

Original Article

Sexual and reproductive health behaviors and experiences reported by young women with cystic fibrosis

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Abstract

Background: The prevalence of general and disease-specific sexual and reproductive health (SRH) concerns is unknown in the United States (U.S.) female CF population. This study aimed to describe and compare the SRH experiences and behaviors of young women with CF with the general U.S. population.

Methods: Young women with CF ages 15–24 years from five geographically diverse U.S. CF centers participated in a survey investigating SRH. Results were summarized and compared to the U.S. National Survey of Family Growth (NSFG) using logistic regression adjusting for confounders.

Findings: A total of 188 young women with CF (mean age 19.7 ± 2.7 years) completed the survey; data were compared to 1997 NSFG respondents (mean age 19.6 ± 0.10 years). Fifty-four percent of women with CF reported having had vaginal sex with a male partner compared to 66% of U.S. women ($p = 0.55$). Women with CF were less likely to have ever used contraception (55% vs. 74%, $p = 0.0001$) or have been tested for sexually transmitted infections in the past year (19% vs. 34%, $p = 0.001$) compared to the general population. Two percent of women with CF reported having ever been pregnant compared to 24% of U.S. women ($p < 0.0001$). One-third of young women with CF reported perceived pubertal delay, 16% urinary incontinence, 16% sexual dysfunction, and 49% yeast infections.

Interpretation: Young women with CF face significant SRH concerns and appear to be experiencing gaps in SRH care provision. Opportunities exist for intervention development around this aspect of comprehensive CF care.

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1. Introduction

Advances in therapy and chronic disease management have led to dramatic increases in the life expectancy for people with cystic fibrosis (CF) [1]. However, despite these improvements, females with CF have a lower median survival relative to males despite accounting for nutritional status, pulmonary function, and airway microbiology [2–4].

In addition to this gender disparity, young women with CF experience a variety of sexual and reproductive health (SRH) concerns. In the United States (U.S.), young women age 15–24 years old endure the highest rates of sexually transmitted infections (STIs), unintended pregnancy, and intimate partner violence (IPV) [5–7]. Along with these general SRH challenges, young women with CF face several disease-specific SRH issues, including pubertal delay, high rates of vulvovaginal candidiasis with frequent antibiotic use, urinary incontinence (UI), sexual dysfunction, concerns regarding contraceptive choice, decreased fertility, and adverse effects of pregnancy [8–14]. The prevalence of such SRH issues in the U.S. female CF population is unknown. Defining the SRH experiences and behaviors of young female patients with CF is important both to improve comprehensive clinical care and serve as a gateway to explore the contribution of SRH on CF-specific health outcomes.

The purpose of this study is to describe the general and disease-specific SRH experiences and behaviors of young women with CF and to compare these findings to the general U.S. population. We hypothesized that young women with CF would have similar SRH behaviors compared to their healthy counterparts, yet would have gaps in SRH care provision. Findings from this study will define the unique healthcare needs of this population and will inform the development of future SRH interventions that improve the overall health for female patients with CF.

2. Methods

Young women with CF ages 15–24 years were recruited to participate in a survey investigating SRH topics including sexual history, STIs, IPV and reproductive coercion (RC), contraceptive use, and pregnancy experiences and attitudes. CF-specific SRH concerns examined included puberty and menstruation, UI, vulvovaginal candidiasis, sexual functioning, CF disclosure to sexual partners, and concerns regarding pregnancy/parenthood. Participants also completed general demographics and self-reported CF health status items (see Online Data Supplement-Patient Survey). Survey content was informed by our prior qualitative work [15,16]. Select survey items were derived from the National Survey of Family Growth (NSFG), prior patient-based surveys, the Female Sexual Functioning Index-6 (FSFI-6), and validated IPV and RC measures [10,11,17–19].

The survey was administered from June 2015 to September 2016 at five CF centers, including both adult and pediatric centers (2 from two different states in the Northeast, 1 in the Southeast, 1 in the West, and 1 in the Mid-Atlantic region). Participants completed the survey during a clinic visit or hospitalization. Data were collected anonymously to encourage disclosure of SRH

behaviors/experiences. Study data were collected and managed using REDCap electronic data capture tools [20]. The Institutional Review Board of each site approved this study.

Descriptive statistics were used to summarize demographics and SRH issues. Demographics and general SRH experiences/behaviors were compared to data for 15–24 year old women from the NSFG, a nationally representative survey of people age 15–44 years conducted by the CDC [17]. The NSFG data was downloaded in its raw form to conduct these analyses and recommended NSFG guidelines on survey design and weighting were applied to account for its complex sampling design. Continuous variables were represented using means and standard deviations for the CF sample and weighted mean and standard errors for the NSFG; similarly, categorical variables were represented with percentages for the CF sample, and weighted percentages for the NSFG. To account for any missing data, percentages were calculated based on total $n = 188$ in the CF sample. Differences in demographics between young women with CF and the NSFG sample were explored via Wald log linear chi-squared testing for categorical variables and linear regression for continuous variables, which allowed for incorporation of NSFG sampling design. To account for observed significant demographic differences between the groups, multivariable logistic regression examining relationships between the samples and SRH outcomes (such as sexual activity or contraception use) was performed adjusting for race, ethnicity, highest level of education and current work/school status.

Using the women in the CF sample only, SRH issues were explored across self-reported markers of CF disease; differences were explored using the Chi-square test for categorical outcomes and unbalanced ANOVA for continuous outcomes. Fisher exact tests were used when cell counts were 5 or less. Statistical analyses were conducted using SAS Version 9.3 (SAS II; SAS, 9 ed., SAS Institute, Cary, NC, USA; 2003).

3. Results

3.1. Demographic and CF-related health characteristics

A total of 188 young women with CF (mean age 19.7 ± 2.7 years) completed the survey out of 206 eligible participants approached (91% response rate). Table 1 describes the sample's demographics and CF health characteristics. Data were compared to women age 15–24 years from the NSFG survey ($n = 1997$; mean age 19.6 ± 0.10 years). Significant differences between the samples were found for race, ethnicity, level of education, current work or school status, and self-reported health status.

3.2. General SRH behaviors and experiences

While nearly all women with CF and in the NSFG sample had reached menarche, the mean age at which women with CF reported menarche was later (13.1 ± 1.3 years compared to 12.4 ± 0.05 years in the NSFG sample, $p < 0.0001$). Fifty-four percent of young women with CF reported a history of vaginal sex with a male partner compared to 66% of women in the NSFG, but this difference was not statistically significant ($p =$

Table 1
Demographics.

Characteristics ^a	Comparison group		Wald log-linear χ^2 p-value
	CF (n = 188) % (n)	NSFG (n = 1997) Weighted %	
Age (mean, SD/mean, standard error of mean)	19.7 (2.7)	19.6 (0.10)	0.56 ^b
Marital status			0.58
Single	91 (172)	91	
Married or living as married	6 (12)	8	
Separated or divorced	1 (2)	1	
Race/ethnicity			<0.001
Black/African-American	3 (5)	18	
White	91 (172)	69	
Other	5 (10)	13	
Hispanic ethnicity	6 (12)	22	<0.001
Highest level of education			<0.001
Some high school or less	38 (71)	38	
High school degree or GED	15 (28)	24	
Some college or vocational school	34 (64)	29	
College degree or higher	13 (24)	9	
Current work or school status			<0.001
Attending school	62 (116)	26	
Working full or part time	24 (46)	52	
Homemaker	1 (2)	10	
Not working due to health ^c	6 (11)	n/a	
Seeking work/not working for other reasons	6 (12)	13	
Current health status (self-report)			<0.001
Excellent	14 (27)	31	
Very good	24 (46)	39	
Good	32 (60)	24	
Fair	25 (47)	5	
Poor	4 (8)	1	
CF severity (self-report)			
Mild	37 (70)	n/a	
Moderate	55 (103)	n/a	
Severe	7 (13)	n/a	
Baseline FEV1 (self-report)			
>70%	71 (133)	n/a	
41–70%	16 (31)	n/a	
<40%	9 (16)	n/a	
Number of hospitalizations in past year			
None	41 (77)	n/a	
One or two times	38 (71)	n/a	
>2 times	21 (40)	n/a	
Presence of G tube	13 (24)	n/a	
CF-related diabetes			
Diabetes	31 (59)	n/a	
Impaired glucose tolerance	8 (15)	n/a	
CF-related liver disease	10 (18)	n/a	

^a Denominator varies by variable (n ranges from 180 to 188); percentages calculated based on total n = 188 to include missing data.

^b Proc surveyreg was used to compare continuous outcomes by sample.

^c “Not working due to health” was combined with the “seeking work/not working for other reasons category” in the CF sample for the comparison to NSFG.

0.55). The average age at first vaginal sex with a male partner was 16.9 ± 1.9 years for young women with CF and 16.2 ± 0.11 years for NSFG women ($p = 0.001$). Similar to the NSFG sample, young women with CF reported an average of 4.7 ± 4.9 lifetime male vaginal sex partners with 1.5 ± 1.8 partners in the prior 12 months ($p = 0.61$ and $p = 0.90$,

respectively). Regarding STIs (gonorrhea, chlamydia, herpes, HIV, syphilis, and/or genital warts), 19% of women with CF reported undergoing testing in the past year compared to 34% in the NSFG sample ($p = 0.001$). Fourteen percent of women with CF reported experiencing IPV and 4% reported experiencing RC. Table 2 further details both groups' SRH experiences.

Fifty-five percent of women with CF had ever used contraception compared to 74% of women in the NSFG ($p < 0.0001$). Among participants who reported sex in the prior three months (CF n = 83, 44%; NSFG n = 1058, 53%), 35% of young women with CF were not using any form of contraception compared to 26% of women in the NSFG ($p < 0.0001$). Table 3 summarizes the rates of use of both groups' current contraceptive methods. A higher percentage of women with CF were using a long-acting reversible contraceptive (LARC) (intrauterine device or implant) compared to NSFG women (17% vs. 8%, $p < 0.0001$). Women with CF currently using contraception had a mean age of contraceptive initiation of 16.8 ± 2.1 years compared to 16.2 ± 0.13 years in the NSFG ($p = 0.001$). In the previous year, women with CF were more likely to consistently

Table 2
CF vs. NSFG sexual and reproductive health experiences and behaviors.

Outcomes	CF	NSFG	p value ^d
	% (n) (n = 188)	Weighted % (n = 1997)	
Reached menarche	98 (184)	99.7	0.42
Age of menarche (in years) (mean, SD/mean, standard error of mean)	13.1 (1.3)	12.4 (0.05)	<0.001
Sexual orientation ^a			0.22
Heterosexual or straight	87 (164)	90	
Homosexual, gay, or lesbian	2 (4)	2	
Bisexual	10 (19)	9	
History of vaginal sex with male partner	54 (101)	66	0.55
History of performing oral sex			
Male partner	50 (94)	59	0.08
Female partner	11 (20)	9	<0.01
History of receiving oral sex			
Male partner	52 (97)	62	0.07
Female partner	10.6 (20)	11	0.02
History of anal sex	12 (22)	22	<0.001
History of any sexual experience with female partner	14 (26)	16	0.26
Age at first vaginal sex with male partner ^b (mean, SD/mean, standard error of mean)	16.9 (1.9)	16.2 (0.11)	<0.01
Number of male vaginal sex partners ^b (mean, SD; median/mean, standard error of mean; median)			
Lifetime	4.7 (4.9); 3	4.9 (0.21); 2.6	0.61
Past 12 months	1.5 (1.8); 1	1.4 (0.06); 0.6	0.90
STI testing in past year ^c	19 (35)	34	<0.001
STI treatment in past year	4 (8)	5	0.86
History of pelvic inflammatory disease	0.5 (1)	2	<.01
Ever pregnant	2 (3)	24	<0.001

^a n = 187; percentages calculated based on total n = 188 to include missing data.

^b Of participants who have had vaginal sex (n = 101 CF, n = 1334 NSFG).

^c NSFG data has past-year diagnosis of chlamydia and gonorrhea and lifetime diagnosis of herpes, genital warts, and syphilis.

^d Adjusted for race, ethnicity, level of education and current work/school status.

Table 3
Contraceptive use.

Outcomes	Comparison group		p value ^c
	CF % (n)	NSFG Weighted %	
History of contraceptive use	55 (103)	74	<0.001
<i>Current contraceptive method^a</i>			
None	35 (29)	26	<0.001
Intrauterine device	11 (9)	6	<0.001
Subdermal implant	6 (5)	2	<0.001
Injection (i.e., Depo-Provera)	8 (7)	6	0.04
Vaginal ring	1 (1)	2	0.16
Contraceptive patch	1 (1)	0.8	0.02
Oral contraceptives	29 (24)	31	<0.001
Male condom	24 (20)	33	<0.01
Withdrawal (“pulling out”)	14 (12)	16	0.32
Current use of long-acting reversible contraception (IUD or implant) ^a	17 (14)	8	<0.001
Age of initiation of contraceptive use for current users (mean, SD/SE) ^b	16.8 (2.1)	16.2 (0.13)	<0.001
<i>Reasons for current contraceptive non-use^c</i>			<0.001
You do not expect to have sex	52 (13)	14	
You do not think you can get pregnant	8 (2)	10	
You don't really mind if you get pregnant	16 (4)	22	
You are worried about the side effects of birth control	20 (5)	32	
<i>Condom use, past 12 months^d</i>			<0.001
Every time	20 (38)	15	
Most of the time	11 (21)	11	
About half of the time	2 (3)	4	
Some of the time	5 (10)	12	
None of the time	14 (27)	20	
I have not had sexual intercourse	46 (86)	39	
History of emergency contraception use	17 (32)	29	<0.001

^a Among participants who report recent sex in the past three months (n = 83 CF, n = 1058 NSFG); can select multiple methods.

^b Among participants who currently use contraception (n = 76 CF, n = 852 NSFG).

^c n = 24; percentages calculated based on participants who currently do not use contraception (n = 25 CF, n = 1058 NSFG) to include missing data; can select multiple choices.

^d n = 185; percentages calculated based on total n = 188 to include missing data.

^e Adjusted for race, ethnicity, level of education and current work/school status.

report condom use with male partners compared to women in the NSFG (31% vs. 26%, $p < 0.0001$). Fewer women with CF (17%) reported a history of emergency contraception use compared to women in the NSFG (29%, $p < 0.0001$) (Table 3).

Three women with CF (2%) reported ever being pregnant (resulting in one miscarriage, one abortion, and one ongoing pregnancy), whereas 24% of NSFG women had ever been pregnant ($p < 0.0001$) (Table 2).

3.3. CF-specific SRH experiences and behaviors

Twenty-nine percent of young women with CF perceived pubertal delay compared to other girls their age. Sixteen percent of women with CF had a history of UI and 49% had a history of yeast infections. Forty-nine percent of women with CF always disclose their CF diagnosis to sexual partners; 29% disclose their CF when they are in a committed relationship (Table 4).

Table 4
CF-specific SRH experience and behaviors.

Outcomes ^a	CF women % (n) (n = 188)
Age of adrenarche, mean (SD)	12.0 (1.4)
Age of menarche, mean (SD)	13.1 (1.3)
<i>Perceived timing of puberty</i>	
Earlier than other girls my age	13 (24)
The same as other girls my age	57 (107)
Later than other girls my age	29 (54)
History of urinary incontinence (UI)	16 (30)
Age of onset, mean (SD)	15.7 (4.5)
Frequency of UI	
Once a day or more	27 (8)
1–4 times per week	13 (4)
2–4 times per month	13 (4)
A few times per year	20 (6)
Very rarely	27 (8)
<i>History of yeast infections</i>	
Never	51 (95)
Yes, once a year or less	25 (47)
Yes, a couple of times a year	19 (36)
Yes, once a month or more	5 (10)
<i>Disclosure of CF diagnosis to sexual partners</i>	
No	4 (8)
Yes, sometimes	9 (17)
Yes, when I am in a committed relationship	29 (55)
Yes, always	49 (92)
Don't know	8 (14)
<i>Sexual functioning^b</i>	
Sexual dysfunction ^{b,c}	16 (13)
<i>Coughing during or after sex^b</i>	
Almost never or never	33 (27)
A few times (less than half the time)	32 (26)
Half the time or most times	21 (17)
Almost always or always	12 (10)
<i>Hemoptysis during or after sex^b</i>	
Almost never or never	95 (77)
A few times (less than half the time)	1 (1)
Half the time or most times	1 (1)
Almost always or always	1 (1)
<i>Excessive flatulence during or after sex^b</i>	
Almost never or never	79 (64)
A few times (less than half the time)	16 (13)
Half the time or most times	3 (2)
Almost always or always	1 (1)
<i>Pain with vaginal penetration^d</i>	
Almost never or never	47 (47)
A few times (less than half the time)	22 (22)
Half the time or most times	14 (14)
Almost always or always	2 (2)
Have not recently attempted vaginal penetration	15 (15)
Informed or told of infertility due to CF	1 (2)
Concerned future children may have CF	72 (136)
Would elect to do genetic testing for CF for future child	79 (148)
<i>Desire to have future child</i>	
Definitely yes	44 (83)
Probably yes	34 (63)
Probably no	11 (20)
Definitely no	6 (11)
<i>Feelings regarding prospect of pregnancy at this time</i>	
Very upset	59 (111)
A little upset	22 (42)

Table 4 (continued)

Outcomes ^a	CF women
	% (n) (n = 188)
<i>Feelings regarding prospect of pregnancy at this time</i>	
A little pleased	8 (14)
Very pleased	6 (12)
Would not care	2 (3)

^a Denominator varies by variable (n ranges from 177 to 188); percentages calculated based on total n = 188 to include missing data.

^b Among participants who report sex in the past month (n = 81); n ranges from 80 to 81; percentages calculated based on total n = 81 to include missing data.

^c Determined by composite score of <19 on Female Sexual Functioning Index-6 scale (mean score 23.1 ± 4.7).

^d n = 100; percentages calculated based on participants who ever had vaginal sex (n = 101) to include missing data.

Sixteen percent of young women with CF who had sexual experiences in the past month had a composite score on the FSFI-6 signaling sexual dysfunction (n = 13 out of 81 women; mean score 23.1 ± 4.7). One-third of women with CF reported coughing during or after sex half the time or more. Sixteen percent of respondents with a history of vaginal penetration (n = 16 out of 101 women) reported pain with vaginal penetration half the time or more (Table 4).

Seventy-two percent of women with CF were concerned that future children might have CF; 79% would elect to do genetic testing for CF for future children. Seventy-eight percent of all surveyed women with CF wanted to have a child in the future; however, 81% would feel upset regarding pregnancy at the current time. Similar proportions of women across age cohorts (15–18, 19–21, and 22–24 years old), expressed a desire for future children (>75% in each age cohort). Two women in the sample reported that a healthcare provider had told them that they were infertile due to their CF (Table 4).

3.4. SRH outcomes by CF health status

Women who rated their CF disease as “severe” reported a lower age of initial sex (16 ± 1.2 years) compared to women who rated their CF as “mild” (18 ± 1.9 years) or “moderate” (17 ± 1.9 years) (p = 0.03). All women with CF used similar methods of contraception with the exception of women who rated their CF as “severe” being less likely to use oral contraceptives (p = 0.035). Women with CF-related liver disease and/or a gastrostomy tube reported later menarche compared to other women with CF (14 ± 1.5 years/14 ± 1.4 years vs. 13 ± 1.3 years; p = 0.003 and p = 0.006). Women with liver disease were also significantly more likely to have had vaginal sex (78% vs. 51%; p = 0.035) compared to those without liver disease. Full data on the effect of CF health markers on SRH outcomes is available in Supplement 1.

4. Discussion

This is the first study to identify and compare the SRH experiences and behaviors of young women with CF to the

general U.S. population. Despite reporting similar levels of sexual activity, young women with CF in this sample appear to be experiencing gaps in SRH care, specifically regarding preventive services including STI testing and contraception. Over a third of recently sexually active women in the sample are not using any form of contraception, but are experiencing lower pregnancy rates compared to U.S. women. The majority of young women with CF surveyed desire future children. Finally, young women with CF are experiencing many disease-specific SRH concerns, including pubertal delay, UI, yeast infections, and sexual dysfunction.

The significant divergence in pregnancy rates between young women with CF in this sample and the general U.S. population deserves attention. This may be partly explained by the increased use of LARCs (the most effective forms of reversible contraception) in the CF population. However, the degree of difference in LARC use (17% vs. 8%) likely cannot fully explain the difference in pregnancy rates reported (2% vs. 24%). The stark contrast in pregnancy rates between the two groups may indicate decreased fertility in the CF population, especially given that women with CF who were currently sexually active were also less likely to be using any contraception. Fertility may be affected in CF through a variety of mechanisms, including thickened cervical mucus, decreased sperm motility and capacitation, and poor nutrition [21,22]. However, understanding of fertility and pregnancy in CF is limited and, while female patients indicate that CF is a major factor in their pregnancy decision-making, they have expressed confusion about how CF actually affects their reproductive futures [16]. Although the U.S. CF Foundation patient registry inquires whether a patient had a pregnancy in the past year, no formalized collection of maternal-fetal outcomes or need for fertility interventions exists [1]. Registry data may be skewed to include only pregnancies that result in live births, as patients may not disclose miscarriage or abortion to their care team. Incorporating additional SRH items into the registry may facilitate understanding the interplay between these elements and CF disease. As nearly 80% of our sample desire future children, research regarding fertility and pregnancy is imperative to provide adequate preconception counseling and care for the increasing numbers of young women with CF who desire children [23].

Female sex hormones, particularly estrogen, are believed to modulate key components of CF physiology and negatively affect infection, inflammation, and mucociliary clearance [24–27]. Over 50% of women with CF in this sample currently using contraception reported using a hormonal method, a potentially useful treatment modality for shrinking the gender gap as it regulates these physiologic hormonal shifts. Despite limited data, oral contraception appears to be safe for use in women with CF¹⁴ and a review of the Cystic Fibrosis Registry of Ireland revealed that the use of oral contraceptives was associated with a decreased need for antibiotics [28]. However, adoption of new therapies that alter the CFTR defect, such as ivacaftor and lumacaftor/ivacaftor, may limit the use of hormonal contraceptives as a treatment. These new drugs may affect metabolism and reduce efficacy of oral hormonal

contraceptives [29] and current product information states that hormonal contraception should be avoided. To complicate matters, these new therapies may have positive effects on female fertility through changes in cervical mucus consistency, yet their effects during pregnancy and lactation are incompletely understood [30].

Because young female patients with CF are engaging in SRH behaviors and have many SRH concerns, improved SRH care is needed. Many CF patients view their CF providers as “de facto” primary care physicians (PCPs) [15,31] and, thus, may use the CF care setting for SRH care and counseling. CF providers should be comfortable discussing SRH concerns and providing appropriate referrals/resources. Unfortunately, providers do not routinely address SRH in the CF setting. A recent national survey of primary CF care providers found that routine discussion of SRH topics in clinical practice was low, although most believed that these topics were important [32].

Standardization of SRH care in the CF care model may help to advance this aspect of comprehensive care. Frayman and Sawyer have described a framework in which the CF provider also assumes the primary role in SRH discussions [33]. This approach emphasizes communication and coordination of care among the CF team, PCPs, and women’s health services. Prior research supports this model as it has elucidated a patient desire for individualized SRH discussions with CF providers [15,16]. Investigating SRH care utilization patterns and preferences of this population is a crucial next step. By understanding the patient experience, the CF community can work to develop ways to facilitate SRH care provision. Future interventions should include patient educational resources, training for the multidisciplinary CF team, and the development of tools that facilitate patient-provider SRH communication.

This study has several limitations. This survey utilized a convenience sample that provided self-reported assessments and is not necessarily generalizable to all women with CF. SRH behaviors and practices are influenced by cultural, educational, and societal differences; thus, a similar study may yield different results in other countries or in a larger U.S. sample. Obtaining objective clinical data on an international group of patients with CF affected by certain disease-specific SRH complications may help further define the effect of SRH on the gender gap and allow for targeted screening and management strategies. Moreover, we did not assess some relevant factors (i.e., insurance status, religious/personal preferences, genotype, and use of targeted CFTR therapies) that could potentially influence SRH care decisions and outcomes. We did not formally adjust for multiplicity in this work; thus, some statistically significant findings may be spurious. A Bonferroni correction for 31 tests yields a significance cut-off of $p \leq 0.002$, which does not affect the significance of the majority of this study’s findings. Finally, the ability to detect statistically significant associations between CF health status and SRH outcomes may have been limited by the relatively small sample sizes of women with severe CF disease. As disease severity and complications may greatly affect SRH decisions, a future, larger study of these issues is warranted.

In conclusion, this study found that young female patients with CF are sexually active and face a variety of both general

and disease-specific SRH concerns in the modern treatment era regardless of disease severity. Thus, health providers should routinely address SRH as part of comprehensive CF care. Opportunities exist for the development of interventions that will improve this important aspect of health. Understanding the unique interplay between the female sex and CF is vital, as the reasons for the gender gap in CF-related morbidity and mortality remain unclear. Whether the SRH concerns identified in this study contribute to worsening overall health outcomes in the female CF population should be explored. Future research should focus on understanding and modifying the complex interplay between being female and having CF.

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.jcf.2017.07.017>.

Authors’ contributions

Dr. Kazmerski conceptualized and designed the survey, performed data analysis, drafted the initial manuscript, revised the manuscript and approved the final manuscript as submitted. Drs. Sawicki, Miller, Weiner, and Tuchman aided in the design of survey, critically revised the manuscript, and approved the final manuscript as submitted. Drs. Pilewski and Orenstein reviewed and revised the survey, critically revised the manuscript, and approved the final manuscript as submitted. Drs. Ladores, Rubenstein, and Sagel served as site co-investigators, revised the manuscript, and approved the final manuscript as submitted. Drs. Abebe and Jones aided in the data analysis plan, performed data analysis, revised the manuscript, and approved the final manuscript as submitted. Dr. Borrero provided mentorship to Dr. Kazmerski throughout the project, aided in the design of the project and survey, critically revised the manuscript, and approved the final manuscript as submitted.

Conflicts of interest

No significant conflicts of interest exist for the authors of this work.

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