Diagnosis of *Chlamydia trachomatis*
Quick Reference Guide for General Practices

SCREENING FOR CHLAMYDIA

Why screen? Prolonged exposure to chlamydia by chronic infection or frequent reinfections cause tubal damage and lead to infertility in about 5 -18%%.[1,2] PID occurs in 10-15% of untreated women attending GUM with chlamydia.[3,4]

Why screen all under 25 years? Prevalence in 15-24 yr olds is 6%[5,6] but over 50% are asymptomatic.[1,7,8]

Therefore offer opportunistic screening to ALL men [7,8] and women <25 attending the surgery for any reason.[9,10]

Are you a low tester? There is a great variation in practice sampling from 0.1-30% of 15-24 year old patients[11]

What do my patients think? Patients say they prefer screening in a GP practice and want **you** to offer them the test.

How often should I screen? Offer screening at partner change and at least annually.

What about those over 25 years? Currently, much GP testing is in older women[12] who are at much lower risk (1% if >30years)[6,13] Patients OVER 25 years should only be screened if new sexual partner in last 12 months.[6,13-15]

SAMPLING

How long will it take me? As most young patients know about chlamydia it is now much quicker to offer, explain the benefits and how to take the specimen. Patient leaflets are available from the national screening programme.

A **How can I maximise return of specimen kits by patients?** It is much better to ask the patient to provide the specimen before they leave the surgery – patients say they would prefer this.

B **In women:** Submit self-taken vaginal swab **specifically for** Nucleic Acid Amplification Test (NOT a charcoal swab).[16,17] *A first void urine specimen may be accepted by some laboratories, check local laboratory preference.*

A **In men:** first void urine. If urine held in bladder for < hour there is a risk of false negatives if mild infection.[18,19]

B **Point of care tests:** Current evidence does not support routine use of point-of-care tests for chlamydia in primary care.[20]

B **Reactive arthritis:** In reactive arthritis, take urine and paired serology, which may detect rising titres.[21,22]

☑ **In symptomatic patients or positive chlamydia test, swabs for other STIs should be taken.**[23]
Give patient verbal and written information about chlamydia, other STIs, and safer sex.

B ALSO TEST IF SYMPTOMS OR SIGNS SUGGEST CHLAMYDIA

In sexually active women with: [24-26]

- ❑ Menstrual abnormalities: post coital/intermenstrual bleeding [25]
- ❑ Mucopurulent cervical discharge[27]
- ❑ Inflamed/friable cervix (which may bleed on contact)
- ❑ Deep dyspareunia
- ❑ Urethral syndrome: Frequency/dysuria with –ve MSU
- ❑ Another sexually transmitted infection including warts[23]
- ❑ Suspected PID (pelvic pain and tenderness)
- ❑ Tubal infertility or ectopic pregnancy[28]
- ❑ Women undergoing cervical instrumentation (IUCD)[13]

In sexually active men with: [27,29,30-33]

- ❑ Dysuria (frequency is more suggestive of UTI)[31]
- ❑ Urethral discharge [27]
- ❑ Urethritis[29]
- ❑ Epididymitis, epididymo-orchitis in sexually active[32]

In men or women if:

- ❑ Reactive arthritis in the sexually active[21]
- ❑ Parents of infants with chlamydial conjunctivitis or pneumonitis[34]
- ❑ Semen and egg donors[35]

TREATMENT OF UNCOMPLICATED INFECTION

In patients with signs or symptoms strongly suggestive of chlamydia, start treatment without waiting for test results and ensure that steps are taken to treat the sexual partner(s). ***Treatment for STIs is free in GU clinics.***

A **First line treatment in women and men.**[36]

- ❑ Azithromycin 1g PO stat **or**
- ❑ Doxycycline 100mg bd PO 7 days

In pregnancy or breast-feeding[37,38]

- ❑ Azithromycin can be used but is 'off label'
- ❑ Alternatives include
- ❑ Erythromycin 500mg bd PO 14 days
- ❑ Amoxicillin 500mg tds PO 7 days

Advise patient and partner to abstain from intercourse or use safe sex until 7 days post-azithromycin or completion of other treatment.

PARTNER NOTIFICATION[39,40]

B

- ❑ Local arrangements for contact tracing vary; this may no longer be arranged by your NCSP.
- ❑ Treat current partners irrespective of result.
- ❑ Positive patients: Attempt to contact all sexual partners in last 6 months.[39,41]

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RETESTING

B **In patients compliant with treatment & no re-infection risk from untreated partner, NO retesting needed.**[26,42]
In pregnancy perform test of cure, which should always be done after 5-6 weeks.[37,43]

WHEN TO REFER OR SEEK EXPERT ADVICE

Consider GUM referral:

- ❑ In symptomatic men and women
- ❑ proven chlamydia
- ❑ multiple sexual partners
- ❑ if dual molecular testing for chlamydia and GC is not done and there is local high prevalence of gonorrhoea
- ❑ If high antibiotic resistance to gonorrhoea locally

Urgent referral:

- ❑ Acute, severe PID or lack of response to treatment
- ❑ Pelvic pain in pregnant or possibly pregnant

Seek expert advice:

- ❑ Pregnant women (if not referred to gynaecology)[43]
- ❑ Complicated upper genital tract infection (but start treatment)
- ❑ Intolerance of treatment
- ❑ Doubt about diagnosis (eg equivocal test result, atypical symptoms)
- ❑ Persistent symptoms following treatment
- ❑ Difficulty with partner notification
- ❑ If high risk of GC and IM ceftriaxone unavailable.

TREATMENT OF COMPLICATED UPPER GENITAL TRACT INFECTION (PID, EPIDIDYMITIS)[26,44-49]

Women:

C First-line treatment:

- ❑ Ofloxacin 400mg BD PO for 14 days *plus*
  Metronidazole 400mg BD PO for 14 days[47]

Second-line treatment if high risk of GC:[A 46,48,49]

A

- ❑ Ceftriaxone 500mg IM single dose *plus*
  Doxycycline 100mg BD PO for 14 days *plus*
  Metronidazole 400mg BD PO for 14 days[47]

Women pregnant or breast feeding:[43]

- ❑ Erythromycin 500mg BD PO for 14 days (or azithromycin 1g PO stat then 500 mg OD for 4 days)
  plus
  Metronidazole 400mg BD PO for 10-14 days *plus*
  Ceftriaxone 500mg IM single dose

(warn women about taste of metronidazole in breast milk)

Men:

- ❑ Ofloxacin 200 mg BD for 14 days **OR**
- ❑ Doxycycline 100 mg BD for 14 days

If Gonorrhoea suspected *add* [46,48,49]

- ❑ Ceftriaxone 500mg IM single dose

☑ **REFER ALL COMPLICATED CASES TO GUM**

Grading of guidance recommendations

Study Design	Recommendation Grade
Good recent systematic review of studies	A+
One or more rigorous studies, not combined	A-
One or more prospective studies	B+
One or more retrospective studies	B-
Formal combination of expert opinion	C
Informed opinion, other information	D
Good practice	☑

LOCAL ADAPTATION:

- We would discourage major changes to the guidance but the Word format allows minor changes to suit local service delivery and sampling protocols.
- To create ownership agreement on the guidance locally, dissemination should be taken forward in close collaboration between primary care clinicians, laboratories and secondary care providers.

Treatment advice can be found on our website:
http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/PrimaryCareGuidance/

We welcome and encourage opinions on the advice given and future topics to cover. We would be most appreciative if you could email any evidence or references that support your requests for change so that we may consider them at our annual review. Comments should be submitted to Dr Cliodna McNulty, Head, HPA Primary Care Unit, Microbiology Laboratory, Gloucestershire Royal Hospital, Great Western Road, Gloucester GL1 3NN. Email: jill.whiting@hpa.org.uk

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SEARCHES:

For this review we undertook Medline searches from 2000 to 2010 for chlamydia trachomatis with appropriate second search terms for each section of the guidance including: men, women, epidemiology, symptoms, asymptomatic, age, urethritis, infertility, GUM, diagnosis, serology, reactive arthritis, treatment, pregnancy and PID. We also consulted widely with the BIA, HPA, NCSP and other experts in the field.

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   This article examines evidence reviewed as part of the Centers for Disease Control and Prevention Chlamydia Immunology and Control Expert Advisory Meeting; 24 reports were included. In high-risk settings, 2%-5% of untreated women developed PID within the approximately 2-week period between testing positive for C. trachomatis and returning for treatment. However, the rate of PID progression in the general, asymptomatic population followed up for longer periods appeared to be low. According to the largest studies, after symptomatic PID of any cause has occurred, up to 18% of women may develop infertility.

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4. Oakeshott P, Kerry S, Aghaizu A, et al. Randomised controlled trial of screening for Chlamydia trachomatis to prevent pelvic inflammatory disease: the POPI (prevention of pelvic infection) trial. BMJ 2010 ; **340(apr08_1):**c1642.

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   This systematic review examines prevalence of Chlamydia trachomatis in women in 19 studies in various health settings across UK and Ireland. Prevalence was highest in those under 20yrs old at 8.1% in general practice and lowest in those over 30 years at 1.4%.

6. Macleod J, Salisbury C, Low N, McCarthy A, Sterne JA, Holloway A *et al*. Coverage and uptake of systematic postal screening for genital Chlamydia trachomatis and prevalence of infection in the United Kingdom general population: cross sectional study. *BMJ* 2005;**330**:940.
   In this postal screening study of 19,773 English individuals in West Midlands and Avon selected from GP registers, the strongest predictor of chlamydia infection was having one or new partners in the past 12 months. Prevalence was highest in women aged 16-24 years and men 20-24 years and below 1% in men over 24 and women over 29 years.

7. Foo C, Browne R, Boag F. Retrospective review of the correlation of symptoms, signs and microscopy with the diagnosis of Chlamydia trachomatis in men. *Int J STD AIDS* 2004;**15**:319-21.
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9. Pimenta JM, Catchpole M, Rogers PA, Perkins E, Jackson N, Carlisle C, Randall S, Hopwood J, Hewitt G, Underhill G, Mallinson H, McLean L, Gleave T, Tobin J, Harindra V, Ghosh A. Opportunistic screening for genital chlamydial infection I: Acceptability of urine testing in primary and secondary healthcare settings. *Sex Transm Infect* 2003;**79**:16-21.

10. Pimenta JM, Catchpole M, Rogers PA, Hopwood J, Randall S, Mallinson H, Perkins E, Jackson N, Carlisle C, Hewitt G, Underhill G, Gleave T, McLean L, Ghosh A, Tobin J, Harindra V. Opportunistic screening for genital chlamydia infection II: Prevalence among healthcare attenders, outcome and evaluation of positive cases. *Sex Transm Infect* 2003;**79**:22-27.
    Prevalence of chlamydia was highest in GUM (17.6%) and termination clinic (13.3%) patients

11. Implementing the National Chlamydia Screening Programme, screening in general practice. http://www.chlamydiascreening.nhs.uk/ps/implementation/practice.html Accessed 07.10.10.
Data from HPA NCSP indicates that although the proportion of screens done in general practice has gradually increased from 10 per cent in Years 1 and 2, to 14 per cent in Years 3 and 4 but decreased slightly in Year 5 to 13 per cent. Positivity among those screened in general practice each year has remained fairly consistent around 10 per cent although in Years 4 and 5 positivity dipped to 8.7 per cent. There have consistently been large disparities between Programme Areas in the engagement of general practice. During April 2007 – March 2008 some areas such as Torbay and Lincolnshire reported as much as 50 per cent (330/663) and 82 per cent (501/601) of tests being done in general practice and Lambeth and Southwark reported 37 per cent (3,827/10,465). On the other hand, six Programme Areas did not report any testing carried out in general practice.

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54% of 222,709 tests for chlamydia submitted to 15 laboratories in this Scottish study were from patients over 25 years. Positivity was greatest in women 15-19 years (14%); and men 20-24 years (18%).

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In Aarhus County, Denmark, population of 630,000, data were collected on 11,423 persons who were being tested for C. trachomatis (10,351 females and 1072 males). 25% of all tests were requested in asymptomatic women above the age of 30, but prevalence was only 1.3%. In women who were tested prior to a transcervical procedure, the prevalence was highest in the 16-20 years age group, whereas most samples were obtained in women aged 31-35 years in whom the prevalence was only 0.8%. This indicates value of testing older women is much less, but if a younger women is undergoing cervical instrumentation this may put them at risk of deep chlamydial infection after the procedure if cervical chlamydia is present.

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In this study 126 patients from rheumatology clinics in Germany with an asymmetrical arthritis and a preceding symptomatic urethritis or enteritis. Chlamydia trachomatis was trigger for arthritis in 24(50% had preceding urethritis/cervicitis. Serology considered diagnostic if IgG >1/64 plus positive IgA or IgM plus chlamydia positive in urogenital sample or antibody titres of 3 SD above normal for IgG plus IgA or IgM. Possible Reactive arthritis was diagnosed if Chlamydia was positive in urogenital smear or IgG >1/64 plus positive IgA or IgM.)

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Three urban STD clinics. 2419 persons had 8129 three-month follow-up intervals. Among 1236 women, 25.8% had 1 or more new infections (11.9% acquired C. trachomatis, 6.3% acquired N. gonorrhoeae, and 12.8% acquired T. vaginalis). Among 1183 men, 14.7% had 1 or more new infections (9.4% acquired C. trachomatis, and 7.1% acquired N. gonorrhoeae). Black persons and those with sexually transmitted infections at baseline were at highest risk for recurrent infection (adjusted odds ratio, 2.5 and 2.4, respectively). Patients with other STIs are more likely to acquire chlamydia.

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- 2005 United Kingdom National Guideline for the Management of Pelvic Inflammatory Disease. http://www.bashh.org/documents/118/118.pdf Accessed 07.10.10
Recommended regimens: the recommended regimens for outpatient management are either ofloxacin plus metronidazole for 14 days, or a stat dose of IM ceftriaxone plus metronidazole and doxycycline for 14 days. Ofloxacin should be avoided in women who are at high risk of gonococcal PID, because of increasing quinolone resistance in the UK. Treatment of partners: partners should be screened for gonorrhoea and chlamydia.
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This study was undertaken in an GUM clinic in Amsterdam. C. trachomatis infections in heterosexual men in 1986-1988 (prevalence 15.8%) were independently associated with: age under 26 years, being an STD contact, coitarche below 13, last sexual contact with a non-prostitute, mucopurulent urethral discharge and ten or more leukocytes per microscopic field of urethral smear or urine. For women (prevalence 21.5%) independent predictors were age under 26, no history of STD, being an STD contact, cervical friability, mucopurulent cervical discharge, presence of clue cells and ten or more leukocytes per field of urethral smear.

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Two hundred twenty-one C. trachomatis-positive cervical and urethral swabs from symptomatically and asymptomatically infected men and women were obtained from several hospital-based departments in Amsterdam. The most prevalent C. trachomatis serovars, D, E, and F, showed no association with either a symptomatic or asymptomatic course of infection. The most prominent differences found were (i) the association of serovar Ga with symptoms in men (P = 0.0027), specifically, dysuria (P < 0.0001), and (ii) detection of serovar Ia more often in asymptomatically infected people (men and women) (P = 0.035). Furthermore, in women, serovar K was associated with vaginal discharge (P = 0.002) and serovar variants were found only in women (P = 0.045). Different serovars of Chlamydia trachomatis may lead to different symptoms and pathologies.

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In this prospective study of Chlamydia trachomatis infection in pregnancy, 198 mothers positive for chlamydial antigen were identified; the infants of 174 were followed for up to six months and C. trachomatis was recovered in cell culture from 43 infants (25%). Conjunctivitis occurred in significantly more infants who were positive for C. trachomatis (20 of 43, 47%) than in those who were negative (18 of 131, 14%). There were also significantly more lower respiratory tract infections among infants with positive cultures (six of 43, 14%, compared with three of 131, 2%). The results confirm that C. trachomatis infection is a common cause of neonatal conjunctivitis, and respiratory infection in the first few months of life, with an incidence of 8.2/1000 live births. The study has showed that infection with C. trachomatis is transmitted to the neonate in a quarter of pregnancies where the mother is infected.

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237 semen samples from 10 institutes for artificial insemination by donor (AID) in Belgium and the Netherlands were tested for Chlamydia trachomatis, and other STIs. As chlamydia was present in 6.3%, and 47% of all samples were infected with one or more of the micro-organisms this should be excluded in all donors.

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Two systematic reviews (search dates 1998 and 1991-2006) that identified the same five RCTs (4 non-blinded; 372 pregnancy women). The RCTs identified by the reviews compared a single dose of azithromycin 1g versus erythromycin 500 mg four times daily for 7 days.

Azithromycin is the recommended first-line treatment in various countries for pregnant women with chlamydia. However, in the UK, the use of azithromycin in pregnancy is "off label". The British national Formulary (BNF) recommends its use only if there is no alternative available.

In pregnant women, erythromycin seems less effective than azithromycin and is more likely to be discontinued because of its GI adverse effects.

Although there is no evidence that amoxicillin is less effective in pregnancy, amoxicillin and ampicillin have traditionally been used with caution to treat genital chlamydia. In vitro *studies suggest that amoxicillin does not eradicate* C. trachomatis*, raising concern that infection may persist and recrudesce* in vivo *and thus studies on the effectiveness of ampicillin and amoxicillin in the treatment of chlamydia are limited. Azithromycin as a single dose antibiotic is suitable when the recipient can be directly observed and compliance can be guaranteed. Animal studies and observational data have not indicated an increased risk of congenital malformations. In 2008, the National Teratology Information Service considered these data too limited to exclude a clinically important increase in risk, although a high risk of congenital malformations seemed unlikely. A large retrospective cohort study assessing nearly 1500 fetuses exposed to azithromycin found no evidence of an increased risk of major congenital malformations with azithromycin. Considering these points, the approach advocated by the Scottish Intercollegiate Guidelines Network would appear pragmatic; taking compliance, tolerability and efficacy into account, azithromycin 1g as a single oral dose is recommended for uncomplicated genital chlamydial infection in pregnancy after discussion of the balance of benefits and risks to the patient.*

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A large retrospective cohort study assessing nearly 1500 fetuses exposed to azithromycin found no evidence of an increased risk of major congenital malformations with azithromycin.

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Nationally 40,845 sexual partners of chlamydia-positive cases were reported through the NCSP in 2008/9. Of these, 26,285 were contacted and 50% (13,214/26,285) accepted a chlamydia test. Positivity among those with a known test result was 65% (3,319/5,123), confirming that partners of chlamydia-positive individuals are a particularly high risk group. The proportion of young people testing positive varied between services. Among the core NCSP services, 10% tested positive in Community Sexual Health services, 8% in termination of pregnancy services and pharmacy, and 7% in general practice. When women seek termination this is an opportunity to screen and they are at slightly higher risk than other GP patients.

40. Mathews C, Coetzee N, Zwarenstein M, Lombard C, Guttmacher S, Oxman AD, Schmid G. Strategies for partner notification for sexually transmitted diseases. *Cochrane Database of Systematic Reviews* 2001, Issue 4. Art. No.: CD002843. DOI: 10.1002/14651858.CD002843.
This review compares the effects of various sexually transmitted disease (STD) partner notification strategies. It includes 11 randomised controlled trials including 8014 participants. The review found moderately strong evidence that: 1. provider referral alone, or the choice between patient and provider referral, when compared with patient referral among patients with HIV or any STD, increases the rate of partners presenting for medical evaluation; verbal, nurse-given health education together with patient-centred counselling by lay workers, when compared with standard care among patients with any STD, results in small increases in the rate of partners treated.

41. Carre H, Boman J, Osterlund A, Garden B, Nylander E. Improved contact tracing for *Chlamydia trachomatis* with experienced tracers, tracing for one year back in time and interviewing by phone in remote areas. *Sex Transm Infect* 2008;**84(3)**:239-42.

42. Ali SM, Booth G, Monteiro E. Test of cure following treatment of genital *Chlamydia trachomatis* infection in male and female patients. *Genitourin Med* 1997;**73**:223.
450 patients had a test of cure one week after a 7 day course of doxycycline for genital chlamydia; only five women (1.9%) and three men (1.5%) were positive and were due to non-compliance or unprotected sex with a known positive partner. Results with azithromycin are likely to be better as there should be less non-compliance with single dose azithromycin.

43. Brocklehurst P, Rooney G. Interventions for treating genital chlamydia trachomatis infection in pregnancy. *Cochrane Database of Systematic Reviews* 2002(2):CD000054.
This systematic review found eleven trials, involving 1449 pregnant women, on erythromycin, amoxicillin, azithromycin and clindamycin, and the overall trial quality was good. The review found amoxicillin and erythromycin equally effective but lack of long-term assessment of outcomes caused concern about routine use of amoxicillin in practice. If erythromycin is used, some women may stop taking it because of adverse effects and therefore azithromycin may be a better choice.

- *Expert opinion is that azithromycin 1g stat is the first-line treatment for Chlamydia in pregnant women. Although there are fewer safety data than for amoxicillin or erythromycin, the available data are reassuring, it is better tolerated and, because it is a single dose, there are no issues with compliance or early cessation of treatment because of adverse effects.*

- *Information from the National Teratology Information Service.* 2008. (Tel: 0844 892 0909, www.toxbase.org) *Azithromycin: there are fewer published data on the use of azithromycin during pregnancy and breastfeeding. The limited published data and follow-up data collected by the National Teratology Information Service do not demonstrate an increased risk of congenital malformations following exposure to azithromycin in human pregnancy. Erythromycin: data from more than 7000 pregnancies does not indicate that erythromycin is associated with an increased risk of congenital malformations or any other adverse fetal effects. A recent study has suggested a possible increased risk of cardiovascular malformations and pyloric stenosis; however, causality has not been established and the individual risk, if any, is thought to be low. Amoxicillin: there is no evidence to suggest that penicillins are associated with an increased risk of malformations or other forms of fetal toxicity in human pregnancy.*

44. Meads C, Knight T, Hyde C and Wilson J. The clinical effectiveness and cost-effectiveness of antibiotic regimens for pelvic inflammatory disease. West Midlands Health Technology Assessment group. 2004. http://www.rep.bham.ac.uk/2004/Pelvic_Inflammatory_Disease.pdf (Accessed 7th July 2010)
This systematic review identified 34 trials of antibiotic treatment for PID. Most studies were small, open-label, and of poor methodological study. One small trial was found that compared oral ofloxacin plus metronidazole with clindamycin plus gentamicin. The cure rate was 15/15 for ofloxacin plus metronidazole plus 17/18 for clindamycin plus gentamicin. The systematic review found one trial of ceftriaxone plus doxyxcyline, two trials of cefoxitin plus probenecid and doxycycline, and three trials of cefoxitin plus doxycycline compared to other antibiotics. Meta-analysis of these six studies found no difference in cure rates between IM ceftriaxone plus doxycycline and the comparator antibiotics.

45. RCOG. Management of Acute Pelvic Inflammatory Disease. Green Top Guideline No.32. *Royal College of Obstetricians & Gynaecologists*. 2008. www.rcog.org.uk (Accessed 30th December 2009) *Recommended regimens: the recommended regimens are broad spectrum to cover N. gonorrhoea, C. trachomatis, and anaerobes. For outpatient management, either ofloxacin plus metronidazole for 14 days, or a stat dose of IM cefuroxime plus metronidazole and doxycycline for 14 days are recommended. Broad-spectrum treatment is warranted in PID because of the consequences of untreated infection (ectopic pregnancy, infertility, pelvic pain). Cefoxitin has a better evidence base for the treatment of PID than ceftriaxone, but it is not readily available in the UK. Ceftriaxone is therefore recommended. Although the combination of doxycycline and metronidazole (without IM ceftriaxone) has previously been used in the UK to treat PID, there are no clinical trials that adequately assess its effectiveness and its use is not recommended. Replacing intramuscular ceftriaxone with an oral cephalosporin (eg cefixime) is not recommended because there is no clinical trial evidence to support its use, and tissue levels are likely to be lower which might impact on efficacy. Reports of decreasing susceptibility of Neisseria gonorrhoeae to cephalosporins also supports the use of parenteral based regimens at a dose of 500mg ceftriaxone when gonococcal PID is suspected (to maximise tissue levels and overcome low level resistance).*

46. GRASP Steering Group. GRASP 2008 report: trends in antimicrobial resistant gonorrhoea. *Health Protection Agency.* 2009. http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/Gonorrhoea/AntimicrobialResistance/ (Accessed 7th July 2010).
Ciprofloxacin resistance is now endemic in England and Wales, accounting for 28% of all gonorrhoea isolates tested in 2008. The Health Protection Agency and the Association of Medical Microbiologists had said that, for practical issues of administration in primary care, a stat dose of oral cefixime 400mg could be substituted for IM ceftriaxone. However, resistance to cephalosporins is increasing and treatment failures have been reported with cefixime; therefore, if gonorrhoea is suspected, IM ceftriaxone is the cephalosporin of choice.

47. Ross JDC, Cronjé HS, Paszkowski T, Rakoczi I. Moxifloxacin versus ofloxacin plus metronidazole in uncomplicated pelvic inflammatory disease: results of a multicentre, double blind, randomised trial. *Sex Transm Infect* 2006;**82(6)**:446-51. *This trial in 564 patients with uncomplicated PID in hospitals from 13 countries, compared oral metronidazole 500mg twice daily with either oral ofloxacin 400mg twice daily or moxifloxacin 400mg once daily. Clinical resolution with both regimens was 90% and bacteriological cure was similar. Metronidazole is included in the regimen to improve the coverage for anaerobic bacteria. Anaerobes are of relatively greater importance in patients with severe PID. Ofloxacin and moxifloxacin should be avoided in patients who are at high risk of gonococcal PID because of increasing quinolone resistance in the UK (eg when the patient's partner has gonorrhoea, in clinically severe disease, following sexual contact abroad). Quinolones should also be avoided as first line empirical treatment for PID in areas where >5% of PID is caused by quinolone resistant Neisseria gonorrhoeae.*

48. Ison CA, Mouton JW, Jones K. Which cephalosporin for gonorrhoea? *Sex Transm Infect* 2004;**80**:386-88. *This study used previously published pharmacokinetic data on cefixime, ceftriaxone and cefuroxime to model the length of time tissue concentrations to these drugs would be above the MIC_{90} (concentration needed to kill 90% of gonorrhoea isolates). Cefuroxime concentrations are too low. Ceftriaxone attains the optimal concentrations to prevent the development of step-wise mutations and resistance in* Neisseria gonorrhoea.

49. Arredondo JL, Diaz V, Gaitan H *et al.* Oral clindamycin and ciprofloxacin versus intramuscular ceftriaxone and oral doxycycline in the treatment of mild-to-moderate pelvic inflammatory disease in outpatients. *Clin Infect Dis* 1997;24(2):720-727. *In this clinical trial in South American outpatients, clinical cure was attained with 97% (65/67) in the oral clindamycin and ciprofloxacin group compared to 95% (61/64) in the ceftriaxone and doxycycline group.*

Additional references for interest

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Stratified probability sample survey of 11,161 men and women aged 16-44 in Britain. Half provided urine samples for chlamydia. Reported partner concurrency or two or more sexual partners in past year were associated with higher prevalence of chlamydia

Health protection Agency 2009. All new STI episodes seen at GUM clinics in the UK: 1999 – 2008.
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Mahto M, Mallinson H. Should we consider alternatives to combined cervical and urethral swabs for detection of *Chlamydia trachomatis* in females? *Sex Transm Inf* 2007;**83**:335-6,
Urethral and endocervical samples for CT were performed on 757 sexually active female GUM patients at Macclesfield District General Hospital. Chlamydia positivity rate was 11.9%, only an additional 7.8% (7 positives on 757 urethral swabs with a detection rate of 1%) were detected with urethral swabs. Considering the low yield and the discomfort of urethral swabbing, an additional urethral swab appears unwarranted on grounds of both cost and patient care.

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