International Journal of Multiphysics
Volume 18, No. 3, 2024
ISSN: 1750-9548

Role of Family Physicians in Management of Type 1 Diabetes and Attention Deficit Hyperactivity Disorder

Aya Ahmed Elsayed Zaki Elmasry[1*], Nelly Raafat Abdel Fattah[2], Shereen Mohammed Bahgat[1], Yasmin Husseiny Hassan Hussein[1]

[1] Family Medicine Department, Faculty of Medicine, Zagazig University, Egypt

[2] Psychiatry Department, Faculty of Medicine, Zagazig University, Egypt

***Corresponding author:** Aya Ahmed Elsayed Zaki Elmasry

Email: ayaelmasry002@gmail.com

Abstract:

Type 1 Diabetes Mellitus (T1DM) and Attention-Deficit/Hyperactivity Disorder (ADHD) are chronic conditions commonly diagnosed in childhood and adolescence, each requiring comprehensive, long-term management. Family physicians are central to the multidisciplinary approach required for these conditions due to their accessibility, continuity of care, and holistic perspective.

Keywords: Family Physicians, Type 1 Diabetes, ADHD.

Introduction:

Family physicians play a central role in the long-term management of chronic conditions such as Type 1 Diabetes Mellitus (T1DM) and Attention-Deficit/Hyperactivity Disorder (ADHD), particularly in pediatric and adolescent populations. These two conditions, though distinct in etiology and management, both require continuous, coordinated care and strong physician–family communication. Type 1 Diabetes Mellitus is a chronic autoimmune disorder characterized by the destruction of pancreatic β-cells, leading to absolute insulin deficiency. The global incidence of T1DM in children continues to rise, necessitating early diagnosis and comprehensive outpatient management to prevent acute and chronic complications (1).

Family physicians are often the first point of contact and are responsible for initiating insulin therapy, providing diabetes education, monitoring glycemic control, and coordinating care with endocrinologists and diabetes educators (2).

Similarly, ADHD is one of the most common neurodevelopmental disorders in children, affecting academic performance, behavior, and social functioning. Family physicians are well-positioned to screen for ADHD, initiate treatment (including behavioral interventions and pharmacotherapy), and provide ongoing monitoring and family support. The continuity of care and accessibility offered by primary care physicians enhances early diagnosis and long-term adherence to management strategies (3).

The dual burden of managing both T1DM and ADHD presents unique challenges, including increased risks for poor self-management, fluctuating glycemic control, and psychosocial stressors. Family physicians serve a vital role in coordinating multidisciplinary care, addressing comorbidities, and empowering families through consistent follow-up and health education (4).

Differentiating T1D vs Type 2 Diabetes (T2D):

To provide the best health care for children and adolescents with diabetes and reduce the incidence of DKA, it is essential that Primary care provider (PCPs) correctly identify T1D. In general, patients with T1D have more acute disease onset and a family history of autoimmunity **(5).**

Diagnosis of T1DM:

The diagnosis of T1DM should be made based on the presence or absence of symptoms and biochemical criteria according to American Diabetes Association **(6).** Biochemical features to support the diagnosis of T1DM includes: low or undetectable (fasting) C-peptide levels, serum assays for pancreatic autoantibodies can be evaluated, including antibodies to glutamic acid decarboxylase, insulinoma-associated antigen 2, islet cell antibodies, and insulin antibodies. In 90% of patients with T1D, at least 1 of these autoantibodies will be positive **(7).**

Whenever a physician is uncertain of the type of diabetes, the patient should be checked for urine ketones, which, if present, indicate the need for **immediate referral** to an emergency department or endocrinologist for initiation of insulin therapy **(8).**

Clinical presentation of T1D:

It is essential that Primary care provider (PCPs) to identify that the clinical presentation of T1DM varies from non-emergency to emergency situations and are shown in **Table 1**.

Table.1 Clinical presentation of T1DM **(9).**

Non-emergency presentations	**Emergency presentations**
Recent onset of enuresis in previously toilet-trained children • Vaginal candidiasis especially in pre-pubertal girls • Chronic weight loss or failure to gain weight in growing children • Recurrent skin infections	• Moderate to severe dehydration • Frequent vomiting • Abdominal pain • Continuing polyuria despite the presence of dehydration • Weight loss due to fluid loss, and loss of muscle and fat • Acetone-smelling breath • Hyperventilation • Decreased level of consciousness • Hypotension • Shock

Symptoms of T1DM may be misinterpreted leading to delayed diagnosis (**Table2**). Therefore, healthcare providers should have a high index of suspicion of DM/DKA when managing such sick children **(9).**

Table 2. Misinterpretation of T1DM symptoms **(9).**

Symptoms	**Misdiagnoses**
Hyperventilation during DKA	Pneumonia or asthma
Abdominal pain associated with DKA	Acute abdomen
Polyuria and enuresis	Urinary tract infection
Polydipsia	Psychogenic polydipsia
Vomiting	Acute gastroenteritis or sepsis
Impaired level of consciousness	Meningitis/encephalitis

Families with a child with T1D often wonder what the risk is for their other children, or even themselves, to develop T1D. A patient whose relative develops T1D has a 10-15 times greater risk of developing T1D in their lifetime in comparison with the general population. Although there are no proven means of preventing or curing T1D at this time, there are many trials enrolling patients with T1D and their family members. Trials aim to target the immune system at multiple different levels **(10).**

DKA identification and management:

PCPs are often the first to see a patient with symptoms of diabetes. Early identification and treatment are essential for the prevention of DKA in new-onset diabetes or recurrent DKA in confirmed patients. The PCPs recognition of signs and symptoms of diabetes can lead to a greater than 50% reduction in the risk of DKA at disease onset **(8).**

Common presenting symptoms include polyuria, nocturia, polydipsia, and weight loss, with abdominal pain, nausea, and vomiting as ketosis develops. Secondary enuresis and constipation also may be presenting signs, especially in young children **(11).**

Any time there is a suspicion of **DKA**, the physician should check a finger stick BG and a urinalysis for the presence of ketones and glycosuria. If the random BG is greater than 200 mg/dL, the child should be **immediately referred** to a local specialist in diabetes management. If ketones are present, or if the child is extremely dehydrated or appears ill, **immediate referral** to the emergency department is required. Early fluid resuscitation and insulin therapy are mandatory in managing DKA **(8).**

Diabetic ketoacidosis (DKA) is the leading cause of death in children with T1D and recurrent DKA in established patients in most cases this is caused by nonadherence to insulin therapy and BG monitoring **(8, 12).**Nonadherence may be exacerbated by the presence of mental health and eating disorders, lack of understanding of proper sick-day care and inadequate parental oversight of diabetes treatment **(13).**

Therapies and Tools in the Management of T1D

Diabetes self-management education and support (DSMES)

It is essential that diabetes self-management education and support (DSMES), medical nutrition therapy (MNT), and psychosocial and behavioral support be provided at diagnosis and routinely (e.g., at each follow-up visit) thereafter in a developmentally appropriate format that builds on prior knowledge by a team of health care professionals experienced with the biological, educational, nutritional, behavioral, and emotional needs of the growing child and family **(6).** Diabetes self-management education has been shown to improve A1C levels and quality of life, and reduce health care costs **(14, 15).**

Diet and exercise

A Strongly advise comprehensive nutrition education at diagnosis, and at least annually as needed, by an experienced registered dietitian nutritionist to assess the eating pattern in relation to weight status, age-appropriate growth, and cardiovascular disease risk factors **(6).**

Individualized meal planning should balance carbohydrate intake with insulin therapy, limiting sugar and refined carbohydrates while ensuring adequate whole grains, fiber, fruits, and vegetables **(16).**

Physical Activity and Exercise

Physical activity and structured exercise positively impact metabolic and psychological health in children with type 1 diabetes **(17).** Physical activity is recommended for all youth with type 1diabetes with the goal of 60 min of moderate (e.g., brisk walking and dancing) - to vigorous (e.g., running and jumping rope) -intensity aerobic activity daily, with vigorous muscle-strengthening and bone-strengthening activities at least 3 days per week **(6).**

Advise frequent glucose monitoring before, during, and after exercise via blood glucose meter and/or continuous glucose monitoring (CGM), to prevent, detect, and treat hypoglycemia **(6).**

Blood glucose goals prior to physical activity and exercise are 126–180 mg/dL (7.0–10.0 mmol/L) but should be individualized based on the type, intensity, and duration of activity **(18).**Consider additional carbohydrate intake during and/or after exercise, depending on duration and intensity of physical activity, to prevent hypoglycemia. For low- to moderate intensity aerobic activities (30–60 min), and if the youth is fasting, 10–15 g of carbohydrate may prevent hypoglycemia **(19).**

For children and adolescents with type 1 diabetes and obesity, physical activity and exercise are key components of diabetes care. Obesity is equally common in youth with or without type 1 diabetes. Having obesity is associated with a higher frequency of cardiovascular risk factors **(20).**

Therefore, diabetes health care professionals should monitor weight status and encourage a healthy eating pattern, physical activity, and healthy weight as key components of pediatric type 1 diabetes care **(6).**

Insulin therapy

Around 50% of people with diabetes do not comply adequately with their therapy which is considered one of the most important problems in chronic diseases management and decrease the effectiveness and efficiency of the treatment **(21).**

To address the continued high prevalence of ketoacidosis in adolescent patients with T1D and to manage the population's poor diabetes control and nonadherence, it is important for providers to understand fully the complexities underlying current T1D management **(8).**

PCPs should adequately educate patients, families or caregivers about insulin doses, methods of insulin delivery and the targeted goals of therapy:

The usual starting regimen for insulin therapy is as the following: during partial remission phase: <0.5 IU/kg/day, pre-pubertal period: 0.7 to 1.0 IU/kg/day and during pubertal period: 1.2 to 2 IU/kg/day **(9).** Dividing this dosage goes by two thirds in the morning (before breakfast) and one third in evening if premixed human short acting and long actin g insulin was used. However, if a mixture of analog insulins was used, then half or 60% of the dose can be given in the morning (before breakfast) and the rest before dinner **(22).**

Human insulin is preferably injected 15 to 30 minutes before the meal, but the insulin analogs can be administered 5 to 15 minutes prior to it. The concentration of these mixtures is widely different, the most common formula is 30/70 insulin mix that is composed of 30% short acting and 70% long acting insulin. Other formulas like 20/80 is

used in the elderly, and 50/50 is used in patients doing heavy work and/or individuals who have poor dietary habits and is injected three times a day **(22, 23).**

Family physicians must teach the patient how to inject (using needle or the pen), the locations of injection, and how to switch between them. Another important point to convey to the patient is how to store insulin in refrigerator and not freeze it Clinician shall confirm that the patient has understood by making him write the steps or doing them in presence of the physician before starting the management. **(22).**

Insulin pumps work by insertion of a plastic cannula into the subcutaneous tissue connected via plastic tubing to a device that delivers rapid-acting insulin at adjustable basal rates throughout the day. Bolus doses of insulin are based on an algorithm programmed into the pump (**Fig.1**). Pump sites must be changed a minimum of once every 3 days but may fail sooner **(8).**

Lispro, aspart, and regular insulin can be given via the pump, and the main advantage of this method is continuous administration based on the plasma glucose levels automatically, this provides unparalleled flexibility for the patients' daily life. The main drawbacks for this method are high cost, possible mechanical failures, and inconvenience of the device. Furthermore, frequent self monitoring and checking the pump function are required to assure effective and safe usage of the pump **(24).**

The PCP and endocrinologist should communicate regularly, at least yearly, to discuss any issues related to the child's diabetes management **(8).**

Blood glucose monitoring:

Patients and their families are required to monitor BGs frequently in the home setting. The most common option for home BG monitoring is the glucometer, which uses a finger-stick capillary blood specimen to estimate the patient's venous BG. The accepted error for these devices is up to 20% above or below the actual value, and this must be taken into account when interpreting BG results from these devices **(25).**

An increasingly popular option is the CGM This system uses a sensor placed at the tip of a small needle, which is inserted into the subcutaneous tissue to measure interstitial glucose concentrations (**Fig.1**). Patients using CGMs should check fingerstick BG values to confirm readings if BG values are high, requiring extra insulin, or if values are low, requiring glucose treatment **(25).**

With the advent of smartphones and sophisticated Internet applications, patients with diabetes have even more options for improved monitoring and management. BG values may be communicated to the patient's diabetes provider between visits through faxing BG diaries or e-mails **(8).**

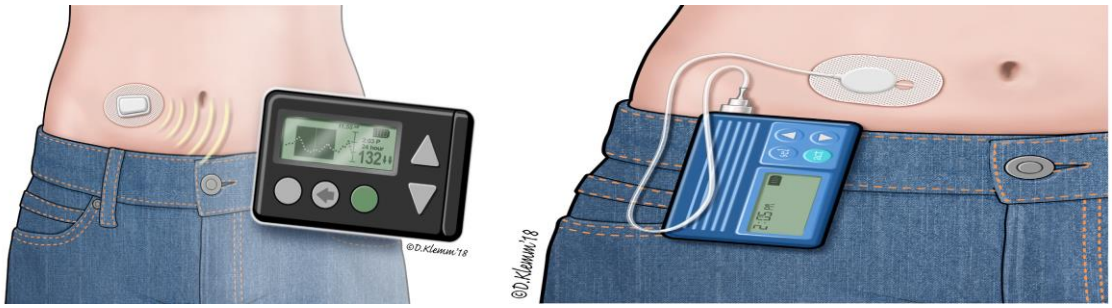

Fig 1 Typical continuous glucose monitor and Conventional insulin pump **(26).**

Motivational interviewing

Motivational interviewing techniques can be an effective strategy for improving glycemic control. One randomized controlled trial demonstrated that adolescents with newly diagnosed type 1 diabetes were able to

decrease their A1C level by an average of 0.6% over 12 months (compared with an increase of 0.2% in the control group) by participating in motivational interviewing sessions every six to eight weeks **(26, 27).**

Hypoglycemia

Another point the family physician should work on before initiating the treatment is teaching the patient about hypoglycemia and its symptoms such as cold sweating, tachycardia, blurred vision and changes in consciousness, and this will help in early recognition and even management of this complication **(22)**. Signs and symptoms of hypoglycaemia are due to adrenergic activation and neuroglycopaenia as shown **Table 3** below **(9).**

Table 3. Signs and symptoms of hypoglycaemia **(9).**

Autonomic symptoms and signs	Neuroglycopaenic Signs and symptoms	Behavioural signs and symptoms	Non-specific symptoms
. Shakiness • Sweatiness • Tremors • Palpitations • Pallor	• Poor concentration • Blurred or double vision • Disturbed colour vision • Difficulty in hearing • Slurred speech • Poor judgment and confusion • Problems with shortterm memory • Dizziness and unsteady gait • Loss of consciousness • Seizure • Death	. Irritability . Erratic behaviour • Agitation • Nightmares • Inconsolable crying	• Hunger • Headache • Nausea • Tiredness

Hypoglycemia Treatment

Health care professionals should counsel individuals with diabetes to treat hypoglycemia with fast-acting carbohydrates at the hypoglycemia alert value of 70 mg/dL (3.9 mmol/L) or less **(28).** Individuals should be

counseled to recheck their glucose 15 min after ingesting carbohydrates and to repeat carbohydrate ingestion and seek care for ongoing hypoglycemia. These instructions should be reviewed at each clinical visit **(6).**

For most individuals, 15 g carbohydrates (1teaspoon ≈5 g) should be ingested. Individuals using automated insulin delivery systems should ingest 5–10 g carbohydrates **(29).**

Severe hypoglycemia is defined as a severe event characterized by altered mental and/or physical functioning that requires assistance from another person for recovery, irrespective of glucose level **(6).** Rapid treatment at hospital with IV dextrose 10% (2–3 ml/kg) and if IV access is not available, SC/ intramuscular glucagon can be given (0.5 mg for patients <12 years old and 1.0 mg for those >12 years old) **(9).**

Patients with T1D also are considered at high-risk for invasive influenza and pneumococcal disease, as well as common infections like urinary tract infections and respiratory tract infections **(30).** Given these facts, children with T1D require influenza vaccination yearly via injection and pneumococcal vaccination with 23-valent pneumococcal polysaccharide vaccine at ≥2 years of age, in addition to regular childhood vaccinations **(31).**

Health care monitoring in the patient with T1D and treatment goals:

The A1C, measuring the level of glycosylated hemoglobin, serves as a surrogate marker for glycemic control over the previous 3 months. The American Diabetes Association (ADA) recommends a goal A1C of <7 % for youth with T1D **(6).**

The International Society for Pediatric and Adolescent Diabetes (ISPAD) guidelines recommend pre-prandial SMBG targets should be 4.0–8.0 mmol/L (70–144 mg/dL), and 4.0–10 mmol (70–180 mg/dL) post-prandial. SMBG should be undertaken at least 6 times a day in persons with diabetes taking insulin **(32).**

The A1C should be monitored at least every 3 months in addition to downloading the patient's glucometer or CGM readings to assess trends in BG levels. Together, this information is used to adjust the patient's insulin regimen with the goal of improved glycemic control, reducing the risk of long term comorbidities from diabetes **(8).**

Screening and treatment of complications in pediatric type 1 diabetes

In addition to BG monitoring, patients must be monitored frequently for diabetes complications.The ADA provides recommendations for the screening of cardiovascular risk factors in people with T1D. For both children and adults with T1D **(6):**

1-Hypertension

Blood pressure should be monitored at diagnosis and at every visit .Goal of blood pressure is <90th percentile for age, sex, and height; if ≥13 years old, the goal is <120/80 mmHg **(6).**

Elevated blood pressure should be confirmed on at least three separate days, and ambulatory blood pressure monitoring should be considered **(33, 34).**

After excluding other causes, in addition to lifestyle modification, ACE inhibitors or angiotensin receptor blockers should be started for treatment of confirmed hypertension (defined as blood pressure consistently ≥95th percentile for age, sex, and height or, in adolescents aged ≥13 years, >130/80 mmHg) **(6).**

Angiotensin receptor blocker can be used if the ACE inhibitor is not tolerated (e.g., due to cough) **(35).**

ACE inhibitors and angiotensin receptor Blockers should be avoided in sexually active individuals of childbearing potential who are not using reliable contraception and are contraindicated in pregnancy **(6).**

2-Dyslipidemia

In children (age ≥2 years) and adolescents, dyslipidemia should be screened with an initial non-fasting lipid profile soon after diagnosis, once glycemia has improved. If initial LDL is ≤100 mg/dL, testing should be repeated at 9 to 11 years of age. If LDL is within accepted risk level <100 mg/dL, then lipid panel should be repeated every 3 years is reasonable **(6).**

Consider age-approved statins, in addition to medical nutritional therapy (MNT) and lifestyle changes, for youth with type 1 diabetes who have LDL cholesterol ≥130 mg/dL (≥3.4 mmol/L). Individuals of childbearing age should receive reproductive counseling, and lipid-lowering medications should be avoided in most individuals of childbearing age who are not using reliable contraception. The goal of therapy is an LDL cholesterol value <100 mg/dL (<2.6 mmol/L) **(6).**

Microvascular complications

1-Diabetic Retinopathy

Because retinopathy is estimated to take at least 5 years to develop after the onset of hyperglycemia, people with type 1 diabetes should have an initial dilated and comprehensive eye examination within 5 years after the diagnosis of diabetes **(36).**

An initial dilated and comprehensive eye examination is recommended once youth have had type 1diabetes for 3–5 years, provided they are aged ≥11 years or puberty has started, whichever is earlier. After the initial examination, repeat dilated and comprehensive eye examination every 2 years. Less frequent examinations, every 4 years, may be acceptable on the advice of an eye care professional and based on risk factor assessment, including a history of A1C<8% (<64 mmol/mol) **(6).**

Promptly refer individuals with any level of diabetic macular edema, moderate or severe non proliferative diabetic retinopathy or any proliferative diabetic retinopathy PDR to an ophthalmologist who is knowledgeable and experienced in the management of diabetic retinopathy **(6).**

2-Diabetic Neuropathy

Individuals with a type 1 diabetes duration ≥5 years should be assessed annually for Diabetic peripheral neuropathy (DPN) using medical history and simple clinical tests **(37).** Assessment should include a careful history and assessment of either temperature or pinprick sensation (small-fiber function) and vibration sensation using a 128-Hz tuning fork (for large-fiber function). All people with diabetes should have annual 10-g monofilament testing to identify feet at risk for ulceration and amputation **(6).**

Individuals who have had type 1 diabetes for ≥ 5 years should be assessed annually for autonomic neuropathy **(37).**Screening for symptoms of autonomic neuropathy includes asking about orthostatic dizziness, syncope, early satiety, erectile dysfunction, changes in sweating patterns, or dry cracked skin in the extremities **(6).**

Optimize glucose management to prevent or delay the development of neuropathy in people with type 1 diabetes .Gabapentinoids, serotonin norepinephrine reuptake inhibitors, tricyclic antidepressants, and sodium channel blockers are recommended as initial pharmacologic treatments for neuropathic pain in diabetes. Opioids, including tramadol should not be used for neuropathic pain treatment in diabetes given the potential for adverse events **(6).**

Consider an annual comprehensive foot exam at the start of puberty or at age ≥10 years, whichever is earlier, once the youth has had type 1diabetes for 5 years. The examination should include inspection, assessment of foot pulses, pinprick, and 10-gmonofilament sensation tests, testing of vibration sensation using a 128-Hz tuning fork, and ankle reflex tests **(6).**

3-Diabetic nephropathy

Annual screening for albuminuria with a random (morning sample preferred to avoid effects of exercise) spot urine sample for albumin to creatinine ratio should be considered at puberty or at age >10 years, whichever is earlier, once the youth has had diabetes for 5 years **(6).**

In people with T1D who have hypertension, angiotensin converting enzyme (ACE) inhibitors and/or angiotensin-receptor blockers (ARBs) at the maximum tolerated dose indicated for blood pressure treatment, is the recommended first-line treatment for hypertension in people with diabetes and urinary albumin-to-creatinine ratio ≥300 mg/g creatinine or 30–299 mg/g creatinine **(6).**

The goal of treatment is to prevent the progression from microalbuminuria to macroalbuminuria which helps to prevent decline in renal function and reduces the risk of cardiovascular events **(6).**

Sick Day Management:

Insulin requirements will often increase during acute illness due to a spike in stress hormones, with resultant insulin resistance and hepatic gluconeogenesis producing hyperglycemia, and lipolysis leading to ketone production **(38).** Children and adolescents often will need additional insulin boluses to correct for hyperglycemia and ketonemia, even when their oral intake is decreased **(39).**

BG levels should be monitored every 2-3 hours, and ketones should be assessed if the patient is hyperglycemic or experiencing abdominal pain, nausea, or vomiting. Ondansetron typically is provided to every child and adolescent with T1D to treat emesis, and patients should be encouraged to increase their fluid intake. When ketones are present, the patient will need extra rapid acting insulin in addition to their usual dose for BG correction **(8, 38).**

Close communication with the diabetes team during illness is a key in determining the proper insulin adjustments. When inadequate oral intake results in hypoglycemia or refractory ketosis, children with T1D may need admission to the hospital for intravenous dextrose-containing fluids **(8).**

Diabetes Care in the Home and School

Family involvement is a vital component of optimal diabetes management throughout childhood and adolescence. As parents or caregivers are critical to diabetes self-management in youth, diabetes care requires an approach that places the youth and their parents or caregivers at the center of the care model **(6).**

It is important that adolescents begin to become independent in their diabetes care and be encouraged to perform tasks on their own that they can successfully achieve. At the same time, continued parental involvement in the form of periodic monitoring of their insulin administration and BG trends has proven beneficial **(39).**

Diabetes management and glycemic levels may be related to academic progress and students' functioning in the school setting, which highlights the need for appropriate accommodations and access to diabetes related support in school **(40).**

As a large portion of a youth's day is spent in school and/or daycare, training of school or daycare personnel to provide care in accordance with the child's individualized diabetes medical management plan is essential for optimal diabetes management and safe access to all school- or daycare–sponsored opportunities **(41).** School personnel must be well trained in diabetes management, because even mature adolescents and adults may still need assistance in times of severe hypoglycemia **(8).**

Referral in T1D (9).

Referral of children and adolescents with T1DM to pediatricians/pediatric endocrinologists should be made in the following conditions:

• Uncertainty with classification of diabetes

• Difficult metabolic control

• Concomitant co-morbidities and other management issues

• Inadequate resources and expertise in management

Transition of care from pediatric to adult diabetes care:

Discussions about transition of care from pediatric to adult diabetes providers should start during early adolescence. If adolescents are not adequately prepared for transition they can face gaps in health care, which can lead to worsening diabetes control and increased risk for diabetes complications **(42).**

Parents can aid in the transition by having the child take more responsibility for getting prescriptions filled, making appointments and communicating BG values with the endocrinology team in between visits. Diabetes care providers can coordinate transition clinics, where adult and pediatric endocrinologists see the patient in the same clinic setting, allowing for a gradual and more cohesive transition **(8).**

Important role of family physician in ADHD management

Presentation of ADHD in primary care settings

Primary care physicians, particularly family physicians caring for both parents and children, often encounter families in which parents and children (and even grandparents) all suffer from ADHD due to the strong genetic basis of ADHD **(43).**

Every family physician can facilitate early detection of ADHD by enquiring during a consultation whether the child has problems in learning at school, and specifically asking the parents whether they are concerned about their child's behavior in school, or at home .The family physician can play a crucial role in coordinating the assessment (obtaining information of child's behavior from parents and classroom teacher) **(44).**

Table 4. Presentation of ADHD during childhood and adolescence, as reported by the patient, parents, or teachers (45).

By Child or Adolescent:	**By Parents:**	**By Teachers:**
Does not like school or particular subjects or teachers	Aggression and problems with anger	Hyperactive
No close or long-term friends	Difficulty completing tasks	Inattentive, easily distracted
Conflict with parents	Disorganized, messy	Interferes with others, disrupts class
Low self-esteem	Does not follow directions	Underachiever, school failure
Always getting in trouble	Impulsive	Does not listen
	Difficulties with school	Fidgets, will not stay in seat

	"Always on the go" Does not make or keep friends Socially or emotionally immature Engages in dangerous activities "Spaced out" or absentminded Loses possessions	Blurts out answers, does not consider others Frequent behavior problems

(45).

Evaluation of ADHD in primary care settings

The evaluation of a patient with ADHD requires multiple visits and should evolve, along with the education of the patient and family members about the condition and its impact. An adequate evaluation includes eliciting the symptoms required to make the diagnosis and their impact on functioning and quality of life. It also includes assessing whether an immediate crisis exists, whether other primary conditions or comorbidities are present, and what resources are available to aid management **(45).**

An initial clinical task is to determine and respond to any crisis that has precipitated the primary care visit and recognition of ADHD symptoms. Depending on the patient's age, these might include threat of suicide, or harm or violence to the affected child or to others. It also might include school- or work-related disruption such as expulsion or termination or threat of arrest or other legal action **(45).**

Confirming the Diagnosis

The American Academy of Pediatrics (AAP) suggests the following questions as useful for screening during the school years, given that symptoms may not be apparent during office visits and routine screening has been demonstrated to increase recognition during childhood **(46):**

• How is your child doing in school?

• Are there problems with learning that you or the teacher has seen?

• Is your child happy in school?

• Are you concerned with any behavioral problems in school or at home or when your child is playing with friends?

• Is your child having problems completing classwork or homework?

In addition to determining symptoms, the DSM-V criteria require that onset of some behavioral symptoms occurred before age 12, have persisted at least 6 months, and are present in more than one setting (home, school, play or work, day care).For children and adolescents, obtaining assessment from at least one teacher or other person in direct contact with the child or adolescent (American Psychiatric Association **(47).**

Identifying Comorbidities and Other Primary Disorders

A number of conditions are highly prevalent among those with ADHD, and these disorders should be sought both initially and periodically during follow-up care.These include psychiatric conditions, academic problems, and family dysfunction. Specifically, mood and anxiety disorders, conduct and oppositional defiant disorders, or substance abuse might already be present or develop over time **(45).**

A final area requiring evaluation is that of family psychosocial problems. Families of patients with hyperactive-impulsive subtype ADHD are more likely to have other members with aggression and substance abuse– related problems, while patients with inattentive subtype are more likely to have family histories of anxiety disorders and learning problems **(48).**

Not uncommonly, the primary care physician will need to either treat or arrange treatment for other family members as well as for the individual with ADHD. This may improve greatly the functioning and long-term outcomes of all involved **(45).**

Developing a Comprehensive Assessment of the Patient with ADHD

The primary care evaluation should culminate in a comprehensive formulation including the subtype of ADHD and comorbid conditions and an understanding of past management strategies used by the family or patient (American Academy of Pediatrics **(49).**

The impact of ADHD and comorbidities, including developmental concerns, academic difficulties, and social, work, and family issues, and an inclusive depiction of the individual's functioning should be part of the formulation. This also should include the patient's and family's vulnerabilities and strengths. This formulation, possibly developed in consultation with those with special expertise in ADHD, is critical to guiding the successful management of ADHD **(45).**

Primary care management of ADHD

Successful management of ADHD begins with establishing a therapeutic alliance with the patient and affected family members. These strategies begin with patient and family education and agreement on patient-specific goals, treatment, follow up, and monitoring. Patient and family education should be viewed as a continuing activity, starting with information about ADHD and relevant comorbidities and ways ADHD can affect attention, impulse control and behaviors, learning, social skills, and family relationships and functioning **(45).**

Demystifying the condition; clarifying misconceptions about ADHD, its treatment options, and barriers to treatment; and discussing realistic expectations of treatment set the basis for involving the patient/family in subsequent decisions about therapy. Several visits may be required before the patient/family understand and accept the diagnosis **(45).**

Putting them in touch with other patients or support groups may be very helpful. Particularly for those patients with comorbidities or severe symptoms or functional impairments, a key function of the primary care physician is assembling a treatment team involving mental health and education specialists or other specialists appropriate to the patient's age and difficulties faced by the patient **(45).**

As the patient/family accepts the diagnosis and need for treatment, a second step suggested by the AAP is setting 3 to 6 specific treatment goals with them. Such goals should be attainable within a reasonable time and measurable and might be school- (or work-) based or related to social or family functioning or self-management activities. These goals should reflect the priorities of the patient/family and can then be used in decisions about treatment and in monitoring treatment response. Communicating these goals to all caring professionals involved will decrease the possibility of conflicting recommendations **(49).**

Tailoring Treatment

The family physician can play an important role in counseling the parents and classroom teacher of a child with ADHD about the need for medication, psychoeducational interventions, analyze their feedback about the child's specific target behaviors to titrate the medication dose , and monitor the child' s academic progress on a long-term basis **(50).**

Primary care physicians familiar with ADHD management can even initiate the medication management, but will need to liaise with a child psychiatrist/developmental pediatrician regarding any complications in treatment (for example, intolerable side effects or treatment failure) or if comorbid conditions (ODD, CD, anxiety, depression) are suspected **(44).**

As pharmacotherapy controls the core symptoms of ADHD, the primary care physician and treatment team should discuss other supportive interventions with the patient. These interventions can help to increase symptom control and help the patient/family adapt to the illness and alter dysfunctional patterns of behaviors, relationships and life choices that they have engaged in prior to treatment **(45).**

For children and adolescents, a variety of behavioral therapies have been demonstrated to be effective. These involve training parents and teachers in specific techniques to improve behaviors and environmental management strategies to reduce distractions, increase structure of activities, and support improved patient functioning **(49).**

Cognitive-behavioral therapy and other psychotherapeutic approaches might be of particular help to the adolescent especially when pharmacotherapy is providing relief from core symptoms and improving cognitive processes **(51).**

As patients and their families progress from initial diagnosis to a stable treatment plan, the primary care physician's role will change, but will remain critical to optimizing long-term success. Patient education should be ongoing, focused on helping patients evolve their understanding of the disorder and its management and promoting competent self-monitoring and self-management **(45).**

A life and family stage approach can be of help in anticipating and helping the patient prepare for developmental tasks and challenges. For example, during adolescence, the development of greater independence and the challenges of expanded social expectations, driving, and alcohol use are areas in which counseling, either directly by the primary care physician or through referral, is likely to be beneficial **(52).**

References:

1. Atkinson, M. A., Eisenbarth, G. S., & Michels, A. W. (2014). *Type 1 diabetes*. The Lancet, 383(9911), 69–82. https://doi.org/10.1016/S0140-6736(13)60591-7
2. Klingensmith, G. J., et al. (2013). *Care of children and adolescents with type 1 diabetes*. American Diabetes Association. Diabetes Care, 36(Suppl 1), S119–S126. https://doi.org/10.2337/dc13-S119
3. Subcommittee on Attention-Deficit/Hyperactivity Disorder, Steering Committee on Quality Improvement and Management. (2011). *ADHD: Clinical practice guideline for the diagnosis, evaluation, and treatment of ADHD in children and adolescents*. Pediatrics, 128(5), 1007–1022. https://doi.org/10.1542/peds.2011-2654
4. Hilliard, M. E., et al. (2013). *Executive functioning and diabetes management in adolescents with type 1 diabetes: A review*. Current Diabetes Reports, 13(4), 486–493. https://doi.org/10.1007/s11892-013-0380-2.
5. Gungor N, Hannon T, Libman I, Bacha F, Arslanian S. Type 2 diabetes mellitus in youth: the complete picture to date. Pediatr Clin North Am 2005;52:1579-609.
6. American Diabetes Association Professional Practice Committee. 2. Diagnosis and classification of diabetes: Standards of Care in Diabetes—2025. Diabetes Care 2025;48(Suppl. 1): S27–S49
7. Pinhas-Hamiel O, Zeitler P. Clinical presentation and treatment of type 2 diabetes in children. Pediatr Diabetes 2007;8(suppl 9):16-27.
8. Dayton, K. A., & Silverstein, J. (2016). What the primary care provider needs to know to diagnose and care for adolescents with type 1 diabetes. The Journal of Pediatrics, 179, 249-255.
9. Hong, Y. H. J., Hassan, N., Cheah, Y. K., Jalaludin, M. Y., & Kasim, Z. M. (2017). Management of T1DM in children and adolescents in primary care. Malaysian Family Physician: The Official Journal of the Academy of Family Physicians of Malaysia, 12(2), 18.
10. Beauchamp G,Haller MJ. Can we prevent type 1 diabetes? Curr Diab Rep 2015;15:86.

11. Roche EF,Menon A, Gill D, Hoey H. Clinical presentation of type 1 diabetes. Pediatr Diabetes 2005;6:75-8.
12. Dahlquist G, Kallen B.Mortality in childhood-onset type 1 diabetes. Diabetes Care 2005;28:2384-7.
13. Wolfsdorf J, Glaser N, Sperling MA. Diabetic ketoacidosis in infants, children, and adolescents. Diabetes Care 2006;29:1150-9.
14. Robbins JM, Thatcher GE, Webb DA, Valdmanis VG. Nutritionist visits, diabetes classes, and hospitalization rates and charges: the Urban Diabetes Study. Diabetes Care. 2008; 31(4): 655-660.
15. Cooke D, Bond R, Lawton J, et al.; U.K. NIHR DAFNE Study Group. Structured type 1 diabetes education delivered within routine care: impact on glycemic control and diabetes-specific quality of life. Diabetes Care. 2013; 36(2): 270-272.
16. Addissouky, T. A., Ali, M. M., El Sayed, I. E. T., & Wang, Y. (2024). Type 1 diabetes mellitus: retrospect and prospect. Bulletin of the National Research Centre, 48(1), 42.
17. Steiman De Visser H, Fast I, Brunton N, et al. Cardiorespiratory fitness and physical activity in pediatric diabetes: a systemic review and metaanalysis. JAMA Netw Open 2024;7:e240235
18. Riddell MC, Gallen IW, Smart CE, et al. Exercise management in type 1 diabetes: a consensus statement. Lancet Diabetes Endocrinol 2017; 5:377–390
19. Moser O, Riddell MC, Eckstein ML, et al. Glucose management for exercise using continuous glucose monitoring (CGM) and intermittently scanned CGM (isCGM) systems in type 1 diabetes: position statement of the European Association for the Study of Diabetes (EASD) and of the International Society for Pediatric and Adolescent Diabetes (ISPAD) endorsed by JDRF and supported by the American Diabetes Association (ADA). Diabetologia 2020;63:2501–2520
20. Redondo MJ, Libman I, Cheng P, et al.; Pediatric Diabetes Consortium. Racial/ethnic minority youth with recent-onset type 1 diabetes have poor prognostic factors. Diabetes Care 2018; 41:1017–1024
21. Escudero-Carretero, M., Prieto-Rodríguez, M. Á., Fernández-Fernández, I., & March-Cerdà, J. C. (2006). Physician/patient relationship in diabetes mellitus type 1 treatment. A qualitative study. Atencion Primaria, 38(1), 8
22. Alali, S. M., Alghamdi, R. L., Al Bosrour, Z. A., Al Dokhi, A. A. A., Alabdulrahim, Z. A., Almazyad, A. Z., ... & Almajhad, A. A. (2019). Role of physicians in diagnosis and management of diabetes mellitus in primary health care. Archives of Pharmacy Practice, 10(2-2019), 12-15.
23. Cengiz, E., Danne, T., Ahmad, T., Ayyavoo, A., Beran, D., Ehtisham, S., ... & Codner, E. (2022). ISPAD Clinical Practice Consensus Guidelines 2022: Insulin treatment in children and adolescents with diabetes. Pediatric Diabetes, 23(8).
24. Peters AL, Ahmann AJ, Battelino T, Evert A, Hirsch IB, Murad MH, Winter WE, Wolpert H. Diabetes Technology-Continuous Subcutaneous Insulin Infusion Therapy and Continuous Glucose Monitoring in Adults: An Endocrine Society Clinical Practice Guideline. The Journal of clinical endocrinology and metabolism. 2016;101(11):3922-37.
25. Rebel A, Rice MA, Fahy BG. Accuracy of point-of-care glucose measurements. J Diabetes Sci Technol 2012;6:396-411.
26. Smith, A., & Harris, C. (2018). Type 1 diabetes: management strategies. American family physician, 98(3), 154-162.
27. Channon SJ, Huws-Thomas MV, Rollnick S, et al. A multicenter randomized controlled trial of motivational interviewing in teenagers with diabetes. Diabetes Care. 2007; 30(6): 1390-1395.
28. McTavish L, Corley B, Weatherall M, Wiltshire E, Krebs JD.Weight-based carbohydrate treatment of hypoglycaemia in people with type 1diabetes using insulin pump therapy: a randomized crossover clinical trial. Diabet Med 2018;35:339– 346
29. Phillip M, Nimri R, Bergenstal RM, et al. Consensus recommendations for the use of automated insulin delivery technologies in clinical practice. Endocr Rev 2023;44:254–280
30. Muller LMAJ, Gorter KJ, Hak E, Goudzwaard WL, Schellevis FG, Hoepelman AIM, et al. Increased risk of common infections in patients with type 1 and type 2 diabetes mellitus. Clin Infect Dis 2005;41:281-8.

31. Nuorti JP,Whitney CG. Prevention of pneumococcal disease among infants and children - use of 13-valent pneumococcal conjugate vaccine and 23- valent pneumococcal polysaccharide vaccine. Morb Mortal Wkly Rep 2010;59(RR–11):1-18.
32. de Bock, M., Agwu, J. C., Deabreu, M., Dovc, K., Maahs, D. M., Marcovecchio, M. L., ... & DiMeglio, L. A. (2024b). ISPAD clinical practice consensus guidelines 2024b: glycemic targets. Hormone research in paediatrics, 1-13.
33. Flynn JT, Kaelber DC, Baker-Smith CM, et al.; Subcommittee on Screening and Management of High Blood Pressure in Children. Clinical practice guideline for screening and management of high blood pressure in children and adolescents. Pediatrics 2017;140:e20171904
34. Marcovecchio ML, Chiesa ST, Bond S, et al.; AdDIT Study Group. ACE inhibitors and statins in adolescents with type 1 diabetes. N Engl J Med 2017;377:1733–1745
35. de Ferranti SD, de Boer IH, Fonseca V, et al. Type 1 diabetes mellitus and cardiovascular disease: a scientific statement from the American Heart Association and American Diabetes Association. Diabetes Care 2014;37:2843–2863
36. Nathan DM, Bebu I, Hainsworth D, et al.; DCCT/EDIC Research Group. Frequency of evidence-based screening for retinopathy in type 1 diabetes. N Engl JMed 2017;376:1507–1516
37. Pop-Busui R, Boulton AJM, Feldman EL, et al. Diabetic neuropathy: a position statement by the American Diabetes Association. Diabetes Care 2017;40:136–154
38. Laffel L. Sick-day management in type 1 diabetes. EndocrinolMetab Clin North Am 2000;29:707-23.
39. Silverstein J, Klingensmith G, Copeland K, Plotnick L, Kaufman F, Laffel L, et al. Care of children and adolescents with type 1 diabetes: a statement of the American Diabetes Association. Diabetes Care 2005;28:186- 212.
40. Kucera M, Sullivan AL. The educational implications of type I diabetes mellitus: a review of research and recommendations for school psychological practice. Psychol Schools 2011;48: 587–603
41. March C, Sherman J, Bannuru RR, et al. Care of young children with diabetes in the childcare and community setting: a statement of the American Diabetes Association. Diabetes Care 2023;46:2102–2111
42. Peters A, Laffel L, American Diabetes Association Transitions Working Group the ADATW,Weissberg-Benchell J,Wolpert H, Anderson B, et al. Diabetes care for emerging adults: recommendations for transition from pediatric to adult diabetes care systems. Diabetes Care 2011;34:2477-85.
43. Faraone SV, Khan SA. Candidate gene studies of attention-deficit/ hyperactivity disorder. J Clin Psychiatry 2006;67(suppl 8):13–20
44. Brown RT, Freeman WS, Perrin JM, Stein MT , Amler RW, Feldman HM, et al. Prevalence and assessment of attentiondeficit/ hyperactivity disorder in pr imary care settings. Pediatrics 2001;107:e43.
45. Culpepper, L. (2006). Primary care treatment of attention-deficit/hyperactivity disorder. Journal of clinical psychiatry, 67, 51.
46. American Academy of Pediatrics. Clinical practice guideline: diagnosis and evaluation of the child with attention-deficit/hyperactivity disorder. Pediatrics 2000;105:1158–1170
47. American Psychiatric Association, D. S. M. T. F., & American Psychiatric Association, D. S. (2013). Diagnostic and statistical manual of mental disorders: DSM-5 (Vol. 5, No. 5). Washington, DC: American psychiatric association.
48. Biederman J, Newcorn J, Sprich S. Comorbidity of attention deficit hyperactivity disorder with conduct, depressive, anxiety, and other disorders. Am J Psychiatry 1991;148:564–577
49. American Academy of Pediatrics. Subcommittee on Attention-Deficit/ Hyperactivity Disorder and Committee on Quality Improvement. Clinical Practice Guideline: Treatment of the School-Aged Child With Attention- Deficit/Hyperactivity Disorder. Pediatrics 2001;108:1033–1044
50. Karande, S. (2005). Attention deficit hyperactivity disorder: A review for family physicians.
51. Safren SA. Cognitive-behavioral approaches to ADHD treatment in adulthood. J Clin Psychiatry 2006;67(suppl 8):46–50
52. Weiss MD, Weiss JR. A guide to the treatment of adults with ADHD. J Clin Psychiatry 2004;65(suppl 3):27–37.