



Department of
**Health, Social Services
and Public Safety**

www.dhsspsni.gov.uk

Changing the Culture 2010

STRATEGY FOR TACKLING ANTIMICROBIAL RESISTANCE (STAR) 2012-2017

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MINISTERIAL FOREWORD

My priority for our healthcare services is to drive up the quality of care and improve outcomes for patients.

One of the most important advances in the history of medicine was the discovery of the antibiotic properties of the *Penicillium* group of fungi. The development of penicillin marked the beginning of an era of antibiotic discovery, and many infections that in the past were often incurable or fatal are now routinely treated effectively, safely and quickly. Today, however, the emergence of new, antimicrobial-resistant strains of micro-organisms is threatening the efficacy of treatments that we take for granted, and may leave us defenceless against new infectious organisms.

Antimicrobial resistance is a world-wide threat but it needs action at local level as well as globally. I am pleased to publish the Strategy for Tackling Antimicrobial Resistance. It builds on previous work and achievements in Northern Ireland; sets the direction of travel, and outlines the key areas for further work to maintain our defences.

The Strategy will be complemented by a Northern Ireland action plan, which will be taken forward by the Health and Social Care Board and the Public Health Agency working in partnership with other health bodies.

Edwin Poots

Minister for Health, Social Services and Public Safety

SECTION 1: INTRODUCTION

Why we need to tackle antimicrobial resistance

- 1.1 Resistance to antimicrobial drugs is a global threat to human health and wellbeing. The World Health Organisation (WHO) regards this as one of the top three such threats. It is an international priority which is receiving focused action from major organisations such as the European Centre for Disease Prevention and Control (ECDC) and the Centers for Disease Control and Prevention (CDC) in the USA.
- 1.2 The high survival rates that we currently expect following a range of serious infections are in part dependent on access to effective antimicrobials and thus are increasingly at risk if the organisms causing the infections are no longer sensitive. The impact of antimicrobial resistance on human pathogens is already tangible. Infections associated with resistant organisms result in delays in patients receiving effective treatment; prolonged length of stay in hospitalised patients; escalating use of broad spectrum antimicrobial drugs with greater risk of adverse effects; and increased cost of healthcare delivery. If resistance increases at a greater rate than the development of new antibiotics, many modern medical interventions that depend on the availability of robust anti-infective agents, e.g. cancer chemotherapy, or organ transplantation, care of extremely premature neonates and major surgery, become jeopardised.
- 1.3 Organisms with multiple antibiotic-resistance are a problem both in hospitals and in the community. Resistance arises in many different human pathogens, such as *Staphylococcus aureus*, e.g. methicillin-resistant *Staphylococcus aureus* (MRSA); *Escherichia coli* producing extended spectrum β -lactamase (ESBL) enzymes, and *Streptococcus pneumoniae* with reduced susceptibility to penicillins. The global nature of the problem of multi-drug-resistant bacteria with potential to affect the UK has been underlined by recent resistance alerts issued by the Health Protection

Agency. Some of these alerts were concerned with carbapenem resistance in enterobacteriaceae and in particular the problem of multi-resistant bacteria imported from India and Pakistan. There is a clear need to take action to control the spread of such resistance among organisms.

- 1.4 The cornerstone of any plan to reduce antimicrobial resistance is the prudent and appropriate use of existing antimicrobials. Good stewardship of antimicrobial use in humans brings additional advantages as well as control of resistance: it maximises successful treatment of infections and minimises adverse effects of antimicrobial therapy such as toxicity; the selection of pathogenic organisms such as *Clostridium difficile*; and sub-optimal usage of healthcare resources. Therefore, ensuring the most appropriate use of antimicrobials is essential in promoting patient safety as well as the health and wellbeing of present and future generations.
- 1.5 This document is focused on improvement in the safety and quality of care related to human health, however there are wider issues including antimicrobial resistance in food and in animals, which need to be addressed through effective communications and collaboration between the agencies and forums concerned. It is imperative also that any work done in Northern Ireland is linked with work taking place elsewhere in the UK, Europe and internationally.

SECTION 2: WHERE WE ARE NOW

Background in Northern Ireland

2.1 The first Antimicrobial Resistance Action Plan (AMRAP) in Northern Ireland was launched in 2002. This Plan was developed by a multi-disciplinary working group chaired by Dr Hugh Webb, Consultant Microbiologist. Its main purpose was to address the issue of increasing antimicrobial resistance. The group identified 6 priority areas for targeted action:

- prudent antimicrobial use in the community;
- prudent antimicrobial use in hospitals;
- infection control;
- prudent antimicrobial use in animals;
- education, information dissemination and research, and
- surveillance.

A total of 49 recommendations were made, and an AMRAP Implementation Steering Group was established under Dr Webb's chairmanship. In addition, each Health and Social Services Board (HSSB) was asked to convene an Area Antimicrobial Resistance Action Committee to lead local implementation.

Recent achievements in Northern Ireland

Primary care prescribing guidelines

2.2 The regional guidelines for primary care, launched in 2008, were updated in 2010 and are available at www.publichealth.hscni.net/publications/northern-ireland-antimicrobial-guidelines-primary-care-2010. These guidelines are currently being reviewed and an updated version will be available in Autumn 2012. The guidelines cover the main infections likely to be seen, and provide information about the most appropriate antimicrobial agent, dose, and length of course to use. They have been distributed to all primary care

prescribers including clinicians in out-of-hours services, A & E units (patients not admitted to hospital), mental health services, care homes and community pharmacies for information.

Audit of implementation of the primary care guidelines

- 2.3 In 2008 the Eastern Health and Social Services Board's Prescribing Team produced updated antibiotic prescribing guidelines for primary care and an audit was developed to encourage practices to reflect on their antibiotic prescribing. As shown in figure 1, within a year of the launch of the guidelines antibiotic prescribing per patient was reduced by 6% overall and decreased in 77% of practices. The proportion of prescriptions within the guidelines, where applicable, increased from 68% to 77%. The proportion of telephone requests given a prescription without consultation decreased from 12% to 8%. The percentage of consultations, particularly face-to-face consultations, before prescribing increased in 75% of practices while the proportion of telephone requests resulting in an antibiotic prescription without consultation decreased (or remained at zero) in 80% of practices.

http://www.dhsspsni.gov.uk/summary_report_of_antibiotic_prescribing_audits.pdf

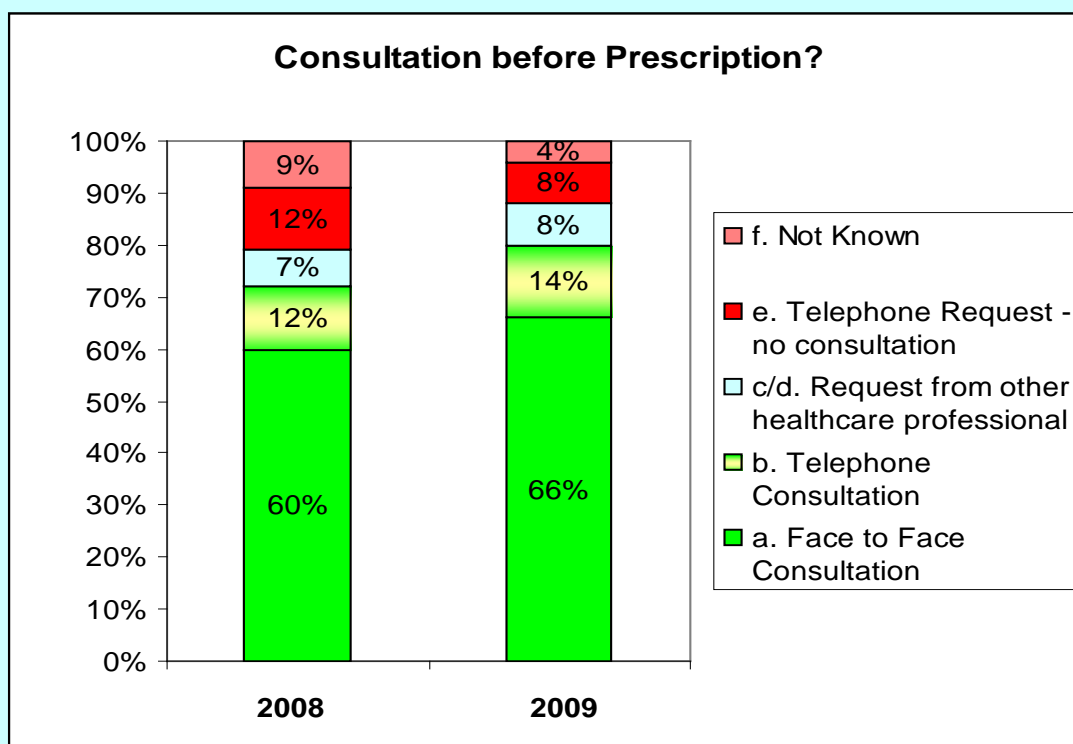
Regional Secondary Care Guidelines for Antimicrobial Prescribing for Northern Ireland

- 2.4 The Northern Ireland Regional Secondary Care Guidelines for Antimicrobial Prescribing, which were developed by A RAC and formally launched on European Antibiotic Awareness Day (EAAD) 2010, have been used to inform the development of Trust guidelines. The Guidelines are at:

www.dhsspsni.gov.uk/index/phealth/php/health_protection_leaflets_and_information.htm.

Individual Trust guidelines have been tailored to reflect local resistance patterns as appropriate.

Figure 1: Consult before prescribing – audit results



Achievements in Secondary Care

2.5 Health and Social Care Trusts have implemented policies and good practice to reduce antimicrobial resistance. The following are examples of initiatives taken forward by the Trusts.

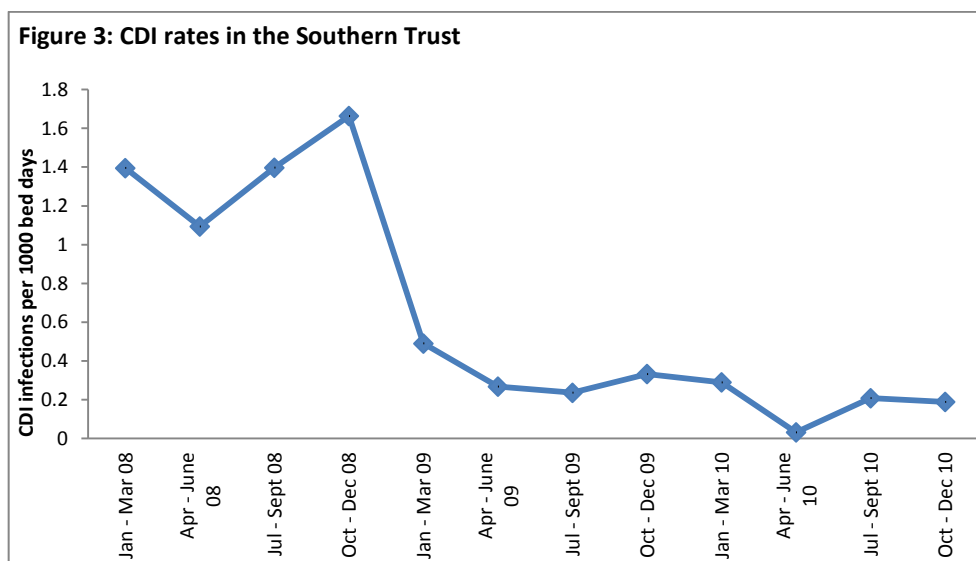
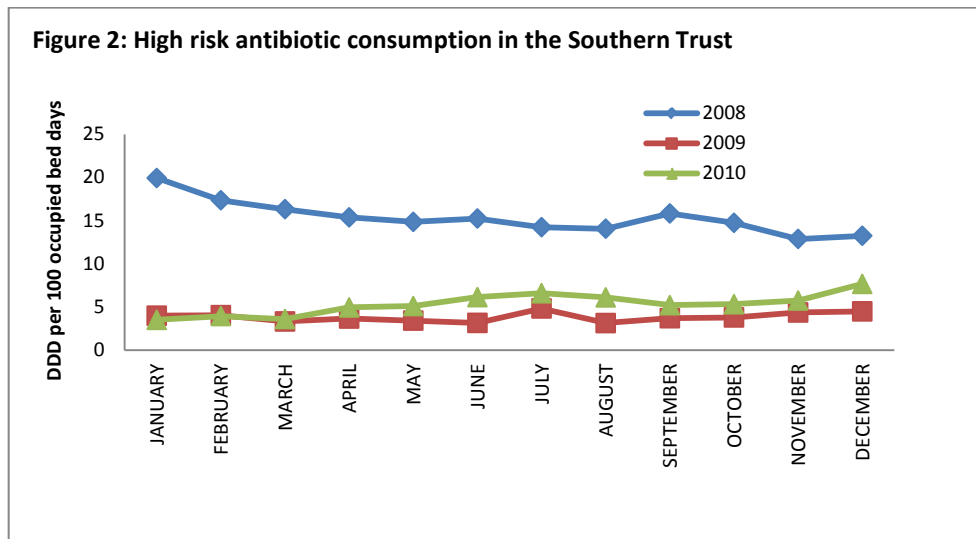
IMPLEMENTING AN ANTIBIOTIC STEWARDSHIP PROGRAMME

2.6 The implementation of an antibiotic stewardship programme in the Southern Trust has led to a reduction in *C. difficile* infection rates. The programme included:

- new guidelines for antibiotic treatment and surgical prophylaxis with removal of cephalosporins and quinolones except for selected conditions;
- auditing of compliance with Trust antibiotic guidelines and timely feedback of information to the clinician via 'E dashboard', and
- weekly antibiotic ward rounds.

2.7 From 2008 to 2010 the programme along with other measures contributed to:

- a 65% reduction in the use of high-risk antibiotics (see Fig 1) and a 35% increase in the use of low-risk antibiotics, with a total increase in antibiotic use of 2%;
- a reduction in *C. difficile* cases by 88% from 197 cases in 2008 compared with only 23 in 2010 (see Fig 2), and
- a 60% reduction in antibiotic expenditure between 2008 and 2010. (This figure also includes a price reduction in some of the antibiotics in 2008/2009.)



ANTIMICROBIAL AUDITS

- 2.8 Weekly audits of antimicrobial prescribing have been undertaken throughout the Northern Trust since 2008 and allow the Antimicrobial Pharmacists to identify any inappropriate prescribing in a timely manner. The results are reported to directorates and clinical pharmacists on a monthly basis. Patients who require further monitoring are followed up by an Antimicrobial Pharmacist.
- 2.9 The weekly audits showed that, in general, compliance with the Trust Guidelines improved from 56% in February 2008 to 97% in September 2011. Adherence to policy has been sustained at around 95% since then.

ANTIMICROBIAL USAGE MONITORING

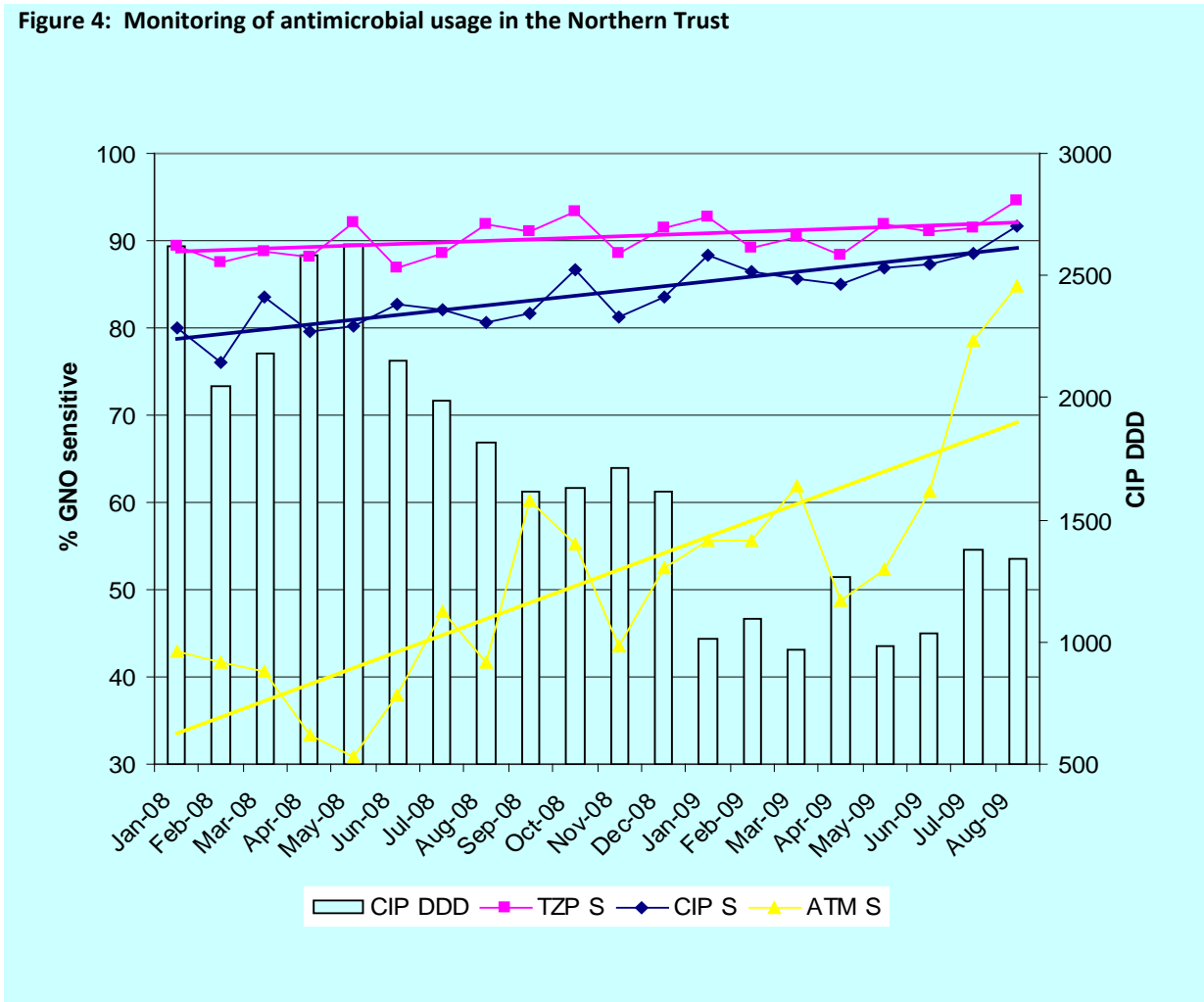
- 2.10 Figure 3 highlights the impact of an antibiotic stewardship programme in the Belfast Trust on reducing ciprofloxacin usage (expressed as defined daily doses per 1000 occupied bed days (DDD/1000 OBD)). Furthermore, the reduction in ciprofloxacin usage was significantly associated with increased susceptibility of Gram-negative bacteria (isolated from blood, urine and sputum) to four antibiotics: aztreonam (ATM), meropenem (MEM), gentamicin (GEN) and ciprofloxacin itself (CIP). Although there also appeared to be an inverse relationship between ciprofloxacin usage and piperacillin/tazobactam (TZP), the association did not reach statistical significance.

PRE-AUTHORISATION REQUIREMENTS FOR 'HIGH RISK' ANTIBIOTICS

- 2.11 In 2008, to help reduce the incidence of *Clostridium difficile*-associated diarrhoea (CDAD) and to minimise the development of antimicrobial resistance in the Northern Trust, 'high risk' antibiotics were removed from all clinical areas except ICU and an Antimicrobial Exemption Form was developed. This form must be completed and Lead Clinician/Consultant Microbiologist approval obtained before the restricted antimicrobials are dispensed. All requests are monitored daily by the Antimicrobial Pharmacists and are validated by a Consultant Microbiologist. Any

inappropriate prescribing is discussed with the prescriber. Since the introduction of the exemption from the consumption of 'high risk' antibiotics has reduced by an average of 83%.

Figure 4: Monitoring of antimicrobial usage in the Northern Trust



EDUCATIONAL INITIATIVES TO IMPROVE PRESCRIBING

2.12 The South Eastern Trust has employed innovative educational approaches to reduce consumption of high risk antibiotics and the rates of *C. difficile* infection.

- Foundation year one doctors have 4 weeks pre-employment work-shadowing in the Trust. Up to 30 of these doctors participate in an antibiotic prescribing audit each year, focusing on accurate documentation and appropriate clinical decision making. This student-

led educational activity introduces new doctors to Trust guidelines and collects useful data.

- Since August 2009 the Trust has piloted structured medical record review and academic detailing in the Lagan Valley Hospital (LVH) and Downe Hospital. All antibiotic prescriptions undergo multidisciplinary scrutiny every week in six acute medical wards, two coronary care units and a rehabilitation ward (over 160 beds in total.) Typically, 50-70 prescribing amendments are made every month.
- Therapeutic Drug Monitoring (TDM) training is provided across the Trust and is available to medical, pharmacy, nursing and phlebotomy staff. This supplements the information provided in the Trust TDM guidance and aims to improve patient safety and outcomes.
- In the first year of these initiatives the South Eastern Trust has seen consumption of high risk antibiotics fall from 11.88 DDD/ 100 patient bed-days to 3.99 DDD/ 100 patient bed days. In Lagan Valley Hospital the monthly average rate of *C. difficile* infection fell from 2.4 cases in the first half of 2009 to 0.5 cases in the second, a reduction that has been sustained.

2.13 The Western Trust undertakes training on the use of antimicrobials as a tool to tackle antimicrobial resistance. The Trust's antimicrobial stewardship programme provides training to all prescribers at induction in secondary care. This is to emphasize the importance of the right dose of antibiotics, through the right route, at the right time and for the right duration. In addition, staff from WHSCT have delivered training to GPs at a series of workshops across Northern Ireland. This training has reinforced the principles of antimicrobial stewardship and highlighted to GPs the importance of avoiding any unnecessary prescribing of antibiotics in primary care to help tackle the emergence of antimicrobial resistance.

Research and development

2.14 Through the Health and Social Care Research & Development Office, the AMRAP Implementation Steering Group commissioned a series of research projects to be conducted on issues related to healthcare-associated

infections and antimicrobial resistance. Following a rigorous selection process, the following four projects were chosen.

- An investigation into the true community levels of antibiotic resistance in *S. pneumoniae* and the relationship between pneumococcal and viridans streptococcal penicillin and quinolone resistance

Lead: Dr Colin Goldsmith

- Factors influencing the success or failure of MRSA decolonisation

Lead: Dr Michael Tunney

- A collaborative primary care-based approach to managing upper respiratory tract infections as a strategy to reduce antibiotic prescribing

Lead: Professor James McElroy

- The impact of quantitative molecular diagnosis of invasive candida infection on antimicrobial drug prescribing in a regional intensive care unit

Lead: Professor Rod Hay / Dr Ronan McMullan

2.15 Summaries of the research projects are available at:

http://www.dhsspsni.gov.uk/research_abstracts_2009.pdf

2.16 The Health and Social Care Research & Development Office is currently funding a Randomised Controlled Trial 'Skin bacteria as a source of surgical infections: molecular epidemiology and prevention of wound contamination' to determine whether a change to the pre-surgical skin disinfection protocol for orthopaedic surgery patients reduces bacterial surgical wound contamination. The data indicate that surgical wound contamination arises primarily from the patient's resident skin microbiota. By reducing surgical wound contamination it should be possible to reduce the impact of post-

surgical infection caused by the predicted future spread of antibiotic resistant bacteria.

Lead: Professor Sheila Patrick

*HSC Research and Development Division Infection and Immunity
Translational Research Group*

2.17 In 2010 the HSC R & D Office Recognised Research Group in Infectious Diseases was replaced by the Infection and Immunity Translational Research Group (I&I TRG), following an initiative from Professor Bernie Hannigan, Director HSC Research & Development Division, Public Health Agency. The I&I TRG is a cross-disciplinary group that is focused on facilitating world-class research in infection and immunity in Northern Ireland and includes pharmacists, clinical academics, full-time NHS clinicians, physiotherapists, clinical and basic scientists. The Group is cross-institutional inclusive of the health service, University of Ulster and Queen's University. The principle aims of the Group are: to facilitate beneficial patient outcomes through collaborative research; develop contacts and collaborations throughout the UK and ensure involvement in major national initiatives; host focused meetings in Northern Ireland and send delegations to meetings that discuss major UK initiatives; seed-fund local research to assist developments that are likely to add significant future value, particularly for visibility nationally and internationally; and to attract further high-profile funding.

The Northern Ireland Centre for Pharmacy Learning and Development

2.18 The Northern Ireland Centre for Pharmacy Learning and Development (NICPLD) has over 20 years experience in delivering CPD programmes via distance learning to the healthcare professions. Recent courses have been developed by NICPLD to support the wider governance agenda. These are available in e-learning format, delivered via the www.nicpld.org (pharmacists) and www.medicinesNI.com (other health professions) websites, which also facilitates post-course assessment and evaluation,

enabling practitioners to print a certificate of completion for their CPD records.

- 2.19 To date, over 3,700 courses have been completed online via both websites. NICPLD currently has 18 online courses which promote best practice in line with guidance by NICE and the Guidelines and Audit Implementation Network (GAIN). The NICPLD website provides access to antimicrobial specific learning in the form of online courses, COMPASS notes and multidisciplinary workshops.

Training for primary care and community staff

- 2.20 COMPASS Therapeutic Notes are circulated to GPs, nurses, pharmacists and others in Northern Ireland. Each issue is compiled following the review of approximately 250 papers, journal articles, guidelines and standards documents. The Therapeutic Notes are written in question and answer format, with summary points and recommendations on each topic. They reflect local, national and international guidelines and standards on current best clinical practice including the appropriate use of antimicrobials within the therapeutic areas discussed. Each issue of the Therapeutic Notes is accompanied by a set of assessment questions.

Northern Ireland Practice and Education Council for Nursing and Midwifery (NIPEC) Review

- 2.21 The Regulation and Quality Improvement Authority (RQIA) report on the *C. difficile* outbreak of 2007/2008 recommended that a review of staff training and development needs for infection prevention and control (IPC) should be undertaken. DHSSPS commissioned NIPEC to conduct this review and their Final Report was published in January 2010. NIPEC has developed outline proposals for IPC training programmes for both non-care staff and care staff. The indicative content for care staff includes the management of multi-resistant organisms and antimicrobial stewardship and administration. The recommendations have been taken forward by the PHA through a regional group.

www.nipec.hscni.net/pub/HCAI%20Review%20Final%20Report%20Jan2010.pdf

All-Ireland conferences

2.22 The AMRAP Implementation Steering Group agreed to work together with their counterparts in the Republic to address common problems in antimicrobial resistance. This collaboration led to three joint conferences with speakers from both sides of the border sharing information, research findings and best practice in promoting prudent and optimum antibiotic use.

Public awareness-raising by the Patient and Client Council

2.23 The Patient and Client Council was established to provide a strong voice for patients, clients and carers. It is a stakeholder in the development of communication approaches and also has a monitoring role in respect of patient perceptions and satisfaction with HSC organisations and progress in the prevention of HCAs. The Patient and Client Council has been hosting events with users of health and social care services to glean feedback about the efficacy of current IPC public information. Some of these events have focused on the issue of antimicrobial prescribing and resistance.

School educational materials

2.24 In 2004 DHSSPS, with the Council for the Curriculum, Examinations and Assessment (CCEA), issued an interactive training pack, 'The Bug Investigators' to all schools in Northern Ireland. The pack covered the topics of microorganisms, infections, and personal hygiene – in particular hand washing – and included a series of pupil activities.

Antimicrobial Resistance Action Committee (ARAC)

2.25 Although the AMRAP Implementation Group achieved significant progress, in recognition that further work was required the Antimicrobial Resistance Action Committee (ARAC) was established by DHSSPS in 2008. ARAC's terms of reference are:

1. to provide expert advice to the Minister and the Chief Medical Officer, as policy lead, on all issues to do with antimicrobial resistance, and

2. to lead s trategic ac tion t o minimise t he oc currence of antimicrobial r esistance and t o maintain t he effectiveness of antimicrobial ag ents in t he t reatment an d pr evention of microbial i nfections in m an and animals. The C ommittee will need t o take i nto ac count t he r elevant work of ot her expert groups i n t he h uman and v eterinary f ields nat ionally an d internationally.

‘Changing the Culture 2010’

2.26 DHSSPS launched *Changing t he C ulture 2010* in J anuary 201 0. T his document updated the 2006 *Changing the Culture action plan*. The starting point remains the two core principles that underpinned the 2006 action plan, namely:

- infection pr evention a nd control i s an i ntegral part of safe he althcare; and
- Infection prevention and control is everyone’s business.

2.27 The f ollowing f our ac tions w ithin *Changing t he C ulture 20 10* relate specifically to tackling antimicrobial resistance.

- Each T rust w ill hav e r obust r eporting s ystems a nd as surance that risks o f p atients being ex posed t o high-risk antibiotics ar e bei ng minimised and prudent prescribing is in place.
- Each T rust w ill h ave established a m ultidisciplinary A ntibiotic Management Team.
- The Department will issue an up-to-date antimicrobial resistance and prescribing ac tion plan, w hich w ill i nclude a r egion-wide ant ibiotic prescribing policy for hospitals.
- Each T rust w ill h ave an ant imicrobial s tewardship pr ogramme i n place, as described in the Antimicrobial Resistance Action Plan.

2.28 Since the publication of *Changing the Culture 2010* the implementation of some recommendations has been r econsidered. Specifically, i t has be en agreed t hat t wo r egional pl anning doc uments, r ather t han a s ingle one,

would be produced: the present document – STAR – and a detailed action plan to complement STAR to be developed and led by the PHA and the HSC Board working with other healthcare bodies.

Roles and responsibilities

Reconfiguration of Health and Social Care bodies

2.29 On 1 April 2009, four new HSC organisations replaced the Health and Social Services Boards, the Health and Social Services Councils, the Central Services Agency, the Health Promotion Agency, the Communicable Disease Surveillance Centre (CDSC) and the Healthcare Associated Infection Surveillance Centre (HISC). The new organisations are the Public Health Agency, the Health and Social Care Board, the Patient and Client Council and the HSC Business Services Organisation. Details of the new HSC bodies are at www.dhsspsni.gov.uk/index/hss/rpa-home.htm.

- Under the new structures the Department is more focused on its core responsibilities of ministerial business, resource planning and priorities, policy, legislation, capital and HR.
- In the context of antimicrobial resistance the Public Health Agency and the Health and Social Care Board jointly ensure that, in commissioning services, priority is given to antimicrobial stewardship.
- Each Trust now has in place an updated, robust plan to address preventable Healthcare Associated Infections (HCAIs). These plans are used to drive quality and improvement and address the risks identified within the organisation.
- The Regulation and Quality Improvement Authority (RQIA) continues to monitor and inspect the quality of services, and encourages improvements. The RQIA also carries out a programme of service or thematic reviews relating to clinical and social care governance which can take into account elements of infection prevention and control.
- The Patient and Client Council has been established to provide a strong voice for patients, clients and carers. It is a stakeholder in the development of communication approaches and has a monitoring role in

respect of patient perceptions and satisfaction with HSC organisations and HCAs.

SECTION 3: THE DIRECTION OF TRAVEL

Where we want to be in the future

Our mission

- 3.1 Our mission is to maintain the efficacy of antimicrobials and to reduce antimicrobial resistance throughout health and social care for the people of Northern Ireland.

Our aims

- 3.2 The overarching aims of the Strategy for Tackling Antimicrobial Resistance – STAR – are:

- to minimise the morbidity and mortality due to antimicrobial resistant infection, and
- to maintain the effectiveness of antimicrobial agents in the treatment and prevention of microbial infections.

Our objectives

- 3.3 More specifically our objectives are:

- (1) to establish an antimicrobial stewardship programme in all HSC settings;
- (2) to establish and maintain systems to monitor antimicrobial usage and surveillance of resistance;
- (3) to promote optimal prescribing through professional education and adaptation of best practice;
- (4) to promote local research, and ensure the use of this and other research evidence by policy makers, commissioners and service providers, and
- (5) to increase appropriate public expectation for antimicrobial prescribing by public engagement and the provision of information.

SECTION 4: HOW WE WILL ACHIEVE OUR AIMS AND OBJECTIVES

The tasks required:

4.1 To improve the quality and appropriateness of antimicrobial prescribing in Northern Ireland, ARAC has identified five key areas for future action and agreed that this Strategy and the accompanying Action Plan should include a focus on antimicrobial stewardship. These five key areas, each reflected in our objectives, are:

- (1) antimicrobial stewardship in all HSC settings;
- (2) monitoring of antimicrobial usage and surveillance of resistance;
- (3) professional education and practice;
- (4) research and development, and
- (5) patient and public engagement and information.

Antimicrobial stewardship

Lead organisation: HSCB, supported by PHA

4.2 The overall goal of antimicrobial stewardship is to optimise clinical outcomes whilst minimising the unintended consequences of antimicrobial use. Antimicrobial stewardship is a multifaceted approach that includes policies, guidelines, education, monitoring and audit. It should not be seen as a separate issue to that of controlling healthcare-associated infections, as both are required in healthcare institutions, therefore a whole-systems approach is required. The Public Health Agency and the Health and Social Care Board will jointly ensure that priority is given to antimicrobial stewardship in commissioning and delivery of services across all HSC organisations including independent contractors.

4.3 An antimicrobial stewardship programme should include the following elements:

- (i) an Antimicrobial Management Team;

- (ii) evidence-based antimicrobial guidelines/policy, and
- (iii) quality improvement measures/audit.

Antimicrobial Management Team

4.4 The establishment of an Antimicrobial Management Team (AMT) is essential to ensure the development and implementation of an effective antimicrobial stewardship programme. *Changing the Culture 2010* included a commitment that by March 2010 each Trust would have established a multidisciplinary Antimicrobial Management Team.

Trust Antimicrobial Stewardship Policy

4.5 Each Trust should develop an antimicrobial stewardship policy and a plan for its implementation. The Trust Antimicrobial Stewardship Policy should include:

- Trust guideline development and implementation
- Monitoring of implementation including audit, processes and outcomes;
- Education and practice and
- Appropriate information for patients and carers

Quality improvement measures/audit

4.6 Antimicrobial Stewardship Programmes should include process and outcome measures as concrete evidence of compliance with the antimicrobial stewardship policy. This is considered further in Section 5 and Annex 1.

Antimicrobial Stewardship in different settings

ANTIMICROBIAL STEWARDSHIP IN HEALTH & SOCIAL CARE TRUSTS

4.7 The Antimicrobial Stewardship Programme is a corporate responsibility for Trusts and should function under the leadership of quality assurance and patient safety programmes. Clear and effective working relationships are required between Antimicrobial Management, Infection Prevention & Control and the Drug and Therapeutics Committees or their equivalents. An

accountability mechanisms should be put in place to provide assurance to Trust Governance Committees and Trust Boards that the programme is working effectively. Trust management should provide support for the necessary infrastructure, including IT, and training.

ANTIMICROBIAL STEWARDSHIP IN PRIMARY CARE

4.8 Antimicrobial Stewardship in primary care is one of the responsibilities of primary care providers and is an integral part of prescribing practice. Approximately 80% of antimicrobial prescribing is estimated to take place in the community, therefore if an antibiotic is required it is important that primary care prescribers use an appropriate antibiotic at an appropriate dose, given the increasing problems with resistance and the need to preserve the usefulness of more specialised antibiotics. Primary care prescribers also need to manage the pressures that come from patients' expectations for an antibiotic. The Board and PHA should continue to oversee the antimicrobial stewardship policy for primary care and to facilitate delivery of this. Areas for consideration include:

- guideline development and implementation;
- monitoring of implementation, including audit, processes and outcomes;
- education and information on best practice and
- appropriate information for patients and carers.

4.9 The regional guidelines for primary care, launched in 2008, have been updated www.publichealth.hscni.net/publications/northern-ireland-antimicrobial-guidelines-primary-care-2010. The Board, supported by the PHA will ensure that they are updated on a regular basis.

ANTIMICROBIAL STEWARDSHIP AT THE HOSPITAL/COMMUNITY INTERFACE

4.10 Appropriate prescribing of antimicrobials is essential across the interface between hospitals and the community. Increasing numbers of patients with specialised antimicrobial needs are being managed in the community, allowing otherwise fit patients to be discharged early from hospital while still on IV antibiotics and to receive these in their own homes or in a nursing or

residential setting. Trusts should ensure that systems are in place for the care and safe management of these patients, working where appropriate with primary care health care professionals in line with local policies and guidelines. Good communication across the interface is essential between all those involved.

Monitoring of antimicrobial usage and surveillance of resistance

Lead organisation: PHA, supported by HSCB

- 4.11 Systems for monitoring antimicrobial prescribing trends in both primary and secondary care should be in place across the region, with monitoring reports considered at Trust, Commissioner and Department levels.

Monitoring of antimicrobial usage in Trusts

- 4.12 In hospitals electronic prescribing has the potential to incorporate clinical decision support and to enable the quality of prescribing to be monitored. Computer surveillance and decision support systems linked to antimicrobial prescribing could present epidemiological information, leading to detailed recommendations and warnings regarding antimicrobial regimes and courses of therapy. In addition, incorporation of clinical guidelines into such systems can, for example, increase the number of surgical patients who receive appropriate pre-operative prophylactic antibiotics. Although progress on this issue remains slow in most UK hospitals, implementation of such systems is desirable and should be the goal in the medium term as resources permit.

Monitoring of antimicrobial usage in primary care

- 4.13 Detailed data are already available for primary care prescribing activity via a number of different routes including
- COMPASS, which provides data on aspects of antimicrobial prescribing at a practice, locality and regional level on a quarterly basis, and
 - data available to the Department and Commissioners through the Business Services Organisation's (BSO) prescribing database.

- 4.14 Good use is already made of these data by all those involved in prescribing and its monitoring, for example, practices identified as outliers in their antibiotic prescribing patterns can be asked to address the issue as one of their prescribing action points.
- 4.15 In 2008 the BSO added a new data collection element to the system for processing and payment of prescriptions. This involves a computer readable barcode printed on the prescription by the GP practice. The barcode captures enhanced data about the prescribing activity, including information such as the age and sex of the patient on the patient receiving the prescription as well as details of the drug prescribed. The enhanced data have the potential to improve the quality of monitoring of antimicrobial usage at individual practice, Local Commissioning Group and regional levels, and this will be addressed in the PHA/HSCB action plan.

Surveillance of resistant organisms

- 4.16 Effective antimicrobial resistance surveillance systems are required to rapidly identify existing and emerging resistant organisms; measure the prevalence of these organisms; identify any associations between antimicrobial resistance and antimicrobial prescribing patterns; and devise strategies to limit spread.
- 4.17 The cornerstone of antimicrobial resistance surveillance will be data held by laboratories. A critical element of this is defining and standardising laboratory identification methods including determination of antimicrobial resistance and the range of core antimicrobials against which positive isolates are tested. These standards should be compatible with other countries to allow meaningful comparison of local data in an international context. Given our size and the small number of laboratories here, there is a unique opportunity to achieve standardised methodology and robust data on antimicrobial resistance susceptibility. The PHA will take this forward with the microbiologist network.

- 4.18 Mandatory surveillance for blood culture isolates of MRSA is currently conducted by all Trusts through a web-based system operated by the PHA and signed off by each Chief Executive. As yet there is no central system for monitoring the incidence of unusual or highly resistant organisms arising on a day-to-day basis in Trusts, however, both laboratory scientific and medical staff monitor these locally and appropriate action is taken on patient management. The central collection of data on a defined group of organisms – for example gram negatives with resistance to defined antibiotics found in different locations such as ICUs – would enable the rapid identification of new resistant organisms; facilitate the issuing of alerts to laboratories to enhance surveillance; enhance monitoring of the incidence of these organisms, and result in agreed action to prevent further spread.
- 4.19 The PHA will undertake a review of available surveillance systems for antimicrobial resistance and recommend the most appropriate system for use in Northern Ireland.

Professional education and practice

Lead organisation: PHA, supported by HSCB

- 4.20 All healthcare professionals should receive appropriate training and education in the appropriate use of antimicrobials; on the challenge of antimicrobial resistance; and the impact of both on healthcare-associated infections. There are pockets of excellent practice in place across Northern Ireland but extending this to a more standardised approach would benefit all staff, particularly those who move between Trusts or who work at the interface between primary and secondary care.

Undergraduate level and Pre-Registration

- 4.21 Medical, dental, pharmacy, nursing and biomedical science students should be introduced to these topics through the undergraduate curriculum. A RAC has reviewed the current coverage of antimicrobial prescribing and antimicrobial resistance in undergraduate and postgraduate curricula. The

results showed that although teaching on Microbiology and Infectious Diseases is included in the curricula for students in QUB Schools of Medicine, Dentistry, Nursing, Biomedical Sciences, Biological Sciences and Pharmacy, there is considerable variation across the different disciplines and universities. See http://www.dhsspsni.gov.uk/professional_education_and_practice.pdf.

- 4.22 Interprofessional education (IPE) for medical, dental, pharmacy and nursing undergraduate students is defined as occasions when two or more professions learn from and about each other to improve collaboration and the quality of care. By utilising the teaching expertise within the respective University Schools and HSC Trusts, IPE promotes collaborative working amongst the different disciplines in their professional practice. Good antimicrobial prescribing practices and relevant practical microbiology could be taught in a similar way.
- 4.23 The General Medical Council conducted a comprehensive review of *Tomorrow's Doctors* (2003) and published an updated edition in 2009, entitled *Tomorrow's Doctors: outcomes and standards for undergraduate medical education*. This document makes specific reference to the graduate's ability to demonstrate knowledge of drug actions "including effects on the population such as the spread of antibiotic resistance". The document also includes the requirement to "Understand the importance of, and the need to keep to, measures to prevent the spread of infection, and apply the principles of infection prevention and control."
- 4.24 At national level, the Advisory Committee on Antimicrobial Resistance and Healthcare Associated Infection (ARHAI) is currently developing a Competency Framework for Antibiotic Prescribing for Professionals.

Postgraduate level

- 4.25 In addition to undergraduate and pre-registration education and training, it is essential that ongoing postgraduate training in antimicrobial prescribing and antimicrobial resistance is provided to healthcare professionals to ensure that they maintain the skills necessary to manage the treatment of infections. This

should be streamlined and aligned with training provided at undergraduate level and should dovetail with IPC training programmes.

IPC training

- 4.26 Paragraph 2.21 above refers to the N IPEC review of IPC training. It is important to ensure that training and education for antimicrobial resistance is integrated into IPC education and training.

Ongoing training for primary care and community staff

- 4.27 All health and social care staff, including those employed in GP practices, community pharmacies, OOH services, residential and nursing homes, and domiciliary care workers, should be kept up-to-date with information about the infection prevention and control and antimicrobial prescribing. Training can be provided in a number of ways ranging from therapeutic updates and systems approaches for the whole practice to newsletters updating on this topic.

Research and development

- 4.28 Research undertaken locally or elsewhere may highlight aspects of antimicrobial prescribing or resistance which may require changes in healthcare practice. Up-to-date research evidence should be used to inform actions and developments.
- 4.29 ARAC will work with HSC R&D to promote the development of local research and the use of this and other research evidence by policy makers, commissioners and service providers.
- 4.30 The Public Health Agency will, through the HSC R&D division, commission research to provide evidence on aspects of antimicrobial resistance where the evidence base is lacking.
- 4.31 An example of the potential for future local research is given below showing how researchers have exploited the potential of the enhanced prescribing database.

Northern Ireland Longitudinal Study (NILS)

- 4.32 The Northern Ireland Longitudinal Study (NILS) is an innovative research resource which allows the exploration of health and socio-demographic characteristics and, can be used to provide an insight into the status of the Northern Ireland population. It is a large-scale, representative, data-linkage study of approximately 28% (approximately 500,000 people) of the Northern Ireland population. It has been created by linking demographic data from the Northern Ireland Health Card Registration system to the 2001 Census returns and to administrative data from various sources such as vital and migration events and deprivation rankings.
- 4.33 As outlined in paragraph 4.15, a recent project¹ has successfully, for the first time, linked NILS data to the BSO's electronic prescribing data to examine variations in use of antibiotics by individual socio-demographic characteristics and area characteristics, to help to inform the management of antibiotic prescribing in Northern Ireland. (*'An exploratory analysis of the use of antibiotics by demographic and area characteristics – an exemplar study using the Northern Ireland Enhanced Prescribing Database'*).

Patient and public engagement and information

Lead organisation: PCC, supported by PHA and HSCB

- 4.34 One of the challenges with the prescribing of antimicrobials in primary care is managing patient expectations. There are a number of resources that can assist practices and patients including leaflets, posters and information sheets and some GP practices already use information leaflets during a consultation as an alternative to prescribing antibiotics, when this is appropriate.

¹

(*'An exploratory analysis of the use of antibiotics by demographic and area characteristics – an exemplar study using the Northern Ireland Enhanced Prescribing Database'*). Fiona Johnston NILS RSU-NISRA, Michael Rosato NILS RSU-QUB and Kim Moylan HSC BSO-NISRA). Website at: www.nils-rsu.census.ac.uk.

- 4.35 Greater involvement of the community, voluntary sectors and proactive engagement with media should be encouraged to disseminate the message about appropriate usage of antibiotics to the wider public. The Public Health Agency will support the development of local capacity to help deliver this agenda including where appropriate the development of public information for all health and social care settings.

The first European Antibiotic Awareness Day (EAAD) was held on 18 November 2008 and ARAC used this event to launch the regional primary care guidelines. EAAD has become an annual event, designed to raise awareness across Europe on how to use antibiotics in a responsible way that will help keep them effective in the future. In 2010, on the third EAAD, the new guidelines for antimicrobial prescribing in secondary care were launched. The most recent EAAD was held on 16 November 2011. The event focused on updated guidelines, with prescribers being asked to 'CAP' their antibiotic use:

- CONSULT (with patients requesting antibiotics). Telephone requests for antibiotics are discouraged as the prescriber cannot make a full assessment of the patient or their need for antibiotics.
- AVOID (and use alternatives where possible).
- PRESCRIBE (within the guidelines).

A number of the Trusts use publicity materials produced by the European Centre for Disease Control to highlight EAAD to staff, patients and visitors.

- 4.37 E-Bug is a website-based European project which aims to help children develop an understanding of microbes, antibiotic resistance, spread of infection and vaccines. The website <http://www.e-bug.eu> continues to be developed with a number of games being launched on EAAD 2010. The intention is to teach children about these issues and raise awareness of prudent antibiotic use in future generations.

SECTION 5: HOW WE WILL KNOW WE ARE MAKING PROGRESS

A logical approach

- 5.1 The impact of this strategy will only become evident through comprehensive monitoring. Thus, an early priority in the implementation of the Strategy must be development of a framework to accurately monitor antimicrobial use and antimicrobial resistance.
- 5.2 Firstly, the framework should clearly demonstrate that activities and interventions are appropriately designed and targeted to achieve clear outputs. These in turn lead to outcomes, the impact of which can be clearly measured. When considered as a whole, the framework should demonstrate that the stated aims and objectives have been achieved. Without this accurate, step-by-step information about antimicrobial usage and antimicrobial resistance and their respective trends, the impact of interventions will be difficult to interpret.



- 5.3 Further details on each activity and potential indicators at different levels are given in the Annex.

The way forward

- 5.4 The current strategy does not include specific, measurable, targets for antimicrobial resistance or disease due to resistant organisms. Identification of achievable yet stretching targets requires considerable further development work and should form part of the action plan which will implement the strategy and deliver on the aims and objectives. This action plan will be led by the PHA and HSC Board working in partnership with other stakeholders.

STRATEGIC MODEL FOR STAR 2012-2017

STAR is a high-level medium-term strategy document which will be complemented by a detailed action plan. The strategic model overleaf is a representation of the direction of travel and intended impacts. It does not include SMART targets as these need to be formulated in conjunction with each of the specific measures that will feature in the action plan.

STRATEGIC MODEL FOR STAR 2012-2017

Impacts	<ul style="list-style-type: none"> - Minimise morbidity and mortality caused by antimicrobial resistant infections. - Maintain effective antimicrobial agents in the treatment and prevention of microbial infections.
Impact-level indicators	<ul style="list-style-type: none"> - Decrease in mortality from drug-resistant microbes. - Decrease in number of infections caused by resistant bacteria.

The tables on the following pages list outputs, outcomes and associated indicators for each of the five key areas for action – ‘activities’ – that will contribute to the overarching impacts.

Activities:	<ol style="list-style-type: none"> 1 Antimicrobial stewardship in all HSC settings 2 Monitoring of antimicrobial usage and surveillance of resistance 3 Professional education and practice 4 Research and development 5 Patient and public engagement and information 	
Outputs	Outcomes	
Output-level indicators	Outcome-level indicators	

Activity:	1. Antimicrobial stewardship	
Outputs		Outcomes
<ol style="list-style-type: none"> 1. Each Trust has an AMR stewardship policy and implementation plan. 2. Primary care AMR stewardship policy and implementation plan. 3. Community care AMR stewardship policy and implementation plan. 		<ol style="list-style-type: none"> 1. Patients are prescribed antibiotics only when it is necessary. 2. Patients get at right time the right antibiotic, by the right route and for the right duration.
Output-level indicators		Outcome-level indicators
<ol style="list-style-type: none"> 1. Each Trust has an appropriate policy and implementation plan in place and available in all relevant departments and on its intranet. 2. Audit of compliance with guidelines. 3. Updated Trust guidelines on antibiotic prescribing. 4. Guidelines development and implementation of AMR stewardship in Primary care and community settings 		<ol style="list-style-type: none"> 1. Total antimicrobial load by class. 2. Total Defined Daily Doses (DDD) of all antimicrobial agents. 3. Usage trends by DDD of agents that have high, medium and low propensity to cause <i>C. difficile</i>. 4. Ratio of IV to oral antimicrobial use. 5. Percentage compliance with guidelines. 6. Antimicrobial spend per bed-day. 7. Antimicrobial load per bed-day.

Activity:	2. Monitoring and surveillance	
Outputs		Outcomes
<p>Systems/mechanisms are in place to monitor antimicrobial usage and antimicrobial resistance at all levels, from individual practices and Trust facilities to regional level, and to provide feedback.</p>		<ol style="list-style-type: none"> 1. Professionals respond to monitoring data, to inform and improve antimicrobial prescribing practice, and adapt relevant infection prevention and control practices more generally. 2. Potential problems identified early and action taken to prevent this in future.
Output-level indicators		Outcome-level indicators
<ol style="list-style-type: none"> 1. Appropriate monitoring and surveillance system in place both in Primary and secondary care including antimicrobial use and surveillance of resistant organisms. 2. Surveillance data is used to inform and improve prescribing e.g. regular reports. 		<ol style="list-style-type: none"> 1. Reduced inappropriate antibiotic use. 2. Trends in antibiotic resistance. 3. Appropriate action taken based on the surveillance report. 4. Control measures evaluated. 5. Prevalence of existing resistant microbe strains. 6. Emergence of new resistant microbe strains.

Activity:	3. Professional education and practice; knowledge base	
Outputs		Outcomes
<ol style="list-style-type: none"> 1. HSC and universities keep abreast of developments in knowledge base, and this is reflected in professional education and practice. 2. HSC professionals are encouraged and supported to undertake relevant local R&D and innovation. 		<p>All prescribers are fully aware of and are following good practice in prescribing.</p>
Output-level indicators		Outcome-level indicators
<ol style="list-style-type: none"> 1. Appropriate coverage in undergraduate curriculum of medical, dental, pharmacy, nursing and biomedical and science students. 2. Appropriate ongoing postgraduate training on antimicrobial prescribing and antimicrobial resistance is provided to health care professional 		<ol style="list-style-type: none"> 1. Increase adherence to appropriate antibiotic use guidelines. 2. Reduced inappropriate antibiotic use. 3. Number of relevant academic departments with module in place for antimicrobial resistance. 4. Number of postgraduate training courses available in Northern Ireland for primary, secondary and community care staff.

Activity:	4. Research and development	
Outputs		Outcomes
<ol style="list-style-type: none"> 1. Promote local research. 2. Promote the use of research evidence from research, both local and from elsewhere, to update policy and local practice. 		<ol style="list-style-type: none"> 1. Local and national evidence available on current best practice. 2. Number of available local and national research opportunities.
Output-level indicators		Outcome-level indicators
<ol style="list-style-type: none"> 1. NILES database link to distinct health and social care databases including prescribing database- which will be available for research analysis. 2. Lectures, workshops, seminars for commissioners, providers, policy makers, practitioners. 		<ol style="list-style-type: none"> 1. Local research initiatives, funding, published literature, reports from local data. 2. Changes in practice and service in response to these research findings.

Activity:	5. Patient and public engagement and information	
Outputs	Outcomes	
<ol style="list-style-type: none"> 1. Measures are in place to raise public awareness and understanding of the need for prudent prescribing. 2. Patients are given appropriate, clear information about their antimicrobial treatments. 	<p>There is a higher level of public awareness and understanding of the risk of AMR, and this is reflected in patients' expectations regarding antimicrobial prescribing.</p>	
Output-level indicators	Outcome-level indicators	
<ol style="list-style-type: none"> 1. Availability of leaflets, posters and information sheets in primary, secondary and social care settings. 2. Web resources available for patient and public access. 3. Number of community development events organised. 4. Online resource available through different websites and dedicated web pages. 	<ol style="list-style-type: none"> 1. Decrease in patient demand and increase in awareness. 2. Patient surveys on awareness. 3. Reduced inappropriate antibiotic use. 4. Trends in antibiotic resistance 	

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