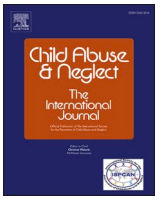
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Interpretation of medical findings in suspected child sexual abuse: An update for 2023

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A B S T R A C T

Health care professionals who examine children who may have been sexually abused need to be able to recognize, and photo-document any physical signs, and to have access to expert reviewers, particularly when signs concerning for sexual abuse are found. Although the general consensus among practitioners is that children will show few signs of sexual abuse on examination, there is considerable variability and rates of positive exam findings among practitioners of different professions, practice settings, and countries. This review will summarize new data and recommendations regarding the interpretation of medical findings and sexually transmitted infections (STIs); assessment and management of pediatric patients presenting with suspected sexual abuse or assault; and testing and treating patients for STIs. Updates to a table listing an approach to the interpretation of medical findings are presented, and reasons for changes are discussed.

Introduction

The "Interpretation of Medical Findings" table has been updated and published 8 times since 1992 (Adams, 2001; Adams, 2004; Adams, 2008; Adams, 2011; Adams et al., 2007; Adams et al., 2016; Adams, Harper, & Knudson, 1992), most recently in 2018 (Adams, Farst, & Kellogg, 2018). Over these 30 years, the list of items in the sections of the table describing normal and non-traumatic findings has expanded significantly while the findings diagnostic of blunt force penetrating trauma has remained relatively short and unchanged. The "no expert consensus" category was added to include findings, when considered independently, that have possible but unclear significance with respect to sexual abuse. The infections section has been consistently expanded with changes to sexually transmitted infection (STI) testing, interpretation, mimics and pathogens. Several edits to improve clarity, thoroughness and precision have been made with each revision. Updates to the table have been based on research studies, recommendations from professional organizations regarding guidelines for providing medical care for children suspected of having been sexually abused, and expert consensus.

Recent studies provide additional guidance for the 2023 Interpretation of Medical Findings in Suspected Child Sexual Abuse Table (Interpretation Table). We present results from a recent survey of child abuse pediatricians regarding their clinical experience and their interpretation of findings in the "no expert consensus" section of the Interpretation Table. In addition, there are updates to clinical assessment, testing, and treatment of children and adolescents who are suspected victims of sexual abuse or assault. Finally, a scoping review of studies reporting rates of positive examination findings over the past 20 years is summarized, highlighting differences in

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Table 1
2023 updated approach to interpretation of medical findings in suspected child sexual abuse.

SECTION 1: PHYSICAL FINDINGS:

A. Findings Documented in Newborns or Commonly Seen In Non-abused Children

[*] *These findings are normal and are unrelated to a child's disclosure of sexual abuse.*

Normal variants

1. Hymenal variations
   a) Annular: hymenal tissue present all around the vaginal opening including at the 12 o'clock location
   b) Crescentic hymen: hymenal tissue is absent at some point above the 3 to 9 o'clock locations
   c) Imperforate hymen: hymen with no opening
   d) Micro-perforate hymen: hymen with one or more small openings
   e) Septate hymen: hymen with one or more septae across the opening
   f) Redundant hymen: hymen with multiple flaps, folding over each other
   g) Hymen with tag of tissue on the rim
   h) Hymen with mounds or bumps on the rim at any location
   i) Any notch or cleft of the hymen (regardless of depth) above the 3 and 9 o'clock location
   j) A notch or cleft in the hymen, at or below the 3 o'clock or 9 o'clock location, that does not extend nearly to the base of the hymen
   k) Smooth posterior rim of hymen that appears to be relatively narrow along the entire rim; may give the appearance of an enlarged opening
   l) Asymmetry in width of posterior hymenal rim
2. Periurethral or vestibular band(s)
3. Intravaginal ridge(s) or column(s)
4. External ridge on the hymen
5. Diastasis ani (smooth area)
6. Perianal skin tag(s)
7. Hyperpigmentation of the hymen, labia minora or perianal tissues
8. Dilation of the urethral opening
9. Normal midline anatomic features
   a) Groove in the fossa, seen in early adolescence
   b) Failure of midline fusion (also called perineal groove; see Figure 2)
   c) Median raphe
   d) Linea vestibularis (midline avascular area)
10. Visualization of the pectinate/dentate line at the juncture of the anoderm and rectal mucosa, seen when the anus is fully dilated, as with passage or presence of flatus or stool in the anal canal
11. Reflex anal dilation that occurs during examination maneuvers, such as traction applied to perianal tissues or positioning the patient, particularly in prone or supine knee-chest positions
12. Anal dilation, causing visualization of the dentate/pectinate line, anal columns, and/or anal crypts, any of which may be mistaken for anal laceration or abrasion (Figures 1A and 1B)

B. Findings commonly caused by conditions other than trauma or sexual contact

These findings require that a differential diagnosis be considered, as each may have several different causes.

13. Erythema, inflammation, fissuring, and/or maceration of the perianal, perineal or vulvar tissues related to poor hygiene or other irritant dermatitis
14. Increased vascularity of vestibule and hymen
15. Labial adhesion
16. Friability of the posterior fourchette
17. Vaginal discharge that is not associated with a sexually transmitted infection
18. Anal fissures
19. Venous congestion or venous pooling in the perianal area
20. Complete/immediate anal dilatation in children with pre-disposing conditions, such as current symptoms or history of constipation and/or encopresis, or children who are sedated, under anesthesia or with impaired neuromuscular tone for other reasons

C. Findings Due to Other Conditions, Which Can Be Mistaken for Abuse

21. Irritative/non-infectious: erythema, inflammation, and fissuring of the perianal, perineal or vulvar tissues due to irritant dermatitis, including Jacquet's dermatitis
22. Inflammatory: aphthous ulcers, inflammatory bowel disease (anal fissures/prominent anal tags, rectal discharge), Behcets disease (painful ulcers)
23. Dermatologic conditions: lichen sclerosus et atrophicus, folliculitis, vitiligo, angiokeratomas,and hemangiomas
24. Immunologic causes: pyoderma gangrenosum (painful ulcers)
25. Multifactorial/idiopathic: urethral prolapse, rectal prolapse, anal funneling
26. Post-mortem changes: anal dilatation, red/purple discoloration of the genital structures (including the hymen) from lividity or other rare systemic conditions. Histologic analysis needed for confirmation.

D. No expert consensus regarding degree of significance

These physical findings have been associated with a history of sexual abuse in some studies, but at present, there is no expert consensus as to how much weight they should be given with respect to abuse. Findings 28 and 29 should be confirmed using additional examination positions and/or techniques, to ensure they are not normal variants (findings 1. i. 1.j) or a finding of residual traumatic injury (finding 38)

27. Complete and immediate anal dilation with relaxation of the internal as well as external anal sphincters, in the absence of other predisposing factors such as constipation, encopresis, sedation, anesthesia, and neuromuscular conditions
28. Notch or cleft in the hymen rim, at or below the 3 o'clock or 9 o'clock location, which extends nearly to the base of the hymen, but is not a complete transection. This is a very rare finding that should be interpreted with caution unless an acute injury was documented at the same location.
29. Complete cleft/suspected transection to the base of the hymen at the 3 or 9 o'clock location

E. Findings Caused by Trauma

These findings are highly suggestive of abuse, even in the absence of a disclosure from the child, unless the child and/or caretaker provides a timely and plausible description of accidental anogenital straddle, crush or impalement injury, or past surgical interventions that are confirmed from review of medical records. Findings that may represent residual/healing injuries should be confirmed using additional examination positions and/or techniques. Isolated/few/superficial injuries that appear to be bruises or petechiae should be confirmed as traumatic injury by showing resolution on follow up examination. Photographs or video recordings of these findings should be taken, then evaluated and confirmed by an expert in sexual abuse evaluation to ensure accurate diagnosis

(*continued on next page*)

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Table 1 (*continued*)

1) Acute trauma to genital/anal tissues
30. Acute laceration(s) or bruising of labia, penis, scrotum, or perineum
31. Acute laceration of the posterior fourchette or vestibule, not involving the hymen
32. Bruising, petechiae, **or** abrasions on the hymen
33. Acute laceration of the hymen, of any depth; partial or complete
34. Vaginal laceration
35. Perianal bruising or perianal laceration with exposure of tissues below the dermis
2) Residual (healing) injuries to genital/anal tissues
36. Perianal scar (a very rare finding that is difficult to diagnose unless an acute injury was previously documented at the same location)
37. Scar of posterior fourchette or fossa (a very rare finding that is difficult to diagnose unless an acute injury was previously documented at the same location)
38. Healed hymenal transection/complete hymen cleft- a defect in the hymen below the 3 to 9 o'clock location that extends to or through the base of the hymen, with no hymenal tissue discernible at that location.
39. Signs of female genital mutilation (FGM) or cutting, such as loss of part or all of the prepuce (clitoral hood), clitoris, labia minora or labia majora, or vertical linear scar adjacent to the clitoris (Type 4 FGM)
3) Acute trauma to oral tissues
40. Acute oral trauma, such as unexplained injury or petechiae of the lips or palate, particularly near the junction of the hard and soft palate
SECTION 2: INFECTIONS
A. Infections not related to sexual contact
41. Erythema, inflammation, fissuring of perianal, perineal, or vulvar tissues due to bacteria, fungus, virus or parasites that are transmitted by non-sexual means, such as Streptococcus Type A or Type B, Staphylococcus sp., Escherichia coli, Shigella or other gram-negative organisms
42. Genital ulcers caused by viral infections such as Epstein Barr Virus
B. Infections that can be spread by (or are associated with) sexual transmission as well as non-sexual transmission
Interpretation of these infections may require additional information, such as mother's gynecologic history (HPV) or child's history of oral lesions (HSV), or presence of lesions elsewhere on the body (Molluscum) which might clarify likelihood of sexual transmission.
43. Molluscum contagiosum in the genital or anal area. In young children, transmission is most likely non-sexual. Transmission from intimate skin-to-skin contact in the adolescent population has been described.
44. Condyloma acuminatum (HPV) in the genital or anal area.
45. Herpes Simplex Type 1 or 2 infections in the oral, genital or anal area diagnosed by culture or nucleic acid amplification test
46. Urogenital Gardnerella vaginalis (associated with sexual contact but also found in prepubertal and adolescent vaginal flora)
47. Urogenital Mycoplasma genitalium or ureaplasma urealyticum; while sexually transmitted in adolescents, prevalence and transmission of these infections in children not well understood
C. Infections caused by sexual contact, if confirmed by appropriate testing, and perinatal transmission has been ruled out
48. Genital, rectal or pharyngeal *Neisseria gonorrhea* infection
49. Syphilis
50. Genital, rectal or pharyngeal *Chlamydia trachomatis* infection
52. *Trichomonas vaginalis* infection isolated from vaginal secretions or urine
53. HIV, if transmission by blood or contaminated needles has been ruled out
SECTION 3: FINDINGS DIAGNOSTIC OF SEXUAL CONTACT
54. Pregnancy
55. Semen identified in forensic specimens taken directly from a child's body

examination approaches and criteria used to interpret examinations.

Updates for clinical assessment, testing and treatment of children and adolescents

Testing for sexually transmitted infections

In children and adolescents evaluated for STIs during sexual abuse/assault assessments, the prevalence of STIs is low; 7.9 % for Chlamydia and 2.5 % for N. gonorrhea in one recent study (Kellogg, Melville, Lukefahr, Nienow, & Russell, 2018). The American Academy of Pediatrics' Committee on Child Abuse and Neglect (Jenny, Crawford-Jakubiak & Committee on Child Abuse and Neglect, 2013) and the Center for Disease Control and Prevention (Workowski et al., 2021) suggest that STI testing in pre-adolescent children be considered when:

1) Child has experienced penetration of the genitals, anus, or oropharynx
2) Child has been abused by a stranger
3) Child has been abused by a perpetrator known to be infected with an STI or is at high risk for being infected (intravenous drug users, men who have sex with men, or people with multiple sexual encounters)
4) Child has a sibling or other relative in the household with an STI
5) Child discloses sexual abuse and lives in an area with a high rate of STI in the community
6) Child has signs or symptoms of an STI
7) Child has already been diagnosed with one STI
8) The abused child or their parent requests STI testing

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9) The child is unable to verbalize details of the assault

In addition, we recommend assessments when:

10) The sexual abuse has been witnessed or documented with photos or video, given that child subjects typically do not fully disclose details of their abuse (Gewirtz-Meydan, Walsh, Wolak, & Finkelhor, 2018)

While many centers routinely test all children who present for examination with sexual abuse allegations, the rate of positive STI results in patients who do not meet this criteria is unknown, Most of these recommendations also apply to testing for STIs in adolescents. Additional considerations for testing adolescents include history or exam findings that support concern for trafficking, sexting, or commercial sexual exploitation of children. Signs that suggest commercial sexual exploitation of children (CSEC) include previous drug and/or alcohol use, runaway behavior, involvement with law enforcement, significant wounds or fractures, STIs, and sexual activity with >5 partners (Greenbaum, Dodd, & McCracken, 2018). When CSEC or trafficking is suspected, the medical assessment should be comprehensive and include assessment for acute and chronic medical, mental health and dental needs, overall nutritional status, pregnancy testing, STI testing, and tests for alcohol and drug use as indicated. In addition to standard prophylaxis for STIs and pregnancy, the clinician should consider offering contraceptive options and referrals to community resources and national organizations that provide services to sex trafficking victims (Greenbaum and Crawford-Jakubiak, 2015).

Alarming trends in media-facilitated sexual assault and sexting have also been reported (MacPherson, Brown, Herold, & Narayan, 2018; Madigan, Ly, Rash, Van Ouytsel, & Temple, 2018; Titchen, Maslyanskaya, Silver, & Coupey, 2019). Stranger assaults, facilitated through social media and texts, involve significant medical and mental health risks. One study (Titchen et al., 2019) found that 24 % of girls and 20 % of boys had sent a sext; sexting by girls was associated with sexual activity, sexual abuse and violence by an intimate partner. Screening children and adolescents for unsafe media use may guide strategies for sexual assault prevention and STI testing.

Modes of STI transmission

The majority of STIs found during abuse evaluations are sexually transmitted, however, non-sexual transmission of Chlamydia, HPV, HSV and syphilis continue to be explored in recent publications. The 2021 CDC guidelines (Workowski et al., 2021) cite studies from 1994 (Bell et al., 1994) and 1986 (Schachter et al., 1986) as support for prolonged Chlamydia vaginitis following birth for "as long as 2–3 years." Recent guidelines from the American College of Gynecology (ACOG) (https://www.acog.org/womens-health/faqs/routine-tests-during-pregnancy?utm_source=redirect&utm_medium=web&utm_campaign=otn, accessed 1/17/2023) recommend routine/universal testing for STIs, including Chlamydia, early in pregnancy followed by treatment and test of cure during pregnancy for positive results. Routine screening and treatment during pregnancy has resulted in a dramatic decrease in perinatal chlamydial infections in the United States (Hammerschlag, 2022). In addition, current STI testing modalities are more sensitive than those used prior to 2000, so it is likely that more infections are detected and treated now than previously, further reducing the likelihood of STI perinatal transmission. Improved testing modalities and observed decreases in perinatal infections also contribute to this lower likelihood of perinatal transmission.

Perinatal transmission of STIs (Table 1, Section 2C) may still be possible, but should be considered less likely in regions where routine screening and treating STIs during pregnancy is the standard of care.

Syphilis beyond the postnatal period is generally considered to be sexually transmitted. A recent publication (Moscatelli et al., 2021) postulates post-natal non-sexual transmission of syphilis by oral secretions. In this study, 24 children (mean age 4.2 years) had serologic evidence of syphilis whereas all mothers had negative serology during pregnancy; 15 children presented with condylomata lata. Sexual transmission was excluded based on "psychosocial evaluation…[that] did not reveal signs of sexual abuse in any of the cases." The authors speculated that "overcrowded and poor household conditions" and transmission via oral secretions through "kisses, breastfeeding, sharing utensils" or "pre-mastication of food," were the primary causes although 70.5 % of the tested ($N = 78$) household contacts were negative for syphilis. This study did not provide clear or convincing evidence to exclude sexual abuse in this population of young children. In evaluating anogenital STI infections in pre-verbal children, the presence of a household member with the same infection does not exclude sexual transmission, and a psychosocial evaluation is inadequate to exclude sexual abuse.

While gonorrhea infections beyond the newborn period are generally considered to be sexually transmitted, past and recent case reports (Hasui, Kamiya, & Nakasuji, 2022; Rana & Gurung, 2021) postulate post-natal non-sexual transmission in young children. In one case report (Rana & Gurung, 2021) of a preverbal (2.5 years old) child with ocular gonorrhea, the mother was described as "irritable and uncooperative" and non-sexual transmission was concluded because there was no history from the child or mother. Other sites were not tested for gonorrhea, nor was the genital examination described. The other case report (Hasui et al., 2022) was a 2-year-old who presented with a bloody vaginal discharge and positive gonorrhea culture. Because the parents developed gonorrhea "simultaneously," the child was "constantly with [the mother]," and "the route of infection could not be identified," it was concluded that the child had contracted gonorrhea through non-sexual means. As these case reports provide a weak evidence base for non-sexual transmission of gonorrhea, the Interpretation Table has retained gonorrhea in the category of infections caused by sexual contact if perinatal transmission has been excluded. Therefore, children presenting in the post-natal period with gonorrhea (identified at any site) and no known history of sexual contact should still have a complete medical assessment for sexual abuse.

Herpes Simplex Virus (HSV) serology is of limited value in determining a primary type-specific herpes infection (Page et al., 2003); serology is also of limited value in confirming that the first known appearance of the lesions is related to the timing of the sexual assault. HSV culture or NAA testing is recommended for diagnosis in patients with suspicious lesions (Workowski et al., 2021). The Interpretation Table has been updated to reflect that HSV infection should be diagnosed with culture or NAA testing only.

A recent metanalysis study examined characteristics of anogenital Human papillomavirus (HPV) lesions in children in an attempt to

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differentiate sexual from non-sexual modes of transmission. (Awasthi, Ornelas, Armstrong, Johnson, & Eisen, 2021;). While the presence of warts in any anogenital location and in children older than 3 years predicted a diagnosis of sexual abuse, several of the included studies were >20 years old and utilized non-specific examination findings (such as enlarged vaginal or anal opening) as diagnostic criteria for abuse. Other publications have examined the role of HPV subtyping of anogenital warts in determining mode of transmission. As both cutaneous HPV subtypes (such as those commonly found on the hands) and mucosal HPV subtypes (such as those commonly found within the genitals and anus) have been identified in anogenital warts subtyping is not helpful in differentiating sexual and non-sexual transmission (Costa-Silva, Azevedo, & Lisboa, 2018; Giannaki et al., 2013). While cutaneous HPV lesions and subtypes are typically considered ubiquitous and transmissible through non-sexual contact, cutaneous HPV can also be sexually transmitted through hand-to-genital contact. Regardless of HPV subtype, condylomata acuminata has been considered suspicious for sexual abuse, especially if the lesions initially appear in a child older than 5 years (Workowski et al., 2021). However, it is not clear whether the age at clinical diagnosis approximates the age at which the infection was transmitted since lesions can be obscure or latent for months or years. Because mucosal HPV subtypes have been identified in vaginal samples of prepubertal and postpubertal children without a history of sexual contact (Bacopoulou et al., 2016), and because the mode of transmission or transference of the virus is unknown in these situations, we have eliminated the statement about sexual transmission of HPV in children older than 5 years from the Interpretation Table. The evaluation of children with anogenital warts should include a detailed medical history (i.e., history of HPV cutaneous and mucocal infections in mother, caregivers and child), interview of verbal children, and examination, including testing for other STIs; reporting to child protection agencies should be considered when abuse remains a possibility. In considering the medical history, it should be noted that a negative history of known HPV infection in a household contact does not imply sexual abuse by a non-family member. Likewise, a history of HPV in a household contact does not exclude the possibility of sexual abuse of the child.

Because HPV infections can occur as a result of sexual assault, the Center for Disease Control and prevention has recommended the HPV vaccine for sexually abused children who are age 9 years and older (Workowski et al., 2015) due to an increased risk for unhealthy or premature sexual behavior. An HPV vaccine can also be provided for unvaccinated or partially vaccinated adolescents presenting acutely following a sexual assault; some evidence suggests a preventative or prophylactic role for the vaccine in this clinical setting (McCormack, 2014).

Screening and treatment for STIs

The most recent CDC guidelines recommend FDA-cleared NAA testing for *N. gonorrhea*, *Chlamydia trachomatis,* and *Trichomonas vaginalis* in children, adults and adolescents. Based on history and clinical assessment, "urogenital, pharyngeal and rectal testing should be considered for preverbal children and children who cannot verbalize details of the assault" (Workowski et al., 2021). In addition, we would recommend that testing not be limited to sites in which penetration is described, given the potential for incomplete disclosures by the child and contiguous spread from genitals to anus (primarily in females). Confirmatory testing of positive results is recommended in situations where the results may be forensically significant (children and adolescents who are not sexually active). In contrast to earlier versions, the 2021 CDC guidelines no longer provide direct references that details alternate target testing as the preferred method of confirmation testing. When considering prepubertal children, there is ongoing potential risk for false positive results when utilizing non-couture testing methodologies to identify an STI in a low prevalence population. Therefore, providers should employ a testing strategy that maximizes specificity (Hammerschlag, 2011; Hammerschlag & Guillén, 2010; Qin & Melvin, 2020). Pharyngeal gonorrhea and chlamydia have been added to the Interpretation Table.

Because rectal Chlamydia has been identified in females denying anal-penile contact, clinicians should consider obtaining rectal swabs for patients with a history of only vaginal-penile contact (Chan et al., 2016). Due to emerging antibiotic resistance, the recommended prophylaxis and treatment for gonorrhea and chlamydia has changed, increasing Ceftriaxone to 500 mg IM and replacing the one-time Azithromycin dose with 7 days of Doxycycline (Workowski et al., 2021). These changes have generated concerns for non-compliance and inadequately treated infections. When non-compliance is a concern, a one-time Azithromycin dose can be provided although follow up evaluation and re-testing may be needed, particularly for patients with positive Chlamydia results from their initial examination. To allow clearance of Chlamydia, a test of cure should be delayed for 4 weeks following treatment (Geisler, Hocking, Darville, Batteiger, & Brunham, 2022).

Follow up care

Follow-up examinations have been recommended in previous publications (Gavril, Kellogg, & Nair, 2012; Workowski et al., 2021) to complete STI testing, complete HPV vaccines, monitor treatment and side effects to post-exposure prophylaxis, and to further clarify examination findings. A statement regarding the importance of confirming some exam findings as trauma through a follow up examination has been added to the Interpretation Table. Additionally, gonorrhea and chlamydia sensitivity to antimicrobial treatment has continued to evolve, presenting challenges to ensuring efficacious treatment and increasing the need to test for cure in some circumstances. Additional reasons to provide follow up include re-assessment of recovery from physical and psychological injury a few days and a few weeks following the assault (Kaplan, Moore, Hirway, Barron, & Goldberg, 2021), particularly in patients at risk for self-injurious thoughts or behaviors.

Interpretation of Physical and Laboratory Findings (Table 1)

Findings that have been edited or added to the 2018 version of the Interpretation Table include:

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1. Section 1B Findings commonly caused by medical conditions other than trauma or sexual contact

   Anal funneling and folliculitis have been added to this section. Anal funneling has been described as an anorectal malformation (Suomalainen, Wester, Koivusalo, Rintala, & Pakarinen, 2007) and as a traumatic finding (Hobbs & Wright, 2014), but further evidence is needed to support a traumatic etiology. Folliculitis is common among adolescents who shave their pubic hair and sometimes progresses to ulcerative lesions and cellulitis. Anal dilatation is further clarified as a normal finding in some children after 1–2 min when they are placed in the prone knee chest position or have stool in the anal vault (McCann, Miyamoto, Boyle, & Rogers, 2007; Myhre et al., 2013).

   New section added: E3. Oral findings reported in individuals who present acutely with oral-penile penetration. Few studies have examined intra-oral injuries that result from oral-penile penetration. "Unexplained injury or petechial hemorrhage of the palate, particularly at the junction of the hard and soft palate" has been attributed to forced oral penetration (Fisher-Owens et al., 2017; Schlesinger, Borbotsina, & O'Neill, 1975). In another study, the most common oral injuries associated with sexual assault in patients 16 and older were abrasions and bruises or petechiae to the lips (Brew-Graves & Morgan, 2015). Facial injuries also occur during physical assault so interpretation of these injuries relies primarily on patient history. While additional research is needed to establish the type and frequency of oral injuries sustained during oral-penile contact, examiners may wish to consider photo-documentation of any oral injuries identified during sexual assault examinations.
2. Section 2B. Infections that can be spread by (or are associated with) sexual transmission as well as non-sexual transmission

   Although there have not been any recent studies regarding anogenital infections with Gardnerella or Mycoplasma in children or adolescents, these are added to the table for completeness.

   Gardnerella vaginalis is uncommonly diagnosed in prepubertal females, but is commonly found in sexually active adolescents and adults. In one study, *Gardnerella* was found in children who were sexually abused and children who were thought not to be sexually abused (Ingram et al., 1992). Gardnerella is considered normal vaginal flora, occurring in up to 13.5 % of prepubertal children (Neyazi, 2019). Rather than sexual transmission, it is likely that sexual contact alters vaginal flora and overgrowth of Gardnerella results in vaginosis. Bacterial vaginosis may increase risk of infection with STIs, including HIV, gonorrhea, Chlamydia, trichomonas, HPV and HSV (Abbai, Nyirenda, & Naidoo S., Ramjee, G., 2018; Abbai, Reddy, & Ramjee, 2016; Brusselaers, Shrestha, van de Wijgert, & Verstraelen, 2019). If *Gardnerella* is identified, the child should be screened for sexual abuse and tested for other STIs.

   Similarly, anogenital infections with *Mycoplasma hominis* and *Ureaplasma urealyticum* are associated with sexual activity in adolescents and adults, but are considered uncommon in prepubertal children and can occur in children who are not sexually abused (Jain, 2004). Identification of these infections should prompt testing for other STIs, but as an isolated finding may be transmitted through non-sexual sources.
3. 2C. Infections caused by sexual contact, if confirmed by appropriate testing, and perinatal transmission has been ruled out

   Pharyngeal *Chlamydia trachomatis* infection has been added, based on studies of STIs identified at extra-genital sites (Kellogg et al., 2018).

2022 interpretation of medical findings survey

In order to determine the level of agreement among providers of sexual abuse evaluations regarding their interpretation of anogenital HSV or HPV infections and findings in the "No expert consensus regarding degree of significance" category of the Interpretation Table, a survey was conducted in November 2022. An invitation to participate was sent via the organization's listserv to the 642 members of the Ray E. Helfer Society, an honorary society for physicians involved in the assessment of child abuse.

Based on responses to the 2022 survey, three physical exam findings remained in the "no expert consensus" section and the two infections remained in the "Infections that can be spread by non-sexual as well as sexual transmission" section. A previous publication (Adams et al., 2018) summarizes the studies and rationale for the exam findings listed in the "no expert consensus" category. Results of the survey are presented in Table 2. Regardless of examiner experience or regularity of practice (Questions 7 and 8), more than half of the respondents indicated that marked, immediate anal dilation to 2 cm or more, a deep posterior notch nearly to the base of the hymen, and anogenital HSV type 1 or 2, and an anogenital HPV infection in a child older than 5 years had "possible but unclear significance with respect to abuse." With one exception, there were no significant differences in responses to questions 1, 3, 4, 5, and 6 when those who practiced regularly (question 7, answer b) were compared to those who practiced less regularly; those who practiced regularly were more likely to indicate that a "very narrow posterior rim of hymen' was not significant finding of abuse when compared with those who conducted exams less regularly (Fisher's exact test, p=.006; implemented in the R package "gtsummary" version 1.6.3; https://cran.r-project.org). Responses to questions 1, 3, 4, 5 and 6 did not significantly differ among those who had performed fewer than 1000 exams when compared to those who had conducted >1000 exams. Whereas about one-third of respondents indicated that anogenital HSV 1 or 2 infections were concerning or highly suggestive of abuse, fewer than 20 % thought condylomata acuminata was concerning or highly suggestive of abuse. This may be due to differences in latency periods, delay of clinical diagnosis, and likelihood of non-sexual transmission via hygiene assistance. No recent studies have further elucidated the probability of non-sexual transmission of anogenital HSV type 2 in children. Assessing the likelihood of sexual transmission in children with anogenital HPV or HSV infections is case-specific and dependent on numerous factors, including the age of the child, presence of other STIs, timing of symptoms, and presence of other evidence to support sexual contact. In addition, the epidemiology of HPV infections in children is likely changing due to HPV vaccines in adolescents and adults.

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Rates of positive examination findings among children and adolescents evaluated for sexual abuse

Why "normal" does not mean "nothing happened"

There have been challenges in the last 10 years as to whether a normal examination is possible in children who experience vaginal-penile penetration. One viewpoint publication (Hariton, 2012) has questioned whether it is "normal to be normal" (Adams, Harper, Knudson, & Revilla, 1994), based on the supposition that "penetration" that is "partially or completely through the hymen ring" (Hariton, 2012) in a prepubertal female will always result in injury. However, there is a lack of certainty that a prepubertal child's statement that "he put it inside" actually represents penetration beyond the hymenal rim or contact to the hymenal rim, both of which can cause pain and/or bleeding. A child or adolescent may have a normal examination following sexual abuse for several reasons, including:

1. No sexual contact occurred
2. Sexual contact occurred but did not result in visible injury
3. Sexual contact occurred and resulted in injury that healed.

Table 2
Responses to 2022 survey ($N = 113$ responders).

1. What is the significance, with respect to possible sexual abuse, of the finding of marked, immediate anal dilation to an AP diameter of 2 cm or more, in the absence of predisposing factors such as chronic constipation, encopresis, sedation, anesthesia, neuromuscular conditions or the postmortem state? (N = 113)
   a. Not a significant finding for abuse 24/113 (24 %)
   b. Possible but unclear significance with respect to abuse 75/113 (66 %)
   c. Concerning for abuse 8/113 (7 %)
   d. Highly suggestive of abuse 1/113 (1 %)
   e. Other: 2/113 (2 %)
2. Do you think the examination position of the child (supine knee-chest, prone knee-chest, left lateral knee-chest) can change the likelihood of observing reflex anal dilation? ($N = 112$)
   a. Yes 72/112 (64 %)
   b. No 7/112 (6 %)
   c. Unsure 32/112 (29 %)
3. What is the significance of a very narrow posterior rim of hymen, located between 9 and 3 o'clock with patient in the supine position, which is confirmed in the prone knee-chest position? (N = 112)
   a. Not a significant finding for abuse 67/112 (60 %)
   b. Possible but unclear significance with respect to abuse 39/112 (35 %)
   c. Concerning for abuse 3/112 (3 %)
   d. Highly suggestive of abuse 0/112 (0 %)
   e. Other: 3/112 (3 %)
4. What is the significance of finding a deep notch, nearly to the base of the posterior rim of hymen, between 3 and 9 o'clock in the absence of a history of injury from an accident or fall? (N = 112)
   a. Not a significant finding for abuse 9/112 (8 %)
   b. Possible but unclear significance with respect to abuse 61/112 (54 %)
   c. Concerning for abuse 33/112 (29 %)
   d. Highly suggestive of abuse 7/112 (6 %)
   e. Other: 2/112 (2 %)
5. What is the significance of diagnosing Herpes Simplex Type 1 or 2 from lesions in the genital or anal area in a child *over 5 years of age, who* no longer requires assistance with bathing or toileting hygiene, has no history of sexual contact or previous oral or anogenital lesions, has no other STDs and an otherwise normal examination? (N = 113)
   a. Not a significant finding for abuse 6/113 (5 %)
   b. Possible but unclear significance with respect to abuse 70/113 (62 %)
   c. Concerning for abuse 31/113 (27 %)
   d. Highly suggestive of abuse 4/113 (4 %)
   e. Other:2/113 (2 %)
6. What is the significance of finding lesions due to condyloma acuminata in the anal or genital area of a child over the age of 5 years who no longer requires assistance with bathing or toileting hygiene, has no history of sexual contact or other verruceous growths, has no other STDs and an otherwise normal examination? (N = 113)
   a. Not a significant finding for abuse 7/113 (6 %)
   b. Possible but unclear significance with respect to abuse 84/113 (74 %)
   c. Concerning for abuse 16/113 (14 %)
   d. Highly suggestive of abuse 5/113 (4 %)
   e. Other: 1/113 (1 %)
7. Are you currently performing child sexual abuse medical evaluations? (N = 113)
   a. Yes, occasionally 21/113 (19 %)
   b. Yes, regularly 83/113 (73 %)
   c. No 9/113 (8 %)
8. Approximately how many child sexual abuse medical examinations have you performed during your career? (N = 113)
   a. <500 29/113 (26 %)
   b. 500 to 1000 27 (24 %)
   c. 1000 to 2000 26/113 (23 %)
   d. d. Over 2000 31/113 (27 %)

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Table 3
Studies reporting acute injuries from sexual abuse and assault (≥80 % of exams done within 5 days).

Publication year, first author[1]	Patients with ano-genital injury (N;%)	Population descriptors	Clinician specialty	Includes findings not listed in Section 1E in 2018 Interpretation Table?	Additional comments
Adams, Girardin and Faugno, 2001 US	137/214;64 %	-All females, -All adolescents -87% seen within 72 h	Nurse-S	Yes; erythema, swelling of hymen, lacerations with toluidine blue dye	-Used toluidine blue dye -No photos -Physician reviewer indicated "findings less than stated" on 26% of cases
Jones, Rossman, Hartman and Alexander, 2003 US	173/204;85 %	-All females, ages 13–17 -89 % seen within 72 h	Nurse-S	Yes, erythema, edema, lacerations with toluidine blue dye	-Used toluidine blue dye -One photo of hymenal bruise -Compared sexually assaulted adolescents (85 %with injury) to adolescents reporting consensual sex (73 % with injury)
Rossman, Jones, Dunnuck, Wynn and Bermingham, 2004 US	43/53;81 %	-All females, ages 13–78 (mean age 20.4 yrs) -94 % seen within 72 h	Nurse-S	Yes, erythema and abrasions and injuries to cervix	- Used toluidine blue dye -Photos provided of vaginal and cervical lacerations but difficult to interpret -Erythema was most common finding -All had history of (only) digital-vaginal penetration
Sugar, Fine and Eckert, 2004 US	52/180;29 %	-All females, ages 15–19 -76.5 % seen within 24 h	Ob-gyn residents	No details of anogenital trauma other than bruise, abrasion, or laceration of unspecified location	-No photos -Genital-anal injury was more common in 15–19 year-olds than older groups -Genital injury more common in those without prior intercourse
White and McLean, 2006 US	90/208;43 %	-All females, Ages 12–17 -Average time to exam 65 h	MD-S	No details of anogenital trauma other than "full thickness/less than full thickness" hymen lacerations, bruises, abrasions	-No photos -Injuries more common in "virgin" vs "non-virgin" group
Hornor, Thackeray, Scribano, Curran and Benzinger, 2012 US	97/336;29 %	-88 % females, ages 1–20 -65 % seen within 24 h and all had forensic kits	Nurse-S	Not specified; looked at "anogenital injury" vs no anogenital injury	-No photos -Goal of study was to compare exam and legal outcomes pre-PSANE to PSANE intervals; positive exam findings increased from 20 % to 34 %
Baker and Sommers, 2008 US	92/140;66 %	-All females ages 14–21 -All seen within 72 h	Nurse-S	Yes, cervical injuries, redness, and edema	-No photos -Used TEARS[2] criteria -Found younger age not associated with presence/absence of injury but was associated with increased number of genital injuries
Gallion, Milam and Littrell, 2016 US	73/340;21 %	-All females, up to age 17 -All seen within 72 h	Nurse-S, PA, MD-S	Indicates uses Adams criteria (see comment)	-No photos -33 of 99 children with anogenital findings had "acute trauma to labia, perineum or fourchette/ fossa"
Zilkens et al., 2017	50/189;26 %	-All females, ages 13–17 -80 % seen within 72 h	24 MD-S; affiliated with legal medicine facilities	Yes, abrasions and injury to cervix, mons pubis, perineum	-No photos -All had history of vaginal penetration
Smith, Raman, Madigan, Waldman and Shouldice, 2018 US	91/ 643;14.2 %	-82 % female, ages 0–18 -All seen within 72 h	Pedi-S	No	-No photos -Adolescents (vs <12 yr) and females (vs males) were more likely to have diagnostic findings
Ohayi and Ezugwu, 2019	22/32;69 %	-All females, ages 10–19 -All seen within 72 h -	MD-S?; unclear	Yes, includes abrasions of labia and clitoris	-No photos -Genital injuries more likely in "virgins" vs "non-virgins"
Rossman, Jones, Dunnuck, Wynn and Bermingham, 2004 US	309/410;75 %	-All females, ages 12–51 -All had forensic evidence collection	Nurse-S EM-MD	Yes, abrasions, erythema, and edema	-No photos -Sexually assaulted females without prior sexual intercourse had greater number of injuries than those with prior sexual intercourse

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Table 3 (*continued*)

Publication year, first author[1]	Patients with ano-genital injury (N;%)	Population descriptors	Clinician specialty	Includes findings not listed in Section 1E in 2018 Interpretation Table?	Additional comments
Kaplan, Moore, Hirway, Barron and Goldberg, 2021 US	29/182;16 %	62.5 % female, all under age 18 -All seen within 96 h	EM-MD EM-NP	Not specified	-All had history of penile penetration -Used TEARS criteria -Toluidine blue dye used -No photos -Examined compliance with follow-up exams which was higher for younger patients, and those with injuries or CPS/law enforcement involvement
Suttipasit, Sinlapamongkolkul, Wongwittayapanich, 2022	275/446;62 %	-All females, ages 10–18 -All seen within 120 h	"Forensic staff" MDs and residents	Yes, included "abrasions" of labia, cervix, and "external" anogenital sites, and edema	-No photos -Anogenital injury was more common in non-consenting females (70 %) than consenting females (56 %)
Ouellette et al., 2022[3] US	687/977;70 %	All females, ages 13 and older; mean age 23.9 yrs. -All seen within 96 h	Nurse-S	Yes, included erythema and edema and nuclear staining with toluidine blue dye	-No photos -Found no difference in frequency, type or location of anogenital injury among rape victims with and without recent consensual sexual contact -Used toluidine blue dye

See Table 5 for footnotes and sbbreviations

Children and adolescents can have normal anogenital examinations even when there is evidence that sexual abuse occurred:

1. Acute definitive evidence that heals completely (McCann et al., 2007)
2. Pregnancy (Kellogg, Menard, & Santos, 2004)
3. Confirmed presence of an STI (Girardet et al., 2009; Kellogg et al., 2018)
4. Confirmed presence of foreign DNA (Girardet et al., 2011; Thackeray, Hornor, Benzinger, & Scribano, 2011)
5. Photographic evidence of sexual abuse (Vrolijk-Bosschaart et al., 2017)

Studies reporting rates of positive examination findings

A scoping review of all papers reviewed from 2000 to 2022 by The Quarterly, a publication of the Helfer Society plus additional references cited in these papers yielded 32 studies that reported positive examination rates in children and adolescents evaluated for sexual assault or abuse. Tables 3, 4 and 5 summarize these studies grouped by acute exams (at least 80 % of examinations conducted within 5 days), non-acute exams (all exams conducted >5 days from the last abusive event) and studies combining rates for both acute and non-acute examinations. A meta-regression analysis (performed on proportions by random intercept logistic regression, implemented in the metaprop function of the R package "meta" version 6.1–0; https://cran.r-project.org/) of these three study groupings examined the relationship between positive exam rate and exam acuity (acute, non-acute, combination of acute and non-acute), use of Adams classification to assess examination findings (yes or no), publication (prior to 2011 and subsequent to 2010), use of toluidine blue dye (yes or no), where study was conducted (U.S. vs non-U.S.), patient population younger than 13 years (yes or no), and exam assessment conducted by pediatric subspecialist or child abuse pediatrician (yes or no).

As expected, positive exam rates were significantly higher among studies of acute exams when compared with studies of non-acute exam findings ($p = 0.0001$) and studies that combined acute and non-acute exam findings ($p = 0.0097$). For acute exams (Table 3), rates of positive exam findings ranged from 14.2 % to 85 %; there was a tendency for lower rates to be reported in studies that included prepubertal children and studies that were conducted in the U.S. However, when U.S. studies were compared to non-U.S. studies, there was no statistical difference in positive exam rates. This is likely due to 5 U.S. studies of adolescents and adults that utilized toluidine blue dye and reported 64 %–85 % positive exam rates. Positive exam rates were significantly higher among studies that utilized toluidine blue dye ($p = 0.0028$). Although the presumption in these studies has been that toluidine blue uptake is specific for sexual assault injury, there are other non-traumatic causes of skin breakdown that can expose nucleated cells and result in toluidine blue uptake. Positive examination rates were lower among studies that involved examinations conducted by pediatric specialists or child abuse pediatricians ($p = 0.0425$). None of the studies conducted by pediatric specialists utilized toluidine blue dye or the TEARS (tears, ecchymoses, abrasions, redness, or swelling) criteria to identify trauma. There were no statistical differences between studies of acute exams that were published prior to 2011 compared with studies published after 2010 or studies that utilized the concurrent version of the Adams criteria versus those that did not.

Positive exam rates for non-acute examinations were all <12 % with one exception (Bruni study, 88 %). This is expected, given that

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all of these studies included prepubertal children. Rates of positive examination findings were lower in studies published subsequent to 2011 ($p = 0.0212$), consistent with the progressively longer list of anatomical variants and mimics of trauma.

Studies reporting findings from combined acute and non-acute clinical assessments ranged in positive exam rates from 4.5 %–74 %, although all but 2 studies reported rates <30 %. Studies with subject populations of only children younger than 12 years ($p = 0.0395$) and those that involved pediatric subspecialists or child abuse pediatricians ($p = 0.0257$) had significantly lower rates of positive exam findings than studies that included adolescents or other clinician disciplines.

This variability in positive exam rates is not unique to pediatric sexual assault examinations; a review of adolescent/adult sexual assault literature reports anogenital findings in 16 % to 77 % of patients and attributes the disparity to variable examination protocols, injury classification and examiner qualifications (Laitinen, Grundmann, & Ernst, 2013). Among pediatric cases, variations in rates of positive examination findings are generally expected based on patient age (adolescents generally higher than pre-adolescents), patient sex (females higher than males), and examination acuity (patients examined acutely have higher rates of positive examination findings than those examined nonacutely), but significant variations are observed beyond these expected differences.

There are several possible explanations for the variance in positive examination rates. First, there appears to be lack of agreement regarding the specificity of some examination findings for trauma. Since anogenital erythema can also be associated with irritation, inflammation, infection, and non-estrogenized state in females, it is listed in the Interpretation Table as a "Finding commonly caused by medical conditions other than trauma or sexual contact." However, the TEARs criteria, utilized in some studies, does include "redness" as a traumatic finding. We have not found any recent studies that support a change in how redness or erythema should be interpreted. Other findings of questionable or unknown specificity to trauma include hymenal perforation, lateral hymenal clefts, anal funneling, reflex anal dilatation, anal tags, anal laxity, abrasions to the cervix, positive staining with toluidine blue dye, and labial fissures. In addition, since many studies did not include photographs of reported examination findings, it is not possible to determine what was observed and how it was interpreted. For example, it was not possible to discern how lacerations were differentiated from fissures, how scars were differentiated from anatomical variants, or whether healed hymenal transections were confirmed with different techniques or independent expert review. Based on review of studies that did provide photo-documentation, interpretation of observed or reported findings likely varies among clinicians.

While it is possible that disparities in reported injury rates are due in part to patient- and geographic-specific variations in sexual assault injuries, this cannot be evaluated without consensus regarding observed findings and interpretation of these findings. High quality video of examination finding may improve reviewer agreement (Killough et al., 2016) regarding observed examination findings, a pre-requisite for agreement on interpretation of such findings. Quality improvement of photo- and video-documentation is

Table 4
Studies reporting non-acute injuries from sexual abuse or assault (exams done >5 days after last contact).

Publication year, first author[1]	Total patient population[2]	Population descriptors	Clinician specialty	Includes findings not listed in Section 1E in 2018 Interpretation Table?	Additional comments
Berenson et al., 2000 US	4/192;2 %	-All females, ages 3–8 yrs with history of penetration	Pedi-S and Gynecologist	Yes, hymenal perforation, deep notch	-Includes photos
Heger, Ticson, Velasquez and Bernier, 2002 US	66/1652;4 %	82 % females, all age 14 years and younger	Pedi-S	No	-No photos -6 % of girls reporting penetration had abnormal exams
Bruni, 2003	44/50;88 %	-74 % females, ages 2–14 -All with abuser guilty plea to "anal abuse"	MD-S and gynecologist	Yes, anal funneling, tags, RAD, venous congestion	-No photos -42 children had anal scars
Anderst, Kellogg and Jung, 2009 US	56/506;11 %	-All females, ages 5–17 with history of genital penetration	Pedi-S	No	-Photos provided -Positive exam findings were associated with a history of bleeding, but not associated with reported number of penetrative events
Gallion, Milam and Littrell, 2016 US	26/1160;2 %	-All females, up to age 17	Nurse-S, PA and MD	No	-No photos -Positive exam findings were associated with patient's history of vaginal (vs genital) penetration
Al-Jilaihawi, Borg, Maguire and Hodes, 2017	16/233;7 %	80 % females, up to age 17	Pedi-S	Yes, hymenal transection at 3 or 9(61 %), partial transection, deep notch, RAD	-No photos -Used 2008 Royal College evidence-based guidance
Vrolijk-Bosschaart et al., 2017	0/54;0 %	-20 % females, up to age 6, all from daycare case with abuse confirmed by conviction and/or pornography	EM-MD	Yes, perianal scars and tags and reflex anal dilatation	-No photos -Used 2015 Royal College evidence-based guidance

See Table 5 for footnotes and sbbreviations

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Table 5
Studies reporting combined acute and non-acute injuries from sexual abuse or assault.

Publication year, first author[1]	Total patient population	Population descriptors	Clinician specialty	Includes findings not listed in Section 1E in 2018 Interpretation Table?	Additional comments
Kelly, Koh and Thompson, 2006	130/1346;10 %	-86 % females, ages 1 mo–17 yrs	Pedi-S	No	-No photos - 26 % had forensic evidence kits -1346 of 2310 disclosed sexual abuse; others referred for behavioral changes and physical symptoms
Watkeys, Price, Upton and Maddocks, 2008	77/193;40 %	-All females, ages 3 mo–17 yrs	Pedi-S	No	-No photos -All had history of penile or digital penetration -Reported abnormal exam findings by acute exam vs exam done >7 days after assault and anal vs vaginal
Modelli, Galvão and Pratesi, 2012	80/1762;4.5 %	-87 % females, all under 12	Not specified; all referred to forensic medicine institute	Yes, anal, and labial fissures, anal dilatation	-No photos -Abnormal findings include bruises in neck, breast, and thigh area, described as "rare" -Did not indicate proportion of acute exams
Myhre et al., 2013 US	11/198;5.5 %	-84 % females, ages .2–19 years	Pedi-S	No	-Photos provided -9/197 had anal laceration(s) and 4/198 had anal bruising; at least 1 child had both and one had laceration and GC -Children with high probability of anal penetration more likely to have anal soiling, fissure, laceration, and total anal dilatation -About half acute, half non-acute exams
Hobbs and Wright, 2014	136/184;74 %	-45 % female, ages 2–16 years -All with "alleged anal abuse"	Pedi-S	Yes, reflex anal dilatation, anal laxity, anal gaping, fissure/laceration, tag, scar	-No photos Physical signs of anal penetration were based on 2008 Royal College evidence-based review and 1989 Hobbs article -Compared sexual abuse (N = 184) to control group(N = 179) with respect to anal findings -16 % (29) children in control group had "classic signs associated with anal abuse"
Morgan, Khadr and Bewley, 2017	30/176;17 %	-80 % females, up to age 12 -All examined within 7 days	Pedi-S, and "Sexual offences examiner"	Yes, abrasions, erythema, swelling, tenderness	-No photos -Specific injuries by location not described; fourchette and labia were most common sites and abrasions most common type -Acute vs non-acute not described, but list of injuries implies mostly acute exams
Smith, Raman, Madigan, Waldman and Shouldice, 2018 US	45/997;4.5 %	-80 % females, up to age 18 -All seen more than 72 h after abuse	Nurse-S Pedi-S	No	-No photos -Overall results: 3118 (87.4 %) normal exams 247 (6.9 %) indeterminate 33 (0.9 %) accidental
Hauet-Wiedemann et al., 2018	75/285;26.3 %	-80 % female, all under 18	Pedi-S	Yes, abrasions, erythema, fissures	-No photos
Zilkens et al., 2018	11/77;14.3 %	All males, all 13 and older -All seen within 10 days	MD-S	Yes, anal abrasion and "injury of anal canal"	-No photos
Garfield, Schou, Lassen and Leth, 2021	20/80;25 %	All females under 15 years old	Pedi-S, "Forensic medical expert"	No	-No photos -All 20 had healed transections (16) or fresh hymenal lacerations (4) -Used foley catheter in pubertal girls

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Table 5 (*continued*)

Publication year, first author[1]	Total patient population	Population descriptors	Clinician specialty	Includes findings not listed in Section 1E in 2018 Interpretation Table?	Additional comments
Hösükler, Yilmaz and Erkol, 2022	29/113;26 %	84 % female, 18 and younger	MD-S	Yes, describes "elastic hymen," "notch of hymen," "chronic anal fissures" and "acute fissure"	-No photos -Unclear if elastic hymen and notch of hymen were considered abnormal
Bravo-Queipo-de-Llano et al., 2022	26/213;12 %	83 % females, all under 17 -50 % seen within 72 h	EM	Indeterminate; indicate they base findings on Adams criteria but list "damaged hymen," "bleeding of vaginal introitus" and other findings	-No photos

1. Studies done in the US indicated.
2. TEARS classification system: codes injuries as tears, ecchymoses, abrasions, redness, or swelling (Slaughter, Brown, Crowley &Peck, 1997).
3. Same US program/authors as Rossman 2021, Rossman 2004 and Jones 2003.
MD-S is a physician who is a faculty member of a "forensic department" but is not a member of a child protection team or board certified in child abuse.
Nurse-S is a SANE nurse or nurse who has received other training.
Pedi-S is a pediatrician who is part of a child protection team (prior to child abuse board certification) or a child abuse pediatrician.
RAD: reflex anal dilatation.
EM: Emergency Medicine clinician.

the first step towards achieving consistency in examination technique and recognition of normal variants, particularly those that mimic trauma or are misattributed to trauma.

Some studies have reported different positive exam rates and types of genital injuries among females based on their prior sexual experience and whether the experience was consensual. These studies have focused primarily on adult women who were examined within 72–120 h of sexual contact/assault (Lincoln, Perera, Jacobs, & Ward, 2013; Rossman, Solis, Ouellette, Kolacki, & Jones, 2021; Suttipasit, Sinlapamongkolkul, & Wongwittayapanich, 2022). None of the studies provide photographs demonstrating the injuries reported. High rates of genital injury were reported for all non-consensual sexual encounters, ranging from 53.7 % to 81.7 %. Of interest, women without prior sexual intercourse experience had very high (81.7 %) rates of acute genital injury whereas other studies of adolescents presenting after an acute assault report much lower rates of injury (14.2 %; Smith, Raman, Madigan, Waldman, & Shouldice, 2018). While there may be differences between adults and adolescents in their sexual assault experiences, the significant disparity in rates suggests other factors, including interpretation of toluidine blue staining and differentiation between superficial and deep abrasions and tears may contribute to these differences.

Working towards consensus among practitioners may require:

1) collaborative expert review of high-quality photo- or video-documentation; 2) agreement on what is viewed in the photo/video-documentation and 3) agreement on interpretation of what is viewed. Initially, this review process could be conducted independent of the patient's history or symptoms which could introduce bias and may result in misinterpretation. For example, some clinicians will interpret a finding as trauma if the patient complains of pain when the area is touched; however, individuals who have experienced traumatic events or who are anxious about the anogenital examination may have emotional reactions that are interpreted by the patient or the practitioner as physical pain.

Conclusion

The main updates to the 2018 guidelines for the medical assessment and care of children who may have been sexually abused relate to testing for sexually transmitted infections, treating sexually transmitted infections, follow up care and the interpretation of physical examination findings. A recent survey of child abuse pediatricians supports no changes to the physical examination items in the "no expert consensus" or "infections that can be spread by non-sexual as well as sexual transmission" categories of the Interpretation table. The finding of a deep notch in the posterior hymen is still an inconclusive finding, with no expert consensus as to the degree of significance with respect to abuse.

A summary of studies reporting positive examination rates indicates suggests considerable variability based not only on acuity of the examination but also on examination techniques, examiner discipline, and differing criteria for what is interpreted as "trauma." Recommendations to approach consensus in recognition and interpretation of anogenital findings include: 1) advocate for high-quality photo- or video-documentation and 2) commit to peer review discussion across disciplines regarding what is seen on examination and how it is interpreted. Indications for STI testing in children and adolescents has expanded, and recommendations for identifying and treating adolescents with high-risk behaviors is discussed. Careful examination and documentation of oral injuries in patients presenting with acute forced oral-penile contact is encouraged. New CDC recommendations regarding prophylactic treatment for gonorrhea and Chlamydia involve challenges in patient compliance, particularly among adolescents with medical or mental health challenges that may compromise follow up care. STI testing with NAATs is the preferred testing modality for children, adolescents and adults, with attention to confirmatory testing when indicated.

The Interpretation Table from 2018 has been revised by adding new items and clarifying the content. The revised table will continue to be useful in assisting medical providers to interpret physical findings in children examined for signs of sexual abuse.

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Declarations of competing interest

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Data availability

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