Pharmaceutical care of patients with infections

Course activities
Pharmaceutical care of patients with infections

Course activities

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Bugs and drugs
A summary of pharmaceutical microbiology

Part 1

• Bugs

Four main groups of bacteria
(according to sensitivity)

1. Gram positive
2. Gram negative
3. Anaerobes
4. Atypical
**Bacterial classification:**  
**Gram stain**

- **Gram +ve (blue/purple)**
  - Thick peptidoglycan cell wall retains primary stain

- **Gram -ve (pink/red)**
  - Thin peptidoglycan cell wall does not retain primary stain

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**Bacteria Structural Differences**

- Gram-positive bacteria
- Gram-negative bacteria

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**Atypical bacteria & mycobacteria:**  
**Why no Gram stain?**

- **Atypical bacteria**
  - **Chlamydia**
    - Intracellular pathogen (hard to culture)
  - **Mycoplasma and Ureaplasma**
    - Small bacteria that lack a cell wall
  - **Legionella**
    - Gram –ve but concentrate intracellularly

- **Mycobacteria**
  - *M. tuberculosis, M. avium complex, M. leprae*
    - Lipid-rich cell wall - NOT peptidoglycan
**Gram +ve Cocci (spherical)**
- Staphylococci
- Streptococci
- Enterococci
- *Peptostreptococci*

**Gram -ve Cocci**
- Neisseria meningitidis
- Neisseria gonorrhoeae
- Moraxella catarrhalis
- Acinetobacter (coccobacillus)

**Gram +ve Rods**
- Clostridia
- Corynebacteria (diphtheroids)
- Listeria
- Bacillus

**Gram -ve Rods**
- Bacteroides
- Lactose-fermenting coliforms
  - E. coli, Klebsiella, Enterobacter
- Non lactose-fermenting coliforms
  - Proteus, Salmonella, Shigella
- Pseudomonas
- Haemophilus
- Helicobacter, Campylobacter
- Legionella

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**Generally Found............**

- **Anaerobes**
- **Gram -ve Cocci**
  - Bacillus
- **Gram -ve Rods**
  - Bacteroides
  - Lactose-fermenting coliforms
    - E. coli, Klebsiella, Enterobacter
  - Non lactose-fermenting coliforms
    - Proteus, Salmonella, Shigella
  - Pseudomonas
  - Haemophilus
  - Helicobacter, Campylobacter
- **Gram positive**
  - Staphylococcus
  - M. catarrhalis
  - Listeria
  - P. aeruginosa
- **Gram negative**
  - Enterobacteriaceae
  - P. aeruginosa
  - M. catarrhalis
  - P. aeruginosa

---

**ANTIBIOTIC TARGETS IN BACTERIA**

- **Inhibition of...**
  - Cell wall synthesis
  - Peptidoglycan
  - Cell membrane
  - DNA synthesis
  - RNA synthesis
  - Protein synthesis
  - Membranes
  - Chloramphenicol

- **Mechanism**
  - Beta-lactams
  - Aminoglycosides
  - Erythromycin
  - Tetracyclines
  - Macrolides
  - Chloramphenicol
  - Tetracyclines
  - Aminoglycosides
  - Beta-lactams
  - Macrolides

- **Side-effects**
  - Lactic acidosis
  - Methemoglobinemia
  - Respiratory depression
  - Nausea
  - Diarrhea
Staphylococci

*S. Aureus (MSSA)*
- Normal skin and mucous membrane flora
- Infected sweat/sebaceous glands, hair follicles e.g. sty, boils, furuncles, carbuncles
- Superficial skin infections e.g. impetigo,
- Deeper infections e.g. cellulitis, wound infections, osteomyelitis, septic arthritis
- Treatment is usually with a β-lactamase stable penicillin such as flucloxacillin.

Staphylococci cont.

*S. epidermidis*
- Normal skin and nasal flora
- Important cause of infected implants e.g. heart valves, catheters

*S. saprophyticus*
- Normal vaginal flora
- Frequent cause of cystitis in women

Streptococci

*S. Pneumoniae (pneumococcus)*
- Carried in the nasopharynx of many healthy individuals
- Most common cause of pneumonia and otitis media
- Can also be a cause of meningitis
- Usually treated with penicillin or a macrolide. Penicillin resistance is currently low in the UK but common in some parts of Europe and USA.
Streptococci cont.

- **S. pyogenes (Group A streptococcus)**
  - Carried in the nasopharynx of many healthy individuals.
  - Most common cause of sore throat, especially in children and teenagers.
  - Local skin infections e.g. impetigo, erysipelas
  - Deeper skin infections e.g. cellulitis, necrotising fasciitis.
  - Treatment is usually with a penicillin.

Streptococci cont.

- **S. agalactiae (Group B streptococcus)**
  - Carried in the vaginocervical tract, urethral mucous membrane in male carriers and the GI tract.
  - Causes meningitis and septicaemia in neonates.
  - Treatment is usually with a penicillin

Atypicals

Atypicals are intracellular parasites so antimicrobials need to penetrate the cell infected with the atypical organism for activity.

- **Mycoplasma pneumoniae**
  - Found within normal flora of the mouth and genitourinary tract.
  - Mainly causes pneumonia but also implicated in bronchitis, pharyngitis and otitis media.
  - Higher incidence in children and young adults
  - Treatment is usually with macrolide
Atypicals cont.

- **Legionella pneumophila**
  - Normal habitat is water and soil but can colonise air conditioning and water distribution systems.
  - Infection usually results from inhalation of aerosolised organisms.
  - Mainly causes "Legionnaires disease" – severe pneumonia.
  - BTS recommend a fluoroquinolone alone or with a macrolide or rifampicin in severe cases.

Atypicals cont.

**Chlamydia pneumoniae**
- Transmitted by respiratory droplets.
- Implicated in pharyngitis, laryngitis, bronchitis, pneumonia.
- Treatment is usually with a macrolide

**Chlamydia trachomatis**
- Cause of non-gonococcal urethritis.
- Other infections include adult eye infections and conjunctivitis of the newborn.
- Treatment is usually with azithromycin or doxycycline.

Gram negative organisms
  - Gut "coliforms"

- **Escherichia coli**
  - Part of the normal flora of the colon
  - GI infections caused by introduced strains that produce toxins resulting in diarrhoea.
  - Strain 0157 can cause serious complications including acute renal failure.
  - *E. coli* is most common cause of urinary tract infection especially in women. Usual treatment is trimethoprim.
  - Can also cause meningitis in neonates

- **Enterobacter, Klebsiella, Serratia and Proteus:**
  - Normal inhabitants of the large bowel
  - Implicated in UTIs, abdominal infections and nosocomial infections particularly in the immunocompromised.
Gram negative organisms - Chest

- *Haemophilus species*
  - Part of the normal flora of the upper respiratory tract
  - Leading cause of meningitis especially in infants
  - Also implicated in pneumonia, otitis media, sinusitis and epiglottitis
  - Vaccine available (Hib)

- *Moraxella catarrhalis*
  Common cause of infective exacerbation of COPD

Gram negative organisms cont.

- *Neisseria meningitidis*
  - Carried in the nasopharynx of many healthy individuals.
  - Can cause meningitis.
  - Treatment is usually with a third generation cephalosporin

- *Neisseria gonorrhoeae*
  - Found in the human genital tract.
  - Infection can be asymptomatic
  - Causes gonorrhoea which can lead to pelvic inflammatory disease and infertility.
  - Can also cause conjunctivitis in the newborn and septic arthritis in adults
  - Resistance is an increasing problem. Treatment is with IV or IM ceftriaxone or oral cefixime (unlicensed use).

Part 2

- Drugs
Antibiotic spectrum

Green = Generally Sensitive; Orange = Unreliable; Red = Generally Resistant

New Antibiotics

- New antibiotics are always becoming available to fight resistance – right?

Antimicrobial Resistance

- Antibiotic use causes resistance through selective pressure.
- Broad spectrum antibiotics select for resistant pathogens by eradicating natural flora.
- Current problems with resistant organisms
  MRSA - methicillin resistant Staphylococcus aureus
  VRE - vancomycin resistant enterococci
  ESBL - extended spectrum betalactamase
### Penicillins

<table>
<thead>
<tr>
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<th>Gram negative</th>
<th>Antibiotic</th>
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<tbody>
<tr>
<td>MRSA</td>
<td>Methicillin</td>
<td>1%</td>
</tr>
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</tr>
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- **Benzylpenicillin & phenoxymethylpenicillin**
- **Flucloxacillin**
- **Amoxicillin**
- **Amoxicillin-clavulanate / Co-amoxiclav (Augmentin®)**

### Cephalosporins

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- **Cefalexin (1st generation)**
- **Cefuroxime (2nd generation)**
- **Cefotaxime & Ceftriaxone (3rd generation)**
- **Cefazidime (Anti-pseudomonal)**

### MRSA cover

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<td>Anaerobes</td>
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- **Vancomycin & Teicoplanin (Glycopeptides)**
- **Linezolid**
- **Daptomycin**

- **Sodium fusidate (not used alone)**
### Tetracyclines & Anti-folates

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<td>Gentamicin</td>
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</table>

- **Doxy cycline**

- **Tigecycline**

- **Trimethoprime**

- **Co-trimoxazol (Septrin +)**

### Macrolides & Clindamycin

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- **Erythromycin**

- **Clarithromycin & Azithromycin**

- **Clindamycin**

### Quinolones & Aminoglycosides

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- **Ciprofloxacin / Ofloxacin (Quinolones)**

- **Levofloxacin / Moxifloxacin (Quinolones)**

- **Gentamicin / Tobramycin / Amikacin (Aminoglycosides)**
## Important side effects 1

1. **GENERAL** - nausea, vomiting, diarrhoea, rashes, thrush
   - Penicillins - hypersensitivity / skin reactions
   - Fluoroquinolones - cholestatic jaundice
   - Macrolides - GI disturbances, hepatitis, Q-T interval
   - Quinolones - Q-T interval, convulsions, tendonitis
   - Aminoglycosides - nephrotoxicity/ototoxicity
   - Vancomycin - 'red man' syndrome
   - Clindamycin & cephalosporins - *C. difficile* colitis
   - Tetracyclines - hepatotoxicity, staining teeth, photosensitivity, dysphagia
   - Nitrofurantoin - peripheral neuropathy

## Important side effects 2

- Sulphonamides - Stevens-Johnson syndrome, blood dyscrasias
- Trimethoprim - blood dyscrasias
- Chloramphenicol - aplastic anaemia, grey baby
- Linezolid - blood dyscrasias, MAOI, optic neuropathy
- Sodium fusidate - hepatotoxicity
- Rifampicin - hepatotoxicity, red colouring of body fluids
- Isoniazid - hepatotoxicity, peripheral neuropathy (+pyridoxine)
- Ethambutol - visual disturbances (visual acuity pre-test)
- Polymyxin (colistin) - nephrotoxicity, neurotoxicity
Important interactions

- Enzyme inhibitors
  - Erythromycin, clarithromycin, lomefloxacin, metronidazole, ciprofloxacin
- Enzyme inducers
  - Rifampicin
- Absorption
  - Tetracyclines/cumarines absorption reduced by antacids/calcium
- Entero-hepatic cycling
  - Broad-spectrum antimicrobials and oral contraceptives
- Vitamin K synthesis
  - Broad spectrum antimicrobials and warfarin (INR)
- Metronidazole - disulfiram-like interaction with alcohol
- Aminoglycosides / glycopeptides / colistin and loop diuretics or ciclosporin or tacrolimus - nephrotoxicity
- Quinolones and steroids (tendonitis) or NSAIDs (convulsions)
- Macrolides / quinolones and Q-T prolonging drugs

Part 3

- CDAD

Clostridium difficile associated disease

Definition of CDAD

“One episode of loose stool enough to take the shape of the container, not attributable to any other cause and occurring at the same time as a positive toxin assay and/or endoscopic evidence of pseudomembranous colitis”
Signs and Symptoms

- Diarrhoea with characteristic foul odour
- Abdominal pain
- Pyrexia
- Raised WCC
- Raised serum creatinine

Complications

- Dehydration
- Hypotension
- Hypokalaemia
- Hypoalbuminaemia
- Pseudomembranous colitis (PMC)
- Toxic megacolon
- Death

Risk factors

**Patient**
- > 65 years of age
- Immunosuppressed
- Antibiotic exposure
- Asymptomatic carriage by patients and staff
- Prolonged hospital stay
- Other drugs e.g. PPIs
- NG tube

**Environmental**
- Inadequate isolation facilities
- Inadequate cleaning of ward facilities and equipment
- Poor Hand Hygiene by patients and staff
- Increased movement of patients in hospitals
- More virulent strains emerging e.g. type 027
Antibiotics and risk of C. difficile infection

<table>
<thead>
<tr>
<th>High Risk</th>
<th>Medium Risk</th>
<th>Low Risk</th>
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<tbody>
<tr>
<td>Clindamycin</td>
<td>Ampicillin/Amoxicillin</td>
<td>Aminoglycosides</td>
</tr>
<tr>
<td>Cephalosporins</td>
<td>Co-trimoxazole</td>
<td>Metronidazole</td>
</tr>
<tr>
<td>Fluoroquinolones</td>
<td>Macrolides</td>
<td>Tazocin</td>
</tr>
<tr>
<td>Co-amoxiclav</td>
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<td></td>
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<td>Vancomycin</td>
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<tr>
<td></td>
<td></td>
<td>Trimethoprim</td>
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Treatment

- Stop precipitating antibiotic if possible.
- If not switch to an antibiotic with a lower risk of inducing CDAD.
- Review other medicines – PPIs, anti-motility agents, laxatives.

Treatment (contd)

- Usual treatment is:
  - 1st line (no severity factors) – metronidazole 400mg tds po for 10-14 days, can also be given iv
  - 2nd line (1 or more severity factors) – vancomycin 125mg qds po for 10-14 days, not iv.

- Vancomycin injection is now licensed to be given orally. After reconstitution, the selected dose may be diluted in 30ml of water and drunk or via NG tube

- For 14 days treatment: metronidazole = £0.57, vancomycin caps = £97.36, vancomycin inj = £26.74
Which antibiotic is most appropriate for society?

1. Minimise resistance potential (4 ways)
   - Prescribe antibiotics ONLY if indicated
   - Three RIGHTS:
     - RIGHT drug at RIGHT dose for RIGHT duration
   - Use combination therapy when required
   - Narrow spectrum antibiotics where possible
   - Balance against risk of missing pathogen
2. Maximise cost-effectiveness
   - Resources are limited in UK healthcare system
Pharmaceutical care of patients with infections

Objectives
To highlight the importance of antibiotic policies and the role of pharmacists promoting their use.
To provide an overview of common pathogens.
To describe the management of common infections.
To provide an overview of current problems with MRSA and C. difficile.

Antimicrobial use is National priority
Scottish Management of Antimicrobial Resistance Action Plan 2008 (ScottMARAP)
Scottish Antimicrobial Prescribing Group
Healthcare Associated Infection Taskforce
Prudent prescribing to reduce antimicrobial resistance

Only use an antimicrobial when clearly indicated.
Select an appropriate agent using local antimicrobial prescribing policy.
Prescribe correct dose, frequency and duration.
Limit use of broad spectrum agents and de-escalate or stop treatment if appropriate (hospital).

Antimicrobial Prescribing Policies

Antimicrobial policies for hospitals and primary care in place in all NHS Boards.
Evidence based guidelines on empirical treatment of common infections.
Promote use of narrow spectrum agents and restrict agents associated with Clostridium difficile.

Antimicrobial Pharmacists

Specialist pharmacist role established in late 1990s/early 2000s.
Strong clinical skills and links with microbiology and infection control.
Key roles are development of policies, education of staff, audit of antimicrobial prescribing and antibiotic consumption.
Government funding in 2005 (CEL 30)
Role of the pharmacist - hospital

All pharmacists have a role in antimicrobial stewardship.
All medicine charts and prescriptions should be checked for compliance with antimicrobial policy for choice of antibiotic, route, frequency and duration.
Clinical pharmacists can promote use of policies at ward level and educate medical and nursing staff.

Role of the pharmacist – primary care

Primary Care pharmacists monitor prescribing of all medicines using PRISMS.
Identify problems with quantity and quality of antimicrobial prescribing.
Feedback of prescribing information to prescribers is best way to influence prescribing and promote compliance with policy.

Role of the pharmacist – community

Awareness of their local antimicrobial prescribing policy.
Query use of non-policy antibiotics and inappropriate dosage or duration with prescribers.
Patient education on self-management of minor infections to avoid unnecessary use of antibiotics.
Provide advice to Nursing homes on antibiotic use in this high risk group.
Bugs and drugs

See accompanying Powerpoint presentation on DVD for full details.

Four main groups of bacteria

Gram positive
Gram negative
Anaerobes
Atypical

Generally...

Anaerobes
Mouth, teeth, throat, sinuses & lower bowel
Dental infection
Peritonitis
Appendicitis
Abscesses

Gram +ve
Skin, bone & respiratory
Cellulitis
Wound infection
Line infection
Osteomyelitis
Pneumonia
Sinusitis

NHS

Gram -ve
GI-tract & respiratory
Peritonitis
Biliary infection
Pancreatitis
UTI
PID
CAP
MPPVAP
Sinusitis

Atypical
Chest and genito-urinary
Pneumonia
Urethritis
PID
Gram positive agents
(Staphy and strept)

- Benzylpenicillin
- Phenoxymethylpenicillin
- Flucloxacillin
- Erythromycin
- Fusidic acid
- Rifampicin
- Clindamycin
- Vancomycin
- Teicoplanin
- Linezolid
- Daptomycin

Gram negative agents

- Ciprofloxacin
- Gentamycin, Tobramycin, Amikacin
- Cotrimoxazole (Co-trimoxazole)
- Colistin
- Ceftazidime
- Aztreonam

Anti-anaerobe agents

- Metronidazole
- Clindamycin
- Tazocin, Timentin
- Imipenem, Meropenem
- Chloramphenicol
- Clindamycin

Widely used in the US
Not as reliable as others due to resistance.
Broad spectrum agents:  
Gram +ve and Gram-ve cover  

Clarithromycin, Azithromycin  
Trimethoprim, Nifuroxamate  
Amoxicillin, Cefalexin  
Minocycline, Glicycorine, Oxytetracycline  
Co-amoxiclav, Cefalexin  
Moxifloxacin, Levofloxacin  
Cefixime, Cefadroxil  
Tigecycline  
Tiaclopin, Ticlopin  
Espirinom, Imipenem, Meropenem  

Common infections  
Most common types of infection both in hospital and primary care are:  
Respiratory – URtis, exacerbation COPD, pneumonia  
Urinary – lower, upper (pyelonephritis)  
Skin & soft tissue – cellulitis, wound infection, diabetic ulcer.  

Upper Respiratory Tract Infections  
Most are viral and will resolve without antibiotics.  
May take up to 3 weeks to resolve.  
Symptomatic relief with paracetamol or ibuprofen should be encouraged.  
Patient information leaflets and delayed prescriptions are useful strategies to reduce inappropriate antibiotic use.
Sore throat

Most are viral and most patients do not benefit from antibiotics.
Soreness will take about 8 days to resolve.
Consider antibiotics if 3 of 4 center criteria present: fever, purulent tonsils, cervical adenopathy, absence of cough.
Phenoxymethylpenicillin is first line agent. Clarithromycin in penicillin allergy.

Otitis media

Many cases viral and resolve over 4 days in 80% without antibiotics.
Antibiotics do not reduce pain in first 24 hours, subsequent attacks or deafness.
Use regular NSAID or paracetamol.
Amoxicillin is first line agent.
Macrolides in penicillin allergy.

Acute sinusitis

Many cases viral.
Symptomatic benefit of antibiotics is small.
Reserve antibiotics for severe or prolonged symptoms (>10 days).
Amoxicillin or phenoxymethylpenicillin are first line agents.
Macrolides or doxycycline are alternatives.
Exacerbation of COPD

30% viral, 30-50% bacterial, rest undetermined.
Use antibiotics if increased purulence of sputum PLUS either increased dyspnoea and increased sputum volume.
Amoxicillin first line agent.
In penicillin allergy use doxycycline. If doxycycline contra-indicated use clarithromycin.

Community acquired pneumonia

Potentially serious infection.
Symptoms of sepsis (1 temp, 1 resp rate, low BP, confusion in elderly).
Assess severity using CRB-65/CURB-65 score and refer/admit patients to hospital if appropriate.
Amoxicillin first line agent. Clarithromycin or doxycycline are suitable alternatives.

Urinary Tract Infections

Symptoms of UTI in young women usually indicate infection – refer to GP (SIGN 88).
UTI in pregnancy always treated with antibiotics even if asymptomatic.
UTI in men often associated with underlying abnormality in urinary tract or prostate.
First line agents are trimethoprim and nitrofurantoin.
Skin and Soft Tissue Infections

Cellulitis
Use flucloxacillin alone if patient afebrile and healthy.
Admit for IV treatment with flucloxacillin + clindamycin if febrile and ill.
Leg ulcers
Bacteria always present.
Antibiotics do not improve healing.
Only indicated if clinical cellulitis, increased pain, enlarging ulcer or pyrexia.

Advice on serious infections

Meningitis – pharmacists can educate public about recognising symptoms.
Endocarditis prophylaxis – few patients now require specific antibiotic prophylaxis prior to surgery including dental procedures (see BNF for details).

MRSA – current situation

In UK 40% of S. aureus are methicillin resistant.
MRSA infection usually SSSI or less frequently respiratory (MRSA pneumonia).
MRSA colonisation more common than MRSA infection.
Screening pilot – patients being admitted to hospital checked for MRSA.
Managing MRSA

Main isolates are spread within a ward to patients with wounds or who are immuno-compromised.
Hospital patients who are MRSA positive require isolation.
Colonisation managed with a 5 day course of eradication therapy – mupirocin
Nasalointibical cream/ointment and skin decontamination with an antibacterial
body wash.

Clostridium difficile – current situation.

Incidence in Scotland approx. 1 case per 1000 occupied bed days.
Scottish Government target – 30% reduction in patients over 65 years by 2011.
Symptoms - diarrhoea with characteristic foul odour, abdominal pain, pyrexia, raised
WCC, raised serum creatinine.
Diagnosis confirmed by detection of C. diff toxin from stool sample.

CEL11 (2009)

Prescribing indicators to support CDAD HEAT target.
Compliance with empirical antibiotic policy in admission units – target 95%.
Compliance with surgical prophylaxis policy – target 95%.
Seasonal variation in quinolone use in primary care – target < 5%.
Management of *Clostridium difficile*

Good infection control practice and cleaning procedures essential to prevent spread of C. diff.

Patients who are symptomatic and C. diff. positive and require isolation.

Patients who develop CDAD while on an antibiotic require to have it stopped or changed.

Treatment – oral metronidazole or vancomycin for 10 – 14 days.

**Antibiotics and risk of C. difficile infection**

<table>
<thead>
<tr>
<th>High Risk</th>
<th>Medium Risk</th>
<th>Low Risk</th>
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<tbody>
<tr>
<td>Clindamycin</td>
<td>Ampicillin/Ampicillin</td>
<td>Anthramycin</td>
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<tr>
<td>Cephalosporins</td>
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<td>Metronidazole</td>
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**Key points**

Pharmacists should:

- have basic knowledge of ‘Bugs and Drugs’
- promote rational and effective use of antimicrobials.

This can help address the problems of antimicrobial resistance and healthcare associated infections.
Skin and Soft Tissue Infection (SSTI)
Case Study 1

A 70 year old lady presents to your pharmacy with a prescription for:
Flucloxacillin capsules 500mg QDS for 7 days

She tells you that she fell last week whilst out walking and had sustained a small cut to her leg. Today, the area around the cut is red, hot, swollen and painful.

Previous Medical History (PMH):
Epilepsy
Dyspepsia
Penicillin allergy

Current medication:
Carbamazepine 400mg BD
Lansoprazole 30mg mane
Discussion points - Case Study 1

1) Do you think an antibiotic is indicated for this patient?

2) Is flucloxacillin an appropriate choice for cellulitis?

3) Is flucloxacillin an appropriate choice for this patient?
4) What antibiotic would you recommend?

You call the GP, who confirms the patient has a true penicillin allergy and agrees that flucloxacillin and clarithromycin are inappropriate and issues a prescription for: Clindamycin capsules 300mg QDS for 7 days

5) What, if any, are your concerns?
4 days later the patient returns to the pharmacy. She tells you that her leg does seem to be improving and asks to purchase Imodium® tablets as she has had terrible diarrhoea for the last 24 hours.

6) What advice would you give to the patient?

7) What advice would you give to the GP?
Management of Respiratory Tract Infections in Primary Care
Case Study 1

James Brown, 74yrs old male presents to his community pharmacist requesting to buy a cold remedy. He complains of increased shortness of breath (SOB), recent cold with 'sniffles', runny nose and increased cough. On questioning he provides the pharmacist with the following information:

PMH:
Hypertension
Chronic Obstructive Pulmonary Disease (COPD)
Ischaemic Heart Disease (IHD)

Current medication:
Lisinopril 20mg od
Aspirin 75mg od
Simvastatin 40mg od
GTN spray prn
Seretide 500 accuhaler 1 puff bd
Salbutamol MDI prn

Lifestyle:
Smoker- 10-15/day (previously 40/day)
Alcohol – 30 units/week

O/E:
BP 144/88
Resp. rate – 25/min
1) What other information should the pharmacist find out about this patient?

2) What are two possible diagnoses and how should the pharmacist advise the patient to manage each of them?
The pharmacist decides that since Mr Brown does also report increased purulence and volume of sputum he should be referred to the GP.

On consulting the GP, his temperature is measured as 37.8˚C and he diagnoses an infective exacerbation of COPD. He notes that Mr Brown complained of nausea last time he was prescribed amoxicillin for a similar episode so he prescribes clarithromycin 250mg bd for 7 days.

3) Comment on his choice of treatment.
Management of Respiratory Tract Infections in Primary Care
Case Study 2

David Walker, 16 year old male, presents to his GP with sore throat/pharyngitis of 4 days duration. He is due to start his Higher prelim exams in 2 days and his mother is keen to get antibiotics to clear it up so that his performance in these exams is not affected.

He is on no current medication.

1) What else should the GP ask this patient?

2) What symptoms would require immediate antibacterial therapy and which antibiotic should be used?
On examination David has slight pyrexia (37.6°C), a cough and slightly swollen glands but no associated exudate. He had one similar episode of sore throat aged 12 years.

3) How should the GP manage this patient?
Management of Respiratory Tract Infections in Primary Care
Case Study 3

Mrs White presents with her daughter Laura, aged 2 years, who appears to have a sore ear and a slight temperature. She has been unable to sleep properly for the past two nights and has been waking up screaming. During the day she has also been crying frequently. Her mother gave her some Calpol® last night which seemed to have some effect but wore off after a few hours.

1) What other information/investigations should the GP request?

On examination Laura has a temperature of 37.6 C, her middle ear looks red but eardrum is intact and no exudate present. She had a cold last week and a similar episode when she was about 6 months old when she was prescribed antibiotics. She has had one 5ml spoonsful (120mg) Calpol® at bedtime last night and another dose early this morning.

2) What is the likely diagnosis and how should the GP manage this patient?
Mrs White queries why Laura got antibiotics last time she had this but is not getting them now.

3) What advice can you give her?

Three days later Mrs White brings Laura back complaining that she does not seem to be improving so the GP decides that antibiotics are required.

4) What treatment should she prescribe?
Hospital Treatment of Community Acquired Pneumonia (CAP)
Case Study 1

AM, a 66 year old male presents to hospital with fever (39.2°C), pleuritic chest pain and cough. On arrival he is tachypnoeic (RR 32/min) and hypotensive (BP 88/57 mmHg). His WCC is raised at 18x10⁹/l, his CRP is 203mg/l and urea is raised at 7.3mmol/l. Arterial blood gases show a type I respiratory failure picture and he remains profoundly hypoxaemic despite maximal oxygen therapy. The decision is made to admit AM to intensive care for ventilatory and cardiovascular support. He is mechanically ventilated and commenced on inotropes to maintain his blood pressure. A diagnosis of severe CAP is made.

PMH:
Hypertension

Current medication:
Aspirin 75mg daily
Lisinopril 20mg twice daily
Simvastatin 20mg nocte
No known drug allergies (NKDA)
1) What is the definition of pneumonia?

2) What are the possible pathogens?

3) How should severity be assessed?
4) What score does AM have?

5) What is appropriate therapy?

6) If AM had recently had influenza, how might that alter therapy?
7) What pharmaceutical care issues would you have for this patient?
Hospital Treatment of Community Acquired Pneumonia (CAP)  
Case Study 2

DL, a 78 year old female nursing home resident was admitted to hospital with a fractured neck of femur. She was taken to theatre where a dynamic hip screw was inserted. During surgery, she became very hypotensive and tachycardic and was taken to the high dependency unit post-operatively for monitoring. After 48 hours, she returned to the ward. On day 4, she became pyrexial (38.9°C) and her oxygen saturations fell to 91%. A full blood count showed an increased white cell count (14.2 x 10⁹/l) and her chest x-ray showed new infiltrates. A clinical diagnosis of hospital acquired pneumonia (HAP) was made. Blood and sputum samples were sent for culture and sensitivity testing.

**PMH:**
Ischaemic heart disease  
Hypertension  
Type 2 diabetes mellitus  
Chronic renal failure  
Recent stroke (discharged 6 weeks ago after 4 week admission)

**Current medication:**
Aspirin 75mg daily  
Atenolol 25mg daily  
Gliclazide 160mg bd  
Ramipril 5mg daily  
Insulatard 12 IU nocte  
Dipyridamole MR 200mg bd  
Bendroflumethiazide 2.5mg daily
1) What is the definition of HAP?

2) What are the likely pathogens?

3) What empirical therapy would you recommend for early onset HAP with no risk factors?
4) In view of the clinical history, would you alter your choice?

5) Sputum culture grew MRSA. What antibiotic choices are there?

6) Vancomycin has been selected. Suggest a suitable starting dose for this patient (latest serum creatinine = 145 micromol/l, weight estimated at 56kg).
7) What pharmaceutical care issues require consideration in this patient?
RB, a 64 year old gentleman with severe COPD has been feeling unwell for the past 5 days. He complains of increased shortness of breath (SOB) and is coughing up purulent sputum. His GP had given him a supply of amoxicillin and oral steroids to keep at home following a similar previous episode and he has been taking these for the past 4 days. Today, he called the GP with worsening symptoms. On examination he was tachypnoeic, his sputum was still purulent and he was struggling to cope. His oxygen saturations were 90% on room air therefore the GP arranged admission to hospital for further investigation and treatment.

PMH:
Severe COPD – frequent admissions to hospitals with infective exacerbations.
Two courses of amoxicillin in past 6 weeks from GP
Atrial fi brillation
Hypertension

Current medication:
Combivent nebules – 1 nebule four times daily
Salbutamol 2.5mg nebules - when required for SOB
Prednisolone 40 mg once daily for past 4 days
Seretide 500 accuhaler – 1 puff twice daily
Uniphyllin 300mg twice daily
Diltiazem SR (Tildiem) 90mg twice daily
Warfarin 3mg daily (INR 2.9 on admission)
Amoxicillin 500 mg three times daily for past 4 days
Home oxygen – 2l/min
Lansoprazole 30mg daily
1) What are the recommended criteria for prescribing antibiotics for infective exacerbation of COPD?

2) What are the most common infective causes of an exacerbation?

3) Which antibiotics are appropriate first line therapy?
4) Discuss appropriate antibiotic choices for this gentleman.

Medical staff decide to change his antibiotic treatment to ciprofloxacin.

5) Is this an appropriate choice?

6) What pharmaceutical care issues are there for this patient with respect to his antibiotic therapy?
Urinary Tract Infection
Case Study 1

Anna, a 20 year-old student, comes in to your pharmacy and asks to speak with the pharmacist. She thinks she has an infection in her urine and asks what you can give her for it.

On her PMR you see a three day course of trimethoprim was dispensed 6 months ago.

1) What questions would you ask Anna to confirm the diagnosis?

2) What recommendations would you make?
Anna states she has a burning or stinging sensation when passing urine (dysuria) and is going to the toilet much more frequently so she is referred to her GP. She returns the next day with a prescription for ciprofloxacin 250mg twice daily for 7 days.

3) What are the likely infecting organisms in UTI and what is the recommended first line agent?

4) Is ciprofloxacin the most appropriate choice for Anna?
5) What would you discuss with the GP?

6) What other advice would you offer Anna to avoid future recurrence?
7) The manufacturers of trimethoprim and nitrofurantoin have applied for reclassification from POM to P. What advantages and disadvantages can you see with this? What steps might pharmacists in the community take to avoid inappropriate use?