolescents.
TREATMENT GOALS FOR PREVENTING COMPLICATIONS

Initial treatment of type 2 diabetes in children depends on clinical presentation, which may run from asymptomatic hyperglycemia to diabetic ketoacidosis. The main goals for treating type 2 diabetes in children include:

- **Achieve and maintain optimal glycemic control.** Near normalization of glucose levels will be the primary factor in avoiding other comorbidities commonly associated with diabetes.

- **Foster age-appropriate weight management.** Increasing lean body mass and decreasing fat body mass will improve insulin sensitivity and overall glucose control as well as general health. At younger ages, this may translate into stabilization of weight rather than weight loss. At older ages, weight loss may be appropriate. Refer to the *Lifestyle and Weight Management for Children and Adolescents CPM* for strategies focused on healthy nutrition and weight management.

Clinicians may want to consider utilizing other members of the care team — such as registered dietitian nutritionists (RDNs) or mental health specialists — to address psychosocial issues that may be driving the associated behaviors.

- **Identify and treat (if necessary) comorbidities,** including:
  - **Hyperglycemia.** Symptoms of hyperglycemia are often subtle and develop slowly. Consistent monitoring of blood glucose is imperative for management. Non-fasting blood glucose levels for hyperglycemia are > 200 mg/dL. Testing for ketones is recommended during periods of intercurrent illness or poor control.
  - **Diabetic ketoacidosis (DKA).** DKA is a state of absolute or relative insulin deficiency resulting in hyperglycemia (blood glucose > 200 mg/dL) and metabolic acidosis. It is the leading cause of morbidity and mortality in children with type 1 diabetes. It is uncommon but possible for a child with type 2 diabetes to develop DKA. A child or adolescent in DKA needs immediate medical attention. (See page 5 of the *Pediatric Type 1 Diabetes CPM* for DKA management.)
  - **Hypoglycemia.** This condition is characterized by abnormally low blood glucose levels, usually < 70 mg/dL. It is a risk for anyone on insulin or oral diabetes medications; however, metformin is not generally associated with hypoglycemia. Patients should learn how to recognize symptoms and respond quickly to avoid serious complications.
  - **Hypertension.** Control of hypertension in children is critical to prevent future complications. Hypertension is defined as BP ≥ 95th percentile (or ≥ 130/80 mmHg if 95th percentile exceeds that value) measured on three or more separate occasions. Children and adolescents whose BP exceeds 120/80 mmHg are considered prehypertensive even if the blood pressure is < 90th percentile.
  - **Dyslipidemia.** The ADA recommends screening at diagnosis. After glycemic control is established, repeat testing annually if lipid levels remain at target. (Note: The ADA recommends an LDL level that is lower than the < 130 mm/dL goal for children without diabetes.) Recommended fasting target levels in patients with diabetes are:
    - LDL < 100 mg/dL (2.6 mmol/L)
    - HDL > 35 mg/dL (0.9 mmol/L)
    - TG < 150 mg/dL (1.7 mmol/L)
  - Weight loss, increased activity, and improvement in glycemic control often results in improved lipid levels. Changes in diet may also be helpful. If these approaches fail, medication should be considered.
  - **Nephropathy** with or without retinopathy.
  - **Prevent microvascular and macrovascular complications.** Historically, microvascular complications have led to debilitating diseases in adulthood. Managing vascular risk factors (above) can help prevent or delay renal failure, blindness, and vascular disease.

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A WORD ABOUT PREDIABETES

Prediabetes is well-described in the adult population but is less well-studied in youth populations. Common risk factors associated with prediabetes should be targeted with lifestyle interventions. Refer to the *Lifestyle and Weight Management for Children and Adolescents CPM* for strategies focused on healthy nutrition and weight management.

Clinicians may want to consider utilizing other members of the care team — such as registered dietitian nutritionists (RDNs) or mental health specialists — to address psychosocial issues that may be driving the associated behaviors.

IS REMISSION POSSIBLE?

Remission in type 2 diabetes is rare, even in adult populations. The ADA defines remission as: “...an abatement or disappearance of the signs and symptoms of the disease.” Patients will always be at risk for relapse as hyperglycemia may be impacted by many factors including sports and exercise, illness, diet, and medications. Remission can be considered partial or complete as indicated:

- Partial remission is described as “sub-diabetic” (A1c < 6.5 % or FPG 100-125 mg/dL) for at least 1 year without the use of medication or procedures.
- Complete remission is considered a "return to normal" glucose metabolism (A1c = normal, FPG < 100 mg/dL) for at least 1 year without the use of medications or procedures.
- A patient is considered to be in prolonged remission after 5 years of complete remission.
KEY RECOMMENDATIONS

- Utilize MHI resources (see below). Children with diabetes need integrated care that responds to changing developmental and psychosocial needs. Good care requires active management — behavioral health screenings, anticipatory guidance, and family-focused planning — with the ultimate goal of good health and a safe transition to adult management.
- Build your team.
  - Find an RDN: https://intermountainhealthcare.org/services/nutrition-services/
  - Find a Certified Diabetes Care and Education Specialist (CDCES) with experience working with pediatric patients and their families: https://intermountainhealthcare.org/primary-childrens/programs-specialties/endocrinology/diabetes
  - Contact Primary Children’s Hospital diabetes clinic (for children already diagnosed with diabetes): 801-662-1640 or diabetes@imail.org
- Access family- and child-friendly resources. For resources in your local area:
  - Call the mental health intake line at Primary Children’s Hospital at 801-313-7711.
  - Search the United Way Utah 211 resources index at: https://211utah.org/

WHAT IS MHI?

Mental health integration (MHI) involves integrating mental health care 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 diabetes management.

ROUTINE CARE AND WELLNESS EXPECTATIONS

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. Integrated wellness care — care that treats the whole child, including the caregivers, and responds to the changing circumstances of the family and child — can identify at-risk families and provide resources to improve health outcomes.

Key goals and concerns

- At each visit, identify and respond to issues that affect diabetes management. Psychosocial issues may underlie poor adherence and diabetes control. Poor socioeconomic status and chronic physical or mental health problems in a parent or other close family member are associated with poorer diabetes control and increased hospitalizations.
  - “Red-flag moments” occur when patients and caregivers are likely to need extra support. For example:
    - At diagnosis, when dealing with fear, shock, and the knowledge that the illness will require significant changes in the patient’s and family’s everyday life
    - One to six months after diagnosis, when secondary emotional effects of the condition’s impact on daily life begin to build up
    - At new developmental stages (see table 3 on page 10) and during challenges at school or at home
  - Actively support good mental health. Teach coping skills and resilience; identify and treat mental health disorders if and when they arise.
  - Regularly screen for mental health issues per care guidelines. Signs of disordered eating or intentional insulin misuse should always be investigated. Disordered eating may take the form of intentional misuse of insulin for weight control. Refer to the Eating Disorders CPM for guidance.

- Treat type 2 diabetes as a family disease. Studies show that when the healthcare team develops a strong connection with the family over time, outcomes improve.
  - Ensure that the child’s family and caregivers understand the importance of their involvement in the child’s care. Stress that family participation is necessary to achieve successful management during adolescence, a smooth transition to adult care, and long-term health.
  - Practice family-focused teamwork, particularly with adolescent patients. Establish a responsibility-sharing plan at the end of each patient visit.
  - Prepare patient and family for expected developmental challenges and transition to adult care.
  - Point patients and families to community resources to help them achieve a goal of 60 minutes of moderate-to-vigorous activity daily. See page 24 of the Lifestyle and Weight Management for Children and Adolescents CPM for a list of online and community resources.
ON-GOING FOLLOW UP

1. TWO TO THREE TIMES EACH YEAR, have a visit focused on diabetes. These visits should include HbA1c checks and review of patient’s blood glucose records (as well as any other diabetes-related checks indicated in table 2 on page 9). Schedule wellness interventions to coincide with diabetes-centered visits as needed.

2. At ANNUAL well-child visits, screen for long-term complications. Reinforce to your patients with diabetes the impact of lifestyle decisions on the risk for long-term complications. Emphasize that self-management isn’t just about faithfully taking medication and/or insulin; daily choices and habits — smoking, recreational drug use, physical inactivity, overeating or disordered eating — profoundly impact long-term health. Assess the patient’s pediatric physical activity vital sign (PAVS) at every visit. Advise to start or increase physical activity to reach 60 minutes of moderate-to-vigorous activity and less than two hours of screen time (outside of school) seven days per week. Consider ongoing dietary counseling as appropriate.

3. AS NEEDED, educate patients about illnesses and other concerns. Key goals and concerns for education include:

   • Intercurrent illness.
     “Normal” childhood illnesses — colds, flu, strep throat, and so on — can impact blood glucose. If the patient is on insulin, refer to the Diabetes: Care on a Sick Day handout for management of blood glucose and ketones.
     Treatment for other chronic illnesses should be provided on a regular basis. When initiating new medication, however, have the patient increase the frequency of blood glucose testing; some medications affect blood glucose levels.

   • The risks of stopping metformin or other medications. Advise on the dangers of stopping medications without provider guidance as serious illness may result.

   • Preparing patients for surgery or dental procedures. Good glycemic control before, during, and after procedures is important. Providers can help patients by advising:
     To ask for the earliest possible slot for their surgery/procedure (shorten the time the patient needs to be NPO)
     To do any necessary monitoring as well as make insulin or dietary adjustments before surgery

   • Driving. As adolescents prepare to start driving, counsel them and their families about the risks of driving with low blood glucose. To obtain a driver’s license in most states — Utah and Idaho included — people with diabetes need a medical evaluation and completed functional ability evaluation attesting to their functional ability to drive. Regulations concerning diabetes and driving in all 50 states can be found on the American Diabetes Association website.

   • Pregnancy. Pregnancy in diabetes is always high-risk. Metformin also increases the risk of pregnancy (due to an increase in ovulation) in sexually active females. As they enter puberty, young women with diabetes should be counseled about the risk of pregnancy and the use of contraception.

   • An increased risk for mental health conditions. Providers should be alert to symptoms of anxiety, depression, and eating disorders in particular. Screen for mental health disorders at least annually.
### TABLE 2: Routine care and follow-up

<table>
<thead>
<tr>
<th>Assess</th>
<th>Test(s)</th>
<th>When?</th>
<th>Targets &amp; goals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blood glucose control</strong></td>
<td>• HbA1c&lt;br&gt;• Review of blood glucose records</td>
<td>X (at diagnosis)&lt;br&gt; X (every visit)&lt;br&gt; X (2 to 4 times per year)</td>
<td>• HbA1c (all ages): &lt; 7%&lt;br&gt; • BG before meals and at bedtime/overnight: 80 – 150 mg/dL</td>
</tr>
<tr>
<td><strong>Patient and family education</strong></td>
<td>Ongoing education discussed on page 11</td>
<td>X</td>
<td>Patient and family demonstrates adequate proficiency at self-management</td>
</tr>
<tr>
<td><strong>Mental health conditions</strong></td>
<td>PHQ-2 depression screen:&lt;br&gt; 1. Are you feeling down, depressed, or hopeless?&lt;br&gt; 2. Have you lost interest or pleasure in doing things?</td>
<td>X X</td>
<td>If answer to either question is positive, or if you suspect a mental health disorder, assess further with Intermountain MHI’s Child/Adolescent Baseline Packet</td>
</tr>
<tr>
<td><strong>Physical activity</strong></td>
<td>Physical activity vital sign (Pediatric PAVS) for pediatric patients assessment/score</td>
<td>X X</td>
<td>• Daily activity: 60 minutes, moderate to vigorous&lt;br&gt; • Screen time: Less than 2 hours outside of school work</td>
</tr>
<tr>
<td><strong>Normal growth</strong></td>
<td>• Height, weight plotted on a CDC or WHO growth chart&lt;br&gt; • Body mass index (BMI)</td>
<td>X X</td>
<td>• Normal growth projection&lt;br&gt; • BMI &lt; 85% of normal for age&lt;br&gt; See pages 2 and 3 of the Lifestyle and Weight Management Child and Adolescent CPM</td>
</tr>
<tr>
<td><strong>Hypertension</strong></td>
<td>Blood pressure</td>
<td>X X</td>
<td>SBP or DBP &lt; 90th percentile for age, sex, and height&lt;br&gt; Age ≥13 years: ≤120 / 80</td>
</tr>
<tr>
<td><strong>Dyslipidemia</strong></td>
<td>Fasting lipid profile</td>
<td>X X</td>
<td>TG &lt; 150 mg/dL&lt;br&gt; LDL &lt; 100 mg/dL</td>
</tr>
<tr>
<td><strong>Kidney disease</strong></td>
<td>Creatinine clearance/eGFR&lt;br&gt; Microalbumin/creatinine ratio</td>
<td>X X</td>
<td>Microalbumin/creatinine ratio &lt; 30 mg/g&lt;br&gt;</td>
</tr>
<tr>
<td><strong>Neuropathy, foot problems</strong></td>
<td>Visual foot exam&lt;br&gt; Neurology foot exam with 10 g mono-filament or a tuning fork</td>
<td>X X</td>
<td>Teach foot self-exam if signs of problems&lt;br&gt; Normal</td>
</tr>
<tr>
<td><strong>Retinopathy</strong></td>
<td>Dilated eye exam (refer to eye care specialist)</td>
<td>X X</td>
<td>Normal</td>
</tr>
</tbody>
</table>

*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.*
<table>
<thead>
<tr>
<th>Stages and ages</th>
<th>Normal developmental tasks</th>
<th>Diabetes management priorities</th>
<th>Common family issues</th>
<th>Provider tips: Wellness care for the patient and family</th>
</tr>
</thead>
</table>
| **Older elementary school** (8–11 years) | • Developing skills in athletic, cognitive, artistic, and social areas  
• Consolidating self-esteem with respect to the peer group | • Creating a flexible diabetes regimen that allows for participation in school or peer activities  
• Teaching child short- and long-term benefits of optimal control | • Developing and maintaining parental involvement in blood glucose management tasks while allowing for independent self-care for special occasions  
• Continuing to educate school and other caregivers | • **Teach and actively promote shared responsibility** (child and caregiver) for lifestyle and medication management. Glucose testing and, if needed, insulin administration should always be supervised by an adult.  
• **Strongly encourage the child’s participation in physical activities.**  
• **Be alert to any emerging behavioral issues, social issues, learning difficulties, and depression.** |
| **Early adolescence** (12–15 years) | • Managing body changes  
• Developing a strong sense of self-identity  
• Developing sexual identity | • Addressing more difficult diabetes and blood glucose management tasks  
• Being sensitive to weight and body image concerns  
• Monitoring signs and symptoms | • Renegotiating parents’ 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  
• Monitoring for signs of depression, eating disorders, and risky behaviors | • **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.  
• **Consider increasing screens for mental health problems**, especially eating disorders, depression, and anxiety.  
• **Continue to encourage participation in physical activities.** |
| **Later adolescence** (16–19 years) | • Establishing a sense of identity after high school (decisions about location, social issues, work, and education)  
• Engaging in sexual activity | • Starting an ongoing discussion of transition to a new diabetes team (discussion may begin in earlier adolescent years)  
• Integrating diabetes into new lifestyle | • Supporting the transition to independence  
• Learning coping skills to enhance ability to self-manage  
• Preventing and intervening with diabetes-related family conflict  
• Monitoring for signs of depression, eating disorders, and risky behaviors | • **Continue family-focused teamwork,** as discussed above.  
• **Continue screens and discussions,** as discussed above and per routine care recommendations.  
• **Teach adolescent drivers to test blood glucose before driving** — emphasize the risks of driving while hypoglycemic (a common problem).  
• **Continue to encourage participation in physical activities.** |

**Expected self-care tasks:** Knows routine and may prompt caregivers. Can figure dosing, perform SMBG testing, and self-administer insulin with adult supervision. Will need assistance with counting carbs.

**Expected self-care tasks:** Can manage all SMBG tasks. Needs continued parental support to help manage those tasks in context with a busy social schedule and extracurricular activities.

**Expected self-care tasks:** All of the above plus works with provider to create portable medical summary; attends transition appointments; completes associated tasks for transition to adult care.
PATIENT AND FAMILY EDUCATION MATERIALS

The following handouts are available on intermountain.net/pen and at Print It! All are available in Spanish. For patients who are prescribed insulin therapy, use the education materials found on the Pediatric Type 1 Diabetes CPM.

- Metformin
- Diabetes, Exercise and Sports
- Diabetes: Care on a Sick Day
- Low Blood Glucose
- Diabetes Electronic Resources
- 8 to Live By booklet
- Healthy Habit Builder
- The Traffic Light Eating Plan
- Your A1c Test
- Meal Plan Basics
- Blood Glucose Tracker Pads

How to access patient education materials

For Intermountain fact sheets, go to Intermountain patient handouts at: https://intermountainhealthcare.org/health-information/health-library/patient-handouts/. Type “Diabetes” in the search bar.

Internet resources

The Diabetes Electronic Resources handout has a list of websites and apps. Additional helpful information can be found at the following locations online:

- Primary Children’s Hospital
- KidsHealth
- 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

PATIENT EDUCATION

The goal of patient education for children and adolescents with type 2 diabetes is to ensure that the patient and family acquire the knowledge and skills needed for the day-to-day management of diabetes. The type and intensity of the education program depends on whether or not insulin has been prescribed.

For type 2 patients who are taking insulin

Patients with type 2 diabetes will typically require higher doses of insulin than those with type 1 diabetes and 12 to 20 hours of instruction, which must begin at onset of insulin therapy (and may or may not happen while the patient is in the hospital). Refer to the Pediatric Type 1 Diabetes CPM for information on:

- Titration of insulin (pages 5–8)
- The patient education curriculum (pages 15–18)

For Type 2 patients who are NOT taking insulin:

- Keep it simple. Offer basic, actionable information and hands-on skill training.
- Use professionals experienced in diabetes education. Ideally, education should be provided by a team consisting of a physician (or other licensed independent practitioner), a Certified Diabetes Care and Education Specialist (CDCES), a Registered Dietitian Nutritionist (RDN), and a mental health professional, all of whom have experience working with pediatric patients and their families.
- Personalize, and be sensitive to family dynamics. Tailor education to the patient’s age, needs, capacities, and interests. Make sure education is culturally sensitive and appropriate for the family’s lifestyle.
- Refer to and provide materials for reference and further learning. Diabetes education is intense and complex and will continue beyond the first days after diagnosis. Provide education in relevant, measured portions to maximize comprehension.
- Lifestyle management is a central element of pediatric type 2 diabetes treatment—not just at diagnosis, but also in the months and years to come. See the Lifestyle and Weight Management for Children and Adolescents CPM for suggestions on behavior change and setting nutrition and activity goals.

Learning curriculum

The following represent the main topics of initial patient and family education.

- Pathophysiology of type 2 diabetes
- Self-monitoring of blood glucose (SMBG) and ketone testing
- Medication and/or insulin therapy
- Nutrition and lifestyle changes
- Hypoglycemia, hyperglycemia, and management during intercurrent illness (“sick days”)

A list of education materials is located in the sidebar at right.
KEY REFERENCES AND RESOURCES


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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.