OPEN

Understanding Sexual and Gender Minority Populations and Organ-Based Screening Recommendations for Human Papillomavirus–Related Cancers

Dominique Jodry, MD,[1] Juno Obedin-Maliver, MD, MPH, MAS,[2] Lisa Flowers, MD, MPH,[3] Naomi Jay, PhD, NP,[4] Serina Floyd, MD,[5] Deanna Teoh, MD,[6] Christine Conageski, MD, MSc,[1] Levi Downs, MD,[7] and Michelle J. Khan, MD, MPH[2]

Objectives: Sexual gender minority (SGM) populations are at risk for human papillomavirus (HPV)–related cancers of the anogenital tract and oropharynx and often face barriers to health care. The goals of this document are to clarify language to provide inclusive care for SGM populations and to provide recommendations for screening and prevention of HPV-related cancers in SGM populations.

Materials and Methods: An expert committee convened by the American Society for Colposcopy and Cervical Pathology performed a narrative review of the literature through February 2023. A comprehensive MEDLINE database search was performed for relevant studies. The literature review was divided into categories by organ/topic and by SGM population. Given the variability in available data for several of the categories, recommendations were made based on national guidelines where appropriate or expert opinion where there were less data to support risk-based guidelines.

Results: Definitions and terminology relevant to SGM populations are presented. The authors advocate the adoption of sexual orientation gender identity data collection and an organ-based screening approach, which is possible with knowledge of patient anatomy, sexual behaviors, and clinical history. This includes screening for cervical cancer per national recommendations, as well as screening for anal, vulvar, vaginal, penile, and oral cancers based on risk factors and shared clinical decision making. The authors recommend consideration of HPV vaccination in all SGM individuals up to age 45 years old who are at risk.

Conclusions: An organ-based screening approach is part of a global strategy to create an inclusive care environment and mitigate barriers to screening and prevention of HPV-mediated cancers in SGM populations.

Key Words: HPV, sexual gender minority, human papillomavirus, neoplasia

(*J Low Genit Tract Dis* 2023;27: 307–321)

Human papillomavirus (HPV) is responsible for cancers of the anogenital tract (cervix, anus, vulva, vagina, and penis) and cancers of the oropharynx. Sexual and/or gender minority (SGM) populations face barriers to health care and as a result experience disparate outcomes in cancer prevention. The goals of this document are to define SGM populations, to review the literature on HPV-related disease in SGM populations, and to provide recommendations for screening and prevention of HPV-related cancers in SGM populations. Our hope is that by providing this guidance, appropriate cancer screening for SGM patients will become more widely performed.

Box 1 provides an overview of the terminology and critical language used throughout this article. Using clinical organ/tissue-based terminology allows for separation of gender from anatomy and hormonal status and avoids excluding marginalized gender identities.[1] We advocate the adoption of an organ-based screening approach, which is possible with knowledge of patient anatomy, sexual behaviors, and clinical history. This includes screening for cervical cancer per national recommendations, and screening for anal, vulvar, vaginal, and penile cancers based on risk factors and shared clinical decision making. A summary of recommendations for organ-based screening is provided in Table 1.

Human papillomavirus causes approximately 5% of cancers worldwide. These include cancers of the anogenital tract (cervix, anus, vulva, vagina, and penis) and cancers of the oropharynx (see Figure 1). National guidelines exist in many countries for screening for cervical cancer, and the World Health Organization has screening and vaccination guidelines that, if optimally implemented worldwide, would ideally eliminate cervical cancer by 2030.[3] In contrast to cervical cancer, the other HPV-related cancers do not have standardized screening recommendations, leading to gaps in knowledge and missed opportunities for screening for many patients.

Sexual and/or gender minority or LGBTQIA+ (lesbian, gay, bisexual, transgender, queer, intersex, asexual, and other) populations often face additional barriers to appropriate health care. Front and foremost is bias and discrimination, which leads to lower utilization of health services.[4]

There is a long history of stigma and discrimination against sexual and/or gender minority people in society and in health care. In health care, this has resulted in negative experiences, disparate access to care, and inequitable health outcomes. These same barriers lead to a lack of visibility and focused inclusion of SGM people in health care research, leading the National Institutes of Health to declare SGM people as a health disparities population for research.[5] Recognition that SGM people are underserved, understudied, and vulnerable to poor health is a notable step and highlights that we are lacking information to better serve this patient population. This includes a lack of information about general health care as it relates to SGM people (e.g., optimal smoking cessation strategies) and a lack of SGM-specific health and health care needs (e.g., family building for SGM people, screening for HPV-related diseases for people who have undergone gender-affirming processes and procedures). Barriers to care lead to poor health outcomes across multiple health domains, and this invisibility in health care research further limits our ability to adequately respond to their health needs. The lack of knowledge or confusion among both patients and providers about which groups should undergo screening tests for cervical or other HPV-related

[1]University of Colorado, Aurora, CO; [2]Stanford University School of Medicine, Stanford, California; [3]Emory University School of Medicine, Atlanta, GA; [4]University of California, San Francisco School of Medicine, San Francisco, California; [5]Planned Parenthood of Metropolitan Washington, DC, Washington, DC; [6]Division of Gynecologic Oncology, University of Minnesota, Minneapolis, MN; and [7]Park Nicollet Health Services, Minneapolis, MN

Reprint requests to: Michelle J. Khan, MD, MPH, Department of Obstetrics and Gynecology, Stanford University School of Medicine, 453 Quarry Road, Mail Code 5317, Palo Alto, CA 94304. E-mail: drkhan@stanford.edu

The authors have declared they have no conflicts of interest.

IRB status: Exempt.

DOI: 10.1097/LGT.0000000000000763

Box 1 SGM/LGBTQ+ Definitions.[1–3]

Lesbian, gay, bisexual, transgender, queer, intersex, asexual, and other (LGBT, LGBTQ+, LGBTQIA+): Often used as an umbrella term for people who are not cisgender or heterosexual. The "+" acknowledges that other groups are included within the LGBTQ umbrella (e.g., asexual, nonbinary, genderfluid etc.).

Sexual and/or gender minority (SGM): Used primarily in medicine and academia as an umbrella term to describe individuals who are neither heterosexual and/or cisgender. This is used by the National Institutes of Health, which recognizes SGM people as a health disparities population.

Sexual orientation (SO): A construct with the following 3 overlapping components: sexual identity, sexual attraction, and sexual behavior. Sexual identity, attraction, and behavior may or may not all "line up." Someone might identify as a lesbian (identity), be attracted to cisgender women and nonbinary people (attraction), and have penis-in-vagina sex with cisgender men (behavior). Common sexual orientation terms that are sometimes used as identity terms are as follows: asexual, bisexual, heterosexual, lesbian, gay, pansexual, and queer. Common sexual behavior descriptors are women who have sex with women "WSW," women who have sex with men "WSM," women who have sex with women and men "WSWM," men who have sex with men "MSM," etc. These terms should be modified by cisgender/transgender terms and description of sexual activities (e.g., penis-in-vagina sex, penis-in-anus sex, oral-anal sex, oral-penile sex, vulva-to-vulva sex, etc.).

- *Sexual identity* is how one thinks about themselves in relation to who they are attracted to, partner with sexually, romantically, emotionally, and who they have sex with.
- *Sexual attraction* is specific to who people are attracted to sexually but does not imply that someone is acting on those attractions.
- *Sexual behavior* describes who someone is having sex with and how. Although sometimes limited to describe the gender of sexual partners (e.g., WSW), using only the partner gender descriptor and not the descriptor of the sexual activity should be avoided, as it limits understanding of pregnancy risk/opportunity, sexually transmitted infection risk, and how to optimize sexual satisfaction. For example, two cisgender gay men (i.e., MSM may not engage in penis-in-anus sex and only engage in penis-in-mouth [oral] sex).

Gender: Societal and cultural attributes, norms, as well as expectations related to being a woman, man, or person of one or many other genders and differ by context, region, culture, and generation. Gender can be further broken down into gender identity and gender expression, which may not "line up" with each other or with society's expectations for an individual.

Gender identity (GI): One's internal held understanding of themselves as a girl/woman, boy/man, multiple genders, no genders, or outside of the gender binary. Gender identity cannot be known without asking someone directly. An individual's willingness to disclose a true answer may be related to their feeling of safety in a given encounter.

Gender expression: How someone expresses and performs their gender, which has to do with the clothes people wear, hair, makeup, accessories, vocal intonations, posture, etc. This is what is seen and experienced by others. This may or may not "line up" with their gender identity.

Sexual orientation and gender identity (SO/GI): As defined previously, this construction is often used together, increasingly in medicine and research, to describe these critical components of people's experiences.

Sex assigned at birth: This describes the phenotypic presentation of usually dimorphic sex characteristics of humans identified on examination of genitalia at birth and occasionally before birth. Common terms to describe sex assignment at birth are "female" and "male" and "intersex."

Assigned female sex at birth (AFAB): Individuals born with a uterus, cervix, ovaries, and fallopian tubes and the capacity to develop milk-bearing breast tissue. Unless there are medical interventions, these individuals' natal puberty will usually be estrogen dominant, begin with breast bud development, and be associated with onset of menses, development of mature oocytes, and pregnancy capacity.

Assigned male at birth (AMAB): Individuals born with a penis, testes, and a prostate. Unless there are medical interventions, these individuals' natal puberty is usually testosterone/androgen driven and will be associated with penile and testicular enlargement and the development of viable sperm.

Intersex, having a difference of sex development "DSD," or sometimes Assigned Intersex at Birth: These individuals may or may not have typically AFAB or AMAB genital phenotypes. There are a variety of conditions and intersex traits that may be classified as a DSD with different phenotypic expressions and medical implications.

Cisgender: A term, primarily used in academia, that describes individuals whose current gender identity is consistent with their sex assigned at birth. For example, a cisgender woman is someone who identifies as a woman and was assigned female sex at birth and was born with a uterus, cervix, ovaries, and fallopian tubes.

Transgender and gender diverse: Transgender and gender diverse people have a gender identity(ies) that differs from their sex assigned at birth.

Transgender man (TGM)/transmasculine individual: is someone who identifies as a man or on the masculine spectrum and was assigned female sex at birth.

Transgender woman (TGW)/transfeminine individual: is someone who identifies as a woman or on the feminine spectrum and was assigned male sex at birth.

Gender expansive/gender diverse: Are terms used to describe individuals whose identities and/or gender experiences are not a binary (i.e., man/woman) gender identity and may be of any sex at birth. In medical and investigational contexts, we would describe this person as a gender diverse person who was assigned female at birth or male at birth if necessary for their medical care or scientific question.

Gender-affirming processes and procedures: Are steps taken to align an individual's body and and/or secondary sex characteristics with their gender identity(ies). These processes can be broadly broken down into social, medical, and surgical activities.

Social gender-affirming processes: These include but are not limited to: name changes, pronoun changes, and changing of identifying documents such as drivers' licenses and insurance cards.

Medical gender-affirming processes: These include the exogenous administration of steroid hormones such as estrogens, progestins, and androgens and/or hormone blockers such as GnRH agonists, antagonists, and/or hormonally active agents like spironolactone and finasteride.

Surgical gender-affirming processes: This describes procedure including facial surgery, "top surgery" to enhance or reduce chest/breast tissue, or "bottom surgery" to change the appearance and/or function of the genitourinary and reproductive system. There are more than 2 dozen such procedures. These processes may impact lower genital tract disease as discussed elsewhere in this review.

1. National Academies of Sciences, Engineering, and Medicine. *Measuring Sex, Gender Identity, and Sexual Orientation*. Washington, DC: The National Academies Press; 2022.
2. American College of Obstetricians and Gynecologists' Committee on Gynecologic Practice; American College of Obstetricians and Gynecologists' Committee on Health Care for Underserved Women. Health Care for Transgender and Gender Diverse Individuals: ACOG Committee Opinion, Number 823. *Obstet Gynecol*. 2021;137(3):e75–e88.
3. ACOG Committee on Health Care for Underserved Women. ACOG Committee Opinion No. 525: Health care for lesbians and bisexual women. *Obstet Gynecol*. 2012;119(5):1077–1080.

cancers can potentiate health care disparities; thus, it is imperative to provide clear direction and language to optimize screening for HPV-related cancers among SGM people.

The goal of this document is to define sexual and gender minority populations, to review the literature on HPV-related disease in these populations, and to provide recommendations for screening and prevention of HPV-related cancers in SGM populations. Our hope is that by providing this guidance, appropriate cancer screening for SGM patients will become more widely performed.

SGM/LGBTQ+ Definitions

In understanding the data and clinical guidelines for caring for SGM people, a few definitions of the principal terms and concepts are needed. Box 1 provides an overview of terminology and critical language used throughout this article.[6–8]

These terms will continue to evolve with our increased understanding of SGM needs and sensibilities. One individual may have a multiplicity of identities and experiences. For example, someone may identify as a gay and pansexual transgender man (TGM) who has sex with other TGM and cisgender men, or a transgender woman (TGW) may choose to retain male gender expression in clothing, body hair, etc., or a cisgender woman may identify as queer and lesbian and engage in different behaviors than someone who identifies as queer alone. The clinical considerations (e.g., sexually transmitted infections, pregnancy, risk for HPV-related cancers) are different in these scenarios. Clinicians and researchers should be attuned to this multiplicity and ask how people identify for sexual orientation and gender identity, as well as specifics of sexual behavior, so they can

TABLE 1. Organ-Based Screening Recommendations for Screening for HPV-Related Cancers in SGM Populations

Organ at risk	Does the risk of HPV-related cancer in this organ warrant screening?	What type of screening should be offered?
Anus	Yes—in individuals at higher risk 35 years and older, with screening initiated no later than age 45[a]: • People living with HIV • Non-HIV immunosuppressed • Men who have sex with men • Transgender women • History of vulvar HSIL or cancer • Other groups with high incidence[b] No—no risk factors present	Anal cancer—DARE or anal cytology and/or hrHPV testing with DARE[c]
Cervix	Yes	High-risk HPV testing, cervical cytology/hrHPV co-testing, or cervical cytology per national guidelines (Table 2)[d]
Oropharynx	Yes	Annual dental examination recommended (no available/validated screening tools in clinical practice)
Penis/scrotum	Yes—in individuals at higher risk: • History of anogenital HSIL or cancer No—no risk factors present	Visual inspection of the penis/scrotum
Vagina	Yes—in individuals with history of cervical HSIL or cancer No—no risk factors present	Vaginal cytology and/or hrHPV testing[e]
Vulva	Yes—in individuals at higher risk: • People living with HIV • Non-HIV immunosuppressed • History of anogenital HSIL or cancer No—no risk factors present	Visual inspection of the vulva

[a] Exact age to start screening is still to be determined, but generally 35–45 years old is the recommended timeframe to start; screening guidelines from the International Anal Neoplasia Society are forthcoming.

[b] Clifford et al. (2021).[2]

[c] Screening tool depends on availability of HRA services. Although hrHPV testing is not FDA approved in the anal canal, multiple studies demonstrate high sensitivity for anal HSIL detection.

[d] The United States Preventive Services Task Force 2018 and American Cancer Society 2020 recommendations.

[e] 2019 ASCCP management guidelines recommend surveillance testing for at least 25 years after treatment of cervical high-grade squamous intraepithelial lesion; although hrHPV testing is not FDA approved in the vagina, the sensitivity of HPV testing compared with cytology alone for detection of vaginal lesions seems superior.

DARE indicates digital anal rectal examination; hrHPV, high-risk HPV; HSIL, high-grade squamous intraepithelial lesion.

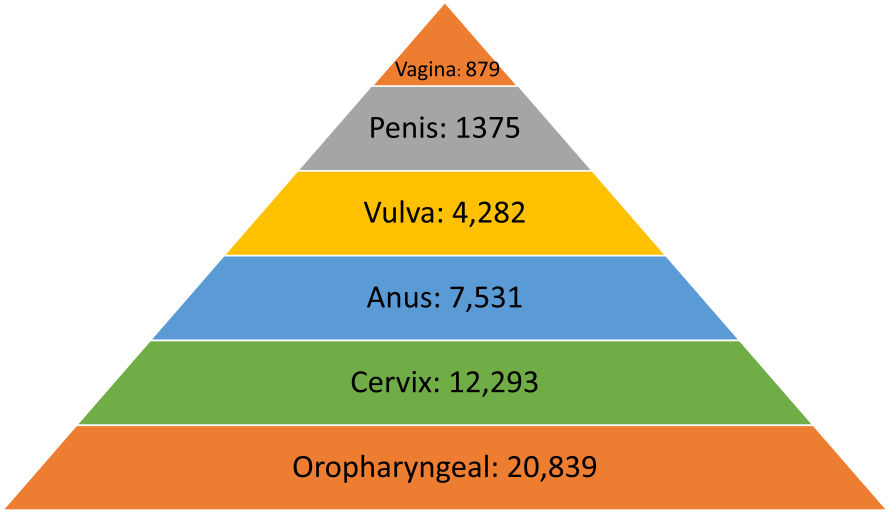

FIGURE 1. Annual incidence of HPV-associated cancers in the United States from the SEER Database, 2015–2019. Adapted from: Cancers associated with human papillomavirus, United States—2015–2019 USCS Data Brief, no. 31. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services; 2022.

take care of whole person needs and calibrate clinical activities to individual patients.

In addition, clinicians and researchers should be aware that in different regions within the United States and around the world, different terminology is used. Furthermore, there are varying definitions for any term of experience and definitions shift over time. Terminology that is considered offensive and/or inaccurate in clinical and investigational settings (e.g., "transsexual" or "female-to-male") may still be used by community members. We suggest using a patient's self-defined terminology and reflecting that to them in one-on-one clinical settings. Clinical documentation should ensure up-to-date and scientifically accurate terminology to aid in programmatic and investigational efforts while also being sensitive to a patient's self-identity, as patients frequently have access to their medical records online.[9]

Using clinical organ/tissue-based terminology allows for separation of gender from anatomy and hormonal status and avoids excluding marginalized gender identities.[1] It is most accurate to discuss cervical cancer screening in reference to persons with a cervix (of any gender) and then specify whether that person has an estrogen or androgen dominant hormonal milieu. For example, a cisgender woman may have an androgen dominant environment due to exogenous testosterone use for libido or a transgender person may be using testosterone for gender affirmation. Other organizations concerned with sexual and reproductive health have adopted language practices that acknowledge this changing awareness and inclusion.[10] In this review, we advocate for clinical organ/tissue-based discussions and risk stratification but acknowledge that past research has not consistently used this framework. Therefore, we will use the terms used by prior researchers as appropriate, that is, "women," where the research may be lacking in definitions, inclusion, or clarity. It is our hope that going forward, clinicians and researchers will use the organ-based approach advocated in this review in conjunction with behavioral risk stratification to move toward simplified, risk-based guidelines for screening for HPV-related disease.

METHODS

A group of experts from the American Society for Colposcopy and Cervical Pathology (ASCCP), the society for anogenital and HPV-related diseases, was convened to address the lack of guidelines for screening for HPV-related cancers in the LGBTQIA population. The group was composed of clinical and research experts in HPV-associated diseases (D.J., L.F., N.J., D.T., C.C., L.D., M.K.), LGBTQ+ health (J.O., N.J., D.T., M.K.), and/or underserved populations (N.J., S.F., L.F., L.D.). Representatives from the International Anal Neoplasia Society (IANS; N.J., M.K., L.F., C.C.) and the American College of Obstetricians and Gynecologists Committee on Underserved Populations (S.F., L.D.) were identified through their respective society leadership and were also invited to participate. Through collaboration with these expert committee members, these recommendations have been endorsed by the IANS and ASCCP.

To carry out this narrative review, a comprehensive MEDLINE database search was performed for relevant studies, using search terms relevant to SGM populations. To narrow down the results to literature relevant to the topic of HPV-related disease in SGM populations, articles were excluded initially based on title, then by abstract, and then by full review. The literature review was divided into categories by organ/topic and by SGM population, including lesbian/women who have sex with women (WSW), gay/men who have sex with men (MSM), transgender male, transgender female, anus, cervix, vagina, vulva, penis/scrotum, and vaccination. Each co-author assigned to a category performed a thorough review of published literature and compiled a summary of relevant citations and recommendations, which were then reviewed centrally by 2 committee members, D.J. and M.K. The bibliographies of included articles were reviewed to identify other relevant works not identified by the primary search. National guidelines for screening for HPV-related cancers were reviewed. Studies presented at national and international meetings were also included as appropriate. The group met at the start of the project and upon completion of the literature review, to discuss findings and formulate recommendations for screening. All authors had the opportunity to vote for or against recommendations in Table 1 and the group unanimously voted to approve the final recommendations. Given the paucity of data for several of the categories, recommendations were made based on the best knowledge available/expert opinion.

RESULTS

Cervix

The incidence of cervical cancer in the United States is 7.5 per 100,000 women per year; in countries without standardized

TABLE 2. US Cervical Cancer Screening Guidelines Per the USPSTF, ASCCP, ACOG, and ACS

Age	USPSTF/ASCCP/ACOG recommendation	Age	ACS recommendation
<21	No screening	<25	No screening
21–29	Screen with cytology every 3 y	25–65	Screen with primary hrHPV testing every 5 y (preferred); screen with co-test every 5 y or cytology every 3 y (acceptable)
30–65	Screen with a co-test (cytology and hrHPV testing) every 5 y, hrHPV testing alone every 5 y, or cytology every 3 y		
>65	Discontinue screening if patient has had adequate negative prior screening results and no history of CIN 2+	>65	Discontinue screening if patient has had adequate negative prior screening results and no history of CIN 2+

ACS indicates American Cancer Society; CIN, cervical intraepithelial neoplasia; hrHPV, high-risk HPV.

screening, rates are as high as 85 per 100,000.[11] Any individual with a cervix is at risk of HPV-related cervical neoplasia, regardless of gender identity or sexual orientation, and therefore should be offered both HPV vaccination and cervical cancer screening according to current guidelines[12–14] (see Table 2). It may be necessary to inquire specifically about a patient's anatomy, and/or surgical history, including the presence or absence of a uterine cervix, as is done commonly with cisgender women who may have had a hysterectomy with removal of the cervix. The same question can be posed to transgender men to determine whether they need cervical cancer screening.

Most cervical cancer screening literature in SGM populations centers on cisgender WSW. Between 8% and 20% of women report same-sexual behavior in at least one encounter in their lifetime.[15] It is important to note the distinction between sexual identity and sexual behavior—WSW may not identify as lesbian or bisexual, and may continue to have male partners. Regardless, HPV has been isolated in the vaginal secretions of 13%–30% of WSW,[16] similar to rates in heterosexual women.[17,18] In addition, up to 12% of WSW have low-grade squamous intraepithelial lesion or greater on initial cytology screening.[17] The similarities between WSW and women who have sex with men (WSM) may be in part because up to 79% of WSW report prior coitus with men,[17,19] but even among WSW who report never having had a male sexual partner, antibodies to high-risk HPV (hrHPV) have been demonstrated in as many as 40% of women,[20] compared with 45%–60% seroprevalence among women in the general population.[21–23] Furthermore, risk factors for cervical neoplasia are prevalent among WSW, including high rates of smoking[16,24,25] and high levels of sexual violence.[26,27] These factors are compounded by lower rates of health care coverage and access to primary care providers.[28,29] In fact, WSW may be up to 10-fold more likely to have never had cytology screening compared with WSM.[28,30–34]

Misinformation regarding risk of HPV-related cervical neoplasia among WSW is a concern among both patients and providers. Among WSW, up to one third may believe that HPV cannot be transmitted between 2 women.[19,35,36] Concerningly, up to 10% of WSW report having been told by a health care provider that they do not need cervical cancer screening because they are not sexually active with men.[17] Women having sex with women also report adverse experiences with health care providers such as the following: not offering cytology screening,[37,38] providing biased care, displaying discomfort with LGBTQIA+ patients, using noninclusive language, having a noninclusive environment, negative interactions with providers,[35,38–40] refusal of treatment, verbal abuse, and experiencing stigma, discrimination, and disrespect.[4,39,41,42] Such adverse experiences with the health care environment may ultimately result in delayed screening and diagnosis of HPV-related neoplasias.[37,43,44]

Transgender men have similar risks for gynecologic cancers as cisgender females, although data are limited in terms of true prevalence estimates. There does not seem to be an increase in cancers related to testosterone gender-affirming hormone use.[45,46] In the 2015 US Transgender Survey, 14% of TGM had had a hysterectomy.[47] Transgender men who retain their cervix are at risk of HPV-related neoplasia regardless of hormone exposure or sexual partner anatomy. Transgender men historically have lower rates of cervical cancer screening participation and are 37% less likely to be up to date on cervical cancer screening compared with cisgender women.[48–50] This has been linked to structural barriers, including lower rates of insurance coverage and high rates of unemployment, provider-level barriers, including adverse experiences with medical environments, and patient-level factors including discomfort with anatomy and screening procedures.[48–50]

Providers should be aware that testosterone therapy is a common gender-affirming treatment in TGM, and it often results in vaginal atrophy, which can further limit patient tolerance of the pelvic examinations and vaginal sex. Transgender men on testosterone therapy may be up to 10 times more likely to experience an unsatisfactory cytology report than cisgender patients,[51] potentially leading to need for repeat tests. Transgender men may be less likely to return for repeat testing after unsatisfactory screening results, so providers can consider techniques to optimize adequate cervical sampling, including swabbing a wide circumference of the cervix and pretreatment with low-dose topical estrogen before examination.[52] Alternatively, self-swab for HPV seems to be better tolerated by TGM patients and is preferred to provider screening in several studies.[53–55] Though not yet approved by the US Food and Drug Administration, self-samples have overall high accuracy for detection of high-grade cervical intraepithelial neoplasia, with similar sensitivity to clinician-collected samples for polymerase chain reaction–based tests, slightly lower sensitivity than clinician-collected samples for signal-amplification tests, and slightly lower specificity for all tests.[56] Discussing self-swab for HPV via a shared decision-making model may represent a reasonable and patient-centered strategy for cervical cancer screening in TGM.[48,51,53,56,57]

Recommendation. Screen all persons with cervices as per US Cervical Cancer Screening Guidelines: Per the US Preventive Services Task Force (USPSTF)/ASCCP/American College of Obstetricians and Gynecologists (ACOG) or the American Cancer Society (ACS) guidelines (Table 2). Self collected vaginal swabs should be recommended to patients as an option for sample collection once approved by the FDA.

Vagina

Vaginal cancer is an uncommon HPV-related malignancy.[58] In the United States, the reported incidence rate of vaginal cancer is 0.4 per 100,000 individuals.[59] The prevalence of HPV is

comparable in the vagina and cervix, although noncarcinogenic genotypes may be detected more frequently in individuals without a cervix.[60–62] However, the rarity of vaginal cancer in comparison with cervical cancer suggests that the cervical transformation zone may be uniquely susceptible to HPV-induced carcinogenesis. Because of the rarity of vaginal cancer, screening for vaginal cancer is not recommended in the general population.[63]

In contrast, individuals who have had cervical high-grade squamous intraepithelial lesion (HSIL) or cancer are at significantly increased risk of developing vaginal cancer.[64] In individuals with cervical HSIL at the time of hysterectomy, the incidence rate of vaginal cancer in 25-year follow-up is 51.3 per 100,000, with an age-adjusted incidence rate ratio of 21 when compared with individuals with a benign cervical history. Similarly, individuals with a history of HSIL who underwent hysterectomy for benign indications have an incidence rate of 17.1 and an incidence rate ratio of 5.81.[65] Current cervical cancer screening guidelines recommend that individuals who have had preinvasive lesions (HSIL/adenocarcinoma in situ) or invasive cervical cancer undergo continued surveillance testing for at least 25 years after treatment.[63] Therefore, our recommendation concurs with current guidelines to continue surveillance in individuals with a history of cervical HSIL or cancer who subsequently undergo hysterectomy, with vaginal cytology and/or hrHPV testing, for at least 25 years after their treatment for cervical precancer.[66,67] We further encourage clinicians performing gender-affirming hysterectomy to review the cervical cancer screening histories of patients to ensure adequate surveillance as well as avoid unnecessary screening in low-risk individuals.

Transgender women who undergo gender-affirming vaginoplasty may have some risk of HPV infection of the neovagina, but evidence is sparse regarding the clinical importance of these infections. High-risk HPV was detected in the neovagina in up to 20% of sexually active women who have undergone vaginoplasty, but no HPV infections were detected in the neovagina of sexually inactive women.[68] However, cases of symptomatic HPV-related lesions of the neovagina are rare enough to warrant case reports in the literature.[69,70] Women may present with pain or abnormal discharge of the neovagina, condyloma/leukoplakia, or coital bleeding or pain; histopathological results may range from condyloma to moderate to severe intraepithelial neoplasia in these cases.[70] There are 4 reported cases of vaginal cancer in TGW with a neovagina.[69] We recommend that women reporting symptoms of pain, abnormal discharge, or bleeding of the neovagina should have a thorough examination of the neovagina by providers, with consideration for vaginal cytology or hrHPV testing and biopsy of any abnormal appearing lesions.

Recommendation. No screening for vaginal cancer is indicated in individuals without a history of cervical HSIL or cancer who no longer retain a cervix. Continue vaginal surveillance testing in individuals with a history of cervical HSIL or cancer who subsequently undergo hysterectomy, with vaginal cytology and/or hrHPV testing, for at least 25 years after treatment.

Vulva

Vulvar cancer accounts for 6% of all cancers of the female reproductive tract and 0.7% of all cancers in women. The incidence rate is 2.4 cases per 100,000.[71] There will be an estimated 6,470 cases of vulvar cancer and 1,670 deaths in 2022 in the United States.[72] Vulvar cancer is generally divided into HPV-associated and HPV-independent cancers. The HPV-associated vulvar cancer, which accounts for approximately 20%–25% of vulvar squamous cell cancers, is preceded by vulvar HSIL.[73] Studies show an increasing incidence of vulvar HSIL (vulvar intraepithelial neoplasia 2/3), the precursor to vulvar cancer, especially among women younger than 50 years. An analysis of vulvar intraepithelial neoplasia in the Surveillance Epidemiology and End Results database showed an increase of 411% from 1973 to 2000.[74] Another study using the Surveillance Epidemiology and End Results has showed an average increase of 3.5% per year of cases of vulvar HSIL.[75]

Despite these increases in incidence, given the low overall incidence of vulvar cancer, no screening guidelines exist, although patients may be encouraged to practice vulvar self-examination to aid in the early detection of vulvar lesions.[76] There are high-risk groups, which include people living with HIV (LWH), people with non-HIV immunosuppression, and individuals with a history of lower genital tract HSIL or HPV-related cancer of other sites.[77–80] These risk factors apply regardless of sexual orientation or gender identity. In these high-risk groups, a visual inspection of the vulva at the time of gynecologic examination can serve as a simple way to detect vulvar HSIL or cancer.[81]

Recommendation. No screening recommended in the general population, regardless of sexual orientation or gender identity. Perform visual vulvar examination at the time of anogenital examination in people LWH, people with non-HIV immunosuppression, or those with a history of anogenital tract HSIL or cancer.

ANAL

Anal cancer is caused by HPV in 90% of cases.[82,83] Like cervical cancer, the natural history of anal HPV lesions can progress from a self-limited HPV infection, to HSIL, to invasive anal cancer over the course of many years to decades. High-risk HPV is detectable in the anal canal via routine swab, and anal cytology has been recognized for the last 2 decades as a viable screening modality.[84] Penile-anal intercourse provides a mechanism of HPV transmission, and detection rates of anal HPV among individuals who engage in penile-anal intercourse are high, up to 70% among MSM[85–90] and reported as high as 98% among transgender women.[91–93] That being said, penile-anal intercourse is not strictly necessary to get HPV into the anus. In individuals assigned female at birth, anal HPV rates are comparable with cervical HPV rates, and this does not depend on history of penile-anal intercourse.[79] In MSM, it has been shown that condomless receptive anal intercourse and increased number of partners in the last 6 months has been associated with elevated risk of anal HPV infection.[94]

A recent systematic review and meta-analysis have demonstrated incidence rates for anal cancer based on risk group.[2] Persons LWH are especially vulnerable to the dysplastic effects of HPV infection, and among MSM LWH, the highest risk group, the incidence of anal cancer was 85 per 100,000 persons, with even higher risks in older MSM LWH when stratified by age. By comparison, the incidence of anal cancer in the general population is 2 per 100,000 individuals.[2] The incidence among MSM not LWH was 19 per 100,000; among men LWH who have sex with women (MSW) was 32 per 100,000, and among women LWH was 22 per 100,000. Furthermore, HIV co-infection may have a synergistic relationship with both HPV acquisition and persistence.[95] Low CD4 count has been found to be positively associated with risk of high-grade anal intraepithelial neoplasia and anal cancer,[84,96] and persistent anal cytologic abnormality is more likely with CD4 < 400.[97] Conversely, protective factors for HPV infection include CD4 count greater than 500, adherence with highly active antiretroviral therapy, and undetectable viral load.[98,99]

The unique vulnerability of transgender women to both HIV infection and HPV-related disease warrants special attention. Because of commonalities in viral transmission mode, many of the risk factors for HIV acquisition in MSM and TGW extend to risk of HPV infection as well. Experiences of gender-based discrimination, violence, victimization, rejection, and social marginalization

are pervasive among transgender women[100–102] and are an identified risk factor for high-risk sexual behavior.[102] Widespread discrimination against TGW limits social and economic position and forces many TGW to sex work as a means to survival,[103] and rates of sexually transmitted infections are disproportionately high among TGW, increasing their vulnerability to HIV acquisition.[104–106] In addition, receptivity during sex may be gender affirming for TGW, and because many TGW do not have access to genital surgery, penile-anal intercourse may provide TGW with an important means of gender affirmation.[107,108]

Individuals at high risk of anal cancer include MSM and TGW regardless of HIV status, as well as individuals with a history of anogenital HSIL or cancer, and immunocompromised individuals, particularly those with a history of solid organ transplant over 10 years ago. Screening for anal HSIL or cancer follows the same principles as for cervical cancer, using anal cytology and/or hrHPV testing as an initial screening methodology among high-risk groups. According to the 2016 high-resolution anoscopy (HRA) standards published by the IANS, anal cytology is useful to predict those at risk of HSIL, but has limited sensitivity and specificity, and thus should be used as a triage tool for referral to HRA for pathologic diagnosis.[109,110] A recent systematic review of anal cancer screening strategies demonstrated a sensitivity of 81% and specificity of 62% of anal cytology in detecting HSIL or higher (HSIL+).[111] Cytology also has a learning curve, with higher rates of unsatisfactory cytology compared with cervical cytology screening but usually with improvement over time as providers learn to sample the anal canal more thoroughly.[112,113]

In addition, hrHPV testing provides long-term risk stratification for precancerous anal lesions, but there are high positivity rates of hrHPV among MSM LWH, which limits its utility as a sole screening modality in this population.[114] Among MSM LWH, hrHPV has a low positive predictive value and a high negative predictive value, with a relatively high sensitivity (96%) and low specificity (30%), but can improve diagnostic efficacy when performed in conjunction with anal cytology.[115] Adding hrHPV testing to anal cytology (anal "co-testing") in all populations improves the sensitivity for detection of HSIL+ to 93% but decreases the specificity to 33%.[114] Also important to note, at this time, hrHPV testing does not have Food and Drug Administration (FDA) approval for the anus, which may limit its utility and is dependent on health care insurance policies.

The follow-up to abnormal anal cytology and/or hrHPV testing is HRA. High-resolution anoscopy with directed biopsy is the criterion standard for diagnosis of anal HSIL. Unfortunately, there is a shortage of trained HRA providers in many areas, leading to a bottleneck in diagnostic and treatment capabilities. Anal cytology should only be performed in areas where referral to a trained HRA provider is available. The IANS has published minimum standards for competency for HRA, but dedicated training efforts are needed to expand the number of HRA-trained providers available worldwide.[110] Where referral to HRA-trained providers is not available, the IANS recommends performing digital anal rectal examination (DARE) to evaluate for palpable lesions in the anal canal. Digital anal rectal examination has the potential to identify cancerous lesions at an earlier stage and is simple, safe, and well tolerated.[116]

Until recently, formal recommendations for screening for anal cancer among high-risk individuals were lacking, because of a dearth of evidence that treating high-grade precancerous lesions (anal HSIL) would ultimately decrease the risk of progression to anal cancer. The Anal Cancer-HSIL Outcomes Research (ANCHOR) trial was a large-scale, multicenter randomized control trial to evaluate the safety and efficacy of treatment of anal HSIL among 4,446 individuals 35 years and older LWH. Most ANCHOR participants were members of SGM populations. The results showed a 57% reduction in the rate of progression to cancer in the treatment group versus the group undergoing active monitoring,[117] and the trial was stopped early because of this treatment efficacy, bolstering the argument for screening and the need for clear screening recommendations. At this time, screening recommendations are being formulated for release by the IANS.

Anal HPV in TGW and MSM

Among TGW, anal HPV infection may be nearly ubiquitous, with detection rates for any anal HPV as high as 97%.[92,93] HIV co-infection seems to accentuate these risks; in a study of 85 TGW and MSM, any anal HPV was detected in 100% of HIV-infected participants, and hrHPV was detected in 94% of participants.[118] In the same study, 70% of participants tested positive for the oncogenic HPV subtype 16 and/or 18. It should, however, be acknowledged that this study, like many in the literature, aggregated TGW and MSM based on shared risk behavior (penile-anal sex) but was underpowered to determine risks unique to TGW. Importantly, while anal HPV is highly prevalent among TGW, Meites et al.[86,119] demonstrated that only a minority (8%) of sexually active TGW will test positive for all HPV subtypes covered in the quadrivalent HPV vaccine, indicating that HPV vaccination would still provide protection.

Anal Squamous Intraepithelial Neoplasia in TGW and MSM

Because of limited sampling, many studies report anal squamous intraepithelial neoplasia (ASIL), which includes both anal low-grade squamous intraepithelial lesion and HSIL, but in studies with well-developed HRA programs, the rates of HSIL alone are approximately 5% in TGW.[120] The largest studies of anal cytology in TGW suggest that at least 43% of TGW, including those not LWH, will have abnormal anal cytology,[121,122] and the risks of cytologic anal ASIL are at least as high among TGW as they are among MSM. Among TGW LWH, anal ASIL may be nearly ubiquitous (95%), although most of these cytologic results (84%) may be low-grade abnormalities.[123] Many TGW may have anogenital warts,[92,93,124] likely contributing to the high rates of abnormal cytology and further underscoring the importance of screening in this population. In these studies of TGW, HPV-16 and HPV-18 were associated with greater degree of cytologic atypia.[125] Notably, the same study observed that HIV infection was independently associated with higher viral loads of HPV-16 and HPV-18 in TGW, suggesting again that the HIV burden among TGW has widespread ramifications on risks of anal cancer.

Only 2 studies have provided histologic confirmation of anal ASIL in TGW but suggest that rates of histologic ASIL in MSM and TGW LWH may be nearly ubiquitous and are at least as high among TGW (91%) as they are among MSM (84%).[123,126] Both studies also report similarly high rates of histologic anal HSIL (58%–59%). No studies to date have examined anal histology among TGW not LWH. In the ANCHOR Trial mentioned previously, one transgender individual developed anal cancer in the study (1/153 transgender participants or 0.65%), which was identical to the proportion of cisgender patients who developed anal cancer (30/4416 total participants or 0.65%).[117]

Anal Cancer in TGW and MSM

No studies to date have reported the risk of anal cancer among TGW. Risks of anal cancer in MSM not LWH are at least double and up to nine times the general population; in MSM LWH, the risk may be as high as 145 per 100,000, 9-fold the risk in those not LWH, and 60- to 150-fold the general population.[2,127–129]

There is a population of TGM who identify as MSM and engage in anal-receptive intercourse. Data on rates of anal HPV and risk of anal cancer in this population are lacking. Although TGM who identify as MSM are not currently defined as a high-risk

population for the development of anal cancer, they should be screened for other identified risk factors, such as the history of previous anogenital HSIL or immunocompromised state. In the absence of data to inform standardized recommendations in TGM who identify as MSM without other risk factors for anal cancer, we recommend discussion between providers and patients and a shared decision-making model to determine whether to perform screening for anal cancer.

Recommendation. We recommend screening for anal cancer in individuals at high risk: MSM and TGW regardless of HIV status, all individuals LWH, solid organ transplant recipients, and individuals with a history of anogenital HSIL or cancer. Although the best age to initiate screening is still unclear, we recommend initiating screening by the age of 45 years, and no earlier than the age of 35 years. Where referral to HRA is available, individuals LWH should be screened via cytology ± hrHPV testing annually, and those not LWH every 1 to 2 years. Where HRA is not available, we recommend annual screening via DARE to evaluate for palpable lesions in the anal canal.

Penis/Scrotum

Rarely, HPV can cause cancer of the penis and scrotum, but the absolute incidence is low. Among MSM, there may be a higher burden of penile HPV infection,[89] but the relation of this to HPV-related cancers of the penis is uncertain. Regarding prevention of penile/scrotal HPV infection among MSM, a recent large-scale systematic review of 62 observational studies demonstrated a clear role for circumcision in prevention of penile HPV infection and transmission,[130] but no prospective trials have examined the role of vaccination in preventing HPV-related penile/scrotal disease. At present, routine screening specifically for penile/scrotal HPV is not recommended in the general population. However, patients should be encouraged to self-inspect their genitals and to come in for evaluation of any abnormalities or lesions. Those with a history of anal or genital tract HSIL or cancer are likely at higher risk and could have visual inspection of the penis and scrotum by their provider at the time of surveillance for their other HSIL or cancer.

Recommendation. No screening recommended in the general population, regardless of sexual orientation or gender identity. We recommend visual inspection of the penis and scrotum at the time of surveillance exam in people with a history of prior anogenital HSIL/cancer.

Oropharynx

Human papillomavirus is associated with up to 80% of oropharyngeal cancers,[131] and the incidence of such cancers has been increasing, with oropharyngeal squamous cell carcinomas cancers now surpassing cervical carcinomas as the most prevalent HPV-associated malignancy in the United States.[132] However, the overall lifetime risk of oropharyngeal carcinoma is low, and risk factors for HPV acquisition and disease progression are not well understood. There is increasing evidence that oral HPV infection is associated with sexual behaviors, including both oral and anogenital sex. Rates of oropharyngeal cancer are highest among MSM, although risk factors for acquisition of oral HPV and development and progression of oral dysplastic lesions are not well documented. In a recent systematic review and meta-analysis, the overall pooled oral HPV positivity rate among MSM was 17%,[133] with HPV-16 being the most commonly detected HPV subtype. The prevalence of oral HPV was higher among MSM LWH compared with MSM not LWH. The overall acquisition of oral HPV infections among MSM seems to be low, and clearance rates of oral HPV infections seem to be high. Among MSM LWH, condomless oral sex seems to be the strongest predictor for incident oral infection with hrHPV, while older age and nadir-CD4 count of less than 200 cells/mm^3 may be associated with reduced HPV clearance among these men.[134]

Presently, there are no validated screening tools for HPV-associated oropharyngeal cancers in clinical practice, and available screening tests have not demonstrated sufficient sensitivity or specificity. Further study is needed to clarify target screening populations and screening frequency as well as the potential benefits and harms of performing large-scale screening. However, a thorough visual examination and palpation performed yearly at the time of dental cleaning is a low-cost and noninvasive method of screening and is recommended in all adults by the American Dental Association.[135,136]

Recommendation. We recommend an annual dental examination for all patients, at which the patient can receive oral cancer screening through inspection and palpation of the oral cavity and neck.

Vaccination

Vaccination against HPV is the only primary prevention strategy against anogenital warts and cancer. Routine HPV vaccination is recommended for all individuals starting at the age of 9 years and continued through the age of 26 years. The nanovalent vaccine (9vHPV) is the only vaccine currently available in the United States, and HPV vaccines have been found to have high efficacy for the prevention of cervical HSIL and anogenital warts when vaccination is initiated among individuals with a cervix ages 9 through 26 years.[137] In 2018, the FDA approved the 9vHPV for persons aged 27 through 45 years. The Centers for Disease Control and Prevention Advisory Committee on Immunization Practices does not recommend routine vaccination for all adults in this age range. Instead, they recommend using shared clinical decision making to provide individualized recommendations in this population specifically for those not previously vaccinated.

Despite high prevalence of HPV infection among MSM, as many as two-thirds of MSM are naive to one or more HPV vaccine subtypes.[91] As many as 80% are negative for HPV-16 and 90% are negative for HPV-18.[86] Vaccination is more likely to be effective when initiated among young MSM before sexual activity, but even among sexually active MSM vaccine-preventable subtypes of HPV are not ubiquitous, indicating a potential role for vaccination even at later ages. Among MSM with a history of anal HSIL, use of the quadrivalent HPV vaccine may decrease recurrence risk[138] and lifetime risk of anal cancer.[139] It should be noted, however, that recent randomized control trials have shown less promise in the prevention of recurrent disease than these initial studies, and thus the benefits of vaccination as an adjuvant treatment in patients with preexisting high-grade disease should be discussed with prudence.[140,141] Nonetheless, although catch-up vaccination in MSM older than 27 years has been shown to have slightly decreased efficacy due to early exposure to HPV subtypes, there does seem to be a benefit in protecting against new HPV infections and resultant disease.[142]

Despite recommendations, vaccination rates lag behind targets across populations, and SGM populations continue to face barriers to vaccine uptake. Initial vaccination efforts in the United States offered a girls-only strategy, with the rationale that male sexual partners would benefit from a herd immunity. However, while rates of anogenital warts decreased among cisgender heterosexual males after the introduction of girls-only vaccination strategies,[143] numerous large-scale studies failed to show any reduction among MSM and even demonstrated an increase among older MSM aged 18–24 years.[143–145] It was clear that MSM are excluded from herd immunity. The US was the first country to start vaccinating boys, and the recommendations now include any gender.[137]

Among cisgender and transgender MSM, research has generally shown high willingness to accept HPV vaccination when offered. There is wide agreement in the literature regarding high vaccine acceptability among MSM and TGW.[146–151] In fact, MSM may be more likely than heterosexual counterparts to accept vaccination, independent of HIV status.[152] This is despite relatively low levels of HPV-related knowledge and is highly sensitive to education and provider recommendation. Trends vary, particularly geographically and by age and racial/ethnic background, but vaccination rates do seem to be improving among MSM.[119] In countries where widespread vaccination programs have been implemented targeting MSM, completion rates may approach 40%.[119,153]

However, disparities exist, and among Black and Latino young MSM in the United States, completion rates are as low as 5%.[123,154] Low HPV knowledge may be of a particular concern among diverse MSM and interestingly may cross geographic borders. Awareness of an HPV vaccine varied between 3% and 30% among ethnic minority MSM from Serbia, China, Puerto Rico, and the United States,[98,155–159] and although low awareness was initially correlated with low willingness to receive the vaccine, this seems to be highly sensitive to education.[146,156,160]

Importantly, while anal HPV is highly prevalent among TGW, Meites et al.[86] demonstrated that only a minority (8%) of sexually active TGW will test positive for all HPV subtypes covered in the quadrivalent HPV vaccine, indicating that HPV vaccination would still have protective utility.

Cost may represent an important potentially modifiable barrier to vaccination among LGBTQIA+ populations. There is low willingness to pay for the vaccine among WSW and MSM,[146,150,159,161,162] but nearly all would accept the vaccine if it were offered free of charge in a study of MSM in China.[163] This sensitivity to cost may be especially true among WSW. Among cisgender WSW, uptake varies (8.5%–20%[34,164,165]), and data are conflicting regarding comparison with heterosexual women, but completion rates are generally below national averages and well below target goals.[166] However, recent studies show that while uptake rates were low among WSW initially, where national policies have been implemented that include insurance coverage for HPV vaccination, WSW may be more likely to initiate vaccination.[167,168] This is a trend not observed among their heterosexual counterparts, suggesting that vaccination among WSW may be highly sensitive to cost and insurance coverage.

Among transgender populations, HPV vaccine uptake was better predicted by their assigned birth sex than by their gender identity,[169] despite evidence that TGW are very willing to receive the HPV vaccine if offered by health care providers,[146] findings which prompted the authors of this study to suggest that providers may be overlooking gender identity in vaccine recommendations. Transgender women are also less likely to be offered the HPV vaccine and have lower HPV-related knowledge than cisgender women.[146,147,169]

In a large cross-sectional online survey of 3258 transgender and gender diverse (TGD) and cisgender sexual minority participants, TGD were overall more likely to report HPV vaccination than cisgender respondents.[170] Conversely, TGD participants were more likely to report HPV vaccination if they obtained information on the vaccine from a social media networking site, suggesting a potential positive effect from peer validation. Low vaccine uptake among TGW means providers must rely upon secondary prevention efforts to lower the burden of anal cancer in TGW.

Numerous studies have demonstrated that one of the strongest facilitators of HPV vaccine completion among SGM populations is provider recommendation.[98,154,171–175] In one study, SGM patients were more than 40 times more likely to initiate vaccination when recommended by a provider.[169] Despite this, rates of provider recommendation may be very low, with as few as 10% of patients reporting receiving a recommendation from a provider.[176] Therefore, we recommend that providers initiate discussion regarding HPV vaccination among all age-eligible SGM individuals.

Recommendation. Human papillomavirus vaccination per the Centers for Disease Control and Prevention Advisory Committee on Immunization Practices guidelines regardless of sexual orientation or gender identity. We emphasize the importance of early HPV vaccination among children and adolescents, to maximize the potential for primary prevention. However, strongly consider vaccination up to the age of 45 years for individuals with ongoing risk factors for new or persistent HPV infections.

CONCLUSIONS

In summary, we recommend an organ-based approach to screening for HPV-related cancers in the SGM population. This approach takes into account (1) the patient's current anatomy, to know what organs are at risk of developing cancer, and (2) what sexual behaviors the patient engages in or has engaged in, to understand better whether they are at elevated risk for the various cancers, and also to improve overall sexual and reproductive health care of the patient.

A strength of this review was the comprehensive and spanning literature review on HPV-related disease among SGM populations. We acknowledge that a limitation of this study was the inability to perform a systematic review because of inconsistent terminology and a wide variety of study methodologies. In addition, because of a paucity of randomized control trial data, we were unfortunately unable to provide commentary on the strength of recommendations. Recommendations provided in this review are expert opinion. Nonetheless, with these recommendations, we hope to dispel common myths about cancer risk in SGM populations that have led to inconsistent and inadequate cancer screening. It is our hope that going forward, clinicians and researchers will use the organ-based approach advocated in this review in conjunction with behavioral risk stratification to move toward a more simplified approach to screening for HPV-related cancers.

Despite these gaps in data, steps can be taken to make clinical and investigational environments more inclusive and welcoming for SGM populations. These first steps will be catalytic in overcoming care barriers and information gaps. We suggest 3 principles of care for SGM people to help identify gaps in care.[177]

(1) Care for SGM people is the same as care for cisgender straight people. All people get colds, flu, and illnesses such as cancer irrespective of sexual orientation and gender identity and every health care system should be comfortable caring for SGM people in every care domain.
(2) Care for SGM people is different than care for non-SGM people precisely because they are living in a world that is designed for non-SGM people. For example, wedding magazines, dating quizzes, “women's” and “men's” sections of clothing stores, and gender-specific facilities all underscore that SGM people are living in a world that excludes their life experiences as part of the norm.
(3) Finally, consider each SGM person as an individual and specify care appropriately. This is true for SGM and non-SGM people alike, but with SGM, the risk of extrapolating from small studies and limited evidence can make generalizations all the more problematic.

Creating an Inclusive Clinic Environment

To provide inclusive care, all clinical environments must undergo a comprehensive assessment of all points of contact with

Box 2 Making Care Environment Inclusive: The 4 Doors Question Model [177].

Consider 4 "doors" or critical contact points to making spaces inclusive for LGBTQIA+* people.

1. **What happens when someone comes in the door?** This pertains to the built environment, signage, colors, magazines, informational materials, and the capacity of all staff includes at parking, check-in, financial, and administrative staff to collectively create a safe and welcoming environment for people of all genders, gender expressions, sexualities, and with family constellations. For example, having a "Women's Clinic" as the only space for colposcopy would be exclusionary of transgender men.
2. **What happens behind closed doors?** This refers to components of the history and physical. Are providers trained and capable of include pertinent but not exhibitionist questions about sexual orientation, gender identity, sex assigned at birth, current organs, use of gender-affirming hormones and surgeries, sexual partners, family supports/partner(s)?
3. **What happens between doors?** How is SGM** status communicated in referrals and collaborations between providers and throughout the health systems? How does your system communicate between providers about names, pronouns, use of gender-affirming hormones, etc. Examples include noting someone's gender identity, pronouns, natal organs, and/or hormones used on an ultrasound or cytology requisition to facilitate respectful and accurate care and appropriate interpretation.
4. **What happens to bring people in the door?** With at least 7.1% of the US population identifying as SGM and 20.8% of Generation Z adults identifying as LGBTQIA, we need to ensure that we are destinations of choice for SGM people. All advertising materials, signage, and staff should be trained to consider what might help bridge access gaps for LGBTQIA+ people in all we do. There are now several resources to help guide systematic change toward inclusion and belonging and we encourage every provider and institution to consider locally relevant solutions to guide meaningful change to making environments welcoming.

patients and assess whether they are welcoming and inclusive of SGM people. Alexis Light and Juno Obedin-Maliver provided a model for inclusive care in their article "Opening the Ob/Gyn doors for sexual and gender minority patients."[177] Because details of what will be needed will vary by practice setting, "the 4 doors" model is a helpful framework to consider (see Box 2 hereinafter): (1) what happens when someone comes in the door? This is a virtual and physical door and pertains to all the features that would invite or deter someone from care. This includes signage, language, and color scheme. Common issues arise in considering places that reference only care for "women," which excludes people of other genders or images that only portray heterosexual appearing couples in reproductive health settings. Attention should also be paid to other axes of diversity such as race/ethnicity, socioeconomic status, age, and language. The first door also pertains to human resources and how people are greeted by clinical and administrative staff, how identity is verified, and whether people are comfortable using someone's affirmed identity as distinct from legal one. (2) Next, consider what happens behind closed doors or in the examination room. Are providers trained and knowledgeable in working with SGM people? Do they consider variations in family structure, romantic, and sexual partners? Do they know how to assess and consider gender-affirming hormone use, surgeries, their benefits, and sequelae? (3) Then, how do providers facilitate culturally humble communications with others' that relay meaningful information? For example, when placing an order for a cytology on a TGM, it should be noted with the pathology report that the individual is on testosterone as it may affect cervical cytology results. In addition, if a transgender woman with a finding on anoscopy is referred for imaging, it should be noted that she is a transgender woman and was born with a prostate so the radiologist can appropriately interpret the imaging. (4) Finally, we should all consider how we can become destinations of choice for SGM people who are thought to comprise at least 7.1% of the current adult population and up to 20.8% of younger generations.[178] There are several helpful references that can guide making clinical spaces more inclusive, and we direct interested readers to them.[179–182]

FUTURE DIRECTIONS

While cancer screening and prevention in SGM populations have seen many advancements in recent decades, there remain several opportunities for future research. Literature specifically addressing HPV-related disease in transgender and gender-diverse populations is sparse, and effective strategies are needed for primary and secondary prevention that take into consideration the unique barriers and needs as well as the strengths of transgender and gender diverse communities. Given the sensitivity of vaccine uptake to cost among SGM populations, we suggest that consideration be given to increasing programmatic funding to provide free-of-charge HPV vaccination among SGM populations. This review did not specifically address the population of TGM who identify as MSM and thus may be at increased risk for anal HPV and anal cancer. There is a paucity of data on this topic, and it merits further exploration to inform recommendations regarding cancer screening in this population. Furthermore, oropharyngeal cancer is increasingly emerging as a significant contributor to HPV-related cancers, but an effective screening method has yet to be determined, although there have been recent advancements in biomarker technology. Collaboration between head and neck specialists and lower genital tract HPV experts is needed to continue to advance screening options and to promote dialog between the 2 communities as the body of scientific evidence continues to expand.

Given the paucity of population-specific data as well as the need to create inclusive and affirming environments, it is incumbent upon all clinicians and investigators to ask about sexual orientation, gender identity, sex assigned at birth, current anatomy, and distinction from sexual behaviors.[1,183] Once these questions are asked, the clinician can move on to the risk assessment and make appropriate recommendations regarding screening for HPV-related cancers.

This review is meant to be a guide for clinicians to determine the appropriate screening timing and modality for organs at risk of HPV-related neoplasia in SGM patients. The shift in language to organ-based screening recommendations is reflective of a broad approach that has been embraced by the scientific and LGBTQIA+ communities to promote inclusiveness and to provide clarity among many myths and confusions in the care of SGM patients. We encourage clinicians to perform a thoughtful inventory of organs, specifically the organs at risk of HPV-related neoplasia that may be present for each patient, and to determine the optimal timing and modality of screening using the recommendations of this review in conjunction with shared clinical decision making between patient and provider. We also strongly encourage all providers to recommend HPV vaccination to all patients within vaccine-eligible age ranges, regardless of sexual orientation or gender identity.

* Lesbian, gay, bisexual, transgender, queer, intersex, asexual, and other.
** Sex and gender minority.

REFERENCES

1. Moseson H, et al. The imperative for transgender and gender nonbinary inclusion: beyond women's health. *Obstet Gynecol* 2020;135: 1059–68.
2. Clifford GM, Georges D, Shiels MS, et al. A meta-analysis of anal cancer incidence by risk group: toward a unified anal cancer risk scale. *Int J Cancer* 2021;148:38–47.
3. Simelela PN. WHO global strategy to eliminate cervical cancer as a public health problem: an opportunity to make it a disease of the past. *Int J Gynaecol Obstet* 2021;152:1–3.
4. Institute of Medicine Committee on Lesbian, G.B, et al. *The National Academies Collection: Reports funded by National Institutes of Health, in The Health of Lesbian, Gay, Bisexual, and Transgender People: Building a Foundation for Better Understanding*. Washington (DC): National Academies Press (US), National Academy of Sciences; 2011.
5. Eliseo J, Pérez-Stable, MD, NIMHD director statement in support of diverse and inclusive speaking panels. June 21, 2019. Available at: https://www.nimhd.nih.gov/about/directors-corner/messages/message_06-21-19.html. Accessed May 30, 2023.
6. ACOG Committee on Health Care for Underserved Women. Health care for transgender and gender diverse individuals: ACOG Committee Opinion, Number 823. *Obstet Gynecol* 2021;137:e75–88.
7. ACOG Committee on Health Care for Underserved Women. ACOG Committee Opinion No. 525: health care for lesbians and bisexual women. *Obstet Gynecol* 2012;119:1077–80.
8. National Academies of Sciences, Engineering, and Medicine. *Measuring Sex, Gender Identity, and Sexual Orientation*. Washington, DC: The National Academies Press; 2022. Available at: https://doi.org/10.17226/26424. Accessed May 30, 2023.
9. Alpert AB, Mehringer JE, Orta SJ, et al. Experiences of transgender people reviewing their electronic health records, a qualitative study. *J Gen Intern Med* 2022;38:970–7.
10. Brandt JS, Eichelberger KY, Wong MS. Society for Maternal-Fetal Medicine Special Statement: Commitment to excellence in obstetrical care, research, and education for people with diverse sexual and gender identities. *Am J Obstet Gynecol* 2022;226:B10–2.
11. World Cancer Research Fund International. Cervical cancer statistics. 2022. Available at: https://www.wcrf.org/cancer-trends/cervical-cancer-statistics/. Accessed May 30, 2023.
12. Human papillomavirus vaccination: ACOG Committee Opinion, Number 809. *Obstet Gynecol* 2020;136:e15–21.
13. American College of Obstetricians and Gynecologists Practice Advisory: Updated Cervical Cancer Screening Guidelines. April 2021, reaffirmed April 2023. Available at: https://www.acog.org/clinical/clinical-guidance/practice-advisory/articles/2021/04/updated-cervical-cancer-screening-guidelines. Accessed May 30, 2023.
14. US Preventive Services Task Force, Curry SJ, Krist AH, Owens DK, et al. Screening for cervical cancer: US Preventive Services Task Force recommendation statement. *JAMA* 2018;320:674–86.
15. Gorgos LM, Marrazzo JM. Sexually transmitted infections among women who have sex with women. *Clin Infect Dis* 2011;53(suppl 3):S84–91.
16. Massad LS, Xie X, Minkoff H, et al. Abnormal pap tests and human papillomavirus infections among HIV-infected and uninfected women who have sex with women. *J Low Genit Tract Dis* 2014;18:50–6.
17. Marrazzo JM, Koutsky LA, Kiviat NB, et al. Papanicolaou test screening and prevalence of genital human papillomavirus among women who have sex with women. *Am J Public Health* 2001;91:947–52.
18. Schulte-Frohlinde R, Georges D, Clifford GM, et al. Predicting cohort-specific cervical cancer incidence from population-based surveys of human papilloma virus prevalence: a worldwide study. *Am J Epidemiol* 2022;191:402–12.
19. Price JH, Easton AN, Telljohann SK, et al. Perceptions of cervical cancer and Pap smear screening behavior by women's sexual orientation. *J Community Health* 1996;21:89–105.
20. Marrazzo JM, Koutsky LA, Stine KL, et al. Genital human papillomavirus infection in women who have sex with women. *J Infect Dis* 1998;178: 1604–9.
21. Učakar V, Jelen MM, Faust H, et al. Pre-vaccination seroprevalence of 15 human papillomavirus (HPV) types among women in the population-based Slovenian cervical screening program. *Vaccine* 2013;31:4935–9.
22. Aminu M, Gwafan J, Inabo H, et al. Seroprevalence of human papillomavirus immunoglobulin G antibodies among women presenting at the reproductive health clinic of a university teaching hospital in Nigeria. *Int J Womens Health* 2014;6:479–87.
23. Pérez-Caraballo AM, Suarez E, Unger ER, et al. Seroprevalence of human papillomavirus (HPV) type 6, 11, 16, 18, by anatomic site of HPV infection, in women aged 16-64 years living in the metropolitan area of San Juan, Puerto Rico. *P R Health Sci J* 2018;37:26–31.
24. Boehmer U, Miao X, Linkletter C, et al. Adult health behaviors over the life course by sexual orientation. *Am J Public Health* 2012;102:292–300.
25. Brown JP, Tracy JK. Lesbians and cancer: an overlooked health disparity. *Cancer Causes Control* 2008;19:1009–20.
26. Everett B, Mollborn S. Differences in hypertension by sexual orientation among U.S. Young adults. *J Community Health* 2013;38:588–96.
27. McCauley HL, Silverman JG, Decker MR, et al. Sexual and reproductive health indicators and intimate partner violence victimization among female family planning clinic patients who have sex with women and men. *J Womens Health (Larchmt)* 2015;24:621–8.
28. Kerker BD, Mostashari F, Thorpe L. Health care access and utilization among women who have sex with women: sexual behavior and identity. *J Urban Health* 2006;83:970–9.
29. Makris N, Vena C, Paul S. Rate and predictors of human papillomavirus vaccine uptake among women who have sex with women in the United States, the National Health and Nutrition Examination Survey, 2009–2012. *J Clin Nurs* 2016;25(23–24):3619–27.
30. Charlton BM, Corliss HL, Missmer SA, et al. Reproductive health screening disparities and sexual orientation in a cohort study of U.S. adolescent and young adult females. *J Adolesc Health* 2011;49:505–10.
31. Diamond LM. Sexual identity, attractions, and behavior among young sexual-minority women over a 2-year period. *Dev Psychol* 2000; 36:241–50.
32. Buchmueller T, Carpenter CS. Disparities in health insurance coverage, access, and outcomes for individuals in same-sex versus different-sex relationships, 2000–2007. *Am J Public Health* 2010;100:489–95.
33. Agénor M, Krieger N, Austin SB, et al. At the intersection of sexual orientation, race/ethnicity, and cervical cancer screening: assessing Pap test use disparities by sex of sexual partners among black, Latina, and white U.S. women. *Soc Sci Med* 2014;116:110–8.
34. Agénor M, Muzny CA, Schick V, et al. Sexual orientation and sexual health services utilization among women in the United States. *Prev Med* 2017;95:74–81.
35. McIntyre L, Szewchuk A, Munro J. Inclusion and exclusion in mid-life lesbians' experiences of the Pap test. *Cult Health Sex* 2010;12:885–98.
36. Polek C, Hardie T. Lesbian women and knowledge about human papillomavirus. *Oncol Nurs Forum* 2010;37:E191–7.
37. Bailey JV, Kavanagh J, Owen C, et al. Lesbians and cervical screening. *Br J Gen Pract* 2000;50:481–2.
38. Waterman L, Voss J. HPV, cervical cancer risks, and barriers to care for lesbian women. *Nurse Pract* 2015;40:46–53 quiz 53-4.
39. Tracy JK, Lydecker AD, Ireland L. Barriers to cervical cancer screening among lesbians. *J Womens Health (Larchmt)* 2010;19:229–37.

40. Agénor M, Bailey Z, Krieger N, et al. Exploring the cervical cancer screening experiences of black Lesbian, bisexual, and queer women: the role of patient-provider communication. *Women Health* 2015;55:717–36.
41. Johnson MJ, Mueller M, Eliason MJ, et al. Quantitative and mixed analyses to identify factors that affect cervical cancer screening uptake among lesbian and bisexual women and transgender men. *J Clin Nurs* 2016;25(23–24):3628–42.
42. ACOG Committee Opinion No. 428: legal status: health impact for lesbian couples. *Obstet Gynecol* 2009;113(2 Pt 1):469–72.
43. Branković I, Verdonk P, Klinge I. Applying a gender lens on human papillomavirus infection: cervical cancer screening, HPV DNA testing, and HPV vaccination. *Int J Equity Health* 2013;12:14.
44. Curmi C, Peters K, Salamonson Y. Lesbians' attitudes and practices of cervical cancer screening: a qualitative study. *BMC Womens Health* 2014; 14:153.
45. Stenzel AE, Moysich KB, Ferrando CA, et al. Clinical needs for transgender men in the gynecologic oncology setting. *Gynecol Oncol* 2020;159:899–905.
46. D'Hoore L, T'Sjoen G. Gender-affirming hormone therapy: an updated literature review with an eye on the future. *J Intern Med* 2022; 291:574–92.
47. James SE, Herman JL, Rankin S, et al. *The Report of the 2015 U.S. Transgender Survey.* Washington, DC: National Center for Transgender Equality; 2016:1–297.
48. Peitzmeier SM, Khullar K, Reisner SL, et al. Pap test use is lower among female-to-male patients than non-transgender women. *Am J Prev Med* 2014;47:808–12.
49. Gatos KC. A literature review of cervical cancer screening in transgender men. *Nurs Womens Health* 2018;22:52–62.
50. Tabaac AR, Sutter ME, Wall CSJ, et al. Gender identity disparities in cancer screening behaviors. *Am J Prev Med* 2018;54:385–93.
51. Peitzmeier SM, Reisner SL, Harigopal P, et al. Female-to-male patients have high prevalence of unsatisfactory Paps compared to non-transgender females: implications for cervical cancer screening. *J Gen Intern Med* 2014;29:778–84.
52. Sterling J, Garcia MM. Cancer screening in the transgender population: a review of current guidelines, best practices, and a proposed care model. *Transl Androl Urol* 2020;9:2771–85.
53. Reiter PL, McRee AL, Katz ML, et al. Human papillomavirus vaccination among young adult gay and bisexual men in the United States. *Am J Public Health* 2015;105:96–102.
54. McDowell M, Pardee DJ, Peitzmeier S, et al. Cervical cancer screening preferences among trans-masculine individuals: patient-collected human papillomavirus vaginal swabs versus provider-administered Pap tests. *LGBT Health* 2017;4:252–9.
55. Seay J, Ranck A, Weiss R, et al. Understanding transgender men's experiences with and preferences for cervical cancer screening: a rapid assessment survey. *LGBT Health* 2017;4:304–9.
56. Arbyn M, Smith SB, Temin S, et al. Detecting cervical precancer and reaching underscreened women by using HPV testing on self samples: updated meta-analyses. *BMJ* 2018;363:k4823.
57. Coleman E, Radix AE, Bouman WP, et al. Standards of care for the health of transgender and gender diverse people, version 8. *Int J Transgend Health* 2022;23(sup1):S1–S259.
58. Aho M, Vesterinen E, Meyer B, et al. Natural history of vaginal intraepithelial neoplasia. *Cancer* 1991;68:195–7.
59. Viens LJ, Henley SJ, Watson M, et al. Human papillomavirus-associated cancers—United States, 2008–2012. *MMWR Morb Mortal Wkly Rep* 2016;65:661–6.
60. Castle PE, Rodriguez AC, Porras C, et al. A comparison of cervical and vaginal human papillomavirus. *Sex Transm Dis* 2007;34:849–55.
61. Castle PE, Schiffman M, Glass AG, et al. Human papillomavirus prevalence in women who have and have not undergone hysterectomies. *J Infect Dis* 2006;194:1702–5.
62. Castle PE, Schiffman M, Bratti MC, et al. A population-based study of vaginal human papillomavirus infection in hysterectomized women. *J Infect Dis* 2004;190:458–67.
63. Fontham ETH, Wolf AMD, Church TR, et al. Cervical cancer screening for individuals at average risk: 2020 guideline update from the American Cancer Society. *CA Cancer J Clin* 2020;70:321–46.
64. Strander B, Andersson-Ellström A, Milsom I, et al. Long term risk of invasive cancer after treatment for cervical intraepithelial neoplasia grade 3: population based cohort study. *BMJ* 2007;335:1077.
65. Alfonzo E, Holmberg E, Sparén P, et al. Risk of vaginal cancer among hysterectomised women with cervical intraepithelial neoplasia: a population-based national cohort study. *BJOG* 2020;127:448–54.
66. Perkins RB, Guido RL, Saraiya M, et al. Summary of current guidelines for cervical cancer screening and management of abnormal test results: 2016–2020. *J Womens Health (Larchmt)* 2021;30:5–13.
67. Khan MJ, Massad LS, Kinney W, et al. A common clinical dilemma: management of abnormal vaginal cytology and human papillomavirus test results. *J Low Genit Tract Dis* 2016;20:119–25.
68. van der Sluis WB, Buncamper ME, Bouman MB, et al. Prevalence of neovaginal high-risk human papillomavirus among transgender women in the Netherlands. *Sex Transm Dis* 2016;43:503–5.
69. Fierz R, Ghisu GP, Fink D. Squamous carcinoma of the neovagina after male-to-female reconstruction surgery: a case report and review of the literature. *Case Rep Obstet Gynecol* 2019;2019:4820396.
70. van der Sluis WB, Buncamper ME, Bouman MB, et al. Symptomatic HPV-related neovaginal lesions in transgender women: case series and review of literature. *Sex Transm Infect* 2016;92:499–501.
71. Siegel RL, Miller KD, Fuchs HE, et al. Cancer statistics, 2022. *CA Cancer J Clin* 2022;72:7–33.
72. Siegel RL, Miller KD, Wagle NS, et al. Cancer statistics, 2023. *CA Cancer J Clin* 2023;73:17–48.
73. Preti M, Joura E, Vieira-Baptista P, et al. The European Society of Gynaecological Oncology (ESGO), the International Society for the Study of Vulvovaginal Disease (ISSVD), the European College for the Study of Vulval Disease (ECSVD) and the European Federation for Colposcopy (EFC) consensus statements on pre-invasive vulvar lesions. *Int J Gynecol Cancer* 2022;32:830–45.
74. Judson PL, Habermann EB, Baxter NN, et al. Trends in the incidence of invasive and in situ vulvar carcinoma. *Obstet Gynecol* 2006;107:1018–22.
75. Bodelon C, Madeleine MM, Voigt LF, et al. Is the incidence of invasive vulvar cancer increasing in the United States? *Cancer Causes Control* 2009;20:1779–82.
76. Hall KL, Dewar MA, Perchalski J. Screening for gynecologic cancer. Vulvar, vaginal, endometrial, and ovarian neoplasms. *Prim Care* 1992;19: 607–20.
77. Reusser NM, Downing C, Guidry J, et al. HPV carcinomas in immunocompromised patients. *J Clin Med* 2015;4:260–81.
78. Casolati E, Agarossi A, Valieri M, et al. Vulvar neoplasia in HIV positive women: a review. *Med Wieku Rozwoj* 2003;7(4 Pt 1):487–93.
79. Moscicki AB, Darragh TM, Berry-Lawhorn JM, et al. Screening for anal cancer in women. *J Low Genit Tract Dis* 2015;19(3 suppl 1):S27–42.
80. Chaturvedi AK, Engels EA, Gilbert ES, et al. Second cancers among 104,760 survivors of cervical cancer: evaluation of long-term risk. *J Natl Cancer Inst* 2007;99:1634–43.
81. Wentzensen N, Schiffman M, Silver MI, et al. ASCCP colposcopy standards: risk-based colposcopy practice. *J Low Genit Tract Dis* 2017;21:230–4.
82. Stier EA, Chigurupati NL, Fung L. Prophylactic HPV vaccination and anal cancer. *Hum Vaccin Immunother* 2016;12:1348–51.

83. Mix J, Saraiya M, Lynch CF, et al. Comparing human papillomavirus prevalence in rectal and anal cancer using US cancer registries, 2014–2015. *J Registry Manag* 2019;46:128–32.
84. Palefsky JM, Shiboski S, Moss A. Risk factors for anal human papillomavirus infection and anal cytologic abnormalities in HIV-positive and HIV-negative homosexual men. *J Acquir Immune Defic Syndr (1988)* 1994;7:599–606.
85. Halkitis PN, Valera P, LoSchiavo CE, et al. Human papillomavirus vaccination and infection in young sexual minority men: the P18 Cohort Study. *AIDS Patient Care STDS* 2019;33:149–56.
86. Meites E, Gorbach PM, Gratzer B, et al. Monitoring for human papillomavirus vaccine impact among gay, bisexual, and other men who have sex with men—United States, 2012–2014. *J Infect Dis* 2016;214: 689–96.
87. Hidalgo-Tenorio C, Ramírez-Taboada J, Gil-Anguita C, et al. Safety and immunogenicity of the quadrivalent human papillomavirus (qHPV) vaccine in HIV-positive Spanish men who have sex with men (MSM). *AIDS Res Ther* 2017;14:34.
88. Giuliani M, Latini A, Colafigli M, et al. Vaccine-preventable anal infections by human papillomavirus among HIV-infected men who have sex with men. *Future Microbiol* 2018;13:1463–72.
89. Kahn JA, Belzer M, Chi X, et al. Pre-vaccination prevalence of anogenital and oral human papillomavirus in young HIV-infected men who have sex with men. *Papillomavirus Res* 2019;7:52–61.
90. King EM, Gilson R, Beddows S, et al. Human papillomavirus DNA in men who have sex with men: type-specific prevalence, risk factors and implications for vaccination strategies. *Br J Cancer* 2015;112:1585–93.
91. Singh V, Crosby RA, Gratzer B, et al. Transgender women have higher human papillomavirus prevalence than men who have sex with men—two U.S. cities, 2012–2014. *Sex Transm Dis* 2019;46:657–62.
92. dos Ramos Farías MS, Picconi MA, Garcia MN, et al. Human papilloma virus genotype diversity of anal infection among trans (male to female transvestites, transsexuals or transgender) sex workers in Argentina. *J Clin Virol* 2011;51:96–9.
93. Brown B, Poteat T, Marg L, et al. Human papillomavirus–related cancer surveillance, prevention, and screening among transgender men and women: neglected populations at high risk. *LGBT Health* 2017; 4:315–9.
94. IKJ Wong, Poynten IM, Cornall A, et al. Sexual behaviours associated with incident high-risk anal human papillomavirus among gay and bisexual men. *Sex Transm Infect* 2022;98:101–7.
95. Looker KJ, Rönn MM, Brock PM, et al. Evidence of synergistic relationships between HIV and human papillomavirus (HPV): systematic reviews and meta-analyses of longitudinal studies of HPV acquisition and clearance by HIV status, and of HIV acquisition by HPV status. *J Int AIDS Soc* 2018;21:e25110.
96. Palefsky JM, Holly EA, Ralston ML, et al. Anal squamous intraepithelial lesions in HIV-positive and HIV-negative homosexual and bisexual men: prevalence and risk factors. *J Acquir Immune Defic Syndr Hum Retrovirol* 1998;17:320–6.
97. Robbins HA, Wiley DJ, Ho K, et al. Patterns of repeated anal cytology results among HIV-positive and HIV-negative men who have sex with men. *Papillomavirus Res* 2018;5:143–9.
98. Colón-López V, Del Toro-Mejías LM, Ortiz AP, et al. HPV awareness and willingness to HPV vaccination among high-risk men attending an STI clinic in Puerto Rico. *P R Health Sci J* 2012;31:227–31.
99. Bertisch B, Franceschi S, Lise M, et al. Risk factors for anal cancer in persons infected with HIV: a nested case-control study in the Swiss HIV Cohort Study. *Am J Epidemiol* 2013;178:877–84.
100. Brennan J, Kuhns LM, Johnson AK, et al. Syndemic theory and HIV-related risk among young transgender women: the role of multiple, co-occurring health problems and social marginalization. *Am J Public Health* 2012;102:1751–7.
101. Nemoto T, Iwamoto M, Perngparn U, et al. HIV-related risk behaviors among kathoey (male-to-female transgender) sex workers in Bangkok, Thailand. *AIDS Care* 2012;24:210–9.
102. Winter S. *Lost in Transition: Transgender People, Rights and HIV Vulnerability in the Asia-Pacific Region., in UNDP Asia Pacific Regional Center*. Bangkok; 2012. Available at: https://weareaptn.org/resource/lost-in-transition-transgender-people-rights-and-hiv-vulnerability-in-the-asia-pacific-region/. Accessed May 30, 2023.
103. Grant J, Mottet LA, Tanis J, et al. *Injustice at Every Turn: A Report of the National Transgender Discrimination Survey*. Washington: National Center for Transgender Equality and National Gay and Lesbian Task Force; 2011.
104. Fernandes FR, Zanini PB, Rezende GR, et al. Syphilis infection, sexual practices and bisexual behaviour among men who have sex with men and transgender women: a cross-sectional study. *Sex Transm Infect* 2015; 91:142–9.
105. Chen MJ, Scheer S, Nguyen TQ, et al. HIV coinfection among persons diagnosed as having sexually transmitted diseases, San Francisco, 2007 to 2014. *Sex Transm Dis* 2018;45:563–72.
106. Bastos FI, Bastos LS, Coutinho C, et al. HIV, HCV, HBV, and syphilis among transgender women from Brazil: assessing different methods to adjust infection rates of a hard-to-reach, sparse population. *Medicine (Baltimore)* 2018;97(1S suppl 1):S16–s24.
107. Melendez RM, Pinto R. It's really a hard life': love, gender and HIV risk among male-to-female transgender persons. *Cult Health Sex* 2007;9:233–45.
108. Sevelius JM. Gender affirmation: a framework for conceptualizing risk behavior among transgender women of color. *Sex Roles* 2013;68(11–12): 675–89.
109. Roberts JM, Thurloe JK. Comparison of the performance of anal cytology and cervical cytology as screening tests. *Sex Health* 2012;9:568–73.
110. Hillman RJ, Cuming T, Darragh T, et al. 2016 IANS International Guidelines for Practice Standards in the Detection of Anal Cancer Precursors. *J Low Genit Tract Dis* 2016;20:283–91.
111. Clarke MA, Deshmukh AA, Suk R, et al. A systematic review and meta-analysis of cytology and HPV-related biomarkers for anal cancer screening among different risk groups. *Int J Cancer* 2022;151:1889–901.
112. Khattab R, McMeekin E, Taege AJ, et al. Unsatisfactory exfoliative anal cytology samples, 15-year experience with histologic, cytologic, and molecular follow-up. *Diagn Cytopathol* 2018;46:117–21.
113. Templeton DJ, Roberts JM, Poynten IM, et al. Prevalence and predictors of unsatisfactory anal cytology tests in a cohort of gay and bisexual men in Sydney, Australia: baseline findings from the Study of the Prevention of Anal Cancer (SPANC). *Eur J Cancer Prev* 2017;26:212–6.
114. Clarke MA, Cheung LC, Lorey T, et al. 5-Year prospective evaluation of cytology, human papillomavirus testing, and biomarkers for detection of anal precancer in human immunodeficiency virus-positive men who have sex with men. *Clin Infect Dis* 2019;69:631–8.
115. Viciana P, Milanés-Guisado Y, Fontillón M, et al. High-risk human papilloma virus testing improves diagnostic performance to predict moderate- to high-grade anal intraepithelial neoplasia in human immunodeficiency virus-infected men who have sex with men in low-to-absent cytological abnormalities. *Clin Infect Dis* 2019;69:2185–92.
116. Hillman RJ, Berry-Lawhorn JM, Ong JJ, et al. International Anal Neoplasia Society Guidelines for the Practice of Digital Anal Rectal Examination. *J Low Genit Tract Dis* 2019;23:138–46.
117. Palefsky JM, Lee JY, Jay N, et al. Treatment of anal high-grade squamous intraepithelial lesions to prevent anal cancer. *N Engl J Med* 2022;386: 2273–82.
118. Supindham T, Chariyalertsak S, Utaipat U, et al. High prevalence and genotype diversity of anal HPV infection among MSM in Northern Thailand. *PloS One* 2015;10:e0124499.

119. Meites E, Winer RL, Newcomb ME, et al. Vaccine effectiveness against prevalent anal and oral human papillomavirus infection among men who have sex with men—United States, 2016–2018. *J Infect Dis* 2020;222: 2052–60.
120. Chin-Hong PV, Vittinghoff E, Cranston RD, et al. Age-related prevalence of anal cancer precursors in homosexual men: the EXPLORE study. *J Natl Cancer Inst* 2005;97:896–905.
121. Ruanpeng D, Chariyalertsak S, Kaewpoowat Q, et al. Cytological anal squamous intraepithelial lesions associated with anal high-risk human papillomavirus infections among men who have sex with men in Northern Thailand. *PloS One* 2016;11:e0156280.
122. Arora R, Pandhi D, Mishra K, et al. Anal cytology and p16 immunostaining for screening anal intraepithelial neoplasia in HIV-positive and HIV-negative men who have sex with men: a cross-sectional study. *Int J STD AIDS* 2014;25:726–33.
123. Thompson AB, Gillespie SE, Mosunjac MB, et al. Prevalence of anal squamous intraepithelial lesions in HIV-1-infected young men who have sex with men and transwomen. *J Low Genit Tract Dis* 2018;22:340–7.
124. Nureña CR, Brown B, Galea JT, et al. HPV and genital warts among Peruvian men who have sex with men and transgender people: knowledge, attitudes and treatment experiences. *PloS One* 2013;8:e58684.
125. Utaipat U, Siriaunkgul S, Supindham T, et al. Association of cytologic grade of anal "Pap" smears with viral loads of human papillomavirus types 16, 18, and 52 detected in the same specimens from men who have sex with men. *J Clin Virol* 2016;85:48–55.
126. Kobayashi T, Sigel K, Gaisa M. Prevalence of anal dysplasia in human immunodeficiency virus-infected transgender women. *Sex Transm Dis* 2017;44:714–6.
127. Machalek DA, Poynten M, Jin F, et al. Anal human papillomavirus infection and associated neoplastic lesions in men who have sex with men: a systematic review and meta-analysis. *Lancet Oncol* 2012;13:487–500.
128. Silverberg MJ, Lau B, Justice AC, et al. Risk of anal cancer in HIV-infected and HIV-uninfected individuals in North America. *Clin Infect Dis* 2012;54:1026–34.
129. Patel P, Hanson DL, Sullivan PS, et al. Incidence of types of cancer among HIV-infected persons compared with the general population in the United States, 1992–2003. *Ann Intern Med* 2008;148:728–36.
130. Yuan T, Fitzpatrick T, Ko NY, et al. Circumcision to prevent HIV and other sexually transmitted infections in men who have sex with men: a systematic review and meta-analysis of global data. *Lancet Glob Health* 2019;7:e436–47.
131. Kreimer AR, Chaturvedi AK, Alemany L, et al. Summary from an international cancer seminar focused on human papillomavirus (HPV)-positive oropharynx cancer, convened by scientists at IARC and NCI. *Oral Oncol* 2020;108:104736.
132. Tang KD, Vasani S, Menezes L, et al. Oral HPV16 DNA as a screening tool to detect early oropharyngeal squamous cell carcinoma. *Cancer Sci* 2020;111:3854–61.
133. Farahmand M, Monavari SH, Tavakoli A. Prevalence and genotype distribution of human papillomavirus infection in different anatomical sites among men who have sex with men: a systematic review and meta-analysis. *Rev Med Virol* 2021;31:e2219.
134. Giuliani M, Rollo F, Vescio MF, et al. Oral human papillomavirus infection in HIV-infected and HIV-uninfected MSM: the OHMAR prospective cohort study. *Sex Transm Infect* 2020;96:528–36.
135. Cleveland JL, Junger ML, Saraiya M, et al. The connection between human papillomavirus and oropharyngeal squamous cell carcinomas in the United States: implications for dentistry. *J Am Dent Assoc* 2011;142: 915–24.
136. Lingen MW, Abt E, Agrawal N, et al. Evidence-based clinical practice guideline for the evaluation of potentially malignant disorders in the oral cavity: a report of the American Dental Association. *J Am Dent Assoc*. 2017;148:712–727e10.
137. Meites E, Szilagyi PG, Chesson HW, et al. Human papillomavirus vaccination for adults: updated recommendations of the Advisory Committee on Immunization Practices. *MMWR Morb Mortal Wkly Rep* 2019;68:698–702.
138. Swedish KA, Goldstone SE. Prevention of anal condyloma with quadrivalent human papillomavirus vaccination of older men who have sex with men. *PloS One* 2014;9:e93393.
139. Deshmukh AA, Chhatwal J, Chiao EY, et al. Long-term outcomes of adding HPV vaccine to the anal intraepithelial neoplasia treatment regimen in HIV-positive men who have sex with men. *Clin Infect Dis* 2015;61:1527–35.
140. Gosens KCM, van der Zee RP, van Heukelom MLS, et al. HPV vaccination to prevent recurrence of anal intraepithelial neoplasia in HIV+ MSM. *AIDS* 2021;35:1753–64.
141. Firnhaber C, Swarts A, Jezile V, et al. Human papillomavirus vaccination prior to loop electroexcision procedure does not prevent recurrent cervical high-grade squamous intraepithelial lesions in women living with human immunodeficiency virus: a randomized, double-blind, placebo-controlled trial. *Clin Infect Dis* 2020;73:e2211–6.
142. Goldstone SE, Giuliano AR, Palefsky JM, et al. Efficacy, immunogenicity, and safety of a quadrivalent HPV vaccine in men: results of an open-label, long-term extension of a randomised, placebo-controlled, phase 3 trial. *Lancet Infect Dis* 2022;22:413–25.
143. Checchi M, Mesher D, Mohammed H, et al. Declines in anogenital warts diagnoses since the change in 2012 to use the quadrivalent HPV vaccine in England: data to end 2017. *Sex Transm Infect* 2019;95:368–73.
144. Canvin M, Sinka K, Hughes G, et al. Decline in genital warts diagnoses among young women and young men since the introduction of the bivalent HPV (16/18) vaccination programme in England: an ecological analysis. *Sex Transm Infect* 2017;93:125–8.
145. Woestenberg PJ, van Benthem BHB, Bogaards JA, et al. HPV infections among young MSM visiting sexual health centers in the Netherlands: opportunities for targeted HPV vaccination. *Vaccine* 2020;38:3321–9.
146. Nadarzynski T, Smith H, Richardson D, et al. Perceptions of HPV and attitudes towards HPV vaccination amongst men who have sex with men: a qualitative analysis. *Br J Health Psychol* 2017;22:345–61.
147. Galea JT, Monsour E, Nureña CR, et al. HPV vaccine knowledge and acceptability among Peruvian men who have sex with men and transgender women: a pilot, qualitative study. *PloS One* 2017;12: e0172964.
148. Gutierrez B Jr., Leung A, Jones KT, et al. Acceptability of the human papillomavirus vaccine among urban adolescent males. *Am J Mens Health* 2013;7:27–36.
149. McRee AL, Reiter PL, Chantala K, et al. Does framing human papillomavirus vaccine as preventing cancer in men increase vaccine acceptability? *Cancer Epidemiol Biomarkers Prev* 2010;19:1937–44.
150. Marra E, Alberts CJ, Zimet GD, et al. HPV vaccination intention among male clients of a large STI outpatient clinic in Amsterdam, the Netherlands. *Papillomavirus Res* 2016;2:178–84.
151. Gilbert P, Brewer NT, Reiter PL, et al. HPV vaccine acceptability in heterosexual, gay, and bisexual men. *Am J Mens Health* 2011;5:297–305.
152. Allen-Leigh B, Rivera-Rivera L, Yunes-Díaz E, et al. Uptake of the HPV vaccine among people with and without HIV, cisgender and transgender women and men who have sex with men and with women at two sexual health clinics in Mexico City. *Hum Vaccin Immunother* 2020; 16:981–90.
153. Knapper C, Birley H, Parker I. Audit of a human papillomavirus vaccine programme for men who have sex with men delivered through an integrated sexual reproductive health service. *Int J STD AIDS* 2018;29: 1106–9.
154. Gorbach PM, Cook R, Gratzer B, et al. Human papillomavirus vaccination among young men who have sex with men and transgender women in 2 US cities, 2012–2014. *Sex Transm Dis* 2017;44:436–41.

155. Bjekic M, Sipetic-Grujicic S, Dunic I, et al. Human papillomavirus and anal carcinoma knowledge in men who have sex with men in Belgrade, Serbia. *Int J Dermatol* 2016;55:1082–7.

156. Li X, Cao X, Li Z, et al. Human papillomavirus awareness and vaccine acceptability among men who have sex with men from mainland China. *Sci Rep* 2019;9:8763.

157. Simatherai D, Bradshaw CS, Fairley CK, et al. What men who have sex with men think about the human papillomavirus vaccine. *Sex Transm Infect* 2009;85:148–9.

158. Brown B, Monsour E, Klausner JD, et al. Sociodemographic and behavioral correlates of anogenital warts and human papillomavirus–related knowledge among men who have sex with men and transwomen in Lima, Peru. *Sex Transm Dis* 2015;42:198–201.

159. Zou H, Meng X, Jia T, et al. Awareness and acceptance of human papillomavirus (HPV) vaccination among males attending a major sexual health clinic in Wuxi, China: a cross-sectional study. *Hum Vaccin Immunother* 2016;12:1551–9.

160. Grace D, Gaspar M, Paquette R, et al. HIV-positive gay men's knowledge and perceptions of Human Papillomavirus (HPV) and HPV vaccination: a qualitative study. *PloS One* 2018;13:e0207953.

161. Nadarzynski T, Smith H, Richardson D, et al. Human papillomavirus and vaccine-related perceptions among men who have sex with men: a systematic review. *Sex Transm Infect* 2014;90:515–23.

162. Sadlier C, Lynam A, O'Dea S, et al. HPV vaccine acceptability in HIV-infected and HIV negative men who have sex with men (MSM) in Ireland. *Hum Vaccin Immunother* 2016;12:1536–41.

163. Tian T, Wang D, Papamichael C, et al. HPV vaccination acceptability among men who have sex with men in Urumqi, China. *Hum Vaccin Immunother* 2019;15:1005–12.

164. Ben-Natan M, Adir O. Screening for cervical cancer among Israeli lesbian women. *Int Nurs Rev* 2009;56:433–41.

165. Kang J, Kim K. Human papillomavirus vaccine predictors among U.S. adults aged 18 to 45 by sexual orientation. *West J Nurs Res* 2019;41:1761–89.

166. Jones J, Poole A, Lasley-Bibbs V, et al. LGBT health and vaccinations: findings from a community health survey of Lexington-Fayette County, Kentucky, USA. *Vaccine* 2016;34:1909–14.

167. Adjei Boakye E, Osazuwa-Peters N, López J, et al. Disparities in human papillomavirus (HPV) vaccine initiation and completion based on sexual orientation among women in the United States. *Hum Vaccin Immunother* 2021;17:428–33.

168. Solazzo AL, Agénor M, Austin SB, et al. Sexual orientation differences in cervical cancer prevention among a cohort of U.S. women. *Womens Health Issues* 2020;30:306–12.

169. Bednarczyk RA, Whitehead JL, Stephenson R. Moving beyond sex: assessing the impact of gender identity on human papillomavirus vaccine recommendations and uptake among a national sample of rural-residing LGBT young adults. *Papillomavirus Res* 2017;3:121–5.

170. Pho AT, Bakken S, Lunn MR, et al. Online health information seeking, health literacy, and human papillomavirus vaccination among transgender and gender-diverse people. *J Am Med Inform Assoc* 2022;29:285–95.

171. Gerend MA, Madkins K, Phillips G 2nd, et al. Predictors of human papillomavirus vaccination among young men who have sex with men. *Sex Transm Dis* 2016;43:185–91.

172. Hoefer L, Tsikis S, Bethimoutis G, et al. HPV vaccine acceptability in high-risk Greek men. *Hum Vaccin Immunother* 2018;14:134–9.

173. Koskan AM, Fernandez-Pineda M. Anal cancer prevention perspectives among foreign-born Latino HIV-infected gay and bisexual men. *Cancer Control* 2018;25:1073274818780368.

174. McRee AL, Katz ML, Paskett ED, et al. HPV vaccination among lesbian and bisexual women: findings from a national survey of young adults. *Vaccine* 2014;32:4736–42.

175. Gerend MA, Madkins K, Crosby S, et al. A qualitative analysis of young sexual minority men's perspectives on human papillomavirus vaccination. *LGBT Health* 2019;6:350–6.

176. Petit B, Epaulard O. Men having sex with men and the HPV vaccine in France: a low vaccine coverage that may be due to its infrequent proposal by physicians. *Vaccine* 2020;38:2160–5.

177. Light A, Obedin-Maliver J. Opening the ob/gyn door for sexual and gender minority patients. 2019. Available at: https://www.contemporaryobgyn.net/view/opening-obgyn-door-sexual-and-gender-minority-patients. Accessed May 30, 2023.

178. Jones, JM LGBT identification in U.S. ticks up to 7.1%. 2022 Available at: https://news.gallup.com/poll/389792/lgbt-identification-ticks-up.aspx. Accessed October 10, 2022

179. Keuroghlian AS, Potter J, Reisner SL. *Transgender and Gender Diverse Health Care: The Fenway Guide*. New York, NY: McGraw Hill; 2022.

180. Keuroghlian, AS The Fenway Institute National LGBTQIA+ Health Education Center. 2023 March 26, 2023. Available at: https://fenwayhealth.org/the-fenway-institute/education/the-national-lgbtia-health-education-center/. Accessed May 30, 2023.

181. HHS.gov. U.S. Department of Health and Human Services LGBT Competency Training. 2014 March 26, 2023. Available at: https://www.hhs.gov/programs/topic-sites/lgbtqi/enhanced-resources/competency-training/index.html. Accessed May 30, 2023.

182. AAMC. Sexual & Gender Minority Health Resources. 2023. Available at: https://www.aamc.org/about-us/equity-diversity-inclusion/lgbt-health-resources. Accessed May 30, 2023.

183. Suen LW, Lunn MR, Katuzny K, et al. What sexual and gender minority people want researchers to know about sexual orientation and gender identity questions: a qualitative study. *Arch Sex Behav* 2020;49:2301–18.