



EUROPEAN NURSE



INFORMATION AND
COMMUNICATION GUIDE

on Antimicrobial Resistance and Stewardship

The European Specialist Nurses Organisation (ESNO) is a non-profit organisation with the goal to facilitate and provide an effective framework for communication and co-operation between the European Specialist Nurses Organisations and its constituent members. ESNO represents the mutual interests and benefits of these organisations to the wider European community in the interest of the public health. Members of ESNO consist of individual European specialist nurses member organizations and associates, both institutional and individual.

The organisation focusses on enhancing the capacity and capability of specialists nurses to deliver high quality healthcare by raising and harmonise specialist nursing education standards and actively contribute to health themes and threats, providing the best possible expertise, both national and in European cross border context.

A publication from the European Specialist Nurses Organisation 2020 - www.esno.org
November 2021

This publication is made possible with the support of the ESNO foundation. FoNSE, the It was founded in 2020 and the goals and mission are the same as those of ESNO. Our specific task is to shape and implement all projects and activities that are entrusted to ESNO with the ultimate aim of providing relevant and high standard professional care in European health to patients and citizens. www.fonse.eu



Copyright: ©2020 European Specialist Nurses Organisation. All rights reserved. No part of this publication may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written permission of the publisher, except in the case of brief quotations embodied in critical reviews and certain other noncommercial uses permitted by copyright law.

CONTENTS

Antimicrobial Resistance and Stewardship

Guidance document	4
1 Introduction	7
PART I Antimicrobial Resistance	8
2 Antimicrobial resistance, a threat to human health and professional practice	9
2.1 Excellent nursing care includes optimal use of antibiotics	10
2.2 Challenges remain for nurses to engage in AMS	10
2.3 Gaps in education about antibiotics hinder the participation of nurses in AMS	11
2.4 Antimicrobial stewardship is not an extra job for nurses	15
2.5 The prevention of infections is an area where nurses can excel	16
3 Preventing infections	16
3.1 Vaccination	16
3.2 Patient, families and citizen education	16
3.3 Engage in the use of non-antibiotic prescription pads and delayed prescriptions	17
3.4 Nursing in long-term care facilities and nursing homes	18
4 Promoting optimal antibiotic use	19
4.1 Review and communicate microscopy or culture results promptly	21
4.2 Timely administration of antibiotics	21
4.3 Missed antibiotic doses	21
4.4 Monitor patient response to treatment	21
4.5 Monitor duration of antimicrobial therapy	21
4.6 Educate students, trainees and other healthcare workers	22
5 Effective Education, better outcomes	22
PART II Stewardship	23
6 AMR stewardship	24
6.1 Antimicrobial resistance and stewardship, a driver to develop competencies for nurses across Europe	24
6.2 The ESNO goals	24
6.3 The need for a harmonised European nursing curriculum on antimicrobial stewardship	24
6.4 About the year programme by Enrique – project lead	25
6.5 Overall programme	25
6.6 Chapters on the Nurse Curricula on AMR Stewardship	26
6.7 Collaborating organisations	26
7 About the ESNO Microbial Focus Group Program	29
7.1 About the program	29
7.2 What have we learned	29
7.3 What we are heading for	29
8 Acknowledgments	30
9 Nursing regulation	31
9.1 Nursing diagnosis	31
9.2 Nursing outcomes	31
9.3 Nurses intervention	31
10 References	32

GUIDANCE DOCUMENT

A TRIBUTE TO FLORENCE NIGHTINGALE

When a child is born, they get a very precious gift in the very first seconds of life – a gift of their mother’s bacteria. These bacteria help to populate the healthy bacteria in the gut, on the skin and throughout the body, as well as train the immune system. The development of the immune system takes about four years.

The first edition of the Nurses Guide on Microbes: Vaccination, Antimicrobial Resistance and Infection Prevention and Control is a result of a project started three years ago. This was as a response to a number of calls to health professionals to get engaged with urgent health threats related to microbes and specifically to vaccination, antimicrobial resistance and infections. Nurses receive education and training related to microbes, but this is often only at the start of their study and may not be in depth. The fundamental understanding of the balance between health and infection was first best understood by Florence Nightingale. The editors are pleased to publish this in 2020, the ‘Year of the Nurse and Midwife’ in tribute to Florence Nightingale, born in 12th May 1820.

FLORENCE
NIGHTINGALE



Wise and humane management of the patient is the best safeguard against infection



Florence Nightingale made amazing achievements in terms of infection prevention amongst her patients; she was one of the very first infection control champions. While she did not have the modern day understanding of infection control, she managed to introduce the concept of the importance of hospital sanitation. She strongly believed in hospital cleanliness including pure air and water. Florence Nightingale was a true patient advocate as she tried to spread her message to all corners of the world. If Florence Nightingale was alive today, she would perhaps be disappointed by the levels of knowledge and competencies related to infections, prevention, vaccination and preventable healthcare-associated infections, despite the best equipment, staff and facilities.

With this guide -created by nurses- we aim provide nurses and all those interested, with accessible information and education materials to increase their ability to understand microbes and deal with the subject and stay competent professionals. ESNO strongly believe that this information needs to be include in education activities including Continuing Professional Development projects and Life Long Learning throughout career span.

BER **OOMEN** Executive Director

INTRODUCTION TO THIS SERIES MICROBES

Nurses with first-line responsibility for hygiene and infection control are familiar with bacteria, viruses and other microbes. However, there may not always be enough information about this in education and professional development for nurses with general and specialist responsibilities.

This guide aims to provide a compact and comprehensive guide tailored to nurses that includes relevant resources such as communication tools, examples, and frequently asked question with answers.

The increasing levels of antimicrobial resistance (AMR) worldwide are one of the motivations behind this guide. Now and in the future, infections with antimicrobial resistant microbes pose a major threat to the treatment of infections, and will have an impact on the workload of nurses and the health of patients. Combined with increasing vaccine hesitancy, the future for preventing and treating infectious diseases looks challenging. Nurses can play an important role in educating healthcare professionals, ancillary staff, patients and citizens in an overall understanding of microbes, the safe and sustainable use of antibiotics, and the role of vaccinations in preventing microbial infections.

This guide to antimicrobial resistance and vaccination for nurses will cover the essential information about microbial infections and the methods of treatment, as well as issues around AMR. The guide will provide information and support optimal communication around topics such as vaccination and infection prevention and control.



MODULE 1 MICROBES AND MEDICATION

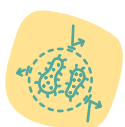
Part 1 - **An introduction to microbes** such as bacteria, viruses, fungi, yeasts, parasites, and prions highlights where patients are most at risk of infection.

Part 2 - **On medication** begins with an overview of antibiotics and other antimicrobials and the different ways in which they work. Antibiotics are only effective against bacterial infections, and this can be an education and communication challenge



MODULE 2 VACCINATION

Takes a closer focus on infections and preventable measures by vaccination, exploring the different types of vaccines, their role in infection prevention, and their storage and handling. Vaccines are used to prevent both bacterial and viral infections. Vaccines are also in development against fungi and parasites. One of the arguments often used by people hesitant to use vaccines relates to their safety and effectiveness. This module covers the monitoring mechanisms for vaccine safety, and discusses ways to improve people's confidence in vaccines



MODULE 3 ANTIMICROBIAL RESISTANCE AND STEWARDSHIP

Part 1 - **Outlines the issues of AMR**, how it develops and spreads, and includes a number of case studies. The module discusses how patients with AMR infections should be treated. It also looks at prevention and containment of AMR, including the role of the One Health approach, which co-ordinates actions across sectors, including veterinary health, agriculture and environmental health. Part 2 - **All about stewardship curricula programs**, and the engagement in European Union initiatives and international health organisations of specialist nurses.



MODULE 4 INFECTION PREVENTION CONTROL AND CURRICULUM

Part 2 - **Provides an overview of infection prevention and control**, and how this can be put in place within healthcare settings. It introduces the chain of infection, and then discusses the principles of hygiene. These begin with hand hygiene and personal protective equipment, and continue with the role of aseptic no-touch techniques to safeguard both patients and healthcare professionals.

Part 1 - **Nurses Curricula on Infection Prevention**. Nurses play a critical role in infection control, both through practical roles, and as educators for healthcare professionals, patients and carers.

1 Introduction

To the reader of this Module 3 on Antimicrobial Resistance and Stewardship.

This is both an update and an extension of the first edition of the Information and Communication guide on Antimicrobial Resistance and Stewardship. In the time of a global pandemic, there is so much changing where vaccines are concerned. This includes discussions of the availability and efficacy of the COVID-19 vaccines, as well as debates on other vaccines, and it's important to keep up-to-date.

Over the centuries, we have seen how disruptive infection diseases can be to the society, and we have also seen how vaccines have made a significant contribution to fighting disease and protecting individuals and families. With the onset of the COVID-19 pandemic in 2019, we have seen once again how dangerous infections can be and how vital is the role of vaccination.

The goal of this information and communication guide is to increase knowledge, understanding and skills around the topic of vaccination. There is so much information on vaccines circulating at the moment, ranging from non-expert opinions to scientific research. This fragmentation of information does not help good communication between nurses, with other healthcare providers and especially to the European public and patients. This guide cannot cover everything. Instead, we hope to provide nurses with the best possible information to equip them to practice their profession to the best of their ability, and trigger curiosity to find out more. The information is collected from the best and most credible sources, enriched with examples and pointers for further reading. The guide is created for nurses but we also advise this to all professionals related to education such as teachers, carers and daycare centers staff.

The module sits alongside Module 1 on Microbes and Medications, Module 2 on AMR and Stewardship into Vaccines and Module 4 on Infection Prevention Control. It touches on COVID-19 in general terms as things are still changing.

Thank you very much for taking your valuable time to read this guide.

ESNO Microbial Project team

Enrique, Alessia, Jeanette, Noel and Ber.

PART I

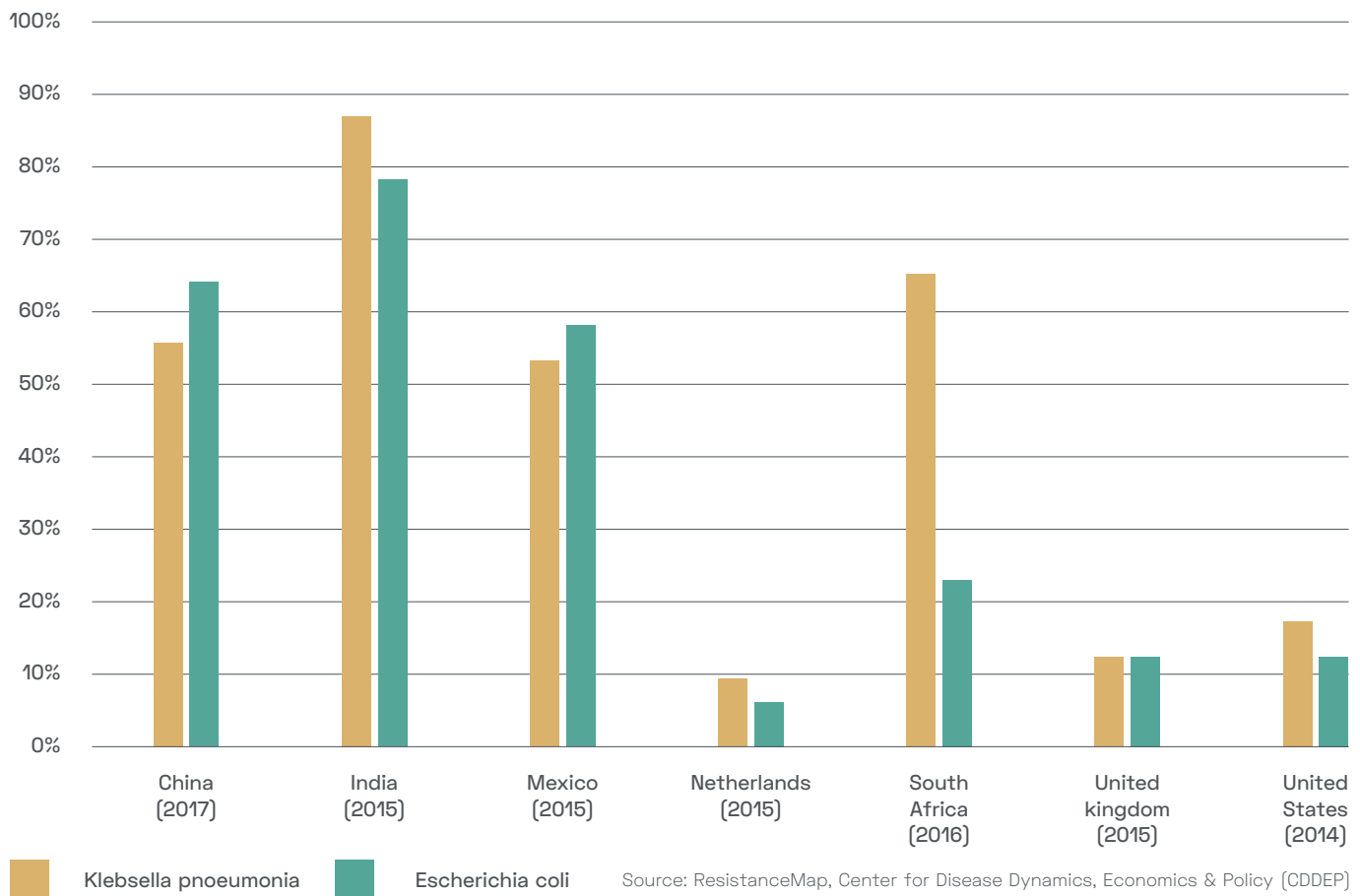
Antimicrobial Resistance

2 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 1). To deal with these variations, nurses need to learn best practices for antimicrobial use and infection prevention and control.

FIGURE 1: CROSS-COUNTRY COMPARISON OF E.COLI AND K. PNEUMONIAE RESISTANCE PATTERNS



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].

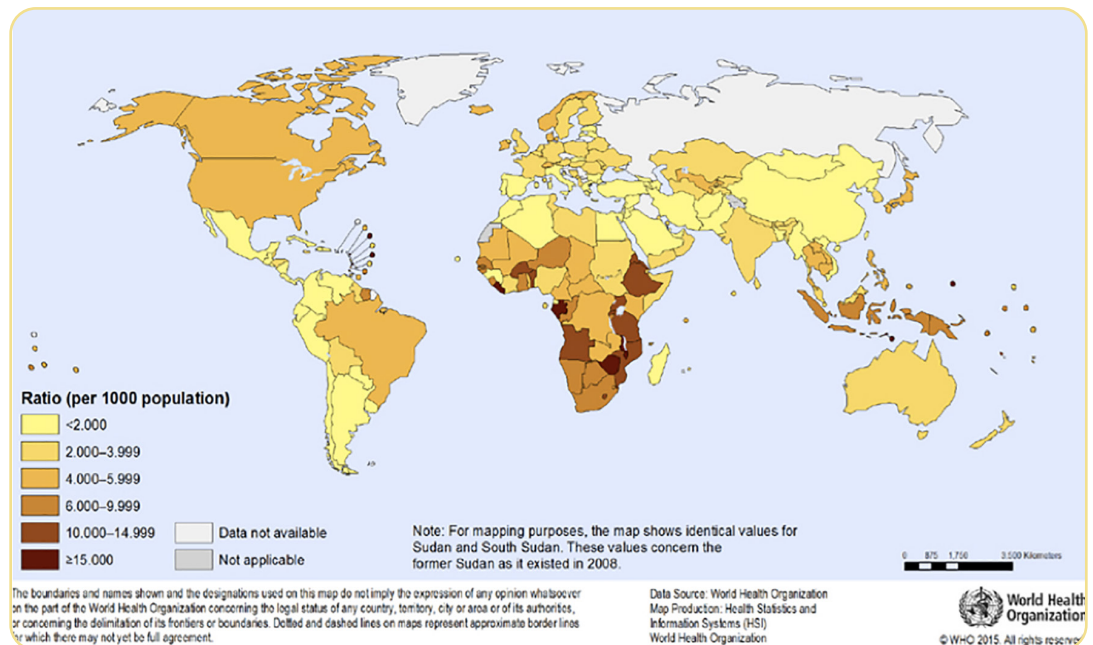
The effectiveness of AMS measures varies, depending on where and how they have been implemented. Many factors influence the decisions to use antibiotics, including personal, team and organisational approaches, culture and policy. However, AMS is overall an effective and safe approach [5,6].

2.1 Excellent nursing care includes optimal use of antibiotics

Nurses are the largest workforce in healthcare [7] (Figure 2), 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 2:
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]

2.2 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.

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 1: 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

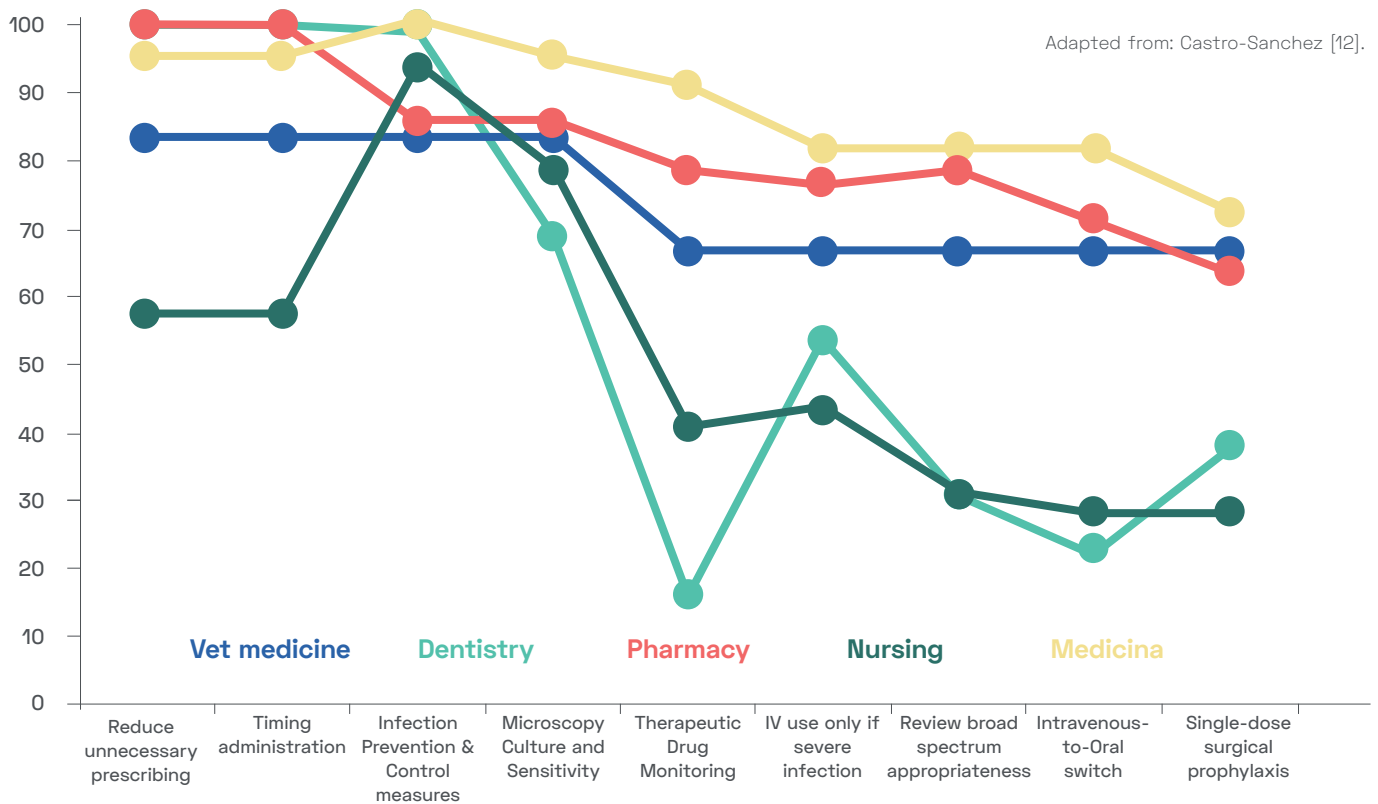
Source: Bulabula [10]

2.3 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 range 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].



FIGURE 3: 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?»

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 2: TAILORING ANTIMICROBIAL STEWARDSHIP MESSAGES TO DIFFERENT HEALTH-CARE 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>>	

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

2.4 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 3).

TABLE 3: START SMART THEN FOCUS KEY STEPS



Start smart	Then focus
Do not start antimicrobial therapy unless there is clear evidence of infection	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’
Take a thorough drug allergy history	The five ‘antimicrobial prescribing decision’ options are:
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	<ol style="list-style-type: none"> 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)
Comply with local antimicrobial prescribing guidance	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
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	

Source: Public Health England [18]



2.5 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.

3 Preventing infections

3.1 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.

3.2 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 safely.
- 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.

3.3 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 4). These help patients to feel listened to, and provides a solution to problem that brought them to the consultation room.

FIGURE 4: 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

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]

3.4 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.

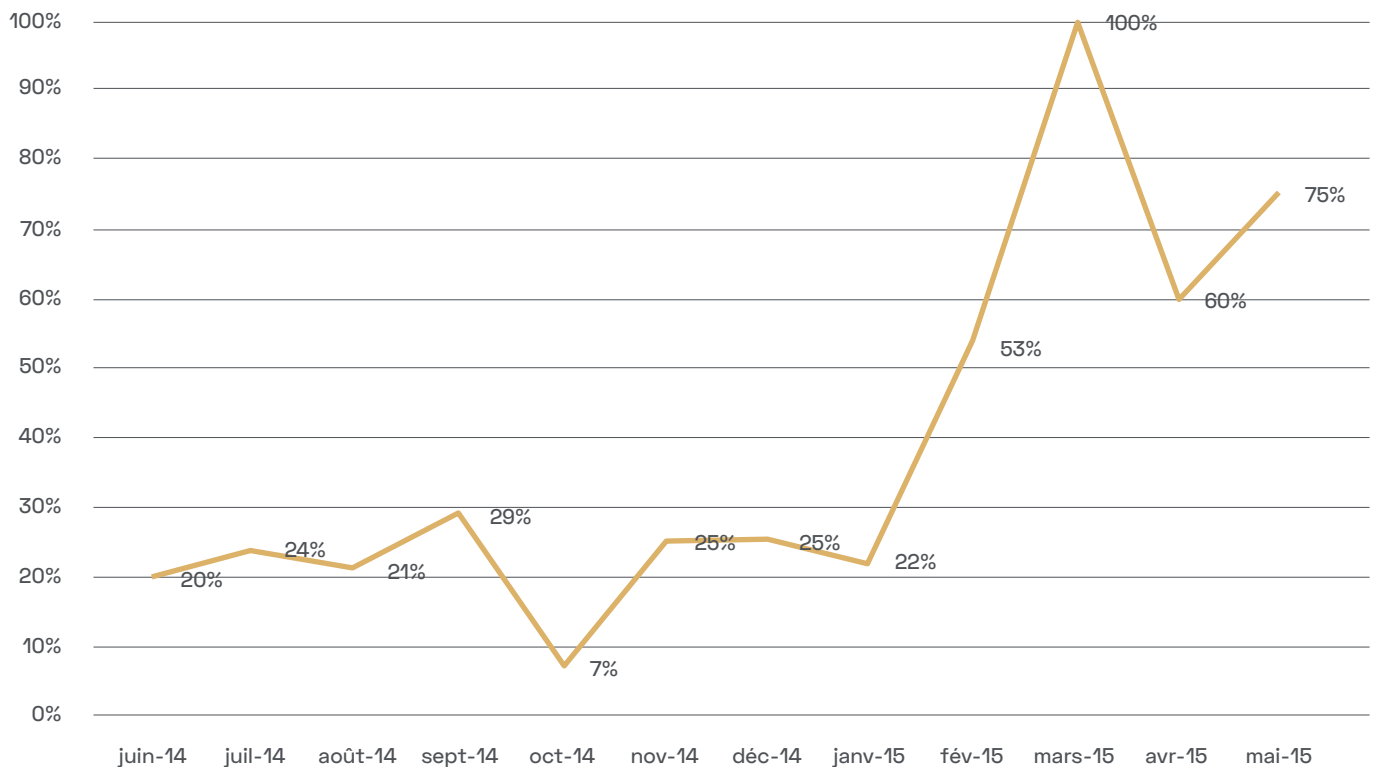


4 Promoting optimal antibiotic use

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 5).

FIGURE 5: 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.

TABLE 4: 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	



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 4).

4.1 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.

4.2 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.

4.3 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].

4.4 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

4.5 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] 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.



4.6 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.

5 Effective Education, better outcomes

Without coordinated planning at national, regional and European level, action to address antibiotic resistance will remain fragmented and ineffective, warns ESNO Executive Secretary, **Ber Oomen**

There's nothing quite so devastating for a nurse than being paralysed by a situation beyond their control. Over recent years, nurses have been increasingly confronted by antimicrobial resistance (AMR) a phenomena which conflicts with the very core of their work. The key question, of course is, if health care professionals and hospitals are 'running out of options' when should antibiotics be used? AMR is, for many professionals, relatively new to them and has been described by EU health commissioner, Vytenis Andriukaitis as the "silent tsunami" but also one «without a warning system». This why the European Specialist Nurses Organisations (ESNO) fully endorses the European One Health Action Plan against AMR. The guidelines on the prudent use of antimicrobials by the European Centre for Disease Prevention and Control (ECDC) are also welcome because they have a practical element and that is where nurses have a role to play.

However, we fear that there will have to be a significant rise in the number of victims in order for Europe's three million nurses to have a greater awareness of AMR. Nurses see patients at home, in the community and in a clinical setting. They see patients using medication according to prescribed guidelines but also see misuse, overuse and no use. Due to heavy caseloads though, there might be a tendency to overlook this. We, therefore believe there should be a greater emphasis around awareness-raising as well as improved education and training on AMR.

Without a clear structure or planning at national, regional and European level, action on dealing with AMR could end up fragmented and ineffective. The challenge facing the health workforce and the threat posed to human health by AMR should not be underestimated. If AMR is not effectively addressed, the problem is likely to increase rather than decrease. We believe that better cooperation in tackling AMR could be an opportunity to show the world how Europe can be the benchmark for best practice. Across the European network of nurses and in Advanced educated specialised areas, there seems to be an understanding on the AMR phenomenon but whether it is understood enough to include this in the wider context such as guidelines and programs is still unfortunately unclear.

No other profession is as aware of the misuse and overuse of medication but, equally, it isn't clear if there is enough understanding of AMR's impact, especially for the most vulnerable, such as children, people with rare diseases and the elderly. Nurses could, and should, be better involved in monitoring AMR cases and in contributing to research and clinical data programmes. We call on national health regulatory bodies to address AMR, to invest in specialist nurses and also to invite the commission to address the key role that nurses can play in tackling AMR in a more direct and explicit way.

Finally, we hope the European Parliament will support all initiatives in this field. As long there is a gap in understanding and recognition for example on the need for more Advanced educated specialist nurses, it will be very difficult to tackle AMR. And that, in our opinion, would be a grave mistake.

'The challenge facing the health workforce and the threat posed to human health by AMR should not be underestimated. If AMR is not effectively addressed, the problem is likely to increase rather than decrease'



PART II

Stewardship

6 AMR stewardship

In this document we speak about **Anti-Microbial Resistance**, abbreviated with AMR. With this we also mean 'Anti-Biotic Resistance'

6.1 Antimicrobial resistance and stewardship, a driver to develop competencies for nurses across Europe

The growing concern caused by the increasing number of infections which cannot be easily treated or at all has clouded the progress about modern care and therapies. Although much attention is given to emerging and novel infections, the silent epidemic of drug-resistant infections is likely to impact human and animal health, health systems and our way of life in a planetary scale. For such reason, it is not enough any longer for prescribers to be the only ones concerned about antimicrobial resistance when starting a course of antibiotics, but all other health professionals must also be aware and contribute to efforts to improve antibiotic decisions. Patients and their families, and in general all citizens, are other key stakeholders which should be encouraged to be involved in stewardship efforts.

There are many scenarios where antibiotics are used, and thus the opportunities to improve this use. Quality improvement interventions around antimicrobial stewardship can be very effective in terms of health and clinical outcomes for patients, as well as other measures such as economic return of investment, especially when these interventions are carried out with knowledge, experience, and good clinical practices are enabled and supported by structural factors.

6.2 The ESNO goals

There are striking differences among different countries in how much and how well they support and encourage nurses to engage in stewardship. Some nations have well established structures, with even nurses in full time stewardship positions embedded in health services and influencing policy frameworks; in other regions however there may be ongoing activities which may be fragmented, based mostly on the good intentions of few spearheading clinicians and organisations, and often lacking a solid and sustained impact on infection or clinical outcomes.

In parallel, there have been several initiatives developing educational support and activities for nurses, including curricula or competencies on AMS. In this part-2 an overview will be provided with information but also details about the ESNO project developing and implementing a pan-European AMR stewardship curriculum which is tailored to the local and national context and characteristics of undergraduate and postgraduate nurse education, competencies and legislation, as well as the culture of infection prevention and control and antimicrobial stewardship. The ESNO project will run over one year and aim to be completed by World Antimicrobial Awareness Week in 2022.

6.3 The need for a harmonised European nursing curriculum on antimicrobial stewardship

Drug-resistant infections are a severe threat to the health of European citizens, European societies, and common European welfare. The need to implement coordinated and comprehensive interventions to promote the best possible use of antimicrobials in human and animals and slow the progress of drug-resistant infections has been recognised by global stakeholders, including the European Commission (2017), in different high-level policies and national and international plans.



Developing common educational pathways and competencies, as well as shared models of nursing care related to antimicrobial management can have benefits, enabling economies of scale and savings (for example, reducing time and resources wasted on duplicated documents), facilitating professional mobility and mutual learning (for example, allowing professionals from neighbouring countries to easily transfer their skills), and contributing towards more efficient evaluation of clinical and research experiences (for example, harmonising nursing-sensitive interventions related to antimicrobial use).

See full text [under this link](#)



The bigger goals on AMR: Keep health systems work and keep medication effective

6.4 About the year programme by Enrique – project lead

I believe that societies worldwide currently face two key existential threats, posed by the climate crisis and drug-resistant infections. In terms of infections which can be difficult to treat, nurses worldwide can undoubtedly play a vital role in supporting and leading interventions to improve how antibiotics are used and managed.

However, for this participation of nurses to be as effective and impactful as it can be, we need to overcome several hurdles related to education, leadership, and role models, and the planned ESNO programme offers support across these areas to empower specialist nurses across Europe in their stewardship journey.

6.5 Overall programme

Although many resources have already been developed to train and educate nurses interested in antimicrobial stewardship interventions, my aspiration is that the ESNO programme draws strength from the rich clinical expertise of European nurses working in infection prevention and control, antimicrobials, and vaccination, to demonstrate knowledge, skills, and competencies around vital topics such as pharmacology and therapeutics, microbiology, implementation of improvement programmes, and communication and leadership, among others. These skills and knowledge are illustrated by case studies and examples of clinical nursing practice in stewardship, to facilitate the contrast with the local context of the learners in the programme, ultimately amplifying the importance of AMR for nurses.

The World AMR Awareness Week 2021 will signal the kick-off of the programme, and besides developing a European curriculum, over this year we aspire to foster connections and collaborations with nurses interested in the project and who would support its implementation. Particularly, we wish to engage with the wider European network of specialist nurses who may demonstrate an interest and passion on AMR and stewardship programme. Finally, ESNO will collaborate with nurse experts to develop two Masterclasses which would offer not only education but will nurture a community of nursing practice in stewardship.

6.6 Chapters on the Nurse Curricula on AMR Stewardship

1. Antimicrobial resistance as a planetary threat to human and animal health
2. The contribution of nurses to optimal infection prevention and control and antimicrobial stewardship: a theoretical perspective
3. Individual, team and organisational barriers to the optimal engagement of nurses in stewardship
4. Educational interventions improving nursing knowledge, skills and behaviours around stewardship
5. Embedding AMS in nursing practice: approaches in the clinical and educational setting
6. Immunisation as vital nursing intervention to address antimicrobial resistance
7. Empowering stakeholders in AMR: patients, families and citizens
8. Interprofessional practice in clinical, education, research and executive settings
9. Nursing and AMS in complex settings: long-term care facilities and nursing homes



6.7 Collaborating organisations

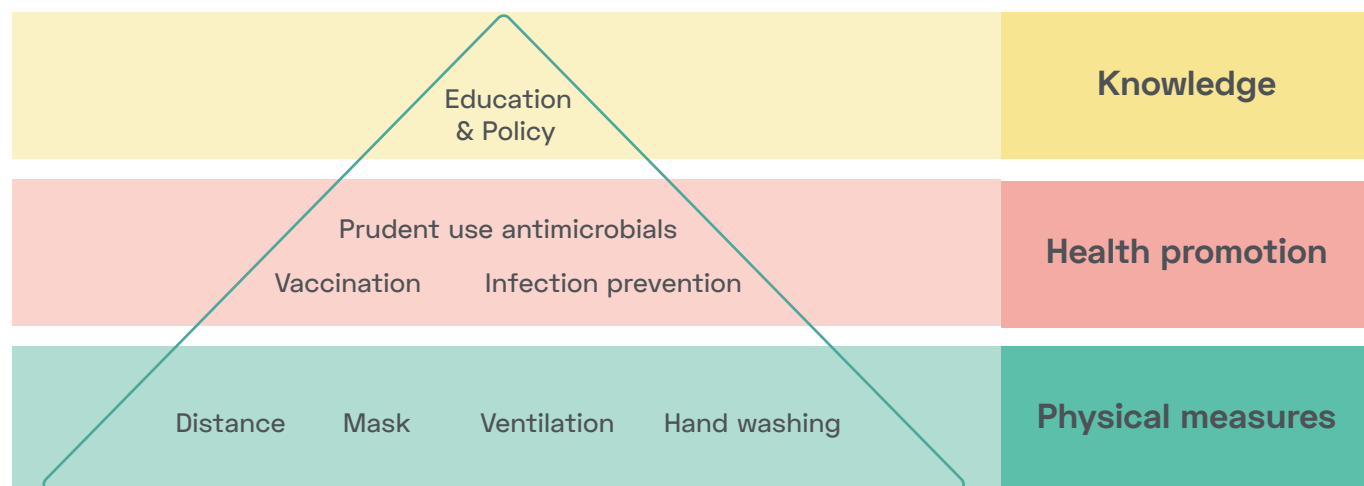
For specialist nurses, collaboration and working interdisciplinary is an essential component of the job. Nothing can be achieved alone, and working in siloes will not contribute to sustainable and enduring impact. The following is an overview of activities and collaborations between ESNO and various organisations to develop and support our stewardship programme.

TABLE 5: SELECTION ORGANISATIONS AND INITIATIVES ON AMR

Name	Goals and relations for Stewardship development
AMR working group EPHA	ESNO is a member of EPHA, connecting health policies of members with the European Commission, and engage with members of the parliament. ESNO is a member of the ‘AMR stakeholders Network group’ and is there to connect with other groups which advocate for the contribution of nurses towards activities related to AMR. Our primary audience is policy- and decision-makers, including European politicians and civil servants, key agencies and international organisations, opinion formers from civil society, relevant stakeholders, and the media. The target is both at EU-level and geographical-Europe level (WHO Europe region).

European Parliament	In the European Parliament, there is a network of MEP's engaging with the AMR issue. They are connected to committees and can address AMR as for example special rapporteurs. For ESNO this is an important group to showcase our work and contribution to AMR and in parallel, emphasise the contribution of specialist nurses.
ESCMID	The European Society for Clinical Microbiology and Infectious Diseases is the largest European organisation focused on infectious diseases and articulates its scientific and educational activities around multiple working groups. Nurses are one of the many professional groups involved in these groups, contributing to educational competencies and guidelines, which will then be cascaded to local and national nursing professional organisations and clinical societies.
Dutch AMR Stewardship program – A-TEAM	ESNO has connection with Dutch specialist nurses developing a national curriculum on stewardship. Briefly, the general structure of the document focuses on the typical components of an antimicrobial stewardship programme such as enabling the right team and organisational preconditions, coordination of surveillance and advice about specific patient categories, provision of systematic measurements of prescribing behaviour and antibiotic use, and leadership and engagement of improvement projects where necessary.
JAMRAI	Right since the start of the Joint Action on AMR, a European Commission-funded collaboration with representatives of national governments, ESNO was involved among the stakeholders. Such involvement means to participate in consultation
WHO AMR	ESNO engages with WHO contributing to information and clinical practice guidelines, as well as embedding latest WHO guidance on ESNO documents. ESNO recognises WHO as a leading organisation in promoting evidence for guidelines and policy.
ECDC - AMR	The European Centre for Disease Control is the agency coordinating the collection and dissemination of relevant intelligence about infections and stewardship. ECDC also leads and contributes to activities during the International AMR Awareness Week, where ESNO has been present over the past years. The activities and projects on our Stewardship Programme will be communicated with the agency and information on AMR will be provided by the ECDC. Additionally, ESNO also contributes as stakeholder organisation in consulting activities related to AMR.
EMA - AMR	In the European Medicines Agency there is a strong connection with public and patient as well as professional stakeholder organisations. These collaborations are crucial to understand the needs, priorities and interests of the organisations and the people they represent. In relation to AMR, ESNO provides expert input to the Healthcare Professional Working Party (HCPWP) group.
EU commission	All AMR related projects from the European commission are carefully followed by the specialist nurses and information is used for information and communication
Other	
AMR insights	Private organisations
RAND	Research alliances
World Bank	Economic forums
Euro Active	pan-European media network specialised in EU policies
EFPC	European Forum for Primary Care

FIGURE 6: POLICY PYRAMID - CONTEXTUAL INFECTION PREVENTION



↑ Back to top

7 About the ESNO Microbial Focus Group Program

7.1 About the program

The ESNO programme and vision about AMR acts in synergy with other activities related to infection prevention and control, vaccination and immunisation, and wider public health and health promotion activities, recognising the increasingly wide range of clinical, educational, research and leadership roles held by specialist nurses across Europe.

7.2 What have we learned

Over the past years, we observe that the health issues on AMR, Infection Prevention Control (IPC) and Vaccination cannot be addressed separately. They are overlapping each other, and when addressed well, they are complementary to each other. In education and training, this requires a separate approach and for good understanding in depth and scientific bases attention. But at the end, nothing can be well executed without an intergrated contextual approach.

7.3 What we are heading for

A future prove specialist nurses' competencies on AMR, IPC and Vaccination. We strive to continue positioning ESNO as one of the European and international nursing think-tank and advocacy organisations - shaping European nursing education and competencies, as well as influencing the policy landscape. We continue to work to equip nurses with the policymaking and communication skills and attitudes necessary to engage with politicians, decisionmakers and civil society on crucial topics such as drug-resistant infections, infection prevention and control, and immunisation. This cannot be reached in a few years but with a long-term vision and clear targeted outcomes with multi-stakeholders' engagement.

8 Acknowledgments

Contributing experts – ESNO Microbe Focus Group 2021

Aafke Bosma - Netherlands

Ber Oomen - Netherlands

Brioni Elena - Italy

Cristiano Magnaghi - Italy

Enrique Castro-Sanchez - Spain

Ingeborg Groothuis - Netherlands

Jeannette Verkerk - Netherlands

Josephine Declay - Belgium

Judith Perez-Gomez - Spain

Luigi Apuzzo - Italy

Maria-Teresa Parisotto - Italy

Marijke Quaghebeur - Belgium

Noel Abela - Malta

Rebecca Cachia-Faerne - Belgium

Suzanne Elvidge - United Kingdom

Members of Reference / Advisory Group

Elena Brioni - Italy

Maria-Teresa Parisotto - Italy

Emma Keulyan - Bulgaria

Cristiano Magnaghi - Italy

Ceman Anel - Bosnia-Herzegovina

Tihana Batrnek - Croatia

Luigi Apuzzo - Italy

We thank also those who advise us and provide valuable information

Elle Kuhlmann – EUPHA

Ted van Essen – Dutch Influenza Foundation

This guide is endorsed by

Health First Europe

European Health Management Association

This guide is made possible with sponsors

Design and layout



9 Nursing regulation

The nursing profession is a state of immense growth and reflects its role in clinical care but also in education, training management at all levels, both local, national and international.¹ In this context it's also crucial to understand that all nursing contributions need to be mentioned in the context of the nursing profession, also related to the competence building in relation to microbes, vaccination, anti-microbial resistance and infection prevention. In this context, it needs to be understood that education on this issue is an integrated part of the profession and needs to be in the context of Nurses Outcome Classification and Interventions Classification. This also applies to maintaining skills related to infection prevention, vaccination and antimicrobial resistance and the general knowledge about microbes and interventions.

9.1 Nursing diagnosis

A nursing diagnosis is a clinical judgment concerning a human response to health conditions/life processes, or vulnerability for that response, by an individual, family, group, or community. The foundation of nursing diagnosis is clinical reasoning, and it requires the ability to distinguish normal from abnormal data, cluster related data, recognize missing data, identify inconsistencies in data and make inferences. Donor suitability assessment involves the collection of subjective and objective information (e.g., vital signs, donor interview, physical exam) and review of historical information in the donor file. Nurses also collect information on strengths (to identify health promotion opportunities) and risks (areas that nurses can prevent or potential problems they can postpone).²

9.2 Nursing outcomes

Nursing diagnoses are used to identify intended outcomes of care and plan nursing-specific interventions sequentially. A nursing outcome refers to a measurable behaviour or perception demonstrated by an individual, family, group, or community that is responsive to nursing interventions. The Nursing Outcome Classification³ (NOC) is a system that can be used to select outcomes measures related to nursing diagnosis. NOC can also be used to determine staffing needs as nursing is the largest operational cost in health centers, so a small change in a staffing model has a large impact on financial outcomes.⁴

9.3 Nurses intervention

An intervention is defined as “any treatment, based upon clinical judgment and knowledge, that a nurse performs to enhance patient/client outcomes”. The Nursing Interventions Classification (NIC)⁵ is a comprehensive, evidence-based taxonomy of interventions that nurses perform across various care settings. Using nursing knowledge, nurses perform both independent and interdisciplinary interventions.

1 https://www.icn.ch/system/files/documents/2021-05/ICN%20Toolkit_2021_ENG_Final.pdf

2 Alfaro-Le Fevre R. Critical Thinking and Clinical Judgment. 3rd Edition. Saunders, editor. St. Louis; 2004.

3 <https://pubmed.ncbi.nlm.nih.gov/9610010/>

4 Eck Birmingham, S., Pickard, B., & Carson L. Leadership and nursing care management. In: D Huber (Ed.), editor. Staffing and scheduling. 5th ed. St. Louis: Elsevier Saunders; 2013. p. 367–86.

5 <https://pubmed.ncbi.nlm.nih.gov/8591448/>

10 References

1. WHO. New report calls for urgent action to avert antimicrobial resistance crisis. UN Ad hoc Interagency Coordinating Group on Antimicrobial Resistance news release, 29 April 2019. Available from: <https://www.who.int/news-room/detail/29-04-2019-new-report-calls-for-urgent-action-to-avert-antimicrobial-resistance-crisis>.
2. ECDC. Surveillance of antimicrobial resistance in Europe 2018 (18 November 2019). Available at: <https://www.ecdc.europa.eu/en/publications-data/surveillance-antimicrobial-resistance-europe-2018>.
3. Holmes AH, Moore LS, Sundsfjord A, et al., Understanding the mechanisms and drivers of antimicrobial resistance. *Lancet* 2016. 387(10014): p. 176-87. 10.1016/S0140-6736(15)00473-0.
4. Doron S, Davidson LE, Antimicrobial stewardship. *Mayo Clin Proc* 2011. 86(11): p. 1113-23. 10.4065/mcp.2011.0358.
5. Plachouras D, Hopkins S, Antimicrobial stewardship: we know it works; time to make sure it is in place everywhere. *Cochrane Database Syst Rev* 2017. 2: p. ED000119. 10.1002/14651858.ED000119.
6. Davey P, Marwick CA, Scott CL, et al., Interventions to improve antibiotic prescribing practices for hospital inpatients. *Cochrane Database Syst Rev* 2017. 2: p. CD003543. 10.1002/14651858.CD003543.pub4.
7. Rechel B, Dubois C-A, McKee M. The Health Care Workforce in Europe: Learning from experience 2006). Available at: http://www.euro.who.int/__data/assets/pdf_file/0008/91475/E89156.pdf.
8. Jaeger FN, Bechir M, Harouna M, et al., Challenges and opportunities for healthcare workers in a rural district of Chad. *BMC Health Serv Res* 2018. 18(1): p. 7. 10.1186/s12913-017-2799-6.
9. Olans RN, Olans RD, DeMaria A, Jr., The Critical Role of the Staff Nurse in Antimicrobial Stewardship--Unrecognized, but Already There. *Clin Infect Dis* 2016. 62(1): p. 84-9. 10.1093/cid/civ697.
10. Bulabula ANH, Jenkins A, Mehtar S, et al., Education and management of antimicrobials amongst nurses in Africa-a situation analysis: an Infection Control Africa Network (ICAN)/BSAC online survey. *J Antimicrob Chemother* 2018. 73(5): p. 1408-1415. 10.1093/jac/dky023.
11. Castro-Sanchez E, Gilchrist M, Ahmad R, et al., Nurse roles in antimicrobial stewardship: lessons from public sectors models of acute care service delivery in the United Kingdom. *Antimicrob Resist Infect Control* 2019. 8: p. 162. 10.1186/s13756-019-0621-4.
12. Castro-Sanchez E, Drumright LN, Gharbi M, et al., Mapping Antimicrobial Stewardship in Undergraduate Medical, Dental, Pharmacy, Nursing and Veterinary Education in the United Kingdom. *PLoS One* 2016. 11(2): p. e0150056. 10.1371/journal.pone.0150056.
13. Barber-Parker ED, Integrating patient teaching into bedside patient care: a participant-observation study of hospital nurses. *Patient Educ Couns* 2002. 48(2): p. 107-13. 10.1016/s0738-3991(02)00024-1.
14. Ashiru-Oredope D, Kinsman J, Vasandani S, et al. Survey of healthcare workers' knowledge, attitudes and behaviours on antibiotics, antibiotic use and antibiotic resistance in the EU/EEA (November 2019). Available at: <https://www.ecdc.europa.eu/sites/default/files/documents/survey-of-healthcare-workers-knowledge-attitudes-behaviours-on-antibiotics.pdf>.
15. Carter EJ, Greendyke WG, Furuya EY, et al., Exploring the nurses' role in antibiotic stewardship: A multisite qualitative study of nurses and infection preventionists. *Am J Infect Control* 2018. 46(5): p. 492-497. 10.1016/j.ajic.2017.12.016.
16. Sumner S, Forsyth S, Collette-Merrill K, et al., Antibiotic stewardship: The role of clinical nurses and nurse educators. *Nurse Educ Today* 2018. 60: p. 157-160. 10.1016/j.nedt.2017.10.011.
17. Grayson ML, Macesic N, Huang GK, et al., Use of an Innovative Personality-Mindset Profiling Tool to Guide Culture-Change Strategies among Different Healthcare Worker Groups. *PLoS One* 2015. 10: p. e0140509.
18. PHE. Start Smart - Then Focus: Antimicrobial Stewardship Toolkit for English Hospitals (March 2015). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/417032/Start_Smart_Then_Focus_FINAL.PDF.
19. Cramer S. Moving the needle: Promoting vaccination uptake across the life course (December 2018). Available at: <https://www.rsph.org.uk/uploads/assets/uploaded/f8cf580a-57b5-41f4-8e21de333af20f32.pdf>.



20. Bennett V, Green D. The role of nurses in delivering successful immunisation programmes (14 May 2019). Available at: <https://vivbennett.blog.gov.uk/2019/05/14/the-role-of-nurses-in-delivering-successful-immunisation-programmes/>.
21. LARGERON N, LEVY P, WASSEM J, et al., Role of vaccination in the sustainability of healthcare systems. *J Mark Access Health Policy* 2015. 3. 10.3402/jmahp.v3.27043.
22. Vila-Candel R, Navarro-Illana P, Navarro-Illana E, et al., Determinants of seasonal influenza vaccination in pregnant women in Valencia, Spain. *BMC Public Health* 2016. 21(1): p. 1173.
23. Klugman KP, Black S, Impact of existing vaccines in reducing antibiotic resistance: Primary and secondary effects. *Proc Natl Acad Sci U S A* 2018. 115(51): p. 12896-12901. 10.1073/pnas.1721095115.
24. Tuells J, Rodriguez-Blanco N, Duro Torrijos JL, et al., Vaccination of pregnant women in the Valencian Community during the 2014-15 influenza season: a multicentre study. *Rev Esp Quimioter* 2018. 31(4): p. 344-352.
25. Little P, Moore M, Kelly J, et al., Delayed antibiotic prescribing strategies for respiratory tract infections in primary care: pragmatic, factorial, randomised controlled trial. *BMJ* 2014. 348: p. g1606. 10.1136/bmj.g1606.
26. BNF. Dehydration in the elderly. British Nutrition Foundation, 2014. Available from: <https://www.nutrition.org.uk/nutritionscience/life/dehydrationelderly.html>.
27. Yates A, Urinalysis: how to interpret results. *Nursing Times* 2016. Online issue 2: p. 1-3.
28. Mambatta AK, Jayarajan J, Rashme VL, et al., Reliability of dipstick assay in predicting urinary tract infection. *J Family Med Prim Care* 2015. 4(2): p. 265-8. 10.4103/2249-4863.154672.
29. IHI. How-to Guide: Prevent Catheter-Associated Urinary Tract Infections. Institute for Healthcare Improvement, December 2011. Available from: <https://www.urotoday.com/images/catheters/pdf/IHIHowtoGuidePreventCAUTI.pdf>.
30. SA Health. Catheter-associated urinary tract infection prevention. Government of South Australia, 2020. Available from: <https://www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/clinical+resources/clinical+topics/healthcare+associated+infections/indwelling+medical+device+management/preventing+catheter-associated+urinary+tract+infection>.
31. Omli R, Skotnes LH, Romild U, et al., Pad per day usage, urinary incontinence and urinary tract infections in nursing home residents. *Age Ageing* 2010. 39(5): p. 549-54. 10.1093/ageing/afq082.
32. Liu C, Cao Y, Lin J, et al. Mouth care for preventing pneumonia in nursing homes (28 September 2018). Available at: https://www.cochrane.org/CD012416/ORAL_mouth-care-preventing-pneumonia-nursing-homes.
33. Mayo Clinic Staff. Periodontitis. Mayo Clinic, 2020. Available from: <https://www.mayoclinic.org/diseases-conditions/periodontitis/symptoms-causes/syc-20354473>.
34. Fortes MB, Diment BC, Di Felice U, et al., Dehydration decreases saliva antimicrobial proteins important for mucosal immunity. *Appl Physiol Nutr Metab* 2012. 37(5): p. 850-9. 10.1139/h2012-054.
35. Du Toit B, The role of the critical care nurse in the implementation of an antimicrobial stewardship programme in a resource-limited country. Thesis (MSc) --Stellenbosch University 2015.
36. Cross HH, Obtaining a wound swab culture specimen. *Nursing* 2014. 44(7): p. 68-9. 10.1097/01.NURSE.0000446645.33489.2e.
37. Rushing J, Clinical do's and don'ts: Obtaining a wound culture specimen. *Nursing2020* 2007. 37(11): p. 18.
38. Patel CN, Swartz MD, Tomasek JS, et al., The Effects of Missed Doses of Antibiotics on Hospitalized Patient Outcomes. *J Surg Res* 2019. 233: p. 276-283. 10.1016/j.jss.2018.08.015.
39. Cooper DM, Rassam T, Mellor A, Non-flushing of IV administration sets: an under-recognised under-dosing risk. *Br J Nurs* 2018. 27(14): p. S4-S12. 10.12968/bjon.2018.27.14.S4.
40. Foolad F, Huang AM, Nguyen CT, et al., A multicentre stewardship initiative to decrease excessive duration of antibiotic therapy for the treatment of community-acquired pneumonia. *J Antimicrob Chemother* 2018. 73(5): p. 1402-1407. 10.1093/jac/dky021.
41. Uranga A, Espana PP, Bilbao A, et al., Duration of Antibiotic Treatment in Community-Acquired Pneumonia: A Multicenter Randomized Clinical Trial. *JAMA Intern Med* 2016. 176(9): p. 1257-65. 10.1001/jamainternmed.2016.3633.
42. Lewis PJ, Tully MP, Uncomfortable prescribing decisions in hospitals: the impact of teamwork. *J R Soc Med* 2009. 102(11): p. 481-8. 10.1258/jrsm.2009.090150.

FULL PROJECT ON WWW.FONSE.EU



FIND MORE INFORMATION ON WWW.ESNO.ORG



*THIS GUIDE IS FOR EDUCATIONAL MATERIAL
AND FOR THEACHING PURPOSES.*

SECRETARIAT@ESNO.ORG