



## Original article

## Evaluation of a Tool to Identify Child Sex Trafficking Victims in Multiple Healthcare Settings

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 A B S T R A C T

**Purpose:** Estimate the prevalence of child sex trafficking (CST) among patients seeking care in multiple healthcare settings; evaluate a short screening tool to identify victims in a healthcare setting.

**Methods:** This cross-sectional observational study involved patients from 16 sites throughout the U.S.: five pediatric emergency departments, six child advocacy centers, and five teen clinics. Participants included English-speaking youth ages 11–17 years. For emergency department sites, inclusion criteria included a chief complaint of sexual violence. Data on several domains were gathered through self-report questionnaires and examiner interview. Main outcomes included prevalence of CST among eligible youth; sensitivity, specificity, positive/negative predictive values, and positive/negative likelihood ratios for a CST screening tool.

**Results:** Eight hundred and ten participants included 91 (11.52%) youth from emergency departments, 395 (48.8%) from child advocacy centers, and 324 (40.0%) from teen clinics. Overall prevalence of CST was 11.1%: 13.2% among emergency department patients, 6.3% among child advocacy center patients, and 16.4% among teen clinic patients, respectively. The screen had a sensitivity, specificity, and positive likelihood ratio of 84.44% (75.28, 91.23), 57.50% (53.80, 61.11), and 1.99% (1.76, 2.25), respectively.

**Conclusions:** This study demonstrates a significant rate of CST among patients presenting to emergency departments (for sexual violence complaints), child advocacy centers, and teen clinics. A six-item screen showed relatively good sensitivity and moderate specificity. Negative predictive value was high.

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 IMPLICATIONS AND  
 CONTRIBUTION

Many victims of child sex trafficking report recent contact with the health system. This study describes a brief screening tool specifically designed to identify child sex trafficking victims in a busy healthcare setting, and clinically evaluated across multiple study sites.

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Intervention for a “positive” screen may identify victims and help prevent high-risk youth from becoming victimized. This is one of the first CST screening tools specifically developed and evaluated in the healthcare setting.

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Child sex trafficking (CST) is a major public health issue [1,2]. According to U.S. federal law, CST involves engagement of a minor (<18 years old) in any commercialized sexual activity (e.g., prostitution, production of sexual material, and performance in sexually oriented businesses) in exchange for something of perceived value [3,4], including money, drugs, food, luxury items, or shelter. CST does not require a third party (“pimp”), nor does it require the presence of force/fraud/coercion, since minors are legally incapable of consenting.

Youth at risk for CST include those with a history of abuse/neglect, involvement with child protective services or the juvenile justice system, those who identify as lesbian/gay/bisexual/transgender/questioning/queer, who have run away from home or are homeless, those with mental health issues or a history of substance misuse or other risk factors [5–10]. Trafficked persons may experience many adverse physical and mental health effects [5,11–18]. Specifically, they are at higher risk for HIV [19], substance misuse [20], suicidality [21], post-traumatic stress disorder [14], sexually transmitted infections (STIs) [5], and violence [22]. Reliable statistics on CST prevalence are lacking, due to the absence of a centralized database, criminal nature of the activity, under-recognition of trafficked persons by authorities, and other factors [23,24]. However, numbers are likely significant. Population-based school surveys in Canada and the U.S. estimate that up to 3% of students may have been sexually exploited [25,26]. Studies of “survival sex” among runaway/homeless youth suggest rates of 10%–50% [6,8,27,28].

Prior research indicates that sex trafficking victims present to healthcare professionals (HCPs) in various clinical settings [14], and highlights the importance of the HCP role in identifying, evaluating, treating, and referring CST victims to appropriate services [29]. In a U.S. study of adult and adolescent female survivors, 88% reported visiting an HCP during their period of exploitation [14]. They presented to emergency departments (EDs; 63%), clinics (57%), Planned Parenthood (30%), and primary care providers (23%). A study of adolescent victims determined that nearly 43% visited a medical provider within the past 2 months [17]. Child-serving HCPs in all settings need to be alert to possible victimization, yet recent research suggests that pediatricians have limited knowledge, comfort, and training on CST [30].

Trafficked persons may not disclose their exploitation to HCPs due to shame, stigma, fear of repercussions, guilt, or failure to recognize their victim status [1,24,31,32]. Thus, the onus of victim identification typically falls on the HCP. While multiple screening tools have been developed primarily for use in nonmedical settings [33–35], these tend to be lengthy which limits their feasibility in busy medical practices.

A recent review of available CST screening instruments found only six that met study inclusion criteria, with two deemed “highly feasible” for an EDs setting [36–38]. One of these is the tool used in this study. More work on CST screening tools is warranted. The aims of this study were to (1) estimate the prevalence of CST among patients seeking care in three adolescent-serving healthcare settings, and (2) further evaluate a short screening tool originally developed in a pediatric ED setting with victims of acute

sexual violence [15]. The items of the tool were selected from 16 variables on which CST patients significantly differed from those experiencing sexual violence with no indication of commercial exploitation. The six items were chosen based on high value of area under the receiver operating curve, percentage of patients answering the question, and ease of obtaining information from the patient chart. With a cutoff value of 2, the screen showed a sensitivity of 92.3% and specificity of 74.4%. Given the limited setting and population of the initial study, the current study examines this tool across multiple healthcare settings and different patient populations.

## Methods

### Study locations

Following an announcement of the study on a child abuse physician list serve and presentation of research at a child maltreatment conference, site leaders were recruited from 16 U.S. healthcare facilities, including 5 pediatric EDs, 6 child advocacy centers (CACs; centers providing medical evaluations for children/adolescents with suspected maltreatment), and 5 teen clinics. All 16 healthcare facilities were located in urban areas, although some sites likely offer services to rural patients. The “teen clinics” ranged from those providing primary care to all teens, to those focusing on adolescents considered “at risk” due to involvement with juvenile justice or child protective services, mental health issues, or runaway behavior, truancy, and/or other high-risk behaviors. Data were collected between May 1, 2015 and November 15, 2016; one site ceased recruitment in March 2016. Sites joined the study at different times based on learning of and agreeing to participate in the study and on site-specific Institutional Review Board (IRB) approvals. Minimum age criteria varied between sites (11–13 years) due to IRB restrictions. Age restrictions and numbers of participants recruited at each site are displayed in Table 1.

Hypothesis testing was performed to determine if there were differences in participant demographics based on site location; *p* values are shown in Table 2. The number of male and female participants varied significantly by site; three sites recruited more than 20% male participants, while seven other sites recruited no male participants. Participant race/ethnicity varied significantly by site, likely because the racial/ethnic makeup of study participants was reflective of the racial/ethnic makeup of the population in each city.

### Participants

Patients meeting inclusion criteria (English speaking, within specified age range: 11–13 years minimum; 17 years maximum) were approached about study participation. EDs maintained an additional inclusion criterion that the chief patient complaint must be acute sexual assault/abuse, or concern for CST. Exclusion criteria included patients with extreme developmental delays, those who appeared intoxicated or in marked distress, those who declined to

**Table 1**  
Site characteristics, age restrictions, and participants, by site location

Site location	Site type	Age restrictions	# (% of 810) of participants, total	# (% of 90) of participants identified as CST victims
Atlanta, GA	CAC	13–17	55 (6.8)	6 (6.7)
Atlanta, GA	ED	13–17	2 (.2)	2 (2.2)
Atlanta, GA	ED	13–17	3 (.4)	1 (1.1)
Atlanta, GA	ED	13–17	4 (.5)	3 (3.3)
Atlanta, GA	Teen clinic	13–17	12 (1.5)	0 (.0)
St. Paul, MN	Teen clinic	12–17	230 (28.4)	51 (56.7)
St. Louis, MO	ED	11–17	35 (4.3)	4 (4.4)
St. Louis, MO	CAC	11–17	26 (3.2)	1 (1.1)
Dallas, TX	CAC	11–17	65 (8.0)	6 (6.7)
Grand Blanc, MI	CAC	13–17	30 (3.7)	3 (3.3)
Columbus, OH	CAC	12–17	215 (26.5)	8 (8.9)
Columbus, OH	ED	12–17	47 (5.8)	2 (2.2)
Denver, CO	Teen clinic	12–17	68 (8.4)	2 (2.2)
New York, NY	CAC	12–17	4 (.5)	1 (1.1)
New York, NY	Teen clinic	12–17	4 (.5)	0 (.0)
Las Vegas, NV	Teen clinic	12–17	10 (1.2)	0 (.0)

CAC = child advocacy center; CST = child sex trafficking; ED = emergency department.

answer questions, or those who were otherwise deemed unable to answer questions accurately by the examiner. Exclusion also occurred when the youth had already completed the study at a different visit, or when patient or practitioner time constraints precluded participation.

Not all sites tracked the number of patients excluded. The most common reasons for exclusion were related to technical issues (e. g., examiner didn't have time or forgot to present study opportunity) or the patient did not want to answer questions/wanted to leave. Site leaders estimated 0%–20% of patients who were approached declined to participate.

A total of 930 patients agreed to participate in the study. However, HCPs gave “unsure” responses regarding CST status of 39 (4.19%) participants (no further details provided) and did not provide responses regarding CST status of 81 (8.71%) participants. Our analysis focused solely on the 810 participants for whom CST status (the outcome variable) was available (15.3% male; 84.3% female); participant demographics for the total sample are shown in Table 2. Of these, 91 (11.2%) were from EDs, 395 (48.8%) from CACs, and 324 (40.0%) from teen clinics; participant demographics by site type are shown in Supplement 1.

### Procedure

IRBs for all participating institutions approved this cross-sectional, multisite study or accepted the lead site's IRB approval. Some site-specific IRBs approved a partial waiver of consent, allowing participants to provide consent and participate in the study without parental permission. Patients completed a self-report questionnaire regarding high-risk behaviors, law enforcement involvement, and sexual history via paper form or tablet; one site administered questions verbally. For patients who appeared to have reading challenges, the questionnaire was administered verbally ( $\leq 1\%$  per site leader report). Before patients began the questionnaire, they were advised by HCPs (physicians, sexual assault nurse examiners, advanced practice registered nurses, all of whom had undergone training and had experience regarding human trafficking) of the limits of confidentiality and were informed that answering questions was voluntary. HCPs then asked patients a series of follow-up questions about behaviors endorsed on the self-report questionnaire. Per study protocol, participants were interviewed by HCPs outside the presence of the person(s) accompanying the youth to the visit. After concluding

**Table 2**  
Demographic characteristics of CST patients, total sample

Characteristic	CST status		Total, N = 810 (%)	Differences between No and Yes groups, $p^a$	Differences based on site location, $p^b$
	No, N = 720 (%)	Yes, N = 90 (%)			
Age, M (SD) (N = 774)	14.5 (1.6)	15.4 (1.5)	14.6 (1.6)	<.001 <sup>c</sup>	.23
Gender (N = 792)					
Female	586 (81.4)	82 (91.1)	668 (84.3)	<.001 <sup>c</sup>	<.001 <sup>c</sup>
Male	114 (15.8)	7 (7.8)	121 (15.3)		
Race/ethnicity (N = 810)					
Black, non-Hispanic	197 (27.4)	26 (28.9)	223 (27.5)	.02 <sup>c</sup>	<.001 <sup>c</sup>
White, non-Hispanic	266 (36.9)	41 (45.6)	307 (37.9)		
Mixed race, non-Hispanic	72 (10.0)	11 (12.2)	83 (10.3)		
Asian or Pacific islander	13 (.0) <sup>d</sup>	1 (1.1)	14 (1.7)		
American Indian or Alaska native	4 (.0) <sup>d</sup>	2 (2.2)	6 (.7)		
Hispanic	142 (19.7)	5 (5.6)	147 (18.2)		
Unknown race/ethnicity	26 (3.1)	4 (4.4)	30 (3.7)		

CST = child sex trafficking

<sup>a</sup>  $p$  based on independent samples  $t$ -test for continuous variables and  $\chi^2$  test for categorical variables, testing the differences between patients who were and were not identified as potential CST victims by HCPs.

<sup>b</sup>  $p$  based on one-way analysis of variance for continuous variables and  $\chi^2$  test for categorical variables, specifically testing the differences between site locations.

<sup>c</sup>  $p < .05$ .

<sup>d</sup> Less than 5%.

the interaction with the patient, HCPs answered written questions about patient demographics and medical history.

### Measures

Patients were asked to complete part or all of a 17-item questionnaire (see Supplement 2). This began with nine questions about prior medical care, injuries, and known risk factors for CST [4,7,18,19]. If a child answered “yes” to the question, “Have you ever had sex of any type? (other than involving the events that brought you here today/tonight),” they were asked an additional eight questions about sexual activity, sexual orientation, STIs, and high-risk behavior. The original CST screening questions were embedded within the 17-item questionnaire [5]. One question from the original screen was split into two dichotomous subquestions: 1a. “Have you ever broken any bones or had any cuts that needed stitches?” and 1b. “Have you ever been knocked unconscious (‘knocked out’)?” These subquestions were scored as a single question; a “yes” to either, or both, subquestions was counted as a single positive answer. Overall, a positive answer to  $\geq 2$  questions was considered a “positive” screen. The study questions were accompanied by other routine questions/surveys at some sites. HCPs asked patients follow-up questions for any positive questionnaire responses in order to obtain more detailed information (see Supplement 3).

### Determination of child sex trafficking status

HCPs were asked, “Based on questions from this survey and on any other information gleaned from the visit, do you believe this patient is a victim of commercial sexual exploitation of children (CSEC)/child sex trafficking? (e.g., exchanging a sex act for something of value to child or another person, including survival sex, prostitution, sex trafficking, pornography, working in sex industry) (Yes/No/Don’t know).” This question was worded to describe the federal definition of CST and to ensure, when possible, that the decision about CST status was based on all available information from all sources (including the medical chart, information provided by the person accompanying the child, information provided by associated authorities via referral forms, etc.). Patients were considered CST victims if the examiner opined they were being victimized. Ninety patients were classified as CST victims. Explicit statements documenting how the decision was determined were given for 81% of those patients. For the remaining 19%, the HCP did not provide a specific reason for the decision. Given the knowledge of examiners about human trafficking and the known underreporting of CSEC in the broad population, it was decided to include all highly likely victims, regardless of whether a detailed explanation for substantiation was included. The HCP’s decision about CST status served as the “gold standard” for calculating sensitivity/specificity, but the decision required specific evidence tied to legal standards.

### Data analysis

Analyses were conducted with SAS version 9.4 (SAS Institute Inc.). Descriptive statistics including two-tailed independent samples *t*-tests and one-way ANOVA tests for continuous variables and one-tailed  $\chi^2$ -tests for categorical variables were used to compare CST patients with non-CST patients; the level of significance was .05. Sensitivity, specificity, positive and negative predictive values,

and positive and negative likelihood ratios were calculated to further describe the effectiveness of the screening tool.

### Results

#### *Aim (1): Estimating the prevalence of child sex trafficking in healthcare settings*

Based on HCP response, 90 of the 810 participants (11.1%) were classified as victims of CST: 12/91 (13.2%) patients at ED sites; 25/395 (6.3%) at CACs; and 53/324 (16.4%) at teen clinics. HCPs gave various reasons for classification: participant disclosed to HCP and admitted to having sex in exchange for money, drugs, or housing (33/90, 36.7%); police found or arrested participant during a sting operation (12/90, 13.3%); participant displayed multiple risk factors of trafficking (5/90, 5.6%); nude pictures or video recordings of participant had been taken (4/90, 4.4%); participant was identified as a trafficking victim using police data (4/90, 4.4%); participant disclosed to HCP and there was also police involvement (3/90, 3.3%); participant was identified and located through an advertisement on Backpage (3/90, 3.3%); participant was communicating electronically with one or more adult perpetrators (3/90, 3.3%); perpetrator was a known trafficker (1/90, 1.1%); and participant was found living on the street but was unusually well groomed (1/90, 1.1%).

#### *Aim (2): Evaluation of a child sex trafficking screening tool across healthcare settings*

Participant responses to the CST screen are summarized in Table 3 for the total sample as well as ED, CAC, and teen clinic groups. For all groups, there were significant differences between CST and non-CST participants on each item, except for the subquestion regarding a history of “broken bones/cuts needing stitches.” In addition, the CST/non-CST samples from the ED group did not significantly differ on the subquestion regarding a history of “being knocked unconscious.”

All groups showed significant differences between CST and non-CST participants in the percentage of children with positive screens. Of the total sample of 810, 288 (40.0%) non-CST patients screened positive compared to 76 (84.4%) CST patients ( $p < .001$ ). The corresponding values for the ED, CAC, and teen clinic groups were as follows: ED: 40 (50.6%) non-CST, 10 (83.3%) CST ( $p < .034$ ); CAC: 143 (38.7%) non-CST, 21 (84.0%) CST ( $p < .001$ ); teen clinic: 123 (45.4%) non-CST, 45 (84.9%) CST ( $p < .001$ ).

The screen had a sensitivity of 84.4% (95% CI: 75.3, 91.2) and specificity of 57.5% (95% CI: 53.8, 61.1) in the total sample; 83.3% sensitivity (95% CI: 51.6, 97.9) and 49.4% specificity (95% CI: 37.9, 60.9) in ED settings; 84.0% sensitivity (95% CI: 63.9, 95.5) and 61.4% specificity (95% CI: 56.2, 66.3) in CACs; and 84.9% sensitivity (95% CI: 72.4, 93.3) and 54.6% specificity (95% CI: 48.5, 60.7) in teen clinics. Additional information on positive predictive value, negative predictive value, positive likelihood ratio, and negative likelihood ratio are listed in Table 4.

Performance measures were repeated after excluding the subquestion regarding broken bones/cuts requiring stitches, since this subquestion was not found to be a significant predictor of CST status (see Table 5). Overall, sensitivities and positive and negative predictive values for this “modified tool” remained unchanged, although there were increases in specificities (58.7%–70.0%), demonstrating improvement in identifying adolescents who were not CST victims.

**Table 3**  
Responses to screen questions and other risk factor questions

Characteristic	Total sample, N = 810			Emergency department, N = 91			Child advocacy center, N = 395			Teen, N = 324		
	Non-CST, N = 720 (%)	CST Victim, N = 90 (%)	p value <sup>a</sup>	Non-CST, n = 79 (%)	CST Victim, n = 12 (%)	p value <sup>a</sup>	Non-CST, n = 370 (%)	CST Victim, n = 25 (%)	p value <sup>a</sup>	Non-CST, n = 271 (%)	CST Victim, n = 53 (%)	p value <sup>a</sup>
<b>Screen questions</b>												
Drug or alcohol use in past year	237 (32.9)	66 (73.3)	<.001 <sup>b</sup>	31 (39.2)	9 (75.0)	.024 <sup>b</sup>	106 (28.6)	17 (68.0)	<.001 <sup>b</sup>	100 (36.9)	40 (75.5)	<.001 <sup>b</sup>
History of running away from home	228 (31.6)	74 (82.2)	<.001 <sup>b</sup>	19 (24.1)	10 (83.3)	<.001 <sup>b</sup>	95 (25.7)	18 (72.0)	<.001 <sup>b</sup>	114 (42.1)	46 (86.8)	<.001 <sup>b</sup>
History with police	176 (24.4)	29 (32.2)	<.001 <sup>b</sup>	33 (41.8)	9 (75.0)	.038 <sup>b</sup>	113 (30.5)	18 (72.0)	<.001 <sup>b</sup>	89 (32.8)	23 (43.4)	<.001 <sup>b</sup>
History of broken bones or cuts needing stitches <sup>c</sup>	235 (32.6)	24 (26.7)	.23	33 (41.8)	6 (50.0)	.643	141 (38.1)	8 (32.0)	.522	61 (22.5)	10 (18.9)	.533
History of being knocked unconscious <sup>c</sup>	64 (8.9)	17 (18.9)	<.001 <sup>b</sup>	12 (15.2)	4 (33.3)	.136	40 (10.8)	7 (28.0)	.011 <sup>b</sup>	12 (4.4)	6 (11.3)	.049 <sup>b</sup>
Have had sex	320 (44.4)	75 (83.3)	<.001 <sup>b</sup>	40 (50.6)	9 (75.0)	.062	148 (40.0)	19 (76.0)	<.001 <sup>b</sup>	132 (48.7)	47 (88.7)	<.001 <sup>b</sup>
History of STI	44 (6.1)	37 (41.1)	<.001 <sup>b</sup>	4 (5.1)	4 (33.3)	.015 <sup>b</sup>	16 (4.3)	10 (40.0)	<.001 <sup>b</sup>	24 (8.9)	23 (43.4)	<.001 <sup>b</sup>
Number of sexual partners												
1–5 partners	200 (27.8)	7 (7.8)	<.001 <sup>b</sup>	35 (44.3)	2 (16.7)	<.001 <sup>b</sup>	141 (38.1)	3 (12.0)	<.001 <sup>b</sup>	84 (31.0)	11 (20.8)	<.001 <sup>b</sup>
>5 partners	23 (3.2)	22 (24.4)		3 (3.8)	7 (58.3)		10 (2.7)	15 (60.0)		40 (14.8)	32 (60.4)	
<b>Other risk factor questions</b>												
History of being threatened or physically hurt in relationships	68 (9.4)	35 (38.9)	<.001 <sup>b</sup>	6 (7.6)	4 (33.3)	.006 <sup>b</sup>	35 (9.5)	7 (28.0)	.004 <sup>b</sup>	27 (10.0)	24 (45.3)	<.001 <sup>b</sup>
History of trading sex for money, shelter, goods, or drugs	12 (1.7)	53 (58.9)	<.001 <sup>b</sup>	1 (1.3)	7 (58.3)	<.001 <sup>b</sup>	6 (1.6)	14 (56.0)	<.001 <sup>b</sup>	5 (1.8)	32 (60.4)	<.001 <sup>b</sup>
Asked/forced by significant other to have sex with someone else	33 (4.6)	28 (31.1)	<.001 <sup>b</sup>	2 (2.5)	4 (33.3)	.002 <sup>b</sup>	12 (3.2)	7 (28.0)	<.001 <sup>b</sup>	19 (7.0)	17 (32.1)	<.001 <sup>b</sup>
Asked/forced to do some sexual act in public	13 (1.8)	7 (7.8)	<.001 <sup>b</sup>	1 (1.3)	3 (25.0)	.003 <sup>b</sup>	9 (2.4)	4 (16.0)	.023 <sup>b</sup>	3 (1.1)	0 (.0)	.744
Asked/forced to pose in a sexy way for a photo or video	79 (11.0)	38 (42.2)	<.001 <sup>b</sup>	9 (11.4)	3 (25.0)	.563	49 (13.2)	10 (40.0)	.099	21 (7.7)	25 (47.2)	<.001 <sup>b</sup>
<b>Results of Screen</b>												
Positive screen (2+ positive responses on screen)	288 (40.0)	75 (83.3)	<.001 <sup>b</sup>	40 (50.6)	10 (83.3)	.034 <sup>b</sup>	143 (38.7)	21 (84.0)	<.001 <sup>b</sup>	123 (45.4)	45 (85.0)	<.001 <sup>b</sup>

CST = child sex trafficking; STI = sexually transmitted infection.

<sup>a</sup> p value is based on independent samples t-test for continuous variables and  $\chi^2$  test for categorical variables.

<sup>b</sup> p < .05.

<sup>c</sup> Original screen combined these two questions.

**Table 4**

Performance measures for screen

	Total sample, N = 810	Emergency department, N = 91	Child advocacy center, N = 395	Teen clinic, N = 324
Sensitivity, % (95% CI)	84.4 (75.3, 91.2)	83.3 (51.6, 97.9)	84.0 (63.9, 95.5)	84.9 (72.4, 93.3)
Specificity, % (95% CI)	57.5 (53.8, 61.1)	49.4 (37.9, 60.9)	61.4 (56.2, 66.3)	54.6 (48.5, 60.7)
Positive predictive value, % (95% CI)	19.9 (16.0, 24.3)	20.0 (10.0, 33.7)	12.8 (8.1, 18.9)	26.8 (20.3, 34.2)
Negative predictive value, % (95% CI)	96.7 (94.6, 98.2)	95.1 (83.5, 99.4)	98.3 (95.6, 99.5)	94.9 (90.2, 97.8)
Positive likelihood ratio (95% CI)	2.0 (1.8, 2.3)	1.7 (1.2, 2.3)	2.2 (1.8, 2.7)	1.9 (1.6, 2.2)
Negative likelihood ratio (95% CI)	.3 (.2, .4)	.3 (.1, 1.2)	.3 (.1, .6)	.3 (.2, .5)

## Discussion

### *Aim (1): Estimating the prevalence of child sex trafficking in healthcare settings*

This study included data from 810 adolescents receiving care in three adolescent-serving medical settings—pediatric EDs, CACs, and teen clinics—from 16 U.S. sites, and is one of the largest quantitative studies of healthcare and CST published to date. Consistent with prior research, we found a significant rate of CST, 90/810, among patients presenting to pediatric EDs (for sexual violence complaints), CACs, and teen clinics [5,14,17,39]. Both males and females were identified as CST victims. Specificity was moderate; negative predictive value was high.

Our study is notable for its relatively large proportion of male participants (121/810, 15.3%), given the paucity of research published on this population [40]. Our findings confirm that males are indeed victims of sex trafficking. They accounted for 17% of identified victims in the EDs, 20% in CACs, and 0% in teen clinics. Given this range, it will be important to conduct additional studies on larger samples of males.

The proportion of eligible patients determined to be CST victims was relatively high: 11.1% of the total sample; 13.2% of those presenting to EDs secondary to sexual violence; 6.3% of patients at CACs; and 16.4% of youth presenting to teen clinics. The higher rates in EDs than CACs were somewhat expected given that inclusion criteria included a presentation of sexual assault. However, the highest rate in teen clinics was unexpected since youth were being seen for a variety of issues in these settings (not all sexually related), and the only other study to date exploring CST in this setting found a rate of 7.3% confirmed CST victimization [38]. It may be that the higher prevalence rate in our study was due in part to the “high-risk” youth served by teen clinics. The largest contributing clinic specifically provides care to children/youth suspected of abuse as well as many runaway/homeless youth. Teen clinics that serve a general teen population with varied socioecological risk profiles may have fewer CST patients.

Collectively, our findings suggest that HCPs working in pediatric EDs serving patients reporting sexual violence, those working in CACs and in teen clinics serving high-risk populations need to

be vigilant about considering the possibility of CST when caring for adolescent patients. Concern is elevated when patients present with multiple risk factors, including running away from home, prior involvement with law enforcement, history of STIs, >5 sex partners, and/or drug/alcohol use [5,21]. These factors were found in large percentages of our CST victims (40%–88%). Given the rarity of spontaneous disclosure of CST, our results suggest that HCPs need to ask questions about risk factors and discuss concerns of CST with patients. However, this should be done only when resources are available to assist those who identify as high-risk or as true victims of trafficking.

### *Aim (2): Evaluation of a child sex trafficking screening tool across healthcare settings*

To our knowledge, this is the first brief screening tool specifically to be designed for use in a busy healthcare setting and clinically evaluated across multiple study sites throughout the U.S. Performance measures of our original screening tool (modified to split one question, resulting in seven items) showed relatively good sensitivity, ranging from 83.3% to 84.9% in three pediatric settings. This implies that 15%–17% of victims would not be identified with its use. However, identification of ~84% of victims represents an enormous improvement over the existing situation, in which victims move through healthcare facilities largely unidentified [14].

When the original tool was modified to omit part of one question (history of broken bones/cuts requiring stitches), sensitivity was stable (83.3%–84.9%) and specificity improved (49.4%–61.4% for original tool; 58.7%–70.0% for modified tool). The moderate specificity suggests that 30%–41% of nonvictimized patients completing the screen would score in the positive range. The negative predictive value is very high (95.2%–98.5%), indicating that the vast majority of patients screening negative are not being victimized. The positive predictive value is low (15.9%–28.7% for modified version of tool), with the highest positive predictive value in the teen clinics. Thus, results suggest that HCPs would screen six to seven patients for each positive victim identified in a CAC, four patients with presenting complaints of sexual violence in an ED, and three to four patients presenting with any chief complaint in a

**Table 5**

Performance measures after excluding subquestion regarding broken bones/cuts requiring stitches

	Total sample, N = 810	Emergency department, N = 91	Child advocacy center, N = 395	Teen clinic, N = 324
Sensitivity, % (95% CI)	84.4 (75.3, 91.2)	83.3 (51.6, 98.0)	84.0 (63.9, 95.5)	84.9 (72.4, 93.3)
Specificity, % (95% CI)	64.6 (61.0, 68.1)	59.5 (47.9, 70.4)	70.0 (65.1, 74.6)	58.7 (52.6, 64.6)
Positive predictive value, % (95% CI)	23.0 (18.5, 27.9)	23.8 (10.9, 36.7)	15.9 (10.1, 23.3)	28.7 (21.7, 36.4)
Negative predictive value, % (95% CI)	97.1 (95.1, 98.4)	95.9 (86.0, 99.5)	98.5 (96.2, 99.6)	95.2 (90.8, 97.9)
Positive likelihood ratio (95% CI)	2.4 (2.1, 2.7)	2.1 (1.4, 3.0)	2.8 (2.2, 3.5)	2.1 (1.7, 2.5)
Negative likelihood ratio (95% CI)	.2 (.2, .4)	.3 (.1, 1.0)	.2 (.1, .6)	.3 (.1, .5)

teen clinic. In the case of CST, however, the ramifications of a false positive screen are minimal. Patients would be asked additional questions about high-risk behavior by the HCP. If they answer negatively, little additional time is required. However, if they answer positively, this important information may help guide the clinician's decisions regarding referrals and resources. Based on information gleaned from the screen and all other available sources, a referral to authorities may or may not be made. Such a referral should not be prompted exclusively by a positive screen. Additionally, a child with a positive screen (e.g., multiple risk factors) should be offered resources that could be helpful regardless of whether the youth is a victim of CST. The "intervention" prompted by a positive screen may prevent an at-risk patient from becoming a victim of trafficking. Alternatively, failure to identify a victim may lead to significant harm.

**Study limitations.** The study included only English-speaking adolescents, reducing generalizability. Sites varied in the minimum age for inclusion criteria. Short of witnessing exploitation, a true gold standard for victim identification is lacking. Thus, we relied on information available to the HCP at the time of the visit, which is consistent with "real world" conditions. As a result, some participants may have been misclassified. While it is possible that some youth identified as CST victims were not being exploited, it is far more likely that exploited victims were misclassified as non-CST, given the reluctance of victims to disclose their status, or their inability to recognize their exploitation [19]. In this case, our results likely underestimated the frequency of victim presentation to the three healthcare settings. Not all examiners provided reasons for their decision to categorize patients as CST victims so it is possible that some patients were misclassified. However, examiners had received training on human trafficking, and the federal definition was included in the question asking about victimization. It will be important in future studies to verify all decisions on victim status.

Conditions of the study varied among the 16 study sites (e.g., some sites gave patients additional routine questionnaires to complete). This may have altered a child's decision to answer study questions accurately, and/or may have provided information about CST that was helpful to the provider. However, the variety of conditions is to be expected between practice settings and reflects "real world" conditions. There were no research coordinators hired for the study; data collection was dependent to some degree on recall/time availability. However, the commitment of HCPs to incorporate the study into their work testifies to the perceived importance of CST and suggests the tool can be incorporated into the normal workflow of a clinical setting. Further, we were not able to obtain an accurate percentage of patients excluded from the study. This limits our ability to comment on the generalizability of results to new settings or the extent to which participants were a select population.

A slightly modified version of a six-item screening tool shows promise in identifying victims of CST in a variety of healthcare settings primarily involving "high-risk" youth. Identification of exploited children by HCPs is critical for prevention and intervention efforts. The frequency of CST victims presenting for healthcare confirms the need for widespread training of clinicians regarding commercial sexual exploitation.

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#### Supplementary data

Supplementary data related to this article can be found at doi:10.1016/j.jadohealth.2018.06.032.

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