Original Study

Trends in Standard Workup Performed by Pediatric Subspecialists for the Diagnosis of Adolescent Polycystic Ovary Syndrome

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A B S T R A C T

Objective: The purpose of this study is to identify trends in the clinical workup, diagnosis, and treatment of polycystic ovary syndrome by pediatric endocrinologists, pediatric gynecologists, and adolescent medicine specialists.
Design: Retrospective chart review.
Setting: Tertiary care medical center.
Participants: Females aged 11-18 y who were evaluated for PCOS from June 2009 to October 2011 were included. Any patients with coexisting diagnoses of other primary etiology for amenorrhea were excluded. Patients were identified by ICD-9 codes for PCOS, hypersecretion of ovarian androgens, irregular menses, hirsutism, oligomenorrhea, or amenorrhea. 261 patients were included: 144 from endocrinology, 9 from gynecology, and 108 from adolescent pediatric practices.
Results: There were no significant differences in the androgen labs ordered by the subspecialties. Gynecologists ordered pelvic ultrasonography for 89% (n = 8) of patients, compared to 9% (n = 10) by adolescent medicine specialists and 24% (n = 34) by endocrinologists ($P < .0001$). Endocrinologists were most likely to treat patients who met diagnostic criteria for PCOS with metformin (58%, n = 66), compared to gynecologists (14%, n = 1) and adolescent medicine specialists (5%, n = 3) ($P < .0001$). Gynecologists (43%, n = 3) and adolescent medicine specialists (58%, n = 39) were more likely than endocrinologists (24%, n = 27) to treat patients with oral contraceptive pills ($P < .0001$).
Conclusions: Inconsistent diagnosis and treatment strategies for young women with PCOS are evident among pediatric subspecialties, reflecting lack of standardized care for adolescents. Quantifying outcomes based on diagnostic and therapeutic approaches are important next steps.
Key Words: Polycystic ovary syndrome, Adolescents, Diagnosis, Therapeutics, Specialization, Adolescent medicine, Endocrinology, Gynecology

Introduction

Polycystic ovary syndrome (PCOS) is generally associated with reduced fertility, oligomenorrhea, hyperandrogenism, and often, obesity. However, the best criteria for the diagnosis of PCOS are controversial in adult women. Presently, 3 sets of guidelines exist for the diagnosis of PCOS in adults. The National Institutes of Health (NIH) require menstrual irregularity and evidence of androgen excess, whereas the Rotterdam guideline accepts any 2 out of 3 criteria: menstrual irregularity, evidence of androgen excess, or the appearance of polycystic ovaries on ultrasonography.[1,2] Lastly, the Androgen Excess and PCOS (AE-PCOS) Society requires the presence of hyperandrogenism along with either menstrual irregularity or polycystic ovaries.[3] All 3 diagnostic criteria also require that other etiologies of hyperandrogenism and menstrual irregularity (including congenital adrenal hyperplasia, Cushing syndrome, thyroid dysfunction, and hormone-secreting tumors) are ruled out prior to the final diagnosis of PCOS.

A lack of consensus on diagnostic criteria may lead to variable diagnosis and treatment of this syndrome, especially in younger patients. Adolescents often exhibit physiologic menstrual irregularity and signs of hyperandrogenism (ie, acne) at this stage of life, which may cloud the clinical picture. Over-diagnosis of PCOS may lead to unnecessary administration of medication as well as undue psychological stress on the patient while under-diagnosis places untreated patients at risk for infertility and metabolic syndrome in the future. Therefore, accurate diagnosis of PCOS at disease onset is essential.

The purpose of this study is to identify trends in the clinical workup, diagnosis, and treatment of PCOS by pediatric endocrinologists, pediatric gynecologists, and adolescent pediatricians.

Materials and Methods

This retrospective chart review was IRB-approved at a children's hospital in a large urban academic setting. Females aged 11-18 years who had been evaluated for or diagnosed with PCOS between June 2009 and October 2011 were included. Patients with a coexisting diagnosis of another primary etiology for amenorrhea or hirsutism were

The authors indicate no conflicts of interest.

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Table 1
Demographics of Patients Worked up for PCOS by Subspecialty

	Endocrinology	Gynecology	Adolescent Medicine	*P* Value
N	144	9	108	
Age (y) at workup, mean (range)	15.39 (11-18)	14.1 (13-17)	15.27 (11-18)	.0665
Age (y) of first menses, mean (range)	11.7 (8-15)	10.4 (9-12)	11.6 (7-15)	.0644
BMI, mean (range)	31.4 (15.5-54.2)	34.5 (23.4-51.7)	33.4 (11.5-63.5)	.2772
Obese, n (%)	76 (53)	6 (67)	56 (52)	.7067
Insurance, n (%)				.9482
Private	74 (51)	4 (44)	52 (48)	
Public	70 (49)	5 (56)	50 (46)	
Unknown	0	0	6 (6)	
Ethnicity, n (%)				<.0001
White	31 (22)	1 (11)	2 (2)	
African American	43 (30)	4 (44)	71 (66)	
Hispanic	29 (20)	3 (33)	26 (24)	
Other	41 (29)	1 (11)	9 (8)	

excluded. Cases were identified by the following ICD-9 codes: PCO/PCOS (256.4), hypersecretion of ovarian androgens (246.1), irregular menses (626.4), hirsutism (704.1), primary or secondary amenorrhea or oligomenorrhea (626.0). Once identified for inclusion, each participant's medical record was reviewed for demographic information (age, race, insurance status), physical exam findings (ie, hirsutism, acne, body mass index [BMI]), menstrual cyclicity, laboratory findings (ie, fasting glucose and lipid levels, thyroid function tests, prolactin, total testosterone, free testosterone, androstenedione, dehydroepiandrosterone sulfate [DHEA-S], luteinizing hormone, follicle stimulating hormone, estradiol, and 17-hydroxyprogesterone), imaging studies (abdominal and/or transvaginal ultrasonography), diagnoses, justification for PCOS diagnosis, and treatment plan for PCOS.

Descriptive statistics are presented for continuous variables using means, standard deviations and ranges for each clinical subspecialty. Percentage distribution of categorical variables is presented within each clinical subspecialty. Comparisons of means of continuous variables among the 3 clinical subspecialties were conducted using ANOVA analysis. Association between categorical variables and clinical subspecialties were tested using chi-square tests, and when a chi-square test was invalid due to small sample size, the Fisher exact test was used. If chi-square or Fisher exact test indicated a strong association, further analysis was performed using multivariate logistic regression to test differences between the subspecialties controlling for other factors, including BMI, age at workup, race, hirsutism, and insurance status. $P < .05$ was considered significant.

Results

Demographically, adolescent medicine specialists saw significantly more African American patients compared to the other 2 specialties ($P < .0001$). Otherwise, there were no significant demographic differences between the patient populations (Table 1). The practitioner-to-patient ratio was 0.05 for endocrinology (7 endocrinologists: 144 patients), 0.2 for gynecology (2 gynecologists: 9 patients), and 0.3 for adolescent medicine (29 practitioners: 108 patients).

The laboratory and imaging studies ordered by the different subspecialties are outlined in Table 2 and the association of presenting characteristics with laboratory orders is outlined in Table 3. Adolescent medicine specialists were significantly more likely to order lipid testing. However, lipid testing is typically done for all adolescent medicine patients in this institution regardless of the reason for the evaluation; thus we cannot comment on the increased frequency of lipid testing among PCOS patients within this practitioner group. Measurement of BMI was positively associated with measurement of lipids. Androgens, including total and free testosterone, DHEA-S, and androstenedione, were ordered with similar frequencies across all specialties. Over 80% of all patients had a total testosterone level documented. Gynecologists ordered significantly more pelvic or trans-abdominal ultrasonography ($P < .0001$; Tables 2 and 3).

Of all of the patients evaluated for PCOS, 72% (n = 187) met diagnostic criteria for PCOS. All of these patients met

Table 2
Labs and Imaging Studies Ordered by Different Subspecialties for the Workup of PCOS. Reported as % (n) of Patients Undergoing the Respective Test

	Endocrine % (n)	Gynecology % (n)	Adolescent Medicine % (n)	*P* Value
Metabolic Markers				
Fasting glucose	22 (32)	44 (4)	40 (43)	.0070
Fasting insulin	24 (34)	22 (2)	19 (21)	.7305
Hemoglobin A1C	33 (47)	22 (2)	27 (29)	.6008
Lipids	16 (23)	22 (2)	51 (55)	<.0001
Thyroid Function Tests				
TSH	63 (90)	67 (6)	74 (80)	.1452
T3	1 (2)	0 (0)	7 (7)	.0976
Free T4	42 (60)	11 (1)	35 (38)	.1388
Total T4	24 (35)	22 (2)	42 (45)	.0111
Androgens				
Total Testosterone	84 (121)	89 (8)	82 (89)	.0451
Free Testosterone	58 (84)	33 (3)	66 (71)	.1146
Androstenedione	6 (9)	11 (1)	8 (9)	.4753
DHEA-S	25 (36)	22 (2)	32 (35)	.3905
Other Sex Hormones				
LH	80 (115)	67 (6)	69 (75)	.1362
FSH	81 (116)	89 (8)	73 (79)	.3579
Estradiol	37 (53)	11 (1)	7 (8)	<.0001
Prolactin	40 (58)	56 (5)	65 (70)	.0006
17-hydroxyprogesterone	41 (59)	56 (5)	10 (11)	<.0001
SHBG	2 (3)	0 (0)	7 (8)	.1183
Ultrasonography				
Any ultrasonography	24 (34)	89 (8)	9 (10)	<.0001