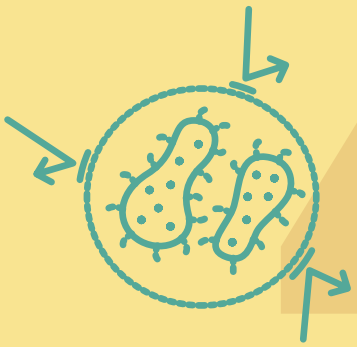
ESN
EUROPEAN SPECIALIST NURSES ORGANISATION

MODULE 4

Antimicrobial Resistance

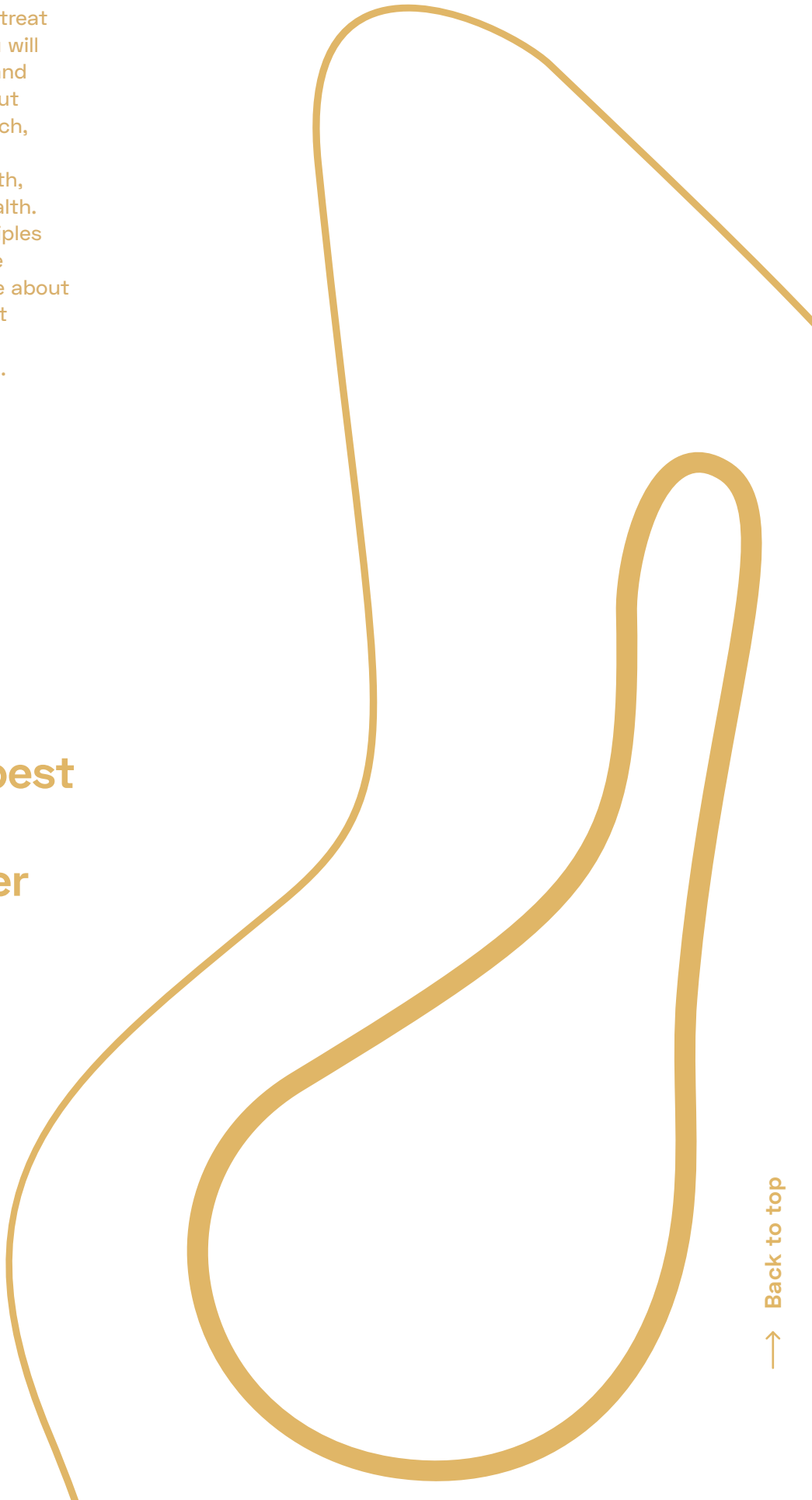


Back to top

After reading Module 4,
you will understand the basics of AMR, how it develops, and how it spreads. You will know more about how to treat patients with AMR infections. You will also understand how to prevent and contain AMR, and know more about the role of the One Health approach, which co-ordinates action across sectors, including veterinary health, agriculture and environmental health. You will understand the key principles of stewardship and help to create programs. You will also know more about the specialist nurses' engagement in European Union initiatives and international health organisations.

J. RICHARD
CLARKE

The best leader brings out the best in those he has stewardship over



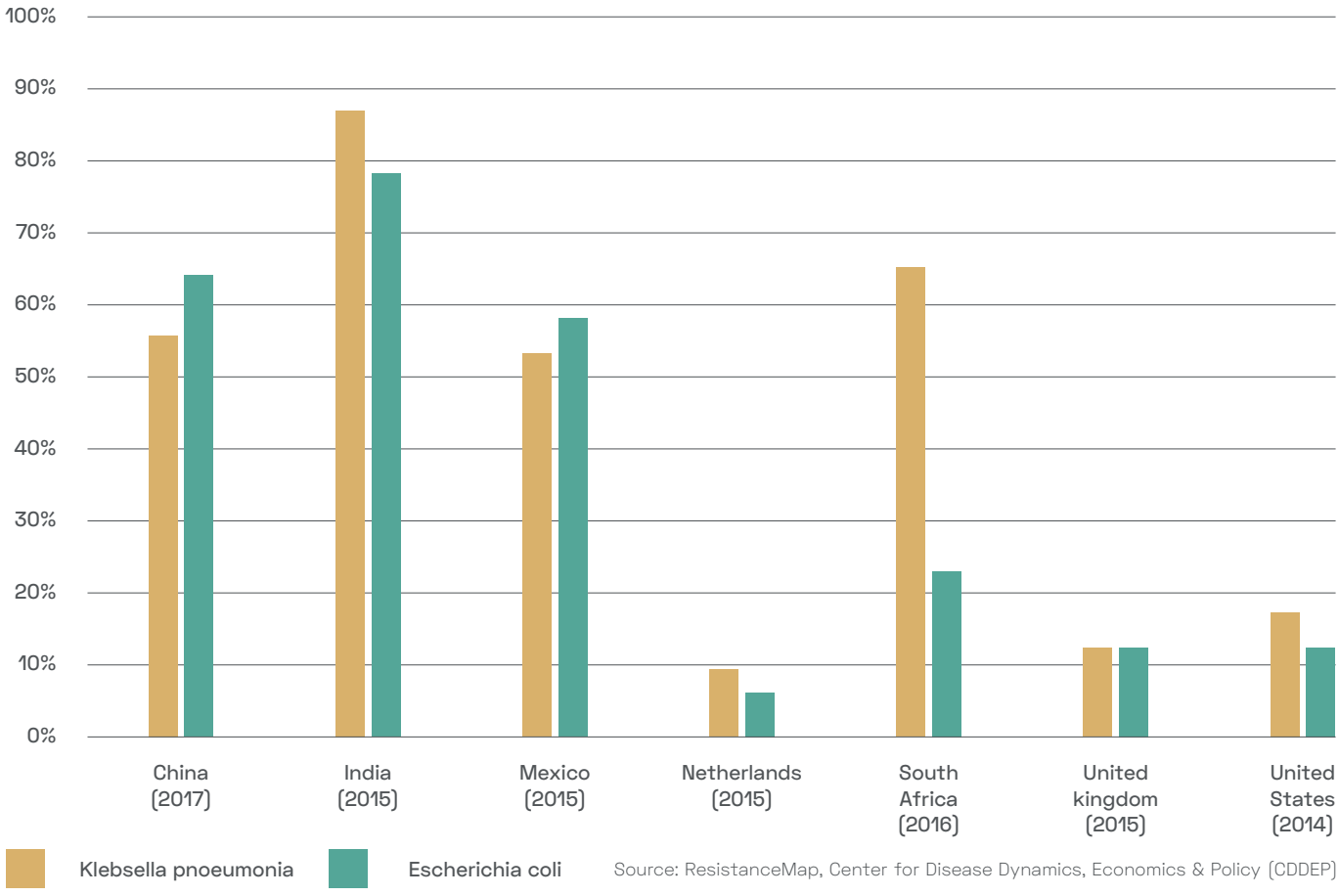
Back to top

28 Antimicrobial resistance, a threat to human health and professional practice

Drug-resistant infections are one of the most urgent global threats to human and animal health. Unless appropriate measures are put in place worldwide, by 2050, 10 million people will die because of infections [1].

Although these infections affect all countries, nurses in each country may face different challenges because of variations in microorganisms, patterns of resistance and available resources – for example, many infections are much more frequent in southern and eastern countries [2] (Figure 34). To deal with these variations, nurses need to learn best practices for antimicrobial use and infection prevention and control.

FIGURE 37: CROSS-COUNTRY COMPARISON OF E.COLI AND K. PNEUMONIAE RESISTANCE PATTERNS



Source: ResistanceMap, Center for Disease Dynamics, Economics & Policy (CDDEP)

Drug resistant infections will affect the delivery of many clinical procedures and treatments, such as cancer chemotherapy or obstetric surgery. Such effect will have a major impact on nursing care and practice across Europe.

Drug resistance is a natural part of the evolution of microorganisms, and cannot be stopped. However, excessive or inappropriate use of antibiotics can speed up its development [3]. To slow the increase of antimicrobial resistance, and to reduce its effects, a combination of clinical, organisational, and educational processes, known as antimicrobial stewardship (AMS), has been developed to improve the use of antibiotics [4].

Back to top

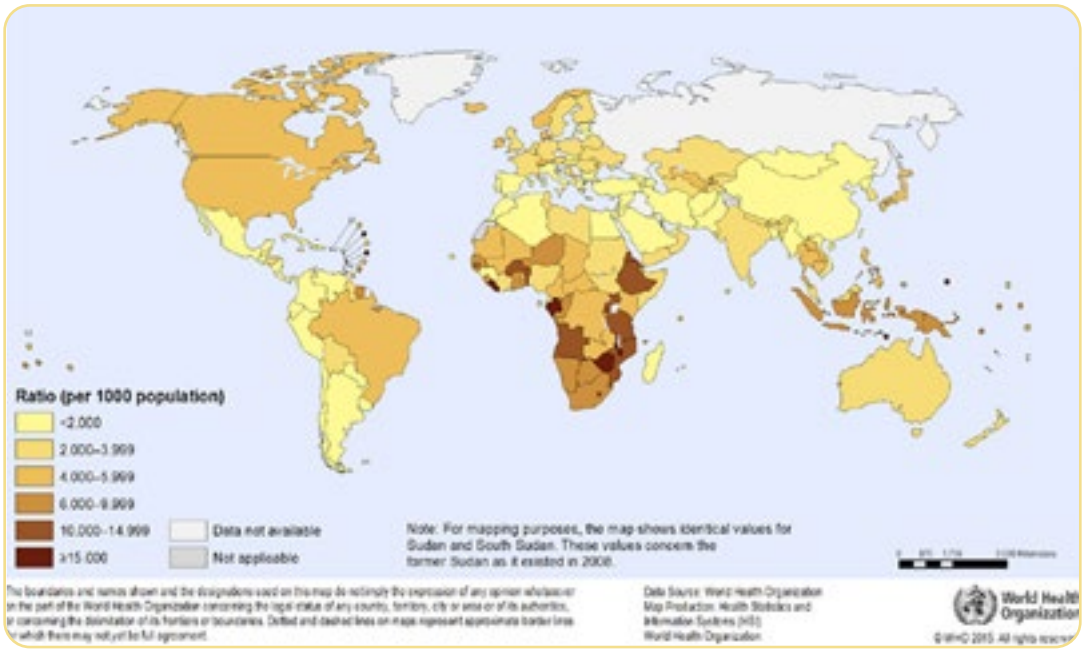
The effectiveness of AMS measures varies, depending on where and how they have been implemented. Many factors influence the decisions to use antibiotics, including personal, team and organisational approaches, culture and policy. However, AMS is overall an effective and safe approach [5,6].

28.1 Excellent nursing care includes optimal use of antibiotics

Nurses are the largest workforce in healthcare [7] (Figure 38), and they play a key role in AMS. In many settings worldwide, nurses are the closest to the community, and may be the only, most qualified or most accessible healthcare workers [8].

FIGURE 38: NURSE-MIDWIFE/ PHYSICIAN RATIO PER 1000 POPULATION

Source: WHO



There are many points in the antibiotic prescribing process where generalist and specialist nurses and their nursing skills and knowledge can be involved, and where nurses can demonstrate how best manage these drugs. See the following sections for some examples of clinical tasks and responsibilities which are central to nursing practice and antimicrobial stewardship.

Antimicrobial stewardship is not an extra or new task that nurses must include in their routines, but a set of skills, knowledge and behaviour that are already part of essential routine nursing care [9].

Excellent nursing care is excellent antimicrobial stewardship, and equally, excellent antimicrobial stewardship is excellent nursing care [9]

28.2 Challenges remain for nurses to engage in AMS

There are challenges that need to be resolved to help nurses to get involved in AMS, for example some nurses are not familiar with the meaning of antimicrobial stewardship, or think that stewardship refers only to the correct prescription of antibiotics. This puts the responsibility of the appropriate use of antibiotics on just those doctors and nurses that are qualified to prescribe.

Back to top

However, non-prescribing nurses can still influence the decisions to prescribe antibiotics by:

- Being part of multidisciplinary ward rounds and providing information about their patients
- Reporting the clinical improvement of patients following the administration of intravenous antibiotics
- Ensuring that appropriate biological samples are obtained promptly, and their results are transmitted swiftly so they inform prescribing decisions
- Administering antibiotic doses correctly and without interruption

These are all part of essential nursing tasks and behaviours, and these behaviours are required worldwide [10].

TABLE 24: AMS TASKS UNDERTAKEN AS PART OF THE JOB

Teach about infection prevention and control
Teach about appropriate use of antimicrobials
Lead or take part in audits and data collection on antimicrobial usage
Communicate laboratory reports daily to the treating prescriber
Remind the treating prescriber to review daily the need for any devices e.g. urinary catheters, central line
Ensure the suitable implementation of protocols for antimicrobial treatments
Ensure that the correct dose of antimicrobials is administered at the right time
Membership of the committee making decisions about antimicrobial prescribing
Remind the treating prescriber to review the antimicrobial daily once the specimen result is known
Ensure adequate and prompt timing of antimicrobial administration in critically ill patients ('hang time')
Remind the treating prescriber to review the need for antimicrobials on day 3 and 7
Ensure that adequate doses of antimicrobials are given according to patient characteristics
Develop antimicrobial prescribing policies and guidelines
Prescribe antimicrobials

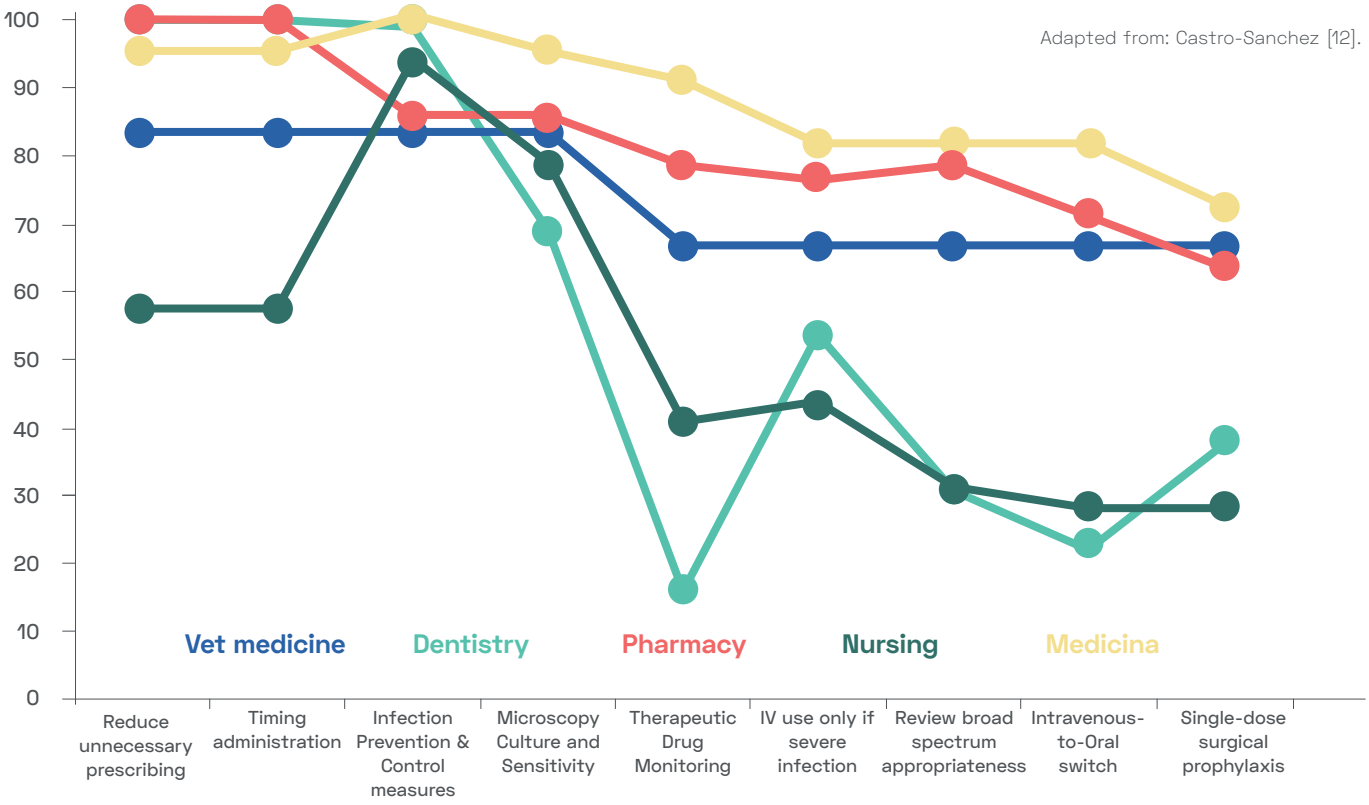
Source: Bulabula [10]

28.3 Gaps in education about antibiotics hinder the participation of nurses in AMS

The optimal use of antibiotics, and the participation of nurses in the process, is not necessarily part of the undergraduate nursing education curricula [11]. For example, in the UK only 63% of nursing university courses included AMS among the content, with an average of 10 (interquartile rage 4.5–13.5) hours taught to students. More worryingly, only 13% of nursing courses included all the principles of AMS recommended by the national public health agency within the educational content. The least time is given to the optimal use of antibiotics in the intravenous-to-oral antibiotic switch, and the need to administer only one dose of antibiotic as surgical prophylaxis [12].

Back to top

FIGURE 39: ANTIMICROBIAL STEWARDSHIP EDUCATION, UNDERGRADUATE UK COURSES, 2013



Gaps in knowledge behaviour because of lack of training mean that nurses may hesitate to take part in antibiotic improvement interventions. This is not only a problem in the UK; there are similar problems in the US and Europe [13,14].

What is the education about antibiotics in the undergraduate curriculum in your country? Find out. Consider how to get involved via your professional association or union, or your national regulatory nursing body

As an example, proposals to include nurses in stewardship programmes have given them bedside roles, such as reminding prescribers about the ideal duration of antibiotic courses, or challenging inappropriate or suboptimal antibiotic prescribing [15]. However, the nurses didn't always get support or training to help them deal with any friction resulting from these requests, which can lead to disinterest and disengagement [11]. These tasks can also reinforce the nurse's role as an assistant, rather than as an HCP in his or her own right.

How to engage in conversations about appropriate use of antibiotics?

Some teams have proposed to use structured conversations about antibiotics to raise issues related to prescriptions and decisions about antibiotics, with a view to improve organisational performance in this area [16]

«Ms X's culture results are back from the laboratory. The culture is positive for ___. She is currently receiving the following antibiotic(s)___. Do you want to continue this/these antibiotic(s)?»

«The sensitivities on Ms X's culture(s) have been received from the laboratory. The report indicates the isolate is sensitive/resistant to___. She is currently receiving the following antibiotic(s)___. Do you want to continue this/these antibiotic(s)?»

«Ms X is afebrile and tolerating clear liquids, do you want to change her intravenous antibiotic to an oral alternative?»

Back to top

Making AMS more relevant for nurses needs to reinforce their role in quality of care, patient safety, or excellence of nursing care (Table 25). Making it about 'doing the right thing for patients is the most important thing for nurses' will be easier to build into nursing routines, and empower nurses to get involved in prescribing decisions [17].

TABLE 25: TAILORING ANTIMICROBIAL STEWARDSHIP MESSAGES TO DIFFERENT HEALTHCARE WORKERS

Healthcare professional category	Key messages and suggested intervention tag lines		
	Hand hygiene	Antimicrobial stewardship	MRO isolation
Doctors—overall	«Hand hygiene appropriately—you know it's right»	«Think about what's needed—use antibiotics carefully»	«MRO isolation?—it's too important—so follow the rules»
		«Re-assess the situation and prescribe appropriately»	«Isolation rules are important—so follow them and avoid the consequences»
Senior medical officers—fulltime (SMOs)	«The benefits of good hand hygiene in preventing hospital-acquired infections are indisputable»	«Antimicrobial prescribing should be rational with a clear indication, duration and expected outcome»	«Placing patients into isolation is inconvenient, but the risk of transmitting MROs to other patients is a much bigger issue»
Senior medical officers—part-time (VMOs)	«Unless you do good hand hygiene, your reputation will suffer»	«Use of broad-spectrum antibiotics will have consequences and you will be held accountable for your actions»	«You will be monitored with mandatory reporting—so don't risk your reputation»
	«Good hand hygiene is good medicine. Bad hand hygiene is bad medicine. No-one tolerates bad medicine.»	«You are smart, so prescribe appropriately»	«The bugs are smart too, so follow the isolation rules»
		«Prescribe appropriately—or there could be problems»	

Back to top

Hospital medical officers (HMOs)	«Realise your potential—perform good hand hygiene»	«Check and get antibiotic approval, you know your career is worth it»	«It's easy to follow the isolation protocols and lead the way—don't jeopardise your future»
	«Don't wreck your future career by striking out on hand hygiene»	«Appropriate antibiotic prescribing shows your potential»	
Nurses-allied health	«Every time you hand hygiene, it shows you care»	«Antibiotic prescribing is a doctor's responsibility, caring for the patient is yours»	«Don't take the bugs in this room home with you—follow the rules»
	«Every 50 times you hand hygiene you save a life»	«Caring for your patients means it is OK to ask if the antibiotic is appropriate»	«Care for all your patients and follow the isolation rules»
		«Care for your patients—check if their antibiotics are appropriate»	
Support services	«A good job needs good hand hygiene»	Not applicable	«Keep your job—follow the isolation rules»
	«Good hand hygiene is essential to doing a good job»		«Isolation rules?—just do it»
	«You know when to hand hygiene—so do it»		

Source: Grayson [17]

Improving AMS teaching could fall into the domains shown in Table 26.

TABLE 26: SUGGESTIONS FOR AMS TEACHING DOMAINS FOR NURSES

Source: Castro-Sanchez [11]

Domain	Topic
Domain One	Infection prevention and control
Domain Two	Antimicrobials and antimicrobial resistance
Domain Three	The diagnosis of infection and the use of antimicrobials
Domain Four	Antimicrobial prescribing practice
Domain Five	Person centred care
Domain Six	Interprofessional collaborative practice

Back to top

28.4 Antimicrobial stewardship is not an extra job for nurses

Nurses have heavy workloads, and they may feel that adding another task to their daily activities is hard because of staff shortages, clinical and administrative workloads, or lack of resources. The principles of optimal antibiotic management included in national and international guidelines are already part of their day-to-day work. The steps included in the UK national action plan 'Start Smart then Focus' [18] are all part of nursing roles and responsibilities (see Table 27).

TABLE 27: START SMART THEN FOCUS KEY STEPS

Start smart	Then focus
Do not start antimicrobial therapy unless there is clear evidence of infection Take a thorough drug allergy history Initiate prompt effective antibiotic treatment within one hour of diagnosis (or as soon as possible) in patients with severe sepsis or life-threatening infections. Avoid inappropriate use of broad-spectrum antibiotics Comply with local antimicrobial prescribing guidance Document clinical indication (and disease severity if appropriate), drug name, dose and route on drug chart and in clinical notes Include review/stop date or duration Obtain cultures prior to commencing therapy where possible (but do not delay therapy) Prescribe single dose antibiotics for surgical prophylaxis where antibiotics have been shown to be effective Document the exact indication on the drug chart (rather than stating long term prophylaxis) for clinical prophylaxis	Reviewing the clinical diagnosis and the continuing need for antibiotics at 48-72 hours (or earlier) and documenting a clear plan of action - the 'antimicrobial prescribing decision' The five 'antimicrobial prescribing decision' options are: 1. Stop antibiotics if there is no evidence of infection 2. Switch antibiotics from intravenous to oral 3. Change antibiotics – ideally to a narrower spectrum – or broader if required 4. Continue and document next review date or stop date 5. Outpatient Parenteral Antibiotic Therapy (OPAT) It is essential that the review and subsequent decision is clearly documented in the clinical notes and on the drug chart where possible e.g. stop antibiotic

Source: Public Health England [18]

Back to top

28.5 The prevention of infections is an area where nurses can excel

Nurses have many opportunities to take part in the process of antibiotic use. Their most important role may be in the prevention of infection, maintenance of patients' health, and promotion of patients' self-care. These steps will reduce antibiotic prescription and, in the long term, reduce the development of antimicrobial resistance.

29 Preventing infections

29.1 Vaccination

Nurses in hospitals and primary care, school nurses, midwives and health visitors play an important role in promoting vaccination. Nurses can reduce infections in patients and in the general population by promoting the uptake of routine vaccines in national immunisation schedules [19,20]. By lowering the numbers of medical visits, diagnostic tests, treatments and hospital stays, vaccination can reduce healthcare costs [21,22].

Promoting influenza vaccines can help to lower the numbers of bacterial infections, decreasing antibiotic use and potentially lowering the development of antibiotic resistance [23]

Nurses and midwives can encourage and support pregnant women to make decisions about whooping cough or influenza vaccination, two health problems particularly relevant for this population group [24]. Module 3 on vaccination provides resources for nurses involved in vaccination programs.

29.2 Patient, families and citizen education

An essential part of nursing is educating patients, caregivers, colleagues and the general public in the correct and best use of antibiotics. This includes:

- Practical skills to increase effective and safe self-management of minor health problems
- Information on the role of antibiotics in bacterial infections, including benefits and potential side effects in the short- and long-term
- The importance of taking antibiotics as prescribed and disposing of any remaining antibiotics safety.
- Understanding the cultural, social and behavioural backgrounds of patients, where it might affect their use of antibiotics
- Using the right levels of language, supported by patient representative groups.
- Sometimes people use antibiotics inappropriately because of their situation:
- Patients know that they should complete the course of antibiotics, but they can't afford to buy all that they need
- Patients can't afford the consultation fees, so they don't get the right information or help
- Patients buy antibiotics over the internet, because it's easier than getting an appointment with a nurse or doctor.

Understanding this helps nurses to provide support as well as education.

Back to top

29.3 Engage in the use of non-antibiotic prescription pads and delayed prescriptions

Nurses may be able to use non-antibiotic prescriptions. These suggest self-management approaches for patients and help to normalise the use of other treatments that are not antibiotics (Figure 40). These help patients to feel listened to, and provides a solution to problem that brought them to the consultation room.

FIGURE 40: SUGGESTION FOR A NON-ANTIBIOTIC PRESCRIPTION PAD

LOGO

YOU DO NOT NEED AN ANTIBIOTIC PRESCRIPTION TODAY

Your doctor has diagnosed you with:

- ☐ Sore throat – can last around a week
- ☐ Common cold – can last around ten days
- ☐ Flu – can last around two weeks
- ☐ Cough – can last around three weeks
- ☐ Earache – can last around four days
- ☐ Sinusitis – can last around two and a half weeks
- ☐ Urinary tract infection (UTI)
- ☐ Other:

Taking antibiotics won't help you because:

- ✗ Your infection should clear up on its own
- ✗ Your infection is likely to be viral
- ✗ Antibiotics don't work on viral infections, including colds and flu

Antibiotics can have side effects, and may stop other medicines from working properly

To help you feel better:

- ✓ Rest
- ✓ Drink plenty of fluids
- ✓ Talk to your pharmacist about over-the-counter remedies that can help, for example paracetamol

If you are not feeling better, or you are worried, call your surgery or make an appointment for advice

Back to top

The advice and information should be tailored to local self-care measures, and could be useful for patients to show to relatives and neighbours. Nurses need to be aware of guidelines and agreed best practice, and use their clinical judgement along with shared decision-making to find the best solution for their patients.

Nurses and other prescribers can give patients a delayed prescription, advising patients to wait for a period of time before taking the prescription.

Case studies

In a UK study of no prescriptions or delayed prescribing for patients visiting the doctor for respiratory tract infections, fewer than 40% of the patients had antibiotics [25]

29.4 Nursing in long-term care facilities and nursing homes

People in long-term care and nursing homes need skilled nursing care because of their vulnerability, and because of the potential difficulties accessing medical or specialist advice. One of the important care needs for these patients is ensuring that they get enough fluids. This can reduce infection, and could also cut the number of urine analyses or dip tests for 'concentrated urine' [26,27]. These samples and tests can bring up false positives for bacterial infection, which could lead to unnecessary antibiotic prescribing [28].

Another way to reduce infection levels is to manage urinary catheters carefully. This includes optimal care, daily evaluation of their continued need and use, and prompt decisions to remove them when no longer needed [29,30]. The use of incontinence pads is linked with increased risk of UTIs [31]. Cutting down the use of incontinence pads and helping people to remain mobile and use toilets independently may help with infection prevention, and also preserves people's dignity and self-sufficiency.

Oral care is important for people unable to look after themselves, and improving oral care may reduce the risk of infection [32]. Avoiding the build-up of tartar reduces the risk of bacterial infections inflammation in the mouth and gums, which can lead to infection [33]. It is equally important for nurses to remember that dentures should receive similar attention. Keeping hydrated increases comfort in people's mouths and enhances the antibacterial action of saliva [34].

All of the activities suggested in this section are useful to nurses and patients in every setting, and allow nurses to use their clinical judgement, experience and expertise to make decisions about optimal care for all patients. These actions play an important part in both antimicrobial stewardship and essential nursing care. Nurse educators and nurses in leadership and management positions should help to build and sustain healthcare approaches that support nurses in clinical practice, and help them to resolve the challenges presented by infections.

Different populations have different factors that affect health and illness, and that drive infections and antibiotic use. Understanding these can help nurses in community and public health positions care for the populations and reduce the reliance on antibiotics. All nurses can work as advocates for patients and the wider population to make sure that the factors affecting health and disease, such as poverty and deprivation are addressed by policymakers in health and non-health policies.

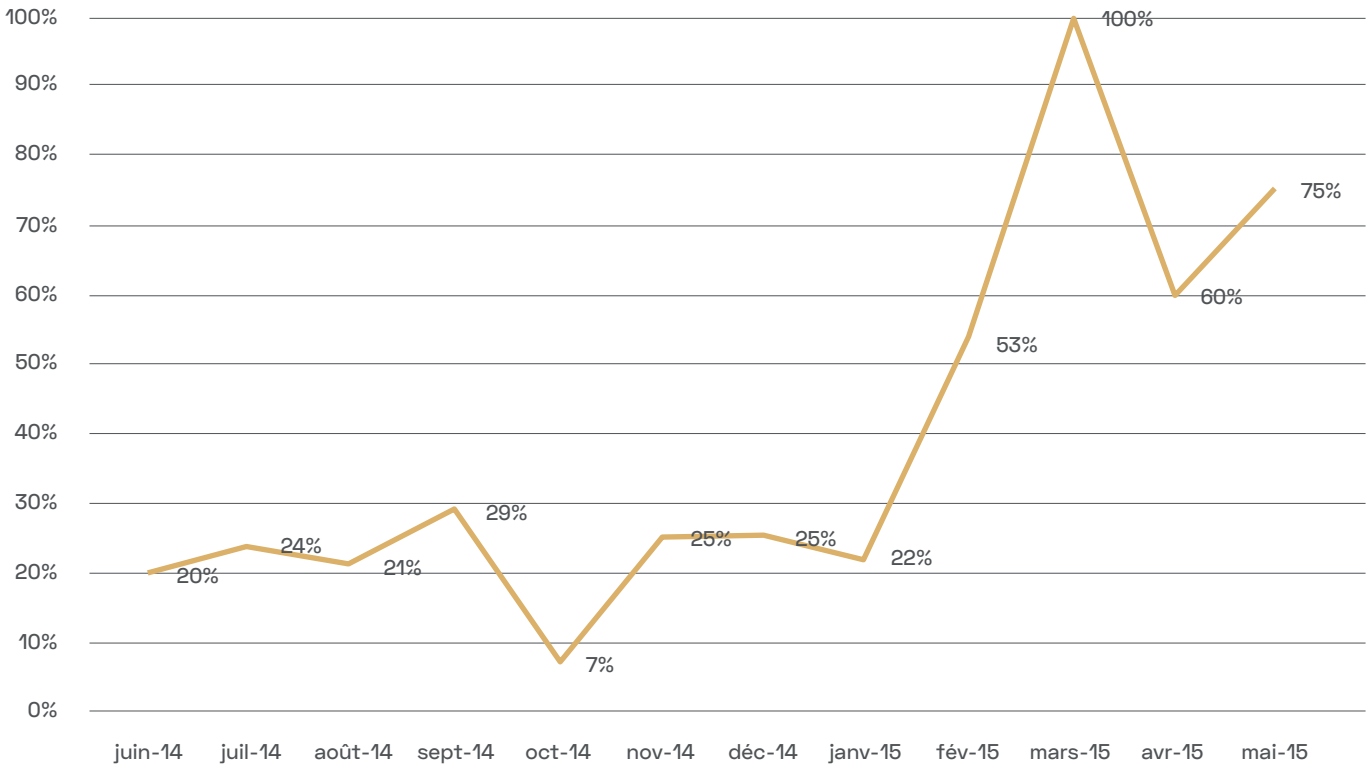
Back to top

30 Promoting optimal antibiotic use

The approach to optimal antibiotic use, as included in national and international recommendations, reflects the best nursing practice and is appropriate for nurses across all settings and countries.

Training in and understanding of antimicrobial stewardship can improve the number of days that patients remain on treatment (Figure 41).

FIGURE 41: IMPROVEMENT IN ANTIBIOTIC TREATMENT DURATION FOLLOWING A NURSE-FOCUSED INTERVENTION



Source: du Toit [35]

Nurses are ideally placed to contribute to the reduction of unnecessary antibiotic use or the improvement of antibiotic decisions by taking appropriate biological samples for microscopy and culture before beginning antibiotic treatment.

Back to top

TABLE 28: OPTIMAL SAMPLE COLLECTION

Do	Don't
Obtain the specimen before the patient starts antimicrobial therapy if possible	Don't take a specimen from exudate or eschar
Review the indication for obtaining the wound culture	Don't use a cotton-tipped swab
Gather supplies to clean the wound, obtain the specimen, and redress the wound	Don't let the sterile swab touch your fingers or other objects
Provide privacy	
Confirm the patient's identity and explain the procedure	
Position the patient	
Perform hand hygiene and put on clean gloves	
Remove the dressing, dispose of gloves and dressing, and perform hand hygiene	
Assess the wound and surrounding tissue	
Arrange the sterile field	
Put on clean gloves and thoroughly rinse the wound with sterile saline solution	
Remove the gloves, perform hand hygiene, and put on clean gloves	
Collect specimen by swabbing the wound in a gentle, rotating manner	
Use a sterile calcium alginate or rayon swab between your fingers	
Swab from margin to margin in a 10-point zigzag fashion	
Use enough pressure to express fluid from within the wound tissue	
Place the swab in the culture medium, label it as per local policy	
Send to the lab immediately	
Redress the wound	
Take off gloves and perform hand hygiene	
Assess patient, ensure that wound pain is managed	
Document the procedure, any findings, and the patient's response	

Source: Cross [36]; Rushing [37]

Samples should be collected according to agreed best practice and guidelines. Wound swabs are not always needed, as they can just reflect the bacteria that normally live on the body or that are contaminating the wound, rather than showing that there is an infection [36]. When wound swabs are needed, these should be taken from the appropriate sites (see Table 28).

30.1 Review and communicate microscopy or culture results promptly

Nurses should be aware of the timescales for laboratory results, review these when they arrive, and then pass the results on to prescribers so that the patient treatment can be started or adjusted as quickly as possible. This also allows infection prevention and control measures to be put in place, for example for C. difficile stool samples, or carbapenem-resistant organisms. Nurses can help to improve communication by being familiar with standard operating procedures and engaging in their development.

30.2 Timely administration of antibiotics

Another core activity for nurses across all settings is the timely administration of antibiotics, including loading doses, according to the prescription. Understanding how the levels of drug vary in the body (pharmacokinetics and pharmacodynamics) can help as a reminder of the importance of timely dosing, and of getting the loading dose right.

30.3 Missed antibiotic doses

Patients can miss antibiotic doses for a variety of reasons. For example, a study in a shock trauma intensive care unit showed that over half had missed doses or off-schedule doses, and this was linked with a longer stay in hospital [38]. As well as affecting patient health, missed doses also weaken any public health messages focused on keeping up with antibiotic dosing after discharge or when accessing primary and community care. Patients may feel that if there is no apparent issue when missing antibiotic doses whilst in hospital, there may not be any concern about similar events when at home.

Nurses can avoid the risk of missing antibiotic doses by planning care tasks and activities around the timing of doses. They should also ensure that patients receive the full dose of antibiotic by flushing the infusion lines when the bag containing the antibiotics is empty. Failing to do this can result in patients missing out on around a fifth of the dose [39].

30.4 Monitor patient response to treatment

Because nurses remain close by throughout patient treatment, this gives them a unique opportunity to monitor the effectiveness of antibiotic therapy. To help decisions about treatment, nurses should measure and record observations and vital signs accurately and at the best time, including temperature and blood pressure. Nurses can also make sure that the route of administration, for example oral, is the most appropriate for the patient, and discuss this with the clinical team and prescribers. If the patient's condition deteriorates and different therapeutic regimens are needed, nurses should alert the multidisciplinary team and be aware of potential alternative treatments

30.5 Monitor duration of antimicrobial therapy

Along with monitoring the patient's response to therapy, nurses should also feel confident to discuss therapy duration with colleagues in the multidisciplinary team, as the treatment approaches or exceeds recommended length. This is part of an emerging drive to minimise as much as safely possible the exposure of patients to antimicrobials, underpinned by a growing body of evidence over the optimal duration [40,41]

Back to top

Often, nurses have been asked to 'challenge' inappropriate prescribing or remind colleagues of best practice, and this is not always easy to do, especially if colleagues are senior to the nurse [42] or there are social or team norms on prescribing. However, nurses must recognise their potential to participate and influence antibiotic decisions, particularly when antimicrobial course duration is based on good quality evidence.

30.6 Educate students, trainees and other healthcare workers

Nurses play a crucial role as mentors and educators for other nurses and healthcare worker colleagues. The gaps in undergraduate and postgraduate education about appropriate use of antimicrobials may be mitigated by demonstration of essential nursing in practice. Nurses can use bedside, research and managerial opportunities to highlight the collective role that the profession has in this area.

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Back to top