5. Infections

Also see

**Primary Care and Hospital Antibiotic Guidance**

**NHS Fife Antibiotic Guidance for the Treatment of Community Managed Infections**

**Management of Serious Infections in Paediatrics.**

**Guidance on Penicillin Allergy.**

**Guidance for the Prevention of Infection in Patients with an Absent or Dysfunctional Spleen**

In order to reduce the risk of antimicrobial resistance and ensure appropriate antibiotic prescribing -

- Do not prescribe an antibiotic for simple sore throats, uncomplicated coughs and colds when the infection is likely to be viral in nature.
- Limit prescribing over the telephone to exceptional cases.
- Consider a delayed prescription.
- Use narrow spectrum generic antibiotics first, whenever possible.
- Avoid broad spectrum antibiotics (e.g. co-amoxiclav, quinolones and cephalosporins) when more narrow spectrum and less expensive antibiotics remain effective, as they increase risk of *Clostridium Difficile*, *MRSA* and resistant organisms.
- Avoid widespread use of topical antibiotics (especially those agents also available as systemic preparations).
- Course of treatment should be for the shortest duration recommended in local guidelines. Patients should be advised to complete the full course of antibiotics prescribed even if they start to feel better.
- If empirical therapy has failed, consider culture for sensitivity (if not already done) before using 2nd line agents.

**General Prescribing Points**

- Patients should be advised of potential side-effects with the use of antibiotics e.g diarrhoea, rash, nausea and vomiting.
- There is the potential of drugs used for the treatment of infections to interact with other prescribed drugs. Refer to the BNF for further advice.

**KEY:**

- **H** - Hospital Use Only
- **S** - Specialist Initiation or Recommendation
- **R** - Restricted Use Only
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Fife Formulary

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5.1 - Antibacterial drugs

5.1.1 Penicillins

Prescribing Points

- Allergic reactions to penicillins occur in up to 10% of individuals. Anaphylactic reactions occur in fewer than 0.05% of individuals and are more common in patients with atopic allergy (e.g. asthma, eczema, hay fever). Individuals with a history of anaphylaxis, urticaria, or rash immediately after penicillin administration should not receive a penicillin in the future. Refer to guidance document on Penicillin Allergy. Available via the NHS Fife ADTC Website Guidance on Penicillin Allergy.

5.1.1.1 Benzylpenicillin and Phenoxymethylpenicillin

- Benzylpenicillin (Penicillin G)
- Phenoxymethylpenicillin (Penicillin V)

5.1.1.2 Penicillinase-resistant penicillins

- Flucloxacillin
- H - Temocillin

5.1.1.3 Broad-spectrum penicillins

- Amoxicillin
- Co-amoxiclav

Prescribing Points

- Temocillin is approved for restricted hospital use only on the advice of a consultant microbiologist. Temocillin, is a narrow spectrum antibiotic and is used as an alternative to meropenem in temocillin sensitive patients.

- Co-amoxiclav (amoxicillin with clavulanic acid) is highly associated with Clostridium Difficile infection. It is not recommended for general use in primary care and should only be used in line with Fife guidance.

5.1.1.4 Antipseudomonal penicillins

- H - Piperacillin with Tazobactam

5.1.2 Cephalosporins, carbapenems, and other beta-lactams

5.1.2.1 Cephalosporins

Not recommended for general use in primary care

- R - Cefalexin
- S - Cefixime
- H - Cefotaxime
- H - Ceftazidime
- H - Ceftriaxone
- H - Cefuroxime

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Prescribing Points

- Cephalosporins are highly associated with *Clostridium Difficile* infection and are not recommended for 1st line, general use. Only use when clinically appropriate and there are no suitable alternatives.
- **R** - Cefalexin is approved for restricted use only for the management of resistant UTI where other formulary options have been ineffective and it has been recommended by microbiology following sensitivity results.
- 0.5–6.5% of penicillin-sensitive patients will also be allergic to the cephalosporins. Patients with a history of immediate hypersensitivity to penicillin should not receive a cephalosporin for mild to moderate infection. Cephalosporins should be used with caution in patients with a life threatening infection. Refer to guidance document on Penicillin Allergy. Available via the NHS Fife ADTC Website **Guidance on Penicillin Allergy**.

### 5.1.2.2 Carbapenems

- **H** - Ertapenem
- **H** - Meropenem

Prescribing Points

- Patients with a history of immediate hypersensitivity to penicillin should not receive a carbapenem for mild to moderate infection. Carbapenems should be used with caution in patients with a life threatening infection. Refer to guidance document on Penicillin Allergy. Available via the NHS Fife ADTC Website **Guidance on Penicillin Allergy**.

### 5.1.2.3 Other beta-lactam antibiotics

- **R** - Aztreonam lysine (Cayston®)

Prescribing Points

- **R** - Aztreonam lysine is approved for restricted use as suppressive therapy of chronic pulmonary infections due to *Pseudomonas aeruginosa* in patients with cystic fibrosis aged 6 years and older. Restricted to use when alternative treatments colistimethate sodium and tobramycin have been ineffective or are not tolerated. Specialist initiation only.

### 5.1.3 Tetracyclines

- **1st Choice**
  - Doxycycline
  - Oxytetracycline
- **2nd Choice**
  - Lymecycline
  - **H** - Tigecycline

Prescribing Points

- Tetracyclines should not be given to children under 12 years, or to pregnant or breast-feeding women as they can cause staining in growing bone and teeth.
- Unlike other tetracyclines, doxycycline may be administered to patients with kidney disease.
Patients should be advised of possible photosensitivity reactions with doxycycline.

Oxytetracycline is considered the 1st line oral antibiotic for the treatment of acne and rosacea at a dose of 500mg twice daily (see section 13.6).

Lymecycline is recommended for the treatment of acne. It is significantly dearer than oxytetracycline and doxycycline (see section 13.6).

Minocycline is no longer recommended as it is associated with a greater risk of hepatitis and lupus-erythematosus-like syndrome. Minocycline can also cause irreversible skin pigmentation.

### 5.1.4 Aminoglycosides

**H** - Gentamicin

**S** - Tobramycin nebulised solution

**R** - Tobramycin powder (TOBI Podhaler®)

**Prescribing Points**

- Refer to gentamicin guidance for the appropriate dosing of gentamicin. Available via the NHS Fife intranet [Gentamicin Guidance](#)
- **R** - Tobramycin powder inhaler is approved for specialist initiation as suppressive therapy for chronic pulmonary infection due to *Pseudomonas aeruginosa* in adults and children aged 6yrs and older with cystic fibrosis when tobramycin nebulised solution is unsuitable.
- Intravesical gentamicin is recommended for the treatment of recurrent urinary tract infections resistant to oral antibiotics and intravesical treatment of Cystistat and/or Ialuril.

### 5.1.5 Macrolides

**Erythromycin**

** Clarithromycin**

** Azithromycin**

**Prescribing Points**

- Macrolides are used as alternatives to penicillins in penicillin allergic patients.
- Erythromycin causes nausea, vomiting and diarrhoea in some patients.
- Clarithromycin causes fewer gastro-intestinal side-effects than erythromycin and may improve compliance. However, in children it is more cost-effective to prescribe erythromycin suspension rather than clarithromycin suspension.

### 5.1.6 Clindamycin

**Clindamycin**

**Prescribing Points**

- Clindamycin is highly associated with *Clostridium Difficile* infection especially in elderly patients and should only be used in line with Fife Guidance.

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5.1.7 Some Other Antibacterials

**Use on Bacteriological advice only**
- H - Chloramphenicol
- H - Colistimethate sodium injection
- S - Colistimethate sodium dry powder nebuliser solution (Promixin®), dry powder for inhalation (Colobreathe®)
- ' - H - Daptomycin
- Use on Bacteriological advice only
- R - Fidaxomicin
- Use on Bacteriological advice only
- R - Fosfomycin trometamol granules (Monuril)
- Use on Bacteriological advice only
- S - Linezolid
- S - Rifaximin (Targaxan®)
- H - Teicoplanin
- H - Vancomycin

**Prescribing Points**
- Colistimethate sodium inhalation may be used as suppressive therapy for chronic pulmonary infection due to *Pseudomonas aeruginosa* in adults and children aged 6yrs and older with cystic fibrosis. The dry powder formulation should only be used in patients who are unable to tolerate the nebulised formulation. Specialist initiation only.
- Maximum duration of treatment with linezolid is 28 days. Refer to BNF for monitoring requirements.
- Rifaximin (Targaxan®) is approved for use as in combination with lactulose in the management of hepatic encephalopathy. Restricted to patients where lactulose monotherapy has been ineffective.
- Refer to vancomycin guidance for the appropriate loading and maintenance doses for vancomycin. Available via the NHS Fife intranet [Vancomycin Guidance](#).
- Oral vancomycin capsules are not absorbed. They should only be used to treat severe or relapsed *Clostridium Difficile* infection.
- **R - Fidaxomicin** is approved for restricted hospital use only in patients with a first recurrence of *Clostridium Difficile* infection on advice of local microbiologists or specialists of infectious disease.
- **R - Fosfomycin granules** (Monuril®) is approved for restricted use on the advice of a microbiologist for patients with uncomplicated lower urinary tract infections caused by multi-drug resistant bacteria that are resistant to 1st line oral antibiotics but sensitive to fosfomycin.
- Fosfomycin (Fomicyt®) infusion is approved for use in patients when alternative antibacterial agents are considered inappropriate or have been ineffective in treating the specific licensed infections. On the advice of local microbiologists.

5.1.8 Sulfonamides and Trimethoprim

**Trimethoprim**
- S - Co-trimoxazole

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Prescribing Points

- Trimethoprim should be avoided in the treatment of urinary tract infections in pregnancy particularly in the 1st trimester.
- Co-trimoxazole can cause blood disorders and Stevens-Johnson syndrome especially in the elderly. Long-term use requires regular blood monitoring. Treatment should be discontinued if blood disorders or rash develops.

5.1.9 Antituberculosis drugs

Tuberculosis should only be treated by a specialist with experience of treating tuberculosis, usually this will be a respiratory consultant.

- Ethambutol
- Isoniazid
- Pyrazinamide
- Rifampicin
- Rifater® (rifampicin, isoniazid, pyrazinamide)
- Rifinah® (rifampicin, isoniazid)

Prescribing Points

- Tuberculosis is treated in two phases - an initial phase using 4 drugs and a continuation phase using 2 drugs in fully sensitive cases.
- The concurrent use of 4 drugs during the initial phase is designed to reduce the bacterial population as rapidly as possible and to prevent the emergence of drug-resistant bacteria. The treatment of choice for the initial phase is the daily use of isoniazid, rifampicin, pyrazinamide (the combination product (Rifater®) should be used whenever possible to aid compliance) and ethambutol. The initial phase drugs should be continued for 2 months.
- After the initial phase, treatment is continued for a further 4 months with isoniazid and rifampicin (the combination product (Rifinah®) should be used whenever possible to aid compliance).
- Drug administration needs to be fully supervised (directly observed therapy, DOT) in patients who cannot comply reliably with the treatment regimen.
- Isoniazid, rifampicin and pyrazinamide are associated with liver toxicity. Hepatic function should be checked before treatment with these drugs. Patients and their carers should be informed about the signs of liver disorders and advised to discontinue treatment and seek immediate medical attention should symptoms occur.
- Patients prescribed ethambutol should be advised to discontinue therapy immediately if they develop deterioration in vision and promptly seek further advice.

5.1.10 Antileprotic drugs

- Dapsone

5.1.11 Metronidazole and tinidazole

- Metronidazole

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5.1.12 Quinolones

Ciprofloxacin
Levofloxacin
Norfloxacin
Ofloxacin

Prescribing Points

- Quinolones are highly associated with *Clostridium Difficile* infection and should only be used in line with Fife Guidance.
- Ciprofloxacin should **not be used** for the empirical treatment of community acquired pneumonia as it has poor activity against *Strep. pneumoniae*.
- The CSM has warned that quinolones may induce convulsions in patients with or without a history of convulsions; taking NSAIDs at the same time may also induce convulsions.
- Tendon damage (including rupture) has been reported rarely in patients receiving quinolones. Tendon rupture may occur within 48 hours of starting treatment; cases have also been reported several months after stopping a quinolone. If tendonitis is suspected the quinolone should be stopped immediately and seek orthopaedic advice.
- For the use of quinolones in children see caution in BNF.

5.1.13 Nitrofurantoin

Nitrofurantoin capsules

Prescribing Points

- Macrobid® is a MR version of nitrofurantoin which allows for twice daily dosing.
- For the treatment of UTIs refer to guidance on the Management of Common Infections.
- Nitrofurantoin may be used for the treatment of urinary-tract infections in pregnancy but should be avoided at term.

5.2 - Antifungal drugs

Terbinafine
Fluconazole
Griseofulvin
Itraconazole
Nystatin

Prescribing Points

- Mild localised fungal infections of the skin respond to topical therapy (see section 13.10.2). Systemic therapy is appropriate if topical therapy fails, if many areas are affected, or if the site of infection is difficult to treat such as in infections of the nails (*onychomycosis*) and of the scalp (*tinea capitis*).
- Griseofulvin is used for *tinea capitis* in adults and children. It is the drug of choice for *trichophyton* infections in children. Duration of therapy is dependent on the site of the infection and may extend to a number of months.
- Antifungal treatment may not be necessary in asymptomatic patients with *tinea* infection of the nails. If treatment is necessary, a systemic antifungal is more effective than topical therapy. Terbinafine has greater efficacy and is more cost-effective than itraconazole for the treatment of fungal nail infections.
Prescribing Points

- Anidulafungin is approved as a second line treatment after fluconazole for invasive candidiasis in adult non-neutropenic patients.
- R - Caspofungin is approved for restricted, hospital use only, for the management of fungal infections in febrile neutropenic patients only.
- Posaconazole is available as tablets and suspension. Due to differences in bioavailability the two formulations are not interchangeable. Posaconazole should only be used in patients who are intolerant of itraconazole.

5.3 - Antiviral Drugs
5.3.1 HIV Infections

**Nucleoside Reverse Transcriptase Inhibitors (NRTIs)**

- H - Abacavir
- H - Didanosine
- H - Emtricitabine
- H - Eviplera®
- H - Lamivudine
- H - Stavudine
- H - Tenofovir
- H - Zidovudine

**Protease Inhibitors**

- H - Atazanavir
- H - Darunavir
- H - Fosamprenavir
- H - Indinavir
- H - Lopinavir with Ritonavir
- H - Nelfinavir
- H - Ritonavir
- H - Saquinavir
- H - Tipranavir

**Non-Nucleotide Reverse Transcriptase Inhibitors (NNRTIs)**

- H - Efavirenz
- H - Etravirine
- H - Nevirapine
- H - Rilpivirine

* - Liposomal Amphotericin
* - Anidulafungin
* - Caspofungin
* - Posaconazole
* - Voriconazole

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Prescribing Points

- Nevirapine (Viramune®) once daily prolonged release tablets may be used for the treatment of HIV-1 infected adults, adolescents, and children three years and above and able to swallow tablets.
- Rilpivirine (Edurant® Eviplera®) is approved for use in treatment naïve adult patients with a viral load ≤ 100,000 HIV-1 RNA copies/ml to be used in patients with a contraindication or unable to tolerate efavirenz therapy.

Other Antiretrovirals

- Enfuvirtide
- Maraviroc
- Dolutegravir
- Raltegravir

Combination Products

- Atripla®
- Biktarvy®
- Eviplera®
- Evotaz®
- Genvoya®
- Juluca®
- Rezolsta®
- Stribild®
- Symtuza®
- Truveda®
- Truvada®

Prescribing Points

- All treatments for HIV should be restricted to use by HIV specialists only.
- Combination products may be used where considered appropriate to aid compliance.
- HIV treatment should be prescribed in line with BHIVA Guidelines and recommendations from the SMC and NICE Multiple Technology Assessments.

5.3.2 Herpes virus infections

5.3.2.1 Herpes simplex and varicella-zoster infection

1st Choice
- Aciclovir

2nd Choice
- Famciclovir
- Valaciclovir

5.3.2.2 Cytomegalovirus infection

Specialist advice only
- Ganciclovir (including ophthalmic implants)

Specialist advice only
- Valganciclovir

KEY:-

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Prescribing Points

- Ganciclovir capsules are restricted to use on specialist advice as maintenance therapy in HIV patients with CMV retinitis. The implants are restricted to ophthalmologists specialising in CMV retinitis.
- Valganciclovir is approved for the induction and maintenance treatment of cytomegalovirus (CMV) retinitis in patients with HIV and also for the prevention of CMV disease in CMV-negative patients who have received a solid organ transplant from a CMV-positive donor.
- Valganciclovir is approved for use in CMV prophylaxis in kidney transplant patients for up to 180 days.

5.3.3 Viral hepatitis

5.3.3.1 Chronic Hepatitis B

H - Tenofovir disoproxil fumarate
H - Entecavir
H - Lamivudine
H - Peginterferon alfa

5.3.3.2 Chronic Hepatitis C

Also see National Clinical Guidelines for the Treatment of HCV in Adults

H - Peginterferon alfa
H - Ribavirin

+/ - In combination with

H - Daclatasvir (Daklinza®)
H - Dasabuvir (Exviera®)
H - Elbasvir 50mg / Grazoprevir 100mg (Zepatier®)
H - Glecaprevir/ Pibrentasvir (Maviret®)
H - Ledipasvir/ Sofosbuvir (Harvoni®)
H - Ombitasvir/ Paritaprevir/ Ritonavir (Viekirax®)
H - Simeprevir (Olysio®)
H - Sofosbuvir (Sovaldi®)
H - Sofosbuvir-Velpatasvir (Epclusa®)

Prescribing Points

- Entecavir is not recommended by the SMC for use within NHS Scotland for the treatment of chronic hepatitis B virus (HBV) infection in adults with decompensated liver disease. Requires submission and approval of a Peer Approved Clinical System (PACS2) Request Form before prescribing for this specific indication.
- Treatment for chronic hepatitis C should be in line with Scottish National Clinical Guidelines - National Clinical Guidelines for the Treatment of HCV in Adults.

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Last amended Jan 2019
5.3.4 Influenza

Oseltamivir (Tamiflu®)
Zanamivir (Relenza®)

Prescribing Points

- For use only when influenza is circulating in the community. Refer to guidelines for the appropriate use of products.

5.3.5 Respiratory Syncytial Virus

Specialist advice only H - Palivizumab

Prescribing Points

- Palivizumab is licensed for preventing serious lower respiratory-tract disease caused by respiratory syncytial virus in children at high risk of the disease; it should be prescribed under specialist supervision, in line with the agreed Fife protocol.

5.4 - Antiprotozoal agents

5.4.1 Antimalarials

Chloroquine
Doxycycline
Mefloquine
Proguanil
Proguanil with Atovaquone (Malarone®)

H - Artemether with lumefantrine (Riamet®)
H - Quinine

Prescribing Points

- For information on malaria prophylaxis or travel advice, health care professionals can contact Travax. Tel 0141 300 1130 or go to www.travax.scot.nhs.uk/.
- It is important to be aware that any illness that occurs within 1 year and especially within 3 months of return from a malarial region might be malaria.
- Both chloroquine and mefloquine are unsuitable for malaria prophylaxis in individuals with a history of epilepsy. Seek specialist advice for alternatives.
- Prophylaxis should be started at least one week prior to travelling (two weeks for mefloquine) and continued for four weeks after leaving the malaria area.

5.4.8 Drugs for Pneumocystis Pneumonia

Specialist advice only H - Co-trimoxazole
Specialist advice only H - Atovaquone

5.5 - Anthelmintics

5.5.1 Drugs for Threadworms

Mebendazole

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Prescribing Points

- Anthelmintics are effective in threadworm infections, but their use needs to be combined with hygienic measures to break the cycle of auto-infection.
- All members of the family should receive treatment at the same time.
- Washing hands and scrubbing nails before each meal and after each visit to the toilet is essential. A bath taken immediately after rising will remove ova laid during the night.
- Mebendazole is the drug of choice for treating threadworm infection in patients of all ages over 2 years. If re-infection occurs, a second dose may be given after 2 weeks.