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## Pediatricians' knowledge, attitudes and practices surrounding menstruation and feminine products

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### **Abstract:**

**Objective:** This study investigates whether primary care pediatricians adhere to the American Academy of Pediatrics (AAP) recommendations by routinely evaluating patients' menstrual cycles and educating patients about menstruation and feminine products. Additionally, this study examines pediatricians' knowledge and attitudes surrounding menstrual health topics.

**Methods:** A 53-item online questionnaire was developed to evaluate pediatricians' knowledge, attitudes and clinical practices regarding menstruation-related topics. The questionnaire was emailed to 2500 AAP members using a geographically-stratified sampling approach, with pediatricians in each state selected randomly. Mann-Whitney U tests, t-tests, and logistic regressions were used to assess associations between correlates and pediatricians' knowledge, attitudes and practices.

**Results:** Five hundred and eighteen out of 2500 pediatricians participated (response rate = 20.7%), 462 met inclusion criteria; 78.8% were female, 79.2% were Caucasian. The majority of the pediatricians (58.2%) were "not at all" or only "slightly" familiar with the AAP guidelines on anticipatory guidance surrounding menarche. Many reported they do not routinely provide anticipatory guidance regarding menstruation to pre-menarchal patients (24.7%), discuss menstruation with post-menarchal patients (33.1%) or ask patients the date of their last period (28.4%). The majority were unlikely to discuss feminine products with patients. Gaps in menstruation-related knowledge were noted. Male pediatricians were significantly less likely to evaluate patients' menstrual cycles and provide patient-education regarding menstruation-related topics, and had significantly lower self-rated and measured knowledge of these topics.

**Conclusions:** A concerning number of pediatricians in a national sample do not abide by AAP recommendations surrounding menstruation and exhibit knowledge gaps in this area. To effectively address the health needs of female patients, pediatricians should better incorporate menstrual health care into their clinical practice.

Keywords: feminine hygiene, menarche, menstruation

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## Introduction

The menstrual cycle is an important indicator of overall female health. In 2006, the American Academy of Pediatrics (AAP) and the American College of Obstetricians and Gynecologists (ACOG) published *Menstruation in Girls and Adolescents: Using the Menstrual Cycle as a Vital Sign* [1]. This publication, reaffirmed in 2015, includes the following key recommendations to guide clinicians caring for pre-adolescent and adolescent females [2]. First, clinicians should provide anticipatory guidance surrounding menstruation to pre-menarchal patients and their caregivers (i.e. parents and guardians). Second, clinicians should routinely evaluate the menstrual cycle by asking patients the date of their last menstrual period (LMP) and pattern of menses at every preventive care or comprehensive visit. Finally, clinicians should instruct patients on the safe usage of feminine products

[1], [2]. These recommendations are further emphasized in the AAP's recent (2017) edition of *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*, which provides evidence-based guidance to pediatric providers [3].

While the AAP and ACOG have highlighted pediatricians' essential role in evaluating the menstrual cycle and educating patients about topics related to menstrual health, no study to date has explored pediatricians' knowledge, attitudes or practices in this important clinical area. Thus, the purpose of this study is to investigate US primary care pediatricians': (1) practices and attitudes surrounding the evaluation and discussion of the menstrual cycle, (2) practices and attitudes surrounding patient-education regarding feminine products and (3) self-rated and measured knowledge of menstruation and feminine products. Additionally, the study aims to assess gender differences across these measures and explore trends between measured knowledge surrounding menstruation-related topics and self-rated knowledge/practices related to these topics.

## Methods

## **Subjects**

A total of 2500 US pediatricians were selected from the AAP's "Member Directory" using a geographically stratified sampling approach, with 50 pediatricians per state invited to participate. Pediatricians in each state were selected randomly, limiting recruitment to pediatricians who did not belong to AAP Committees, Sections or Councils to specifically target pediatricians providing primary care.

Pediatricians were emailed an explanation of the study and a link to an online questionnaire created through Qualtrics software (Qualtrics LLC, Provo, UT, USA). As an incentive to participate, pediatricians were informed that they would receive a "Feminine Hygiene Fact Sheet" upon completion of the questionnaire. This clinical resource for healthcare providers, developed by the researchers, summarized relevant AAP/ACOG recommendations and provided correct answers to all factual questions in the questionnaire. Two follow-up emails were sent, with the final email offering access to an additional clinical online resource ("ADHD Medication Guide") to pediatricians who completed the questionnaire [4]. This second incentive was intended to motivate pediatricians who may not have a strong interest in feminine hygiene. All responses were anonymous and no personally identifying information was obtained. This study was approved by the Institutional Review Board of [Northwell Health].

### Instrument

The anonymous 5–7 min online questionnaire was developed by the researchers based on AAP/ACOG recommendations and specific concerns raised by a focus group of seven females aged 19–23 years who participated in structured conversations regarding their early experiences with menstruation. The initial questionnaire was pilot-tested on seven physicians (two pediatric residents, five primary care pediatricians including an adolescent medicine specialist) for clarity and content, and subsequently revised to incorporate feedback. The final 53-item questionnaire can be found in the Appendix.

Section Introduction (11 items, 5-point Likert scales) assessed pediatricians' practices related to the evaluation and discussion of the menstrual cycle, as well as their self-rated knowledge and attitudes regarding the discussion of menstruation. These items were developed based on specific AAP/ACOG recommendations, including: "Clinicians should educate girls and their caretakers (e.g. parents or guardians) about what to expect of a first menstrual period"; "Once girls begin menstruation, clinicians should ask at every ... visit for the patient's first day of her last menstrual period and the pattern of menses"; "Young females ... should be instructed on the use of feminine products and on what is considered normal menstrual flow"; and "It is important for clinicians to have an understanding of the menstrual patterns of adolescent girls, the ability to differentiate between normal and abnormal menstruation, and the skill to know how to evaluate the adolescent girl patient" [1], [2].

Section Methods (15 items, 5-point Likert scales) evaluated pediatricians' self-rated knowledge of feminine products and patient-education practices surrounding these products. Items in this section were developed based on the AAP/ACOG recommendation that young females should be "instructed on use of feminine products" [1], [2]. The first nine items asked pediatricians to rate their knowledge of three feminine products (tampons, menstrual pads, menstrual cups) and their likelihood of discussing each product with patients in early adolescence (12–13 years) and mid-adolescence (16–17 years). These specific products were selected based on their popularity and because they are the three products mentioned on ACOG's official menstrual-education

page, "Your First Period (Especially for Teens)" [5]. An additional six questions regarding pediatricians' likelihood of discussing specific tampon-related topics identified as important by the focus group were also included.

Section Results (14 items, multiple-choice) assessed pediatricians' knowledge regarding menstruation and safe tampon usage. Knowledge-based questions about menstruation (eight items) were based directly on information the AAP and ACOG deemed necessary for physicians to properly evaluate the menstrual cycle [1], [2]. Knowledge-based questions about tampons (six items) were developed using alternative sources, as AAP/ACOG recommendations do not specify what information pediatricians should know regarding tampons. Specifically, three questions were based on information identified by the Food and Drug Administration (FDA) as important for consumers to know to safely use tampons (maximum time tampon can be left inserted; safest tampon absorbency; tampon use when sleeping) and three were based on areas identified by the focus group as important (minimum age for tampon use; relationship between tampons and the hymen; tampon use when swimming) [6].

The final section (13 items) solicited pediatricians' demographic information, including gender, race/ethnicity, state and region of residence and number of years in practice. Pediatricians also reported the setting (private practice, clinic, hospital-based) and surrounding population density (urban, suburban, rural) of their practice.

## Statistical analysis

Responses to items in sections 1 and 2 were scored as 5-point Likert items. Distributions of responses were compared across gender using the two-sided Mann-Whitney U test, which has been found to be Type I error robust at an alpha of 0.05 for 5-point Likert items [7].

Responses to menstruation-related and tampon-related items in section 3 were scored on a binary system for correctness. Results for menstruation-related items were summed to create composite scales, as were results for tampon-related items. Differences between genders for these scales were identified using the two-sided Welch's two-sample t-test. Multivariate logistic regression was used to explore associations between correctness of responses to individual items and gender.

Associations between measured knowledge concerning menstruation/tampons and self-rated knowledge/practices concerning menstruation/tampons were identified using proportional odds logistic regressions, controlling for gender. All analyses were performed using the statistical software R, version 3.5.2 (R Foundation), and package MASS, version 7.3–51.2(R Core Team, Vienna, Austria; MASS, Springer, New York). p-Values less than 0.05 were considered statistically significant.

## Results

Of the 2500 pediatricians emailed, 518 pediatricians completed the questionnaire (response rate = 20.7%) and 462 (89.2%) met the inclusion criteria (self-reported primary care pediatrician; currently practicing in the US); 78.8% (n = 364) of the sample was female and 79.2% (n = 366) identified as Caucasian. Further sample characteristics are shown in Table 1.

**Table 1:** Sample characteristics of primary care pediatricians (n = 462).

Characteristics of pediatrician	No. (%)
Gender	
Female	364 (78.8)
Male	97 (21.0)
Other	1 (0.2)
Race <sup>a</sup>	
White/Caucasian	366 (79.2)
Asian/Asian American	44 (9.5)
Hispanic/Latino	19 (4.1)
Black/African American	15 (3.2)
Native Hawaiian/Pacific Islander	4 (0.9)
Other	19 (4.1)
Region	
South	143 (31.0)
West	123 (26.6)
Northeast	98 (21.2)

Midwest	98 (21.2)
Practice setting <sup>a</sup>	, ,
Private practice	263 (56.9)
Clinic	181 (39.2)
Hospital	30 (6.5)
Other	16 (3.5)
Geographic density of practice <sup>a</sup>	
Suburban	251 (54.3)
Urban	127 (27.5)
Rural	96 (20.8)
Number of years in practice	
1–5 Years	84 (18.2)
6–10 Years	84 (18.2)
11–15 Years	70 (15.2)
16–20 Years	71 (15.4)
21–25 Years	70 (15.2)
Over 25 years	83 (18.0)
Clinical experience/training <sup>a</sup>	
Rotation in adolescent medicine	310 (67.1)
CME program in adolescent medicine	120 (26.0)
Fellowship in adolescent medicine	4 (0.9)
Rotation in pediatric gynecology	22 (4.8)
CME program in pediatric gynecology	43 (9.3)

<sup>&</sup>lt;sup>a</sup>Subjects could select multiple options.

## The menstrual cycle: clinical practices, attitudes and self-rated knowledge

In total, 75.3% (n = 348) of pediatricians reported that they provide anticipatory guidance surrounding menstruation to "most" or "almost all" pre-menarchal patients, and 62.1% (n = 287) reported that they educate caregivers of "most" or "almost all" pre-menarchal patients about what to expect of menarche. While 70.8% (n = 327) felt this anticipatory guidance was "very" or "extremely" important, the majority (58.2%, n = 269) were "not at all" or only "slightly" familiar with AAP guidelines surrounding anticipatory guidance for menstruation. With respect to post-menarchal patients, 66.9% (n = 309) of pediatricians reported that they discuss menstruation with "most" or "almost all" post-menarchal patients and 78.6% (n = 363) believed it was "very" or "extremely" important to do so. The majority reported that they "very often" or "almost always" ask post-menarchal patients about their pattern of menses (94.4%, n = 436) and the date of their LMP (71.6%, n = 331). Overall, 60.4% (n = 279) rated themselves as "very" or "extremely" knowledgeable about menstruation (Table 2).

Compared to female pediatricians, male pediatricians were less likely to provide anticipatory guidance about menstruation to pre-menarchal patients (3.65 vs. 4.10, p < 0.001) and their caregivers (3.35 vs. 3.76, p = 0.002), and rated the provision of anticipatory guidance as less important (3.65 vs. 3.98, p < 0.001). Similarly, male pediatricians were less likely to discuss menstruation with post-menarchal patients (3.55 vs. 3.97, p = 0.005) and felt that doing so was less important (3.78 vs. 4.13, p < 0.001). They were also less likely to evaluate the menstrual cycle by asking patients about their pattern of menses (4.30 vs. 4.76, p < 0.001) and the date of their LMP (3.61 vs. 4.22, p < 0.001) (Table 3). Finally, male pediatricians felt less knowledgeable about menstruation (3.29 vs. 3.85, p < 0.001), with only 32.0% indicating they felt "very" or "extremely" knowledgeable about menstruation compared to 68.1% of female pediatricians (Table 2 and Table 3).

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Table 2: Pediatricians' practices, self-rated knowledge, and attitudes surrounding the discussion and evaluation of the menstrual cycle.

								Response	Response (Likert score)
	Overall no. (%) (n = 462)	Female no. (%) (n = 364)	Male no. (%) (n = 97)	Overall no. (%) (n = 462)	Female no. (%) (n = 364)	Male no. (%) (n = 97)	Overall no. (%) (n = 462)	Female no. (%) (n = 364)	Male no. (%) (n = 97)
	,	"Almost none" (1	l) or "Few" (2)			"Some" (3)		"Most" (4) or "Almost all" (5)	Jmost all" (5)
"To how many of your pre-menarchal female patients do you provide anticipatory guidance about menstruation	46 (10.0)	30 (8.2)	16 (16.5)	68 (14.7)	51 (14.0)	17 (17.5)	348 (75.3)	283 (77.7)	64 (66.0)
during annual well-child visits?  "With how many post-menarchal female patients do you discuss menstruation, including menstrual hygiene products such as pads and tampons, during	65 (14.1)	41 (11.3)	24 (24.7)	88 (19.0)	71 (19.5)	17 (17.5)	309 (66.9)	252 (69.2)	56 (57.7)
annual wen-critic visits:  "How many caretakers of pre-menarchal female patients do you educate about what to expect of a first menstrual period?"	71 (15.4)	48 (13.2)	23 (23.7)	104 (22.5)	78 (21.4)	26 (26.8)	287 (62.1)	238 (65.4)	48 (49.5)
	"	"Not at all" (1) or	"Slightly" (2)		N,,	"Moderately" (3)		"Very" (4) or "Extremely" (5)	Extremely" (5)
"Please rate your familiarity with the AAP guidelines surrounding anticipatory guidance for	269 (58.2)	212 (58.2)	56 (57.7)	138 (29.9)	105 (28.8)	33 (34.0)	55 (11.9)	47 (12.9)	8 (8.2)
"Please rate your knowledge of menstruation from a clinical	16 (3.5)	6 (1.6)	10 (10.3)	167 (36.1)	110 (30.2)	56 (57.7)	279 (60.4)	248 (68.1)	31 (32.0)
"How important do you think it is for pediatricians to provide anticipatory guidance surrounding menstruation to pre-menarchal female patients during annual well-child visits?"	22 (4.8)	15 (4.1)	7 (7.2)	113 (24.5)	77 (21.2)	35 (36.1)	327 (70.8)	272 (74.7)	55 (56.7)

"Almos	"Almost Never" (1) or "R	"Rarely" (2)		47 (12.9) "Son	) 26 (26.8) "Sometimes" (3)	363 (78.6) "Very Often	363 (78.6) 299 (82.1) 64 (66.0) "Very Often" (4) or "Almost Always" (5)	64 (66.0) Always" (5)
	33 (9.1)	22 (22.7)	76 (16.5)	57 (15.7)	19 (19.6)	331 (71.6)	274 (75.3)	56 (57.7)
	5 (1.4)	6 (6.2)	15 (3.2)	6 (1.6)	9 (9.3)	436 (94.4)	353 (97.0)	82 (84.5)

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**Table 3:** Gender differences in pediatricians' practices, self-rated knowledge, and attitudes surrounding menstruation and feminine products.

	Me	ean Likert item	score (SD) <sup>a</sup>	Mann- Whitney U
				test p-value
	Overall (n = 462)	Female (n = 364)	Male (n = 97)	
Menstruation: self-reported practices, knowledge, and attitud	les			
Frequency of providing anticipatory guidance about	4.00 (1.05)	4.10 (1.00)	3.65 (1.17)	<0.001 <sup>b</sup>
menstruation to pre-menarchal patients	,	,	,	
Frequency of discussing menstruation (including	3.88 (1.15)	3.97 (1.10)	3.55 (1.30)	$0.005^{b}$
products) with post-menarchal patients	(1120)	(2120)	(1.00)	0.000
Frequency of educating caretakers of pre-menarchal	3.67 (1.12)	3.76 (1.09)	3.35 (1.18)	$0.002^{b}$
patients about what to expect of menarche	0.07 (1.12)	0.10 (1.05)	0.00 (1.10)	0.002
Self-rated familiarity with AAP guidelines surrounding	2.24 (1.06)	2.23 (1.09)	2.26 (0.93)	0.61
anticipatory guidance for menstruation	2.21 (1.00)	2.25 (1.07)	2.20 (0.55)	0.01
Self-rated knowledge of menstruation	3.73 (0.78)	3.85 (0.73)	3.29 (0.79)	<0.001 <sup>b</sup>
Rated importance of providing menstruation		3.98 (0.73)	3.65 (0.83)	<0.001 <0.001 <sup>b</sup>
	3.91 (0.84)	3.96 (0.63)	3.03 (0.63)	<0.001
anticipatory guidance to pre-menarchal patients	4.06 (0.94)	4.12 (0.92)	2.70 (0.04)	-0.001h
Rated importance of discussing menstruation (including	4.06 (0.84)	4.13 (0.83)	3.78 (0.84)	<0.001 <sup>b</sup>
products) with post-menarchal patients	4.00 (1.01)	4.00 (1.10)	2 (1 (1 20)	0.001h
Frequency of asking post-menarchal patients for the first	4.09 (1.21)	4.22 (1.12)	3.61 (1.38)	<0.001 <sup>b</sup>
day of their last period	1 ( ( ( ( ( ) ( ) )	1 = 4 (0 = 4)	1.00 (0.01)	a aaah
Frequency of asking post-menarchal patients about their	4.66(0.69)	4.76 (0.56)	4.30 (0.91)	<0.001 <sup>b</sup>
pattern of menses				
Feminine products: self-rated knowledge and discussion practice.				1
Self-rated knowledge of tampons	3.31 (1.04)	3.52 (0.96)	2.53 (0.94)	<0.001 <sup>b</sup>
Self-rated knowledge of pads	3.41 (1.02)	3.62 (0.93)	2.63 (0.96)	<0.001 <sup>b</sup>
Self-rated knowledge of menstrual cups	1.86 (1.04)	1.95 (1.08)	1.54 (0.82)	<0.001 <sup>b</sup>
Likelihood of discussing tampons with 12–13-year-old	2.55 (1.07)	2.63 (1.09)	2.25 (0.95)	<0.001 <sup>b</sup>
patients				
Likelihood of discussing pads with 12–13-year-old	2.98 (1.11)	3.09 (1.12)	2.57 (1.05)	<0.001 <sup>b</sup>
patients				
Likelihood of discussing menstrual cups with	1.40 (0.80)	1.39 (0.78)	1.44 (0.85)	0.64
12–13-year-old patients				
Likelihood of discussing tampons with 16–17-year-old	2.97 (1.12)	3.09 (1.11)	2.52 (1.06)	<0.001 <sup>b</sup>
patients	, ,	. ,	, ,	
Likelihood of discussing pads with 16–17-year-old	2.79 (1.10)	2.85 (1.12)	2.55 (1.01)	$0.03^{b}$
patients	` ,	` ,	, ,	
Likelihood of discussing menstrual cups with	1.49 (0.87)	1.49 (0.88)	1.47 (0.83)	0.96
16–17-year-old patients		(0.00)	(0.00)	
Frequency of discussing how to insert a tampon	2.08 (1.06)	2.23 (1.07)	1.53 (0.84)	<0.001 <sup>b</sup>
Frequency of discussing how often to change a tampon	2.93 (1.32)	3.09 (1.31)	2.33 (1.23)	<0.001 <sup>b</sup>
Frequency of discussing risks associated with tampon	2.86 (1.27)	2.94 (1.27)	2.58 (1.21)	0.01 <sup>b</sup>
	2.00 (1.27)	2.74 (1.27)	2.56 (1.21)	0.01
use Frequency of discussing tampon use when sleeping	2.24 (1.27)	2.38 (1.28)	1.71 (1.05)	<0.001 <sup>b</sup>
Frequency of discussing tampon use when swimming	2.46 (1.22)	2.62 (1.21)	1.86 (1.03)	<0.001 <sup>b</sup>
				0.02 <sup>b</sup>
Frequency of discussing relationship between tampons	1.81 (1.01)	1.86 (1.02)	1.63 (0.95)	0.02
and the hymen				

<sup>&</sup>lt;sup>a</sup>Ratings ranged from 1 to 5.

## Feminine products: clinical practices and self-rated knowledge

Many pediatricians reported that there was a "very low" or "low" likelihood they would discuss tampons, pads or menstrual cups with 12–13-year-old patients (respectively, 51.9%, n = 240; 33.5%, n = 155; 91.8%, n = 424) or 16–17-year-old patients (respectively, 34.4%, n = 159; 39.8%, n = 184; 89.2%, n = 412). A substantial percentage also reported that they "almost never" or "rarely" discuss tampon insertion (61.9%, n = 286), how often to

<sup>&</sup>lt;sup>b</sup>Indicates significance (p < 0.05).

change tampons (35.5%, n=164), risks associated with tampons (36.4%, n=168), tampon use when sleeping (61.9%, n=286), tampon use when swimming (50.9%, n=235), and the relationship between tampons and the hymen (76.6%, n=354). Only a minority of pediatricians felt they possessed "high" or "very high" knowledge about tampons (43.1%, n=199), pads (45.7%, n=211) or menstrual cups (8.4%, n=39) (Table 4).

Male pediatricians were less likely than female pediatricians to discuss tampons and pads with 12–13-year-old patients (respectively, 2.25 vs. 2.63, p < 0.001; 2.57 vs. 3.09, p < 0.001) and with 16–17-year-old patients (respectively, 2.52 vs. 3.09, p < 0.001; 2.55 vs. 2.85, p = 0.03). They were also significantly less likely to discuss each of the six areas related to tampon usage and safety. No gender differences were noted with respect to likelihood of discussing menstrual cups. Overall, male pediatricians had lower self-rated knowledge scores for tampons (2.53 vs. 3.52, p < 0.001), pads (2.63 vs. 3.62, p < 0.001) and menstrual cups (1.54 vs. 1.95, p < 0.001) (Table 3).

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 Table 4: Pediatricians' self-rated knowledge and patient-education practices regarding feminine products.

								Response	Response (Likert score)
	Overall no. (%) (n = 462)	Female no. (%) (n = 364)	Male no. (%) (n = 97)	Overall no. (%) (n = 462)	Female no. (%) (n = 364)	Male no. (%) (n = 97)	Overall no. (%) (n = 462)	Female no. (%) (n = 364)	Male no. (%) (n = 97)
		"Very low" (1)	.) or "Low" (2)		•	'Moderate" (3)		"High" (4) or "Very high" (5)	Very high" (5)
Self-rated knowledge of specific feminine product	ninine product	(1, 2, 1, 2, 1)	(4 7 4 7 4 )	173 (37.4)	133 (36 E)	20 (70.2)	100 (42.1)	187 (51 4)	12 (12.4)
Pads	74 (16.0)	32 (8.8)	40 (47.4)	177 (38.3)	137 (37.6)	39 ( <del>1</del> 0.2) 40 (41.2)	211 (45.7)	195 (53.6)	12 (12.4) $16 (16.5)$
Menstrual cups	352 (76.2)	268 (73.6)	83 (85.6)	71 (15.4)	60(16.5)	11 (11.3)	39 (8.4)	36 (9.9)	3(3.1)
Likelihood of discussing product with 12-13-year-old patients	ith 12–13-year-ol	ld patients	,	,	,	•	,	,	•
Tampons	240 (51.9)	175 (48.1)	64 (66.0)	141 (30.5)	119 (32.7)	22 (22.7)	81 (17.5)	70 (19.2)	11 (11.3)
Pads	155 (33.5)	109 (29.9)	45 (46.4)	162 (35.1)	126 (34.6)	36 (37.1)	145 (31.4)	129 (35.4)	16(16.5)
Menstrual cups	424 (91.8)	335 (92.0)	88 (90.7)	21 (4.5)	16 (4.4)	5 (5.2)	17 (3.7)	13 (3.6)	4(4.1)
Likelihood of discussing product with 16-17-year-old patients	ith 16–17-year-o	ld patients							
Tampons	159 (34.4)	109 (29.9)	49 (50.5)	152 (32.9)	123 (33.8)	29 (29.9)	151 (32.7)	132 (36.3)	19 (19.6)
Pads -	184 (39.8)	139 (38.2)	44 (45.4)	170 (36.8)	131 (36.0)	39 (40.2)	108 (23.4)	94 (25.8)	14 (14.4)
Menstrual cups	412 (89.2)	324 (89.0)	87 (89.7)	27 (5.8)	21 (5.8)	6 (6.2)	23 (5.0)	19 (5.2)	4 (4.1)
	"Alr	"Almost never" (1) or	or "Rarely" (2)		5,	"Sometimes" (3)	"Very oft	"Very often" (4) or "Almost always" (5)	st always" (5)
	impon-related to	pics							
How to insert a tampon	286 (61.9)	205 (56.3)	81 (83.5)	134 (29.0)	120 (33.0)	13 (13.4)	42 (9.1)	39 (10.7)	3 (3.1)
How often to change a tampon	164 (35.5)	110 (30.2)	54 (55.7)	135 (29.2)	109 (29.9)	25 (25.8)	163 (35.3)	145 (39.8)	18 (18.6)
Risks associated with tampon	168 (36.4)	125 (34.3)	43 (44.3)	149 (32.3)	115 (31.6)	33 (34.0)	145 (31.4)	124 (34.1)	21 (21.6)
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Tampon use when sleeping	286 (61.9)	208 (57.1)	78 (80.4)	98 (21.2)	87 (23.9)	10 (10.3)	78 (16.9)	69 (19.0)	9 (9.3)
Tampon use when swimming	235 (50.9)	161 (44.2)	73 (75.3)	131 (28.4)	116 (31.9)	15 (15.5)	96 (20.8)	87 (23.9)	9 (9.3)
Relationship between tampons and the hymen	354 (76.6)	273 (75.0)	80 (82.5)	76 (16.5)	65 (17.9)	11 (11.3)	32 (6.9)	26 (7.1)	6 (6.2)

## Menstruation and feminine products: measured knowledge

On average, pediatricians correctly answered 66.9% (5.35/8) of knowledge-based questions about menstruation and 66.7% (4.00/6) of knowledge-based questions about tampons. With respect to menstruation, less than half of pediatricians were knowledgeable about the Tanner stage at which menarche occurs, average length of bleeding of menarche, and whether a medical evaluation is necessary if periods occasionally occur more than 90 days apart. With respect to tampons, pediatricians were least knowledgeable about the maximum time tampons can safely be left inserted (47.2% correct) (Table 5). An increase in composite score on menstruation-related knowledge questions was not a significant predictor for an increase in self-rated knowledge about menstruation [adjusted odds ratio (aOR), 1.08; 95% confidence interval (CI), 0.94–1.24], the likelihood of discussing menstruation with 12–13 year olds (aOR, 1.09; 95% CI, 0.91–1.19). However, a 1-point increase in composite score on tampon-related knowledge questions was a significant predictor for higher self-rated knowledge about tampons (aOR, 1.29; 95% CI, 1.14–1.46), higher likelihood of discussing tampons with 12–13 year olds (aOR, 1.27; 95% CI, 1.25–1.43), and higher likelihood of discussing tampons with 16–17 year olds (aOR, 1.14; 95% CI, 1.01–1.28).

Male pediatricians achieved a lower average composite score on knowledge-based questions regarding menstruation (63.7% vs. 67.8%, p = 0.02) and tampons (51.7% vs. 70.7%, p < 0.001) (Table 5).

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 Table 5: Pediatricians' measured knowledge of menstruation and tampons and comparisons across gender.

		No. (	No. (%) correct	Logistic	Logistic regression
	Overall (n = 462)	Female (n = 364)	Male (n = 97)	Odds ratio (95% CI)	p-Value
Menstruation-related questions <sup>a</sup> "What is the median age of menarche?" [12–13 years old]	326 (70.7)	260 (71.4)	(089)	1.17 (0.72, 1.89)	0.52
"At what Tanner stage breast development does menarche typically occur?" [Stage IV]	169 (36.7)	145 (39.8)	24 (24.7)	2.01 (1.23, 3.40)	$0.007^{d}$
"What is the typical length of bleeding for first menses?" [2–7 days]	186 (40.3)	154 (42.3)	32 (33.0)	1.49 (0.94, 2.41)	0.10
"How long after onset of breast development does menstruation typically begin?" [2–3 years] "Please indicate whether a medical evaluation may be necessary in the following scenario for an	438 (95.0)	352 (96.7)	86 (88.7)	3.75 (1.58, 8.84)	$0.002^{\rm d}$
otherwise normally developing female patient"					,
"Menstrual periods have not started by 15 years of age" [Yes, medical evaluation may be necessary] "Menstrual periods have not started within 3 years of thelarche" [Yes, medical evaluation may be	331 (71.8) 368 (79.8)	251 (69.0) 294 (80.8)	80 (82.5)	0.47 (0.26, 0.82)	$0.01^{\rm d}$
necessary]					
"Menstrual periods are irregular within the first year of menarche" [No, medical evaluation is not	455 (98.7)	360 (98.9)	(6.76) 66	1.89 (0.25, 9.86)	0.46
incressary] "Menstrual periods occasionally occur more than 90 days apart" [Yes, medical evaluation may be	194 (42.1)	157 (43.1)	37 (38.1)	1.23 (0.78, 1.96)	0.38
necessary]					
Tampon-related questions					
"What is the maximum time a tampon can remain in the body before it should be removed?" [8 h] <sup>b</sup>	218 (47.2)	178 (48.9)	39 (40.2)	1.42 (0.91, 2.26)	0.13
True of Faise: Fatients should use the lowest effective absorbency tampon in order to minimize risk of TSS?" [True] <sup>b</sup>	(6.79)	(7.89) 067	38 (39.2)	3.40 (2.13, 3.43)	<0.001
"Can girls/women sleep with a tampon in?" [Yes, but tampon should be removed within 8 h] <sup>b</sup>	287 (62.1)	243 (66.8)	43 (44.3)	2.52 (1.60, 4.00)	<0.001 <sup>d</sup>
"Is there a recommended age at which patients can start using tampons, given they have started	365 (79.0)	319 (87.6)	45 (46.4)	8.19 (4.96, 13.69)	$< 0.001^{d}$
menstruation?" [No, it is up to patient preference] <sup>c</sup>					
"Can girls/women swim in the ocean with a tampon inserted?" [Yes]	376 (81.4)	311 (85.4)	64 (66.0)	3.03 (1.81, 5.04)	<0.001 <sup>d</sup>
"It a girl with an intact hymen uses a tampon, can the tampon tear her hymen?" [Yes, it could tear the hymen but it is unlikely] <sup>c</sup>	317 (68.6)	244 (67.0)	72 (74.2)	0.71 (0.42, 1.16)	0.18
Composite score		Average no. correct (%)	orrect (%)	t-Te	t-Test p-value
Menstruation-related questions (scored from 0 to 8)	5.35 (66.9)	5.42 (67.8)	5.09		0.02 <sup>d</sup>
Tampon-related questions (scored from 0 to 6)	4.00 (66.7)	4.24 (70.7)	3.10 (51.7)		<0.001 <sup>d</sup>

<sup>a</sup> Information included based on American Academy of Pediatrics (AAP) / American College of Obstetricians and Gynecologists (ACOG)

recommendations.  $^{\rm b}$  Information included based on Food and Drug Administration (FDA) consumer information (FDA 2018).  $^{\rm c}$  Information included based on female focus group.  $^{\rm d}$  Indicates significance (p < 0.05).

## **Discussion**

The menstrual cycle is increasingly recognized as a critical component of female health [1], [2], [8]. However, the results of this national study demonstrate that many primary care pediatricians do not follow key AAP recommendations surrounding menstruation in girls and adolescents. For example, approximately one in four pediatricians surveyed do not routinely provide anticipatory guidance surrounding menstruation to pre-menarchal patients, with an even higher proportion failing to routinely educate caregivers. This may be partially explained by the fact that most pediatricians were unfamiliar with the AAP guidelines on anticipatory guidance surrounding menstruation. These findings are particularly concerning given that girls who have not been educated about menarche experience greater anxiety surrounding menstruation and are unprepared to identify menstrual concerns [9], [10], [11].

Adolescents who have already experienced menarche may also not be receiving care in line with AAP/ACOG recommendations. Approximately one in three pediatricians surveyed do not routinely discuss menstruation with post-menarchal patients, and over one in four do not routinely ask post-menarchal patients for the date of their LMP. Research shows that, similar to abnormal blood pressure or heart rate, abnormal menstrual patterns may indicate serious health conditions [1], [2], [12], [13], [14]. Thus, by failing to routinely discuss menstruation or ask for key information regarding the patients' menstrual cycles, pediatricians may miss important information needed to fully assess patient health. Respondents also demonstrated a lack of knowledge about certain areas of menstruation, which may further impede their ability to identify abnormal menstrual patterns and comprehensively evaluate patient health.

With respect to patient-education regarding feminine products, the majority of pediatricians reported that they do not routinely discuss the most common products (pads and tampons), with an even higher percentage reporting that they do not routinely discuss menstrual cups, an increasingly popular alternative [15], [16]. This finding is consistent with previous studies examining pediatricians' likelihood of discussing feminine products. For example, one study found that while most 11–18-year-old females have used tampons, the majority report that no doctor ever talked to them about tampon use [17], [18]. These results are concerning given previous research showing that adolescents generally lack knowledge about feminine products, which can pose serious risks such as toxic shock syndrome if used improperly [17], [19]. While it is unclear why pediatricians do not routinely educate patients about feminine products, this trend may be partially explained by knowledge gaps in this area, as tampon-related knowledge was a significant predictor of pediatricians' likelihood of discussing tampon usage/safety with patients.

Notably, there were significant gender differences in almost every area evaluated. Compared to female pediatricians, male pediatricians were less likely to provide anticipatory guidance to pre-menarchal patients and caregivers, discuss menstruation with post-menarchal patients, evaluate the menstrual cycle and discuss feminine products. Male pediatricians also obtained significantly lower measured and self-rated knowledge scores for all menstruation-related topics assessed. These findings suggest that young girls and adolescents seen by male pediatricians may be even less likely to receive medical care that addresses important components of female health.

Although parents, especially mothers, may educate young females about menstrual health, studies show that many mothers feel uncomfortable discussing this topic [20]. Moreover, research indicates that many mothers of adolescent females are not knowledgeable in this area, inhibiting their ability to properly inform their daughters [17], [21], [22]. While girls may learn about these topics in school, menstrual education in school is often minimal or absent due to time constraints and the stigma associated with menstruation [23]. Given these barriers to menstrual health education, it is particularly important that pediatricians provide accurate information to adolescents and their caregivers regarding these topics.

There are several ways to improve pediatricians' knowledge and practices surrounding the evaluation of the menstrual cycle and discussion of menstruation-related topics. First, interactive continuing medical education (CME) programs, which have been shown to effectively influence physician practices, should include these topics [24]. Second, as studies show that physicians frequently rely on the Internet for medical information, web-based resources related to menstruation should be developed specifically for pediatricians [25]. Existing resources referenced in this study, including the AAP/ACOG Committee Opinion and the AAP Bright Futures Guidelines, should also be more widely disseminated [1], [2], [3]. Additionally, these resources should be expanded to provide more detailed guidance for physicians regarding the evaluation of the menstrual cycle and discussion of menstruation-related topics. Third, patient-education materials such as pamphlets and websites can also play an important role. Given the time constraints of well-child visits, these resources would be a convenient way for pediatricians to supplement patient education. Though some patient-education resources currently exist, such as ACOG's webpage, "Your First Period (Especially for Teens)", the AAP should consider expanding its patient education material [5]. Finally, broader efforts to reduce societal stigma surrounding

menstruation would encourage patients to actively seek out information about menstrual health from their providers [26].

This study has several limitations. Although the response rate (20.7%) is comparable to other studies which surveyed pediatricians using online methods, the sample may not be fully representative of US primary care pediatricians [27], [28], [29], [30]. For example, stratified sampling of pediatricians from the AAP member directory may have limited the generalizability of this study. Additionally, offering a "Feminine Hygiene Fact Sheet" to respondents who completed the questionnaire may have encouraged pediatricians interested in the topic to participate, though the "ADHD Medication Guide" was used to incentivize participation independent of this interest. Also, female pediatricians, who had higher scores on average than male pediatricians, may have been overrepresented, as 78.8% of respondents were female, compared to 66.9% of primary care pediatricians nationally [31]. Moreover, pediatricians' practices were self-reported, and though the questionnaire was anonymous, responses may have been affected by social desirability. Together, these factors indicate that the findings may overestimate pediatricians' overall adherence to AAP/ACOG recommendations and self-rated and measured knowledge. Finally, due to the absence of an existing instrument to measure knowledge of menstruation-related topics, the instrument used in this study was not formally validated. While the questionnaire was reviewed by multiple non-affiliated pediatricians and the knowledge-based questions were developed from highly relevant sources (AAP/ACOG Committee Opinion, FDA, focus group), scores on these questions may not fully reflect pediatricians' overall knowledge. Despite these limitations, this study, reflecting a large national sample, provides important and previously unexplored insights into pediatricians' knowledge, attitudes, and practices surrounding menstrual health.

## **Conclusion**

The results of this national study suggest that a concerning number of pediatricians do not routinely educate female patients and their caregivers about menstruation-related topics or evaluate the menstrual cycle in accordance with AAP recommendations. Moreover, the findings reveal that many pediatricians have knowledge gaps in this clinical area. Significant gender differences were noted with respect to pediatricians' knowledge, attitudes and clinical practices regarding menstruation and feminine products. Efforts to improve adolescent female health should include initiatives to increase pediatricians' knowledge of menstruation-related topics and adherence to AAP recommendations surrounding menstruation.

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## **Appendix**

## Introduction

Thank you for agreeing to complete this 5-min IRB-approved survey regarding adolescent feminine hygiene and menstrual health! This study is an important step towards improving the health of girls and women. Your participation is voluntary. Your responses are anonymous. Please answer all the questions. You have the right to withdraw from participation at any time. After completing the survey, you will be given a fact sheet on female adolescent health guidelines. Thank you in advance for your time!

1. After reading the above statements, I understand that this is a voluntary study, and I would like to participate. [Yes/No]

## If respondent selects "No," additional question:

**2.** Are you sure you do not want to participate? It will only take a few minutes. The information that you provide us with is important and can help improve practices around women's health! Please remember you will also get a fact sheet if you choose to complete this survey! [Yes, I will continue taking this survey/No, I would not like to participate in this survey]

End survey if respondent selects "No, I would not like to participate in this survey." If respondent selects "Yes" to question 1 or "Yes, I will continue taking this survey" to question 2, additional questions:

3. Do you consider yourself a primary care pediatrician? [Yes/No/Other (elaborate)] End of survey if respondent selects "No." If respondent selects "Yes" or "Other," additional questions:

## Section 1. Attitudes and Practices Surrounding the Evaluation and Discussion of Menstruation

- 1. To how many of your pre-menarchal female patients do you provide anticipatory guidance about menstruation during annual well-child visits? [Almost no patients/Few patients/Some patients/Most patients/Almost all patients]
- 2. How many caretakers of pre-menarchal female patients do you educate about what to expect of a first menstrual period? [Caretakers of almost no patients/Caretakers of few patients/Caretakers of some patients/Caretakers of most patients/Caretakers of almost all patients]
- 3. At what age do you generally start discussing menstruation with female patients?\* [Under 7 years old/7–8 years old/8–9 years old/9–10 years old/10–11 years old/11–12 years old/12–13 years old/13–14 years old/14–15 years old/15–16 years old/16–17 years old/17–18 years old/Over 18 years old]
- **4.** With how many post-menarchal female patients do you discuss menstruation, including menstrual hygiene products such as pads and tampons, during annual well-child visits? [Almost no patients/Few patients/Some patients/Most patients/Almost all patients]
- 5. How often do you ask post-menarchal female patients for the first day of their last period during annual well-child visits? [Almost never/Rarely/Sometimes/Very often/Almost always]
- **6.** How often do you ask post-menarchal female patients about their pattern of menses (i.e. period frequency/flow) during annual well-child visits? [Almost never/Rarely/Sometimes/Very often/Almost always]
- 7. How many caretakers of adolescent girls do you educate about the range of normal menstrual cycle length? [Caretakers of almost no patients/Caretakers of few patients/Caretakers of some patients/Caretakers of most patients/Caretakers of almost all patients]
- **8.** Please rate your familiarity with the AAP guidelines surrounding anticipatory guidance for menstruation. [Not at all familiar/Slightly familiar/Moderately familiar/Very familiar/Extremely familiar]
- **9.** Please rate your knowledge of menstruation from a clinical standpoint.[Not at all knowledgeable/Slightly knowledgeable/Moderately knowledgeable/Very knowledgeable/Extremely knowledgeable]
- 10. How important do you think it is for pediatricians to provide anticipatory guidance surrounding menstruation to pre-menarchal female patients during annual well-child visits? [Not at all important/Slightly important/Moderately important/Very important/Extremely important]
- 11. How important do you think it is for pediatricians to discuss menstruation (including menstrual products) with post-menarchal female patients during annual well-child visits? [Not at all important/Slightly important/Moderately important/Very important/Extremely important]

## Section 2. Patient-Education Practices and Self-Rated Knowledge Surrounding Feminine Hygiene Products

- 1. When discussing tampons with your patients, how often do you discuss the following topics?
  - a. How to insert a tampon [Almost never/Rarely/Sometimes/Very often/Almost always]
  - b. How often to change a tampon [Almost never/Rarely/Sometimes/Very often/Almost always]
  - c. Risks associated with tampon use [Almost never/Rarely/Sometimes/Very often/Almost always]

- d. Tampon use when sleeping [Almost never/Rarely/Sometimes/Very often/Almost always]
- e. Tampon use when swimming [Almost never/Rarely/Sometimes/Very often/Almost always]
- **f.** Relationship between tampons and the hymen [Almost never/Rarely/Sometimes/Very often/Almost always]
- **2.** Please rate the following regarding tampons:
  - **a.** My knowledge of tampons, including guidelines and potential risks [Very Low/Low/Moderate/High/Very High]
  - **b.** My likelihood of discussing tampons with 12–13-year-old patients [Very Low/Low/Moderate/High/Very High]
  - **c.** My likelihood of discussing tampons with 16–17-year-old patients [Very Low/Low/Moderate/High/Very High]
- 3. Please rate the following regarding sanitary pads:
  - **a.** My knowledge of pads, including guidelines and potential risks [Very Low/Low/Moderate/High/Very High]
  - **b.** My likelihood of discussing pads with 12–13-year-old patients [Very Low/Low/Moderate/High/Very High]
  - **c.** My likelihood of discussing pads with 16–17-year-old patient [Very Low/Low/Moderate/High/Very High]
- 4. Please rate the following regarding menstrual cups:
  - **a.** My knowledge of menstrual cups, including guidelines and potential risks [Very Low/Low/Moderate/High/Very High]
  - **b.** My likelihood of discussing menstrual cups with 12–13-year-old patients [Very Low/Low/Moderate/High/Very High]
  - **c.** My likelihood of discussing menstrual cups with 16–17-year-old patients [Very Low/Low/Moderate/High/Very High]

## Section 3. Knowledge-Based Questions: Tampons (Questions 19-24) and Menstruation (Questions 25-29)

- 1. What is the maximum time a tampon can remain in the body before it should be removed? [1 h/3 h/4 h/5 h/6 h/7 h/8 h/9 h/10 h/11 h/12 h/13 h/14+ h/Unsure]
- **2.** True or false: patients should use the lowest effective absorbency tampon in order to minimize risk of TSS. [True/False/Unsure]
- 3. Is there a recommended age at which patients can start using tampons, given they have started menstruation? [Yes, 11–12 years old/Yes, 13–14 years old/Yes, 15–16 years old/No, it is up to patient preference/Unsure]
- **4.** Can girls/women sleep with a tampon in? [Yes, regardless of sleep duration/Yes, but the tampon should be changed within 8 h/Yes, but the tampon should be changed within 10 h/No/Unsure]
- 5. Can girls/women swim in the ocean with a tampon inserted? [Yes/No/Unsure]
- **6.** If a girl with an intact hymen uses a tampon, can the tampon tear her hymen? [Yes, it will likely tear the hymen/Yes, it could tear the hymen but it is unlikely/No, it will never tear the hymen/Unsure]
- 7. What is the median age of menarche? [8–9 years old/10–11 years old/12–13 years old/14–15 years old/Unsure]
- 8. At what Tanner stage breast development does menarche typically occur? [Stage I/Stage II/Stage III/Stage IV/Stage V/Unsure]
- 9. What is the typical length of bleeding for first menses? [1–5 days/2–7 days/5–10 days/Unsure]
- **10.** How long after onset of breast development does menstruation typically begin? [0–1 year/2–3 years/4–5 years/Unsure]

- 11. Please indicate whether a medical evaluation may be necessary in the following scenarios for an otherwise normally developing female patient.
  - **a.** Menstrual periods have not started by 15 years of age [Yes, medical evaluation may be necessary/No, medical evaluation is not necessary/I am unsure]
  - **b.** Menstrual periods have not started within 3 years of thelarche [Yes, medical evaluation may be necessary/No, medical evaluation is not necessary/I am unsure]
  - **c.** Menstrual periods are irregular within the first year of menarche [Yes, medical evaluation may be necessary/No, medical evaluation is not necessary/I am unsure]
  - **d.** Menstrual periods occasionally occur more than 90 days apart [Yes, medical evaluation may be necessary/No, medical evaluation is not necessary/I am unsure]

## Section 4. Demographic Information

- 1. What is your gender? [Male/Female/Other]
- 2. How do you identify? Please check all that apply. ["Hispanic/Latino"/"White/Caucasian"/"Black/African American"/"Asian/Asian American"/"Native American/Alaskan Native"/"Native Hawaiian/Pacific Islander"/ "Other"]
- 3. For how many years have you been practicing? [1-5/6-10/11-15/16-20/21-25/26-30/31-35/36-40/41-45/46-50/51+]
- **4.** In what state do you primarily practice? [All 50 states and "I do not reside in the United States" listed as response options]
- 5. In what setting do you primarily practice? Select all that apply. [Hospital/Private Practice/Clinic/Other (elaborate)]
- 6. In what area do you primarily practice? Select all that apply. [Urban/Suburban/Rural]
- 7. Are you board certified in any of the following specialties/subspecialties? Please select all that apply. [Pediatrics/Family Medicine/Adolescent Medicine]
- **8.** Did you complete any of the following during or after residency? Please select all that apply. [Rotation in adolescent medicine/Rotation in pediatric gynecology/Fellowship in adolescent medicine/CME programs in adolescent medicine/CME programs in pediatric gynecology/Fellowship in adolescent medicine]
- 9. How many daughters do you have in the following age ranges?
  - **a.** 0-8 years [0/1/2/3+]
  - **b.** 9–11 years [0/1/2/3+]
  - **c.** 12–14 years [0/1/2/3+]
  - **d.** 15–18 years [0/1/2/3+]
  - **e.** 19+ years [0/1/2/3+]

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