Antimicrobial Resistance and Stewardship
Principles in Practice

Kerrie Aitken – AMS Pharmacist
Townsville Hospital and Health Service
LEARNING OBJECTIVES

Principles of Antimicrobial Stewardship in Practice

- Understand the basic AMS Principles
- Discuss the impact of AMR
- Review MINDME
- Highlight AMS in practice initiatives for Infection Control practitioners
Antimicrobial Stewardship
A systematic approach to optimising selection, dosage, route and duration of antimicrobial treatment to:
- Reduce inappropriate antimicrobial use
- Improve patient outcomes
- Reduce adverse consequences of antimicrobial use
- Reduce development of multi-resistant organisms

Inappropriate prescribing is associated with increased adverse effects including:
- Antimicrobial allergy
- Treatment failure
- Toxicity (e.g. ototoxicity)
- Clostridioides difficile (formerly called Clostridium difficile)
- Increased health care costs (i.e. length of stay)
- AMR (current and future patients)
Antimicrobial Resistance and Stewardship – in practice

Why is AMS important?

• Antibiotic use contributes to the development of antibiotic resistance
  – Resistance developed from exposure to an antibiotic may affect the patient, but also affects future patients and the wider community

• Modern medicine, especially surgery and cancer treatments, depends on effective antibiotics to minimise the risk of infection
  – Currently, antibiotics reduce post-operative infection rates to below 2%
  – Without effective antibiotics, this could increase to around 40% to 50%. Up to 30% of these patients could die from resistant bacterial infections
  – The risk of mortality without access to effective antibiotics may make some treatments and surgical procedures too risky to continue

• Antimicrobial resistance results in substantial financial cost for patients and healthcare systems

• Resistance to an antibiotic means the drug is no longer effective against the infecting bacteria
  – intrinsic or acquired → selective pressure

• Examples:
  – Methicillin-resistant *Staphylococcus aureus* (MRSA) cannot be treated with flucloxacillin
  – Vancomycin-resistant enterococci (VRE) cannot be treated with vancomycin
  – Carbapenem-resistant Enterobacteriaceae (CRE) cannot be treated with meropenem or other carbapenems
Antimicrobial Resistance and Stewardship – in practice

Antimicrobial Resistance

“AMR is an increasingly serious threat to global public health that requires action across all government sectors and society”

https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance
UK’s “O’Neill Report” – May 2016
- 1st international report examining the ECONOMIC consequences of AMR
- Gross domestic product would decrease due to AMR \(\rightarrow\) translate to a reduction in global economic output worth US$60 - US$100 trillion

Main recommendations
1. **Reduce antimicrobial demand** by:
   - Massive global awareness campaign
   - Improve hygiene
   - Reduce unnecessary use of antimicrobials in agriculture and their dissemination into the environment
   - Improve global surveillance of drug resistance and antimicrobial consumption in humans and animals
   - Promote new, rapid diagnostics to cut unnecessary use of antibiotics
   - Promote the development and use of vaccines
2. **Increase the number of effective antimicrobials**
3. **Build a global coalition for action on antimicrobial resistance**

• Though AMR is a long-established and slow-moving threat, it is no less dangerous than the COVID-19 pandemic impacting the world today.

• As we’ve seen with COVID-19, we are all still vulnerable to infectious diseases – and, as we scramble to find treatments and vaccines for COVID-19, we see the huge economic and public health costs from a lack of preparedness.
  – Ultimately, being prepared is more cost-effective in the long run.

• Whereas the new coronavirus was not known until early January 2020, AMR is a threat we know.
  – It is here now and only increasing.
  – We know the priority pathogens for which there is an urgent need for new treatments, and AMR has been on the political agenda for years.

Projected AMR deaths by 2050

This looming global crisis has the potential to be as large or even larger than COVID-19 in terms of deaths and economic costs.
Antimicrobial Resistance and Stewardship – in practice

Australia’s response to antimicrobial resistance

Today, we take them for granted, but before 1941, an infection from even a small cut to the skin could kill.

The first patient treated with penicillin was a 43-year-old English policeman who scratched his face on a rose thorn.
- Within a month, the infection spread, his head was covered in abscesses and one eye had to be removed.
- But after just 24 hours of the first treatment with the experimental drug, his temperature dropped, his appetite returned, and the infection began to heal.
- On the fifth day, the supply of penicillin ran out; the man relapsed and died a month later.
The Organisation for Economic Co-operation and Development (OECD) has estimated that an average of 290 people die each year in Australia due to infections from eight resistant bacteria.

- Between 2015 and 2050, it is estimated that 10,430 people will die as a result of AMR.

The rate of antibiotic dispensing under the PBS declined in 2017, following steady increases between 2013 and 2015. This is the first downward trend in community antibiotic dispensing since the late 1990s.

In 2017, 41.5% (n = 10,215,109) of the Australian population had at least one systemic antibiotic dispensed under the PBS/RPBS.

Australia remains in the top 25% of countries with the highest community antimicrobial use (compared with European countries and Canada).

The most commonly dispensed antibiotics under the PBS/RPBS continue to be cefalexin, amoxicillin and amoxicillin–clavulanic acid.

April 2020: The PBAC amended the maximum quantity and repeats for the top five most commonly prescribed PBS-listed antibiotic medications: amoxicillin, amoxicillin with clavulanic acid, cefalexin, doxycycline and roxithromycin.

Maximum quantities were amended to reflect a full course of antibiotic treatment to be dispensed in one prescription for specific indications. Short courses of antibiotics will continue to be available with nil repeats.

These changes are intended to encourage clinicians to prescribe antibiotic repeats only when clinically indicated, thus reducing inappropriate prescribing and increasing quality use of antibiotic medicines.
Principles of Antimicrobial Therapy

Hospital NAPS 2018

Antimicrobial prescribing practice in Australian hospitals
Results of the 2018 Hospital National Antimicrobial Prescribing Survey

Table 7: Reasons for a prescription being assessed as inappropriate, Hospital NAPS contributors, 2018

<table>
<thead>
<tr>
<th>Reason</th>
<th>Yes</th>
<th>No</th>
<th>Not specified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectrum too broad</td>
<td>23.7%</td>
<td>40.4%</td>
<td>36.9%</td>
</tr>
<tr>
<td>Incorrect dose or frequency</td>
<td>20.3%</td>
<td>45.7%</td>
<td>34.0%</td>
</tr>
<tr>
<td>Incorrect duration</td>
<td>20.0%</td>
<td>47.6%</td>
<td>32.4%</td>
</tr>
<tr>
<td>Antimicrobial not required</td>
<td>16.0%</td>
<td>50.9%</td>
<td>32.5%</td>
</tr>
<tr>
<td>Spectrum too narrow</td>
<td>8.0%</td>
<td>52.3%</td>
<td>39.7%</td>
</tr>
<tr>
<td>Incorrect route</td>
<td>4.0%</td>
<td>55.2%</td>
<td>34.8%</td>
</tr>
</tbody>
</table>

n=4,773
Figure 5: The 20 most common antimicrobials prescribed by Hospital NAPS contributors, by percentage, 2013–2018

Figure 6: Appropriateness for the most commonly prescribed antimicrobials in Hospital NAPS contributor hospitals, 2018

Antimicrobial Resistance and Stewardship – in practice

Hospital NAPS 2018

Figure 9: The 20 most common indications for prescribing antimicrobials in Hospital NAPS contributors, 2013–2018

Figure 10: Appropriateness of prescribing for the 20 most common indications in the Hospital NAPS contributors, 2018

Bacteremia, Gram positive

Osteomyelitis

Fever and neutropenia

Medical prophylaxis

Peritonitis

Diabetic foot infection

Sepsis

Pyelonephritis

Pneumonia, hospital acquired

DVT

Pneumonia, community acquired

Osteomyelitis

Cellulitis/erysipelas

Cutaneous and mucosal candidiasis

Chronic obstructive pulmonary disease (COPD)

Pneumonia, aspiration

Sepsis

Pyelonephritis

Wound infection, surgical site

Pneumonia, hospital acquired

Fungal skin and nail infections

Wound infection, non-surgical

Bacteremia, Gram positive

Diverticulitis

Cutaneous and mucosal candidiasis

Fungal skin and nail infections

Wound infection, surgical site

Bacteremia, Gram positive

Diverticulitis

Cutaneous and mucosal candidiasis

Fever and neutropenia

Diabetic foot infection

Percentage of total prescription indications from NAPS contributors (%)


2013

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Percentage appropriateness (%)

Appropriate Not assessable Inappropriate
The thoughtless person playing with penicillin treatment is morally responsible for the death of the man who succumbs to infection with the penicillin-resistant organism.

Sir Alexander Fleming
Antimicrobial Resistance and Stewardship – in practice

Why AMS is important

- Very few antibiotics have been developed in the last 20 years
  - Financial incentive
- Most ‘new’ antibiotics are variations of existing antibiotics
- Only 5 novel classes have been developed in the last 20 years.
In July 2020, more than 20 leading biopharmaceutical companies announced the AMR Action Fund that will invest in developing innovative antibacterial treatments.

- The Fund aims to bring 2-4 new treatments to patients by 2030.

Recent bankruptcies have shown how small antibiotics companies struggle to survive in the current market environment.

- The process of getting new drugs to market is cost intensive as new antibacterial treatments have to be underpinned with rigorous data that are derived from a series of complex and costly clinical trials to demonstrate their advantages over existing treatment regimens.

The AMR Action Fund will invest, through equity or debt, in small companies developing innovative antibacterial treatments that target existing public health priorities.

The WHO review of the clinical antibiotic pipeline identifies a number of potential investment candidates.

- Currently, there are only 32 antibacterial treatments, in clinical development, targeting the WHO’s list of priority pathogens and of these, only 6 fulfil at least one of the innovation criteria as defined by WHO.

The latest WHO review of the preclinical pipeline revealed that new and innovative approaches are emerging in the development of antibacterial agents; of the 252 antibacterial agents that were in preclinical development, over one-third were non-traditional products.

- The next WHO clinical pipeline review will expand to include non-traditional products such as phages and other new innovative approaches to overcome antibacterial resistance.
Antimicrobial Resistance and Stewardship – in practice

Antimicrobials are Unique

• In general, the impact or consequences of medications are limited to the patient taking them
  – Adverse Effects individual specific

• Antimicrobials are different!
  – Use of antimicrobials has an impact not just for the patient using them but the global community as well

The tragedy of the commons

**Individual benefit:**
Immediate effectiveness of antibiotics against disease

**Common externalities:**
Other patients: antibiotic-resistant infections
Society: reduced antibiotic effectiveness and higher healthcare costs
• Consider benefits versus harms of antimicrobial therapy

  – **Direct Adverse Effects:**
    – Non-immune-mediated, pharmacologically predictable reactions e.g. diarrhoea, nausea
    – Immune-mediated non-severe delayed reactions e.g. rash
    – Severe or life threatening immune-mediated hypersensitivity reactions e.g. anaphylaxis, SCAR

      *Always check if a patient has a history of antimicrobial hypersensitivity*

  – **Indirect Adverse Effects:**
    – Effects on both commensal and environmental flora
    – Antibiotics disrupt the microbiome

      → **problems ranging from mild yeast infections (eg thrush) through to more serious infections (e.g. *Clostridium difficile*).**

    – Antibiotics can lead to the development of resistance

      → **increased risk of colonisation or infection with a drug-resistant pathogen**
Antimicrobial Resistance and Stewardship – in practice

“ONE HEALTH”

Antibiotic resistance happens when bacteria change and become resistant to the antibiotics used to treat the infections they cause.

Antibiotics are given to patients, which can result in drug-resistant bacteria developing in the gut.

Patient attends hospital or clinic.

Drug-resistant bacteria spreads to other patients through poor hygiene and unclean facilities.

Drug-resistant bacteria spreads to the general public.

Drug-resistant bacteria reaches humans through food, the environment (water, soil, air) or by direct human-animal contact.

Antibiotics are given to food producing animals and crops.

Animals develop drug-resistant bacteria in their gut.

Antimicrobial Stewardship isn’t about “not using antimicrobials” but rather “identify that small group of patients who really need antibiotic treatment and then explain, reassure and educate the large group of patients who don’t”

- Stewardship means to protect something
- AMS is a systematic approach to optimising the use of antimicrobials
- Goals of AMS are to:
  - improve patient outcomes / patient safety
  - reduce antimicrobial resistance
  - reduce costs.
- AMS works hand-in-hand with infection prevention and control, and environmental cleaning strategies
In hospitals, the incidence of MRO has been correlated with the use of broad-spectrum antimicrobials.
- Third-generation cephalosporins and the prevalence of ESBL-producing organisms

Association at the individual level
- Longstanding changes to an individual’s microorganisms (microbiome)

Persistence of antimicrobial resistance
- Once resistant organisms have been introduced into a particular setting, they may persist even if the selective pressure of inappropriate antimicrobial use is removed.
- This can make it difficult to prove that a reduction in the use of antimicrobials will result in a concomitant decrease in AMR, and reflects the complexity of resistance emergence, transmission and persistence.
- Additionally, even if antimicrobial use at one institution is effectively managed, frequent movement of patients between institutions, and lapses in infection prevention and control practices, can reintroduce resistant organisms.
- This highlights the importance of a multifaceted approach to minimising AMR, including robust infection control management and AMS activities.
In a meta-analysis - AMS activities in hospitalised patients:

- Reduced AMR rates by 34% (incidence rate ratio [IRR] 0.66; 95% confidence interval [CI] 0.47, 0.93; P = 0.02)
- Reduced C. difficile colonisation by 62% (IRR 0.38; 95% CI 0.23, 0.65; P < 0.001)
- Were more effective in reducing AMR among gram-positive bacteria (43% reduction) than gram-negative bacteria (28% reduction);
  - MRSA (49% reduction; IRR 0.51; 95% CI 0.33, 0.80)
  - carbapenem-resistant gram-negative bacteria (48% reduction; IRR 0.52; 95% CI 0.32, 0.84)
- Did not appear to be effective in reducing vancomycin-resistant enterococci rates.

Studies have demonstrated that reducing the overall use of antimicrobials, combined with improved infection control precautions, reduces the incidence of nosocomial C. difficile infection.

- Restricting use of antibiotics deemed high risk for C. difficile infection has been associated with significant reductions in targeted antibiotics and C. difficile infection rates.
- The 2017 Cochrane review of interventions to improve antimicrobial prescribing in hospitalised patients reported an association of planned AMS interventions with a consistent reduction in C. difficile infection (median –48.6%; interquartile range –80.7% to –19.2%).
• It is important to consider the drivers behind behaviour, and to target interventions and messages accordingly
• Organisational culture
  – Different cultural factors, encompassing how the organisation operates and communicates, may influence the success of an AMS program.
• Cultural factors that may support successful AMS include
  – Management and workforce
    – endorsement and recognition from management
    – engagement of clinical leaders
    – institutional buy-in
    – awareness of, or practical access to, antimicrobial prescribing guidelines and resources
  – Communication – collaborative styles of communication
  – Relationships – respectful and trusting – collegial and collaborative – multidisciplinary engagement
  – Conflict management – leadership support – direct communication with those who resist change.
Clinical Excellence Commission

Recommendation 3: Focus on interventions which **build relationships of inter- and intra-disciplinary support**, and which **break down cultural, social and political barriers** to appropriate antibiotic prescribing.

- The vast majority of antimicrobial prescriptions in hospitals are written by junior doctors, however it is the senior-level clinicians who are providing either direct instruction or bearing indirect influence over antimicrobial decision-making.

- Due to a strong perception of disempowerment amongst junior prescribers, the engagement of senior clinicians is absolutely critical in attempting to change antimicrobial prescribing practice.
Emotional, cognitive and social factors of antimicrobial prescribing: can antimicrobial stewardship intervention be effective without addressing psycho-social factors?

V. Donisi¹,², M. Sibani², E. Carrara², L. Del Piccolo¹, M. Rimondini¹, F. Mazaferri², C. Bovo³ and E. Tacconelli²,⁴,*

¹Clinical Psychology, Department of Neurosciences, Biomedicine and Movement Sciences, University of Verona, Verona, Italy; ²Infectious Disease, Department of Diagnostics and Public Health. University of Verona, Verona, Italy; ³Medical Direction. University Hospital of Verona, Verona, Italy; ⁴Infectious Diseases, J Antimicrob Chemother 2016; 71: 2295 - 2299

What prevents the intravenous to oral antibiotic switch? A qualitative study of hospital doctors’ accounts of what influences their clinical practice

Jennifer Broom¹,², Alex Broom³, Kate Adams⁴ and Stefanie Plage³,*

¹Department of Medicine, Sunshine Coast Hospital and Health Service, PO Box 547, Nambour, QLD 5470, Australia; ²The University of Queensland, Brisbane, QLD 4072, Australia; ³School of Social Sciences, The University of New South Wales, Sydney, NSW 2052, Australia; ⁴Hull and East Yorkshire NHS Trust, Kingston upon Hull HU3 2JZ, UK
Sustainability of Handshake Stewardship: Extending a Hand Is Effective Years Later

Christine E. MacBrayne,1 Monon C. Williams,2 Claire Lovek,3 Jasen Child,1 Kotty Pearce,4 Meghan Birkholz,2 James K. Todd,5 Amanda L. Harst,1 and Sarah K. Parker2

1Department of Pharmacy Children’s Hospital Colorado, University of Colorado, Aurora, Colorado, USA; 2Department of Pediatrics, Section of Pediatric Infectious Diseases, Children’s Hospital Colorado, University of Colorado School of Medicine, Aurora, Colorado, USA; 3Department of Pediatrics and Child Health Research Biostatistical Core, Children’s Hospital Colorado, University of Colorado School of Medicine, Aurora, Colorado, USA; 4Department of Infection Prevention and Control, Children’s Hospital Colorado, University of Colorado, Aurora, Colorado, USA; and 5Department of Pediatrics, Section of Pediatric Infectious Diseases and Department of Infection Prevention and Control, Children’s Hospital Colorado, University of Colorado School of Medicine, Aurora, Colorado, USA

Can the Perfect Handshake Hold the Key to Success and Sustainability of Antimicrobial Stewardship Programs?

Debra A. Goff,1 and Ravina Kullar2

1The Ohio State University College of Pharmacy, The Ohio State University Wexner Medical Center, Columbus and 2Expert Stewardship, Inc, Newport Beach, California
Knowledge, awareness, and attitude towards infection prevention and management among surgeons: identifying the surgeon champion


Abstract
Despite evidence supporting the effectiveness of best practices of infection prevention and many surgeons worldwide fail to implement them. Evidence-based practices tend to be underused in surgery. Surgeries with knowledge in surgical infections should provide feedback to prescribers and integrate among surgeons and implement changes within their team. Identifying a local opinion leader to champion within the surgical department may be important. The “surgeon champion” can integrate best clinical practices of infection prevention and management, drive behavior change in their colleagues, and interact with both infection control teams in promoting antimicrobial stewardship.

Keywords: Surgeon, Infection, Prevention, Antibiotic therapy

How can collective leadership influence the implementation of change in healthcare?

Chun-Mei Ly a, Li Zhang b, c

a Nursing Administration Department, The First People’s Hospital of Foshan, Foshan, Guangdong 528000, China
b Nursing Administration Department, Foshan Hospital Affiliated to Sun Yat-sen University, Foshan, Guangdong 528030, China

ARTICLE INFO

Article history:
Received 26 May 2017
Received in revised form 7 July 2017
Accepted 24 August 2017
Available online 16 October 2017

Keywords:
Collective leadership
Health care organizations
Change
Barrier
Kotter’s 8-step process

ABSTRACT

Aim: This study focuses on how a collective leadership style could influence the implementation of change in healthcare.

Method: Kotter’s 8-step process and leadership can guide the implementation of change. Collective leadership can highlight all levels of staff engagement, establish an organizational culture of learning and trust, and create continuous improvement. At the same time, it can formulate a well-designed plan to develop efficient strategies; communicate and empower the staff; assess the performance; and integrate the improvement.

Results: Collective leadership can establish vision and trust, highlight all levels of staff engagement, establish an organizational culture of learning and trust, create continuous improvement, communicate and empower the staff and integrate the improvement.

Conclusions: Collective leadership can be a powerful way to overcome the barrier and create an effective environment of adaptation of changes by analyzing Kotter’s eight stage process.

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Antimicrobial Resistance and Stewardship – in practice

AMS in Australia

National Safety and Quality Health Service Standards

→ **Standard 3: Preventing and Controlling Healthcare-Associated Infections**

→ The number of hospitals with AMS increased from 36% in 2010 to 98% in 2015

→ Formularies restricting use of broad-spectrum antimicrobials increased from 41% to 86%

→ Inappropriate use of antimicrobials decreased by 12.6%
Antimicrobial Stewardship Clinical Care Standard

• Describes best-practice in antibiotic prescribing:
  1. Urgent treatment of severe infection
  2. Appropriate investigations collected (preferably before antibiotics)
  3. Information given to patient about diagnosis
  4. Prescribing as per Therapeutic Guidelines: Antibiotic (or other local guidelines)
  5. Information given to patient about treatment
  6. Documentation of treatment plan in the record
  7. Narrowing of broad-spectrum empiric treatment when appropriate
  8. Investigations reviewed in a timely way
  9. Surgical prophylaxis in accordance with guidelines
## Antimicrobial Resistance and Stewardship – in practice

### Essential strategies for AMS Programs

<table>
<thead>
<tr>
<th>Pre-prescription</th>
<th>Post-prescription</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formulary management</td>
<td>Direct patient input e.g. AMS Round</td>
</tr>
<tr>
<td>Restriction System</td>
<td>Audit and Feedback</td>
</tr>
<tr>
<td>Guidelines</td>
<td>Monitor appropriateness – National Antimicrobial Prescribing Survey (NAPS)</td>
</tr>
<tr>
<td>Education</td>
<td>Monitor utilisation – National Antimicrobial Utilisation Surveillance Program (NAUSP)</td>
</tr>
<tr>
<td>Antibiograms (susceptibility of microorganisms to antimicrobials)</td>
<td>Education</td>
</tr>
<tr>
<td>Selective reporting of susceptibility testing</td>
<td>Electronic solutions - eMeds – automatic stops</td>
</tr>
<tr>
<td>Confirming patient’s allergy status</td>
<td>IV to Oral switch</td>
</tr>
</tbody>
</table>

Antimicrobial Stewardship – not just for hospitals

• In the community
  – General Practice
    – Not prescribing antibiotics for colds and flu
    – Delayed prescribing
    – Shared decision making
    – Public declarations in the practice about conserving antibiotics
  – Pharmacies
    – Offering symptomatic support for cold and flu

• In the home
  – Not taking antibiotics that haven’t been prescribed for you
  – Discarding old antibiotic medicines appropriately

• In industry
  – Investing in research and development for antimicrobials

### Antimicrobial Stewardship – not just for hospitals

<table>
<thead>
<tr>
<th>Component of general practice</th>
<th>Strategies for antimicrobial stewardship (AMS)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Health Networks</strong></td>
<td>Promote Antibiotic Awareness Week.</td>
</tr>
<tr>
<td></td>
<td>Establish a local antimicrobial stewardship advisory group.</td>
</tr>
<tr>
<td></td>
<td>Promote antimicrobial stewardship through education, information resources and tools for schools, childcare centres and community groups.</td>
</tr>
<tr>
<td><strong>General practice owners</strong></td>
<td>Promote the Antimicrobial Stewardship Clinical Care Standard [NSI].</td>
</tr>
<tr>
<td></td>
<td>Provide staff with access to Therapeutic Guidelines: Antibiotic.</td>
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<tr>
<td></td>
<td>Encourage participation in audit and feedback on antimicrobial prescribing at a practice level.</td>
</tr>
<tr>
<td><strong>General practitioners</strong></td>
<td>Participate in online learning modules on antimicrobial stewardship.</td>
</tr>
<tr>
<td></td>
<td>Demonstrate commitment to antimicrobial stewardship using a “commitment poster”.</td>
</tr>
<tr>
<td></td>
<td>Prescribe according to Therapeutic Guidelines: Antibiotic.</td>
</tr>
<tr>
<td></td>
<td>Configure clinical software to default to zero repeats for antimicrobials.</td>
</tr>
<tr>
<td></td>
<td>Specify the duration of antimicrobial therapy on the prescription.</td>
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<tr>
<td></td>
<td>Use shared decision making with consumers for antimicrobial decisions, when appropriate.</td>
</tr>
<tr>
<td></td>
<td>Use delayed antimicrobial prescriptions in selective situations for management of upper respiratory tract infections.</td>
</tr>
<tr>
<td></td>
<td>Participate in audit and feedback activities for prescribing of antimicrobials.</td>
</tr>
<tr>
<td></td>
<td>Discuss vaccination to minimise need for antibiotics.</td>
</tr>
<tr>
<td><strong>General practice staff</strong></td>
<td>Implement infection control and prevention strategies according to rational guidelines.</td>
</tr>
<tr>
<td></td>
<td>Provide displays (eg posters, videos, information pamphlets) for consumers.</td>
</tr>
<tr>
<td></td>
<td>Promote up-to-date immunisation.</td>
</tr>
</tbody>
</table>

NE1: See the Australian Commission on Safety and Quality in Healthcare website.
## AMS in Australia

### Antibiotic Prescribing in Primary Care: Therapeutic Guidelines Summary Table 2019

This table summarises information in eTG complete about the management of common conditions in primary care. For detailed and up-to-date information, including second-line treatment options and management of special patient groups (eg, penicillin hypersensitivity, renal impairment), see eTG complete.

This table should be used in conjunction with clinical judgment. Prescribers should consider the harm-benefit profile of a drug in each patient (eg, consider potential drug interactions).

Antibiotics that are overused in primary care include amoxicillin + clavulanate, cefalexin, cefadroxil, roxithromycin and erythromycin.

<table>
<thead>
<tr>
<th>Indication</th>
<th>First-line therapy</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>acute rhinosinusitis</td>
<td>symptomatic treatment</td>
<td>Antibiotic treatment is required rarely—most cases are viral. See eTG complete for more information and resources to support discussion with the patient or carer.</td>
</tr>
<tr>
<td>acute otitis media</td>
<td>symptomatic treatment for most cases</td>
<td>80% of cases spontaneously resolve without antibiotic treatment. Advise the carer to return if symptoms do not improve within 72 hours. Consider a delayed prescription for antibiotic therapy. Treat the following groups: infants younger than 6 months; children younger than 2 years with bilateral infection; children who are systemically unwell (eg, lethargic, pale; fever alone is not sufficient); children who have otitis media; Aboriginal or Torres Strait Islander children; patients at risk of complications (eg, immunocompromised children). See eTG complete for the dose of amoxicillin. See eTG complete for resources to support discussion with the patient or carer.</td>
</tr>
<tr>
<td>acute pharyngitis/tonsillitis</td>
<td>symptomatic treatment for most cases</td>
<td>Most cases are viral. Even if infection is bacterial, antibiotic treatment is not required unless the patient is at increased risk of rheumatic fever (eg, Aboriginal and Torres Strait Islander Australians, patients with scarlet fever)—see eTG complete for the dose of phenoxymethylpenicillin. See eTG complete for resources to support discussion with the patient or carer.</td>
</tr>
<tr>
<td>acute bronchitis</td>
<td>symptomatic treatment</td>
<td>Antibiotic treatment is not indicated—over 90% of cases are viral. See eTG complete for resources to support discussion with the patient or carer.</td>
</tr>
<tr>
<td>mild infective exacerbation of COPD</td>
<td>amoxicillin 500 mg orally, 8-hourly for 5 days</td>
<td>Antibiotic treatment has little benefit for patients managed in the community with less severe COPD; for every 100 patients treated with antibiotics, only 8 patients will be better by 4 weeks because they took antibiotics. Consider a delayed prescription for antibiotic therapy. See eTG complete for more information and resources to support discussion with the patient or carer.</td>
</tr>
<tr>
<td>community-acquired pneumonia in adults: low-severity (mild)</td>
<td>amoxicillin 1 g orally, 8-hourly. If the patient has significantly improved after 2 to 3 days, treat for 5 days. If the clinical response is slow, treat for 7 days</td>
<td>Asses the patient's pneumonia severity, comorbidities and social circumstances to decide whether to admit the patient to hospital; see eTG complete. See eTG complete for risk factors for infection caused by atypical bacteria. Patient review within 48 hours is essential. If patient follow-up within 48 hours may not occur, consider using initial combination therapy with clarithromycin instead; see eTG complete. If the patient is not improving after 48 hours of monotherapy, see eTG complete.</td>
</tr>
<tr>
<td>pneumonia in residents of aged-care facilities: oral therapy</td>
<td>amoxicillin 1 g orally, 8-hourly. If the patient has significantly improved after 2 to 3 days, treat for 5 days. If the clinical response is slow, treat for 7 days</td>
<td>Consider whether a viral infection could be the cause of symptoms. See eTG complete for indications for parenteral therapy. If infection caused by atypical bacteria (eg, Legionella species) is suspected, see eTG complete. Patient review within 48 hours is essential; see eTG complete if the patient is not improving.</td>
</tr>
<tr>
<td>localised odontogenic infection</td>
<td>dental treatment</td>
<td>Prescribe analgesia and refer the patient to the dentist. Explain that antibiotic treatment without dental intervention will not be effective. If dental treatment will be delayed or the infection is spreading, see eTG complete.</td>
</tr>
</tbody>
</table>

Antimicrobial Resistance and Stewardship – in practice

AMS – Endorsed Recommendations

The Thoracic Society of Australia and New Zealand
- Recommendations
  1. Do not prescribe antibiotics for exacerbation of asthma.

The Royal Australian College of General Practitioners
- Recommendations
  1. Do not treat otitis media (middle ear infection) with antibiotics, in non-Indigenous children aged 2-12 years, where reassessment is a reasonable option.

The Australasian College of Dermatologists
- Recommendations
  1. Monotherapy for acne with either topical or systemic antibiotics should be avoided.
  2. Do not routinely prescribe antibiotics for inflamed epidermoid cysts (formerly called sebaceous cysts) of the skin.
  3. Do not assume that bilateral redness and swelling of both lower legs is due to infection unless there is clinical evidence of sepsis such as malaise, fever and neutrophilia, plus an expanding area of redness or swelling over a period of hours to days.

The Australasian College of Surgeons
- Recommendations
  1. Don’t prescribe oral antibiotics for uncomplicated acute discharge from grommets.
  2. Don’t prescribe oral antibiotics for uncomplicated acute otitis externa.

College of Intensive Care Medicine of Australia and New Zealand
- Recommendations
  1. Consider antibiotic de-escalation daily.

The Society of Hospital Pharmacists of Australia
- Recommendations
  1. Don’t initiate an antibiotic without an identified indication and a predetermined length of treatment or review date.

Australasian Society for Infectious Diseases
- Recommendations
  1. Do not take a swab or use antibiotics for the management of a leg ulcer without clinical infection.
  2. Avoid prescribing antibiotics for upper respiratory tract infection.
  3. Do not use antibiotics in asymptomatic bacteriuria.

Australian and New Zealand Intensive Care Society
- Recommendations
  1. Consider antibiotic de-escalation daily.

Australian and New Zealand Society for Geriatric Medicine
- Recommendations
  1. Do not use antimicrobials to treat bacteriuria in older adults where specific urinary tract symptoms are not present.


Slide 36
• There are often high rates of antibiotic use in residential aged-care facilities.

• Care providers can implement organisation-wide antimicrobial stewardship activities to promote safe and effective use of antimicrobials for residents.

• These activities should complement good infection prevention and control strategies, and support the efforts of general practitioners who care for residents.

• Examples of antimicrobial stewardship activities in residential aged-care facilities include:
  – educating staff about antibiotic resistance and antimicrobial stewardship, viral versus bacterial infections, and recognition of suspected infection
  – providing information for residents and families about infection prevention and antibiotic use
  – participating in audit activities such as the Aged Care National Antimicrobial Prescribing Survey
Antimicrobial Stewardship

AMS in a nutshell – a balance

- Antimicrobial Stewardship

**MIND ME**

- Identify source of infection to narrow empiric treatment
- Importance of appropriate empiric therapy
- Mortality increase when initial therapy is inappropriate
- De-escalation of empiric therapy with cultures and sensitivities
- Increase in resistance with broad spectrum antimicrobial use
- Cost increase with broad spectrum antimicrobials
- Risk of toxicity and adverse drug reactions
The Antimicrobial Creed - MINDME

- Microbiology guides therapy (wherever possible)
- Indications should be evidence-based
- Narrowest spectrum therapy required
- Dosage individualised to the patient and appropriate to the site and type of infections
- Minimise duration of therapy
- Ensure monotherapy where appropriate
### Appropriate Prescribing

**Box** Best-practice antimicrobial prescribing in general practice

**Do:**
- consider microbiological testing to direct therapy (e.g., urinary tract infection, abscess), especially when the causative organism is difficult to predict (e.g., recurrent or unresponsive infection, or overseas travel)
- use the current version of Therapeutic Guidelines: Antibiotic, or available local guidelines
- know why you are prescribing the antibiotic (document indication and duration in the medical record)
- prescribe the shortest duration of therapy (or total number of tablets), even if this means the pharmacist breaking the pack.

**Don’t:**
- culture every infection, or potential infection (especially urine in residential aged-care facilities)
- prescribe an antimicrobial without an appropriate indication
- routinely provide a repeat prescription.

---

**Table** Recommended antibiotic prescribing for common bacterial infections

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Indications for antibiotic therapy</th>
<th>First-line antimicrobial (if indicated)</th>
<th>Duration</th>
<th>Tablets (for maximum adult dose)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute otitis media</td>
<td>&lt;6 months old, or systemic symptoms, or indigenous community</td>
<td>Non-indigenous: amoxicillin 12-hourly</td>
<td>5 days†</td>
<td>20 x 500 mg</td>
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<tr>
<td></td>
<td></td>
<td>Indigenous: amoxicillin 12-hourly</td>
<td>7 days†</td>
<td>20 x 500 mg</td>
</tr>
<tr>
<td>Community-acquired pneumonia (child can review progress in 48 hours)</td>
<td>Adults: amoxicillin 8-hourly, or doxycycline 12-hourly</td>
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<td>5-7 days‡</td>
<td>30 x 500 mg / 10 x 100 mg</td>
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<td>Children:</td>
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<td></td>
<td>1 month to &lt;6 months: azithromycin daily</td>
<td>3-5 days†</td>
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<tr>
<td></td>
<td>6-12 months: amoxicillin 8-hourly</td>
<td>3-5 days†</td>
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<tr>
<td></td>
<td>5 years or older: amoxicillin 8-hourly†</td>
<td>3-5 days†</td>
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<tr>
<td>Uncomplicated urinary tract infection</td>
<td>Non-pregnant women: trimethoprim daily</td>
<td>3 days‡</td>
<td>3 x 300 mg</td>
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<td></td>
<td>Pregnant women: cefalexin or nitrofurantoin 12-hourly</td>
<td>5 days‡</td>
<td>10 x 500 mg / 10 x 100 mg</td>
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<tr>
<td></td>
<td>Men: trimethoprim daily</td>
<td>7 days‡</td>
<td>7 x 300 mg</td>
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<tr>
<td></td>
<td>Children ≥1 month: trimethoprim/ sulfamethoxazole 12-hourly</td>
<td>3-5 days‡</td>
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<tr>
<td>Cephalosporin (mid, low risk for meticillin-resistant Staphylococcus aureus)</td>
<td>Dicloxacillin or flucloxacillin 6-hourly, or phenoxymethylpenicillin 6-hourly**</td>
<td>5 days‡††</td>
<td>20 x 500 mg</td>
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<td></td>
<td></td>
<td></td>
<td>5 days‡††</td>
<td>20 x 500 mg</td>
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<tr>
<td>Impetigo</td>
<td>Non-remote setting:</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Localised lesion: topical mupirocin</td>
<td>7 days</td>
<td></td>
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<tr>
<td></td>
<td>• Multiple lesions/recurrent dicloxacillin or flucloxacillin 6-hourly</td>
<td>7-10 days††</td>
<td>40 x 500 mg</td>
<td></td>
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<tr>
<td></td>
<td>Remote setting:</td>
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<tr>
<td></td>
<td>• trimethoprim/sulfamethoxazole 12-hourly, or benzylpenicillin intramuscular</td>
<td>5 days†</td>
<td>10 x 160/800 mg</td>
<td></td>
</tr>
<tr>
<td>Access (low risk for meticillin-resistant Staphylococcus aureus)</td>
<td>Dicloxacillin or flucloxacillin 6-hourly, as an adjunct to incision and drainage</td>
<td>7 days††</td>
<td>20 x 500 mg</td>
<td></td>
</tr>
</tbody>
</table>
Antimicrobial Resistance and Stewardship – in practice

Appropriate Prescribing – Pharmacy perspective

Deliver the correct DRUG for the BUG

At the correct CONCENTRATION

To the SITE of infection

Nurses and midwives make up more than half of the Australian health workforce and are involved in all aspects of patient care.

Nurses are a constant in the patient journey and advocate for patients, and their contribution to patient safety and quality of care is acknowledged.

Examples include:
- recognising signs of sepsis
- assessing infection risk and making decisions about precautions to be put in place
- implementing standard and transmission based precautions and practices to prevent infections associated with invasive medical devices
- administering antimicrobials safely
- monitoring patient responses
- educating patients and their carers about safe and appropriate medication use.

Nurses and midwives can play a significant role in AMS by embedding AMS principles into routine practice.
Antimicrobial Stewardship

Nurses: Under-utilised AMS Resource

Position Statement
The Role of the ICP in Antimicrobial Stewardship

ACIPC Recommends

Infection control practitioners bring specific expertise and should be part of a multidisciplinary antimicrobial stewardship program that is supported by clinicians with professional expertise in antimicrobial use (infectious diseases physicians, pharmacists and microbiologists). This expertise may be provided onsite, or as part of a network or group arrangement.

Infection control practitioners can participate in AMS through:

- advising on appropriate governance structures for AMS.
- a patient-centric approach to managing risk.
- making current endorsed therapeutic guidelines on antimicrobial prescribing readily available.
- participating in multidisciplinary antimicrobial stewardship committees that include infectious diseases physicians, general practitioners, pharmacists, microbiologists, and nurses.
- educating healthcare workers on infection prevention and control strategies to minimise risk and transmission of antimicrobial resistance, including safe and appropriate antibiotic use.
- advising healthcare workers on appropriate specimen collection procedures, different types of microbes and infections, and local resistance patterns.
- undertaking surveillance of antimicrobial-resistant organisms, healthcare-associated infections, and in some circumstances, surveillance of antimicrobial usage and appropriateness.
- reporting and providing feedback to teams on surveillance data.

Table 12.4: Areas of influence for infection control practitioners

<table>
<thead>
<tr>
<th>Participating roles</th>
<th>Leading roles, in collaboration with other experts (on site or remote)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Promoting compliance with standard and transmission-based precautions, including hand hygiene</td>
<td>• Triaging patients for post-prescription review at 48–72 hours</td>
</tr>
<tr>
<td>• Educating and providing information to clinicians, students, consumers and others</td>
<td>• Coordinating Antibiotic Awareness Week activities</td>
</tr>
<tr>
<td>• Undertaking surveillance and providing information to incorporate feedback on - local infection patterns - local pathogen antimicrobial resistance patterns - local infection patterns - local antimicrobial prescribing patterns</td>
<td>• Informing senior management and relevant committees about the AMS program</td>
</tr>
<tr>
<td>• Translating information about patient outcomes into educational opportunities</td>
<td>• Coordinating, or actively participating in, AMS ward rounds</td>
</tr>
<tr>
<td>• Facilitating the implementation of clinical care bundles to reduce infection in high-risk situations (e.g. CAUTI, CLABSI, PIVC, VAP)</td>
<td>• Implementing intravenous-to-oral switching programs</td>
</tr>
<tr>
<td>• Providing expert advice to clinicians, patients and carers</td>
<td>• Auditing, evaluating and reporting on antimicrobial use, including quality indicators</td>
</tr>
<tr>
<td>• Promoting uptake of, and compliance with, national standards for AMS</td>
<td>• Conducting AMS research</td>
</tr>
<tr>
<td>• Participating in AMS committees or AMS team rounds</td>
<td></td>
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<tr>
<td>• Supporting nurses and midwives in resolving disagreements about adherence to antimicrobial prescribing guidelines</td>
<td></td>
</tr>
</tbody>
</table>

AMS = antimicrobial stewardship; CAUTI = catheter-associated urinary tract infection; CLABSI = central line-associated bloodstream infection; PIVC = peripheral intravenous cannula; VAP = ventilator-associated pneumonia

Source: Nagel et al.14


## Antimicrobial Stewardship

### Nurses: Under-utilised AMS Resource

<table>
<thead>
<tr>
<th>Table 1. Overlap of Nursing Activities With Function Attribution in Current Antimicrobial Stewardship Models</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient admission</strong></td>
</tr>
<tr>
<td>Triage and appropriate isolation</td>
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<tr>
<td>Accurate allergy history</td>
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<td>Early and appropriate cultures</td>
</tr>
<tr>
<td>Timely antibiotic initiation</td>
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<tr>
<td>Medication reconciliation</td>
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<tr>
<td>Daily (24 h) clinical progress monitoring</td>
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<tr>
<td>Progress monitor and report</td>
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<tr>
<td>Preliminary micro results and antibiotic adjustment</td>
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<tr>
<td>Antibiotic dosing and de-escalation</td>
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<tr>
<td>Patient safety &amp; quality monitoring</td>
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<tr>
<td>Adverse events</td>
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<tr>
<td>Change in patient condition</td>
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<tr>
<td>Final culture report and antibiotic adjustment</td>
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<tr>
<td>Antibiotic resistance identification</td>
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<tr>
<td>Clinical progress/patient education/discharge</td>
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<tr>
<td>IV to PO antibiotic, outpatient antibiotic therapy</td>
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<tr>
<td>Patient education</td>
</tr>
<tr>
<td>Length of stay</td>
</tr>
<tr>
<td>Outpatient management, long-term care, readmission</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nursing</th>
<th>Microbiology</th>
<th>Case Management</th>
<th>Pharmacy</th>
<th>Infectious Diseases</th>
<th>Infection Control</th>
<th>Inpatient Physician</th>
<th>Administration</th>
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**Abbreviations:** IV, intravenous; PO, per os [oral].

• **Antimicrobial allergy is lifelong**
  – Antimicrobial allergy is likely to wane over time and many people who report an allergic reaction in childhood are able to tolerate the drug as an adult.

• **All childhood rashes associated with beta-lactam antibiotics are due to allergy**
  – Childhood rashes are commonly caused by a viral infection or a drug–virus interaction rather than drug allergy, and are often not reproducible upon a supervised challenge when the patient is well.

• **Documented antimicrobial allergies are always true allergies**
  – In an Australian review of antimicrobial prescribing, up to 20% of documented ‘allergies’ were pharmacologically predictable non–immune-mediated adverse reactions (e.g. gastrointestinal intolerance).

• **Cephalosporin cross-reactivity in patients allergic to penicillin is around 10%**
  – Recent reviews have found that overall, only 1 to 2% of patients with a confirmed penicillin allergy have a cephalosporin allergy
  – Cefazolin has no common side-chains with other beta lactams so is often tolerated in penicillin or cephalosporin allergy*.
Discussions with patients should outline:
- The reason for receiving antibiotic therapy
- The name of antibiotic
- How it should be taken and how long it needs to be taken for
- Possible side effects of antibiotic and what to do if these occur
- Address concerns about antibiotic resistance or interactions with the patient’s other medications
- Arrange an interpreter if needed

An ongoing effort that aims to optimise antimicrobial use, in order to:
- Improve patient outcomes
- Ensure cost-effective therapy
- Minimise the risk of adverse consequences (including side effects and antibiotic resistance)
Antimicrobial Resistance and Stewardship – in practice

NPS Antimicrobial Prescribing Courses

- Surgical antibiotic prophylaxis 2020
- Bacteraemia 2020
- Catheter-associated urinary tract infections 2020
- Introduction to antimicrobial prescribing 2020
- Community acquired pneumonia (CAP) 2020

Antimicrobial prescribing courses

Developed in collaboration with the Australian Commission on Safety and Quality in Health Care (ACSQHC) this is a collection of online courses that deal with antimicrobial prescribing in hospital settings.

The antimicrobial prescribing courses are computer and mobile device compatible.

Issues with Internet Explorer
**Penicillin allergies**

*For community healthcare providers*

**Action plan: Patients reporting penicillin allergies**

1. **Assess the nature of the allergy**
   - If the allergy is the same, it is important to assess and document the nature of the allergy (i.e.,
     - What is the name of the penicillin? (Generic)
     - What happened and why was it stopped?
     - The specific penicillin received (first or second-generation penicillin or a beta-lactamase inhibitor)?
   - The Penicillin Allergy Panel: Risk/Stewardship Risk Assessment (available for download)

2. **Action**
   - If on penicillin, do not prescribe a cephalosporin.
   - Nonallergic side effects (musculoskeletal or urticaria cholestatic reaction). Usually delayed onset after 12 hours of exposure.
   - These are **not** allergies. They are side effects.

3. **Prevent serious allergic reactions**
   - These are **not** allergies. They are side effects.

4. **Localized or mild urticarial rash**
   - Usually within 2 hours of onset.
   - Avoid penicillin.
   - These are **not** allergies. They are side effects.

5. **Severe cutaneous adverse reactions**
   - Avoid all penicillins and all cephalosporins.
   - These are **not** allergies. They are side effects.

6. **Anaphylaxis, hypotension, collapse, arrhythmia and/or tongue swelling**
   - Avoid all penicillins and all cephalosporins.
   - Use non-beta-lactam antibiotics or use spectinomycin (if available).

7. **Checklist for Antibiotic Prescribing in Dentistry**

   **Pretreatment**
   - Correctly diagnose an oral bacterial infection.
   - Consider therapeutic management interventions, which may be sufficient to control a localized oral bacterial infection.
   - Weigh potential benefits and risks (i.e., toxicity, allergy, adverse effects,Clostridium difficile infection) of antibiotics before prescribing.
   - Prescribe antibiotics only for patients of record and only for bacterial infections you have been trained to treat. Do not prescribe antibiotics for oral viral infections, fungal infections, or ulcerations related to trauma or aphthae.
   - Implement routine antibiotic prophylaxis recommendations for the medical concerns for which guidelines exist (e.g., cardiac defects).
   - Assess patients’ medical history and conditions, pregnancy status, drug allergies, and potential for drug-drug interactions and adverse events, any of which may impact antibiotic selection.

   **Prescribing**
   - Ensure evidence-based antibiotic references are readily available during patient visits. Avoid prescribing based on non-evidence-based historical practices, patient demand, convenience, or pressure from colleagues.
   - Make and document the diagnosis, treatment steps, and rationale for antibiotic use (if prescribed) in the patient chart.
   - Prescribe only when clinical signs and symptoms of a bacterial infection suggest systemic immune response, such as fever or malaise along with local oral swelling.
   - Review empiric antibiotic regimens on the basis of patient progress and, if needed, culture results.
   - Use the most targeted (narrow-spectrum) antibiotic for the shortest duration possible (2-3 days after the clinical signs and symptoms subside) for otherwise healthy patients.
   - Discuss antibiotic use and prescribing protocols with referring specialists.

   **Patient Education**
   - Educate your patients to take antibiotics exactly as prescribed, take antibiotics prescribed only for them, and not to save antibiotics for future illness.

   **Staff Education**
   - Ensure staff members are trained in order to improve the probability of patient adherence to antibiotic prescriptions.
World Antimicrobial Awareness Week (WAAW) 18-24 November every year

- Increase awareness of global antimicrobial resistance (AMR) and to encourage best practices among the general public, health workers and policy makers to avoid the further emergence and spread of drug-resistant infections.

Following a stakeholder's consultation meeting in May 2020 organized by the Tripartite Organizations (the Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (OIE) and WHO) the scope of WAAW was expanded, changing its focus from "antibiotics" to the more encompassing and inclusive term "antimicrobials".

Expanding the scope of the campaign to all antimicrobials will facilitate a more inclusive global response to antimicrobial resistance and support a multisectoral One Health Approach with increased stakeholder engagement.

The slogan for 2020 will be "Antimicrobials: handle with care" applicable to all sectors.

The theme for the human health sector for WAAW 2020 is "United to preserve antimicrobials".
• AMH

• eTG – ANTIBIOTIC


• Understanding and Interpreting Pharmacokinetic (PK) and Pharmacodynamic (PD) Targets for Antimicrobial Dosing - South Australian expert Advisory Group on Antimicrobial Resistance (SAAGAR) June 2018