COMPASS Therapeutic Notes on Appropriate Use of Antibacterial Drugs in Primary Care

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Section ONE: The problem of antibacterial resistance

**Introduction**

One of the most pressing problems faced by healthcare services is the increasing prevalence of antibacterial resistance.1 Compoundled by a diminishing number of new agents entering clinical practice, such resistance is widely recognised as a major threat to public health.2,3 The growth of antibacterial resistance has prompted calls to reduce unnecessary antibacterial use and to improve treatment protocols to maximise the lifespan of these drugs. These calls rest on the well-supported idea that the use of antibacterial agents is a powerful selective force that promotes the emergence of resistant strains. Although it is a legitimate focus for prescribers, use of antibacterials by humans is not the only source of selective pressure. The massive use of antibacterials for therapeutic purposes and growth promotion in the agriculture and food industries and in veterinary medicine are reasons for concern.4 Such use could result in colonisation of humans by resistant organisms through a variety of routes.

Microbiological resistance is defined by a reduced level of antibacterial activity. Clinical resistance is defined by a level of antibacterial activity associated with a high likelihood of therapeutic failure.5 Potentially, all antibacterial use, appropriate or not, “uses up” some of the effectiveness of that antibacterial, diminishing our ability to use it in the future.6 Over the last 50 years the use of antibacterials has been increasingly associated with the emergence of resistant bacteria: Resistance to various antibacterials was first reported as follows:

- penicillins in the 1940s
- tetracycline and chloramphenicol in the 1950s
- methicillin in the 1960s
- aminoglycosides in the 1970s
- broad-spectrum beta-lactam agents in the 1980s
- vancomycin in the 1990s

Bacteria continue to out-perform healthcare professionals by developing increasing levels of resistance to both old and new antibacterials. Just as bacteria continue to adapt, healthcare professionals must continue to adapt their practice. In the field of resistance, this is essential given the lack of antibacterials in development that possess novel mechanisms of action. Protecting the efficacy of our existing antibacterial armamentarium is essential.

**What is the clinical significance of antimicrobial resistance?**

Antimicrobial resistance continues to be of great concern because it may make infections more difficult to treat, limit therapeutic options and drive prescribers to use newer and more expensive agents.2,3,7-11 In extreme cases, multi-resistant leaves no treatment options. Antimicrobial resistance may also increase:

- **Length and severity of illness**
- **Period of infectiveness**
- **Likelihood of adverse reactions occurring (due to the need to use less safe alternative drugs)**
- **Length of hospital admission**
- **Workload of healthcare professionals**
- **Economic burden of treatment & care.**

**Is there evidence of a link between antibacterial use and the development of resistance?**

Yes, studies have shown direct links between antibacterial prescribing and the subsequent development of bacterial resistance.12-15 This is confirmed by studies that show how reducing prescribing of antibacterials has been associated with reduced levels of antimicrobial resistance.16,17 Antibacterial use is driving resistance at all levels, whether in an individual, in a local community, on a ward, in a hospital, across a country or throughout the international community.18-23 Indeed, countries with higher community antibacterial prescribing have been shown to have higher resistance rates in several pathogens.24

**Key message:**

Antimicrobial prescribing affects the patient, their environment and potentially all the people that come in contact with the patient or with their environment.25

**Methicillin-resistant Staphylococcus aureus (MRSA)**

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a type of staphylococcal bacteria that is resistant to beta-lactams including methicillin and more common antibacterials such as penicillin and amoxicillin.26 Historically, MRSA had been thought of as a hospital-acquired infection.27 However, the epidemiology of infections caused by MRSA is rapidly changing, and in the past 10 years the incidence of community-acquired MRSA has increased dramatically.27-30 The emergence of true community-acquired strains is a challenge to the effective treatment of *S. aureus* infections.27
Cases of community-acquired MRSA usually present in younger patients without underlying risk factors, typically cause skin and soft tissue infections, and are usually susceptible to ciprofloxacin, clindamycin, gentamicin and trimethoprim/sulfamethoxazole.41

Clostridium difficile

Clostridium difficile is a gram-positive, spore-forming, toxin-producing, bacillus that causes a spectrum of disease, including asymptomatic carriage, colitis (which usually manifests as diarrhoea), and occasionally life-threatening toxic megacolon. C. difficile accounts for 15-25% of cases of diarrhoea after antibacterial administration.32,34 C. difficile-associated diarrhoea has a mortality of up to 25% in frail elderly people.46

Several factors predispose patients to developing C. difficile infection, including being over 65 years old; having a severe underlying illness; receiving nasogastric intubation; receiving a PPI; and having a prolonged hospital stay.36,40 However, the major risk factor for C. difficile infection is treatment with “high-risk” antibacterials, which alter the normal bowel flora enabling C. difficile to establish infection.38,41,43 Different levels of risk are associated with different classes of antibacterials (see Table ONE). In primary care, cephalosporins are amongst the agents most likely to be linked to C. difficile-associated diarrhoea.46

Antibacterial treatments that include more than one type of antibacterial either concomitantly or sequentially or that continue for an extended duration also increase the risk of developing C. difficile infection. Key steps in the pathogenesis of C. difficile-mediated diarrhoea include disruption of normal colonic flora by antibacterials, colonisation with C. difficile via faecal-oral transmission, production of toxins, and mucosal injury and inflammation.47 The patient who is newly exposed to C. difficile, not the patient who is already colonised with this bacillus, is at the greatest risk of developing C. difficile-associated disease during a hospital stay. In healthcare facilities, workers’ hands can become contaminated with C. difficile spores easily, enabling infection to spread from patient to patient.48 Although C. difficile is most often associated with healthcare settings, the bacillus can cause disease in healthy persons in the community. Furthermore, some persons may continue to acquire C. difficile-associated disease in the community may not have a history of antibacterial use.49 Prevention of C. difficile-associated disease in healthcare facilities is aimed at interrupting its transmission between persons.

Evidence supports four interventions:50

1. Instituting policies that support the prudent use of antibacterials
2. Wearing gloves when in contact with infected patients
3. Thoroughly cleaning and disinfecting patient rooms
4. Using disposable, single-use thermometers

Hand-washing with soap and water (using the 7-step technique) is recommended; alcohol does not eradicate spores. The Health Protection Agency has produced a good practice guide to controlling C. difficile, and avoiding the use of broad-spectrum antibacterials unless there is a good clinical need. It can be found at: www.hpa.org.uk/web/HPAwebFile/HPA_web_C/1194947384014

Introduction of a narrow-spectrum antibacterial policy, reinforced by feedback, has been shown to be associated with significant changes in antibacterial prescribing and a significant reduction in C. difficile infections.35

Vancomycin-resistant enterococci

Vancomycin-resistant enterococci (VRE) are another gram-positive bacteria that have become multidrug-resistant. A dramatic increase in VRE has been seen among hospitalised patients. Enterococci are inhabitants of the GI tract and act as opportunistic pathogens, causing UTIs, bacteraemia and surgical site infections. VRE have intrinsic resistance to multiple antibacterial drugs, making therapy difficult. In clinical practice only a limited number of agents are available to treat VRE infections, including teicoplanin, linezolid and tigecycline, although the usefulness of teicoplanin is decreasing46 and is limited to strains with so-called “low level vancomycin resistance”.

Within the hospital environment, the use of certain antibacterials has been demonstrated to cause selection of VRE; in particular ticarcillin/clavulanate and third generation cephalosporins.57 The intensive use of oral vancomycin in hospitals for the treatment of Clostridium difficile infection is also likely to select for increased faecal carriage of VRE.

What is the societal impact of resistance?

Antibacterials have been termed “societal” drugs because, unlike an antihypertensive agent, which benefits only the patient to whom it is prescribed, an antibacterial agent potentially impacts countless others.58 Because resistance can develop during antibacterial therapy, any resistant organisms that emerge can be spread to persons who have never been exposed to the antibacterial. Thus, the use and misuse of these resources have “societal consequences” that underscore the importance of stewardship in the hospital, community and in long-term care facility populations.

The effect of antibacterial use on the emergence of resistance in INDIVIDUAL PATIENTS – more detail:

Antibacterial agents affect not only the target pathogen but also the normal gut flora of the human host. The extent of the impact on non-target microorganisms depends on:29
- The antibacterial agent used
- Its mode of action
- The degree of resistance in the community

As well as causing intestinal problems such as diarrhoea, an imbalance in the normal gut flora can result in the emergence of resistant bacterial populations. Until recently it was thought that the commensal flora is normalised a few weeks following withdrawal of treatment. However, increasing evidence suggests that even short-term antibacterial treatment can lead to resistant bacterial populations in the intestine that persist for years.23,59-62

This residual effect is likely to be an important driver for the high endemic levels of antibacterial resistance in the community.44 The only way to avoid the

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**Table ONE: Examples of antibacterials associated with development of C. difficile infection**

<table>
<thead>
<tr>
<th>High-risk</th>
<th>Low-risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third generation cephalosporins</td>
<td>Penicillin G, penicillin V</td>
</tr>
<tr>
<td>(cefotaxime, ceftriaxone)</td>
<td>Aminoglycosides (gentamicin, amikacin,</td>
</tr>
<tr>
<td></td>
<td>neomycin, tobramycin)</td>
</tr>
<tr>
<td>Second generation cephalosporins</td>
<td>Trimethoprim</td>
</tr>
<tr>
<td>(cefotaxime, cefuroxime)</td>
<td>Tetracyclines (tetracycline,</td>
</tr>
<tr>
<td></td>
<td>demeclocycline, doxycycline,</td>
</tr>
<tr>
<td></td>
<td>lymecycline, minocycline,</td>
</tr>
<tr>
<td></td>
<td>oxytetracycline, tigecycline)</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>Antipseudomonal penicillins +/- β-</td>
</tr>
<tr>
<td>Quinolones (cipprofloxacin, levofloxacin,</td>
<td>lactamase inhibitor (piperacillin-</td>
</tr>
<tr>
<td>moxifloxacin, ofloxacin, norfloxacin)</td>
<td>tazobactam, ticarcillin-clavulanate)</td>
</tr>
<tr>
<td>Prolonged courses of aminopenicillins:</td>
<td>Vancomycin</td>
</tr>
<tr>
<td>amoxicillin, ampicillin, co-amoxiclav,</td>
<td></td>
</tr>
<tr>
<td>cl-fluampicil</td>
<td></td>
</tr>
</tbody>
</table>
vicious cycle of resistance leading to ever greater use of more powerful broad spectrum antibacterials is to avoid their initial use whenever possible.1 Information on the adverse effects of antibacterials on the normal flora might provide a stronger incentive for not using antibacterials unnecessarily than would more general messages about risks for society through the development of resistance.6

**Key Points: Resistance in individual patients**

- Antibacterials prescribed to an individual have been shown to be consistently associated with emergence of resistant bacteria in that individual.
- Antibacterials prescribed in primary care may impact on bacterial resistance in a patient for many years.
- The greater the number or duration of antibacterial courses prescribed in the previous 12 months, the greater the likelihood that resistant bacteria will develop.

**Does antibacterial dose/duration have a role in the development of resistance?** Yes, inappropriate antibacterial dosing/duration of use may be contributing to the increasing rate of antibacterial resistance.65,66 The rate and extent of an antibacterial agent’s activity is dependent on the interaction between drug concentrations at the site of infection, bacterial load, phase of bacterial growth and the minimum inhibitory concentration (MIC) of the pathogen.67 Typically, antibacterials fall into one of the following three categories:68

- Those with time-dependent bactericidal effect
- Those with concentration-dependent bactericidal effect and
- Those with both time-dependent and concentration-dependent effects.

(See Table TWO).

The time-dependent antibacterials (e.g. β-Lactam antibacterials) exert optimal bactericidal effect when drug concentrations are maintained above the MIC. For agents with time-dependent properties, higher concentrations do NOT result in greater kill of organisms. Furthermore, they have minimal post-antibacterial effect. Concentration-dependent antibacterials display maximal bactericidal activity when their concentrations are high, even if they are maintained for a relatively short time.70 In addition, these agents have post-dose effect in which bactericidal action continues for a period of time after the antibacterial level falls below the MIC. Antibacterial agents that display concentration-dependent kill characteristics should not be dosed sub-therapeutically.

**Table TWO: Antibacterial pharmacodynamic categories**69,70

<table>
<thead>
<tr>
<th>Time-dependent</th>
<th>Concentration-dependent</th>
<th>Time-dependent and concentration-dependent</th>
</tr>
</thead>
<tbody>
<tr>
<td>β-Lactams</td>
<td>Aminoglycosides</td>
<td>Clarithromycin</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>Daptomycin</td>
<td>Clindamycin</td>
</tr>
<tr>
<td></td>
<td>Fluoroquinolones</td>
<td>Erythromycin</td>
</tr>
<tr>
<td></td>
<td>Metronidazole</td>
<td>Linezolid</td>
</tr>
<tr>
<td></td>
<td>Azithromycin</td>
<td>Tetracyclines</td>
</tr>
<tr>
<td></td>
<td>Telithromycin</td>
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**Prescribing Note: Azithromycin**

Azithromycin has a long terminal elimination half-life.71 Although this has proven convenient from a dosing point of view, the downside is that there is a great deal of time at the end of a course of therapy when the drug is still present in the body at sub-inhibitory concentrations. Several studies indicate that azithromycin is far more likely to select for macrolide resistance than drugs of the same class with shorter half-lives.21,22,75

**Section TWO: Antibacterial Stewardship**

**What is antibacterial stewardship?** As antibacterial resistance increases and antibacterial development declines, we should use our current range of antibacterials more wisely. This means optimising antibacterial use to ensure they are used appropriately. Programmes developed from this strategy are called “antimicrobial or antibacterial stewardship programmes”. Good antibacterial stewardship involves selecting the most appropriate drug at its optimal dosage and duration of therapy to eradicate an infection while minimising side effects and pressures for the selection of resistant strains.76,77 Making appropriate antibacterial choice starts with knowledge of infectious diseases and the pathogens involved in particular infections, as well as understanding which organisms are susceptible to a given antibacterial and whether that agent is capable of reaching the infection site. Overall knowledge of the patient, including renal function, drug allergies and concomitant medication should be factored into the decision to select and use an antibacterial.
**What are the consequences of inappropriate prescribing of antibacterial agents?**

Inappropriate prescribing of antibacterial agents wastes money, exposes people to unnecessary side-effects, encourages future consulting and drives antimicrobial resistance.77,78 Given the evidence of these problems, prescribers need to consider their levels of prescribing of antibacterial agents. This may not be straightforward, since patients may have clear expectations of treatment based on how similar problems were dealt with in the past.

### 1. Reconsulting

Being prescribed an antibacterial reinforces patients’ perceptions that they should consult for similar problems in the future, and their expectation of receiving a prescription. Previous antibacterial usage has a strong relationship with belief in the effectiveness of antibacterials.50 For example, studies show:

- Prescribing an antibacterial for sore throat was associated with intention to reconsult and with actual reconsulting with sore throat during the following year.81,82
- If patients with lower respiratory tract infections have been given an antibacterial, a fifth to a quarter of them will reconsult and many receive further antibacterials.51

### 2. Microbial resistance

See Section ONE.

### 3. Harms/adverse effects

Antibacterials, whether used appropriately or inappropriately, can potentially cause serious harm to patients. The risks of antibacterial therapy to the patient are well-known and include:

- **Antimicrobial-associated diarrhoea** (experienced by 5-30% of patients; rates increase as the antimicrobial spectrum gets broader)
- **Clinically important drug interactions**
- **Life-threatening allergic reactions** (β-lactams) – see Box.
- **Nephrotoxic effects** (aminoglycosides, amphotericin-B)
- **Clostridium difficile infections** (all antimicrobials)
- **Liver injury** (antibacterial agents are the largest class of agents which cause liver injury; accounting for at least 45% of all cases of drug-induced liver injury).
- **QT-interval prolongation** that may result in potentially life-threatening arrhythmias (macrolides, azole antifungals, most fluoroquinolones)
- **Stevens–Johnson syndrome** (trimethoprim/sulfamethoxazole)

### For which conditions is there a lack of evidence for the use of antibacterials?

Studies suggest that 50% or more of antibacterial use may be unnecessary or inappropriate, whether in hospital, community, or ambulatory settings.107-109

### For which conditions is there a lack of evidence for the use of antibacterials?

Studies have identified a number of factors influencing prescribers’ decision to prescribe antibacterials, including:

#### Patient and prescriber expectations

Clinicians report that they often prescribe antibacterials because they perceive that patients want them100-104 and when prescribers perceive that patients expect antibacterials, they are more likely to be prescribed.95-99 However, this demand may be overestimated,14 as clinicians do not usually discuss patients’ demands and expectations for antibacterials directly, and the demand is often assumed.95

### Fear of complications from untreated infections – However, there is little convincing evidence that lower rates of prescribing are associated with higher rates of complications.100 Therefore much of the historically high volume of prescribing to prevent complications may be inappropriate.100

### Lack of awareness of the problems caused by antimicrobial resistance,101 or perception that antibacterial resistance is only a theoretical or minimal risk102,103 – This may be in part because some studies have only investigated the relation between prescribing and resistance at a population level.16,104,105 Consequently for prescribers, whose primary concern is the unwell individual, the impact of antibacterial use on the prevalence of societal resistance may not be an important consideration.106 To reduce inappropriate prescribing, it may therefore be important to highlight the effect of antibacterial use on emergent resistance for individuals.

Other reasons cited for the inappropriate prescribing of antibacterials include:103,104 a desire to preserve the doctor-patient relationship, tension between the need to respond to external pressures (policy and evidence) and the daily pressures of clinical practice, and a lack of knowledge as to which patients will benefit from antibacterial agents.

### Allergic reactions

Allergic reactions to penicillins occur in 1-10% of exposed individuals; anaphylactic reactions occur in fewer than 0.05% of treated patients.105 Patients with a history of atopic allergy are at a higher risk of anaphylactic reactions to penicillins. Individuals with a history of anaphylaxis, urticaria or rash immediately after penicillin administration are at risk of immediate hypersensitivity to a penicillin.105 Patients who are allergic to one penicillin will be allergic to all because the hypersensitivity is related to the basic penicillin structure. As patients with a history of immediate hypersensitivity to penicillins may also react to the cephalosporins and other β-lactam antibacterials, they should not receive these antibacterials.106

Individuals with a history of minor rash (i.e. non-confluent, non-pruritic rash restricted to a small area) or rash occurring more than 72 hours after penicillin administration are probably not allergic to penicillin, and, in these individuals, a penicillin should not be withheld unnecessarily for serious infections but allergy should be borne in mind.107 Other β-lactam antibacterials (including cephalosporins) can be used in these patients.108

For a number of conditions often seen in primary care, antibacterial treatment is of limited or no value;110 any benefits are outweighed by considerations including the potential for unwanted effects, the medicalisation of self-limiting illness, treatment costs and the risk of bacterial resistance. A “no antibacterial” strategy or a “delayed antibacterial” prescribing strategy should be agreed for patients with the following conditions:110

- **Acute otitis media**
- **Acute sore throat/acute pharyngitis/acute tonsillitis**
- **Common cold**
- **Acute rhinosinusitis**
- **Acute cough/acute bronchitis**

Depending on clinical assessment of severity, some patients in particular subgroups can also be considered for an immediate antibacterial prescribing strategy:

- **Bilateral acute otitis media in children younger than six months**111
- **Acute otitis media in children with otitis media**
- **Acute sore throat/acute pharyngitis/acute tonsillitis when three or more Centor criteria (see later) are present**100

### Acute otitis media (AOM)

It is recognised that antibacterials are effective only in reducing duration of pain of AOM.112 The NNT in order to prevent one child from having some pain after 2 days was 15, and children who took antibacterials were more at risk of having adverse effects.113,114 However, antibacterials did seem to be beneficial in children younger than 2 years with bilateral AOM (NNT=4), and
in children with both AOM and otitis media (OM) (NNT=3). Children prescribed amoxicillin for AOM are about 50% more likely to have recurrence of AOM over the following three years than those given placebo.115 Three years after randomisation, AOM had recurred in 63% of children in the amoxicillin group compared with 43% in the placebo group. The NNH was 5; in other words, for every 5 children given antimicrobials for AOM, one developed AOM in subsequent years who would have not done so had they all been given placebo.116 Prescribers should try to agree a no-antimicrobial or delayed-antimicrobial strategy for most children with AOM, and generally prescribe antimicrobials only to children with AOM who are systemically very unwell or at high risk of serious complications because of pre-existing co-morbidity, or who appear unwell with symptoms and signs of mastoiditis.117

Depending on clinical assessment of severity, an immediate antimicrobial prescription could be considered for children with otitis media and children under six months of age with bilateral AOM,111 but it is important to weigh the likely benefits against the possible risk, including side-effects. The National Prescribing Centre patient decision aid relating to AOM may be helpful in some consultations (www.npci.org.uk/therapeutics/infect/co mmonresp/patient_decision_aids/patien t_decision aid1.php).

It is very important to optimise analgesia in patients with AOM; studies show that most parents use suboptimal doses of analgesics.113,114

**Sore throat**

Evidence shows that most sore throats are viral, self-limiting, easily managed and do not require treatment with an antimicrobial.79,117,118 Antibacterial agents do not appear to prevent complications nor do they reduce the symptom burden.79 Prescribers should negotiate with patients to improve symptomatic management of sore throat without relying routinely on antimicrobials.79 However, some sub-groups of patients with sore throat may benefit from an antimicrobial. These include patients with:

- three or more of the Centor criteria (fever >38°C, purulent tonsils, cervical adenopathy or absence of a cough)120
- confirmed Strept. A infection (treat for 10 days)
- history of valvular heart disease
- marked systemic upset
- peritonitis cellulitis

- increased risk from acute infection (e.g. immunocompromised or diabetic)

If prescribing penicillin for sore throat, the probability of preventing one case of rheumatic fever or acute glomerulonephritis is the same as the probability of causing death by penicillin-induced anaphylaxis.79

The NNT for an antibacterial to prevent quinsy is greater than 400.119

**Common cold**

It is well known and supported by robust evidence that antibacterials are not effective in reducing persistence of common cold symptoms and patients may experience adverse effects from antibacterial use.117 However, one-third of the population believe that antibacterials are an effective treatment for the common cold.122

**Acute rhinosinusitis**

For the majority of patients with acute rhinosinusitis, antibacterial agents are not necessary.79,123-127 (In 80% of patients, symptoms will resolve within 14 days without the need for treatment with an antibacterial79). Prescription for a delayed or immediate antibacterial could be considered in patients with a purulent nasal discharge (NNH=8).119

**Acute bronchitis/acute cough (without underlying pulmonary disease)**

Antibacterials only slightly modify the course of acute bronchitis127-131 and the probability of obtaining benefit from antibacterials may be similar to the probability of being harmed by them.129,130

The effects of antibacterials on the duration of cough, and on feeling ill are small – a fraction of one day in an illness lasting several weeks.130 Hence, a cough of less than 2 weeks duration in otherwise healthy adults with no co-morbidities or systemic illness does not require an antibacterial.131

There is still a widespread belief in the UK that in acute bronchitis/non-pneumonic LRTI, a cough and discoloured sputum requires antibacterial treatment,127 despite contrary evidence that has been in the literature for over 30 years!133

How can inappropriate antimicrobial use be minimised?

The following measures could help reduce the use of antibacterial agents in situations in which their use is usually regarded as discretionary:

Ask the patient if they are expecting an antibacterial drug.

Patients who state prior to the consultation that they expect an antibacterial are more likely to receive a prescription, even when the prescriber does not think it is warranted.124,125 and prescribers do not accurately assess which patients expect an antibacterial.

Clariﬁcation of expectations will allow a discussion of the advantages and disadvantages of antibacterial use and is likely to improve doctor and patient satisfaction. Patient satisfaction correlates better with information and reassurance than receipt of an antibacterial prescription. In patients who expect an antibacterial prescription prior to consultation, information, reassurance and receipt of an antibacterial are equally important in determining satisfaction.135

Reassure the patient that their condition is self-limiting in nature.

Setting realistic expectations is likely to reduce subsequent unnecessary consultations. Patients can be advised that on average acute otitis media lasts four days, sore throat seven days, common cold 10 days, sinusitis 18 days and acute bronchitis 21 days.

Many patients simply want to know if there is anything they can do to relieve symptoms.

Advise on rest, fluids and analgesia. Explaining that they are doing “all the right things”, especially if parents, can be very reassuring. Misconceptions that antibacterials were responsible for relief experienced in previous infections may need to be challenged.

Give the patient a leaflet.

Leaflets that explain the natural history and symptom control have been shown to reduce antibacterial consumption. Find leaflets at www.patient.co.uk.

Similarly, a recent study showed that use of a booklet on respiratory tract infections in children within primary care consultations leads to important reductions in antibacterial prescribing and reduced intention to consult without reducing satisfaction.131 Clinicians were trained in the use of an interactive booklet on respiratory tract infections (www.equipstudy.com) and asked to use the booklet during consultations (and provide a booklet for the parent/patient to take home). Clinicians in the control group conducted their consultations as usual. The study resulted in an NNH of 4-5; in other words, for every 4-5 consultations where the booklet was used there was one less prescription for antibacterials. There was also a significant reduction in the proportion of patients who said they would consult in the future if their child developed a similar illness.

Discuss the disadvantages of prescribing an antibacterial.

These include side effects (diarrhoea, vomiting, rash and more serious side effects such as anaphylaxis, C. difficile infection, Stevens Johnson syndrome and hepatitis), drug interactions (e.g. combined oral contraceptive pill failure) and resistance.

Consider a delayed prescription.

Compared with an immediate prescription, delayed prescribing can reduce antibacterial consumption by two-thirds and does not reduce patient satisfaction or result in poorer clinical outcomes.
Do's and don'ts of treatment with an antibacterial agent

<table>
<thead>
<tr>
<th>DO</th>
<th>DON'T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use professional judgement in deciding if an antibacterial is necessary</td>
<td>Accept telephone requests for antibacterials without speaking to the patient, and discourage these requests</td>
</tr>
<tr>
<td>Evolve the patient in the decision</td>
<td>Prescribe an antibacterial unless there is likely to be a clear clinical benefit</td>
</tr>
<tr>
<td>Modify the dose and duration of treatment based on the patient’s age, weight and renal function</td>
<td>Prescribe an antibacterial for viral sore throat, simple coughs and colds</td>
</tr>
<tr>
<td>Consider using larger doses in severe or recurrent cases of infection</td>
<td>Use broad spectrum antibacterials when narrow spectrum agents remain effective</td>
</tr>
<tr>
<td>Have a lower threshold for antibacterial treatment in immunocompromised patients or those with multiple morbidities</td>
<td>Consider a no, or delayed, antibacterial strategy for acute self-limiting upper respiratory tract infections</td>
</tr>
<tr>
<td>Use simple generic antibacterials where possible</td>
<td>Use cephalosporins and quinolones</td>
</tr>
</tbody>
</table>

Compliance/concordance issues

**What are the consequences of non-concordance with antibacterial therapy?**

10-44% of people do not finish the prescribed course of antibacterial. Non-compliance with antibacterial therapy for acute community-acquired infections can have an impact on:
- Treatment effectiveness (reductions in clinical success rates of between 16% and 52% are reported)
- Health-related quality of life
- Costs (increased due to additional drug costs, doctor visits, hospitalisation)

**The NI antimicrobial guidelines for primary care (www.publichealth.hscni.net/sites/default/files/Antibiotics_Booklet_0.pdf)**

The Northern Ireland antimicrobial guidelines for primary care, 2010 aim:
- Provide a simple best guess approach to the treatment of common infections
- Promote the safe, effective and economic use of antibacterials
- Minimise the emergence of bacterial resistance in the community.

References


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COMPASS THERAPEUTIC NOTES ASSESSMENT
Appropriate use of Antibacterial Drugs in Primary Care

COMPASS Therapeutic Notes are circulated to GPs, nurses, pharmacists and others in Northern Ireland. Each issue is compiled following the review of approximately 250 papers, journal articles, guidelines and standards documents. They are written in question and answer format, with summary points and recommendations on each topic. They reflect local, national and international guidelines and standards on current best clinical practice. Each issue is reviewed and updated every three years.

Each issue of the Therapeutic Notes is accompanied by a set of assessment questions. These can contribute 2-3 hours towards your CPD/CME requirements. Submit your completed MCQs to the appropriate address (shown below) or complete online (see below). Assessment forms for each topic can be submitted in any order and at any time.

If you would like extra copies of Therapeutic Notes and MCQ forms for this and any other topic you can:
Visit the COMPASS Web site: www.medicinesni.com
or
www.hscbusiness.hscni.net/services/Family%20Practitioner%20Services/COMPASS/
or
Email your requests to: compass.team@hscni.net
or
Phone the COMPASS Team on: 028 9053 5661

You can now complete your COMPASS multiple choice assessment questions and print off your completion certificate online:
• Doctors and nurses should submit their answers at: www.medicinesni.com
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Are you a
Pharmacist? □ Community □ Hospital □ Other (please specify) ______________
GP? □ Enter your cipher number: __________  
Nurse? □ Enter your PIN number: __________

Title: Mr/Mrs/Miss/Ms/Dr
Surname: ___________________ First name: ___________________
Address: __________________________________________________________
______________________________________________________________

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GPs and Nurses:
Complete the form overleaf and return to:
COMPASS Unit
Pharmaceutical Department
HSC Business Services Organisation
2 Franklin Street
Belfast
BT2 8DQ

Pharmacists:
Complete the form overleaf and return to:
Northern Ireland Centre for Pharmacy Learning & Development
FREEPOST NICPLD
Belfast BT9 7BL
1 With regard to *Clostridium difficile*, mark each of the following statements true or false:

<table>
<thead>
<tr>
<th>Statement</th>
<th>True (T)</th>
<th>False (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a In primary care, cephalosporins are amongst the agents most likely to be associated with <em>C. difficile</em>-associated diarrhoea.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>b At present, <em>C. difficile</em>-associated infections are an issue only in healthcare settings.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>c Alcohol rubs will eradicate <em>C. difficile</em> spores from the hands.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>d Prolonged courses of amoxicillin, ampicillin, co-amoxiclav or co-fluampicil are associated with a high risk of development of <em>C. difficile</em> infection.</td>
<td>T</td>
<td>F</td>
</tr>
</tbody>
</table>

2 Concerning the development of antibacterial resistance:

<table>
<thead>
<tr>
<th>Statement</th>
<th>True (T)</th>
<th>False (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a After an antibacterial course, commensal flora is normalised within a few weeks of stopping treatment.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>b Use of an antibacterial agent can have an impact on the individual, people they are in contact with and their environment.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>c Metronidazole displays maximal bacterial activity when concentrations are high, even if they are maintained for a relatively short time.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>d The greater the number or duration of antibacterial courses prescribed in the previous 12 months, the greater the likelihood that resistant bacteria will develop.</td>
<td>T</td>
<td>F</td>
</tr>
</tbody>
</table>

3 Which of the following statements are important counselling points for a patient who has been prescribed an antibacterial?

<table>
<thead>
<tr>
<th>Statement</th>
<th>True (T)</th>
<th>False (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Reason(s) for prescribing an antibacterial agent.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>b Complete the course as prescribed.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>c Expected side-effects.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>d Any unused antibacterials can be kept and re-used should symptoms recur.</td>
<td>T</td>
<td>F</td>
</tr>
</tbody>
</table>

4 For which of these conditions would you consider prescribing an immediate antibacterial?

<table>
<thead>
<tr>
<th>Condition</th>
<th>True (T)</th>
<th>False (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Any patient with acute otitis media.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>b An immunocompromised patient with a sore throat.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>c An otherwise healthy individual with acute bronchitis and a cough productive of discoloured sputum.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>d A patient with acute rhinosinusitis with a purulent nasal discharge.</td>
<td>T</td>
<td>F</td>
</tr>
</tbody>
</table>

5 Which of the following are considered to be “good” antimicrobial stewardship practices?

<table>
<thead>
<tr>
<th>Practice</th>
<th>True (T)</th>
<th>False (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Discussions about patient expectations.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>b Giving leaflets explaining natural history of the illness and symptom management.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>c Prescribing courses of antibacterials to be kept by the patient in case they become ill in the future.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>d When an antibacterial is deemed necessary, prescribing short courses of narrow spectrum antibacterials.</td>
<td>T</td>
<td>F</td>
</tr>
</tbody>
</table>