

Treating Infections in Primary Care

Clinical Guidelines

STRAMA - South West Skåne 2000

Contents

- Introduction..... 3
- Management of children with a suspected penicillin allergy..... 4
- Acute sinusitis..... 5
- Acute otitis media..... 7
- Acute tonsillitis/pharyngo-tonsillitis..... 9
- Acute bronchitis in adults..... 11
- Acute exacerbation of chronic bronchitis..... 12
- Community-acquired pneumonia in adults..... 13
- Urinary tract infections in adults..... 14
- Skin and soft tissue infections..... 16
- Acute bronchitis in children..... 17
- Pneumonia in children..... 18
- Management of UTI in children in primary care..... 20

Introduction

During the nineties, we have become increasingly aware of the problem of antibiotic resistance in patho-genic bacteria. Much remains to be learned about the relationship between the prescribing of antibiotics and the development of resistance, but it is reasonable to assume that increased use increases the risk of resistance. The prescribing of antibiotics increased in Sweden during the eighties and early nineties. Increased resistance was then observed in several strains of bacteria. During the nineties, several local and national initiatives were taken in order to stem this development. 1995 saw the establishing of the STRAMA network - the Swedish Strategic Programme for the Rational Use of Antimicrobial Agents and Surveillance of Resistance. This is a national body with peripheral branches all over the country, including Skåne, where several STRAMA groups were established. Since 1993, the prescribing of antibiotics for non-veterinary use in primary care has fallen by 18%.

Treatment guidelines in common primary care infections have previously been distributed in the form of STRAMA information, via the department for infection control in Malmö. These guidelines are beginning to show their age. Now, the primary care STRAMA group in South West Skåne has revised these guidelines and collected them in this document which is intended for the geographical area roughly equivalent to South West Skåne Health District. The group was made up of the following members:

Rolf Alsterlund, *, Skåne

Agneta Björck Linné, **

Anita Bylander-Groth, Curakliniken, Malmö

Göran Ilestam, Eden Health Centre, Malmö

Ami Larsson, ENT Dept, UMAS

Inga Odenholt, Inf Dis Dept, UMAS

Johan Thunander, Paed Dept, Trelleborg

Mats Walder, Bact Dept, UMAS

The purpose of these guidelines is to promote the optimal use of antibiotics. By which is meant the prescribing of the most suitable antibiotic when it is genuinely necessary, and the avoidance of prescribing inappropriate antibiotics for inadequate indications.

These treatment guidelines also include diagnostic guidelines. One extremely useful diagnostic approach is to **wait and see**. One can often wait a couple of days, so that time will tell us if the patient really needs antibiotics. The opportunity for a free follow-up consultation within 7 days for adults and children over 7 with upper respiratory tract infections (URTIs) makes this a lot easier. (Children under 7 can see the doctor free of charge in any case.)

Our treatment recommendations have been influenced by Skåne's local formulary. The doses we recommend, however, differ on occasions from those in FASS (Swedish Catalogue of Ethical Drugs). The past decade has seen a significant increase in our knowledge of the pharmacodynamics of antibiotics, i.e. which doses and which dosage intervals are most appropriate. Both animal and human studies have shown that different antibiotics have different pharmacodynamic properties. As regards β -lactam antibiotics (i.e. penicillins and cephalosporins), efficacy depends on the length of time that the free (non protein bound) serum concentrations remain above the Minimal Inhibitory Concentration (MIC) for that particular bacterium. Higher concentrations do not produce a greater bactericidal effect, and as it is the $T > MIC$ which determines efficacy, these drugs should be given frequently, as their half-life is short - in the order of 45 min to 2 hours. This is especially important in serious infections, (e.g. erysipelas, pneumonia, skin and soft tissue infections), and in the immunocompromised patient. Phenoxymethylpenicillin i.e. penicillin V (Kåvepenin), flucloxacillin (Heracillin), and amoxicillin (Amimox) should all be given 3 times daily for the indications mentioned.

*Department for Infection Control

**Drug Therapeutic Committee

- **The management of children with suspected penicillin allergy**

This section is based upon the guidelines published by the Swedish Paediatricians' Society's section for paediatric allergy 1996.

Penicillin treatment produces some sort of skin or intestinal reaction in 5-10% of cases. Serious reactions to oral treatment with penicillin are extremely rare. IgE-mediated reactions are rare compared to toxic, cytotoxic, or immune-complex reactions related to the actual infection. Penicillin V has a good bactericidal effect, has ecological advantages and is cheap. Therefore it is important not to label a patient as penicillin allergic on inadequate grounds. The aim should be to identify children at high risk of a serious reaction to future penicillin treatment, and to 'give the all clear' to children who have had a harmless reaction.

Practical management

Drug allergy is an important diagnosis, and treatment should never be stopped on the grounds of a rash that has not been examined and properly documented. The diagnosis of urticaria is easier when you can palpate the wheal.

A. A rash with little or no itching, or gastrointestinal symptoms:

Continue treatment. Further evaluation is unnecessary, and penicillin can be used in future.

B. A rash with troublesome itching or mild urticaria:

Discontinue treatment. Review the need for continuing antibiotic treatment. Change, if necessary, to erythromycin or a cephalosporin. If the symptoms developed during the first 1-2 days of treatment, the patient should be referred to a paediatrician for investigation. If the reaction was delayed beyond that, the patient can be investigated in primary care by means of a single oral provocation dose. In the absence of a reaction, penicillin may be prescribed in future. Refer any patient that reacts to a further course of penicillin treatment.

C. Extensive urticaria with or without joint or facial swelling:

Discontinue treatment. High risk of recurrence, so penicillin should be avoided in future.

D. Anaphylactic reaction or mucocutaneous syndrome:

Acute paediatric referral for immediate treatment. Mark the notes with a WARNING!

In the event of a severe reaction, i.e. in category C or D above, an adverse reaction report should be sent to Läkemedelsverket (Medical Products Agency). Children who have had anaphylaxis or severe urticaria within the first few days of treatment should not be treated with a cephalosporin because of the risk of cross-reaction.

Oral provocation test

This is done by administering penicillin V at a dose of 25 mg/kg body weight as a single dose when the patient is free of infection, or as the initial dose of an intended course of treatment. This should only be carried out where equipment for treating anaphylaxis is immediately available, and the patient should be observed for at least 1 hour. The dose should ideally be given in tablet form, but powder for dilution may be used in younger children. The absence of a reaction does not exclude the possibility of future reactions, but it means that the risk of a serious future reaction is not increased.

Acute sinusitis

Sinusitis in one or more paranasal sinuses may be due to infection (bacteria, viruses, fungi) or may have another inflammatory cause.

Upper respiratory tract infection (URTI) causes swelling of the mucous membranes. The ostia (drainage holes from the sinuses) can thereby become blocked, resulting in sinusitis, which should therefore be regarded as a complication of the common cold.

The maxillary sinus is involved in more than 90% of cases. Spontaneous resolution is common, and complications are rare.

Diagnosis

- The **history** is relatively unreliable, as URTI with pressure discomfort in the sinuses produces similar symptoms. **Unilateral symptoms** suggest a greater likelihood of a true sinusitis, which rarely develops in less than **a week** and is sometimes accompanied by a **foul-smelling nasal discharge**. The condition is certainly over-diagnosed.
- **Clinical examination:** Pus in the nasal cavity suggests the presence of sinusitis. Tenderness over the maxillary sinus is an unreliable sign.
- **Ultrasound/X-rays**
- **Lavage/aspiration.** The only way to be entirely certain of the presence of purulent sinusitis! (Has the advantage of being therapeutic.)

Bacterial aetiology

Pneumococci and *Haemophilus influenzae* are the commonest pathogens. The incidence of *H. influenzae* infection is greater in children and young adults.

Dental abscesses contain oral cavity bacteria.

Treatment

1. **URTI symptoms of <1 week's duration are very rarely due to sinusitis:** nose drops + analgesics + raised position.

Maxillary sinusitis

2. **Sinusitis:** symptoms >1 week, ideally confirmed by ultrasound showing fluid levels, or plain radiography. Treat as above with the addition of **penicillin V** (Kåvepenin) 2g x 2 or 1g x 3 (the latter is preferable as it holds the serum concentration over the MIC for longer, which gives greater efficacy) for 10 days.

In penicillin allergy, **doxycycline** (Doxyferm) can be given instead - 100mg x 2 on day one, followed by 100mg x 1 for a further 8 days.

In the event of **treatment failure: amoxicillin** (Amimox) 500mg x 3 (dosage justified as above) for 10 days. **Consider lavage.** In penicillin allergy, confirm the diagnosis by radiological investigation and contact an ENT specialist.

3. **Non-draining purulent sinusitis or sinusitis of dental origin:** Lavage, possibly in combination with antibiotics (penicillin V in high dose).

NB - consider **antral lavage** in frequently **recurring sinusitis**, or in **treatment failure**.

Frontal sinusitis

Radiography is advisable in order to confirm the diagnosis.

Antibiotics, nose drops and "pinning" (direct intranasal application of decongestant/anaesthetic).

More serious infection demands trepanation.

Seriously consider antral lavage if there is concurrent maxillary sinusitis.

Frontal sinusitis is a considerably more serious infection than maxillary sinusitis, therefore *Haemophilus influenzae* infection should be covered with greater certainty. One of the ampicillin family of antibiotics is preferable in confirmed frontal sinusitis.

Referral is obligatory.

Ethmoiditis (ocular swelling)

Affects small children. Should, in principle, be admitted to hospital. Very commonly caused by *Haemophilus influenzae*. Most often treated with intravenous cefuroxime.

Complications

Uncommon. Mainly occurs in frontal, ethmoid and sphenoidal sinusitis - e.g. orbital and brain abscess, meningitis.

Treatment failure

Wrong diagnosis, poor drainage, resistant bacteria, dental abscess, other complicating factors such as nasal polyps, allergy, pregnancy, etc.

Differential diagnosis

Tension headache, migraine, dental or gingival infection, temporo-mandibular joint pain, zoster, trigeminal neuralgia, etc.

Acute otitis media

Acute otitis media (AOM) is a common disease of childhood. 70-80% of children will experience at least one attack during the pre-school years. The highest incidence is seen between the ages of 6 and 24 months. AOM is caused by the common upper respiratory pathogens: pneumococci in 30-50%, *Haemophilus influenzae* in 15-30% (of which 5-8% are β -lactamase producing and 3-7% display chromosomal resistance), *Moraxella catarrhalis* in 1-9%, streptococci in <5% and other pathogens in a small remainder.

Complications, which include mastoiditis, labyrinthitis and brain abscess are nowadays rare. When they do occur, however, they are extremely serious, and demand prompt treatment. Initially, it is difficult to distinguish the 75-80% of infections that will resolve spontaneously from those that won't.

Diagnosis

The diagnosis is clinical, and based upon the history and the findings on direct inspection, preferably by aural microscope. In a crying child, it can be very hard to distinguish between secretory and acute otitis. It is very important to examine the mobility of the eardrum, in order to reduce the frequency of over-diagnosis. This is done by pneumatic otoscope or by tympanometry. A red eardrum does not necessarily imply AOM. A bulging, thickened, pale or inflamed eardrum or a bullous myringitis displaying reduced mobility confirms the presence of suppuration. Nasopharyngeal culture is not routinely carried out in primary AOM.

Treatment

The following recommendations came out of a consensus conference held in May 2000: If the child has only experienced transient earache, becoming symptom free within 24 hours, medical examination is not necessary. Children under 2 with confirmed otitis should be given antibiotics. In children of 2 yr. or older, antibiotics may be withheld, provided that the child is not generally ill or the eardrum perforated. A fresh clinical examination should be carried out in the absence of improvement within 2-3 days, or earlier in the event of worsening symptoms, in which case antibiotics should be given.

1 Primary otitis

Penicillin V (Kåvepenin) 25 mg/kg x 2 for 5 days

In penicillin allergy - **erythromycin** (Ery-Max) 25 mg/kg x 2

2 Recurrent otitis.

A recurrence is defined as a new occurrence of AOM within 1 month of a previous occurrence, after completed treatment and a symptom-free interval. Recurrence is usually caused by the same bacteria that caused the primary infection (i.e. most commonly pneumococci).

Treatment: **Penicillin V** (Kåvepenin) 25mg/kg x 2 for 10 days, alternatively **amoxicillin**

(Amimox) 20mg/kg x 2 for 10 days. In the event of penicillin allergy - see above.

3. Treatment failure

I.e. absence of improvement or the occurrence of a new otitis after the first 3 days of treatment.

Usually caused by non- β -lactamase producing *Haemophilus influenzae*.

Treatment: **amoxicillin** (Amimox) 20mg/kg x 2 for 10 days

In the event of penicillin allergy: **trimethoprim-sulfamethoxazole** (Bactrim) - dosage according to FASS.

If β -lactamase producing *H. Influenzae* is isolated: **amoxicillin-clavulanate** (Spektramox), **trimethoprim-sulfamethoxazole** (Bactrim) or a cephalosporin (not, however, cefadroxil, cephalixin or cefaclor).

In treatment failure, referral to an ENT specialist can be of value.

Nasopharyngeal culture

A nasopharyngeal swab should be taken in treatment failure and frequent recurrence. In perforating otitis media, a swab can even be taken from the ear. The culture result does not necessarily require a change of treatment, if clinical improvement or resolution has already taken place. *Moraxella catarrhalis* never causes complications, so its resistance pattern should not affect treatment choices.

Follow-up

Uncomplicated primary AOM should be followed up after 3 months. Follow-up should be individually determined in more complicated cases. Children aged 12 months or less should be followed up by an ENT specialist, as should children who have had more than 3 attacks of otitis within 6 months.

Acute tonsillitis/pharyngo-tonsillitis

A common illness with an incidence of approx. 300,000/yr in Sweden.

Causes

bacteria in 40-50%

20-40% group A streptococci (GAS)

1-5% group C or G streptococci

5-10% other bacteria

viruses in 30-50%

adeno-, coxsackie A and herpes viruses

EB virus, CMV

influenza etc.

Tonsillitis is not synonymous with streptococcal infection. Don't forget that half of all attacks of pharyngo-tonsillitis are virus related, and that there are now ways of diagnosing streptococcal infection!

Diagnosis

*Always take a **POC (Point Of Care) direct antigen detection test, or a throat swab for culture!***

Immunological POC tests (Cards OS Strep A or Testpack Strep A) or a throat swab are **necessary** to establish the presence of GAS. Clinical inspection alone is **not** sufficient to distinguish between viral and GAS tonsillitis. Signs that indicate a GAS infection include rapid onset of fever, intense pharyngeal inflammation, strawberry tongue, petechiae on the soft palate, oedema of the uvula, markedly tender lymph nodes, paronychia and impetigo. Only 1% of patients with GAS infection have soft palate petechiae.

GAS are found in about 30% of patients with isolated pharyngitis, i.e. without involvement of the tonsils. So take a test! (POC or culture)

Tonsillitis in children under 3 is rarely due to GAS, viruses being the common infectious agent. URTI with yellow, sometimes bloodstained, nasal discharge and sore nostrils suggests GAS infection. Take a nasopharyngeal swab! Unlike conventional culture, POC tests cannot as yet identify group G or group C streptococci. These bacteria are not thought to cause any late complications.

POC tests have a sensitivity of 90% in symptomatic cases. Much depends on swabbing technique! Adequate swabbing requires good light and a spatula, and the swab should be rubbed against both tonsils 2-3 times. Specificity is high, about 95%, which means that false positive results are rarely a problem.

The POC tests require the presence of a large number of bacteria before they show positive. They are **not** therefore suitable for detecting carrier states. Conventional swabs for culture must be used to investigate symptom-free family members, and to follow up treated cases.

C-reactive protein (CRP) testing is pointless as adenovirus and EB virus infections can give rise to markedly elevated values (150), and normal values are sometimes seen in GAS infections.

Treatment

*Antibiotic of choice: **Penicillin V** (Kåvepenin) 12.5 mg/kg x 2 daily.*

*In penicillin allergy (excluding type 1): **cefadroxil** (Cefadroxil NM Pharma) 30 mg/kg once daily or 15 mg/kg x 2 daily or **clindamycin** (Dalacin) 5 mg/kg x 3 or 7.5 mg/kg x 2.*

*In penicillin allergy type 1: **clindamycin** (Dalacin) 5 mg/kg x3 or 7.5 mg/kg x 2. Possibly **erythromycin** (Ery-Max).*

Length of treatment - 10 days! Shorter courses result in more recurrences.

Recurrence within 14 days:

Clindamycin or **cefadroxil** in the above doses for 10 days.

Erythromycin should be avoided because of the risk of inducing resistance, and because it is no more effective in recurrences.

10% all cases of GAS tonsillitis recur within 2 weeks and 25% within 2 months. In these cases, taking a throat swab for culture or for immunological POC testing is an absolute requirement.

In the event of more than one recurrence: Swab the whole family for culture, maybe even children in the same nursery class. Don't forget that 1-10% of all adults and 15-25% of all children have positive throat swab cultures for GAS during the winter, and yet remain free of symptoms. Bacterial cultures demonstrate the presence of GAS but tell us nothing about the need for treatment. All carriers need **not** be treated - the risk of spread of infection is the deciding factor.

Acute bronchitis in adults

Acute bronchitis in adults is a benign, self-limiting lower respiratory tract infection in people who otherwise have healthy airways. Simultaneous upper respiratory symptoms, such as rhinorrhoea, laryngitis and pharyngitis commonly occur.

Aetiology

Rhinovirus, adenovirus, influenza A and B viruses, parainfluenza virus. Uncommon causes include mycoplasma and chlamydia.

Clinical picture

Fever, dry cough and retrosternal pain are common symptoms in the early stages of the illness. The temperature returns to normal within a couple of days, and the cough becomes more productive, not unusually with yellow or green sputum. The cough usually disappears within 10 days (longer in smokers).

Laboratory tests

A slightly raised leucocyte count, and a moderate rise in CRP (<100) are common.

Treatment

Conservative, possibly cough suppressants.

NB!

Discoloured sputum is no indication for treatment.

Acute exacerbation of chronic bronchitis

Definition of chronic bronchitis:

Productive cough for at least 3 months in 2 successive years. Commonly caused by smoking.

Definition of acute exacerbation of chronic bronchitis:

1. Increased airway obstruction for more than a week AND
2. Purulent sputum for more than a week AND
3. Morning fever of $>38.5^{\circ}\text{C}$ for more than 3 days

Aetiology

Often starts with a viral URTI, e.g. rhinovirus, influenza virus, etc. Secondary bacterial infection then follows, commonly with *Streptococcus pneumoniae*, *Haemophilus influenzae* or *Klebsiella pneumoniae*.

Treatment

1. Initiate or increase treatment with inhaled β_2 -agonists or inhaled steroids. This will often suffice.
2. If the above fails to help and treatment with antibiotics is being considered, then alternating therapy with the antibiotics listed below is to be preferred.

Amoxicillin (Amimox): favourable pharmacokinetics with 90% absorption. Very effective against *Streptococcus pneumoniae* and *Haemophilus influenzae*. Use 500mg x 3 daily

Doxycycline (Doxyferm): Also well absorbed and effective against most of the relevant pathogens. Dose - 200mg x 1 on day one, followed by 100mg x 1 daily.

Trimethoprim-sulfamethoxazole (Bactrim): 100% absorption and effective against all the relevant pathogens. Note that a lower dose of 1 tablet daily should be used in patients over 70 because of the risk of side effects. The normal dose is 2 tabs x 2 daily.

Levofloxacin can be used as **second line treatment**. It is not included in treatment of first choice because of the risk of inducing resistance.

Levofloxacin (Tavanic) is a newly registered quinolone antibiotic which, unlike ciprofloxacin, is also effective against pneumococci.

Dose - 500mg x 1 daily.

Length of treatment

Antibiotics - 7-10 days

NB! Discoloured sputum alone is no indication for antibiotic treatment.

Community-acquired pneumonia in adults.

Pneumonia remains, in terms of incidence, one of the most important illnesses. In Sweden, pneumonia is the fifth commonest cause of death and the commonest cause of death from infection.

Aetiology

Community-acquired pneumonia is defined as pneumonia contracted outside hospital, as opposed to nosocomial pneumonia which is defined as pneumonia contracted by patients who have spent at least 3 days in hospital. Pneumococcal infection is the commonest cause of community-acquired bacterial pneumonia (>60%). This is equally true in the elderly, and in those with an underlying illness, such as heart disease or diabetes. Infection in patients with an underlying respiratory tract disease, such as chronic bronchitis or asthma, can often have a different aetiology, (e.g. *Haemophilus influenzae* or *Klebsiella pneumoniae*). Young patients with headache, dry cough, raised ESR and a normal leucocyte count can have pneumonia caused by *Mycoplasma pneumoniae*. In such cases there are often other cases in the nearby surroundings.

Diagnosis

A chest X-ray should be carried out whenever pneumonia is suspected unless the clinical findings are conclusive. Auscultation may be entirely normal in pneumonia of rapid onset, or in mycoplasma pneumonia. C-Reactive Protein (CRP), ESR and leucocyte counts are useful in distinguishing between viral and bacterial respiratory tract infection, as well as between typical and atypical pneumonia.

Treatment

Patients without systemic signs can be given oral treatment with **penicillin V**, e.g. Kåvepenin 1.0 g x 3 daily. (Thrice daily treatment should be used). Patients with breathing difficulties or who have systemic signs should be admitted to hospital.

In the event of penicillin allergy, **erythromycin** (Ery-Max) 500 mg x 2 or **clindamycin** (Dalacin) 300mg x 3 can be given.

For patients with an **underlying disease**, in whom pneumonia might reasonably be attributed to agents other than pneumococci, **amoxicillin** (Amimox) 500mg x 3 is recommended (normal dosage). Orally administered cephalosporins such as cefuroxime axetil (Zinnat) and cefpodoxime (Orelox) should **not** be used because of the high risk of inducing *Clostridium difficile* infection. Furthermore, the orally absorbable cefuroxime axetil (Zinnat) lacks an indication for pneumonia as adequate serum concentrations are not achieved, in contrast to intravenous form of cefuroxime (Zinacef).

If **atypical pneumonia** is suspected, give **erythromycin** tablets (Ery-Max) 500mg x 2, or **doxycycline** (Doxyferm) 100 mg 2 x 1 on day one, followed by 100mg daily. Mycoplasma or chlamydia serology should be considered if symptoms persist for more than a week.

Length of treatment

Few studies have been carried out concerning the optimal length of treatment in respiratory tract infections. It is normal practice in Sweden to give 10 days treatment for pneumonia, whereas in Germany treatment is given for 7 days.

Urinary tract infection (UTI) in adults

Lower urinary tract infection is one of the most common bacterial infections treated in primary care. It is estimated that 0.5 to 1 million UTIs are treated annually in Sweden. This accounts for about 25% of all antibiotics prescribed in primary care. About 80% are caused by *Escherichia coli*, but *Staphylococcus saprophyticus* is also a common causal agent, particularly in young women during the spring and summer months. Lower UTI differs from upper UTI, mainly in that the former is not associated with fever.

Diagnosis

The classical symptoms of dysuria, pollakisuria and urgency together with a positive urinalysis (leucocytosis and positive nitrite) is often enough to diagnose a lower UTI. Many also use a dip slide (e.g. Uricult). A traditional urine culture should be ordered, however, in recurrent infection, treatment failure, and when the patient has an underlying disease. Urine culture should always be carried out in men with lower UTI, as there is often a precipitating factor, such as stones, prostatic hypertrophy, etc.

Treatment

Because of the large amounts of antibiotics prescribed for patients with UTI, it is advisable to rotate between several different drugs. Less than 10% of the commonly occurring strains of *E. coli* are resistant to the recommended first line treatments for lower UTI except for trimethoprim, where resistance among *E. coli* now reaches 15%. As regards clinical efficacy, there is no difference between the drugs.

A. First line drugs in uncomplicated UTI in women:

Mecillinam (Selexid): A narrow spectrum penicillin, which is an excellent UTI treatment. Has had a somewhat poor reputation because of its effect on the body's carnitine content. Läkemedelsverket (Medical Products Agency) has now withdrawn its previous restrictions, but the drug should not be used for long term prophylaxis, in premature babies, in unstable diabetics or during the last month of pregnancy. (This last restriction does not apply e.g. in Denmark). When tested in vitro, *Staphylococcus saprophyticus* is invariably resistant to mecillinam, but studies show clinical resolution in >90%.

Cefadroxil (Cefadroxil NM Pharma). A cephalosporin which is very suitable for the treatment of lower UTI. It can be given during pregnancy and is very effective against *Staphylococcus saprophyticus*.

Trimethoprim (trimetoprim) A old drug that is unfortunately subject to increasing bacterial resistance (10-15%). It is also suitable for prophylaxis of recurrent UTI (160mg nocte). It is also effective against *Staphylococcus saprophyticus*.

Nitrofurantoin (Furadantin). This is also an old drug which still works well. Has come to be used extensively in children. It, too, is effective against *Staphylococcus saprophyticus*. Caution should be used in the elderly because of the risk of adverse lung reactions. It should not be given to diabetics or to those with impaired renal function, because of the risk of peripheral neuropathy.

Fosfomycin (Monurol). This drug has recently been registered in Sweden and is given exclusively as a single 3g dose. Clinical studies show a somewhat lower resolution rate compared to the treatments listed above, but in suitable cases it can be a reasonable alternative, e.g. in penicillin allergy. *Staphylococcus saprophyticus* is resistant to this drug.

Because of the risk of inducing resistance, quinolone antibiotics should not be used in uncomplicated UTI.

B. Treatment of complicated UTI (e.g. patients with a neurogenic bladder, catheter bearers), **upper UTI** (that can be treated orally) and **UTI in men** (where the prostate often plays a part).

Norfloxacin (Lexinor) or **levofloxacin** (Tavanic). Both drugs belong to the quinolone group, which has a broader spectrum compared to the above mentioned antibiotics which are intended for use in uncomplicated UTI in women. Both drugs display good penetration of prostatic tissue.

Trimethoprim-sulfamethoxazole (Bactrim): Is comparable to the quinolones for these indications. Use with caution in the elderly (dose of 1x1), because of the risk of side effects.

Investigation and follow-up

Follow up of patients after an isolated lower UTI is not required. Patients with recurrent UTI should be investigated by urography, and elderly women should undergo a gynaecological examination to determine if oestrogen replacement is needed. These patients should be followed up after treatment and 1-2 times a year.

Length of treatment

Uncomplicated UTI in women: 5-7 days is sufficient (3 days in the case of trimethoprim).

Upper UTI, complicated UTI and UTI in men: 14 days.

NB!

Treatment is not indicated for

1. Asymptomatic bacteriuria in women without an underlying serious disease.
2. Catheter bearers, in whom it is not possible to eliminate bacteria as long as the catheter remains in situ. (With the exception of UTI with fever).

Skin and soft tissue infection

Patients with skin and soft tissue infection are common attenders in clinical practices. The problems they present are often relatively harmless, but some can be serious and lead to systemic infection. Treatment of skin and soft tissue infection does not necessarily involve prescribing antibiotics, as cleaning, minor surgery and dressing will often suffice.

Aetiology

The commonest causes of skin and soft tissue infection are *Staphylococcus aureus* and *Streptococcus pyogenes*, β -haemolytic group A. Animal bites contain other bacteria which are not described here.

Treatment

Penicillin V (Kåvepenin) is an excellent antibiotic for use in infections caused by *Streptococcus pyogenes*. These bacteria remain fully sensitive to penicillin, and penicillin resistance has not been found anywhere in the world. The treatment of choice for erysipelas and impetigo (if oral treatment is indicated) is **penicillin V** (Kåvepenin) tabs 1g x 3 for 10-14 days in adults. Children are given 12.5 mg/kg x 2-3.

Isoxazolylpenicillins e.g. **flucloxacillin** (Heracillin) can be used in mixed infections with *Staphylococcus aureus* and group A streptococci, or in pure staphylococcal infection. I.e. it is not necessary to combine flucloxacillin and penicillin V in mixed infections.

Note that we recommend a dose, in adults, of 500mg 2 x 3 as this drug is heavily protein bound and the dose recommended in FASS, 750mg 1 x 2, is insufficient.

Clindamycin (Dalacin) is effective against both streptococci and staphylococci. However, it is also effective against anaerobic bacteria, which is undesirable in this context as it increases the risk of inducing *Clostridium difficile* infection. It is, however, one of the drugs of choice in patients allergic to penicillin.

Fusidic acid (Fucidin) is effective against staphylococci, but not against streptococci. It can also be used as a first line treatment in patients allergic to penicillin. Increasing resistance in staphylococci has recently been observed in Skåne, reaching 9% in 1999.

Cephalosporins (**Cefadroxil** NM Pharma). Only the older cephalosporins have any effect against staphylococci. Cefadroxil is effective against gram negative bacteria, which is undesirable in this context. Furthermore, extensive use probably increases the risk of selecting out resistant enterococci. This drug can be used as second line treatment of patients allergic to penicillin (not in type 1 hypersensitivity). Dosage: 500mg x 2.

Macrolides e.g. **erythromycin** (Ery-Max) Extensive use increases the risk of inducing resistance in streptococci. Should not be used for skin and soft tissue infections.

Quinolones e.g. **ciprofloxacin** (Ciproxin), **levofloxacin** (Tavanic) are largely ineffective against streptococci and staphylococci. Resistance appears rapidly in staphylococci, which is why these drugs, too, should **not** be used for this indication.

Acute bronchitis in children

Inflammation of the mucous membranes of the larger airways is seen not only in asthma, but also in respiratory tract infections that may affect the lungs, bronchioles, trachea and upper airways. Some children have a greater tendency to react with bronchitis.

Aetiology

The causes are usually the same viruses that are associated with URTI (rhino-, adeno-, influenza, parainfluenza and RS-viruses).

Clinical picture

It is often preceded by a few days' URTI, with increasing dry, troublesome cough, retrosternal pain, moderate fever but little or no general malaise. The patient often sounds 'chesty'. The cough often comes in bouts that produce gagging or vomiting, with production of **discoloured sputum - which should not be seen as a sign of bacterial complication**. The cough usually lasts about 5-10 days, sometimes longer, and is not uncommonly followed by a week's general tiredness.

Auscultation reveals rhonchi and transmitted adventitious sounds. Widespread fine or coarse crepitations do not necessarily imply pneumonia, and they frequently disappear after inhalation of salbutamol or terbutaline. (Ventoline, Bricanyl)

Infants and toddlers can react with pronounced bronchial constriction, especially with RS virus, producing a tachypnoea of >40/min, intercostal recession, prolonged expiration, with risk of hypoxia and general deterioration. These children are so obstructed that at times it can be difficult to hear any rhonchi - a hospital case!!

Lab tests: CRP values are often slightly or moderately raised. With levels >50 consider chest X-ray to exclude pneumonia.

Treatment

Antibiotics do not significantly affect the natural course of disease.

Give a good explanation of the illness, including the expected course of events. Make it clear that the child can return in the event of deterioration, and make sure that the parents understand how important it is to get in touch immediately if their child develops breathing difficulties or becomes generally ill.

The cough can be treated with terbutaline or salbutamol mixture (Bricanyl, Ventoline) according to FASS. Children under the age of one may benefit from Quilla simplex (a proprietary expectorant) with ephedrine chloride 1mg/ml, 1.5-2.5ml x 1-3 daily.

Give paracetamol for fever, and frequent fluids.

In the event of more troublesome bronchoconstriction, review regularly with clinical examination and inhalation treatment.

Differential diagnosis

In persisting fever, or if the CRP is >50: consider pneumonia - chest X-ray.

If the coughing bouts are unusually persistent, or with repeated attacks of bronchoconstriction - consider the possibility of asthma.

Pneumonia in children

This chapter relates only to pneumonia of infectious origin, and its treatment in primary care.

Aetiology

Viruses - by far the commonest cause after the neonatal period, especially in children under 4, peaking between the ages of 1 and 3, and particularly during the winter. Adenovirus and the **RS**, influenza and parainfluenza viruses.

Bacterial pneumonia is not particularly common, the average family doctor seeing about 1 case/yr., which is usually caused by **pneumococci**. *Haemophilus influenzae* has virtually disappeared since the introduction of immunisation. Although rare, *Staphylococcus aureus* can cause severe pneumonia in infants, and group A streptococcal pneumonia is occasionally seen in children aged 3 to 5.

Atypical pneumonia. *Mycoplasma pneumoniae* is the commonest cause of pneumonia in children of school age, and in common with *Chlamydia pneumoniae*, is rare before the age of 5 and occurs in localised outbreaks.

Clinical picture

Viral pneumonia. There are often similar cases at home or at the nursery school/crèche. URTI symptoms for a few days are followed by increasing cough. Fever up to 39.5°C, conjunctivitis, pharyngitis, diarrhoea and rashes are not uncommon. The children often don't seem generally ill, but may have trouble breathing due to airway obstruction. They often sound very 'chesty'. The presence of rhonchi strongly indicates a virus infection.

Chest x-ray - commonly diffuse perihilar and interstitial changes.

Lab. CRP usually <50, without pronounced leucocytosis.

Bacterial pneumonia is usually preceded by mild URTI symptoms

Pneumococci: Older children present with rapid onset of shivering, dry cough and chest pain associated with high fever, general malaise and short, rapid breathing. In basal pneumonia they sometimes have abdominal pain. Examination reveals dullness to percussion, reduced breath sounds with crepitations.

Young children: sudden deterioration of URTI symptoms with high fever, restlessness/lethargy, troubled breathing and malaise. They sometimes have reduced breath sounds, but crepitations are not often heard. The child seems more ill than one might expect from auscultation.

Chest X-ray: commonly lobar or segmental changes.

Lab. CRP usually >100, leucocytes >20

Mycoplasma. Schoolchildren with a sore throat, headache, moderate fever, not particularly unwell, without a runny nose but with an intensive cough. There is often a history of close contact with a similar case 2-3 weeks earlier. Little is heard with the stethoscope initially, crepitations come later.

Chest X-ray: Non-specific picture, most often lower lobes, hilar lymph nodes in 1/3.

Lab: CRP normal - >100.

Treatment

Antibiotics are not indicated for viral pneumonia and don't prevent secondary infection!

In bacterial pneumonia, **penicillin V** (Kåvepenin) 12.5 mg/kg x 3 daily for 10 days is the treatment of choice in all age groups. **Erythromycin** (Ery-Max) 25 mg/kg x 2 daily for 10 days can be given to patients allergic to penicillin.

Schoolchildren with suspected mycoplasma infection can be given erythromycin as first line treatment (or doxycycline over the age of 8). Clarithromycin is expensive and is no more effective, but may be considered if erythromycin has to be discontinued because of gastrointestinal side effects.

Children that are so ill that one is tempted to prescribe a broad spectrum antibiotic should probably be referred to hospital for admission (children under 3 months, the severely ill, those with cyanosis, pronounced atelectasis or pleural effusion, and those who can't take medicines or fluids in adequate amounts).

Children who don't show a clear improvement within 2 days should have their diagnosis and treatment reviewed.

X-rays

Should be done if they may affect management.

Required in recurring pneumonia (which may be a sign of immune deficiency, cystic fibrosis, disturbance of ciliary function, reflux with aspiration, inhaled foreign body, etc.)

A single attack of uncomplicated pneumonia, where the child seems healthy after a completed course of antibiotics, does not need to be followed up with clinical examination or with radiography.

The management of UTI in children in primary care

This chapter is based upon the recommendations of consultant paediatrician Ingrid Sjöberg of the Dept of Child and Adolescent Medicine, UMAS and consultant paediatrician Ingemar Helin of the Dept of Child and Adolescent Medicine, Lund. Their recommendations have been adapted for primary care.

Background

1-3% of all children suffer a urinary tract infection, especially during the first year of life (mainly boys), or during the pre-school years (mainly girls). Children with febrile UTIs should be referred for specialist care, whilst afebrile UTIs (cystitis) in children above the age of 2 can be managed in primary care. About 5-10% of children with pyelonephritis run the risk of permanent damage to renal function, and the aim of investigation and treatment is to prevent this.

Failure to diagnose, or delay in treatment, increases the risk of renal damage, whereas overdiagnosis exposes the child to unnecessary and sometimes uncomfortable radiological investigations.

The clinical picture

In children over 2-3 months old, pyelonephritis manifests itself with high fever (over 38.5° C), a CRP greater than 20 mg/L, general malaise and possibly, abdominal symptoms. In children under 2 yrs old it can be difficult to distinguish from cystitis, which is why every UTI in this age group should be regarded as pyelonephritis unless proven otherwise. In babies, UTI during the first months of life can cause failure to thrive, vomiting and screaming attacks without fever.

Diagnosis

The diagnosis of UTI should **always** be made by the demonstration of bacterial growth in a urine culture. Urinabag collection tends to isolate periurethral flora, which is why doubts over the relevance of bacterial isolates in children aged 6-12 months should be resolved by direct aspiration from the bladder (contact a paediatrician). Change the bag after 1 hour, keep the child in a sitting position during the collection, and remove the bag immediately after micturition. Even a midstream specimen is possible with well motivated parents.

Keep the specimen at 4°C before and during transportation. Don't forget that even low bacterial counts (less than 10⁸/L) are compatible with UTI, because urine spends so little time in the infant bladder. Positive nitrite tests in girls implies a UTI, but in boys a false positive nitrite test can occur because nitrite is produced by bacteria under the foreskin. Urine needs to remain in the bladder for a while before it can show a positive nitrite test, which is, in any event, always negative in *Staphylococcus saprophyticus* and enterococcal infection. Leucocyturia can be a sign of UTI, but occurs also in non-specific conditions, e.g. fever.

Causative bacteria

Figures collected in Malmö during 1993-95 showed that in first time UTI in children under 2, *Escherichia coli* was isolated in 75% and klebsiella, enterococci and proteus each in 3% of cases. 27% of *E. coli* were resistant to ampicillin, 16% to trimethoprim, 1% to nitrofurantoin, 1% to cefadroxil and 2% to mecillinam. Of all bacterial strains, 33% were resistant to ampicillin, 12-14% to each of nitrofurantoin, trimethoprim and mecillinam. In the presence of obstruction or anatomical abnormalities in the urinary tract, staphylococci, enterococci and pseudomonas can also be found. Proteus is a common cause of cystitis in boys.

Bladder dysfunction

Bladder dysfunction in girls of pre-school and school age, with incomplete bladder emptying (residual urine) can predispose to recurrent cystitis (with consequent risk of pyelonephritis) and daytime enuresis. Obtaining a full history of urgency, frequency of micturition, micturition intervals and difficulties with bladder emptying is a vital part of the investigation of all cases of UTI. Instructions to void frequently, regularly and in a relaxed fashion should be given to all children with UTI.

Treatment in primary care

Cystitis in children >2yrs.: **nitrofurantoin** (Furadantin) 2-3mg/kg/day divided into 2 doses, or **trimethoprim** (trimetoprim) 6 mg/kg/day divided into 2 doses. Length of treatment - 5 days.

Pyelonephritis (refer to a paediatrician): Oral - **trimethoprim-sulfamethoxazole** (Bactrim) is the treatment of choice at 6/30mg trim/sulfa per kg/day divided into 2 doses, or **cefadroxil** (Cefadroxil NM Pharma) 50 mg/kg/day divided into 2 doses, or **ceftibuten** (Cedax) 9 mg/kg/day in a single daily dose.

Check all urine culture results at 1 week.

Prophylaxis

In children with pyelonephritis, until the results of reflux investigations are known: **nitrofurantoin** (Furadantin) 1 mg/kg/day as a single daily dose, or **trimethoprim** (trimetoprim) 0.5-1 mg/kg/day as a single daily dose.

Cover during MUCG: **nitrofurantoin** (Furadantin) or **trimethoprim** (trimetoprim) treatment dose given 1-3 times.

In asymptomatic bacteriuria (ABU), prophylaxis prior to radiological investigation is not required.

Refer the following:

1. Children with febrile i.e. upper UTI. Younger children should be referred acutely, older children after discussion with a paediatrician
2. Babies with bacteriuria.
3. Children <2 yrs. in whom there is doubt if the UTI is upper or lower.
4. Children with recurrent cystitis.
5. Children with an abnormal pattern of micturition (history, urodynamic testing, residual urine). If there are no suspicions of obstruction or of a neurogenic cause, advice on bladder training can be given in primary care.

If in doubt, consult a paediatrician.

Investigation

All - cystitis and pyelonephritis

A proper voiding history must be obtained including micturition and defecation patterns.

Examination

should include abdomen, back, genitals and blood pressure. Follow-up urine culture. Serum creatinine.

NB! Bladder dysfunction is the commonest cause of recurrent UTI in girls.

Recurrent cystitis - Ultrasound (residual urine?)

The paediatrician investigates:

Children under 2 with pyelonephritis are primarily investigated with ultrasound of the kidneys and urinary tract, and micturating ureterocystography (MUCG). NB - under antibiotic cover. After 3-6 months DMSA scintigraphy is carried out, or, not earlier than 1 yr post infection, intravenous urography is done to exclude permanent renal parenchymal damage.

Children over 2 yrs with pyelonephritis are primarily investigated by ultrasound. After 3 months, DMSA scintigraphy is carried out. If scintigraphy proves abnormal, a MUCG is carried out. If DMSA scintigraphy is not available, a MUCG is carried out primarily and urography should be done at 1 yr to exclude renal parenchymal damage. Boys with pyelonephritis are a high risk group. MUCG is a primary investigation if there is suspicion of bladder disturbance or intravesical obstruction.

The diagnosis of UTI should always be based upon the isolation of bacteria on urine culture. Suspect pyelonephritis on signs of fever without obvious focus, generalised symptoms or raised CRP. If the diagnosis is proving difficult, refer to a paediatrician.