Healthcare Improvement Scotland

Scottish Antimicrobial Prescribing Group

NHS Education for Scotland

Antimicrobial Stewardship

Educational Workbook

WORKBOOK CONTENTS

TARGET AUDIENCE

This workbook is suitable for all registered nurses and midwives across NHS Scotland health boards to learn about the nursing/ midwifery role in Antimicrobial Stewardship.

The resource will be beneficial to nurses and midwives who have a role in the administration, prescribing or education of antimicrobial therapy.

HOW TO USE THE WORKBOOK

The purpose of this workbook is to support your learning around antimicrobial stewardship practice and provide you with an introductory level of knowledge of antimicrobial stewardship and supporting practice. It is a resource where you can assess your current level of knowledge and identify any development needs on the topics.

There are several activities to complete to support your learning which may take from **5 to 30 minutes each**, however the time to read the workbook learning sections also needs to be considered by each individual nurse/midwife and the current level of exposure and experience in antimicrobial stewardship practices.

The workbook is broken down into bite size learning to help completion

By the end of the workbook, you will be able to:

1. **Demonstrate an understanding of the contents and their implications for your practice**
2. **Deliver – accept the role and identify opportunities for regular practice**
3. **Discuss with colleagues current and expected antimicrobial stewardship practice in your clinical area**
4. **Identify good practice and promote the sharing of this good practice**
5. **Seek further opportunities to develop knowledge and skills in antimicrobial practice**

The shaded box at each learning activity is for you to record your text. When you have completed the activity please click in the yes box to activate the tick to show completion. At the bottom of each page next to the forward and back arrows is a save button. **Please remember to save the workbook to retain any notes you have made and answers to the learning activities.**

Once you have successfully completed the learning activities in the workbook, meet with your line manager/supervisor/mentor and complete and sign the achievement certificate. Print and file or record as per local department practice. Download and save the certificate and add to eKSF or ePortfolio.

Click here to download the Certificate.

NMC REVALIDATION

Revalidation is a continuous process that nurses and midwives will engage with to demonstrate that they practice safely and effectively – requiring them to evidence learning and good practice throughout their career. For more information visit http://www.nmc.org.uk.

Options for recording your NMC revalidation evidence

The NHS Education for Scotland (NES) Nursing and Midwifery ePortfolio provides nurses and midwives across Scotland with an online portfolio to record and securely store their evidence for appraisal, NMC revalidation and personal and career development. For more information visit www.nhseportfolios.org.

The e-KSF is an online database. The Knowledge and Skills Framework (KSF) is used to support the development review process for agenda for change staff. It provides a framework that identifies the skills and knowledge staff will need to apply in their roles effectively to deliver quality services.

Staff will have an approved KSF post outline that sets out the competencies applicable to their post. Whilst the outlines reflect the demands of the post itself, each person will have their own Personal Development Plan (PDP) to reflect their individual development and learning needs. Evidence can be stored in eKSF. Access eKSF at https://www.e-ksf.org.

Completing the antimicrobial stewardship interactive workbook will provide outcomes and evidence for revalidation such as:

- A record of your up to date practice and professional development
- A record of completing the self-directed learning workbook
- A record of evidence of reflective practice of new or refreshed knowledge and skills
- Recording the reflective practice evidence to demonstrate how you have applied the learning in daily clinical practice
- Opportunities for practice related feedback or written reflection to demonstrate what you learnt, how you changed or improved your work as a result and how it is relevant to the Code.

KSF MAPPING

Completion of the Antimicrobial Stewardship in Nursing and Midwifery workbook will supply you with evidence against the KSF core dimension Core 2: Personal and People Development.

You will be able to provide evidence of contributing to your own personal development and the further development of knowledge and skills related to antimicrobial stewardship and prudent antimicrobial management.

In addition, being able to demonstrate the application of the new knowledge and skills to your practice can also support the provision of evidence for other KSF dimensions relevant to your post.

For example, applying your new knowledge and skills acquired from this course in order to:

- Promote safe and effective use of antimicrobial therapy supports evidence for **Core 3: Health, Safety and Security**
- Improve the quality of your own practice in relation to reducing antimicrobial resistance supports evidence for **Core 5: Quality**
- Improve your assessments for care and/or treatment planning in relation to antimicrobial stewardship supports evidence for **HWB2: Assessment and Care Planning to Meet Health and Wellbeing Needs** and/or **HWB6: Assessment and Treatment Planning**
- Improve the effectiveness of delivery of care or treatments and interventions supports evidence for **HWB5: Provision of Care to meet Health and Wellbeing Needs** and/or **HWB7: Interventions and Treatments.**

These are just some examples. As you can see, it is how you apply your new knowledge that will give you flexibility and scope in providing evidence.

SECTION 1: INTRODUCTION TO ANTIMICROBIAL STEWARDSHIP

Learning outcomes:

- To understand and demonstrate what antimicrobial stewardship is and the importance of nurses actively participating in stewardship as part of the multidisciplinary team
- To demonstrate an awareness of the approach to antimicrobial stewardship in Scotland and within your own health board

Definition of antimicrobial stewardship:

Taking care of antibiotics to ensure we use them correctly so that they remain active for future generations

Definition of antimicrobial:

Covers antibacterials (antibiotics), antifungals, antivirals, antimalarials

Antimicrobial stewardship encompasses review of the following:

- Is an antibiotic required to treat the patient?
- If so, does the choice of antibiotic follow local antibiotic prescribing guidelines?
- Have the correct microbiology samples been taken sent to the lab and the results reviewed?
- Is the antibiotic being given by the correct route, for the correct duration and at the correct dose? (Right drug by right route at the right dose for the right time)
- Is the antibiotic being reviewed on a daily basis to assess whether it can be stepped down to oral (if IV) and/or stopped?

All healthcare teams involved in the prescribing, supply and administering of antimicrobials should be:

- Aware of the importance of, and their role in, optimising antimicrobial stewardship for the benefit of patients and the public, and can demonstrate this in practice.
- Able to demonstrate knowledge of common infections and their antimicrobial management following local guidelines together with any microbiology investigations required.

Clinical staff should be able to demonstrate awareness of:

- The ability to access advice from local experts on the management of infection and use of antimicrobials and be able to locate and promote local antimicrobial guidelines relevant to their roles and responsibilities.

Why do we need antimicrobial stewardship?

This is one of key methods to address antimicrobial resistance along with prevention of transmission of resistant organisms through infection control and improved environmental decontamination.

Effective stewardship has been shown to reduce healthcare associated infections with associated benefits for patient outcomes.

ANTIMICROBIAL PRESCRIBING AND STEWARDSHIP VIDEOS

The following videos featuring members of the Scottish Antimicrobial Prescribing Group (SAPG) discussing the national and global concern in our approach and behaviour towards antibiotic prescribing and the role that nursing staff can play in their daily role towards antimicrobial stewardship.

Video 1

National and global concern to antibiotic prescribing and stewardship

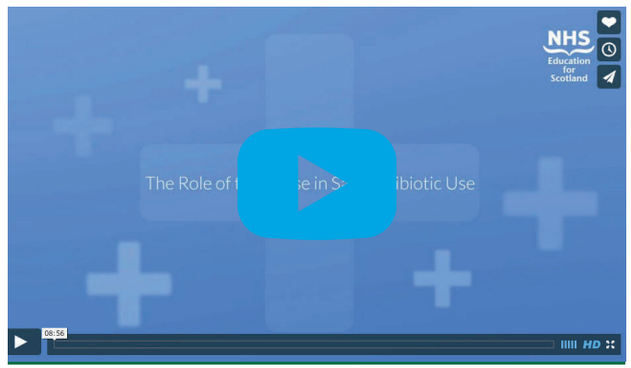
Duration: 8 minutes

REFLECTION

Note your key points from video 1:

Video 2

The role of the nurse in antimicrobial stewardship



Duration: 7 minutes

REFLECTION

Note your key points from video 2:

SECTION 2: ANTIMICROBIAL STEWARDSHIP IN PRACTICE

Learning outcomes:

- To raise awareness to the ScotMARAP action plan
- To understand the key role nurses play in the action plan
- To locate important documents supporting the learning
- To identify key members of a local antimicrobial prescribing team
- To raise awareness of the Scottish patient safety programme initiatives
- List key points in nursing accountability and responsibility
- Explain the role of the Antimicrobial Nurse

Antimicrobial Stewardship In Scotland

The Scottish Management of Antimicrobial Resistance Action Plan (ScotMARAP) was issued in March 2008 and updated version published in 2014 (ScotMARAP2). The document made recommendations for national and board level interventions to improve use of antimicrobials as part of national Healthcare Associated Infection (HAI) Delivery Plan.

The Scottish Antimicrobial Prescribing Group (SAPG) was formed to ensure national delivery of the ScotMARAP action plan. The practice of antimicrobial stewardship forms part of the HAI Standards which were updated in 2015.

Delivery of ScotMARAP

SAPG is a multi-professional national clinical forum which includes representatives from key national stakeholders and regional NHS boards

Antimicrobial Management Teams (AMTs) lead and deliver antimicrobial stewardship at local level

Antimicrobial Pharmacists are key members of the Antimicrobial Team

SAPG and AMTs include primary care representatives

Initial priority for SAPG and AMTs was to restrict the use of antibiotics associated with high risk of Clostridium difficile infection (CDI)

ScotMARAP2 2014-2018 – Registered nurses' responsibilities:

- Patient safety and quality of care is the personal responsibility of each registered nurse.
- In the context of ScotMARAP2 all registered nurses must ensure they have adequate knowledge of infection management and appropriate antimicrobial use.

HAI STANDARDS

Key objectives for registered nurses include:

- Supporting the multi-professional team to ensure that all use of antimicrobials is rational, appropriate and follows local policy.
- Understand and support appropriate taking of microbiological samples for patients with infection.
- Ensure timely administration of antimicrobials by supporting the sepsis programme and bundle.
- Follow up missed doses of antibiotic medicines.
- Monitor duration and route of antimicrobial treatment including instigating prompt de-escalation from intravenous to oral therapy as part of care bundles for venous access devices.
- Monitor for drug allergies and side effects.
- Support appropriate therapeutic drug monitoring of antimicrobials following local policy.
- Engage with opportunities for education and training on antimicrobials and management of infection.
- Support patients and carers understanding of antibiotic use.

Activity 1

Locate the following documents and record the URL addresses in the text box below

ScotMARAP 2 (2014-2018)
HAI Standards (February 2015)
Your local antimicrobial prescribing policy
Achieved: Yes ☐ No ☐

ANTIMICROBIAL MANAGEMENT TEAMS (AMT)

The Core activities of the group include:

- Develop and implement local antimicrobial policies for hospital and primary care
- Monitor antimicrobial use at local level – antibiotic usage data and compliance with antimicrobial policy
- Ensure clinical staff are educated and trained in use of antimicrobials
- Feed back data on antimicrobial use and surveillance of microbiology samples to prescribers

Activity 2

Know your local Antimicrobial team:

Complete the following:

Lead Doctor:
Consultant Microbiologist:
Antimicrobial Pharmacist:
Infection Prevention and Control representative:
Primary Care representative:
Other members:
Achieved: Yes ☐ No ☐

SCOTTISH PATIENT SAFETY PROGRAMME (SPSP)

The Scottish Patient Safety Programme (SPSP) was launched in 2008. This is a national programme which builds on previous work and is focused on improving quality through reducing harm. A key element of the programme is that staff caring directly for patients lead the changes and are able to monitor their improvement through the collection of real time data at individual unit level.

There are five main goals of the programme:

1. Reduce healthcare associated infections
2. Reduce adverse surgical incidents
3. Reduce adverse drug events
4. Improve critical care outcomes
5. Improve the organisation and leadership on safety.

Scottish Patient Safety Indicator (SPSI)

Consultation across NHS Scotland took place to determine the best approach to the measurement of harm in acute healthcare. This consultation led to the development of the SPSI with an aim of reducing the occurrence of specified harms:

- Cardiac Arrest
- Catheter Associated Urinary Tract Infections (CAUTI)
- Falls with Harm
- Pressure Ulcers (Grade 2–4)

The SPSI brings a person-centred approach to reducing harm experienced by patients in acute healthcare and brings together existing improvement work across the multidisciplinary teams.

Further reading:

The Healthcare Quality Strategy for NHSScotland has three quality ambitions to provide safe, effective, person-centred care. SPSP is key to the delivery of these ambitions and supports the Scottish Government's 2020 Vision to provide safe, high quality care, whatever the setting.

The programme is supported by a range of stakeholders including NHS Education for Scotland (NES) and the NHSScotland Quality Improvement Hub (QI Hub). The Programme is co-ordinated by Healthcare Improvement Scotland on behalf of the Scottish Government. Further information on the Scottish Patient Safety Programme is available on the website.

RESPONSIBILITY AND ACCOUNTABILITY

The nurses' role in antimicrobial management is supported by NMC professional accountability and responsibility standards and national programmes.

Points to remember:

Nurses have a duty of care to ensure patients get the correct medication

Nurses and midwives are accountable for their role in medicines management under the NMC 'Standards for Medicines Management' (2007)

Nurses and midwives are required to keep knowledge and skills up to date

NMC code principles

- Provide a high standard of practice and care at all times
- Keep your skills and knowledge up to date
- Keep clear legible and accurate records

What matters:

1. Translating policy objectives and ambition into best practice at the frontline with the supporting evidence
2. The quality of service we provide and the most efficient and safest way we provide the service
3. The opinion and feedback we receive from the patient and public
4. The opportunity to demonstrate continuing professional development

Evidence of safe practice:

- Knowledge Skill Competence approach and maintenance
- What do I have to be knowledgeable about and what skills must I have?
- How will I know when I am competent?

Leading Better Care components:

- Underpinning the role of the senior Charge Nurse
- Ensuring safe and effective practice
- Person centredness to enhance the patient experience
- Being effective (manage and develop the performance of the team)
- Contributing to the delivery of the organisation's objectives

Nursing and Midwifery (NMC) Code for Professional Standards of Practice and Behaviour for Nurses and Midwives

THE ROLE OF THE NURSE IN ANTIMICROBIAL MANAGEMENT

Within healthcare settings, nurses are a constant factor, spending the most amount of time with patients and delivering hands-on care.

Through the administration of medicines and monitoring vital signs, nurses are ideally placed to monitor a patient's response to therapy.

As the main care provider within healthcare settings, nurses are also able to assess improvements in clinical symptoms such as wounds, coughs and urinary symptoms.

Why the nursing role in antimicrobial stewardship is important:

- Supporting pharmacists in regular review of medication charts
- Regular clinical review and engagement with patients
- Consistent role at point of care for patients and families
- Primary role to administer medications safely and effectively
- Safe administration of IV therapy and drug calculations

Key areas of nursing influence in antimicrobial management:

There are key areas where the nurse can influence and contribute towards good antimicrobial management:

- Adherence to infection prevention and control standards both national and local
- Provision of essential nursing care including nutrition, hydration and prevention of pressure ulcers.
- Appropriate sampling
- Prescribing in line with recommended guidelines – non medical prescribers
- Monitor duration of therapy
- Promote appropriate route of administration
- Timing of antimicrobial administration
- Participation in therapeutic drug monitoring
- Check allergy status
- Contribute to preparing patient for Out-patient Parenteral Antimicrobial Therapy (OPAT)
- Patient education, awareness and involvement in antibiotic use

Reference Documents:

National Infection Prevention and Control Manual

Healthcare Associated Infections (HAI) Standards

SECTION 3: BACTERIA, RESISTANCE AND ANTIBIOTICS – THE BASICS

Learning outcomes:

- Demonstrate the different types of bacteria that may cause infections.
- Demonstrate an awareness of which bacteria cause infections at which body sites.
- Demonstrate an understanding of what antimicrobial resistance is and why it is important.
- Demonstrate an understanding of why inappropriate antibiotic use may lead to antimicrobial resistance.
- Demonstrate an awareness of at least two different ways that antibiotics may kill bacteria
- Demonstrate an awareness of which antibiotics are broad spectrum and which are narrow spectrum
- Demonstrate an awareness of common side effects associated with the antibiotics which you commonly administer.

DIFFERENT TYPES OF BACTERIA

In this section we will focus on bacteria and bacterial infection although it must be remembered that infection can also be caused by viruses, parasites and fungi too.

There are **four** main groups of bacteria (according to sensitivity)

1. Gram positive
2. Gram negative
3. Anaerobes
4. Atypical

Gram staining:

Gram staining, although pioneered many years ago, remains as first step in identifying bacteria.

Gram stains are carried out on most samples that are sent to the laboratory and can quickly and easily provide essential information to direct empirical treatment of potentially serious infections.

This technique is particularly useful in blood cultures. In this section we will focus on bacteria and bacterial infection although it must be remembered that infection can also be caused by viruses, parasites and fungi too.

Gram stain (colour observed when the bacteria are treated with Gram stain involving initial purple crystal violet followed by red safranin).

Gram negative (-ve) (pink/red)

Thin peptidoglycan cell wall does not retain primary stain but does retain red safranin stain

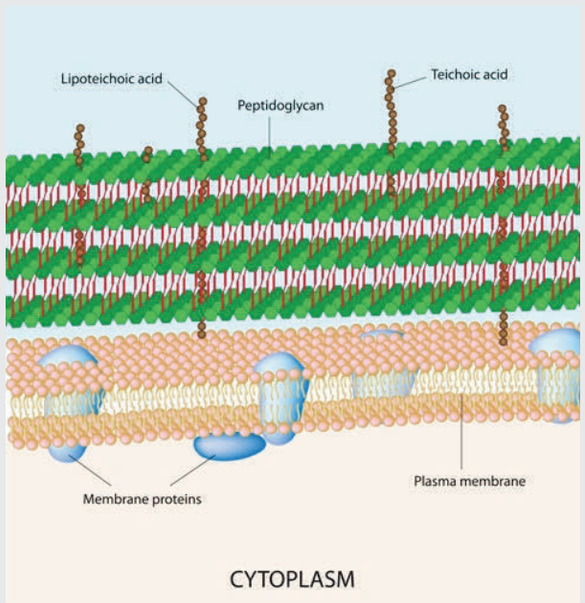
Gram positive (+ve) (blue/ purple)

Thick peptidoglycan cell wall retains primary crystal violet stain

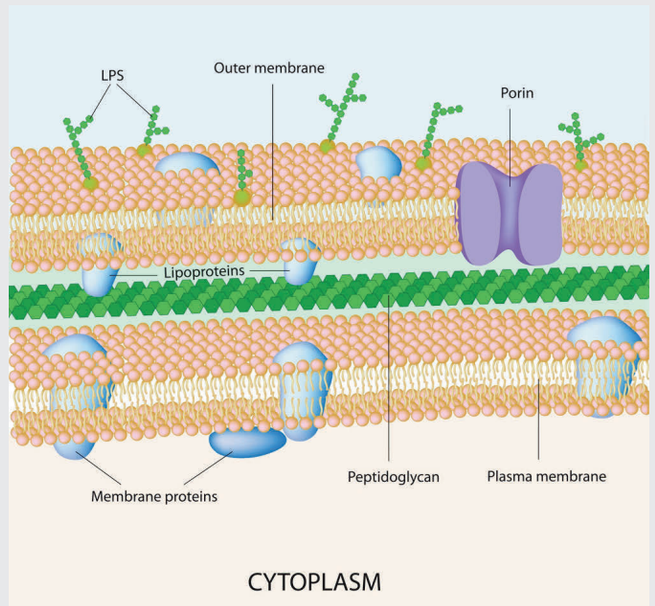
The thicker peptidoglycan cell wall of the Gram-positive bacterium retains the primary blue/purple stain and looks blue/purple under a microscope.

The thinner peptidoglycan cell wall of the Gram-negative bacterium does not retain the primary Gram stain so the bacteria will look pink under a microscope

Gram positive bacteria



Gram negative bacteria



Common bacteria that cause Gram positive infection:

Staphylococcus aureus – methicillin sensitive Staphylococcus aureus (MSSA) & methicillin resistant Staphylococcus aureus (MRSA)

- Where is it found? Skin
- Infections: cellulitis, wound infections, blood stream infections

Streptococcus pneumoniae

- Where is it found? Respiratory tract
- Infections: otitis media, pneumonia, meningitis

Common bacteria that cause Gram negative infection:

Escherichia coli

- Where is it found? Colon
- Infections: GI infections, UTI

Haemophilus influenzae

- Where is it found? Respiratory tract
- Infections: otitis media, sinusitis, pneumonia

Moraxella catarrhalis

- Where is it found? Respiratory tract
- Infections: COPD exacerbation

Common Anaerobes

Anaerobic bacteria are bacteria that grow in the absence of oxygen.

Clostridium perfringens(Gram +ve)

- Where is it found? GI tract
- Infections: tissue necrosis and gas gangrene

Clostridium difficile (Gram +ve)

- Where is it found? GI tract
- Infections: C. difficile associated disease causing diarrhoea and pseudomembranous colitis

Bacterioides fragilis (Gram -ve)

- Where is it found? GI tract
- Infections: tonsillitis, peritonitis

Common Atypicals

Atypical bacteria do not have any peptidoglycan in their cell walls so do not show any colour when treated with Gram stain.

Mycoplasma pneumoniae

- Where is it found? Respiratory tract
- Infections: pneumonia

WHERE DO WE FIND MICROBES AND MICROBIAL INFECTION?

When a microbe encounters a potential host, in order for it to survive it must be able to adhere to either the host's skin/mucous membrane or other bacteria already attached. Having formed an attachment it must then be able to grow and colonise its host. A major factor that affects the adherence, growth and colonisation of bacteria is the normal bacterial flora.

The normal flora are a collection of bacterial species that have adapted to a co-existence with the conditions found at various sites within and on the human body. The normal flora is acquired rapidly during and shortly after birth and it fluctuates continually throughout life. Specific organisms tend to be found in specific areas of the body.

This knowledge allows infections to be treated empirically (without prior microbiological identification) if the site of infection is known.

If the site of infection is unknown then a broad spectrum agent or a combination or two or more narrow spectrum agents may be required.

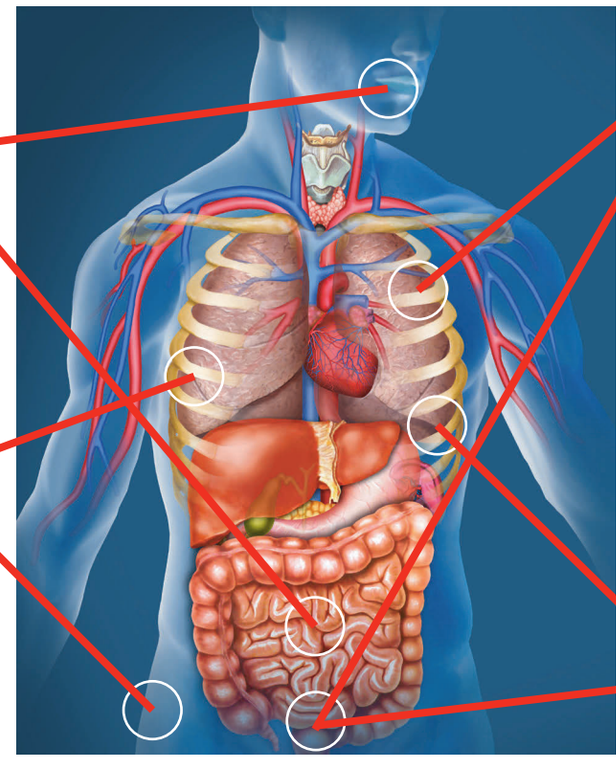
The diagram provides some guidance on where different types of bacteria tend to thrive and cause infection.

Click on each of the boxes to see where this type of bacteria can be found

Anaerobes
Mouth, teeth, throat, sinuses & lower bowel

Gram +ve
Skin, Bone & Respiratory

Cellulitis
Wound infection
Line infection
Osteomyelitis
Pneumonia
Sinusitis



Gram -ve
GI-tract & Respiratory

Peritonitis
Biliary infection
Pancreatitis
UTI
PID
CAP / HAP / VAP
Sinusitis

Atypicals
Chest and genito-urinary

UTI
Urinary Tract Infection

PID
Pelvic Inflammatory Disease

CAP
Community Acquired Pneumonia

HAP
Hospital Acquired Pneumonia

VAP
Ventilator Associated Pneumonia

Activity 3

Find an individual in your care environment who has an infection and has had microbiology specimens taken.

Where was the site of infection?
What samples were taken?
Did the results (if available) show that bacteria has been isolated in the specimen?
Which bacterial infection was found (if results available)
Achieved: Yes ☐ No ☐

ANTIMICROBIAL RESISTANCE (AMR)

DEFINITION:

Antimicrobial resistance is the ability of a microorganism to stop an antimicrobial from working against it. As a result, treatments become ineffective, infections persist and may spread to others.

What causes antibiotic resistance?
(Video published August 2014)

Duration: 4.5 minutes

Resistance is not a new problem
Sir Alexander Fleming (1881–1955), the discoverer of penicillin wrote:

"The microbes are educated to resist penicillin and a host of penicillin fast organisms is bred out which can be passed on to other individuals and perhaps from there to someone else and to others until they reach someone with a pneumonia which penicillin cannot save.

"I hope this evil can be averted."

HOW DOES ANTIMICROBIAL RESISTANCE (AMR) DEVELOP?

The development of AMR is a natural phenomenon but certain human actions accelerate the emergence and spread of AMR.

Development of resistance may take the form of a spontaneous or induced genetic mutation, or the acquisition of resistance genes from other bacterial species.

Exposure to an antibiotic naturally selects for the survival of the organisms with the genes for resistance. In this way, a gene for antibiotic resistance may readily spread through an ecosystem of bacteria.

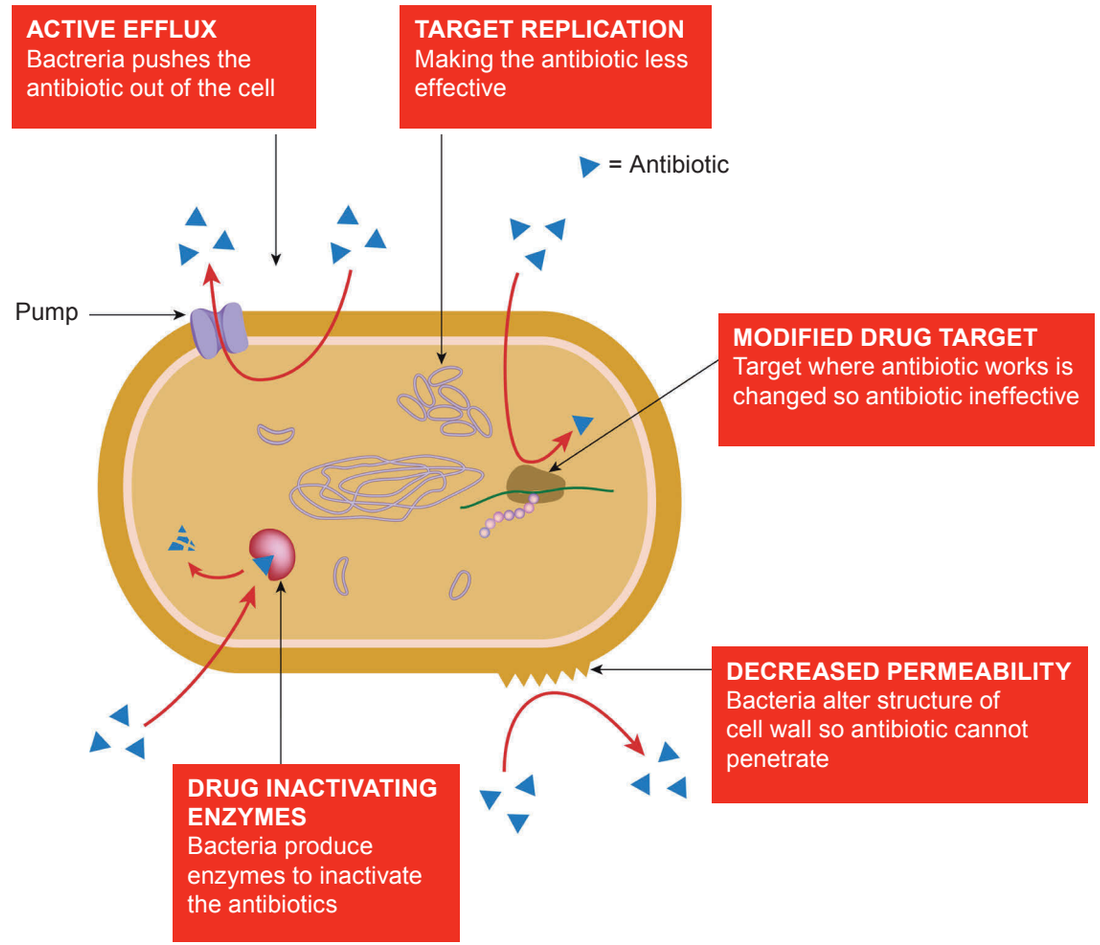
Bacteria can become resistant to antibiotics by the methods shown in the diagram opposite and some bacteria can use more than one method. Once a bacterium has become resistant it can pass on its DNA to other types of bacteria to spread resistance.

What can we do about antimicrobial resistance (AMR)?

1. **USE ANTIBIOTICS MORE WISELY**
2. **STOP** unnecessary use and use appropriate choice, dose, route and duration when antibiotics are required
3. **MINIMISE** use of broad spectrum antibiotics like co-amoxiclav, piperacillin/tazobactam, meropenem

Mechanisms of resistance

Click in boxes for details



ANTIBIOTICS AND HOW THEY WORK

Antibiotic use

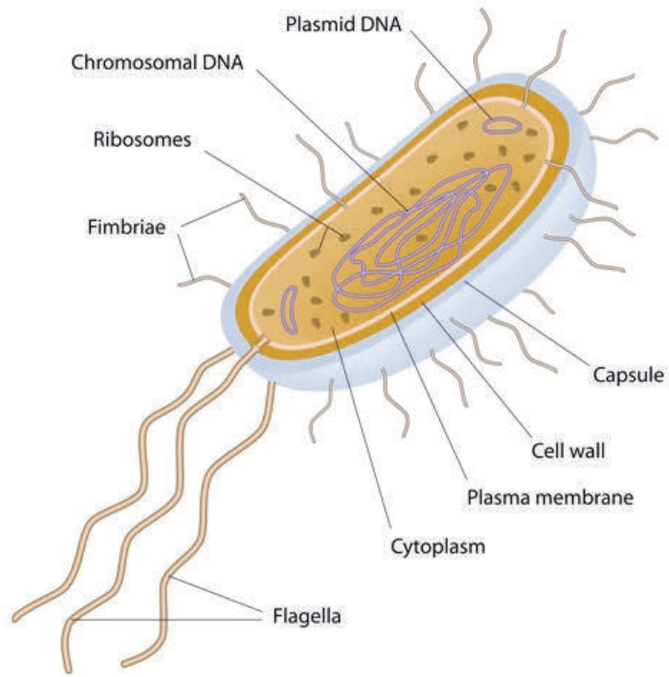
Antibiotics exert their action on bacteria in different ways. Some inhibit the development of the bacterial cell wall and so kill the bacteria that way. Others bind with and damage various mechanisms within the bacterial cell thus preventing cell replecation.

Antibiotics may kill Gram positive bacteria or Gram negative bacteria. Some antibiotics can kill both Gram positive and Gram negative bacteria, these are called broad spectrum because they kill a wide range of organisms.

When choosing an antibiotic prescribers will consider the site of infection and the type of bacteria likely to cause an infection at this site.

Where possible, a narrow spectrum antibiotic will be used i.e. one that only kills Gram positive or only kills Gram negative bacteria. However in some infections a broad spectrum antibiotic may be required.

Structure of a bacterial cell



Inhibition of…
Cell wall synthesis Penicillins Cephalosporins Carbapenems Daptomycin Glycopeptides
DNA synthesis Fluoroquinolones
RNA synthesis Rifampin
Protein synthesis Macrolides Chloramphenicol Tetracycline Aminoglycosides Oxazolidonones
Folic acid synthesis Sulfonamides Trimethoprim

Antibiotics for Gram positive infections (Staphs and Streps)

Commonly used policy antibiotics

- Benzylpenicillin (IV penicillin)*, No S. aureus cover
- Phenoxymethylpenicillin (oral penicillin V)*
- Flucloxacillin
- Erythromycin, Clarithromycin (macrolides)

Restricted use antibiotics

- Clindamycin
- Fusidic acid
- Rifampicin
- Teicoplanin, (glycopeptide)
- Daptomycin
- Linezolid

Antibiotics for Gram negative infections

(Pseudomonas, E-coli)

- Gentamicin, Tobramycin, Amikacin (aminoglycosides)
- Ceftazidime (anti-pseudomonal cephalosporin)
- Aztreonam
- Colistin
- Fosfomycin
- Ciprofloxacin (quinolone – restricted due to C. diff risk)

Broad spectrum antibiotics

Gram +ve and Gram -ve cover

- Clarithromycin, Azithromycin (macrolides)
- Trimethoprim, Nitrofurantoin (used specifically for UTI)
- Amoxicillin, Co-amoxiclav (amoxicillin/clavulanate)
- Minocycline, Doxycycline, Oxytetracycline (tetracyclines)
- Moxifloxacin, Levofloxacin (quinolones – restricted due to C. diff risk)
- Cefalexin, Cefuroxime, Ceftriaxone, Cefotaxime (cephalosporins – restricted due to C. diff risk)
- Tazocin (piperacillin/tazobactam)
- Ertapenem, Imipenem, Meropenem (carbapenems)

ANTIBIOTICS AND HOW THEY WORK

Common side effects:

GENERAL

(with most antibiotocs): Nausea, vomiting, diarrhoea, rashes, Candida infections

Penicillins in general:

hypersensitivity/skin reactions

Flucloxacillin & co-amoxiclav:

cholestatic jaundice

Clindamycin, cephalosporins (e.g. cefuroxime) & quinolones (e.g. ciprofloxacin):

C. difficile infection

Macrolides (e.g. erythromycin):

GI disturbances, hepatitis, Q-T interval (cardiac problems)

Quinolones (e.g. ciprofloxacin):

Q-T interval (cardiac problems), convulsions, tendonitis

Aminoglycosides (e.g. gentamicin)/ glycopeptides (e.g. vancomycin):

damage to kidneys and hearing

Vancomycin:

'red man' syndrome

For further information on antibiotics see the British National Formulary which you can access via:

www.medicinescomplete.com/mc/bnf/current/ (you may need your Athens password if you are accessing this outside NHS premises)

Remember to report any serious side effects to the MHRA using the Yellow Card Scheme: www.mhra.gov.uk/yellowcard

Activity 4

Select 3 antibiotics that you commonly see prescribed in your clinical area and find out the following:

- What is it usually used to treat?
- What is usual dose and frequency?
- What is usual course length?
- Are there any precautions or contraindications to using it?
- What are common side effects?
- What are common interactions?

1	2	3
Name of antibiotic:	Name of antibiotic:	Name of antibiotic:
Used to treat:	Used to treat:	Used to treat:
Dose & frequency:	Dose & frequency:	Dose & frequency:
Length of course:	Length of course:	Length of course:
Precautions/contraindications:	Precautions/contraindications:	Precautions/contraindications:
Common side effects:	Common side effects:	Common side effects:
Common drug or food interactions:	Common drug or food interactions:	Common drug or food interactions:
		Achieved: Yes ☐ No ☐

SECTION 4: DIAGNOSIS AND ASSESSMENT OF INFECTION

Learning outcomes:

- Demonstrate awareness of the core components of antimicrobial stewardship with specific relation to prescribing practice. (For Non-Medical Prescribers in particular although all nurses will benefit from an understanding of this section)
- Demonstrate an understanding of the importance of reviewing antibiotic prescriptions
- Demonstrate an understanding of the key components of an effective review of an antibiotic prescription
- Explain the key factors which need to be reviewed when considering changing a patient's antibiotic prescription from IV to oral
- Explain how microbiology samples may aid diagnosis of infection
- Demonstrate awareness of how and when to take various samples following local procedures
- Demonstrate awareness of how samples are processed and results interpreted.

MICROBIOLOGY INVESTIGATIONS

Importance of microbiology samples

Any tissue or bodily fluid can undergo microbiological investigation. Microbiology samples are integral in the diagnosis and management of infection as they identify causative organisms and effective antimicrobial therapy.

There are costs associated with microbiology sampling and should therefore only be obtained where there is a clinical indication that will assist in the diagnosis, treatment and on going management of a patient.

Transmission based precautions should be taken at the time samples are obtained and not when results are known to prevent the spread of infection i.e. consideration of isolation of patients with diarrhoea.

Microbiology samples should only be obtained where there is a clinical indication that will assist in the diagnosis, treatment and on going management of a patient.

Many methods are used within microbiology to identify organisms and within this section we will provide a brief overview of the techniques that are used for the most frequently requested samples.

Sample collection

Microbiology samples are taken to assist in the diagnosis of infection and to provide information on the appropriate antimicrobial treatment. Microbiology samples should NOT be taken as a matter of routine on admission to a ward or department and should be taken within the context of a patient's illness and presenting symptoms.

Remember:

1. Where possible, samples should be taken before antimicrobial therapy starts
2. If the patient is already on antibiotics then blood cultures should be taken immediately before the next dose (with the exception of paediatric patients)
3. Use appropriate sample containers. Using inappropriate containers may result in the delay of diagnosis and subsequent treatment
4. Adhere to Standard Infection Control Procedures (SICPs) when collecting samples taking care not to contaminate samples
5. Only take samples when it is appropriate to do so.

Activity 5

Within your clinical area think about which of the following investigations are routinely carried out then read below to find out if it is appropriate to do these routinely.

Tick each one you perform routinely in your area.

- **A.** MRSA screen ☐
- **B.** Urinalysis ☐
- **C.** Urine Sample ☐
- **D.** Sputum sample ☐
- **E.** Wound swab ☐
- **F.** Stool sample ☐
- **G.** Blood culture ☐

Key points to consider on appropriate sample collection:

A. MRSA Screen

There is no requirement to screen every patient that is admitted to hospital. By following Health Protection Scotland's MRSA Clinical Risk Assessment, only individuals who are at a higher risk of MRSA acquisition/infection are required to be screened.

B. Urinalysis

Urine should not be tested indiscriminately, but tested within the context of a patient's illness or to assist in the management of a condition.

Urinalysis should not be used in the diagnosis of UTI in the over 65s or for those with indwelling urinary catheters. Individuals over the age of 65 and those with urinary catheters are likely to have asymptomatic bacteriuria which will be highlighted through the presence of leucocytes and nitrites (by-products of bacteria) in a urinalysis. The diagnosis of UTI in both patient groups should be made based on signs and symptoms as detailed in the SAPG management guides.

C. Urine Sample

Urine samples should not be routinely obtained unless there is a clinical indication for the sample.

D. Sputum Sample

Sputum samples should only be obtained where there is clinical indication. Sputum samples should not be taken as a matter of routine practice.

E. Wound swab

Wound swabs should only be taken where there is evidence of local or systemic infection. Many wounds are colonised with bacteria but are NOT infected. Refer to local wound management policy.

F. Stool sample

Unless clinically indicated stool samples should not be taken as a matter of routine.

G. Blood cultures

Blood cultures should only be taken where there is clinical indication.

Microbiology samples should not be taken as a matter of routine or without thinking about why the samples are being obtained.

AVOIDING CONTAMINATION OF BLOOD CULTURES

Definition of contamination

Growth of organisms in the blood culture that were not present in the patient's blood stream

How common is contamination?

Estimated that at present 10% of all blood cultures in Scotland are contaminated

Aiming for an inpatient rate of <3%

How does contamination occur?

Introduced during sample collection from:

- Patient's skin
- Equipment used to take sample and transfer to the bottle
- Hands of the person taking the sample

How to avoid contamination?

When taking blood culture samples ensure you follow the local procedures and use aseptic technique throughout.

For further information check out the NES modules on specimen sampling including blood cultures

www.nes.scot.nhs.uk/education-and-training/by-theme-initiative/healthcare-associated-infections/online-short-courses/aseptic-technique.aspx

TESTING FOR ANTIMICROBIAL SUSCEPTIBILITY

Not all antibiotics will be effective against all bacteria, it is therefore vital that susceptibility testing is carried out on every sample that is sent for culture and results reviewed so antimicrobial therapy can be streamlined where possible.

Traditional method

Paper disks impregnated with antibiotics are placed on agar plate inoculated with the sample organism. The sensitive antibiotic diffuses into the surrounding agar and inhibits bacterial growth (zone of inhibition). The extent of inhibition reflects the susceptibility of the organism to the antibiotic.

Automated method

In most centres susceptibility testing is now done using an automated system called the Vitek2.

Interpreting results

When an organism has been isolated from a sample, a report will be generated detailing the organism and the antibiotics that have been tested. Antibiotic sensitivities will be reported in one of three ways:

1. S = Sensitive (antibiotic effective against the organism)
2. I = Intermediate (some activity against the organism, but not enough to provide effective clinical treatment)
3. R = Resistant (no activity against the organism) All organisms will be resistant to some antibiotics– this does not make them multi drug resistant organisms.

[redacted] Date/Time of Specimen: 22 Aug 2007
Catheter spc. urinet

Sensitivities	1
Amoxicillin	R
Cefalexin	R
Trimethoprim	R
Nitrofurantoin	R
Co-amoxiclav	R
Ciprofloxcin	R
Ceftazidime	R
Ceftriaxone	R
Meropenem	S

CULTURE
1) 10^5 orgs/ml of Klebsiella pneumoise
** NB ESBL **

Bacteriuria is an inevitable consequence of long term catheterisation. Routine sampling and treatment is not indicated unless patient is symptomatic, has clinical evidence of infection, or as part of MRSA screen

ANTIMICROBIAL PRESCRIBING PRACTICE

Commonly encountered infections

The following infections are commonly encountered by prescribers. When treating each it is essential to follow the same approach and stewardship practice.

- Respiratory tract infections
- Urinary tract infections (UTIs)
- Sepsis
- Intra abdominal infections
- Skin & soft tissue infections
- Bone and joint infections
- Central nervous system infections
- Healthcare associated infections
- Fungal infections

When taking the decision to prescribe an antimicrobial drug, prescribers must be assured that there are clear symptoms or suspicion of infection. In addition, for some self-limiting bacterial or viral infections presenting in primary care antimicrobials are unlikely to be beneficial, may cause side effects and have a negative impact on resistance e.g. otitis media, viral pharyngitis, coughs, colds. In these cases patients should be advised about how to reduce their symptoms with simple analgesics, rest and fluids.

Treatment Choice

Empirical prescribing

The majority of patients are started on empirical antibiotic treatment while awaiting microbiology results (if a sample has been obtained). Empirical antimicrobial therapy refers to the initiation of antibiotics before the causative organism is known. The choice of antibiotic is based on a patient's presenting symptoms, clinical assessment and the most likely organism thought to be causing the infection.

To ensure they receive the safest and most effective treatment for their infection it is important to follow the local antibiotic policy. These policies are evidence-based and reflect effective choice, dosage and duration of antibiotic therapy whilst minimising the risk of adverse effects such as C. difficile Infection (CDI) and antimicrobial resistance.

Empirical treatment should always be reviewed when microbiology results become available to check that the patient is on the most appropriate antibiotic. Often the initial broad spectrum antibiotic can be changed to a narrower spectrum one or an initial combination of 2 or 3 antibiotics can be reduced to just one.

It is important to document indication(s) for an antibiotic prescription in clinical notes and ideally also on the medicine administration chart' to ensure that there has been adequate indication/symptoms identified to justify treatment and that recurrent infection can be identified and treated accordingly.

LOCAL ANTIMICROBIAL PRESCRIBING POLICY AND PRACTICE

Local antimicrobial policies differ from board to board and take into account local resistance patterns.

Activity 6

Familiarise yourself with the antibiotics that are used locally to treat common infections using your health board's antimicrobial prescribing policy.

What are the first line antibiotics used in your health board to treat:

1. Clostridium difficile infection (first episode with no severity markers):
2. Hospital acquired pneumonia:
3. Cellulitis:
4. Otitis media:
Achieved: Yes ☐ No ☐

Alert antibiotic policy

Resistance to antibiotics and other antimicrobials is recognised nationally and internationally as a major threat to public health and patient safety which requires rapid effective intervention. Prudent prescribing using agents less likely to select for resistance can delay the emergence of resistant strains. It is known that a significant proportion of current antimicrobial usage in hospitals is not 'prudent' because of excessive use or inappropriate choice.

Every board in Scotland therefore has an Alert antibiotic policy although their content may differ slightly.

Alert antibiotics comprise of:

1. Those that are likely or known to promote resistance e.g. Cephalosporins
2. Those that promote Clostridium difficile e.g. ciprofloxacin
3. Those that are protected or preserved for the use of Infectious Disease specialists or Microbiologist e.g. Daptomycin, Ertapenem

Activity 7

Locate your health boards "Alert" antibiotic policy and identify and list three antibiotics currently on your Alert antibiotic policy:

1.
2.
3.
Achieved: Yes ☐ No ☐

Patients with allergies

Allergy to antibiotics is an important factor in choosing an antibiotic for a patient. The phrase ‘allergic to penicillin’ is commonly seen in medical notes and on medicine charts. The diagnosis of ‘penicillin allergy’ is often simply accepted without obtaining a detailed history of the reaction. It has been reported that a significant percentage of patients labelled as ‘penicillin allergic’ are not truly allergic to the drug. As a result, penicillins are unnecessarily withheld from these patients, which may subsequently affect their clinical outcomes.

General hypersensitivity reactions (e.g. rashes) to penicillin occur in between 1 and 10% of exposed patients but true anaphylactic reactions (which can be fatal) occur in less than 0.05% of treated patients. Please note that patients who have a vague history of symptoms or gastro-intestinal intolerance are probably not truly allergic to penicillins. Understanding the key classification systems and clinical presentations of penicillin allergy can help the practitioner make informed decisions about future therapy in order to treat the infection by the safest means.

Despite true allergies being documented, patients do sometimes still receive an antibiotic to which they are allergic. Antibiotics which are penicillins may not appear obviously so from their name e.g. co-amoxiclav, Tazocin. Always check with the pharmacist if unsure.

Patients with renal impairment (poor kidney function)

A number of antimicrobials rely on the kidneys to be cleared from the bloodstream and some can also damage the kidneys and make renal impairment worse. Always consider the patient’s renal function when a patient is being prescribed antimicrobials.

Key points to remember:

1 Antimicrobial stewardship is everyone’s business and responsibility

2 Although all professionals have an important role to play it is essential that clinicians prescribing antimicrobial treatments prescribe optimally, and by doing so reduce the risk of increasing antimicrobial resistance.

3 The use of broad spectrum antibiotics contributes to C. difficile infection (CDI) and antimicrobial resistance (AMR)

4 Compliance with local antibiotic policies ensures patients get the most effective treatment for their infection

5 Always document the indication for prescribing antimicrobials in the clinical notes and ideally on the medicine administration chart

6 Check patients with a documented allergy are prescribed an antibiotic that is safe for them

7 Be aware of microbiology results being available and prompt their review by the team to ensure empirical treatment is appropriate

8 Consider renal function when prescribing antimicrobials.

Therapeutic monitoring

Key points to remember:

1. Patients on gentamicin or vancomycin require serum blood levels to be monitored for safe and effective treatment
2. Samples need to be taken at the appropriate time to get meaningful results
3. Ensure details of samples are documented correctly in the patient's notes and on the lab request form
4. Nurses can contribute to monitoring of blood results and dose adjustment – understand when to withhold a dose until results available (gentamicin) and when to give dose with levels informing the subsequent dose (vancomycin)
5. Gentamicin and Vancomycin are covered in a learnPro module available through NES

Treatment duration

Correct duration of therapy is essential to ensure that the infection is adequately treated but that adverse effects are minimised. Most common infections require treatment for a maximum of 7 days. Exceptions are meningitis, some types of pneumonia, bone and joint infections and endocarditis.

Extending antibiotic treatment beyond the recommended duration leads to emergence of resistant strains. The duration should be recorded on the Kardex and in the case notes. If duration is unknown at the start of therapy then a review date should be specified – this should be within 72 hours of starting treatment.

Key points to remember:

1. Prolonged duration of antimicrobial treatment is a risk factor for CDI and AMR
2. Local antibiotic policies specify recommended duration for each infection type
3. In collaboration with doctors and pharmacists, nurses can ensure antimicrobials are prescribed for appropriate duration
4. Highlight to prescribers if antibiotic prescribed longer than indicated
5. Ensure duration of therapy and/or review date are documented on Kardex and in patient notes

Administration timing

Timing is more important for antibiotics than for many other medicines because they are usually administered several times per day. The time between doses affects whether the invading organism is killed or not and also influences development of resistant strains.

Timing may not be ideal for staff administering the antibiotics or patient sleep patterns. Antibiotics given 3 or 4 times per day should be given at regularly spaced intervals.

Prompt administration of antibiotics is essential in patients diagnosed with sepsis as each hour of delay significantly reduces survival. This is addressed by the Scottish Patient Safety Programme/Scottish Antimicrobial Prescribing Group collaborative on Sepsis which aims to improve both recognition and management of sepsis.

Key points to remember:

1. Administration of antibiotics at the recommended dosage interval is an important factor in their effectiveness
2. Prompt and timely administration of antimicrobials saves lives

PATIENT EDUCATION, AWARENESS AND INVOLVEMENT

It is essential that patients under our care fully understand the reasons they are started on antibiotics. Patients and/or their carers should be involved in the education process from initiation informing them of reason for starting antibiotic, likely duration of therapy, known side effects and what to do if they experience any of these.

Completion of antibiotic course is an important issue to consider when a patient's discharge is being planned. Often patients will require to continue their antibiotics for a few days after they go home. Supply of the correct quantity of antibiotics and discussion of how to take them with the patient will ensure that the treatment is completed correctly.

If a patient requires prolonged IV antimicrobial therapy, many NHS boards now offer an Out-patient Parenteral Antibiotic Therapy OPAT service whereby certain patient groups can attend hospital on a daily basis to receive a dose of an IV antibiotic. Nursing staff are in a suitable position to assess whether patients may be suitable for this type of treatment – they need to be mobile and motivated to ensure they attend daily appointments.

Key points to remember:

1. Patient and/or carer education, awareness and involvement in antimicrobial therapy
2. Review need for antibiotics on discharge to complete course
3. Ensure patients understand directions for antibiotics to be completed on discharge
4. Contribute to consideration of patients for Out-patient Parenteral Antibiotic Therapy (OPAT) where prolonged IV therapy is required

Activity 8

Using the areas of nursing influence, plan and then discuss with your line manager how you can promote effective antimicrobial management within your role

Consider how you will share this work with your colleagues

Challenging Communication/Conversations:

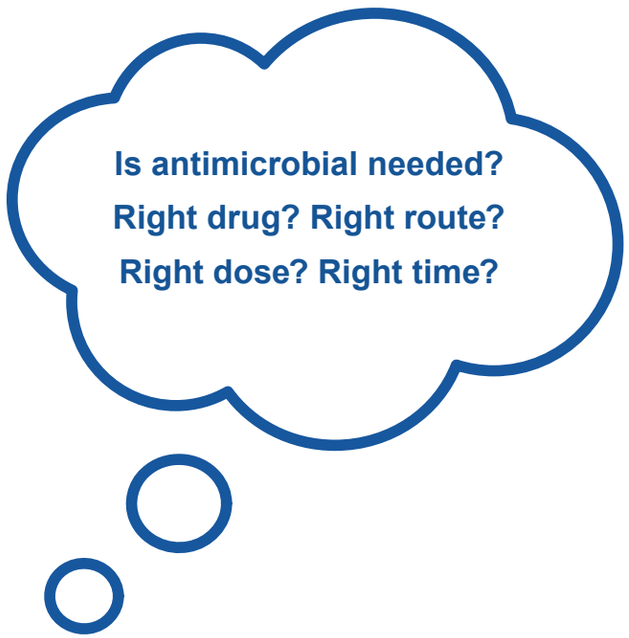
Reflect on when you could have adopted the areas of nursing influence in the past and consider how you will change your future practice i.e. when antibiotics had been prescribed longer than recommended on policy or when IV therapy has continued when oral route available

Achieved: Yes ☐ No ☐

REVIEW OF ANTIMICROBIAL PRESCRIPTIONS

Key components of the review of antimicrobial prescriptions:

- **Please** ensure good antimicrobial stewardship with each antimicrobial prescription.
- **Always** check the medicines record chart and think:



Antimicrobial stewardship encompasses review of the following:

- Is an antibiotic required to treat the patient?
- If so, does the choice of antibiotic follow local antibiotic prescribing guidelines?
- Have the correct microbiology samples been take?
- Is the antibiotic being given by the correct route, for the correct duration and at the correct dose? (Right drug by right route at the right dose for the right time)
- Is the antibiotic being reviewed on a daily basis to assess whether it can be stepped down to oral (if IV) and/or stopped?

Activity 9

Locate a copy of your local antimicrobial prescribing guidelines

Find a medicines record chart where a patient is receiving an IV antimicrobial*
*If nobody is on an IV antimicrobial then choose an oral antimicrobial

Is the choice of antimicrobial and route of administration appropriate?
Did you need further information to complete your prescription review?
What was it?
Where did you find it?
Achieved: Yes ☐ No ☐

SECTION 5: CONSIDERATIONS FOR HOSPITAL PRACTICE

Learning outcomes:

- Understand the criteria for considering IV to oral switch (IVOST) in your clinical area
- Identify the types of procedure that require prophylaxis and why prophylaxis is given
- Describe the importance of optimal timing and duration of antibiotic prophylaxis
- Give examples of the recommended drug choice and dosing information for two procedures needing surgical prophylaxis practice in your area if appropriate
- Understand the key factors in the safe and effective use of Gentamicin and Vancomycin
- To raise awareness of the key elements in Sepsis management

IV TO ORAL SWITCH THERAPY (IVOST)

Most boards have IVOST policies to promote early switch from intravenous antibiotics to oral therapy. Check your local antimicrobial prescribing guidelines.

Decision options:

If your patient has been on IV antimicrobials for more than 48 hours

STOP – if no evidence of infection

SWITCH – IV to oral

CHANGE to narrow spectrum antimicrobial agent

CONTINUE and review again in 12–24 hours

OPAT Consider Outpatient Parenteral Antimicrobial Therapy

This is important because IV therapy:

- Is associated with more infection risks
- Is more costly overall
- Takes up more nursing time for administration
- Keeps patients in hospital longer

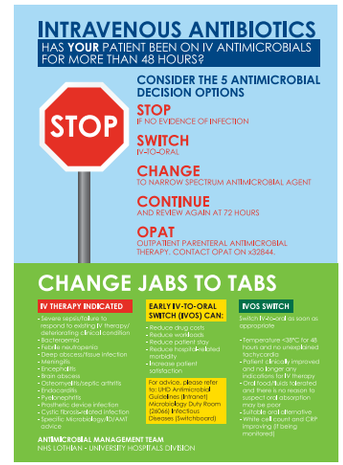
Key points to remember:

1. Most patients do not require IV antibiotics
2. Those who do will normally only need them for 24–48 hours
3. Use narrow spectrum agents where possible
4. Document indication for starting antibiotic in patient case notes and/or medicine prescription chart
5. Document intended duration on the medicine prescription chart
6. SWITCH to oral therapy when Sepsis criteria are resolving and the oral route is not compromised
7. Ensure peripheral vascular catheter (PVC) care bundle is in place, applied and followed if you use this in your health board.

Consider switch from IV to oral when:

- Temperature less than 38°C and more than 36°C for 48 hours
- Patient showing signs of clinical improvement – e.g. CRP WCC normalising
- Tolerating oral fluids and food – poor oral absorption of antibiotic unlikely
- Suitable oral alternative is available

Remember Patients should continue IV therapy if:
There are continuing signs of Sepsis (2 or more of the following) • temp >38°C or , 36°C • tachycardia >90 beats/min • tachypnoea >20 breaths/min • WCC >12 or <4
Febrile with neutropenia WCC<1.0 or immunosuppression Specific infections which require high dose IV therapy e.g. endocarditis, septic arthritis, osteomyelitis, meningitis, abscess, cystic fibrosis patients, prosthetic infection
Oral route is compromised for example: • vomiting • nil by mouth • reduced absorption e.g. severe diarrhoea or steatorrhoea • mechanical swallowing disorder • unconscious
Patient post surgery not tolerated 1 litre oral fluids
IV antibiotics not included in IVOST protocol



To view or download the complete IV to Switch poster **click here**

Activity 10

IV to Oral Switch (IVOST):

Find at least 2 patient medicine record charts and case notes for patients on IV antibiotics in your area (if available)
For each patient consider the factors for switching from an IV to an oral antibiotic prescription
For each patient, record the criteria documented for switching from IV to oral antibiotic therapy

Patient 1
IV Antimicrobial: Criteria for switch
What action would you take:
Patient 2
IV Antimicrobial: Criteria for switch
What action would you take:
Achieved: Yes ☐ No ☐

SIGN 104 GUIDELINES – ANTIBIOTIC PROPHYLAXIS IN SURGERY

Surgical site infection

SIGN guideline 104 was produced in 2008, and makes recommendations on best practice in the use of peri-operative prophylactic antibiotics to prevent surgical site infections (SSI).

An infection that develops after a surgical procedure can occur for many reasons. A surgical site infection is an infection of the wound site and is a healthcare-associated infection which we should take steps to avoid.

Many other factors are involved in the development of post-operative infection such as skin antisepsis, normothermia, normoglycaemia and maintained fluid balance but this section will concentrate on the use of antibiotics.

The risk of infection increases with the level of potential contamination of the wound which are classified as follows:

Clean:

an incision without a break in sterile technique, no inflammation is encountered and there is no breach of the respiratory, gastro-intestinal or genitourinary tracts.

Clean-contaminated:

an incision through which the respiratory, gastro-intestinal, or genitourinary tract is entered under controlled conditions but with no contamination encountered.

Contaminated:

there is a major break in sterile technique or gross spillage from the gastrointestinal tract, or an incision in which acute, non-purulent inflammation is encountered. Open traumatic wounds that are more than 12–24 hours old also fall into this category.

Reducing surgical site infection

Choice of antibiotic

The antibiotic is selected to cover the most likely organisms that may cause infection. A combination of drugs may be used. If the patient is known to be colonised with MRSA or has an antibiotic allergy, additional or alternative drugs may be recommended. Use of drugs with a lower risk of infection with Clostridium difficile is encouraged. Your local policy for surgical prophylaxis will contain the details for each procedure.

Optimal time of administration

Optimal antibiotic levels at the site of incision and for the duration of the operation are required.

This is achieved by giving an intravenous dose of an antibiotic in the 60 minutes prior to knife to skin.

The Scottish Patient Safety Programme peri-operative workstream includes optimal timing of antibiotic prophylaxis.

How many doses?

For most procedures, a single dose given prior to skin incision will provide good antibiotic levels until skin closure is achieved.

For some short acting antibiotics, a second dose is required every 4 hours until the procedure is completed.

Further doses given after theatre are usually only required to treat active infection encountered during the procedure.

Cardiac surgery and orthopaedics are clinical areas where up to 48 hours of therapy may be given post-op.

What about blood loss?

When blood is lost during a procedure, antibiotic is lost. The drug level in the blood and tissues is further diluted when replacement IV fluid is given.

If more than 1500mls of blood is lost, a further dose of antibiotic should be given.

The same dose is given unless specified in the local policy. Some drugs (e.g. gentamicin) require only half the original dose to be given.

Further Reading:

SIGN 104 – quick reference guide

NICE **Clinical Guideline 74** Surgical Site Infection

NES Recognising Surgical Site Infections educational resources

Scottish Antimicrobial Prescribing Group (SAPG) – Good Practice Recommendations for Surgical Prophylaxis

Recommendations for Re-dosing Antibiotics for Surgical Prophylaxis

Activity 11

SURGICAL PROPHYLAXIS

If you have access to appropriate patients, find two patients that have been to theatre and find out what antibiotic prophylaxis was given.

Does SIGN 104 suggest that an antibiotic should be used for this procedure?
Was the right dose given at the right time according to the local policy?
Were any additional doses given and can you find out why?
Speak to the SPSP peri-operative workstream lead about local initiatives
Contact the local infection surveillance team for information on surgical site infection rates (SSI) in your area
Achieved: Yes ☐ No ☐

GENTAMICIN AND VANCOMYCIN

Key factors of Gentamicin therapy:

- Indicated for treatment of gram negative infections and in surgical prophylaxis
- Dosage regimen is individualised for each patient, based on weight and renal function
- Excessive doses or prolonged treatment can lead to renal and/or ototoxicity
- Accurate baseline patient characteristics and regular monitoring of U&Es and gentamicin levels are required to ensure safe and effective use
- Review the need for therapy daily
- Always seek advice from pharmacy, microbiology or an infection specialist if you are not sure what to do
- Scottish Antimicrobial Prescribing Group has endorsed two **guidelines** in NHS Scotland – either Hartford or GGC guidelines

Key factors of Vancomycin IV therapy (Not Oral treatment of CDI):

- First line agent for methicillin-resistant staphylococcus aureus (MRSA) infections
- May be used for surgical prophylaxis in patients at risk of MRSA
- Should not be given orally for systemic infections as it is not significantly absorbed from the gut
- Dosage regimen is individualised for each patient, based on weight and renal function
- Accurate baseline patient characteristics and regular monitoring of creatinine and vancomycin are required to ensure safe and effective use
- See local guidelines for duration of infusion. Administration rate should never exceed 10mg/minute (Doses up to 500mg usually given over 1 hour)
- Review the need for IV vancomycin daily
- IV vancomycin not appropriate for the treatment of CDI – only oral preparation should be used as acts topically in the intestine
- Always seek advice from microbiology or pharmacy if you are unsure how to interpret the result

Other useful resources:

British National Formulary (BNF)

SAPG Model policies for gentamicin and vancomycin

Your local antimicrobial prescribing policy

The NES Gentamicin and Vancomycin (GaV) Education Modules on learnPro (includes clinical scenarios)

Sepsis Management

Sepsis can occur in any clinical situation. It may be due to a primary infection (e.g. pneumonia) or result from clinical interventions for other conditions (e.g. immunosuppressants, chemotherapy, invasive lines).

Severe sepsis, also known as septicaemia or blood poisoning, is the body's systemic response to an infection and results in your body attacking its own organs and tissues. It can rapidly lead to acute physiological deterioration with the risk of multiple organ failure and death.

Early identification of sepsis with appropriate intervention has been shown to improve survival.

Patients and health workers need to work together to ensure life-saving treatment is delivered as soon as possible.

DEFINITIONS:

SEPSIS = infection + systemic inflammatory response

SEVERE SEPSIS = sepsis + organ dysfunction, hypoperfusion or hypotension

SEPTIC SHOCK = sepsis + hypotension despite fluid resuscitation

Early identification and management of Sepsis

Sepsis Six Measurement Plan:

The Sepsis Six Measurement Plan is concerned with the early identification and treatment of established sepsis.

- Consider SEWS and SIRS criteria
- SEWS (Scottish Early Warning Score) of 3 or more THINK SEPSIS
- Are any 2 or more of SIRS criteria present?
- Temperature: less than 36°C or more than 38°C
- Heart rate more than 90 bpm
- Respiratory Rate more than 20 breaths pm
- White Cell Count less than 4 or greater than 12
- AND clinical suspicion of infection
- Note, new confusion may be a sign of infection

The Sepsis Six

The Sepsis Six is a set of interventions which can be delivered by any junior healthcare professional working as part of a team. All you need to deliver the Sepsis Six is a patient with suspected sepsis, a qualified prescriber, basic healthcare equipment and the will to make it happen!

Just by doing these six simple things in the first hour after suspected sepsis has been diagnosed, you can double your patient's chance of survival!

Apply Sepsis six criteria within 1 hour

- Administer high flow oxygen
- Take blood cultures
- Give broad spectrum antibiotics
- Give intravenous fluid challenges
- Measure serum lactate and haemoglobin
- Measure accurate hourly urine output (insert urinary catheter if necessary)

Further information

SPSP Sepsis/VTE collaborative community space at

www.knowledge.scot.nhs.uk/sepsisvte.aspx

RESOURCES AND READING LIST

NHS Education Scotland (NES)
www.nes.scot.nhs.uk/education-and-training/by-theme-initiative/healthcare-associated-infections/educational-programmes/antimicrobial-resistance-and-stewardship.aspx

Scottish Antimicrobial Prescribing Group (SAPG)
www.scottishmedicines.org.uk/SAPG/Scottish_Antimicrobial_Prescribing_Group__SAPG_

Health Improvement Scotland (HIS)
www.healthcareimprovementscotland.org

Health Protection Scotland (HPS)
www.hps.scot.nhs.uk

Health Quality Strategy for NHS Scotland
www.scottishneurological.org.uk/content/res/quality_strategy.pdf

Scottish Government 2020 Vision
www.gov.scot/Topics/Health/Policy/2020-Vision

NHS Scotland Quality Improvement Hub
www.qihub.scot.nhs.uk/default.aspx

Nursing Standards on Infection Prevention and Control
www.healthcareimprovementscotland.org/our_work/inspecting_and_regulating_care/hei_policies_and_procedures/hai_standards_2015.aspx

National Infection Prevention and Control Manual
www.documents.hps.scot.nhs.uk/hai/infection-control/ic-manual/ipcm-p-v2.4.pdf

NES Prevention and Management of Pressure Ulcers
www.nes.scot.nhs.uk/education-and-training/by-theme-initiative/healthcare-associated-infections/educational-programmes/tissue-viability/prevention-and-management-of-pressure-ulcers-an-educational-workbook.aspx

British National Formulary
(You will require an Athens Password to log in)
www.medicinescomplete.com/about/subscribe.htm

Yellow Card Website
www.mhra.gov.uk/yellowcard

NES Aseptic Technique – Taking a Blood Culture Sample and Taking a Specimen for Microbiological Examination
www.nes.scot.nhs.uk/education-and-training/by-theme-initiative/healthcare-associated-infections/online-short-courses/aseptic-technique.aspx

SIGN 104 Antibiotic prophylaxis in surgery quick reference guide
www.sign.ac.uk/pdf/qrg104.pdf

NICE Surgical Site Infection Clinical Guideline 74
www.nice.org.uk/guidance/cg74

NES Recognising Surgical Site Infections
www.nes.scot.nhs.uk/education-and-training/by-theme-initiative/healthcare-associated-infections/training-resources/recognising-surgical-site-infections.aspx

SAPG Good Practice Recommendations for Surgical Prophylaxis
www.scottishmedicines.org.uk/files/sapg1/Good_practice_recommendations_for_surgical_prophylaxis_2014_for_website.pdf

SAPG Recommendations for Re-dosing Antibiotics for Surgical Prophylaxis
www.scottishmedicines.org.uk/files/sapg/SAPG_Recommendations_for_Re-dosing_Antibiotics_for_Surgical_Prophylaxis.pdf

NES GaV Education Modules on LearnPro (includes clinical scenarios)
www.nes.scot.nhs.uk/education-and-training/by-theme-initiative/healthcare-associated-infections/online-short-courses/gav-gentamicin-and-vancomycin.aspx

SAPG Model policies for gentamicin and vancomycin
www.scottishmedicines.org.uk/SAPG/Quality_Improvement/Gentamicin_and_Vancomycin

Sepsis 6
www.qihub.scot.nhs.uk/safe/sepsis.aspx

NMC Code review 2015
www.nmc-uk.org/Documents/NMC-Publications/revised-new-NMC-Code.pdf

Decision aid for diagnosis and management of suspected urinary tract infection (UTI) in older people
www.scottishmedicines.org.uk/files/sapg/SAPG_Decision_aid_for_UTI_in_older_people_-_May_2013.pdf

Decision aid for the management of urinary tract infection
www.scottishmedicines.org.uk/files/sapg1/Decision_aid_for_management_of_CAUTI.pdf

SPSP Sepsis/VTE collaborative community space
www.knowledge.scot.nhs.uk/sepsisvte.aspx

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EVALUATION

Your feedback is valuable to helping us improve our resources. Please take a few minutes to complete the evaluation and let us know your thoughts on the workbook.

Please use the link below to access the online evaluation form.

https://response.questback.com/nhseducationforscotland/amsworkbookfeedback/

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I confirm that the above named person has completed the contents of the antimicrobial stewardship education workbook.

Line Manager/Mentor/Supervisor:

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Learner:

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