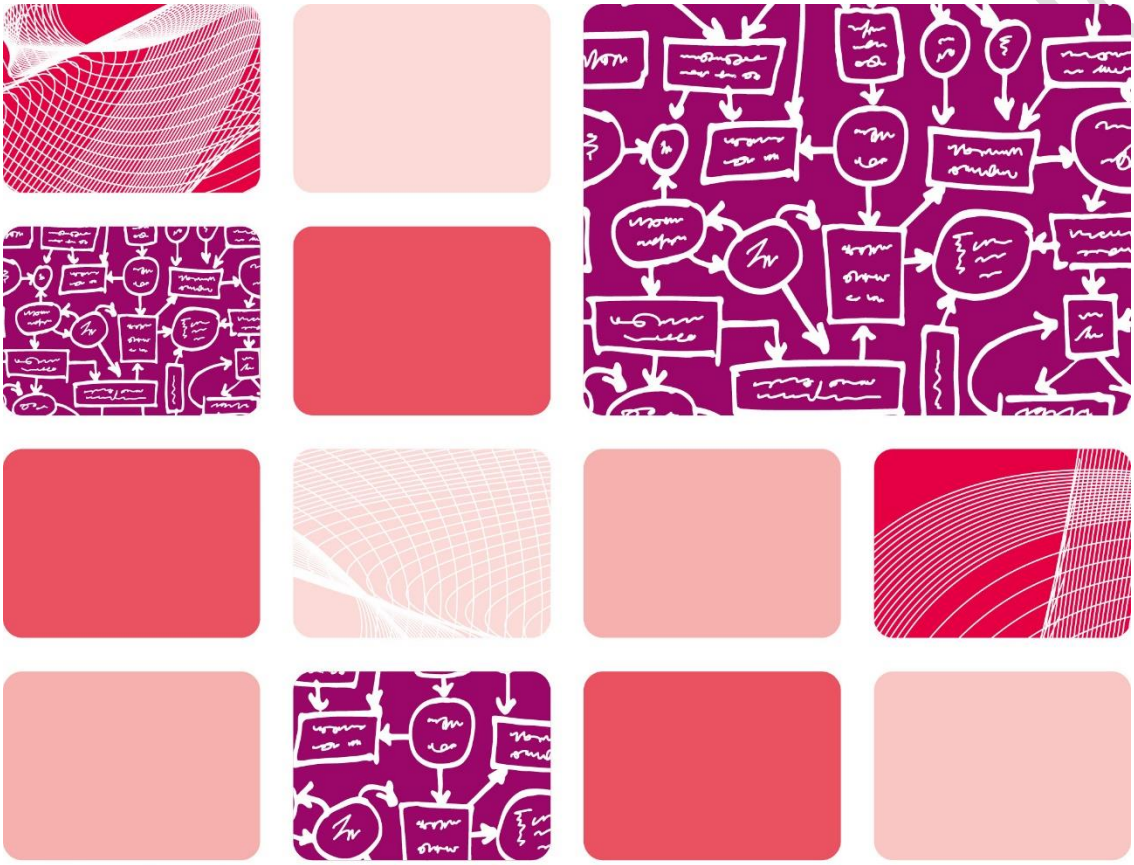
UK Health Security Agency

UK Standards for Microbiology Investigations

Infectious syndromes affecting the genitourinary tract and reproductive organs



National Institute for Health and Care Excellence (NICE) has renewed accreditation of the process used by the **UK Health Security Agency** to produce **UK Standards for Microbiology Investigations (UK SMIs)**. The renewed accreditation is valid until **30 June 2026** and applies to guidance produced using the processes described in '**UK Standards for Microbiology Investigations Development Process' (2021)**. The original accreditation term began on 1 July 2011.

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Contents

Amendment table

Each UK SMI document has an individual record of amendments. The amendments are listed on this page. The amendment history is available from standards@ukhsa.gov.uk.

Any alterations to this document should be controlled in accordance with the local document control process.

Amendment number/date	x/dd.mm.yy
Issue number discarded	
Insert issue number	
Anticipated next review date*	dd.mm.yy
Section(s) involved	**Amendment**
	New syndromic document

*Reviews can be extended up to 5 years where appropriate

1 General information

View general information related to UK SMIs.

2 Scientific information

View scientific information related to UK SMIs.

3 Scope of document

This UK Standards for Microbiology Investigations (UK SMI) document describes the infections and relevant associated tests, that should be considered according to the different clinical presentations consistent with sexually transmitted infections (STIs) and non-sexually transmitted infections (non STIs) affecting the genitourinary tract and reproductive organs.

The document focuses on symptomatic patients. The syndromes included have been selected to reflect the common presenting complaints of the genital area, including vaginal discharge, pelvic pain, cervicitis, post coital bleeding, genital ulcers/vesicles, urethritis, epididymitis, orchitis, proctitis and balanitis. The main clinical presentations have been incorporated to the algorithms. Test selection should factor in the sexual history and risk assessment of the patient. Please also refer to the BASHH summary guidance on testing for STIs. Self-testing has also increased in the last few years. Please refer to the Guidance for the design of self-sampling packs and associated support for self-sampling processes within Sexually Transmitted Infection and Blood Borne Virus testing for more information.

Urinary tract infections are not covered in this document. For signs and symptoms of urinary tract infections please refer to UK SMI B 41: investigation of urine.

Please note, following the recent update of fungal taxonomy, many species formerly part of the genus Candida now belong to a number of other genera. For the purposes of this document, both old and new names are mentioned as required and they are collectively referred to as ‘Candida and associated ascomycetous yeasts’ (1).

UK SMIs should be used in conjunction with other relevant UK SMIs.

Definitions

For the purpose of this document the focus is on anatomical structures affected by an infection. Where appropriate anatomical descriptions have been used. When reference is made to males/men or females/women, our intention is to use these terms in a fully inclusive manner and include all people whose gender identity differs from that expected from their birth assigned gender as well as the trans community and those with both binary and non-binary identities.

When reference is made to persons with a penis, it also includes person with or without testes and/or scrotum. This covers transgender people and people who have penile cancer.

Terminology is both sensitive and constantly evolving and we therefore advise local service user engagement to ensure that the terminology used in individual services is acceptable their users (2).

Neovagina - vagina constructed using penile and scrotal skin

Neopenis - penis of a transgender person who has transitioned from female to male, made from the former clitoris.

GBMSM – gay, bisexual and other men who have sex with men

MSM - men who have sex with men

4 Background

This section covers sexually transmitted infections (STIs), non sexually transmitted infections (non STIs) and other infections affecting the genitourinary tract and reproductive organs.

4.1 Sexually transmitted infections (STIs)

Chlamydia

Chlamydia is caused by *Chlamydia trachomatis,* which is the most common STI in the UK. Chlamydia diagnoses in all ages remained stable with 194,970 diagnoses in 2023 compared to 194,244 diagnoses in 2022 (3).

Chlamydia occurs in all people and is common in young people aged 15-24 years. Transmission to neonate can occur at birth and newborn babies can develop eye infections or pneumonia (4-6).

Most cases are asymptomatic; however patients with lower genital tract infection can have the following signs and symptoms:

- person with a vagina: vaginal discharge, intermenstrual bleeding, dysuria, lower abdominal pain, dyspareunia, mucopurulent cervicitis, pelvic tenderness and cervical motion tenderness (6)
- persons with a penis: urethral discharge and dysuria.

Extra genital infections can also occur such as rectal infection, pharyngeal infection and conjunctivitis.

If chlamydia is not treated, it can lead to upper genital and systemic complications such as pelvic inflammatory disease (PID), pregnancy outside the womb (ectopic pregnancy) infertility, endometritis, salpingitis, sexually acquired reactive arthritis, perihepatitis and long term pelvic or abdominal pain (6).

Gonorrhoea

Over the years *Neisseria gonorrhoeae* the causative agent of gonorrhoea, has developed resistance to all classes of antibiotics recommended for treatment (7).

The number of gonorrhoea diagnosis in England has increased. In 2022 there were 79,268 reported diagnosis, which increased to 85,223 in 2023 (3).

In many countries, ciprofloxacin and azithromycin resistance is increasing high and decreased susceptibility to cefixime and ceftriaxone continue (8).

An international spread of ceftriaxone-resistant gonococcal strain has been reported in Denmark, France, Japan and the United Kingdom. And there are increasing numbers of treatment failure cases being reported from Austria, the United Kingdom and other countries (8).

The emergence of highly resistant N. gonorrhoeae strains in recent years is of worldwide concern. UK Health Security Agency (UKHSA) are currently reviewing and updating the Gonococcal Resistance to Antimicrobials Surveillance Programme (GRASP) 2013 Action Plan to reflect the changes that have been made to strengthen real-time surveillance of gonococcal AMR and to include the lessons that have been learnt from the management of antimicrobial resistance *N. gonorrhoeae* incidents (9).

Gonorrhoea is caused by the Gram-negative diplococcus *Neisseria gonorrhoeae*. Diagnoses are highest in young people aged 15-24 years and in the GBMSM community. It is spread by sexual contact through the vagina, anus and by oral sex (10).

The primary sites of infection are the urethra, endocervix, rectum, pharynx and the conjunctiva. Transmission is by direct inoculation of infected secretions (11). A pregnant mother with gonorrhoea can infect her child through childbirth (10).

Infection may be asymptomatic, but signs and symptoms may appear 1-14 days after a person is exposed to an infected person. These include:

- penile urethral infection - usually a mucopurulent urethral discharge. Same patients may complain of testicular and epididymal pain with tenderness and swelling present on examination
- urethral infection in persons with a vagina - may present with dysuria
- endocervical infection - increased or altered vaginal discharge
- rectal infection - most cases are asymptomatic, but symptoms may include anal discharge and perianal, anal pain or discomfort
- pharyngeal infection - usually asymptomatic but is occasionally associated with a sore throat (11)

If gonorrhoea is left untreated, it can cause systemic disease, infertility and PID (3).

Refer to UK SMI ID 6: Identification of Neisseria species.

Neisseria meningitidis urogenital and anorectal infections

Rare sporadic cases of meningococcal urogenital and anorectal infections, including urethritis, proctitis, and cervicitis, have been reported; typically following orogenital contact with an oropharyngeal meningococcal carrier. The resulting infections were clinically indistinguishable from infections caused by *N. gonorrhoeae*.

Over the past two decades, there have also been multiple outbreaks across North America and Europe of invasive meningococcal disease among the MSM community. The responsible meningococci belong to a highly virulent and predominantly serogroup C lineage, including strains that are able to express nitrite reductase and grow in anaerobic environments, such as the urogenital and anorectal tracts. More recently, a

distinct clade within this lineage has expanded to cause urethritis predominantly among men who have sex with women (12).

Syphilis

Syphilis is caused by the bacterium *Treponema pallidum* subspecies *pallidum* and is broadly defined as congenital or acquired. Acquired syphilis is grouped into primary, secondary, latent or tertiary stage. There has been an increase in syphilis diagnoses in England. In 2022 there were 8,693 reported diagnosis, which increased to 9,513 in 2023 (3). Syphilis is grouped into the following:

- primary syphilis can be asymptomatic but often presents with a painless chancre (sometimes can be painful) or ulcer on the genitals, rectum or mouth. This usually resolves spontaneously over 3-8 weeks
- If primary syphilis is untreated 25% will develop secondary syphilis. Secondary syphilis often presents with a widespread mucocutaneous rash that can affect multiple systems
- latent stage is where the disease is asymptomatic. Approximately 25% of patents will develop a recurrence of secondary disease during the early latent stage
- late (tertiary) disease will develop in approximately one third of untreated patients which divides into gummatous, cardiovascular and late neurosyphilis (13)

Neurosyphilis can occur at any stage of infection.

Refer to UK SMI V 44: Laboratory diagnosis of syphilis.

Genital Warts

Genital warts are a common STI diagnosed in the UK caused by the Human papillomavirus HPV types 6 and 11. Infections are common in the sexually active population (14). Transmission is through direct skin contact with an infected individual. Lesions are most often multiple and non-pigmented, such as condylomata acuminata (flesh-coloured, soft exophytic papillomatous lesions); keratotic warts (thickened horny papules); flat warts (macular lesions) and papular warts. Lesions may be seen anywhere throughout the anogenital skin and mucosa including the vulva, vagina, cervix, urethral, meatus and anal canal. Extragenital sites include the lips, oral mucosa, oropharynx, larynx, conjunctivae and nasal cavity (15,16) .

Diagnosis is made clinically and usually no laboratory tests are required, although in some cases a biopsy may be required for confirmation (15)

Prior to the introduction of the National HPV immunisation programme, rates of genital warts diagnosed in sexual health services in England had been increasing since the early 1970 (17). Recent data suggests genital warts diagnoses in all ages remained stable with 26,133 diagnoses in 2023 compared to 26,068 diagnoses in 2022. Amongst the largely vaccinated age group of 15 to 17 year olds diagnoses remained low (104 in 2022, then 107 in 2023) (3).

Genital Herpes

Genital herpes is caused by herpes simplex virus (HSV). There are 2 types:

- HSV-1 causes orolabial herpes and is now the most common cause of genital herpes in the UK (18)

- HSV-2 is mainly transmitted during sexual intercourse through contact with genital or anal surfaces, skin, sores or fluids of someone infected with the virus. HSV-2 can be transmitted even in the absence of symptoms.

In rare circumstances, herpes (HSV-1 and HSV-2) can be transmitted from mother to child during delivery, causing neonatal herpes (19).

Most people infected are asymptomatic. Patients who are symptomatic will experience bumps, painful blisters or ulcers around the genital areas or anus. There is no cure and recurrent infection can occur. Symptoms begin with tingling, itching or burning near the sores (19).

Lymphogranuloma venereum

Lymphogranuloma venereum (LGV) is less frequently reported. However, there has been an increase in the number of reported cases from 1,173 in 2022 to 1,360 in 2023 (20).

LGV is an STI caused by 3 genovars of *C. trachomatis:* genoovars L1, L2 and L3. There has been an increase in the number of reports in the MSM community (21). LGV can occur at any age but is common in 15 to 40 year olds. Symptoms can be complex, severe and may involve multiple sites in the body such as the genitals, the anus, rectum, oral cavity and lymph nodes (22,23). The incubation period can range from 3 – 30 days from the time of contact with an infected individual. There are 3 stages of infection:

- Primary stage - development of painless genital ulcer or papules
- Secondary stage - development of unilateral or bilateral tender inguinal and/or femoral lymphadenopathy. An anorectal syndrome may also present with proctitis like symptoms such as pain during urination or passing stools, rectal bleeding, abdominal and anal pain (21)
- Late stage occurs in a few patients by progressive spread of *C. trachomatis* in anogenital tissues, which will incite a chronic inflammatory response and destruction of tissue in the involved areas, including: proctitis, proctocolitis mimicking Crohn's disease, fistulae, strictures and chronic granulomatous disfiguring fibrosis and scarring of the vulva with esthiomene

Mycoplasma genitalium

Mycoplasma genitalium belongs to the Mollicutes class. Due to the lack of a cell wall it is not visible under Gram Stain. It can be detected from genitourinary, rectal and respiratory tract specimens. It is rare to be found in the throat. *M. genitalium* is associated with the detection of *C. trachomatis* and non gonococcal urethritis.

Signs and symptoms in symptomatic persons with a penis include urethral discharge, discomfort, dysuria, penile irritation, urethritis and balanoposthitis.

Signs and symptoms in symptomatic persons with a vagina include dysuria, post-coital bleeding, painful inter-menstrual bleeding, cervicitis and lower abdominal pain.

Complications include PID, tubal factor infertility, sexually acquitted reactive arthritis and pre-term delivery (24).

Trichomoniasis

Trichomoniasis is caused by a protozoan parasite called *Trichomonas vaginalis* (TV). Trichomoniasis is the most common non-viral STI in the world. *T. vaginalis* diagnosis is relatively rare in the UK, which may in part be due to suboptimal diagnosis, with around 6000 cases reported each year, compared to over 200,000 chlamydia cases in the UK (25).

In adults, transmission is almost exclusively through sexual intercourse. Due to site specificity, infection can only follow intravaginal or intraurethral inoculation of the organism (26)

In this section reference is made to men and women as TV is not a known issue for people with a neovagina (26).

In women the infection is most commonly found in the lower genital tract (vulva, vagina, cervix, or urethra). Urethral infection is present in 90% of infected women, although the urethra is the sole site of infection in fewer than 5% of cases. Signs include vaginal discharge (up to 70%), vulvitis and vaginitis. Approximately 2% of patients will have strawberry cervix appearance to the naked eye and 5–15% will have no abnormalities on examination (26)

In men, infection is usually of the urethra and 15–50% diagnosed with TV are asymptomatic. Men usually present as the sexual partners of infected women.

The common symptomatic presentation is urethral discharge and/or dysuria. Other symptoms include urethral irritation and urinary frequency (26).

Ureaplasma

Ureaplasma can be found in the cervix or vagina of approximately 40–80% of sexually active, asymptomatic patients, and should be considered primarily as commensals when detected in the lower genital tract. Testing for ureaplasma is no longer recommended by the British Association of Sexual Health and HIV (BASHH) (2).

Mpox

Mpox (monkeypox) is caused by infection with monkeypox virus (MPXV). Although primarily recognised as a zoonosis, human to human transmission, including sexual transmission also occurs. The virus is spread by close contact with lesions, bodily fluids, respiratory droplets from an infected animals/human, or contaminated materials such as infected clothing/linen (27).

The incubation period is usually between 5-21 days. Illness can begin with a fever, headache, muscle aches, backache, swollen lymph nodes and exhaustion. This can develop into a rash starting on the face and spreading to the hands, feet, chest, face, or mouth or the rash may start near the genital areas (penis, testicles, labia, vagina, and anus). The rash forms scabs which eventually fall off. In some cases, there are no symptoms. The appearance of the rash can be confused with chickenpox (27).

Cases of mpox have been reported in multiple countries including the UK. There are 2 major clades of MPXV: Clade I (formerly known as Central African or Congo basin clade) and Clade II (formerly known as West African clade). Clade II is split into Clade IIb and Clade IIa, with subgroup clusters called lineages. A large outbreak involving many countries occurred in 2023, mainly among MSM (27).

A risk assessment should be carried out for cases linked to Clade I as infections have both genital and non genital infections.

Following the identification of a cluster of sexually transmitted high consequence infectious disease (HCID) Clade I mpox in 2023, there is an increased risk of mpox HCID infection circulating unrecognised on the background of Clade II infections (28).

Molluscum contagiosum

Molluscum contagiosum belongs to the Poxviridae family and Molluscipox genus and causes a benign epidermal eruption of the skin. Infection is spread by physical contact. Most cases occur in young children over the age of 1, affecting the face, neck trunk or limbs.

Molluscum is also an STI affecting the genitals, pubic region, lower abdomen, upper thighs and/or the buttocks. Severe molluscum infection can manifest in the context of immunocompromise, notably late stage HIV infection.

Molluscum contagiosum lesions present as smooth-surfaced, firm, dome-shaped papules with central umbilication. Their colour can vary from pearly-white or pink to yellow (29). The papules usually disappear spontaneously within 6 to 12 months but may take as long as 4 years to resolve (30).

Epididymitis and Orchitis

Epididymitis is when the epididymis tube at the back of the testicles becomes swollen or painful, which is common in young men under 35 years of age.

Acute epididymitis is a clinical syndrome causing pain, swelling, and inflammation of the epididymis and lasting less than 6 weeks. It is caused by STIs such as *C. trachomatis, N. gonorrhoeae, M. genitalium* or can be caused by enteric organisms such as *Escherichia coli*. Chronic epididymitis occurs when there is greater than 6 week history of symptoms of discomfort or pain in the scrotum, testicle or epididymis (31).

Orchitis is caused by swelling of the testis. Any infection or inflammation affecting the epididymis may spread to the testis and cause epididymo-orchitis (31).

Diagnosis of epididymo-orchitis is based on presenting history, risk of STIs, physical examination findings and preliminary investigations. Patients with epididymo-orchitis typically present with acute onset unilateral scrotal pain, swelling and erythema. Patients may complain of symptoms of urethritis or urethral discharge. Testicular torsion (torsion of the spermatic cord) is the most important differential diagnosis (31).

Genital ulcers

Genital ulcers are usually found on the anus, vulva (outer part of the vagina) penis and on the skin around these areas. Some people show no symptoms whereas others may experience burning sensation, fever, itching, pain or vaginal discharge.

Genital ulcers can form if the patient has chancroid, chlamydia, genital herpes, Human Immunodeficiency virus (HIV) and syphilis. Varicella zoster and enterovirus may cause genital ulcers. Rarer infectious causes include Cytomegalovirus Epstein- Barr virus, Enterovirus, Group A Streptococcus and Mycoplasma pneumoniae.

Not all genital ulcers are caused by infection. Other causes include sexual injury, chemical burns and other trauma.

Mucopurulent cervicitis

Mucopurulent cervicitis is diagnosed by a purulent or mucopurulent endocervical exudate visible in the endocervical canal. Causative organisms include *C. trachomatis*, *N. gonorrhoeae,* Trichomoniasis, HSV or *M. genitalium.* Most women/persons with a vagina are asymptomatic and some may experience vaginal discharge or bleeding (32).

Chancroid

Chancroid is a bacterial infection caused by *Haemophilus ducreyi.* Chancroid is rare in the UK but was previously common in some African and Asian countries. Chancroid is transmitted through unprotected sexual intercourse by an infected person. Signs include an ulcer on the foreskin or shaft of the penis or on the lips of the vulva and swollen lymph glands in the groin.

Chancroid has a short incubation period of 3 - 7 days after sexual intercourse with an infected person. Papules develop which progress into pustules. These rupture after a few days and develop into superficial ulcers which are soft and painful (33).

Non-gonococcal urethritis

Non-gonococcal urethritis (NGU) is inflammation of the urethra which is sexually acquired in the majority of (but not all) cases. Patients present with urethral discharge, penile irritation, dysuria, urethral discomfort, balano-pothitis or they may be asymptomatic (34).

The commonest organisms implicated are *C. trachomatis* (prevalence 11-50%) and *M. genitalium* (prevalence 6-50%). These organisms are more likely detected in younger patients, those with urethral discharge and/or dysuria. Other causes include ureaplasmas (prevalence 11-26%), *T. vaginalis* (prevalence 1-20%), adenoviruses (prevalence 2-4%) and HSV (prevalance 2-3%) (34).

Pathogen negative NGU is more likely with increasing age and the absence of symptoms. It is recommended that asymptomatic men/person with a penis are not tested for NGU.

Microscopy of a smear obtained from the anterior urethra or urethral discharge is the mainstay of diagnosis. In addition, all patients should be tested for *N. gonorrhoeae* and *C. trachomatis* by NAATs. Where available male patients with urethritis should be tested for *M. genitalium* and if detected macrolide resistance to assist management.

4.2 Non Sexually transmitted infections (STIs)

Vaginitis

Vaginitis is inflammation of the vagina due to irritants, hormonal deficiency such as atrophic vaginitis or infection such as bacterial vaginosis, trichomoniasis and candidiasis. It affects persons with a vagina particularly during the reproductive years. Common symptoms include: discharge, pruritus and dyspareunia (35).

Vulvovaginal candidiasis (VVC)

Candidiasis is a fungal infection caused by yeasts (36). Candida and associated ascomycetous yeasts are present in low numbers on healthy skin in moist areas and are part of the normal flora of the mucous membranes of the respiratory, gastrointestinal and genital tracts of persons with a vagina; however, overgrowth of these organisms can cause symptoms to develop. VVC is mainly caused by *Candida*

albicans. Other candida and associated ascomycetous yeasts and *Saccharomyces cerevisiae* can also contribute.

Recurrent VVC is thought to be related to host factors. For many women/persons with a vagina an identifiable host factor is not found, but can include:

- persistence of Candida species
- poorly controlled diabetes mellitus
- immunosuppression
- endogenous and exogenous oestrogen (including pregnancy, HRT and possibly the combined oral contraceptive pill)
- recent (up to three months before the episodes) antibiotic use causing a disturbance in the vaginal flora (37)

Vulval itch and vaginal discharge are typical presentations of VVC. Other symptoms include soreness, burning, superficial dyspareunia and cyclical symptoms (37).

Persons presenting with recurrent VVC should have a clinical examination. If this is not possible, a high vaginal swab (HVS) of the discharge should be taken for Gram stain and/or phase contrast wet film microscopy (37). Molecular diagnosis is also becoming available.

Pelvic inflammatory disease (PID)

PID is a tern used for infection of the upper genital tract which affects young women/ persons with a vagina. Infection spreads from the endocervix, which can cause endometritis, salpingitis, parametritis, oophoritis, tubo-ovarian abscess and pelvic peritonitis. The main organisms associated with PID are *N. gonorrhoeae* and *C. trachomatis* (14-35% of cases). Other organisms include *T. vaginalis,* anaerobes (including Prevotella, Atopobium and Leptotrichia) and *M. genitalium*. Signs and symptoms of PID include:

- lower abdominal pain which is typically bilateral (but can be unilateral)
- abnormal vaginal or cervical discharge which is often purulent
- deep dyspareunia
- abnormal vaginal bleeding, including post coital bleeding, inter-menstrual bleeding and menorrhagia
- secondary dysmenorrhoea
- women/persons with a vagina with immunosuppression secondary to HIV may have more severe symptoms (38).

Differential diagnosis of lower abdominal pain in a young woman includes:

- Ectopic pregnancy
- Acute appendicitis
- Endometriosis
- Ovarian cyst torsion or rupture

- Urinary tract infection
- Functional pain

Diagnosis of PID should be made clinically.

Salpingitis

Salpingitis is a bacterial infection and inflammation of the fallopian tubes, involving *C. trachomatis, N. gonorrhoeae,* mixed anaerobic, facultative anaerobic and aerobic bacteria *M. hominis.* Specimens from the fallopian tubes are superior to endocervical swabs. Endocervical swabs may be useful but require more careful interpretation. Acute salpingitis can result in sequelae such as chronic abdominal pain and an increased risk of ectopic pregnancy.

Balanitis and Balanoposthitis

Balanitis is an inflammation of the glans penis, most commonly caused by inadequate personal hygiene in uncircumcised persons with a penis leading to fungal infections such as *Candida albicans* and other yeasts (39). Other organisms include group B and group A beta-hemolytic *streptococci, N. gonorrhoea*, Chlamydia species, anaerobic infection, HPV, *Gardnerella vaginalis, T. pallidum*, Trichomonas species, *Borrelia vincentii* and *Borrelia burgdorferi* (39).

Balanoposthitis involves both the glans and the foreskin and occurs in uncircumcised persons with a penis. It often occurs with balanitis (39).

Prostatitis

Prostatitis can be described as acute, chronic bacterial, chronic pelvic pain syndrome and asymptomatic inflammation.

- Acute bacterial prostatitis - characterised by acute bacterial urinary tract infection
- Chronic bacterial prostatitis - Persistent bacterial infection/recurrent urinary tract infections
- Chronic prostatitis/chronic pelvic pain syndrome - pelvic pains, urinary complaints, and sexual dysfunction
- Chronic prostatitis/chronic pelvic pain syndrome is divided into 2 subtypes:

  - Inflammatory, where leukocytes are in the expressed prostatic fluid, post-prostate massage urine or seminal fluid

  - non inflammatory where there is no evidence of urogenital inflammation
- asymptomatic inflammatory prostatitis, occurs in patients who have no symptoms but who have documented inflammation in prostatic tissue or in their seminal fluid (40)

Please refer to UK SMI B 41: Investigation of urine.

Bartholinitis

Bartholinitis also known as Bartholin gland cysts is described as inflammation of the Bartholin gland which is located at either side at the opening of the vagina. It is more common in women/persons with a vagina at risk of STIs. The incidence of Bartholin cysts and abscesses appears to increase with age until menopause. Infections may be caused by aerobic and anaerobic organisms including *E. coli*. Some have also been

caused by *N. gonorrhoeae* and *C. trachomatis*. Symptoms include a painful lump located near the opening of the vagina, discomfort, and pain during sexual intercourse (41).

Bacterial vaginosis

Bacterial vaginosis (BV) is defined as an overgrowth of anaerobic organisms (*Gardnerella vaginalis, Prevotella* species, *Mycoplasma hominis* and *Mobiluncus* species) often relacing normal commensal lactobacilli. It is the most common cause of abnormal discharge in persons with a vagina of childbearing age. In pregnancy BV is associated with late miscarriage, preterm birth, preterm premature rupture of membranes, and postpartum endometritis (42).

BV is most common amongst sexually active persons with a vagina and is associated with STIs and other genital infections. Many BV cases are asymptomatic. Others may experience a thin white, homogeneous discharge, coating the vaginal wall. Often the discharge will have a fishy odour. BV may co-exist with other causes of abnormal discharge such as candidiasis, trichomoniasis and cervicitis. Patients with BV symptoms do not experience soreness, itching, irritation or signs of inflammation (42-44).

Miscarriage/Recurrent miscarriage/Intrauterine death

Miscarriage (also known as spontaneous abortion) is a natural pregnancy loss before 24 weeks of gestation. There are 2 types:

- Sporadic - occurs most commonly in the first trimester. It often results from random foetal chromosomal anomalies
- Recurrent - three or more miscarriages affecting approximately only 1% (45)

Organisms including ureaplasma/mycoplasma, *C. trachomatis* and those causing bacterial vaginosis have been implicated. The presence of bacterial vaginosis in the first trimester of pregnancy has been reported as a risk factor for miscarriage and preterm birth. However, the evidence for an association with first trimester miscarriage is inconsistent. There is also a lack of data regarding the recurrent miscarriage population (45).

For an infective agent to be implicated in the aetiology of recurrent miscarriage, it must be capable of persisting in the genital tract and avoiding detection or must cause insufficient symptoms to disturb the woman. Toxoplasmosis, rubella, cytomegalovirus, herpes simplex (TORCH) and listeria infections do not fulfil these criteria and therefore routine TORCH screening should not be undertaken (45).

Transplacental infections associated with IUFD include cytomegalovirus, syphilis and parvovirus B19 as well as listeria, rubella, toxoplasmosis, herpes simplex, coxsackievirus, leptospira, Q fever, and Lyme disease. Malaria parasitaemia has also been associated with stillbirth. Ascending infection, with or without membrane rupture, with Escherichia coli, Klebsiella, Group B Streptococcus, Enterococcus, mycoplasma/ureaplasma, Haemophilus influenzae and Chlamydia are the more common infectious causes in developed countries (46).

IUCDs

Intrauterine contraception (IUCDs) methods are long-acting reversible contraceptives. There are 2 types available in the UK: levonorgestrel intrauterine devices (LNG-IUDs) and copper intrauterine devices (Cu-IUDs). When inserting these devices patients may experience the following:

- pain on insertion
- expulsion of the device
- unscheduled bleeding
- uterine perforation
- infection, including pelvic inflammatory disease.
- ectopic pregnancy
- for the LNG-IUD, hormonal adverse effects, such as acne and ovarian cysts
- pelvic pain or cramping has been reported
- Pain or bleeding can occur from a malpositioned or expelled levonorgestrel intrauterine device

For both devices, the risk of pelvic infection appears to increase in the first 3 weeks after IUC insertion. However, the overall risk is very low (less than 1%).

Pelvic actinomycosis is a very rare, chronic bacterial pelvic infection that is associated with long-term IUC use (47).

5 Medicolegal Cases

If the presence of an STI is to be used in medico-legal proceedings, then there should be a chain of evidence (COE) for the samples taken. Specimens should be handled in accordance with Royal College of Pathologists' Guidance for handling medicolegal samples and preserving the chain of evidence.

Local legal requirements and guidance should be sought for maintaining and documenting a chain of custody for specimens and results that might be used in a legal investigation and for which test results are accepted as evidence.

NAATs for the detection of *N. gonorrhoeae* or *C. trachomatis* are not licensed for use in extra-genital specimens and have not been evaluated in genital specimens from children. Evidence for the use of NAATs in children is limited. However, in adult populations, NAATs are more sensitive than culture and can be used on non-invasive specimens. Therefore, on balance, their use is recommended for testing in children.

Samples for culture for *N. gonorrhoeae* should be directly plated onto culture medium in the clinic, but Amies swabs (or equivalent) are clinically acceptable when this is not possible, providing there is prompt transport of samples to the laboratory.

Culture for *C. trachomatis* is no longer available in many laboratories (48).

Note:

- Examination of a pre-pubertal child should be undertaken by qualified clinician.
- For pre-pubertal girls, vulvo-vestibular swabs inside the labia minora but avoiding the hymen should be used. Trans-hymenal sampling should only be taken in exceptional circumstances (48).

Table 1: Testing for pre pubertal females

Pre pubertal females	
Specimen	**Test**
Vulvo-vestiblar swabs	• NAAT for *N. gonorrhoeae* and *C. trachomatis* • *N. gonorrhoeae* culture • Optional if discharge present: Microscopy for *T. vaginalis,* candida species, BV and/or culture for *T. vaginalis,* candida species, anaerobes or aerobes
Urine only if child/carer declines examination and self-taken vulvo-vaginal swab not possible	• NAAT for *N. gonorrhoeae* and *C. trachomatis*
Rectal swab	• NAAT for *N. gonorrhoeae* and *C. trachomatis* • *N. gonorrhoeae* culture
Pharyngeal swab	

Table 2: Testing for post pubertal females

Post pubertal females	
Specimen	**Test**
Vulvo-vestiblar swabs or endocervical swab	• NAAT for *N. gonorrhoeae* and *C. trachomatis* • *N. gonorrhoeae* culture
Urine if vulvo-vaginal or endocervical swab declined	• NAAT for *N. gonorrhoeae* and *C. trachomatis*
Rectal swab if anal penetration indicated	• NAAT for *N. gonorrhoeae* and *C. trachomatis* • *N. gonorrhoeae* culture
Pharyngeal swab if oral penetration indicated	

Table 3: testing for males

Males	
Specimen	**Test**
Urethral discharge meatal swab (pre-pubertal) or urethral swab (post-pubertal)	• Microscopy for pus cells • *N. gonorrhoeae* culture
First void urine sample	• NAAT for *N. gonorrhoeae* and *C. trachomatis*
Rectal swab	• NAAT for *N. gonorrhoeae* and *C. trachomatis* • *N. gonorrhoeae* culture
Pharyngeal swab	• NAAT for *N. gonorrhoeae* and *C. trachomatis* • *N. gonorrhoeae* culture

(48)

Please note the following:

- Presence of genital blisters or ulcers
  - Swab for herpes simplex virus PCR
  - Swab for bacterial culture (consider)
  - Dark ground microscopy for Treponema pallidum should be considered. Swab for T. pallidum PCR if available. Syphilis serology should also be performed, and repeated in six weeks

- Bacterial vaginosis
  - The prevalence of BV in asymptomatic sexually abused pre-pubertal girls is extremely low. Bacterial vaginosis is seen slightly more often in sexually abused girls who have a discharge. There are insufficient data in children to determine the significance of bacterial vaginosis.

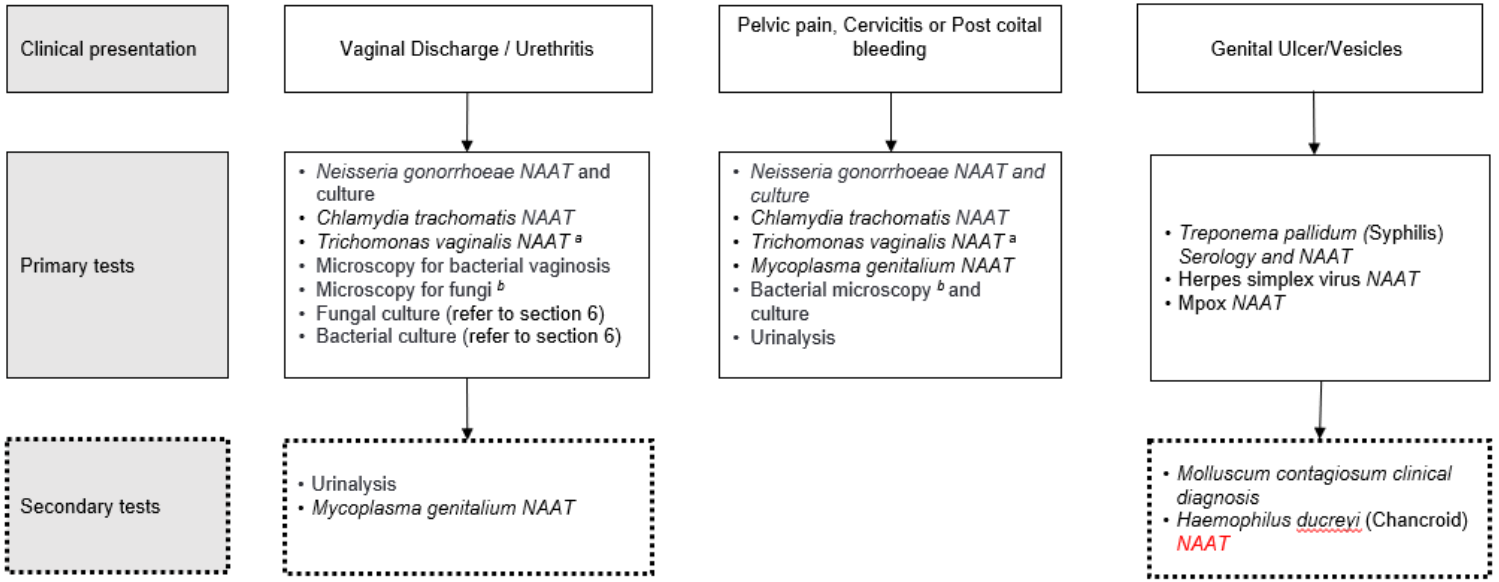
- Syphilis
  - In a child presenting with syphilis, history, examination and syphilis serology in both the child and mother are needed to determine acquired or congenital disease
  - Despite the lack of evidence and in view of the fact that syphilis is almost exclusively a sexually transmitted disease in adults, sexual abuse should always be considered if vertical, perinatal or blood contamination have been excluded
  - anogenital warts
  - Sexual abuse must be considered in any child presenting with anogenital warts (48).

6 Clinical presentations

Algorithm 1: Sexually transmitted infections in persons with a vagina

The algorithm below shows the main clinical presentations that presents in persons with a vagina followed by primary testing and in some cases secondary testing.

Definition: NAAT - Nucleic Acid Amplification Test



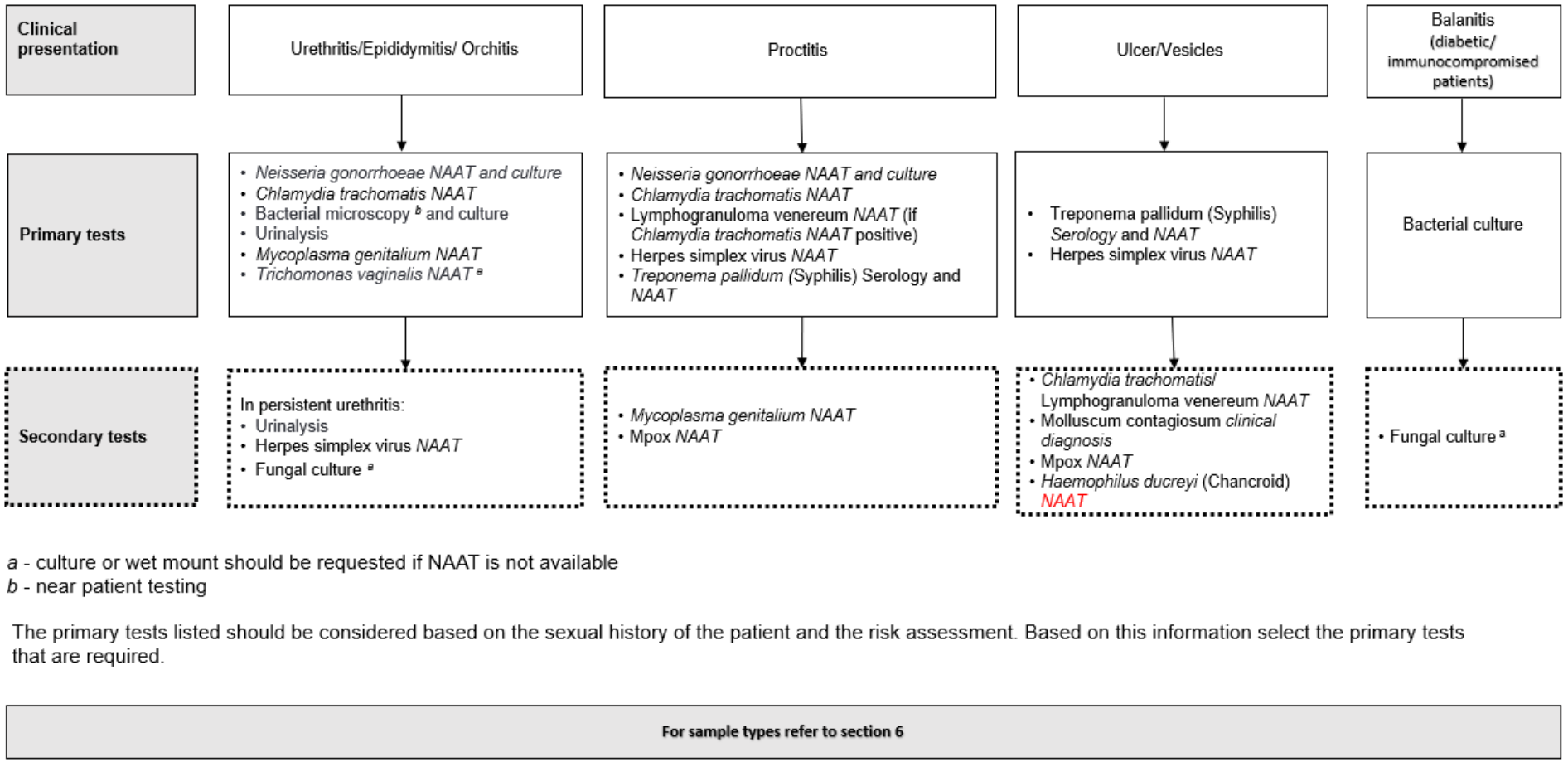
a - TV culture or wet mount should be requested if NAAT is not available
b - near patient testing

The primary tests listed should be considered based on the sexual history of the patient and the risk assessment. Based on this information select the primary tests that are required.

For sample types refer to section 6

Algorithm 2: Sexually transmitted infections in persons with a penis

The algorithm below shows the main clinical presentations that presents in persons with a penis followed by primary testing and in some cases secondary testing.



a - culture or wet mount should be requested if NAAT is not available
b - near patient testing

The primary tests listed should be considered based on the sexual history of the patient and the risk assessment. Based on this information select the primary tests that are required.

For sample types refer to section 6

7 Pre-laboratory processes (pre-analytical stage)

7.1 Specimen type, collection, and handling

Collect specimens as soon as possible after onset of symptoms.

Collect specimens before antimicrobial therapy where possible.

Refer to current guidance on the safe handling of all organisms in the safety considerations section.

NAAT testing may require specific sample types. This information should be provided by the testing laboratory.

Table 4: Specimen type

Type of specimen	Description
Vulvo-vaginal swabs (VVS)	This may be collected either by a healthcare professional or self-collected by the patient by inserting a dry swab about 2–3 inches into the vagina and gently rotating for 10 to 30 seconds (6). For *Trichomonas*, the posterior fornix, including any obvious candidal plaques should be swabbed.
Endocervical swabs	The sample must contain cervical columnar cells, the swab should be inserted into the cervical os and firmly rotated against the endocervix. Inadequate specimens reduce the sensitivity of NAATs (6).
High vaginal swabs	After the introduction of the speculum, the swab should be rolled firmly over the surface of the vaginal vault. The swab should then be placed in the appropriate transport medium. Liquid swabs are used in laboratories with automated processing systems.
Self-collected vaginal swab	Self-collected vaginal swabs are equivalent in sensitivity and specificity to those collected by a clinician. An endocervical swab is acceptable when a pelvic examination is indicated (49).

Type of specimen	Description
Vaginal discharge	For the specific diagnosis of BV, it is recommended that an air-dried smear of vaginal discharge is sent in addition to the swab. NAAT testing is also available in some laboratories. Separate samples should be collected into appropriate transport media for detection of viruses
Genital ulcer	Ulcer/vesicle fluid swab into NAAT collection tube, viral transport medium, bacterial culture transport medium or dry swab.
First-catch urine (FCU)	Urine samples are easy to collect, do not cause discomfort and thus are preferable to urethral swabs. To collect FCU, patients should be instructed to hold their urine for at least 1 h before being tested. The first 20 ml of the urinary stream should be captured as the earliest portion of the FCU contains the highest organism load.
Urethral swabs	Urethral swabs, if taken, should be inserted 2–4 cm inside the urethra and rotated once before removal. Studies of self-taken penile-meatal swabs have yielded good results (6)
Intrauterine Contraceptive Device (ICUD)	The entire device should be sent.
Retained products of conception	Fluids / Tissue sample
Rectal swabs	Rectal swabs are taken via a proctoscope, although self-collected rectal swabs are also acceptable for NAATs. In order to minimise testing costs, some centres combine samples by pooling urine, rectal swab and oro-pharyngeal swabs together into a single sample. Validation of such an approach is required as the pooling may reduce sensitivity and in the event of a reactive result, the precise site of infection would be unknown (6).
Throat swabs	Throat swabs can be either be self-taken or by a clinician. Samples should be taken from the tonsillar area and/or posterior pharynx avoiding the tongue and uvula. These swabs can be self-taken or taken by a clinician.

Type of specimen	Description
Fluids and pus vaginal-rectal specimens	These are taken from the fallopian tubes, tubo-ovarian and Bartholin's abscesses during surgery. Collect using a flocked swab and place in a liquid-based transport medium such as Amies transport media. Dacron and cotton swabs prevent the release of microorganisms which reduces GBS recovery.

Table 5: Bacterial, viral and fungal organisms, laboratory technique and specimen type in persons with a penis and vagina

Bacterial Investigations		
Organism	**Laboratory technique**	**Specimen type**
Chlamydia trachomatis *Neisseria gonorrhoea*	NAAT (other molecular methods)	Persons with a vagina: Endocervical swab, vaginal swab (including self-collected), urine and liquid based cytology solution samples. If pelvic infection, including *N. gonorrhoeae* is suspected, the cervical os should be swabbed. Persons with a penis: urine, sometimes a swab from the tip of the penis Rectal and pharyngeal swabs can be tested using a validated NAAT for these specimen types – discuss with local laboratory Genital reconstructive surgery (GRS): A first-pass urine is the specimen of choice in those with either a neovagina or neopenis. A swab of the neovagina should be considered especially if mesothelial grafts have been used in reconstruction.
Neisseria gonorrhoea	Culture	Swabs/urine

Lymphogranuloma venereum (LGV)	NAAT (other molecular methods)	Persons with a vagina /penis: rectal swab
Mycoplasma genitalium	NAAT (other molecular methods)	Persons with a vagina: VVS followed by endocervical swab Persons with a penis: FCU Genital reconstructive surgery (GRS): guided by sexual history and symptoms (24)
Haemophilus ducreyi	NAAT	Ulcer swab in viral transport medium or dry-swab. Only in patients with a relevant travel link and in those where LGV/syphilis/HSV/Mpox have been excluded.
Treponema pallidum (Syphilis)	NAAT (other molecular methods)	A swab of the chancre can be taken and collected in appropriate viral transport medium, lysis buffer or dry swab as per local laboratory protocol for NAAT. NAAT is preferred over microscopy. Refer to UK SMI V 44: Laboratory diagnosis of syphilis
	Serology	Plasma or serum for syphilis EIA or CLIA for detecting treponemal IgM/IgG may be sent, antibody detection occurs within two weeks of the chancre.
	Microscopy	Chancre in primary syphilis can be swabbed onto a slide for dark field microscopy. Lesion/biopsy of condylomata lata may be viewed under dark field microscopy or via histopathological staining.
Trichomonas vaginalis	Microscopy	Persons with a vagina: Vaginal swab (clinical or self-administered), urine Persons with a penis: Clinician taken urethral swabs or self-taken penile-meatal swab
	NAAT (other molecular methods)	Persons with a vagina: Endocervical swab, vaginal swab (including self-collected), urine. Persons with a penis: urine, penile-meatal and urethral swabs may require local validation.
	Microscopy	Microscopy with gram staining is the gold standard. A vaginal smear on a slide should be dried and sent to the laboratory for testing or a vaginal swab (42).

Bacterial vaginosis	NAAT	There are no current recommendations for the use of NAAT for the diagnosis of BV however, assays are emerging. Importantly making a BV diagnosis by NAAT should not be made on the detection of *Gardnerella* species alone. Where NAAT assays are used they should be well designed and include multiple targets, assessing the relative abundance of Lactobacilli compared to other bacterial species implicated in BV infection as this offers improved accuracy in diagnosis.

Virological investigations		
Organism	**Laboratory technique**	**Specimen type**
Herpes simplex virus (HSV)	NAAT (other molecular methods)	Viral swab (in viral transport medium) of any lesions or ulcers. Amies and charcoal swabs are not usually validated for NAAT testing, please consult user manual for local laboratory.
	Serology	Type specific HSV antibody testing may be required in some cases e.g. pregnancy. RCOG and BASHH guidance should be followed for these requests.
Mpox virus	NAAT (other molecular methods)	Viral swab (in viral transport medium) of any lesions. The crusts of lesions and/or the roofs of the lesions can be collected for NAAT testing. Rectal and throat swabs can be collected from those who are contacts of cases or who show systemic symptoms but have not yet developed lesions. If local laboratory does not offer Mpox virus testing the swab should be sent to your designated reference laboratory. Amies and charcoal swabs are not usually validated for NAAT testing, please consult user manual for local laboratory.

Fungal investigations		
Organism	**Laboratory technique**	**Specimen type**
Candida and associated	Microscopy	Acute VVC- A high vaginal swab (HVS) of the discharge should be taken for Gram stain and/or phase contrast wet film microscopy.

ascomycetous yeasts	Culture	Recurrent VVC- An HVS of the discharge should be taken for direct plating onto solid fungal growth medium (Sabouraud plate).

7.2 Specimen transport and storage

This section covers specimen transport and storage consideration related to this UK SMI, and should be read in conjunction with the scientific information.

Specimens should be transported and processed as soon as possible.

7.3 Relevant clinical history details needed on patient request forms when referring samples to the laboratory

Full clinical details and information on patient history should be provided with clinical requests.

These details should include:

- specimen date and time of collection
- site of specimen collection
- type of infection suspected
- type of swab/sample sent to the laboratory
- immune status
- trauma
- other relevant information

7.4 Safety considerations

All Hazard group 2 organisms must be confirmed at Containment Level 2.

Due to the severity of the disease and the risks associated with generating aerosols, any manipulation of suspected isolates of *N. meningitidis* should always be undertaken in a microbiological safety cabinet until *N. meningitidis* has been ruled out (as must any laboratory procedure giving rise to infectious aerosols).

The section covers specific safety considerations (50-72) related to this UK SMI, and should be read in conjunction with the general safety considerations.

If infection with a Hazard group 3 organism is suspected, testing should be undertaken in a microbiological safety cabinet under Containment Level 3 conditions.

Mpox testing should be performed in the appropriate laboratory, with the correct PPE and trained staff. Refer to The Green Book for more information on vaccinations.

Please refer to the Green book for other organisms.

8 Laboratory processes (analytical stage)

8.1 Molecular testing

When performing molecular testing, knowledge of the detection range, sensitivity and specificity to a specific assay is required. Molecular assays for the detection of pathogens are widely available. Some multiplex molecular testing may give results for organisms not requested. Under these circumstances' laboratories should follow local procedures. Please refer to UK SMI Q 4: Good practice when performing molecular amplification assays.

8.2 Microscopy

Microscopy is still useful in primary identification. Refer to UK SMI TP 39: Staining procedures.

Refer to algorithms in section 5 for the use of microscopy.

For safety considerations refer to Section 2

8.3 Culture media, conditions and organisms

The use of molecular methods is widely used due to the high sensitivity and specificity and faster turnaround times. Culture maybe be recommended in certain settings and is the preferred method for some samples.

For safety considerations refer to Section 2.

Table 6: Investigation of bacterial and fungal culture

Investigation	Clinical details/ presentation	Culture media	Incubation			Cultures read
			Temp °C	Atmos	Time	
Standard media						
Bacterial aerobic culture *S. aureus* Lancefield Groups A, B, C and G streptococci Any abnormal overgrowth	Vaginal discharge pelvic pain Urethritis Epididymitis Orchitis Balanitis	Blood agar*	35-37	5-10% CO_2	16-24hr	16-24hr
Fungal culture Yeasts	Vaginal discharge Urethritis Epididymitis Orchitis/ Balanitis	Sabouraud agar or CHROM agar	35-37	air	24-48hr	≥ 24hr
Supplementary culture media *N. gonorrhoeae* *N. meningitidis* May require anaerobic incubation, based on clinical presentation	Vaginal discharge Pelvic pain Cervicitis post coital bleeding Urethritis Epididymitis Orchitis Proctitis	GC selective agar with antifungal agent	35-37	5-10% CO_2	40-48hr	≥40hr
Supplementary media						
Bacterial anaerobic culture	Balanitis Epididymitis Orchitis	Neomycin fastidious anaerobe agar with metronidazole 5µg disc	35-37	anaerobic	40-48hr*	≥40hr
Bacterial aerobic Gram negative culture Enterobacterales Pseudomonas	Balanitis Epididymitis Orchitis Miscarriage	CLED	35-37	air	≥16hr	≥16hr

Note: If a vaginal swab is received in combination with a cervical and urethral swab, include standard media only with the vaginal and urethral swabs and add supplementary media as appropriate for the cervical swab.

*incubation may be extended to five days; in such cases plates should be read at ≥40hr and left in the incubator/cabinet until day five.

9 Post-laboratory processes (post analytical stage)

9.1 Reporting Microscopy results

Report organism or fungal elements seen.

For fungal infection please refer to the British Society for Medical Mycology best practice guidelines).

9.2 Reporting Molecular results

Report bacterial, fungal, parasite or viral DNA/RNA as ‘detected’ (state the organism).

Report bacterial, fungal, parasite or viral DNA/RNA as ‘not detected’.

9.3 Reporting Culture results

Positive results should be released immediately. Report clinically significant organisms isolated as growth detected. State the species level identified.

Growth not detected report as ‘Absence of growth’.

Any notifiable disease should also be reported.

9.4 Reporting time

Interim or preliminary results should be issued on detection of clinically significant isolates as soon as growth is detected, unless specific alternative arrangements have been made with the requestors. Positive results for microscopy should be released immediately, following local policy. Many preliminary results require specialist interpretation before they are released.

Final reports should follow as soon as possible.

Results are communicated in accordance with local policy.

Results associated with medicolegal cases and chain of evidence should be considered as urgent. Local policies should be followed.

10 Antimicrobial susceptibility testing

All clinically significant isolates (bacterial and fungal) should be tested for antimicrobial susceptibility, particularly in cases of poor treatment response.

Laboratories should test and interpret antimicrobial susceptibility where available.

Antimicrobial susceptibility test result reporting is guided by local epidemiology and stewardship guidelines. Refer to the table below.

10.1 Phenotypic Antimicrobial Susceptibility Testing Panels

Organism	Panel Examples of agents to be included within primary test panel (recommended agents to be reported are in bold depending on clinical presentation)	Panel Examples of agents to be included within secondary test panel (recommended agents to be reported are in bold depending on clinical presentation)	Referral to Reference Services & Notes
Neisseria gonorrhoeae	**Ceftriaxone** **Ciprofloxacin** Azithromycin	Ertapenem Gentamicin Cefixime Spectinomycin	Isolates that exhibit resistance to ceftriaxone, spectinomycin or from suspected treatment failures only. Refer to the appropriate reference or specialist laboratory England, Wales, Scotland or Northern Ireland
Beta Haemolytic Streptococci (A,B,C,F and G)	**Penicillin** **Clindamycin*** **Erythromycin** Vancomycin / Teicoplanin Tetracycline / Doxycycline	Linezolid Trimethoprim/Cotrimoxazole	Isolates that exhibit resistance to Penicillin or Linezolid/Tedizolid Refer to the appropriate reference or specialist laboratory England, Wales, Scotland or Northern Ireland *Inducible Clindamycin resistance detection required
Anaerobes	**Metronidazole**	Clindamycin Amoxycillin / Ampicillin Co-Amoxyclav Pip – Tazobactam Meropenem	Species level identification is required for interpretation of antimicrobial susceptibility tests Isolates that exhibit resistance to Metronidazole or Carbapenems Refer to the appropriate reference or specialist laboratory England, Wales, Scotland or Northern Ireland
Listeria monocytogenes	**Penicillin / Ampicillin** **Meropenem**	Linezolid Erythromycin Cotrimoxazole	Refer to the appropriate reference or specialist laboratory England, Wales, Scotland or Northern Ireland
Actinomycetes	By specialist reference facilities only.		
Candida	**Fluconazole** Nystatin Itraconazole Clotrimazole	Amphotericin Anidulafungin / Caspofungin Flucytosine Miconazole	Species level identification is required for interpretation of antimicrobial susceptibility tests

- Note AST for the following: Molecular detection of macrolide resistance should be carried out on all samples positive for *M. genitalium*. This may be provided locally, or samples can be referred for determination of mutations associated with macrolide resistance by PCR and sequencing. Molecular detection of fluoroquinolone resistance is also carried out but is only available for patients who have failed quinolone treatment.

- All diagnostic samples from all individuals testing positive for mpox should now be subject to clade confirmation. Positive mpox samples should be sent to Rare and Imported Pathogens Laboratory (RIPL) for clade specific testing if clade differentiation is not available through local mpox testing services (28).

- HSV 1 and 2- Phenotypic and genotypic resistance detection (DNA polymerase and Thymidine Kinase) usually after discussion with specialist/

References

1. Borman AM, Johnson EM. Name Changes for Fungi of Medical Importance, 2018 to 2019. J Clin Microbiol 2021: volume 59, issue 2.**2++** 10.1128/jcm.01811-20

2. Coleman H SI, Soni S, Murchie M, Clarke M, Williams A, Mohammed H, Medland N, Nori A. BASHH Summary Guidance on Testing for Sexually Transmitted Infections, 2023 2023.**++**

3. Gonorrhoea and syphilis at record levels in 2022 GOV.UK; 2023. **++**

4. Prevention CfDCa. Chlamydia – CDC Basic Fact Sheet 2022.**++**

5. UKHSA. 'Chlamydia: surveillance, data, screening and management'.'last updated' 2022 '(viewed on' 10.07.2023) https://www.gov.uk/government/collections/chlamydia-surveillance-data-screening-and-management

6. Nwokolo NC and others. 2015 UK national guideline for the management of infection with Chlamydia trachomatis. Int J STD AIDS 2016: volume 27, issue 4, pages 251-67.**++** 10.1177/0956462415615443

7. Agency UHS. Guidance Managing incidents of ceftriaxone-resistant Neisseria gonorrhoeae in England 2022.**++**

8. Organization WH. Multi-drug resistant gonorrhoea. World Helath Organization 4 July 2024.**++**

9. Merrick R and others. Antimicrobial-resistant gonorrhoea: the national public health response, England, 2013 to 2020. Euro Surveill 2022: volume 27, issue 40. 10.2807/1560-7917.Es.2022.27.40.2200057

10. Prevention CfDCa. 'Gonorrhea – CDC Basic Fact Sheet'.'last updated' 2022 '(viewed on' 26.04.2023) https://www.cdc.gov/std/gonorrhea/stdfact-gonorrhea.htm

11. Fifer H and others. 2018 UK national guideline for the management of infection with Neisseria gonorrhoeae. Int J STD AIDS 2020: volume 31, issue 1, pages 4-15.**++** 10.1177/0956462419886775

12. Ladhani SN and others. Meningococcal disease and sexual transmission: urogenital and anorectal infections and invasive disease due to Neisseria meningitidis. Lancet (London, England) 2020: volume 395, issue 10240, pages 1865-77. 10.1016/S0140-6736(20)30913-2

13. Kingston M and others. UK national guidelines on the management of syphilis 2015. Int J STD AIDS 2016: volume 27, issue 6, pages 421-46.++ 10.1177/0956462415624059

14. GOV.UK. 'Genital warts and human papillomavirus: guidance, data and analysis '.'last updated' 07.10.2016 2016 '(viewed on' 10.07.2023) https://www.gov.uk/government/collections/genital-warts-and-human-papillomavirus-hpv-guidance-data-and-analysis

15. Nugent D and others. British association for sexual health and HIV national guideline for the management of anogenital warts in adults (2024). International Journal of STD & AIDS 2024: volume 35, issue 7, pages 498-509.++ 10.1177/09564624241233338

16. Grennan D. Genital Warts. Jama 2019: volume 321, issue 5, pages 520. 10.1001/jama.2018.20181

17. Care UHSAaDoHaS Immunisation against infectious disease, chapter 18a Human Papillomavirus GOV.UK 2021. ++

18. Excellence NIfHaC. Herpes simplex - genital 2023.++

19. Organization WH. 'Herpes Simplex Virus '.'last updated' 2023 '(viewed on' 10.07.2023) https://www.who.int/news-room/fact-sheets/detail/herpes-simplex-virus

20. UKHSA. 'Sexually transmitted infections and screening for chlamydia in England: 2023 report '.'last updated' 2024 '(viewed on' 17.06.2024) https://www.gov.uk/government/statistics/sexually-transmitted-infections-stis-annual-data-tables/sexually-transmitted-infections-and-screening-for-chlamydia-in-england-2023-report

21. Rawla P and others. Lymphogranuloma Venereum. StatPearls. Treasure Island (FL) ineligible companies. Disclosure: Krishna Thandra declares no relevant financial relationships with ineligible companies. Disclosure: Faten Limaiem declares no relevant financial relationships with ineligible companies.: StatPearls Publishing

22. GOV.UK. 'Lymphogranuloma venereum (LGV): guidance, data and analysis '.'last updated' 2016 '(viewed on' 10.07.2023) https://www.gov.uk/government/collections/lymphogranuloma-venereum-lgv-guidance-data-and-analysis

23. White J and others. 2013 UK National Guideline for the management of lymphogranuloma venereum: Clinical Effectiveness Group of the British Association for Sexual Health and HIV (CEG/BASHH) Guideline development group. Int J STD AIDS 2013: volume 24, issue 8, pages 593-601.++ 10.1177/0956462413482811

24. Soni SH, P. Rayment, M et al and others BASHH national guideline for the management of infection with Mycoplasma genitalium (2018). Internation journal of STD and AIDs 2019: volume 30, issue 10, pages 938-50.**++**

25. Excellence NIfHaC. 'Trichomoniasis: How common is it?'.'last updated' May 2020 2020 '(viewed on' 26.04.2023) https://cks.nice.org.uk/topics/trichomoniasis/background-information/prevalence/

26. (BASHH) BAfSHaH. BASHH UK National guideline on the management of Trichomonas vaginalis 2021 2022. **++**

27. UKHSA. 'Guidance Mpox (monkeypox): background information '.'last updated' 2023 '(viewed on' 10.07.2023) https://www.gov.uk/guidance/monkeypox

28. Agency UHS. Guidance Mpox (monkeypox): diagnostic testing 2022.**++**

29. Fernando I and others. British Association for Sexual Health and HIV national guideline for the management of Genital Molluscum in adults (2021). Int J STD AIDS 2022: volume 33, issue 5, pages 422-32.**++** 10.1177/09564624211070705

30. Prevention CfDCa. Molluscum Contagiosum 2015.**++**

31. Prevention CfDCa. Sexually Transmitted Infections Treatment Guidelines, 2021 Epididymitis 2021 **++**

32. Prevention CfDCa. Diseases Characterized by Urethritis and Cervicitis 2021.**++**

33. Lautenschlager S and others. 2017 European guideline for the management of chancroid. Int J STD AIDS 2017: volume 28, issue 4, pages 324-9.**++** 10.1177/0956462416687913

34. Horner. P BK, Mahony. C O, Muir. P, Evan. C, Radcliff. K. . 2015 UK National Guideline on the management of non-gonococcal urethritis. Internation journal of STD and AIDs 2015.

35. S ID. BMJ Best Practice Vaginitis 2022.**++**

36. Van Schalkwyk J, Yudin MH. Vulvovaginitis: screening for and management of trichomoniasis, vulvovaginal candidiasis, and bacterial vaginosis. J Obstet Gynaecol Can 2015: volume 37, issue 3, pages 266-74. 10.1016/s1701-2163(15)30316-9

37. Saxon Lead Author G and others. British Association for Sexual Health and HIV national guideline for the management of vulvovaginal candidiasis (2019). Int J STD AIDS 2020: volume 31, issue 12, pages 1124-44. 10.1177/0956462420943034

38. and BAfSH, (BASHH) H. United Kingdom National Guideline for the Management of Pelvic
Inflammatory Disease (2019 Interim Update) 2019.

39. Wray AA VJ, Khetarpal S. Balanitis: StatPearls Publishing; 2022.

40. Krieger JN and others. Epidemiology of prostatitis. Int J Antimicrob Agents 2008: volume 31 Suppl 1, issue Suppl 1, pages S85-90. 10.1016/j.ijantimicag.2007.08.028

41. Elkins JM and others. Association of Bartholin cysts and abscesses and sexually transmitted infections. Am J Emerg Med 2021: volume 44, pages 323-7. 10.1016/j.ajem.2020.04.027

42. Hay. P PS, Daniels. D. . UK National Guideline for the management of Bacterial Vaginosis 2012. BASHH 2012.

43. Excellence NIfHaC. Bacterial vaginosis 2023.

44. Prevention CfDCa. Bacterial Vaginosis – CDC Basic Fact Sheet 2022.

45. Rai R, Regan L. Recurrent miscarriage. Lancet 2006: volume 368, issue 9535, pages 601-11. 10.1016/s0140-6736(06)69204-0

46. Gynaecologists RCoO. Late Intrauterine Fetal Death and Stillbirth, Green–top Guideline No. 55 2010.**++**

47. Excellence NIfHaC. Contraception- IUC 2024.

48. (BASHH) BAfSHaH. BASHH National Guideline on the Management of Sexually Transmitted Infections and Related Conditions in Children and Young People 2021.

49. Prevention CfDCa. Recommendations for the Laboratory-Based Detection of Chlamydia trachomatis and Neisseria gonorrhoeae 2014 2014.

50. Advisory Committee on Dangerous Pathogens. The Approved List of Biological Agents. Health and Safety Executive 2021. pages 1-39. **++**

51. British Standards Institution (BSI). BS EN12469 - Biotechnology - performance criteria for microbiological safety cabinets 2000. **++**

52. British Standards Institution (BSI). BS 5726:2005 - Microbiological safety cabinets. Information to be supplied by the purchaser and to the vendor and to the installer, and siting and use of cabinets. Recommendations and guidance. 2005. pages 1-14. **++**

53. Centers for Disease Control and Prevention. Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories. MMWR Surveill Summ 2012: volume 61, pages 1-102.**+**

54. Department for Transport and others. Transport of infectious substances UN2814, UN2900 and UN3373 Guidance note number 17/2012 (revision 7). 2013. **++**

55. Department of Health. Health Protection Legislation (England) Guidance. pages 1-112. 2010. **++**

56. Gizzie N, Adukwu E. Evaluation of Liquid-Based Swab Transport Systems against the New Approved CLSI M40-A2 Standard. J Clin Microbiol 2016: volume 54, issue 4, pages 1152-6.**2+** 10.1128/JCM.03337-15

57. Health and Safety Executive. Managing risks and risk assessment at work (accessed 28/07/2021). https://www.hse.gov.uk/simple-health-safety/risk/index.htm. **++**

58. Health and Safety Executive. Blood-borne viruses in the workplace. Guidance for employers and employees. HSE. 2001. **++**

59. Health and Safety Executive. Safe use of pneumatic air tube transport systems for pathology specimens. 2009. **++**

60. Health and Safety Executive. Control of Substances Hazardous to Health Regulations. The Control of Substances Hazardous to Health Regulations 2002 (as amended). Approved Code of Practice and guidance L5 (sixth edition). HSE Books. 2013. **++**

61. Health and Safety Executive. Risk assessment: A brief guide to controlling risks in the workplace. HSE. 2014. **++**

62. Health and Safety Executive, Advisory Committee on Dangerous Pathogens. Management and operation of microbiological containment laboratories. HSE. 2019. **++**

63. Health Services Advisory Committee. Safe working and the prevention of infection in clinical laboratories and similar facilities. Books. H 2003. **++**

64. Home Office. Public Health Act (Northern Ireland) 1967 Chapter 36. 1967. **++**

65. Home Office. Anti-terrorism, Crime and Security Act. 2001. **++**

66. Official Journal of the European Communities. Directive 98/79/EC of the European Parliament and of the Council of 27 October 1998 on *in vitro* diagnostic medical devices 1998. pages 1-37. **++**

67. Public Health England. Laboratory reporting to Public Health England: a guide for diagnostic laboratories. PHE. 2020. pages 1-31. **++**

68. Scottish Government. Public Health (Scotland) Act. 2008. **++**

69. The Royal College of Pathologists. The retention and storage of pathological records and specimens (5th edition). pages 1-59. 2015. **++**

70. The Welsh Assembly Government. Health Protection Legislation (Wales) Guidance. 2010. **++**

71. Tyrrell KL and others. Comparison of the Copan eSwab System with an Agar Swab Transport System for Maintenance of Fastidious Anaerobic Bacterium Viability. J Clin Microbiol 2016: volume 54, issue 5, pages 1364-7.**2+** 10.1128/JCM.03246-15

72. World Health Organization. Guidance on regulations for the transport of infectious substances 2019-2020. WHO. 2019. **++**