

Antimicrobial stewardship

This bulletin focuses on the effective prescribing of antibiotics in primary care. It brings together in one place the extensive range of guidelines and resources available to support Antimicrobial Stewardship (AMS) across Integrated Care Boards (ICBs) and Health Boards (HBs).

Recommendations

- AMS should be in place across the health system and led by a nominated senior/board level AMS lead role in ICBs/HBs to support antimicrobial prescribing.
- Monitor and evaluate antimicrobial prescribing using data available, such as the [PrescQIPP AMS visual analytics](#), and examine how this relates to local resistance patterns. Regular feedback on antimicrobial prescribing should be provided by ICBs/HBs to individual PCNs, practices or prescribers, at least annually.
- The TARGET antibiotics toolkit resource should be used to support implementation of their AMS programme. Resources include presentations, leaflets for patients, videos for waiting areas, prescribing data, audits and a self-assessment checklist to benchmark antibiotic prescribing practice against others.
- Health and social care staff should implement local or national antimicrobial guidelines and recognise the significance of them for AMS. Health professionals should be familiar with current AMS campaigns and programmes.
- ICBs/HBs should author, implement and review antibiotic guidelines for primary care prescribers across the ICB/HB (including doctors, dentists, locums, nurses and pharmacists) in line with national antimicrobial guidelines in [England](#), [Wales](#), [Scotland](#) and [Northern Ireland](#).
- Antibiotic guidelines should be written and reviewed in conjunction and consultation with consultant and antimicrobial pharmacists, primary care clinicians, microbiologists, public health clinicians, the Director of Infection Prevention and Control (DIPC), Infection Prevention and Control (IPC) nurses, secondary care providers, out of hours providers and other local key stakeholders.
- Antibiotics should not be used for preventing or treating COVID-19 unless there is clinical suspicion of additional bacterial co-infection.
- ICBs/HBs should consider providing IT or decision support systems that prescribers can use to help decide whether to prescribe an antimicrobial or not and optimising antibiotic prescribing.
- The use of delayed antibiotic prescribing and the use of patient information leaflets such as "[Managing Your Common Infection \(self care\)](#)", "[Respiratory tract infection](#)" and "[Urinary tract infection](#)" leaflets should be promoted.
- Develop systems and processes to ensure that relevant information concerning antimicrobial treatment is provided when a patient's care is transferred to and from another care setting, for example, out of hours providers, walk in centres or community pharmacies.
- Encourage prescribers to complete the [Antimicrobial Stewardship Self-Assessment Checklist](#), group training presentations, e-learning modules and audits on the TARGET website.

Recommendations

- Manage patient expectations around the prescribing of antibiotics by encouraging the use of the TARGET self-care forum fact sheets, posters and videos for patient waiting areas.
- Support [World Antimicrobial Awareness week](#) (18th - 24th November) each year.
- Encourage all to become an “[Antibiotic Guardian](#)” which raises awareness among health professionals and the public about AMR and appropriate prescribing.

Background

The increased and inappropriate use of antibiotics together with the lack of any new classes of antibiotics discovered since the 1980s, means we are heading rapidly towards a world in which our antibiotics no longer work.¹

An independent review of antimicrobial resistance, commissioned by the UK Government in 2014 and chaired by Lord Jim O'Neill, analysed the global impact. It estimated that a failure to address the problem of antibiotic resistance could result in:

- 10 million deaths every year globally by 2050.
- A cost of \$100 trillion (£82 trillion) to the global economy.²

The term 'AMS' is defined as 'an organisational or healthcare-system-wide approach to promoting and monitoring judicious use of antimicrobials, to preserve their future effectiveness'.³⁻⁵

AMS entails measuring and improving how antibiotics are prescribed by clinicians and used by patients. Improving antibiotic prescribing and use is critical to effectively treat infections, protect patients from harms caused by unnecessary antibiotic use and combatting antibiotic resistance.⁶

Antimicrobial resistance (AMR) is the loss of antimicrobial effectiveness. Although it evolves naturally, this process is accelerated by the inappropriate or incorrect use of antimicrobials.⁵

The World Health Organisation (WHO) states that the cost of AMR to the economy is significant, resulting in death, disability, prolonged illness resulting in longer hospital stays and the need for more expensive medicines.⁷

A 2017 Parliamentary report stated that infectious diseases account for 7% of deaths and annual costs of £30 billion in UK. The epidemiology of infectious disease is determined by the interplay of numerous factors: the individual (sex, age, health status, immunity and behaviour), the pathogen (its pathogenicity and ability to mutate) and the environment (climate, air quality and socio-economic factors such as income, quality of nutrition and housing).⁸

Clostridioides difficile associated diarrhoea (CDAD) is also a consequence of unnecessary and inappropriate antibiotic prescribing. It leads to a significant increase in morbidity, mortality and use of healthcare resources. The NICE evidence summary *Clostridium difficile* infection: risk with broad-spectrum antibiotics [ESMPB1] reports three meta-analyses in people with hospital-associated and community-associated *Clostridium difficile* (*C. difficile*) infection and confirms that the antibiotics most strongly associated with the infection were clindamycin, cephalosporins and quinolones. Although the data have limitations that prevent firm conclusions, the evidence shows the importance of following antibiotic guidelines that recommend that all broad-spectrum antibiotics are prescribed appropriately and with careful stewardship.⁹

Guidance on managing suspected or confirmed *Clostridioides difficile* is recommended in NICE guideline 199, including:

- How to prevent *C. difficile* infection through good antimicrobial stewardship, infection control and environmental hygiene measures.

- Recording the diagnosis of *C. difficile* infection (particularly when a person transfers from one care setting to another). This is so that it can be taken into account before any future antibiotics are prescribed.
- For adults, offering an oral antibiotic to treat suspected or confirmed *C. difficile* infection. In the community, consider seeking prompt specialist advice from a microbiologist or infectious diseases specialist before starting treatment.
- Do not advise people taking antibiotics to take prebiotics or probiotics to prevent *C. difficile* infection.¹⁰

Although CDAD presents more commonly in hospitalised patients, its development can be driven by antibiotic use in the preceding four weeks, which is often a result of antibiotic prescribing in primary care. The prescribing of multiple antibiotics and an inappropriate length of treatment should be considered key risk factors for CDAD, especially for the elderly and patients with severe or multiple co-morbidities.¹¹

Furthermore, antibiotics and proton pump inhibitors (PPIs) are associated with *C. difficile* infection.^{12,13} A Canadian study demonstrated that reducing the co-administration of antibiotics and PPIs can be achieved with an automatic computer entry alert. Antimicrobial stewardship directed prospective audit and feedback also represents a novel intervention to reduce the co-administration of antibiotics and PPIs among hospitalised patients.¹⁴

The UK has done significant work to secure AMR on the global agenda, not just as a health issue, but as a 'One-Health' issue with enormous social and economic impact.¹ The vision for AMR in 2040 recognises that a global problem as significant and complex as AMR will not be addressed in a single five-year plan.^{1,15} Addressing AMR through improving AMS is a national medicines optimisation priority, led by NHS England and supported by the UK Health Security Agency (UKHSA) and the UK Government.^{5,16,17}

AMR can be managed by a combination of interventions that address:

- A political commitment to prioritise AMR.
- Monitoring antimicrobial use and resistance in microbes.
- Development of new drugs, treatments, and diagnostics.
- Individuals' behaviour relating to infection prevention and control, antimicrobial use, and AMR.
- Healthcare professionals' prescribing decisions.⁵

In the past, national antimicrobial resistance improvement schemes, in particular the NHS England Quality Premium 2017-2019, have influenced CCG improvement priorities.^{18,19} For 2022/23, the NHS England oversight metrics include an ICB level metric for antimicrobial resistance: appropriate prescribing of antibiotics and broad-spectrum antibiotics in primary care.²⁰

The overall burden of AMR decreased by 4.2% between 2017 and 2021, although the trend varied by key pathogen. Total antibiotic consumption had been decreasing prior to the COVID-19 pandemic (4.3% reduction between 2017 and 2019, from 18.8 to 18.0 defined daily dose (DDD) per 1,000 inhabitants per day). A sharp decrease was seen during the COVID-19 pandemic, with consumption declining by 10.9% between 2019 and 2020 (to 16.02 DDD per 1,000 inhabitants per day). Data remained similar from 2020 to 2021, with only a slight further decline in consumption of 0.5% (to 15.9 DDD per 1,000 inhabitants per day).¹⁶

Antibiotic prescribing continued to be highest in general practice (72.1%), with a marginal reduction seen in this setting (from 11.65 to 11.49 DDDs per 1,000 inhabitants per day, between 2020 and 2021). Hospital inpatient, hospital outpatient and other community settings have shown an increase in consumption between 2020 and 2021. This may be a result of an increase in routine healthcare

activities following the pandemic. Consumption in dental practices has declined (-7.1%) following the large increase seen during 2020, although it has not returned to pre-pandemic levels.¹⁶

The AMR burden in bloodstream infections (BSI) varies markedly across regions in England. Ethnic minorities appear to be disproportionately affected by infections associated with AMR with 33.0% (n = 1,243) of Asian or Asian British ethnic group patients with a key BSI, contracting a resistant BSI compared to 20.9% (n = 10,536) of White ethnic group patients.¹⁶

Public Health England (PHE) has produced guidance on managing common infections which aims to improve the management of common infection in primary care and minimise the emergence of antimicrobial resistance in the community.²¹ The PHE's principles of treatment are outlined including:²¹

- Use professional judgement and involve patients in management decisions.
- Use the summary tables alongside patient information about safety netting, back-up antibiotics, self-care, infection severity and usual duration, clinical staff education, and audits.
- Only prescribing antibiotics when there is clear clinical benefit, giving alternative, non-antibiotic self-care advice, where appropriate.
- Limit prescribing over the telephone to exceptional cases.
- Use simple, generic antibiotics if possible. Avoid broad spectrum antibiotics (for example co-amoxiclav, quinolones and cephalosporins) when narrow spectrum antibiotics remain effective, as they increase the risk of *Clostridium difficile*, MRSA and resistant UTIs.
- Avoid widespread use of topical antibiotics, especially in those agents also available systemically (for example fusidic acid).

English Surveillance Programme for Antimicrobial Utilisation and Resistance (ESPAUR)

The ESPAUR programme and oversight group works across the healthcare system to ensure that surveillance is optimised for antimicrobial use and resistance and that interventions related to AMS, including public and professional education and training, are delivered. The annual ESPAUR report includes national data on antibiotic prescribing and resistance, AMS implementation, and awareness activities across the UK.¹⁶

Healthcare Associated Infection & Antimicrobial Resistance Programme (HARP) Public Health Wales

The Healthcare Associated Infection, Antimicrobial Resistance & Prescribing Programme ([HARP](#)), is part of Public Health Wales, and supports the NHS in Wales to reduce the burden of healthcare associated infections and antibiotic resistance across Wales. This is delivered through feedback of surveillance data and the promotion of appropriate antimicrobial prescribing and interventions to prevent the spread of infections. Reports on antibacterial usage in primary care and secondary care in Wales are available.²²

Scottish Antimicrobial Prescribing Group (SAPG)

The [SAPG](#), established in 2008 at the request of the Scottish Government, is part of Healthcare Improvement Scotland. It provides leadership and support for NHS Health Boards in Scotland for AMS and infection management. The SAPG promotes the safe and effective use of antibiotics across hospital and community settings to tackle antimicrobial resistance. The aim is to have 'no avoidable injury or harm to people from the healthcare they receive'. They have developed a range of guidance, quality improvement toolkits and other resources to support clinical teams and patients to ensure safe, effective and patient-centred care when using antimicrobials.²³

Healthcare-associated Infection and AMS Improvement Board

The [Healthcare-associated Infection and Antimicrobial Stewardship Improvement Board](#) is a multi-agency group led by the Public Health Agency in Northern Ireland (NI). The board translates policy and strategy

into action and has developed a number of initiatives to measure and reduce unnecessary antibiotic use, antimicrobial resistance and gram-negative bloodstream infections.²⁴

Pharmacy Quality Scheme (PQS) (England) 2022/23

Within the 2022/23 PQS for community pharmacy in England there is a prevention domain for AMS. By the end of 31 March 2023, over a four week period, a minimum of 15 patients should be issued with two TARGET leaflets: [Treating your infection – Urinary Tract Infection \(UTI\)](#) and [Treating your infection – Upper Respiratory Tract Infection \(RTI\)](#), to help them assess patients presenting to the pharmacy with suspected UTI or upper RTI without a prescription, provide tailored advice to patients and promote awareness of antimicrobial resistance and antimicrobial stewardship. This can be extended to eight weeks if the minimum number of patients are not achieved within four weeks for each leaflet.²⁵

Dental AMS

The dental AMS toolkit for primary care was developed in collaboration between the Dental Subgroup of Public Health England's English surveillance programme for antimicrobial utilisation and resistance (ESPAUR), Faculty of General Dental Practice (FGDP) and British Dental Association (BDA). The aim of the toolkit is to provide resources to help primary care practitioners promote the appropriate use of antibiotics in dental care.²⁶

Safety

Hypersensitivity to penicillins can cause rashes and anaphylaxis and can be fatal. Allergic reactions occur in 1–10% of people who have taken a penicillin. Anaphylactic reactions to penicillins occur in fewer than 0.05% of treated patients. Individuals with a history of anaphylaxis, urticaria, or rash immediately after penicillin administration are at risk of immediate hypersensitivity to a penicillin and these individuals should not receive a penicillin. Individuals with a history of a minor rash (i.e. non-confluent, non-pruritic rash restricted to a small area of the body) or a rash that occurs more than 72 hours after penicillin administration are probably not allergic to penicillin. In these individuals a penicillin should not be withheld unnecessarily for serious infections, but the possibility of an allergic reaction should be considered. Other beta-lactam antibiotics (including cephalosporins) can be used in these patients. Patients who are allergic to one penicillin will be allergic to all penicillins because the hypersensitivity is related to the basic penicillin structure. Patients with a history of immediate hypersensitivity to penicillins may also react to the cephalosporins and other beta-lactam antibiotics and so should not receive these antibiotics. If a penicillin (or another beta-lactam antibiotic) is essential in an individual with immediate hypersensitivity to penicillin then specialist advice should be sought on hypersensitivity testing or using a beta-lactam antibiotic with a different structure to the penicillin that caused the hypersensitivity.⁵

A label of penicillin allergy is carried by 5.6% of the general population, with an estimated 2.7 million people in the UK affected. About 95% of penicillin allergy labels are incorrect when tested. The Standards of Care Committee of the British Society of Allergy and Clinical Immunology (BSACI) have developed a guideline for UK clinicians to help them set up a penicillin allergy de-labelling service for their patients. It includes a checklist to identify patients at low risk of allergy and a framework for the conduct of drug provocation testing by non-allergists.²⁷ ICB/HBs working with their PCN/GP practices should consider setting up a penicillin allergy de-labelling service for patients.

Cholestatic jaundice can occur either during or shortly after taking co-amoxiclav. This is more common in patients aged over 65 years and in men.²⁸

Antibiotic-associated colitis may be fatal; it occurs more frequently with clindamycin, second and third generation cephalosporins (e.g. cefaclor, cefuroxime) and quinolones (e.g. ciprofloxacin), but few antibiotics are free of this side effect.^{5,9}

Tendon damage (including rupture) has been reported rarely in patients receiving quinolones. This may occur within 48 hours of starting treatment and cases have also been reported several months after stopping a quinolone. Quinolones are contra-indicated in patients with a history of tendon disorders related to quinolone use. Patients over 60 years of age are more prone to tendon damage and the risk of tendon damage is increased by the concomitant use of corticosteroids. If tendonitis is suspected, the quinolone should be discontinued immediately.⁵ In addition to tendon damage quinolones can, rarely, produce severe, disabling, multisystem problems with symptoms that are persistent, progressive and/or delayed (for example, neuropathy, photosensitivity, psychosis). Oxidative and mitochondrial mechanisms may contribute to or underlie these problems. Prescribers should be aware of the possibility of these adverse effects and make patients aware to promptly report any. Consider reserving quinolones for conditions for which other effective antibiotics are not available.^{29,30}

The benefits of antibiotics should be weighed against the possible harms. For example, in the treatment of acute otitis media, for every 14 children treated with antibiotics, one child will experience an adverse event (such as vomiting, diarrhoea or rash) that would not have occurred if antibiotics were withheld.³¹

Global and national guidance

World Health Organization (WHO)

The WHO published its “Global Strategy for Containment of Antimicrobial Resistance” in 2001. The intention was to address this challenge by providing interventions to slow the emergence and reduce the spread of AMR.³² The latest 2021 WHO publication, “Antimicrobial stewardship interventions: a practical guide”, advises on and explores ten interventions:³³

Interventions prior to or at the time of prescription

- Clinician education.
- Patient and public education.
- Institution-specific guidelines for the management of common infections.
- Cumulative antibiograms (or cumulative antimicrobial susceptibility test data) can provide a broad overview of local antibiotic resistance over time. The intervention is appropriate for any hospital with a reliable microbiology laboratory demonstrated by consistent technical performance of in vitro susceptibility testing.
- Prior authorisation of restricted antimicrobials.
- Review spurious antibiotic allergies in consultation with local microbiologists. Clarify with the patient and amend with the patient.³⁴

Interventions after prescription

- Prospective audit and feedback.
- Self-directed antibiotic reassessments (antibiotics timeouts).
- Dose optimisation.
- Duration optimisation.

UK 5-year national plan

- The UK 5-year national plan, ‘Tackling antimicrobial resistance 2019-2024’, aims to build on the achievements in the 2013-2018 plan to reduce the need for, and unintentional exposure to, antimicrobials; optimise use of antimicrobials; and invest in innovation, supply and access.^{1,15} It was developed collaboratively across the UK governments in England, Scotland, Wales and Northern Ireland and advises that the biggest drivers of resistance in the UK are:
 - » A rise in the incidence of infections, particularly Gram-negatives.

- » The import of resistant infections through international travel.
- » Antimicrobial use.¹

These are underpinned by actions across 15 'content areas', ranging from reducing infection and strengthening stewardship to improving surveillance and boosting research. This includes ensure board-level leadership with a combined IPC and AMS role for all regulated health and social care providers. The plan also sets out four measures of success to ensure progress towards a 20-year vision. These include to:

- Halve healthcare associated Gram-negative blood stream infections.
- Reduce the number of specific drug-resistant infections in people by 10% by 2025.
- Reduce UK antimicrobial use in humans by 15% by 2024.
- The target to reduce UK antibiotic use in food-producing animals by 25% between 2016 and 2020.
- Be able to report on the percentage of prescriptions supported by a diagnostic test or decision support tool by 2024.¹

As well as the national plan, there are a number of other national documents in the UK which are designed to improve and measure the appropriate use of antimicrobials:

- The UK's 20-year vision for antimicrobial resistance' outlines the [vision for AMR in 2040](#), and defines the UK's nine ambitions for change as:¹⁷
 - » Continue to be a good global partner.
 - » Drive innovation.
 - » Minimise infection.
 - » Provide safe and effective care.
 - » Protect animal health and welfare.
 - » Minimise environmental spread.
 - » Support sustainable supply and access.
 - » Demonstrate appropriate use of antimicrobials.
 - » Engage the public on AMR.
- The [NHS England Long Term Plan](#) reiterates support for the five-year action plan on AMR and promotes medicines optimisation to reduce inappropriate prescribing of antimicrobials. There will be support for system-wide improvement, surveillance, infection prevention and control practice, and antimicrobial stewardship, ensuring resources are available for clinical expertise and senior leadership at all levels.³⁵
- [Antimicrobial prescribing and stewardship competencies'](#) provides information on competencies for AMS and antimicrobial prescribing. They can be used by any independent prescriber to help develop their prescribing practice in relation to prescribing antimicrobials.³⁶
- [Antimicrobial resistance \(AMR\): applying All Our Health](#) contains evidence and guidance for healthcare professionals on AMR, AMS and infection prevention and control.³⁷
- The PHE and NICE [guidance for managing infections in primary care](#) can be adapted for local implementation. It provides a simple, effective, economical and empirical approach to the treatment of common infections. It aims to target the use of antibiotics and antifungals in primary care and to minimise the emergence of bacterial resistance in the community.²¹
- [NICE quality standard 121](#) covers the effective use of antimicrobials (including antibiotics) in children, young people and adults. It aims to reduce the risk of AMR, change prescribing practice to help slow the emergence of AMR and ensure that antimicrobials remain an effective treatment for infection. It covers all settings and all types of antimicrobials for treating bacteria, viral, fungal and parasitic infections. It describes high quality care in priority areas for improvement.³⁸

- The [NICE guideline on Antimicrobial stewardship: changing risk-related behaviours in the general population \[NG63\]](#) covers making people aware of how to correctly use antimicrobial medicines (including antibiotics) and the dangers associated with their overuse and misuse. It also includes measures to prevent and control infection that can stop people needing antimicrobials or spreading infection to others. It aims to change people's behaviour to reduce antimicrobial resistance and the spread of resistant microbes.³⁹
- NICE have produced a number of [products to support AMS](#). There are many guidelines which offer evidence-based, antimicrobial prescribing information for all care settings. They focus on bacterial infections and appropriate antibiotic use.
- [Changing the Culture 2019-2024: One Health. Tackling antimicrobial resistance in Northern Ireland](#). A five-year action plan was produced by the Department of Health, the Department of Agriculture, Environment and Rural Affairs and the Food Standards Agency in Northern Ireland in 2019. This was prepared in conjunction with the UK 20-year vision and five-year national action plan and provides actions under these national documents specific to Northern Ireland. It includes measures to reduce the need for antimicrobials and unintentional exposure, optimised use of antimicrobials, and investing in innovation, supply and access to tackle AMR.⁴⁰
- NICE has produced COVID-19 rapid guidelines and advises that antibiotics should not be used for preventing or treating COVID-19 unless there is clinical suspicion of additional bacterial co-infection.⁴¹
- Pharmacist contribution towards AMS is reported in the Royal Pharmaceutical Society document, 'The pharmacy contribution to antimicrobial stewardship'.⁴² It recommends AMS should be strengthened by:
 - » Pharmacist leadership in the development of all national and local action plans for AMS/AMR to ensure a robust evidence based approach to the use of antibiotics.
 - » Effective collaboration across the multidisciplinary team (MDT) in the implementation of AMS. Plans should maximise the expertise of pharmacists in medicines leadership to provide greater communication and coordination in the delivery of consistent approaches to AMS.
 - » Pharmacist access to the patient health record, including diagnostic results as well as up to date local formulary information. This will enable more informed clinical decisions, in partnership with patients and the multidisciplinary team regarding antibiotics, ensuring safe prescribing alongside the patients' other medicines and health conditions.
 - » Increased public awareness of the support, advice and treatment available through pharmacy to ensure better use of NHS resources and investment in medicines.
 - » Commissioning of research into simple diagnostic testing, use of clinical scores and pathways in a community pharmacy setting, and its effects on appropriate antibiotic prescribing rates.
 - » Ongoing high quality education and training for pharmacists to keep up to date with the latest evidence base for antibiotics. This will ensure pharmacists are empowered to confidently contribute to prescribing decisions, patient counselling and advice regarding antibiotic use.
- The UK One Health Report is a joint report that discusses antibiotic use and antibiotic resistance in animals and humans.⁴³
- National toolkits to support the implementation of AMS best practice include:
 - » The Royal College of General Practitioners' (RCGP) [TARGET antibiotics](#) toolkit for primary care.⁴⁴
 - » [PHE Start Smart – Then Focus](#).⁴⁵
 - » [Dental AMS: toolkit](#) for dentists.⁴⁶
- The RCGP toolkit aims to help influence prescribers' and patients' personal attitudes, social norms and perceived barriers to optimal antibiotic prescribing. It includes a range of resources that can each be used to support prescribers' and patients' responsible antibiotic use, helping to fulfil Continuing Professional Development (CPD) and revalidation requirements.⁴⁴

- The UKHSA and Health Education England provide guidance, e-learning and campaigns on AMR, AMS and reducing inappropriate antibiotic prescriptions:
 - » [Antimicrobial Resistance and Infections programme](#)
 - » [PHE guidance Health matters: antimicrobial resistance](#)
 - » [Antibiotic Guardian](#)
 - » [Keep Antibiotics Working](#)
- NHS Improvement and Public Health England provide a resource '[Preventing healthcare associated Gram-negative bloodstream infections \(GNBSI\)](#)' to help health and social care economies reduce the number of GNBSIs, with an initial focus on *Escherichia coli* (*E.coli*).¹⁸ In addition, the UKHSA ESPAUR report highlights the changes in incidence of bloodstream infections (BSIs), antibiotic resistant infections, and the burden of resistant infection and subsequent mortality between 2021 and 2022.¹⁶
- NHS England's 'Improving the blood culture pathway' is a national review of blood culture pathway processes to support better antimicrobial stewardship and improved patient safety in Trusts. The document sets out proposals to improve and standardise the pre-analytical phase of the blood culture pathway. Optimising the blood culture pathway is essential in ensuring the best outcomes for patients with sepsis and in providing the most effective antimicrobial stewardship programs.⁴⁷

Guidance for organisations

The prescribing of antibiotics in primary care should be managed by encouraging an overall reduction in the total number of antibiotics prescribed as well as a reduction in the proportion of broad spectrum antibiotics prescribed.¹⁶

ICBs/HBs can achieve this by having a programme in place which supports AMS across all health systems. Encouragingly, a review in 2017 analysed that most CCGs reported successful improvement strategies including the use of both local and national antibiotic prescribing data to motivate improvements; these should be continued and extended to out-of-hours providers. The report concluded that local audit data helped to identify reasons for inappropriate prescribing and inform improvement planning; consequently all organisations should adopt this strategy and include it in local quality improvement schemes, ensuring performance reporting to organisational board level.⁴⁸

Furthermore, a US review noted that although AMS strategies implemented in long-term care facilities vary considerably in design and resource intensity, they collectively suggest potential to reduce antimicrobial by 14% (95% confidence interval: -8% to -20%; $P < 0.0001$) when pooling across all types of interventions used.⁴⁹

Roles of AMS Teams

- The AMS programme should include an AMS team: the AMS team should have core members (including an antimicrobial pharmacist and a medical microbiologist) and can co-opt additional members (e.g. Chief nurse, Director of Infection Prevention and Control (DIPC), IPC nurses) depending on the care setting and the issue being considered. Ensure roles, responsibilities and accountabilities are clearly defined.
- Monitor and evaluate antimicrobial prescribing and how this relates to local resistance patterns. Identify ways of feeding this information back to prescribers in all care settings.
- Provide regular feedback to individual prescribers on their antimicrobial prescribing at least annually. Feedback should include individual prescribing benchmarked against local and national antimicrobial prescribing rates and trends; local and national AMR rates and trends; and patient safety incidents related to antimicrobial use, including hospital admissions for potentially avoidable life-threatening infections, infections with *C. difficile* or adverse drug reactions such as anaphylaxis.
- Assist the local formulary decision-making group (preferably a system wide group) with recommendations about new antimicrobials:

- » Update local formulary and prescribing guidance.
- » Work with prescribers to explore the reasons for very high, increasing or very low volumes of antimicrobial prescribing, or use of antimicrobials not recommended in local or national guidelines.
- » Integrate audit into existing quality improvement programmes.
- Develop systems and processes for identifying and reviewing whether hospital admissions are linked to previous prescribing decisions in patients with potentially avoidable infections (e.g. *Escherichia coli* bacteraemias, mastoiditis, pyelonephritis, empyema, quinsy or brain abscess).⁴
- Foster a working relationship with the [National and Regional AMS Teams](#)⁵⁰
- Promote the use of digital technology to optimise AMS.⁴
- Ensure that ICBs have a governance system to ensure AMS activities are implemented, delivered, monitored for progress, and any risks escalated to the ICB board.

Education and training

Various education and training initiatives are available to support optimising antimicrobial prescribing practice.¹ For example, for primary care, the [TARGET antibiotics toolkit](#) is designed to support CPD, audit, training and self-assessment for the whole primary care team within a GP practice or out of-hours setting.⁴⁴

In Scotland, the [Scottish Reduction in Antimicrobial Prescribing \(ScRAP\)](#) toolkit provides educational resource to improve antibiotic prescribing.

The [Start Smart - Then Focus](#) toolkit is aimed at secondary care in England and provides an outline of evidence-based AMS in the secondary care healthcare setting.⁴⁵

A US article reviewed educational components and noted that they should not be used alone but to support other antimicrobial stewardship interventions.⁵¹

Data

Feedback on antibiotic prescribing data can help stimulate action for benchmarking, improvement and trends. Further information on the behaviour change theory model can be found in attachment 4.

A progress report from the Patients Association in 2020 on AMS programmes in primary care concluded that results from CCGs showed an encouraging level of engagement with AMS strategies and programmes, and some considerable progress in three years. This suggests that, at least in some areas, primary care professionals are engaging well with AMR efforts. However, there remains significant variation between different geographical areas, and areas of policy where progress is lagging behind, for example Point of Care (POC) diagnostic testing options.⁵²

The RCGP TARGET toolkit has resources to support ICBs/HBs/PCNs/practices/prescribers implementing their AMS programme. This includes a guide to all the resources available in the toolkit, presentations and a self-assessment checklist to benchmark the current antibiotic prescribing practice against others locally and nationally.⁴⁴

There is a variety of prescribing data which can be utilised by commissioners to give feedback to prescribers, for example:

- [UKHSA Fingertips AMR local indicators](#) - provide a source of information to enable action planning.
- [ePACT2 AMS dashboard](#)
- [OpenPrescribing](#)
- [PrescQIPP AMS visual analytics to support AMS activity during COVID-19 pandemic](#)
- [PrescQIPP AMS visual analytics to support antimicrobial stewardship activity](#)

- [NHS Model Health System RightCare UTI and CDI bundle](#)
- [Nuffield Trust Antibiotic prescribing](#)

Prescribers should be encouraged to complete the following on the TARGET website:

- The “[AMS Self-Assessment Checklist](#)” this is designed to be used by GPs, PCNs and commissioners to assess antibiotic prescribing. It allows the comparison of the results to other practices in the area and nationally.
- The training resources which include group training presentations and e-learning modules. These can help to fulfil CPD and revalidation requirements.
- Audits for the management of sore throat, UTI, otitis media, acute cough and rhinosinusitis.⁴⁴

The use of delayed prescribing should be encouraged and can be supported using the collection of “Treating Your Infection” patient leaflets for common infections from the RCGP TARGET toolkit.⁴⁴

These leaflets are a useful tool for clinicians to use in consultations for patients who do not require an antibiotic prescription for their infection. They include information on illness duration, self care advice and advice on when to re-consult. It aims to increase the patient’s confidence to self care, and to facilitate the use of back-up antibiotic prescriptions, but it also allows the patients to go away with something, so ending the consultation on a positive note. Delayed prescribing, the discussion and issue of the leaflet can and should be read coded in the patient’s record if used.⁴⁴

Patient expectations around the prescribing of antibiotics in primary care should be managed.³⁹ The TARGET toolkit has useful resources available to raise the awareness of the issues and risks involved with antibiotic resistance. These include the [back-up/delayed antibiotic prescriptions: why and how to use them in primary care settings](#). The [Self Care Forum factsheets](#) are available for common ailments which aim to help clinicians and patients discuss issues around self care during consultation and how to handle symptoms in the future.⁴⁴

World Antimicrobial Awareness Week occurs between 18-24 November every year to raise awareness among health professionals and the public about AMR and appropriate prescribing. Evaluations of the activities have shown them to be cost-effective and successful in raising awareness of the issues and in driving behavioural changes.³⁹ More information and useful resources can be found here: <https://www.who.int/campaigns/world-antimicrobial-awareness-week>

Antibiotic guidelines

ICBs/HBs should author, implement and review primary care antibiotic guidelines across the ICB/HB for use by doctors (including locums), independent prescribers, nurses, pharmacists and dentists which are in line with national antimicrobial guidelines in:

- [England](#)
- [Wales](#)
- [Scotland](#)
- [Northern Ireland](#)

Major changes from the guidance are discouraged, however adaption for local use to reflect local service delivery, AMR and sampling protocols is recommended. ICB/HB guidelines should:

- Provide a simple, effective, economical and empirical approach to the treatment of common infections.
- Target the use of antibiotics and antifungals in primary care.
- Minimise the emergence of bacterial resistance in the community.
- Create local ownership and agreement for the guidance by collaboration between primary care clinicians, laboratories and secondary care providers.

Decision support systems

- NG15 says consider providing IT or decision support systems that prescribers can use to decide whether:
 - » To prescribe an antimicrobial or not, particularly when antimicrobials are frequently prescribed for a condition but may not be the best option.
 - » Use alternatives to immediate antimicrobial prescribing may be appropriate (for example, back-up [delayed] prescribing or early review if concerns arise).⁴
- Also consider developing systems and processes to ensure the following information is provided when a patient is transferred to another care setting:
 - » Information about current or recent antimicrobial use.
 - » When a current antimicrobial course should be reviewed.
 - » Who a patient should contact, and when, if they have concerns about infection.⁴
 - » As much information as possible should be reported and prescribers should be encouraged to add this information when requesting tests for sensitivities.
- IT or decision support systems should also support or promote optimising antibiotic prescribing such as:
 - » Shorter effective courses where possible.
 - » Compliance with local and national guidance.
 - » Patient safety messages.
 - » Shared clinical decision making.
 - » Signposting/referral.
 - » Sending messages to patients with resources (AccuRx).
 - » Access to patient information leaflets and resources.
 - » Appropriate coding.
 - » Diagnosis.

Guidance for health and social care setting

Health professionals should be aware of resources and services that can help individuals minimise their risk of infections, such as travel vaccination clinics, screening programmes, sexual health services, immunisation programmes (including COVID-19), and other local referral pathways or schemes. The benefits of good hygiene, vaccination, and other preventative measures to reduce the risk of acquiring infections should be discussed with individuals, and individuals referred to further information or services if necessary.

Those involved in providing care should be educated about the standard principles of infection prevention and control. They should be trained in hand decontamination, the use of personal protective equipment, and the safe use and disposal of sharps. For further information, see the [Clinical Knowledge Summary on Healthcare-associated infections](#).⁵³

Prescribing

- When deciding whether or not to prescribe an antimicrobial, undertake a clinical assessment and consider the risk of AMR for individual patients and the population as a whole.⁵
- An immediate antimicrobial prescription for a patient who is likely to have a self-limiting condition is not recommended.⁵
- Document in the patient's records (electronically wherever possible) the decisions related to antimicrobial use, including the plan as discussed with the patient, and their family and/or carers (if appropriate), and reason for prescribing/not prescribing an antimicrobial.⁵

- In hospital, microbiological samples should be taken before initiating an antimicrobial for patients with suspected infection. In primary care, consider taking microbiological samples when prescribing an antimicrobial for patients with recurrent or persistent infections. The choice of antimicrobial should be reviewed when microbiological results are available. For non-severe infections, consider taking microbiological samples before making a decision about prescribing an antimicrobial, providing it is safe to withhold treatment until the results are available.⁵
- Follow local or national guidelines on prescribing the shortest effective course and most appropriate dose and route of administration. If prescribing outside of local or national guidelines, document in the patient's records the reasons for the decision.⁵
- Patients on antimicrobial treatment should be appropriately monitored to reduce side-effects and be assessed on the continued need for treatment. Repeat antimicrobial prescriptions are not recommended, unless needed for a particular clinical condition or indication. Avoid issuing a repeat prescription for longer than six months without review.⁵

Advice for patients and their family and/or carers

- Prescribers, primary care and community pharmacy teams should provide patients with resources educating them about not asking for antimicrobials as a preventive measure against becoming ill or as a stand-by measure, unless the patient has a specific condition or a specific risk that requires antimicrobial prophylaxis.⁵
- Prescribers should discuss with patients, and their family and/or carers (if appropriate) the likely nature of the condition, their views on antimicrobials, benefits and harms of antimicrobial prescribing, and why prescribing an antimicrobial may not always be the best option. Information should be provided about what to do if their symptoms worsen or if problems arise as a result of treatment. Written information should be provided if needed.⁵
- If antimicrobial treatment is not the most appropriate option, prescribers should advise patients, and their family and/or carers (if appropriate) about other options (as appropriate), such as self-care with over-the-counter preparations, back-up (delayed) prescribing, or other non-pharmacological interventions. Prescribers, primary care and community pharmacy teams should verbally emphasise and provide written advice about managing self-limiting infections.⁵
- If antimicrobials are prescribed or supplied, prescribers, primary care and community pharmacy teams should provide patients with verbal and written information on the correct use of antimicrobials. Advice should encourage people to:
 - » Take, or use antimicrobials only when recommended by a suitably qualified health care professional.
 - » Obtain antimicrobials only from a health care professional.
 - » Take, or use antimicrobials as instructed (right dose for the duration specified and via the right route).
 - » Return any unused antimicrobials to a pharmacy for safe disposal.⁵
 - » The RPS has an [antibiotic amnesty website](#) which has advice on running a campaign plus posters which can be downloaded to promote the amnesty.

Summary

- The increased and inappropriate use of antibiotics together with the lack of any new classes of antibiotics discovered since the 1980s, means we are heading rapidly towards a world in which our antibiotics no longer work.¹
- A serious consequence of inappropriate antibiotic prescribing is CDAD which leads to an increase in morbidity and mortality. Its development can be driven by antibiotic use in the preceding four weeks and is associated with the prescribing of broad-spectrum antibiotics such as clindamycin, cephalosporins, co-amoxiclav and quinolones.^{9,11,14}
- ICBs/HBs and prescribers across all health and social care settings that use NICE guidance should implement NICE guideline [NG15], Antimicrobial stewardship: systems and processes for effective antimicrobial medicine use. The purpose of this guideline is to provide good practice recommendations on systems and processes for the effective use of antimicrobials.⁴
- The RCGP TARGET toolkit has many resources to support ICBs/HBs/PCNs/practices and prescribers to help influence prescribers' and patients' personal attitudes, social norms and perceived barriers to optimal antibiotic prescribing. It includes a range of resources that can each be used to support prescribers' and patients' responsible antibiotic use, helping to fulfil CPD and revalidation requirements.⁴⁴

Further resources

The charity [Antibiotic Research UK](#) is a group of leading UK university and company scientists and clinicians all with an interest in AMR. It aims to kick start antibiotic drug development.

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Additional PrescQIPP resources

Briefing	https://www.prescqipp.info/our-resources/bulletins/bulletin-313-antimicrobial-stewardship/
Implementation tools	

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