Antimicrobial resistance (AMR) poses a significant threat to public health. Antimicrobial-resistant infections result in at least 700,000 deaths worldwide each year.

This report focuses on how NICE’s evidence based guidance can change prescribing practice to help slow the emergence of AMR and ensure that antimicrobials remain effective treatments for managing infections.

**Antimicrobials in primary care** p6
Prescribing of antimicrobials in primary care in England has reduced in recent years. This section highlights NICE guidance that provides primary care with the tools they need to further reduce inappropriate antibiotic prescribing.

**Antimicrobial stewardship in secondary care** p11
Prescribing of antimicrobials in hospitals in England has risen overall since 2013. This section reviews the uptake of recommendations from NICE’s guidance on antimicrobial stewardship, including a focus on the timely review of antimicrobial prescribing.

**Spotlight on sepsis** p14
Sepsis is a leading cause of avoidable death in people of all ages. This section looks at the the uptake of NICE’s recommendations for people with suspected sepsis in hospital, including the timely recording of vital signs and the prompt administration of antibiotics.

**Commentary** p17
Professor Mike Sharland and Professor Peter Wilson review recent achievements and consider NICE’s role in combating antimicrobial resistance.
Why focus on antimicrobial resistance?

NICE impact reports review how NICE recommendations for evidence-based and cost-effective care are being used in priority areas of the health and care system, helping to improve outcomes where this is needed most.

NICE provides evidence-based guidance and advice to help improve health and social care services. The uptake of NICE guidance is influenced by close relationships with our partners in the system, such as The Department of Health and Social Care (DHSC), NHS England and Public Health England (PHE).

AMR is increasing, with few new antimicrobial medicines coming to market. NICE is working in collaboration with DHSC, NHS England and industry to explore new funding models for innovative antimicrobials that do not link payment to the volume of antimicrobials prescribed. Such models have the potential to provide much needed incentives for the development of new antimicrobials. The appropriate use of existing antimicrobials remains vitally important.

NICE first published guidance on antibiotic use in 2008. This guideline, on self-limiting respiratory tract infections, provides practical strategies for prescribing in primary care. Since then NICE has published a suite of guidance, quality standards and advice products on antibiotic use. Our guidelines and quality standard on antimicrobial stewardship aim to change prescribing practice to help slow the emergence of AMR and ensure that antimicrobials remain an effective treatment for infection.

DHSC’s UK Five Year Antimicrobial Resistance Strategy outlines approaches to slowing the development and spread of AMR. Since the strategy was launched in 2013, significant progress has been made to tackle the threat of AMR. Data from PHE’s English surveillance programme for antimicrobial utilisation and resistance (ESPAUR) reports show that prescribing behaviours are gradually changing.

Medicines used to treat infections are called antimicrobials. Antibiotics are antimicrobials that are widely used for treating a range of bacterial infections such as chest and urinary tract infections. They are also used to help prevent infection in some people who may be at higher risk of getting an infection, such as those having surgery or receiving cancer treatment.

Widespread use of antimicrobials has been linked to microbes such as bacteria and viruses changing and becoming resistant to treatment. This means that the antimicrobials we have no longer stop all microbes causing the infection. Some survive to cause long lasting and severe infections. This is known as antimicrobial resistance (AMR).

The Chief Medical Officer (CMO) Dame Sally Davies advocates globally on AMR. The CMO report on the threat of antimicrobial resistance was published in 2013. The report highlighted encouraging the development of new antibiotics and looking after the current supply of antibiotics. This means using better hygiene measures to prevent infections, prescribing fewer antibiotics and making sure that antibiotics are only used when needed.
In England, total prescribing of antibiotics in all settings, measured using defined daily dose (DDD) per day, reduced by 4.5% between 2013 and 2017, although prescribing increased in secondary care. The increase in secondary care prescribing may be in part connected to the shortage in the supply of broad-spectrum antibiotic piperacillin/tazobactam and the need to use 2 or more alternative antibiotics to give the same degree of antibacterial coverage.

*Prescribing of antibiotics in England reduced by 4.5% overall between 2013 and 2017*

Data from the European Centre for Disease Prevention and Control show that, when compared to other European countries, the UK ranks in the middle for antibiotic prescribing in primary care. However for prescribing of antibiotics in hospitals, the UK prescribes the third highest out of the 23 European countries with data.

Data from Austria, Belgium, Bulgaria, Croatia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Sweden, United Kingdom.
The 2018 ESPAUR report provides an update on the burden of antimicrobial resistance. Data show that the proportion of bacteria resistant to antibiotics remained largely stable from 2013 to 2017, but that the total number of infections resistant to key antibiotics increased from 12,250 in 2013 to 16,504 in 2017, a rise of 35%.

For example, the number of cases of *Escherichia coli* (*E. coli*), the most common bloodstream infection, increased from 33,497 in 2013 to 41,287 in 2017, a rise of around 23%. The ESPAUR report estimates that, for *E. coli*, there was an increase in the number of infections resistant to the broad spectrum antibiotics piperacillin/tazobactam and third-generation cephalosporins.

**Surveillance data show that the number of bloodstream infections increased between 2013 and 2017**

While progress has been made and total prescribing has reduced, AMR remains one of healthcare’s biggest challenges. To help prevent the development of current and future bacterial resistance and resistant infections, it is important to use antibiotics according to the principles of antimicrobial stewardship as recommended by NICE. This includes prescribing antibiotics only when they are needed and reviewing the continued need for them.

We routinely collect data which give us information about the uptake of NICE guidance. To produce this report, we have worked with national partners to select data which tell us how our guidance might be making a difference in priority areas of antimicrobial stewardship and infectious diseases. These data also highlight areas where there remains room for improvement.

‘Over the last few years, we have managed to reduce antibiotic prescribing in England. But we’ve still got a long way to go. We need to equip prescribers with the right tools to move away from an over-reliance on antibiotics. Your guidance will help with this.’

Dame Sally Davies, Chief Medical Officer
Antibiotics in primary care

In England around three quarters of all antibiotic prescribing takes place in primary care. To minimise the development of antimicrobial resistance (AMR) it is important to prescribe antibiotics only when they are necessary.

Antibiotics are often assumed to be a quick fix when feeling unwell and many people ask their GP for them. However, antibiotics are inappropriate for self-limiting mild bacterial infections and viral infections such as colds. NICE and our partners in the healthcare system are working to reduce the level of inappropriate prescribing by producing guidance and toolkits along with using incentives to support safe and effective prescribing.

NICE’s antimicrobial stewardship guidelines on changing risk-related behaviours in the general population and systems and processes for effective antimicrobial medicine use aim to make people aware of how to correctly use antimicrobial medicines, outline the dangers associated with their overuse and misuse, and aim to change prescribing practice to help slow the emergence of AMR.

Prescribing of antibiotics in primary care has reduced in recent years but there is still more to do. NICE’s suite of antimicrobial prescribing guidelines on managing common infections aim to provide clear guidance about when to use antimicrobials to minimise AMR.

The prescribing of antibiotics in primary care has been successfully reduced by about 11% between 2013 and 2017, but there is still more to do.

1m fewer antibiotics were dispensed in 2017/18 than in 2016/17

Antibiotic prescribing in a primary care centre

NICE’s guideline on prescribing antibiotics for self-limiting respiratory tract infections provides practical strategies for prescribing, including identifying when immediate antibiotics are needed and when to offer a back-up (delayed) prescription or reassurance alone. One primary care centre, Churchill Medical Centre in Surrey, developed and implemented a programme based on the guideline, which they described in a NICE shared learning example.

The practice introduced a consistent set of messages based on NICE’s guidance. These were presented in the form of leaflets, posters, waiting room messages, summaries of evidence and short positive messages to patients that clinicians could give with confidence. This made sure that clinicians, staff and patients had access to the best available evidence to manage common respiratory tract infections effectively. The practice showed a 15% reduction in antibiotic prescribing for respiratory tract infections within 3 months.
Antibiotic prescribing and antibiotic resistance are inextricably linked. The UK Five Year Antimicrobial Resistance Strategy states that ‘indiscriminate or inappropriate use of antibiotics is a key driver in the spread of antibiotic resistance’. Most antibiotic prescribing takes place in primary care and so, alongside NICE guidance, incentives have been put in place to encourage appropriate prescribing in primary care.

Since 2015, NHS England’s Quality Premium has included a focus on improving appropriate antibiotic prescribing. This payment is intended to reward CCGs for improvements in the quality of the services that they commission. To achieve the antibiotic prescribing element of the payment, each CCG has been required to reduce the number of antibiotics prescribed and the percentage of those prescriptions which are for broad spectrum antibiotics.

Both of these measures have seen improvement since the UK Five Year Antimicrobial Resistance Strategy was published in 2013. Data from Public Health England (PHE)’s AMR local indicators show that, between 2013 and 2017, total antibiotic prescribing in primary care decreased by around 11%. In the first quarter of 2018, 82% of CCGs had reduced their levels of prescribing to below the England average for the same quarter in 2013.

Antibiotic prescribing in primary care

Antibiotic items prescribed in primary care per 1,000 people, England

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<thead>
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<td>2016</td>
<td>157</td>
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<td>2017</td>
<td>151</td>
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However there remains wide variation in the prescribing of antibiotics in different areas of England, suggesting that there is still room for improvement in many areas.

As well as reducing overall prescribing, it is important to prescribe the appropriate antibiotic. Broad-spectrum antibiotics, such as co-amoxiclav, quinolones and cephalosporins, should be reserved for treating more serious infections as they are more likely to contribute to antimicrobial resistance.

Data from PHE’s AMR local indicators show that the median proportion of broad-spectrum antibiotics as a proportion of all antibiotic items reduced from over 11% in 2013 to under 9% in 2017. In March 2018, the prescribing of broad spectrum antibiotics as a proportion of all antibiotic prescribing in primary care was at or below 10% in over 85% of CCGs.

### The TARGET toolkit

Public Health England, the Royal College of General Practitioners and the Antimicrobial Stewardship in Primary Care Group have produced the Treat Antibiotics Responsibly, Guidance, Education, Tools (TARGET) toolkit. This helps influence prescribers’ and patients’ personal attitudes, social norms and perceived barriers to responsible antibiotic prescribing. A TARGET patient leaflet on treating respiratory tract infection has been endorsed by NICE. It supports the implementation of recommendations in the NICE guidelines on processes for antimicrobial stewardship, behaviour change for antimicrobial stewardship and antibiotic prescribing for respiratory tract infections.

### Managing common infections

A study led by researchers from PHE’s National Infection Service found that, in England between 2013 and 2015, as many as 23% of all antibiotic prescriptions in GP practices may have been inappropriate. The study identified that sore throat, cough, sinusitis, ear infection and urinary tract infections were the conditions most associated with inappropriate prescribing of antibiotics.

To drive further improvement, NHS England has maintained the focus on reducing antibiotic prescribing in the 2018/19 Quality Premium. To help prescribers meet these targets and reduce the risk of AMR, NICE’s new suite of evidence-based antimicrobial prescribing guidelines make recommendations for appropriate prescribing for common infections, the choice of antibiotic, dosage and course length.
Upper respiratory tract infections

In October 2017 NICE published its first managing common infections guideline, on acute sinusitis. The guideline recommends that antibiotics should not be offered to people presenting with acute sinusitis symptoms of around 10 days or less. The NICE guideline on otitis media (ear infection) says that in most cases infections last up to a week, and that most children get better in 3 days without antibiotics. Serious complications are rare.

Acute sinusitis is usually triggered by a viral infection such as a common cold and most people will get better without treatment, regardless of cause

The evidence reviewed during the acute sore throat guideline development found that most sore throats will get better without antibiotics. However, research suggests antibiotics were prescribed in 60% of cases. Instead of prescribing antibiotics, NICE advises people to manage their symptoms themselves with self-care, for example, treating pain with paracetamol or ibuprofen if appropriate.

Urinary tract infections (UTIs)

A suite of guidelines support antibiotic prescribing for UTIs. UTIs are common, with a recently published study showing that, over a 10-year period, around 1 in 5 older adults will have at least one UTI clinically diagnosed in primary care. Although the majority of UTIs will require antibiotic treatment, it is important to use the right antibiotic, at the right dose, for the right length of time.

Our lower UTI guideline advises healthcare professionals to ask people about the severity and regularity of their symptoms before prescribing antibiotics. This includes asking about the steps they have taken to manage the UTI themselves, for example taking painkillers. It may also involve asking the person for a urine sample, and using the results to identify which antibiotic is likely to work most effectively.

‘Having the NICE guidance to share with patients helps with those difficult conversations where patient expectations include antibiotics for self limiting ailments. It’s nice to have the guidance and evidence behind you.’  GP, Herefordshire
Data from the 2017 ESPAUR report indicate that around half of people with E. coli infection had a UTI that was thought to have been the underlying source of the invasive infection. Testing of samples from community and acute settings showed that around 3% were resistant to nitrofurantoin while over a third were resistant to trimethoprim. The 2018/19 Quality Premium incentivises CCGs for reducing inappropriate antibiotic prescribing for UTI in primary care, focusing on a reduction in the prescribing of trimethoprim to people aged 70 or older.

Supporting decision making

The managing common infections suite of guidance include a visual summary, which is an overview of the guideline recommendations, and a prescribing table. This aims to support decision making alongside the healthcare professional’s own clinical judgement.

### Otitis media (acute): antimicrobial prescribing

- **Acute otitis media**
  - Offer regular doses of paracetamol or ibuprofen to manage pain, with the right dose for age or weight at the right time and maximum doses for severe pain
  - Evidence suggests that decongestants or antihistamines do not help symptoms
  - Evidence on antibiotics
    - Antibiotics make little difference to the number of children whose symptoms improve
    - Antibiotics make little difference to the number of children with recurrent infections, short-term hearing loss or perforated ear drum
    - Complications (such as mastoiditis) are rare with or without antibiotics
    - Possible adverse effects include diarrhoea and nausea

#### Groups who may be more likely to benefit from antibiotics

- Children and young people with acute otitis media and ototrauma (discharge following ear drum perforation)
- Children under 2 years with acute otitis media in both ears
Antimicrobial stewardship in secondary care

Unlike in primary care, the overall use of antibiotics in hospital has been rising in recent years. To minimise antimicrobial resistance it is important to prescribe antimicrobials only when they are necessary.

NICE’s guideline on antimicrobial stewardship (AMS) aims to improve appropriate antimicrobial use through organisational or healthcare systemwide approaches. The guideline recommends antimicrobial stewardship programmes and interventions to promote and monitor appropriate antimicrobial use, preserving their future effectiveness.

In April 2015, NHS England launched a national programme to reduce inappropriate antibiotic prescribing, with incentive funding for hospitals. The payments form part of the Commissioning for Quality and Innovation (CQUIN) scheme that rewards quality improvement.

Antibiotic prescribing in secondary care

Data from Public Health England (PHE)’s English surveillance programme for antimicrobial utilisation and resistance (ESPAUR) report 2018 show that, overall antibiotic use in secondary care in England increased by 7.7% between 2013 and 2017.

The increased level of antibiotic prescribing in hospital may be in part connected to the shortage in the supply of broad-spectrum antibiotic piperacillin/tazobactam and the need to use 2 or more alternative antibiotics to give the same degree of antibacterial coverage.

As well as a focus on overall prescribing, it is important to prescribe the appropriate antibiotic, preserving some antibiotics for the most serious infections. Between 2013 and 2017 carbapenem use in secondary care remained stable overall while colistin use increased.
In 2017/18, 23% of NHS acute trusts met their CQUIN objectives to reduce total antibiotic prescribing, 75% met their objectives to reduce piperacillin/tazobactam prescribing and 49% met their objectives to reduce carbapenem prescribing. However, since many acute trusts did not meet their objectives, there is still room for improvement in this area.

**Antimicrobial stewardship teams**

NICE’s AMS guideline recommends that organisations establishing AMS teams should ensure that the team has core members including an antimicrobial pharmacist and a medical microbiologist. A survey carried out by PHE as part of the 2017 ESPAUR report demonstrated that all AMS committees included an antimicrobial pharmacist and microbiologist. The survey also showed that the NICE AMS guideline was discussed by 93% of trust AMS committees and 83% had completed the NICE AMS baseline assessment tool.

NICE says AMS teams should review prescribing and resistance data and identify ways of feeding this information back to prescribers in all care settings. Most respondents (91%) had accessed the AMR local indicators data via the PHE Fingertips tool and the majority (71%) had shared this data with their AMS committee. However only one-third had shared the data with their trust board and just 5% reported sharing it with front-line clinical staff.

**Antimicrobial review**

PHE’s start smart – then focus toolkit provides an outline of evidence-based antimicrobial stewardship in the secondary healthcare setting and supports the NICE antimicrobial stewardship guideline. It identifies the steps prescribers should take to make sure that antibiotics are appropriate when starting treatment. The tool then outlines how treatment should be focused and reviewed, in line with NICE guidance.

The NICE quality standard on antimicrobial stewardship highlights that it is best practice to take appropriate microbiological samples before antibiotics are used in hospital. Where it is appropriate to prescribe antibiotics before the type of infection is confirmed, such as when sepsis is suspected, microbiological samples should be taken before administering the antimicrobial and, when the results are available, used to review the antimicrobial prescription.
For some infections, people need to have an antimicrobial given by injection directly into their bloodstream (an intravenous antimicrobial). NICE’s AMS guideline recommends that healthcare professionals should consider reviewing these prescriptions after 48 to 72 hours. They should check whether antimicrobial treatment is still needed and, if it is, whether it can now be taken orally.

NICE recommends that people in hospital who are prescribed an antimicrobial have a microbiological sample taken and their treatment reviewed when the results are available

Part of the national CQUIN indicators for acute care providers is to ensure that prescriptions are reviewed within 72 hours of starting an antibiotic. Data from ESPAUR show the proportion of antibiotic prescriptions reviewed within 72 hours was over 90% in 2017/18.

Antibiotic review in neonatal care

NICE’s quality standard on neonatal infection states that newborn babies who start antibiotic treatment for possible early-onset neonatal infection should have their need for it reassessed at 36 hours. To deliver this, the quality statement says that service providers should have systems in place for blood culture results to be returned within 36 hours of samples being taken.

A study published in the Journal of Hospital Infection surveyed microbiological laboratories in the UK to identify barriers to implementing the guideline. The survey showed that fewer than half of the laboratories in England had a system to automatically report negative blood culture results to neonatal units at 36 hours, including out of hours. These results suggest there is room for improvement in this area.
Spotlight on sepsis

Sepsis is a common cause of serious illness and death, with an estimated 123,000 cases in England each year and 37,000 deaths.

Sepsis is a clinical syndrome caused by the body’s immune and coagulation systems being switched on by an infection. It is a life-threatening condition that is characterised by low blood pressure despite adequate fluid replacement, and organ dysfunction or failure.

Sepsis is a leading cause of avoidable death in people of all ages and is difficult to diagnose with certainty. Although people with sepsis may have a history of infection, fever is not present in all cases. The signs and symptoms of sepsis can be non-specific and can be missed if clinicians do not think ‘could this be sepsis?’.

In 2016 NICE published guidance on the recognition, diagnosis and early management of sepsis. The guideline recommends that healthcare professionals should consider using an early warning score to assess people with suspected sepsis in acute hospital settings. NICE did not find enough evidence during guideline development to inform a recommendation for the use of any specific scoring system. NICE supports the 2017 implementation advice published by NHS England on the National Early Warning Score as a pragmatic approach in hospital settings.

Sepsis care in hospital

The Royal College of Emergency Medicine (RCEM) severe sepsis and septic shock clinical audit 2016/17 reported on sepsis care in hospitals in England. NICE recommends that temperature, heart rate, respiratory rate, blood pressure, level of consciousness and oxygen saturation should be assessed in people with suspected sepsis. The audit reported that these vital signs were recorded on arrival in the emergency department in around 90% of cases.
Where healthcare professionals decide a person is at high risk of life-threatening illness from sepsis, NICE recommends that they should have antibiotics administered no more than an hour after being identified as high risk. For people at high risk of severe illness or death from sepsis, the clinical benefits of having the first dose of intravenous antibiotics within an hour outweigh any risks associated with possible antimicrobial resistance.

The RCEM audit reported that, in 2016/17, 41% of people identified as high risk had antibiotics administered within 1 hour. This is an increase from 28% in 2011/12.

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NICE recommends that people at high risk should also receive extra fluids through a drip or injection (intravenous fluids) if needed, within an hour of arriving at hospital. Early intervention with intravenous fluids can help reverse septic shock and restore cardiovascular stability for people who are at high risk of severe illness or death. The RCEM audit reported that the first intravenous crystalloid fluid bolus was given within 1 hour in 40% of cases. An additional 27% of people were given this within 4 hours.

For people with suspected sepsis, NICE recommends giving oxygen to achieve a target saturation of 94 to 98% for adults. The RCEM audit reported that oxygen was initiated to maintain the required level before leaving the emergency department in 58% of cases. This measure has also improved, from 47% in 2013/14 and 51% in 2011/12.

The NICE quality standard on sepsis highlights that people who have been stratified as at low risk of severe illness or death from sepsis should be given information about

‘Harry arrived at the hospital and was immediately taken to the paediatric department. He was transferred to the children’s high dependency unit and started on 2 different antibiotics and treated for meningitis as the possible cause. On day 3 he was given gentamicin which helped to rid him of Sepsis after 5 full days in hospital. I cannot thank the doctors and staff enough for their care which ultimately saved Harry’s life.’ Jordan, a young father, whose 5 week old baby Harry developed sepsis.
symptoms to monitor and how to access medical care. This is because sepsis cannot always be ruled out for people who have been assessed as being at low risk. They need to know which symptoms to look out for and how to access medical care urgently if these symptoms develop.

Information on symptoms and how to access medical care should be given to people assessed at low risk of developing sepsis

However the RCEM audit reported that, in 2016/17, just 26% of people at low risk or their relatives were provided with information. There appears to be room for improvement in the delivery of this element of care.

Sepsis antibiotic review

NICE works with a community of medicines and prescribing associates to support and promote high quality, safe, cost-effective prescribing and medicines optimisation in their local health economies. One of these associates supported the work of Frimley Health NHS Foundation Trust antimicrobial stewardship team.

In the financial year 2017/18 the trust achieved its target for the review of antibiotic prescriptions for sepsis within 72 hours. This increased from 82% in quarter 1 to 91% by quarter 4, exceeding the CQUIN target of 90%.

The Trust identified reasons for non-achievement of antibiotic review, including that the review was not undertaken by a senior clinician or did not detail an antibiotic plan.

Following the review of antibiotics, over the course of the financial year the decision to continue current antibiotics decreased from 68% in quarter 1 to 35% by quarter 4. In the same period the proportion who switched from intravenous to oral antibiotic at review increased from 6% to 14% and the proportion that stopped antibiotics at review increased from 17% to 22%.
Commentary
Mike Sharland, Peter Wilson, September 2018

The challenge of multiresistant bacterial infections in the UK is considerable and the prospect of untreatable infections is becoming a reality. The appearance of these infections is mirroring a pattern seen in other European countries. The main defence is infection control including antimicrobial control and stewardship.

NICE guidance has a central role in promoting and ensuring best clinical practice. Compliance with its recommendations is the standard and it is non-compliance that needs explanation and justification. Incentives in terms of Quality Premium and CQUIN are important in helping to deliver compliance with best practice. This report demonstrates some of the considerable successes already achieved.

In primary care broad spectrum antibiotic use has been reduced, exceeding the expected targets and alleviating pressures for emergence of antimicrobial resistance. There have been many previous attempts to reduce patient expectation and unnecessary prescription of antibiotics for likely viral respiratory infections. Finally these moves are gaining momentum in the range of guidelines for appropriate prescribing when treating common infections (p8).

Rising levels of bacteremia due to Escherichia coli have been a concern and resulted in major campaigns to improve catheter care, early diagnosis and appropriate antibiotic treatment of urinary infections in both primary and secondary care. Whether these are succeeding is not yet clear. However, new NICE guidance on treatment of urinary infection is intended to ensure that the choice of antibiotic in both lower and upper urinary infection limits the risk of bacteremia (p9).

It contains an example of a visual summary and prescribing table to help the prescriber to ensure the decision to use an antimicrobial is evidence-based and likely to be effective (p10).

In secondary care the complexity of treatment and improvements in survival of elderly and cancer patients has resulted in greater needs for broader spectrum antimicrobial use. Antibiotic usage has been rising for several years. Hence delivering a reduction in total antibiotic use, and of the very broad spectrum carbapenems in particular, has proved difficult.
The need to choose the most appropriate antibiotic at the time of diagnosis is not adequately supported by clinical or diagnostic studies. More National Institute for Health Research supported projects are required to improve targeting treatment to the causative organisms and instituting additional infection control precautions. NICE guidance on treatment of health care acquired infection aims to improve the appropriate choice and use of antibiotic according to the risk of antimicrobial resistance in the healthcare setting (p12).

Combining effective early treatment and stewardship goals is a pressing need. Ensuring an empirical antibiotic is of sufficiently broad spectrum to be effective against all likely pathogens can work against the need to narrow the spectrum to avoid resistance emerging.

Encouraging the prescriber to de-escalate from an effective but very broad spectrum agent before the patient has fully recovered can be difficult. NICE guidance promotes rational prescribing through taking of microbiological specimens and the review of antimicrobial prescriptions at 48–72 hours.

The different pressures make developing strategy difficult but the impressive record in this country suggests the correct paths will be found to halt the progress of these threats to the nation’s health.
We would like to thank Professor Mike Sharland and Professor Peter Wilson, for their input. We would also like to thank the Sepsis Trust for their contributions to this report.

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