

Diagnosis and treatment of polycystic ovary syndrome in adolescents

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ABSTRACT

Polycystic ovary syndrome (PCOS), characterized by ovulatory dysfunction and hyperandrogenism, is one of the most common endocrine disorders in women of reproductive age. Early diagnosis can help clinicians address associated long-term metabolic and reproductive health complications and mitigate the negative effects of PCOS on a patient's mental health and quality of life. Clinicians often are challenged by the diagnosis and management of PCOS because of controversies around diagnostic criteria, especially for adolescents. The International Consortium of Paediatric Endocrinology 2017 Consensus Statement provides practical guidance for clinicians to implement best practices for the identification, diagnosis, and management of PCOS in adolescents.

Keywords: polycystic ovary syndrome, PCOS, adolescents, ovulatory dysfunction, hyperandrogenism, endocrine disorder

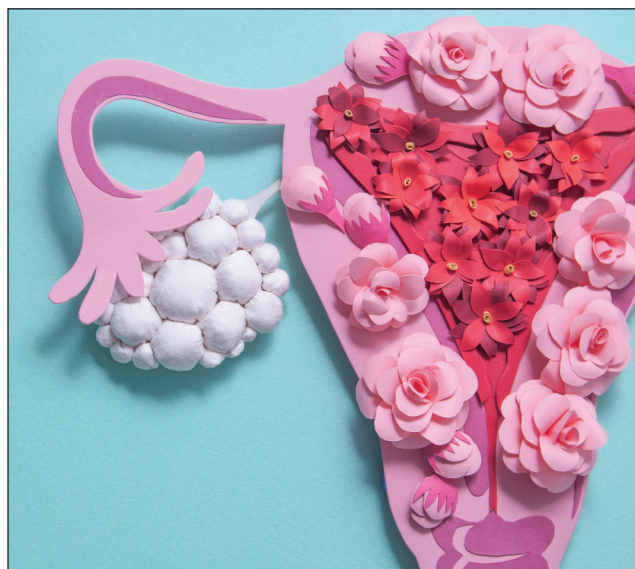
Learning objectives

- Describe the clinical presentation of PCOS in adolescents.
- Discuss adolescent-specific guidelines for the diagnosis of PCOS based on the ICPE 2017 Consensus Statement.
- Outline appropriate short and long-term management plans for an adolescent with PCOS.

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Polycystic ovary syndrome (PCOS) is a complex endocrine disorder characterized by ovulatory dysfunction and hyperandrogenism. PCOS is considered one of the most common endocrine disorders in women, the leading cause of infertility in the United States, and a major risk factor for metabolic syndrome and type 2 diabetes.¹ Symptoms of PCOS often begin in adolescence, but it commonly is not diagnosed until adulthood, when women present with complications such as infertility.² The prevalence of PCOS in adolescents is unclear, but estimated prevalence in women of reproductive age in the United States is 6% to 15% depending on the diagnostic criteria used.¹

Many experts agree that there is a missed opportunity when PCOS is not diagnosed until adulthood, because the condition is associated with several complications of reproductive, metabolic, and mental health.¹ Early identification can prompt early intervention and education about lifestyle modifications that can reduce health risks associated with PCOS.² Additionally, early diagnosis is important when considering appropriate transition of care from pediatric to adult medicine.^{3,4} Patients must be prepared for long-term management to prevent and screen for potential complications of PCOS, such as type 2 diabetes.

Diagnosis of PCOS in adolescents is challenging because of the difficulty of distinguishing between manifestations

Key points

- Irregular menses, hirsutism, and/or moderate to severe acne are common clinical manifestations of PCOS in adolescents.
- PCOS is a diagnosis of exclusion.
- Management of PCOS in adolescents should include lifestyle modifications and focus on the symptoms of PCOS that are most bothersome to the adolescent.
- Metformin and/or the use of combined hormonal contraception are considered safe and effective to manage symptoms of PCOS in adolescents barring contraindications.

of PCOS and normal physiologic changes of puberty; therefore, clinicians must be aware of adolescent-specific guidelines. In 2015, the first consensus statement for the diagnosis of PCOS in adolescents was developed by an international panel of pediatric and endocrine experts.⁵ This consensus statement was reaffirmed in 2017, resulting in the International Consortium of Paediatric Endocrinology (ICPE) 2017 Consensus Statement, which is supported by the Pediatric Endocrine Society (PES) and aligns with diagnostic criteria for adolescents in the 2018 International Evidence-Based Guidelines for the Assessment and Management of PCOS across the lifespan.^{3,4}

The appropriate diagnostic criteria for PCOS, especially among adolescents, have been debated for several decades. The more commonly known diagnostic criteria (NIH, Rotterdam, and Androgen Excess and PCOS Society criteria), published between 1990 and 2009, did not account for physiologic differences in adolescents.^{6,7} The first official diagnostic criteria to address adolescents, known as the Amsterdam Consensus, was published in 2012.⁶ Since then, experts have sought to clarify specific criteria regarding when menstrual cycles are considered irregular, the appropriate evaluation for hyperandrogenism, and whether polycystic ovarian morphology (PCOM) should be considered for diagnostic criteria in an adolescent.⁶

Lack of knowledge of adolescent-specific guidelines can create significant confusion for clinicians and patients. Due to limited publication of the ICPE 2017 Consensus Statement outside the specialty literature, many clinicians may be unaware of new expert guidance.

The aim of this article is to inform clinicians of adolescent-specific criteria for the diagnosis and management of PCOS, and support clinicians, including primary care providers (PCPs), who may be the first line for early identification of this complex condition in adolescents.

BRIEF HISTORY OF PCOS

PCOS was first described by Stein and Leventhal in 1935.⁷ Their evaluation of seven women who had excess body weight, amenorrhea, and infertility revealed a common

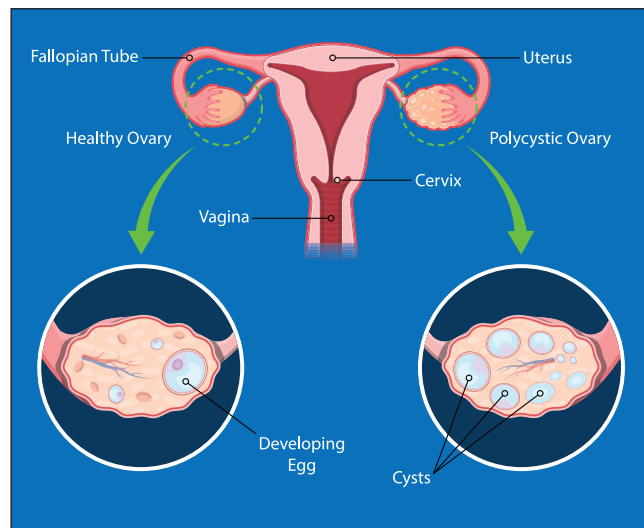


FIGURE 1. Normal and polycystic ovaries

finding of multiple ovarian cysts (Figure 1).⁷ The condition was initially understood as a primary ovarian disorder, and later named PCOS.⁷ However, research over the last several decades has demonstrated that PCOS is a complex endocrine disorder involving several endocrine signaling pathways, and is not solely defined by ovarian dysfunction.³ Attention has been directed away from relying on PCOM as a main diagnostic feature, and many experts believe that PCOM is a misnomer.⁸ This is especially true in adolescents, in whom increased ovarian volume and polycystic morphology is a normal finding in puberty.⁹

PATHOPHYSIOLOGY

The pathophysiology of PCOS is complex and its exact cause is unknown. Androgen excess is the hallmark of PCOS in adolescents.³ No single specific mechanism is known to be the origin of androgen excess; rather, several pathophysiologic components may be involved.³ These components include primary ovarian dysfunction, insulin resistance, alteration in signaling from neuroendocrine hormones, genetics, epigenetics, and alterations in sympathetic nerve activity.^{3,9} PCOS is the result of disruptions in the signaling among these various pathophysiologic components, but not all components are involved in all patients with PCOS.

CLINICAL PRESENTATION

The most common presenting signs and symptoms of PCOS are associated with ovarian dysfunction and hyperandrogenism. Ovarian dysfunction manifests as irregular menses, and hyperandrogenism presents as hirsutism and/or moderate-to-severe acne (also referred to as cutaneous hyperandrogenism).¹⁰ Irregular menses and cutaneous hyperandrogenism also can be normal findings during puberty, creating difficulty in differentiating between normal and abnormal findings that require further evaluation. The

diagnostic criteria offer definitions and guidance for better understanding when it is appropriate to consider a diagnosis of PCOS in adolescents with these clinical findings.

Excess body weight and obesity are common findings of PCOS in both adolescent and adult women.¹¹ However, excess body weight is not present in all patients with PCOS and is not a diagnostic criterion.¹¹ The relationship of obesity with PCOS is complex and not completely understood. Preclinical models investigating the pathophysiology of PCOS have suggested a bidirectional relationship between obesity and PCOS.³ Obesity exacerbates the metabolic complications of PCOS, but has not been proven to be a distinct feature or cause of PCOS.¹² From the opposite direction, PCOS has been associated with inefficient energy oxidation and metabolic inflexibility, which are markers of reduced metabolism, resulting in an increased risk of obesity.¹³

Other metabolic conditions, such as impaired glucose tolerance, also may be part of the clinical presentation for a patient in whom PCOS should be considered as part of a differential diagnosis. Similar to obesity, these metabolic conditions may be associated with PCOS, but are not a part of the diagnostic criteria.⁹ Asking about menstrual irregularity and evaluating for cutaneous hyperandrogenism are warranted in adolescents who present with evidence of metabolic abnormalities.⁹

DIAGNOSIS

Consider two key points in an initial evaluation for PCOS in adolescents: First, PCOS is a diagnosis of exclusion.

Clinicians must be aware of the other conditions to rule out and the appropriate ancillary diagnostic tests. Second, several of the characteristics of PCOS, such as menstrual irregularities, can be normal findings during puberty.

Adolescent-specific guidelines, based on the ICPE 2017 Consensus Statement, provide the following criteria for diagnosing PCOS in adolescents: irregular menses in adolescents who are at least 2 years postmenarche, the presence of persistent clinical or biochemical hyperandrogenism, and exclusion of other causes of these findings.³ Specific criteria for what defines irregular menses and hyperandrogenism in an adolescent are discussed in **Table 1**. Understanding these specifications is vital to supporting early recognition of PCOS and avoiding overdiagnosis.

Irregular menses Irregular menses can be normal in the early postmenarchal years as the hypothalamus-pituitary-ovarian (HPO) axis matures. It can take up to 5 years postmenarche for maturation of the HPO axis, but most adolescents will have regular ovulatory cycles within 1 to 2 years postmenarche.³ Based on this evidence, the guidelines define parameters of when irregular menses may be considered abnormal (**Table 1**). Adolescents may find it challenging to accurately track their menstrual cycle; therefore, more general guidance suggests that patients with irregular menses that persist 2 years postmenarche be evaluated for PCOS.^{3,4}

Primary amenorrhea also may be a sign of ovulatory dysfunction in PCOS in an adolescent who otherwise has normal pubertal development.³ The guidelines define primary

TABLE 1. Diagnostic criteria for PCOS in adolescents^{3,4}

Criteria	Evaluation	Considerations
Irregular menses/ovulatory dysfunction	Comprehensive history and physical/menses tracking. Irregular menses are defined as: <ul style="list-style-type: none"> • From 1 to 3 years postmenarche: <21 or >45 days • From 3 years postmenarche: <21 days or >35 days, or <8 cycles per year • Menstrual cycle >90 days for any one cycle >1 year postmenarche • Primary amenorrhea by age 15 years or age 13 years with absence of menses and no secondary sexual characteristics such as breast development 	Generally, patients with irregular menses must be 2 years postmenarche
Hyperandrogenism: clinical or biochemical	<ul style="list-style-type: none"> • Clinical hyperandrogenism • Progressive hirsutism • Complete physical examination; use validated visual scale to evaluate hirsutism • Moderate to severe acne; follow-up with evaluation for biochemical hyperandrogenism • Biochemical hyperandrogenism • Use of high-quality assays for total and free testosterone 	Moderate to severe acne alone is not adequate to diagnose clinical hyperandrogenism, must use follow-up testing
Rule out other disorders of hyperandrogenism	Laboratory evaluation for pregnancy, thyroid disorders, nonclassic congenital adrenal hyperplasia, Cushing syndrome, androgen-secreting tumor	Ultrasound is not recommended to evaluate ovarian morphology*

*Ultrasound should not be used to evaluate for PCOS in patients <8 years postmenarche. Ultrasound should be reserved for evaluation of other conditions as needed, such as evaluation for structural abnormalities in primary amenorrhea.

amenorrhea as lack of menses by age 15 years or more than 3 years post-thelarche.³

Hyperandrogenism Findings of irregular menses must be present along with evidence of excess androgens.^{3,4} Excess androgens can manifest as clinical and/or biochemical hyperandrogenism. Although clinical hyperandrogenism, along with menstrual irregularities, is suggestive of PCOS, confirmation of biochemical hyperandrogenism is recommended before making a diagnosis of PCOS.^{3,4}

Clinical hyperandrogenism is defined by the International Consortium of Paediatric Endocrinology 2017 Consensus Statement as moderate to severe hirsutism.³ Hirsutism is the presence of dark coarse hair growth in a male-like pattern (upper lip, chin, sideburns, neck, periumbilical, chest, upper back, around nipple area).^{3,4} Dark hair growth on arms and lower legs is not hirsutism and may represent ethnogenetic variation. Clinicians should perform a physical examination and evaluate hirsutism with a validated numerical scale, such as the modified Ferriman-Gallway scale.⁴ Measurement scales should be used with caution, however, because normative cutoffs for adolescents have not been established.⁴

Moderate or severe inflammatory acne that is resistant to topical treatment is suggestive of clinical hyperandrogenism, but requires follow-up testing for biochemical hyperandrogenism.³ Although mild comedonal acne is considered a normal finding of puberty, severe inflammatory acne is uncommon and is present in less than 5% of adolescents during early postmenarchal years.⁴

Biochemical hyperandrogenism can be documented by measuring total testosterone or calculating free testosterone with a high-quality assay (liquid-chromatography spectrometry and extraction/chromatography immunoassays).^{3,4} Other laboratory tests to evaluate hyperandrogenism include androstenedione, dehydroepiandrosterone sulfate (DHEAS), and 17-hydroxyprogesterone.³ These three tests

are not used to diagnose PCOS, but rather to exclude other causes of hyperandrogenism such as nonclassic congenital adrenal hyperplasia, adrenal tumors, and other androgen-secreting tumors.⁴

Exclusion of other causes PCOS is a diagnosis of exclusion. Clinicians must rule out conditions that can cause irregular menses or excess androgens, including pregnancy, thyroid dysfunction, nonclassic congenital adrenal hyperplasia, and androgen-secreting adrenal or ovarian tumors.³ Cushing syndrome and/or hypothalamic pituitary insufficiency also may be considered depending on clinical presentation.³ **Table 2** summarizes the diagnostic laboratory tests suggested for the initial PCOS evaluation in an adolescent who presents with irregular menses and clinical hyperandrogenism.^{3,14}

Two laboratory tests that are not recommended for initial evaluation, but that are often discussed in the literature regarding PCOS in adult women, are sex-hormone binding globulin and anti-Müllerian hormone. Sex-hormone binding globulin is suppressed by elevated androgen concentrations, which contributes to higher free testosterone concentrations. Sex-hormone binding globulin levels provide additional information if free testosterone levels are elevated, but they are not diagnostic of PCOS.³ Elevation of anti-Müllerian hormone is reported in the literature as a common finding in women with PCOS, but research has demonstrated a weaker association among adolescents with PCOS.³

Ultrasound for PCOM Adolescent-specific diagnostic criteria do not require the presence of polycystic morphology to diagnose PCOS.³ Increased gonadotropin stimulation during adolescence results in increased ovarian volume and follicular maturation, resulting in the appearance of polycystic morphology that is normal in an adolescent.¹² Guidelines state that pelvic ultrasound should not be used for the diagnosis of PCOS and that in general, evaluation

TABLE 2. Diagnostic testing for adolescents with suspected PCOS^{3,11}

Laboratory test	Indication
Beta-hCG pregnancy	Rule out pregnancy
TSH	Rule out thyroid dysfunction
17-OH progesterone	Part of testing to rule out nonclassic congenital adrenal hyperplasia
Total testosterone, free testosterone	To document hyperandrogenism, elevated in PCOS. Required for diagnosis of PCOS.
FSH, LH, estradiol	Reserved for patients with amenorrhea to rule out premature ovarian failure (high FSH, low estradiol). LH:FSH ratio of 2:1 or greater is common in patients with PCOS but is not absolute (LH and FSH levels vary in cycle) and is not diagnostic.
Prolactin	Rule out hyperprolactinemia in a patient with amenorrhea
Dehydroepiandrosterone sulfate	Part of testing to rule out nonclassic congenital adrenal hyperplasia and androgen-secreting tumors
Androstenedione	Produced in the ovaries and adrenal glands. Part of testing to rule out androgen-secreting tumors.
Fasting blood glucose, lipid panel, and A1C	Screening for metabolic components of PCOS

TABLE 3. Recommendations and medication options for managing PCOS in adolescents^{3,4}

Treatment or medication	Indication	Potential effect	Common adverse reactions, contraindications, special considerations
Lifestyle modifications: combine weight loss and physical exercise	<ul style="list-style-type: none"> • Excess weight or obesity • Physical exercise without recommendations for weight loss in normal-weight adolescents 	Decreased androgen levels, normalized menstrual cycles, improved markers of cardiometabolic health	<ul style="list-style-type: none"> • Interdisciplinary care recommended when available. • Consider family preferences and cultural norms. • Family should be involved in lifestyle changes.
Metformin (850 mg/day up to 1 g twice a day)	Evidence of insulin resistance (regardless of BMI)	Improve insulin sensitivity, improve glycemic control, decrease BMI, decreased androgen levels, ovulation	<ul style="list-style-type: none"> • Common adverse reactions include GI discomfort. • Cannot be used in patients with renal or hepatic dysfunction.
Combined oral contraceptives	Menstrual irregularities	Increased production of hepatic SHBG results in less circulating androgens, normalized menstrual cycles	<ul style="list-style-type: none"> • Adverse reactions may include breast tenderness, headache, increased risk of VTE, increased insulin resistance. • Consider family preferences and cultural norms.
Cosmetic procedures such as photoepilation or topical eflornithine (13.9% twice a day)	Localized hirsutism	Long-term removal of unwanted hair growth	<ul style="list-style-type: none"> • Cost if not covered by insurance • Discomfort
Spironolactone (50-200 mg/day)	Features of hyperandrogenism that do not resolve after 6 months of combined oral contraceptives or cosmetic procedures	Reduced excess androgens	<ul style="list-style-type: none"> • Adverse reactions may include irregular menses, headache, hypotension, nausea, feminization of male fetus. • Contraindicated in patients with renal failure. • Monitor for hyperkalemia. • Prescribe with contraception due to fetal effects.
Flutamide (62.5 mg/day to 250 mg/day)	Hyperandrogenism that do not resolve after 6 months of combined oral contraceptives or cosmetic procedures	Reduced excess androgens	<ul style="list-style-type: none"> • Dose-dependent hepatotoxicity at doses greater than 1 mg/kg/day. • Prescribe with contraception due to fetal effects of feminization of male fetus.

of ovarian morphology is not recommended before 8 years postmenarche.⁴ Additionally, transvaginal ultrasound is an invasive test that can cause significant discomfort in adolescent girls and is not recommended in nonsexually active adolescents.³ A transabdominal approach may not be reliable, especially in adolescents with excess body weight or obesity.³

TREATMENT

Two main principles guide the treatment and management of PCOS in adolescents. First, lifestyle modifications are the first line of treatment for all adolescents who either have PCOS or who are determined to be at risk before confirmation of diagnosis.³ Second, additional treatments should be individualized to optimize symptom relief.¹² Interventions should be patient-centered, addressing the patient’s main concerns. Additionally, patient education and counseling about PCOS is vital and should be appropriate for the patient’s age and culture. Discussions about PCOS may need to be repeated as the adolescent ages, and should include recommendations for lifelong management

and screening for comorbid conditions associated with PCOS (Table 3).¹²

Lifestyle interventions Healthful eating, increasing physical activity while reducing sedentary activity, and incorporating other behavior change strategies comprise the first line of therapy for adolescents who are overweight or obese.³ Weight loss of 5% to 7% has been shown to result in improved menstrual regularity and reduced testosterone levels.¹⁰ The ICPE 2017 consensus statement does not encourage weight loss in normal-weight adolescents with PCOS, but recommends reducing sedentary lifestyles and increasing physical activity to decrease the risk of developing metabolic syndrome.³ Guidelines recommend a multidisciplinary approach to addressing lifestyle modifications, incorporating nutritionists, mental health practitioners, and primary care and/or specialty providers.⁴

Education and counseling about lifestyle modifications should include families and consider family dynamics. Family readiness to change affects adolescents’ motivation and ability to change their behaviors. Family members can provide support as adolescents set measurable, achievable

lifestyle goals and track progress toward attaining those goals.^{3,10} Additionally, clinicians should be sensitive when discussing diet and exercise with adolescents, and have an awareness of concerns related to body image and the effect on psychologic well-being in this age group. Clinicians should focus discussions on the benefit of overall health and lifestyle modification, rather than highlighting deficits and long-term negative outcomes.

Pharmaceutical interventions Treatment recommendations for symptoms of PCOS include insulin sensitizers such as metformin, combined hormonal oral contraceptives, and antiandrogenic medications such as spironolactone.³ Medications can be prescribed in combination or individually, barring medical contraindications. Key points to keep in mind when prescribing medications to treat PCOS in adolescents include:

- Understanding individual characteristics, preferences, and values
- Balancing risks and benefits based on what is most bothersome to the patient
- Informing patients that although no pharmaceutical treatments are approved for PCOS, off-label use of some pharmaceuticals can help to manage PCOS symptoms.³
- Maintaining a holistic approach by incorporating lifestyle modifications into any pharmaceutical management plan is paramount.

Metformin is the most commonly used insulin sensitizer in the management of PCOS.^{3,12} Studies of its use in patients with PCOS have demonstrated improvement in insulin resistance, improved glycemic control, decreased BMI, and decreased androgen excess.¹² Metformin is used to promote ovulation in patients with infertility, but may not regulate menses and has minimal effects on hirsutism.¹⁵

Doses of metformin used for PCOS in clinical trials range from 1,500 to 2,000 mg daily, but no studies have compared the effectiveness of different doses in adolescents.⁴ Adverse reactions include mild to moderate self-limiting GI symptoms (nausea, vomiting, diarrhea, and abdominal pain).⁴ Overall, metformin is considered safe to manage PCOS in adolescents and can be used alone or in combination with combined hormonal oral contraceptive pills.^{12,15}

Combined oral contraceptives containing estrogen and progestin are helpful in managing irregular menses and/or hyperandrogenism in adolescents with PCOS. The quality of the evidence supporting this recommendation is low because few trials have evaluated the use of combined oral contraceptives for managing PCOS in adolescents. The duration of treatment has not been evaluated beyond 24 months.^{4,12} However, combined oral contraceptives have been used for contraception among adolescents for durations longer than 24 months and are considered to be relatively safe.¹² The combination of estrogen and progestin in these drugs helps to regulate menses and provide endometrial protection from high unopposed levels of circulating estrogen during anovulatory cycles of PCOS.¹²

The estrogen content in combined oral contraceptives lowers serum androgens by increasing hepatic production of sex-hormone binding globulin and suppressing luteinizing hormone.¹²

Adolescents must be evaluated for any contraindications to the use of combined oral contraceptives, including a history of migraines with aura, history of venous thromboembolism (VTE), presence of thrombogenic mutations, cardiovascular disease, breast cancer, or decompensated liver function.^{4,16} The overall risk of VTE in a patient without contraindications is low. Specialists consider that the benefits of combined oral contraceptives outweigh the risks, given the low risk of VTE in adolescents.⁴

Antiandrogens such as spironolactone and flutamide may help address clinical hyperandrogenism associated with PCOS, although neither medication is approved by the FDA for hyperandrogenism. Additionally, experts indicate low quality evidence to support the use of antiandrogens due to lack of clinical trials for use in adolescents, so clinicians should use caution in prescribing.¹² Guidelines recommend the use of combined oral contraceptives and/or cosmetic procedures, such as electrolysis or laser treatments for hirsutism, for 6 months before starting antiandrogens.⁴ Effective doses of spironolactone range from 100 to 200 mg daily in two divided doses, with a starting dose of 25 mg/day.⁹ Flutamide has been shown to be effective in treating hirsutism at doses of 250 mg daily in two divided doses.⁹ Effective contraception should be prescribed along with antiandrogenic medications due to risk of impairment of external genital development in male fetuses.¹²

Family planning Adolescents with PCOS can have intermittent ovulatory cycles. Clinicians should not assume that all patients with PCOS experience infertility. In a retrospective chart review of 127 adolescent patients with PCOS, 48% of patients (ages 12 to 24 years) reported being sexually active, and six reported previous pregnancies.¹⁷ Discuss family planning with adolescents with PCOS and engage in shared decision-making about contraception and prevention of sexually transmitted infections.

COMPLICATIONS

PCOS is associated with complications of metabolic, reproductive, and psychologic health. Short- and long-term management of PCOS includes screening for these comorbid conditions. Clinicians also should consider the important role they play in the transition of adolescent patients from pediatric to adult medical care. PCOS is a chronic condition that will require follow-up throughout the patient's lifespan.^{4,9} Adolescents with PCOS require guidance in order to develop the knowledge and skills needed to be advocates for their own healthcare and treatment goals as adults.

Metabolic health Although some patients with PCOS are of normal weight or underweight, metabolic complications of PCOS include excess body weight, obesity,

hyperinsulinemia, insulin resistance, impaired glucose tolerance, dyslipidemia, hypertension, metabolic syndrome, nonalcoholic fatty liver disease, gestational diabetes, type 2 diabetes, cardiovascular disease (CVD), and obstructive sleep apnea (OSA).^{3,9} Adolescent girls diagnosed with PCOS have a higher prevalence of insulin resistance, impaired glucose tolerance, metabolic syndrome, and type 2 diabetes compared with adolescents without PCOS.^{10,12} Complications of insulin resistance and hyperinsulinemia are not dependent on an increase in adipose tissue; they are also common in lean girls with PCOS.^{3,9} Evaluate the glycemic status of all women at the time of diagnosis and screen them regularly.⁹

Increased risk for CVD in patients with PCOS is theoretical, although studies have identified increased arterial stiffness in adolescent girls with PCOS and obesity.⁹ To date, limited data demonstrate increased cardiovascular events in patients with PCOS; however, some patients with PCOS have early onset and higher incidence of features of metabolic syndrome, placing them at greater risk for the development of CVD.¹²

The effect of OSA on health outcomes in adolescents with PCOS has not been determined; however, current literature has reported OSA in adolescent girls with PCOS.¹⁸ The association with OSA also is not clear; it mostly is related to the other long-term complications associated with PCOS, such as obesity.⁹

Risks of the metabolic complications related to PCOS persist throughout the patient's lifespan. Clinicians must be aware of potential long-term complications and recognize PCOS as a chronic condition that will require screening patients for complications during adolescence and providing them with guidance for lifelong management. Guidelines do not make specific recommendations for screening for comorbid conditions associated with PCOS.¹⁰ Instead, clinicians should reference other screening recommendations for conditions associated with PCOS and note where PCOS is mentioned as a risk factor. For example, the American Diabetes Association recommends annual screening for type 2 diabetes for patients with a diagnosis of PCOS.¹⁰

Reproductive health Patients with PCOS have an increased risk of infertility, endometrial hyperplasia, and endometrial cancer.⁹ The risk of infertility is due to anovulation, and the risk of endometrial cancer is due to unopposed estrogen. Without ovulation, progesterone is not produced from the corpus luteum, resulting in unopposed circulating estrogen in the body. Unopposed estrogen over several years leads to increased risk of endometrial hyperplasia and endometrial cancer.⁹

Psychologic health Research demonstrates psychologic implications and a negative effect on quality of life in adolescents and adults with PCOS.¹⁹ Psychologic comorbidities include depression, anxiety, eating disorders, negative body image, and psychosexual dysfunction.⁹

Clinicians should be aware of the increased risk of anxiety and depression in adolescents with PCOS and screen for symptoms of anxiety and depression as part of routine care.^{4,9} A recent study investigating coping and depression in adolescents with PCOS revealed two aspects of the disorder that contributed to psychologic distress: not knowing what is going on with their bodies, and feeling they are not in control of their symptoms.²⁰ Furthermore, clinicians should be mindful of the higher prevalence of clinical and subclinical eating disorders in adolescents with PCOS, which calls for a thoughtful patient-centered approach to addressing lifestyle modifications.²¹ Clinicians should identify appropriate referral sources for adolescents with PCOS who may need mental health treatment.

CONCLUSION

The ICPE 2017 Consensus Statement provides meaningful guidance for the diagnosis and management of PCOS in adolescents. With a focus on documenting irregular menses and evaluation of clinical hyperandrogenism, these guidelines can help with early identification of PCOS during adolescence while also reducing overdiagnosis of PCOS. Experts suggest that increased attention be paid to identification and diagnosis in adolescents in order to more effectively manage PCOS and support lifestyle modifications at a younger age.¹ Early diagnosis and management of PCOS can address short-term complications that pose a risk to adolescents' psychosocial well-being, and may mitigate long-term complications by engaging adolescents in a lifelong management approach.⁹ Managing this complex condition requires a comprehensive multidisciplinary approach that often is best facilitated by pediatric PCPs. Additionally, adolescents with PCOS require guidance from their PCPs in order to develop the knowledge and skills needed to be advocates for their own health and reaching their individual treatment goals throughout their lifespan. Physician assistants are well-positioned to ensure that adequate screening takes place during adolescence, and also play a vital role in patient education and management of PCOS. **JAAPA**

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