



DIAGNOSIS AND TREATMENT OF Pediatric Type 2 Diabetes

2021 Update

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.^{ADA1, AAP2}

► 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.^{CDC} 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.^{BUS} 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.^{AAP2}
- 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*.^{AAP1}

Key messages

- Distinguishing between type 1 and type 2 at diagnosis is critical ([page 3](#)).
- Individualized medical therapy is key to successful management ([page 4](#)).
- Ongoing emphasis on healthy diet and lifestyle, including RDN referral and ongoing nutrition counseling, is also important for successful management ([page 7](#)).

► WHAT'S INSIDE?

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► 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



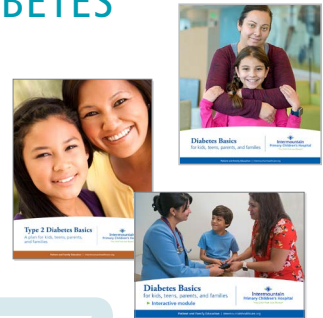
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MANAGEMENT ROAD MAP: PEDIATRIC TYPE 2 DIABETES

Provider tool
 Algorithm 1:
 Differential Diagnosis
 (page 3)

Newly diagnosed type 2 diabetes

- Key patient tools:**
- [Type 2 Diabetes Basics](#) booklet
 - [Diabetes Basics](#) (Type 1) book
 - [Diabetes Nutrition](#) module



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

Diabetes specialist or PCP, support team provide care

Education	Medication & Monitoring	Wellness
<p>Focus Teaching basic skills and information to prepare patient for safe self-management at home (approx. 8–12 hours of learning)</p> <p>Provider tools Refer to Pediatric Type 1 Diabetes CPM for “survival” education if insulin prescribed.</p>	<p>Focus</p> <ul style="list-style-type: none"> • Stabilizing patients in diabetic ketoacidosis (DKA) • Initial management, especially if insulin therapy needed <p>Provider tools</p> <ul style="list-style-type: none"> • In the Pediatric Type 1 Diabetes CPM: <ul style="list-style-type: none"> – Management of DKA (page 4) – Initial Insulin Therapy (page 6) • In this CPM: Medical Management (page 4) 	<p>Focus</p> <ul style="list-style-type: none"> • Helping patient and family cope with stress of diagnosis • Assessing family support and needs • Integrating lifestyle management <p>Provider tools</p> <ul style="list-style-type: none"> • Lifestyle and Weight Management for Children and Adolescents CPM • Treatment Goals for Preventing Complications (page 6)

For ongoing diabetes care, child will likely be followed by a PCP. Considerations:

- Medical stability at follow-up
- Patient/family preference
- PCP availability and team support

Home **Ongoing FOLLOW-UP with provider and SELF-MANAGEMENT at HOME**

PCP and care team provide ongoing management

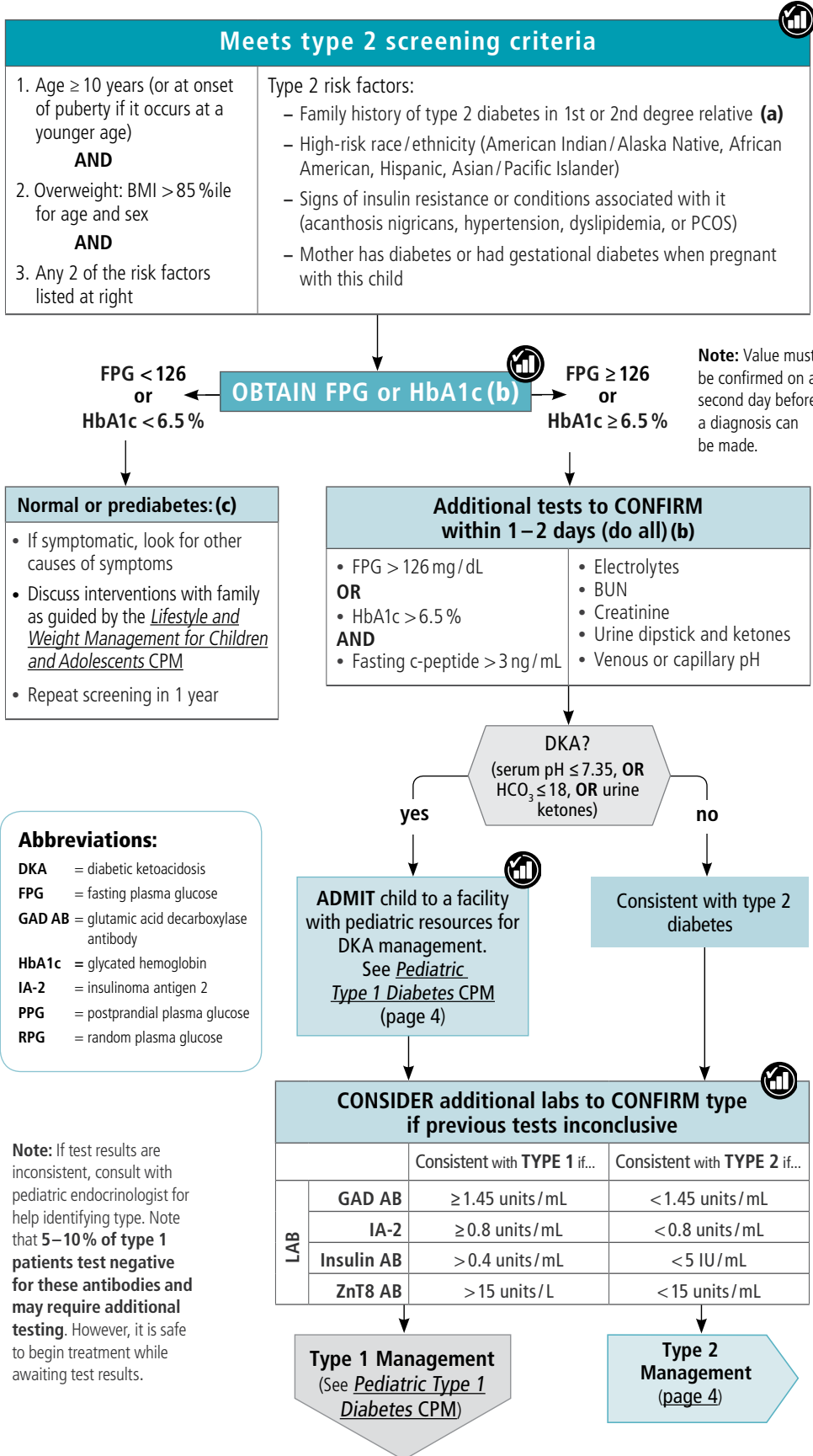
Education	Medication & Monitoring	Wellness
<p>Focus</p> <ul style="list-style-type: none"> • Support for patient/family management at home (phone calls, visits) • Follow-up education 2–4 weeks after diagnosis • Support for patient and family for self-management of diabetes • Healthy choices & management: nutrition, activity, weight, symptoms, medication <p>Provider tools</p> <ul style="list-style-type: none"> • Medical Management (page 4) • Pediatric Type 1 Diabetes CPM: table 6 lists education resources in context (page 18) • Lifestyle and Weight Management for Children and Adolescents CPM 	<p>Focus</p> <ul style="list-style-type: none"> • Optimized medical management • Complications monitoring <p>Provider tools</p> <ul style="list-style-type: none"> • Medical Management (page 4) • Algorithm 2: Monitoring and Management (page 5) • Treatment Goals for Preventing Complications (page 6) • Routine Care and Wellness (page 7) 	<p>Focus</p> <ul style="list-style-type: none"> • 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 <p>Provider tools</p> <ul style="list-style-type: none"> • Routine Care and Wellness (page 7) • Lifestyle and Weight Management for Children and Adolescents CPM

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** ADA1,BUS



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.

(a) RISK FACTORS

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

(b) 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, polydipsia, 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.

(c) 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).

✓ KEY RECOMMENDATION

Confirming type

Except in American Indian or Alaska Native populations, type 1 diabetes is more common than type 2 in children and adolescents.

As indicated in the differential diagnosis algorithm (page 3), type should be confirmed with further laboratory testing. If testing indicates type 1, follow the guidelines for type 1 management (see *Pediatric Type 1 Diabetes CPM*) while pursuing education for lowering additional risk factors (obesity, dyslipidemia, etc.) as appropriate.

See the *Lifestyle and Weight Management for Children and Adolescents CPM* for suggestions on how to approach lifestyle and weight management issues with patients and families.

▶ TYPE 2 MEDICAL MANAGEMENT ADA1,LEV2

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.

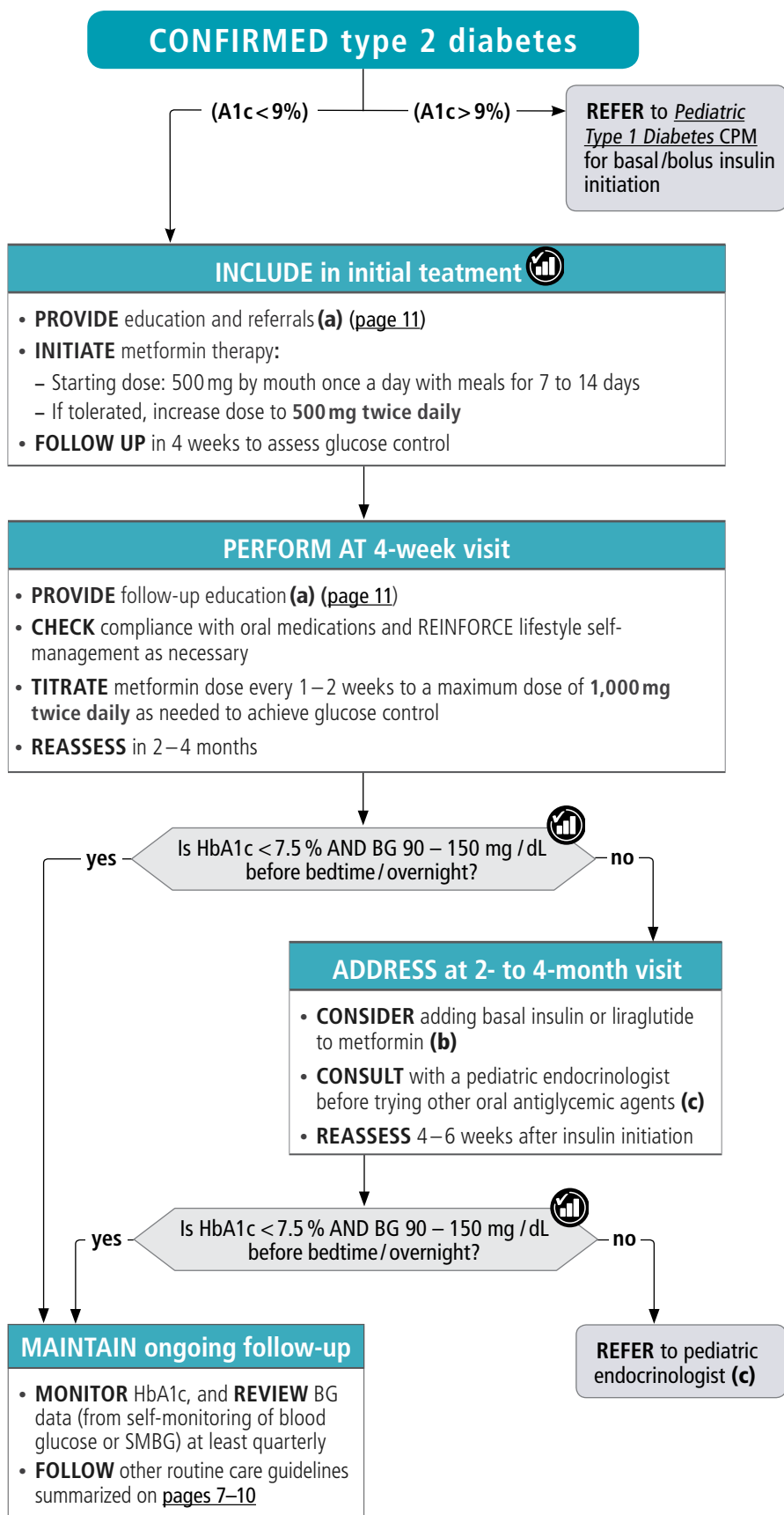
Metformin does have some side effects that can be particularly troubling in adolescent patients and may limit compliance. At the beginning of therapy, metformin is frequently associated with some gastrointestinal discomfort and/or diarrhea. This can be managed by adjusting the dose and ensuring that 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.

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

Generic Name	Brand Name	Usual Dosing	AWP Cost*	Pros	Cons
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	<ul style="list-style-type: none"> Minimizes weight gain (preferred for obese patients) Favorable lipid effects No hypoglycemia Maximum BG effect 3 to 4 weeks after initiation 	<ul style="list-style-type: none"> May cause GI distress (nausea/diarrhea) Increases risk of acidosis (very rare but serious): <ul style="list-style-type: none"> 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		<ul style="list-style-type: none"> Some weight loss 	<ul style="list-style-type: none"> 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** ^{ADA1}



(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.^{ADA1} 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).^{ADA1}
- 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.

Indicates an Intermountain measure

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.^{BUS}

► 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 age-appropriate weight management strategies including physical activity, diet, behavior change, and parent engagement as well as issues associated with pharmacological therapy and bariatric surgery in these populations.
- **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.^{ADA1} (**Note:** The ADA recommends an LDL level that is lower than the < 130 mg/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.

✓ 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.^{PER} 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.^{NAB}

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.
- **Two to four times a year, assess the family for stressors and mental health issues.** Coordinate with a mental health specialist to provide psychosocial assessments and interventions at “red-flag moments” and as indicated by screening.
 - **“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.^{SCO}
 - **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.

✓ KEY RECOMMENDATIONS

• Initiate efforts to control body weight with all type 2 patients.

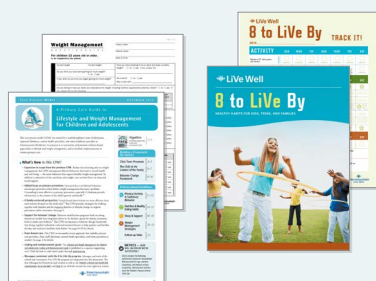
Weight stabilization and management improves glycemic control, is a critical component of successful type 2 management, and prevents complications and comorbidities.

• Use age-appropriate tools for building healthy habits.

Intermountain's [Lifestyle and Weight Management for Children and Adolescents CPM](#) provides evidence-based, practical guidance for treating children and teens who are overweight or obese. The CPM is accompanied by a suite of tools, including:

- The [Lifestyle and Health Risk Questionnaire for Children and Adolescents](#)
- [Making a Healthy Change Worksheet](#)
- [Rx to Live](#), a one-page prescription sheet
- [8 to Live By](#) booklet and [Habit Builder](#)
- [Track It!](#) pages that help kids set goals, track progress, and celebrate success

• Use a multidisciplinary approach to weight management. Refer to RDNs and other 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

Assess	Test(s)	When?			Targets & goals
		at diagnosis	every visit	annual (or other)	
Blood glucose control 	<ul style="list-style-type: none"> HbA1c Review of blood glucose records 	X	X (2 to 4 times per year)		<ul style="list-style-type: none"> HbA1c (all ages): <7%* BG before meals and at bedtime/overnight: 80–150 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.					
Patient and family education	Ongoing education discussed on page 11	X	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 in doing things?	X	X		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
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: Less than 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 Child and Adolescent CPM
Hypertension 	Blood pressure	X	X		SBP or DBP <90th percentile for age, sex, and height Age ≥13 years: <120/80
Dyslipidemia 	Fasting lipid profile	X once glycemia is stable		X	TG <150 mg/dL LDL <100 mg/dL
Kidney disease 	Creatinine clearance / eGFR	X once glycemia is stable		X	Microalbumin/creatinine ratio <30 mg/g
	Microalbumin / creatinine ratio	X once glycemia is stable		X	
Neuropathy, foot problems 	Visual foot exam		X		Teach foot self-exam if signs of problems
	Neurology foot exam with 10 g mono-filament or a tuning fork	X		X	Normal
Retinopathy 	Dilated eye exam (refer to eye care specialist)	X		X	Normal

 Indicates an Intermountain measure

TABLE 3: Wellness expectations and suggestions^{ADA1,LEV2}

Stages and ages	Normal developmental tasks	Diabetes management priorities	Common family issues	Provider tips: Wellness care for the patient and family
<p>Older elementary school (8–11 years)</p>	<ul style="list-style-type: none"> Developing skills in athletic, cognitive, artistic, and social areas Consolidating self-esteem with respect to the peer group 	<ul style="list-style-type: none"> Creating a flexible diabetes regimen that allows for participation in school or peer activities Teaching child short- and long-term benefits of optimal control 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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.
<p>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.</p>				
<p>Early adolescence (12–15 years)</p>	<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"> Addressing more difficult diabetes and blood glucose management tasks Being sensitive to weight and body image concerns Monitoring signs and symptoms 	<ul style="list-style-type: none"> 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 	<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. Consider increasing screens for mental health problems, especially eating disorders, depression, and anxiety. Continue to encourage participation in physical activities.
<p>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.</p>				
<p>Later adolescence (16–19 years)</p>	<ul style="list-style-type: none"> Establishing a sense of identity after high school (decisions about location, social issues, work, and education) Engaging in sexual activity 	<ul style="list-style-type: none"> Starting an ongoing discussion of transition to a new diabetes team (discussion may begin in earlier adolescent years) Integrating diabetes into new lifestyle 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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.
<p>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.</p>				

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

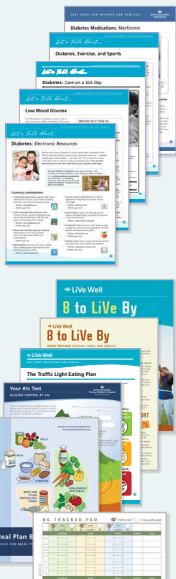
Healthy Habit Builder

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.

PROVIDER RESOURCES

Related Care Process Models (CPMs):

- [Pediatric Type 1 Diabetes DM CPM](#)
- [Eating Disorders CPM](#)
- [Lifestyle and Weight Management for Children and Adolescents CPM](#)

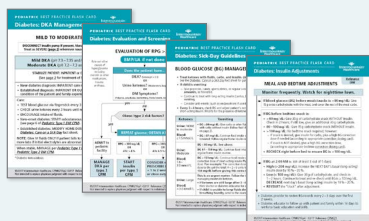


To access Intermountain materials:

- 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.

Best Practice Flash Cards:

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



► KEY REFERENCES AND RESOURCES

- AAP1 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.
- AAP2 Copeland KC, Silverstein J, Moore KR, et al. Management of newly diagnosed type 2 Diabetes Mellitus (T2DM) in children and adolescents *Pediatrics*. 2013;131(2): 364-382.
- ADA1 American Diabetes Association. Classification and diagnosis of diabetes: Standards of medical care in diabetes—2020. *Diabetes Care*. 2020;43(Suppl 1):S14-S31.
- ADA2 American Diabetes Association: Evaluation and management of youth-onset type 2 diabetes: A position statement by the American Diabetes Association. *Diabetes Care*. 2018;41(12):2648-2668.
- BEA Beacham BL, Deatrick JA. Health care autonomy in children with chronic conditions. *Nursing Clinics of America*. 2013;48(2):308-317.
- BUS Buse JB, Caprio S, Cefalu WT, et al. How do we define cure of diabetes? *Diabetes Care*. 2009;32(11):2133–2135.
- CDC Centers for Disease Control and Prevention. Diabetes Report Card 2014. <https://www.cdc.gov/diabetes/library/reports/reportcard.html>. Accessed November 27, 2016.
- FLI Flint A, Arslanian S. Treatment of type 2 diabetes in youth. *Diabetes Care*. 2011;34:s177-s183.
- GLA Glaser N, Barnett P, McCaslin I, et al. Risk factors for cerebral edema in children with diabetic ketoacidosis. *N Engl J Med*. 2001; 344(4):264-269.
- LEV1 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.
- LEV2 Levitsky LL, Misra M. Epidemiology, presentation, and diagnosis of type 1 diabetes mellitus in children and adolescents. UpToDate. <https://www.uptodate.com/contents/epidemiology-presentation-and-diagnosis-of-type-1-diabetes-mellitus-in-children-and-adolescents>. Updated March 15, 2016. Accessed November 23, 2016.
- NAB Nabors LA, Lehmkuhl HD. Children with chronic medical conditions: recommendation for school mental health clinicians. *J Dev Phys Disabil*. 2004;16(1):1-15.
- PER Perrin J, Guyer B, Lawrence J. Health care services for children and adolescents. *The Future of Children*. 1992;2(2):58-77.
- SCO Scott JG, Cohen D, Dicicco-Bloom B, Miller WL, Stange KC, Crabtree BF. Understanding healing relationships in primary care. *Ann Fam Med*. 2008;6(4):315-322.
- TOD TODAY Study Group, Zeitler P, Hirst K, Pyle L, et al. A clinical trial to maintain glycemic control in youth with type 2 diabetes. *N Engl J Med*. 2012;366(24):2247–56.

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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 Sirstens, Manager, Primary Children's Hospital Diabetes Program, Intermountain Healthcare, Janet.Sirstens@imail.org.