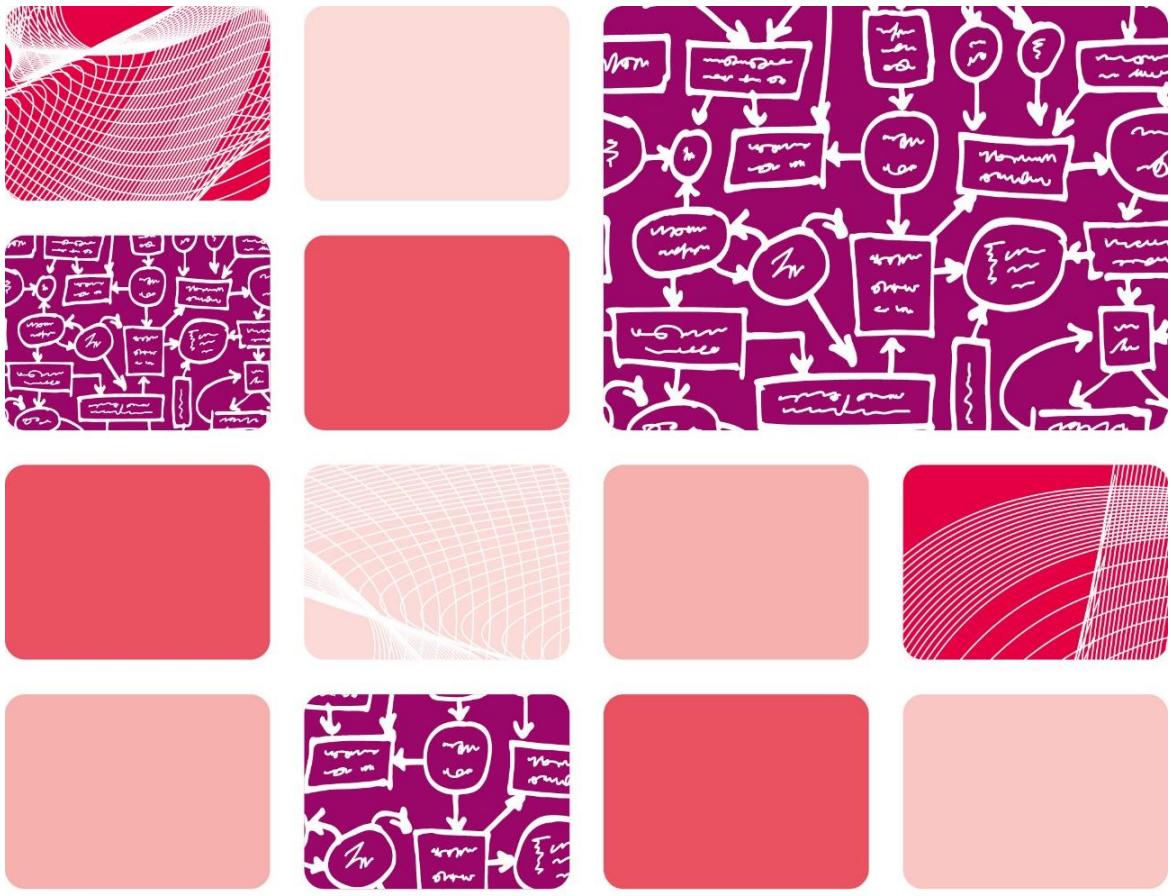
UK Health Security Agency

UK Standards for Microbiology Investigations

Infectious syndromes affecting the genitourinary tract and reproductive organs



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Acknowledgments

UK Standards for Microbiology Investigations (UK SMIs) are developed under the auspices of UKHSA working in partnership with the partner organisations whose logos are displayed below and listed on the UK SMI website. UK SMIs are developed, reviewed and revised by various working groups which are overseen by a steering committee.

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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	3/25.02.25
Issue number discarded	1.2
Insert issue number	2
Anticipated next review date*	25.02.28
Section(s) involved	**Amendment**
General	The title has changed from *'Sexually transmitted infections'* to *'Infectious syndromes affecting the genitourinary tract and reproductive organs'.* The template has been updated Hyperlinks throughout document updated to Royal College of Pathologists website. Public Health England replaced with UK Health Security Agency throughout the document, including the updated Royal Coat of Arms Partner organisation logos updated. Broken links to devolved administrations replaced. References to NICE accreditation removed. Scope and Purpose replaced with General and Scientific information to align with current UK SMI template.
Scope	Has been updated with 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.
Background	Expanded to include common presenting STIs and non STIs.
Algorithms	There are 2 separate algorithms for vaginal and penile infections.
All sections	Have been updated and new current references added.

*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-collected swabs have become increasingly common 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.

Screening and 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 that, 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 used and these organisms 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. We therefore advise engagement with local service users to ensure that the terminology used in individual services is acceptable to their users (2).

Neovagina –a reconstructed vagina using penile, scrotal tissue, sigmoid colon, the peritoneum, skin graft through a surgical procedure (3,4)

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

Natal vagina**-** A term used to refer to the vagina that was not surgically created

At the time of writing, there was a lack of evidence in the literature for the presentation of and pathogens associated with neovaginal and neopenile infections. Therefore, this document focuses on diagnosing infections affecting natal genitals and reproductive organs. Users need to be aware that significant differences in causative organisms are likely between surgically constructed and natal genitals.

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. Although blood-borne virus infection is not covered in this guideline, consideration should always be given to such testing in the context of patients presenting with a sexually transmitted infection.

4.1 Sexually transmitted infections (STIs)

Some organisms causing genitourinary STIs present with a fairly specific and distinctive range of symptoms and signs, but many can cause a clinical syndrome for which the causative organism is impossible to differentiate on a clinical basis. Most STIs also have the potential to cause asymptomatic or subclinical infections.

Bacterial

Gonorrhoea

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 (5). The primary sites of infection are the urethra, endocervix, rectum, pharynx and the conjunctiva. Transmission is by direct inoculation of infected secretions (6). A pregnant mother with gonorrhoea can infect her newborn during childbirth (5).

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

- penile urethral infection - usually a mucopurulent urethral discharge. Some patients may complain of testicular and epididymal pain, with tenderness and swelling found 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 or anal pain / discomfort
- pharyngeal infection - usually asymptomatic but is occasionally associated with a sore throat (6)

If gonorrhoea is left untreated, it can cause systemic disease, infertility and pelvic inflammatory disease (PID) (7). There are increasing numbers of treatment failures being reported from Austria, the United Kingdom and other countries (8).

The number of gonorrhoea diagnoses in England is increasing. In 2022 there were 79,268 reported diagnosis, which increased to 85,223 in 2023 (7). Certain strains of *N. gonorrhoeae* have developed resistance to all classes of antibiotics recommended for treatment (9). In many countries, ciprofloxacin and azithromycin resistance is high and resistance to cefixime and ceftriaxone continues to increase (8). International spread of ceftriaxone-resistant gonococcal strains has been reported in Denmark, France, Japan and the United Kingdom.

The emergence of highly resistant *N. gonorrhoeae* strains in recent years is of worldwide concern. Guidance for managing incidents of ceftriaxone-resistant Neisseria gonorrhoeae in England has been developed by the Gonococcal Resistance to Antimicrobials Surveillance Programme (GRASP) team at the UK Health Security Agency (UKHSA) (9).

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

Chlamydia

Chlamydia is caused by *Chlamydia trachomatis,* which is the most common bacterial STI in the UK. Chlamydia diagnoses in all ages have remained stable recently, with 194,970 diagnoses in England in 2023 compared to 194,244 diagnoses in 2022 (7).

Chlamydia can occur in any exposed person and is common in young people aged 15-24 years. Vertical transmission can occur at birth with the risk of eye infections or pneumonia in the neonate (10-12).

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 (12)
- 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), ectopic pregnancy, infertility, endometritis, salpingitis, sexually acquired reactive arthritis, perihepatitis and long-term pelvic or abdominal pain (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 (7). Syphilis disease is grouped into the following stages:

- 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% of patients will develop secondary syphilis. Secondary syphilis occurs due to dissemination of treponemes and/or antibody complexes and can affect multiple systems. It often presents with a widespread mucocutaneous rash and lymphadenopathy.
- latent infection follows when the disease becomes asymptomatic. Approximately 25% of patients will develop a recurrence of secondary disease during the early latent stage
- late (tertiary) disease will develop in approximately one third of untreated patients. Late syphilis can manifest as gummatous (granulomas with necrosis), cardiovascular or late neurosyphilis (13)

Neurosyphilis can occur at any stage of infection.

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

Mycoplasma genitalium

M. genitalium belongs to the Mollicutes class of bacteria. 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. *M. genitalium* is a cause of non-gonococcal urethritis and may be seen as a co-infection of *C. trachomatis.*

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

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

Infection may be asymptomatic. Complications include PID, sexually acquired reactive arthritis and pre-term delivery (14).

Lymphogranuloma venereum

Lymphogranuloma venereum (LGV) is less frequently reported compared to other STIs. However, in England there has been an increase in the number of reported cases from 1,173 in 2022 to 1,360 in 2023 (15).

LGV is caused by 3 genovars of *C. trachomatis:* L1, L2 and L3. There has been an increase in the number of reported infections in GBMSM over recent years (16). Symptoms can be complex, severe and may involve multiple sites in the body such as the genitals, anus, rectum, oral cavity and lymph nodes (17,18). 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 when passing stools, rectal bleeding, abdominal and anal pain (16)

- 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 (or disfiguration) of tissue in the involved areas, including: proctitis, proctocolitis mimicking Crohn's disease, fistulae, strictures, chronic granulomatous fibrosis and scarring of the vulva with esthiomene (elephantiasis).

Neisseria meningitidis urogenital and anorectal infections

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 of invasive meningococcal disease among GBMSM across North America and Europe. 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 (19).

Ureaplasmas

Ureaplasma urealyticum and *parvum* 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. Routine testing and treatment of asymptomatic or symptomatic patients for *Mycoplasma hominis*, *U. parvum*, and *U. urealyticum* is not recommended by the British Association of Sexual Health and HIV (BASHH) (2). It can be considered in certain scenarios under expert guidance.

Viral

Herpes simplex virus (HSV)

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

- HSV-1 primarily causes orolabial herpes and is now also the most common cause of genital herpes in the UK (20)
- 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
- HSV-1 and HSV-2 can be transmitted even in the absence of symptoms, though the risk of transmission is greater when there are active lesions

In rare circumstances, herpes (HSV-1 and HSV-2) can be transmitted from mother to child during delivery, causing neonatal herpes (21).

Most people infected are asymptomatic. Patients who are symptomatic will experience bumps, painful blisters or ulcers around the genital areas or anus. Symptoms begin with tingling, itching or burning near the sores (21). HSV is a lifelong infection; there is no cure and recurrent symptoms can occur.

Human papillomavirus (HPV)

Genital warts are caused by the human papillomavirus (HPV) types 6 and 11. Infections are common in the sexually active population (22). 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 (23,24).

Diagnosis is made clinically and usually no laboratory tests are required, although in some cases a biopsy may be required for confirmation (23).

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 (25). Recent data suggests genital warts diagnoses in all ages remained common but 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) (7).

Molluscum contagiosum

Molluscum contagiosum belongs to the Poxviridae family and Molluscipox genus. Infection causes a benign epidermal eruption of the skin and 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 with profuse lesions can manifest in the context of significant 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 (26). The papules usually disappear spontaneously within 6 to 12 months but may take as long as 4 years to resolve (27).

Mpox

Mpox 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 or respiratory droplets from an infected animal/human, and also through contact with contaminated materials such as clothing/linen (28).

The incubation period is usually between 5-21 days. Prodromal symptoms may include fever, headache, muscle aches, backache, swollen lymph nodes and exhaustion. Rash is the predominant symptom as the illness develops; it typically begins on the face and/or mouth or near the genital areas (penis, testicles, labia, vagina) and anus. It may remain localised or spread to affect all areas (including the hands and feet). Lesions progress from a maculopapular form to pustules (which may be umbilicated) before forming scabs, which eventually fall off. The extent of symptoms is highly variable and some cases appear to be asymptomatic (28).

Cases of human mpox have recently been reported in multiple countries that have not previously had MPXV in animal or human populations, including the UK. There are two major Clades of MPXV: Clade I and Clade II. Clade II is split into Clade IIb and Clade IIa, with subgroup clusters called lineages. The majority of these cases are from Clade IIb, lineage B.1 (28).

Since January 2023, Clade II mpox is no longer considered a high consequence infectious disease (HCID) within the UK. Clade I mpox remains an HCID. In 2024, Clade I mpox cases were reported from countries beyond the five Central African Region countries, marking the first known expansion of its geographical range and heightening the risk of spread beyond the region. At the time of writing a single case of Clade 1 mpox has been confirmed in Sweden, the first outside Africa. Healthcare professionals should remain vigilant for Clade 1 mpox, including in sexually acquired mpox cases, and should obtain comprehensive travel histories from patients (28).

Clinical diagnosis of mpox can be difficult, and it is often confused with other infections such as chickenpox. A definitive diagnosis of mpox requires assessment by a health professional and specific testing in a specialist laboratory. Mpox is diagnosed by PCR test for MPXV on viral swabs taken from a vesicle or ulcer (28).

It is recommended that 2 samples are taken for each patient to ensure sufficient material for confirmatory testing (28).

Samples which are PCR positive require Clade typing (29).

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 (30).

Orchitis is caused by swelling of the testis. Any infection or inflammation affecting the epididymis may spread to the testis and cause epididymo-orchitis (30).

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 (30).

Genitourinary brucellosis is common among infected humans in endemic areas, which presents as epididymo-orchitis (31). However, it is not an STI in all cases.

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 (HSV), Human Immunodeficiency virus (HIV), syphilis and varicella zoster virus (VZV). In rare cases Cytomegalovirus (CMV), Epstein- Barr virus (EBV), Group A Streptococcus, *Klebsiella granulomatis* (32) and *Mycoplasma pneumoniae* may cause genital ulcers.

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

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, Trichomonas vaginalis*, HSV or *M. genitalium.* Most women/persons with a vagina are asymptomatic and some may experience vaginal discharge or bleeding (33).

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, 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 (34).

Other

Trichomoniasis

Trichomoniasis is caused by a protozoan parasite called *T. 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 (35).

In adults, transmission is commonly through sexual intercourse or sex toys. Due to site specificity, infection can only follow intravaginal or intraurethral inoculation of the organism (36). However, there are reports of nonsexual transmission, where trichomonas survive on fomites. But no direct link to transmission has been made (37).

In this section reference is made to men and women as TV is not a known issue for people with a neovagina (36).

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 (36).

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 (36).

4.2 Non Sexually transmitted infections (Non STIs)

Vaginitis

Vaginitis is inflammation of the vagina, which may occur due to irritants, hormonal deficiency such as atrophic vaginitis, or infection such as bacterial vaginosis. Other common infectious causes include trichomoniasis and candidiasis. It affects persons with a vagina particularly during the reproductive years. Common symptoms include discharge, pruritus and dyspareunia (38).

Vulvovaginal candidiasis (VVC)

Candidiasis is a fungal infection caused by yeasts (39). 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; however, overgrowth of these organisms can cause symptoms to develop. VVC is most commonly caused by *Candida albicans*; other Candida species, associated ascomycetous yeasts and *Saccharomyces cerevisiae* may also contribute (40).

Vulval itch and vaginal discharge are typical presentations of VVC. Other symptoms include soreness, burning, superficial dyspareunia and cyclical symptoms (40).

Recurrent VVC may be predisposed to by host factors, such as:

- persistence of Candida species
- poorly controlled diabetes mellitus
- immunosuppression
- endogenous and exogenous oestrogen (including pregnancy, hormone replacement therapy (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 (40)

Persons presenting with features suggesting recurrent VVC should be examined. A self-collected vaginal swab of the discharge maybe submitted for Gram stain and/or phase contrast wet film microscopy and culture (40).

Bacterial vaginosis

Bacterial vaginosis (BV) is defined as an overgrowth of anaerobic organisms (*Gardnerella vaginalis, Prevotella* species, *Mycoplasma hominis* and *Mobiluncus* species) often replacing 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, pre-term birth, pre-term premature rupture of membranes and postpartum endometritis (41).

BV is most common amongst sexually active persons with a vagina and is associated with STIs and other genital infections. Many individuals with BV are asymptomatic. Others may experience a thin, white, homogeneous vaginal discharge, often with a fishy odour. BV may co-exist with other causes of abnormal discharge such as candidiasis, trichomoniasis and cervicitis. Patients with BV do not experience soreness, itching, irritation or signs of inflammation (41-43).

Pelvic inflammatory disease (PID)

PID is a term 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*. PID can be symptomatic or asymptomatic. 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 (44)

A positive test for *C. trachomatis, N. gonorrhoeae* and *M. genitalium* supports the diagnosis of PID. However, the absence of infection doesn't exclude PID. Differential diagnosis of lower abdominal pain in a young woman/persons with a vagina includes:

- Ectopic pregnancy
- Acute appendicitis
- Endometriosis
- Ovarian cyst torsion or rupture
- Urinary tract infection
- Functional pain

Refer to BASHH guidance for further information (44).

Salpingitis is a bacterial infection and inflammation of the fallopian tubes, involving *C. trachomatis, N. gonorrhoeae,* mixed anaerobic, facultative anaerobic and aerobic bacteria. 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.

Non-gonococcal urethritis

Urethritis is inflammation of the urethra which is sexually acquired in the majority of (but not all) cases. Symptomatic patients present with urethral discharge, penile irritation, dysuria, urethral discomfort or balanoposthitis. Urethritis is described as either gonococcal, when *N. gonorrhoeae* is detected, or non-gonococcal (NGU) when it is not detected (45).

The commonest organisms implicated are *C. trachomatis* (prevalence 11-50%) and *M. genitalium* (prevalence 6-50%). These organisms are more likely to be 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%) (45). Refer to BASHH guidance for further information.

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 (46). Other organisms include group B and group A beta-haemolytic *streptococci, N. gonorrhoeae*, Chlamydia species, anaerobic infection, HPV, *G. vaginalis, T. pallidum*, *Trichomonas* species, *Borrelia vincentii* and *Borrelia burgdorferi* (46).

Balanoposthitis involves both the glans and the foreskin and occurs in uncircumcised persons with a penis. It often occurs with balanitis (46).

Prostatitis

Prostatitis can be classified as acute; chronic bacterial; chronic pelvic pain syndrome; and asymptomatic inflammation.

- Acute bacterial prostatitis - associated with acute bacterial urinary tract infection
- Chronic bacterial prostatitis – associated with persistent bacterial infection/recurrent urinary tract infections
- Chronic prostatitis/chronic pelvic pain syndrome causes pelvic pain, urinary symptoms and sexual dysfunction. It is divided into 2 subtypes:

  - inflammatory, with leukocytes present 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 (47).

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

Bartholinitis

Bartholinitis is inflammation of the Bartholin glands, which are located at either side of the vaginal vestibule. It is commonly associated with cysts and abscesses within the gland, It is more common in women/persons with a vagina who are sexually active and 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 associated with *N. gonorrhoeae* and *C. trachomatis*. Symptoms include a painful lump located near the opening of the vagina, discomfort and dyspareunia (48).

Aerobic vaginitis and desquamative inflammatory vaginitis

Aerobic vaginitis (AV) shares some characteristics with BV, such as increased discharge with odour (fishy smell in BV and a rotten smell in AV) and increased pH due to loss of lactobacilli. However, there are some significant differences in their presentation which should guide the diagnostic work-up. BV presents with no vaginal

inflammation, the discharge is usually whitish or grey and of a watery consistency, and the diagnosis is often possible on a clinical basis. In contrast, in AV the vaginal walls are inflamed and the discharge is yellow to green in colour, with a rather thick or mucoid consistency. In cases of severe AV, the vaginal and vestibular mucosa may also have ecchymotic bleeding points and erosions.

It is important to note that severe AV is clinically indistinguishable from desquamative inflammatory vaginitis, which is a non-infectious inflammatory condition. There is an increased risk of acquisition of STIs (such as human papilloma virus, human immunodeficiency virus, *T. vaginalis* and *C. trachomatis*) in both conditions, due to the mucosal inflammation, therefore concurrent screening should be undertaken for STIs.

Bacteria most frequently associated with AV are *E. coli*, *Staphylococcus aureus*, coagulase-negative staphylococci such as *S. epidermidis*, group B s*treptococcus* (*Streptococcus agalactiae*) and *Enterococcus faecalis*. AV can co-occur with BV and candidiasis (49).

4.3 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% (50)

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 pre-term 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 (50).

For an infective agent to be implicated in the aetiology of recurrent miscarriage, it must be capable of persisting undetected in the genital tract. Toxoplasmosis, rubella, CMV, HSV and listeria infections do not fulfil these criteria and therefore routine infection screening is not recommended in this clinical scenario (50).

Late intrauterine fetal death (IUFD) refers to babies with no signs of life *in utero* after 24 completed weeks of pregnancy. Ascending infection, with or without membrane rupture, with *E. coli, Klebsiella, Group B Streptococcus, Enterococcus, Mycoplasma/Ureaplasma, Haemophilus influenzae* and Chlamydia are the most common infectious causes in developed countries (51). Other, transplacental infections associated with sporadic late IUFD include CMV, syphilis, parvovirus B19, listeriosis, malaria, rubella, toxoplasmosis, HSV, enterovirus (in late pregnancy), leptospirosis, Q fever, and Lyme disease (51).

IUDs

Intrauterine devices (IUDs) offer a means of long-acting, reversible contraception. There are two types available in the UK: levonorgestrel intrauterine devices (LNG-IUDs) and copper intrauterine devices (Cu-IUDs). For both devices, the risk of pelvic infection appears to increase in the first 3 weeks after IUD insertion. However, the overall risk is very low (less than 1%). Also, IUD insertion can cause symptoms that could be suggestive of infection, such as pelvic pain and altered discharge, but these are normal side effects (generally short lived) and care should be taken to not over diagnose. Therefore, microbiological examination of removed devices is rarely needed.

Pelvic actinomycosis is a very rare, chronic, bacterial pelvic infection that is associated with long-term IUD use (52).

5 Medicolegal Cases

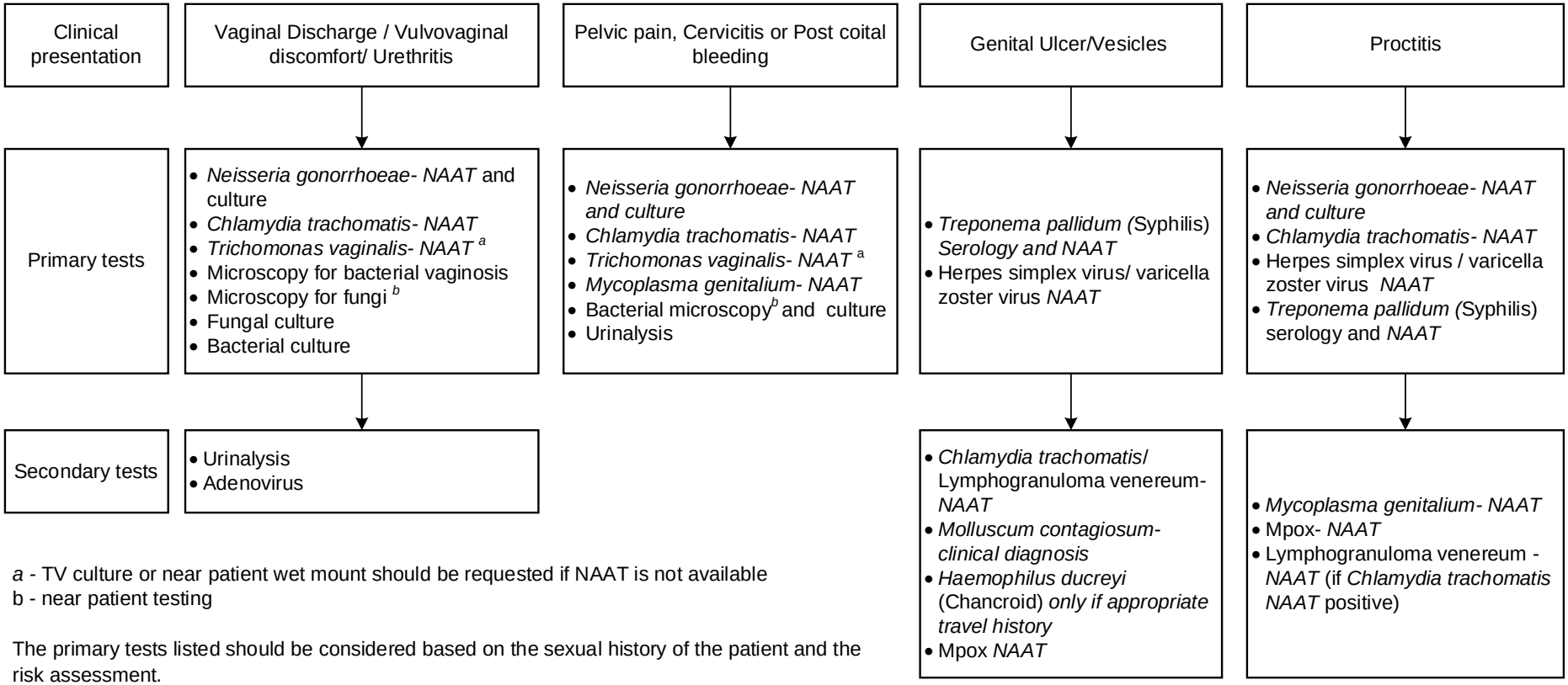
If the presence of an STI is to be used in medico-legal proceedings, specimens should be handled in accordance with Royal College of Pathologists Guidance for handling medicolegal samples and preserving the chain of evidence and BASHH National Guideline on the management of STI and related conditions in children and young people. Refer to manufacturer's instruction when using testing kits.

6 Clinical presentations

Algorithm 1: Vaginal infections

The algorithm below summarises the main clinical presentations of ano-genital STI and non-STI, together with the recommended primary and secondary tests. This algorithm may not apply to testing samples from a neovagina.

Definition: NAAT - Nucleic Acid Amplification Test



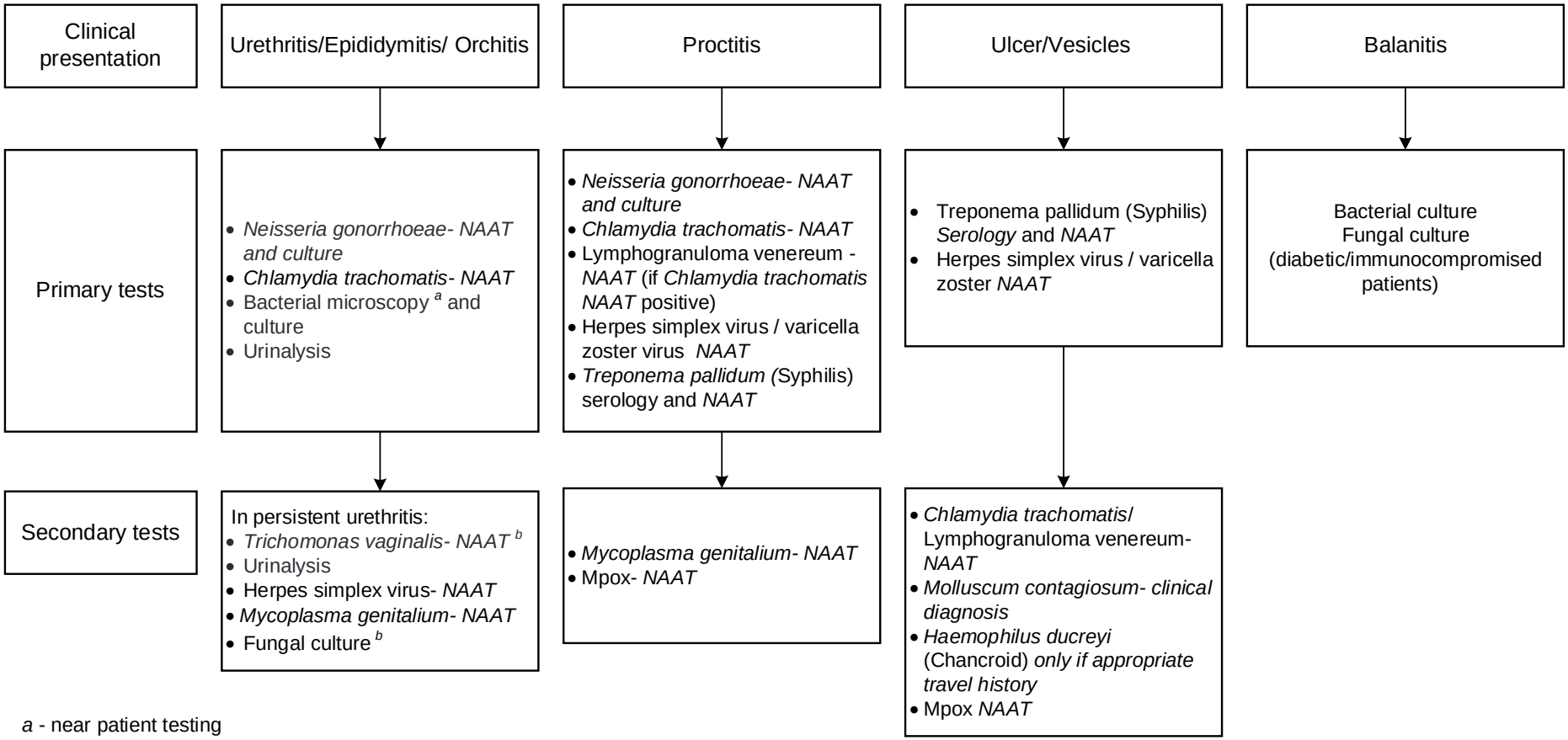
a - TV culture or near patient wet mount should be requested if NAAT is not available
b - near patient testing

The primary tests listed should be considered based on the sexual history of the patient and the risk assessment.

For sample types, target organisms and media refer to section 7.

Algorithm 2: Penile infections

The algorithm below summarises the main clinical presentations of ano-genital STI and non-STI, together with the recommended primary and secondary tests. This algorithm may not apply to testing samples from a neopenis.



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

The primary tests listed should be considered based on the sexual history of the patient and the risk assessment.

For sample types, target organisms and media refer to section 7.

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 and specimen containers. This information should be provided by the testing laboratory.

Table 1: 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 (12). For *Trichomonas*, the posterior fornix, including any obvious candidal plaques should be swabbed. 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.
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 (12).
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.
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.

Type of specimen	Description
	Separate samples should be collected into appropriate transport media for detection of viruses.
Genital ulcer	A swab of the ulcer base and/or vesicle fluid collected into a NAAT collection tube, viral transport medium, bacterial culture transport medium or plain transport container.
First-catch urine (FCU)	Urine samples are easy to collect, do not cause discomfort and thus are preferable to urethral swabs for males. 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 (12).
Intrauterine Device	The entire device should be sent in a sterile container.
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 locally, as the pooling may reduce sensitivity and, in the event of a reactive result, the precise site(s) of infection would be unknown (12).
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.
Fluids and pus	These may be obtained from the fallopian tubes, tubo-ovarian and Bartholin’s abscesses during surgery. Fluid/pus specimen in a sterile container. 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 2: Target organisms, laboratory technique and specimen types.

Note that the specimen types described may not be applicable to persons with a neovagina or neopenis. Not all tests may be available and/or validated at all laboratories.

Bacterial Investigations		
Organism	**Laboratory technique**	**Specimen type**
Chlamydia trachomatis *Neisseria gonorrhoeae* (12) (6)	Molecular methods	Persons with a vagina: vaginal swab (including self-collected), endocervical swab and liquid based cervical cytology solution samples. Urine is generally not a preferred specimen type but can be used if no other sampling options are available. Persons with a penis: urine, sometimes urethral swab Rectal and pharyngeal swabs can also be tested using a validated NAAT for these specimen types 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 gonorrhoeae (6)	Culture	Persons with a vagina: endocervical and/or urethral or meatus swab Persons with a penis: urethral, rectal, neovaginal and/or pharyngeal swabs
Lymphogranuloma venereum (LGV) (24)	Molecular methods	Rectal swab, ulcer swab
Mycoplasma genitalium (14)	Molecular methods	Persons with a vagina: VVS Persons with a penis: FCU Genital reconstructive surgery (GRS): guided by sexual history and symptoms (14)

Haemophilus ducreyi	Molecular methods	Ulcer swab in viral transport medium or plain sterile container (dry swab). Only in patients with a relevant travel history of contact and in those where LGV/syphilis/HSV/Mpox have been excluded.
Treponema pallidum (Syphilis) (13)	Molecular methods	A swab of the chancre can be collected into appropriate viral transport medium, lysis buffer or plain sterile tube (dry swab) as per local laboratory protocol for NAAT. Refer to UK SMI V 44: Laboratory diagnosis of syphilis
	Serology	Plasma or serum for treponemal and non-treponemal tests may be sent. Note that serological markers may take up to 3 months to become detectable and the response may be abrogated by prompt antibiotic treatment of primary infection.
	Microscopy	Lesion/biopsy of condylomata lata may be viewed under dark field microscopy or via histopathological staining.
Trichomonas vaginalis (36)	Microscopy	Persons with a vagina: Vaginal swab (clinical or self-administered), urine Persons with a penis: Clinician taken urethral swabs or self-taken swab of the penile meatus
	Molecular methods	Persons with a vagina: Endocervical swab, vaginal swab (including self-collected), urine. Persons with a penis: urine, penile meatus swab and urethral swabs may require local validation.
Bacterial vaginosis (41)	Microscopy	Microscopy with gram staining is the gold standard. A dried smear of vaginal fluid on a slide or a vaginal swab should be sent to the laboratory for testing (41). This does not apply to neovagina samples.
	Molecular methods	There are no current recommendations for the use of NAAT for the diagnosis of BV; however, commercial assays are available. Importantly, a diagnosis of BV should not be based solely on the detection of *Gardnerella* species by NAAT. 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) Varicella Zoster virus (VZV)	NAAT	Viral swab (in viral transport medium, where required) of any lesions or ulcers. Some laboratories test dry swabs. Amies / charcoal swabs are not usually validated for NAAT testing, please consult user manual for local laboratory.
	HSV Serology	Type-specific HSV antibody testing may be required following a positive NAAT in some cases e.g. pregnancy. RCOG and BASHH guidance should be followed for these requests.
Mpox virus	NAAT	Viral swab (in viral transport medium, where required) of any lesions. The crusts of lesions and/or the roofs of the lesions can also be collected for NAAT testing. Rectal and throat swabs may be collected from those who are contacts of cases or who show systemic symptoms but have not yet developed lesions. Amies / 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 ascomycetous yeasts	Microscopy	Acute VVC - A high vaginal swab (HVS) of the discharge should be taken for Gram stain and/or phase contrast wet film microscopy as the minimal approach for near-patient test.
	Culture	Recurrent VVC - An HVS of the discharge should be taken for culture

7.2 Specimen transport and storage

This section covers specimen transport and storage considerations 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 of the presentation and patient history should be provided with requests.

Other relevant information 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
- any history of trauma

7.4 Safety considerations

The section covers specific safety considerations (53-75) 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.

All suspected Hazard group 2 organisms must be handled and 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 that may give rise to infectious aerosols).

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 vaccination information for other organisms.

8 Laboratory processes (analytical stage)

8.1 Molecular testing

When performing molecular testing, knowledge of the detection range, sensitivity and specificity of a specific assay is required, along with an understanding of the limitations and risks of genomic amplification. 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 6 for the use of microscopy. For safety considerations refer to Sections 2 and 7.

8.3 Culture media, conditions and organisms

Molecular methods are widely used due to high sensitivity, high 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 Sections 2 and 7.4 (53-75).

Table 3: 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 Bartholin's abscess	Blood agar	35-37	5-10% CO_2	16-24hr *	16-24hr *
Fungal culture Yeasts	Vaginal discharge Urethritis Epididymitis Orchitis/ Balanitis Bartholin's abscess	Sabourad 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 Bartholin's abscess	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 Bartholin's abscess	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.

N. meningitidis may require anaerobic incubation based on clinical request. See also safety considerations in sections 2 and 7.

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).
Report on clue cells if present and whether microscopy is suggestive of BV according to the Nugent or Hays criteria.

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’.
- Repeat testing or sampling may be required for inadequate or inhibitory specimens; refer to the assay manufacturer’s instructions for use.

9.3 Reporting Culture results

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

If clinically significant organism growth not detected report as ‘Absence of significant growth’.

Growth not detected report as ‘Absence of growth’.

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. Any notifiable disease should also be notified to the relevant body.

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

10 Antimicrobial susceptibility testing

The table below is to aid laboratories to decide the appropriate antibiotic panel. Antimicrobial susceptibility test result reporting is guided by local epidemiology and stewardship guidelines. Laboratories should test and interpret antimicrobial susceptibility using the criteria in The European Committee on Antimicrobial Susceptibility Testing (EUCAST) for systemic and topical agents. Refer to EUCAST and BSAC guidelines for breakpoint information, where available.

10.1 Phenotypic Antimicrobial Susceptibility Testing Panels

Organism	**Examples of agents to be included within primary test panel (recommended agents to be reported are in bold depending on clinical presentation)**	**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** **Azithromycin**	Cefixime Ciprofloxacin	Isolates that exhibit resistance to ceftriaxone or from suspected treatment failures only. Refer to the appropriate reference or specialist laboratory England, Wales, Scotland or Northern Ireland. Refer to BASHH guidance.
Beta Haemolytic Streptococci (A,B,C,F and G)	**Penicillin** **Clindamycin*** **Erythromycin** Vancomycin / Teicoplanin Tetracycline / Doxycycline	Linezolid (only for Beta Haemolytic Streptococci B) 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 Amoxicillin / Ampicillin Amoxicillin – clavulanic acid Pipericillin – 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**	Erythromycin Cotrimoxazole	Refer to the appropriate reference or specialist laboratory England, Wales, Scotland or Northern Ireland
Actinomycetes	By specialist reference facilities only.		
Candida species and other ascomycetous yeasts	**Fluconazole** Itraconazole	Amphotericin B Anidulafungin / Caspofungin	Species level identification is required for interpretation of antimicrobial susceptibility tests. In cases of recurrent VVC and in certain species of Candida (e.g. C. glabrata), susceptibility testing should be considered and referred to the appropriate reference or specialist laboratory England, Wales, Scotland or Northern Ireland

Notes:

- Molecular detection of macrolide resistance should be carried out on all samples which yield a positive result for *M. genitalium*. This may be provided locally, or samples can be referred for the molecular determination of mutations associated with macrolide resistance. 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 (76).
- HSV 1 and 2: Phenotypic and genotypic detection (DNA polymerase and Thymidine Kinase) of resistance to common antivirals is available at specialist laboratories, usually after discussion.

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. Long A and others. Sigmoid Neovagina: A Case Presentation and Pathological Review of Intestinal Transfer. ACG Case Rep J 2019: volume 6, issue 9, pages e00220.**3+** 10.14309/crj.0000000000000220

4. Birse KD and others. The neovaginal microbiome of transgender women post-gender reassignment surgery. Microbiome 2020: volume 8, issue 1, pages 61.**3++** 10.1186/s40168-020-00804-1

5. Centers for Disease Control and Prevention. Gonorrhea – CDC Basic Fact Sheet 2022: volume 2023, issue 26.04.2023.**++**

6. 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

7. UK Health Security Agency. Gonorrhoea and syphilis at record levels in 2022 2023.**++**

8. World Health Organization. Multi-drug resistant gonorrhoea. World Health Organization, 4 July 2024.**++**

9. UK Heath Security Agency. Guidance Managing incidents of ceftriaxone-resistant Neisseria gonorrhoeae in England 2022.**++**

10. Centers for Disease Control and Prevention. Chlamydia – CDC Basic Fact Sheet 2022.**++**

11. UK Health Security Agency. Chlamydia: surveillance, data, screening and management 2022, issue 10.07.2023.**++**

12. 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

13. Kingston M, French P, Higgins S, McQuillan O, Sukthankar A, Stott C et al. UK national guidelines on the management of syphilis 2015. Int J STD AIDS 2016;27:421-46. **++** 10.1177/0956462415624059

14. 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.**++**

15. 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 **++**

16. Rawla P and others. Lymphogranuloma Venereum. StatPearls: StatPearls Publishing; 2024. **++**

17. 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 **++**

18. 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

19. 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.**1++** 10.1016/S0140-6736(20)30913-2

20. National Institute for Health and Care Excellence. Herpes simplex - genital 2023.**++**

21. World Health Organization. Herpes Simplex Virus 2023, issue 10.07.2023.**++**

22. 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 **++**

23. 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

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

25. UK Health Security Agency and Department of Health and Social Care Immunisation against infectious disease, chapter 18a Human Papillomavirus GOV.UK 2021. **++**

26. 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

27. Centers for Disease Control and Prevention. Molluscum Contagiosum 2015.**++**

28. UKHSA. 'Guidance Mpox (monkeypox): background information '.'last updated' 2024 '(viewed on' 07.11.2024) https://www.gov.uk/guidance/monkeypox **++**

29. UKHSA. Mpox outbreak: epidemiological overview, 7 November 2024 GOVUK 2024.**++**

30. Centers for Disease Control and Prevention. Sexually Transmitted Infections Treatment Guidelines, 2021 Epididymitis 2021 **++**

31. Hamoda TAA and others. Brucellar testicular abscess: The 17(th) case report and review of literature. Urology Annals 2023: volume 15, issue 3, pages 340-8.**3++** 10.4103/ua.ua_129_22

32. Vendhan DS and others. Granuloma inguinale diagnosed on the bedside. Indian Journal of Sexually Transmitted Diseases and AIDS 2023: volume 44, issue 1, pages 87-8.**3++** 10.4103/ijstd.ijstd_68_22

33. Centers for Disease Control and Prevention. Diseases Characterized by Urethritis and Cervicitis 2021.**++**

34. 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

35. National Institue for Health and Care Excellence. Trichomoniasis: How common is it? 2020: volume 2023, issue 26.04.2023.**++**

36. British Association for Sexual Health and HIV (BASHH). BASHH UK National guideline on the management of Trichomonas vaginalis 2021 2022. **++**

37. Bishop KM. A Resistant Case of Familial Nonsexual Transmission of Trichomonas. Cureus 2020: volume 12, issue 7, pages e9246.**3++** 10.7759/cureus.9246

38. S ID. BMJ Best Practice Vaginitis 2024.**++**

39. Van Schalkwyk J, Yudin MH. Vulvovaginitis: screening for and management of trichomoniasis, vulvovaginal candidiasis, and bacterial vaginosis. Journal of Obstetricians and Gynaecologists Canada, 2015: volume 37, issue 3, pages 266-74.**++** 10.1016/s1701-2163(15)30316-9

40. 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

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

42. National Institue for Health and Care Excellence. Bacterial vaginosis 2023.**++**

43. Centers for Disease Control and Prevention. Bacterial Vaginosis – CDC Basic Fact Sheet 2022.**++**

44. British Association for Sexual Health and HIV (BASHH). UK National Guideline for the Management of Pelvic Inflammatory Disease (2019 Interim Update) 2019.**++**

45. 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.**++**

46. Wray AA VJ, Khetarpal S. Balanitis: StatPearls Publishing; 2022. **++**

47. Krieger JN and others. Epidemiology of prostatitis. Int J Antimicrob Agents 2008: volume 31 Suppl 1, issue Suppl 1, pages S85-90.**2-** 10.1016/j.ijantimicag.2007.08.028

48. Elkins JM and others. Association of Bartholin cysts and abscesses and sexually transmitted infections. Am J Emerg Med 2021: volume 44, pages 323-7.**1++** 10.1016/j.ajem.2020.04.027

49. Donders GGG and others. Aerobic vaginitis: no longer a stranger. Res Microbiol 2017: volume 168, issue 9-10, pages 845-58.**+** 10.1016/j.resmic.2017.04.004

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

51. Royal College of Obstetricians & Gynaecologists. Late Intrauterine Fetal Death and Stillbirth, Green–top Guideline No. 55 2010.**++**

52. National Institute for Health and Care Excellence. Contraception- IUC 2024.**++**

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

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

55. 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. **++**

56. 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.**+**

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

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

59. 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

60. 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. **++**

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

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

63. 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. **++**

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

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

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

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

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

69. 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. **++**

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

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

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

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

74. 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

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

76. UKHSA. Guidance Mpox (monkeypox): diagnostic testing 2022.**++**