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Antimicrobial prescribing policy and practice in Scotland: recommendations for good antimicrobial practice in acute hospitals

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This guidance document on prudent use of antibiotics and other antimicrobial drugs has been produced for NHSScotland by the Scottish Medicines Consortium (SMC). It fulfils one of the requirements set out in the Antimicrobial Resistance Strategy and Scottish Action Plan (Scottish Executive Health Department 2002) and forms part of the Healthcare Associated Infection (HAI) Action Plan work programme overseen by the Ministerial HAI Task Force. The objective was the development of a set of Good Practice Recommendations for Antimicrobial Prescribing in Hospitals to be implemented at the national or local level. The publication of the recommendations of this document in the *Journal of Antimicrobial Chemotherapy* (JAC) aims to highlight the value of such a national framework to a broader national and international community, particularly aimed at those decision-makers involved in antimicrobial stewardship. While some of its content may only be applicable to a devolved Scottish Health Care system we feel that many of the principles and good practice points are of generic concern and would be of relevance and value to all acute hospitals. On behalf of the all the authors involved in producing this document it is our hope that this article will stimulate debate and action within our acute hospitals.

Keywords: antimicrobial stewardship, healthcare acquired infection, consensus, antimicrobial management team

Introduction to antimicrobial stewardship

A number of guidelines and national policy documents related to antimicrobial stewardship have been produced in North America[1] and by the European Antibiotic Resistance Prevention and Control Project (ARPAC).[2] The recent Cochrane systematic review of antimicrobial control interventions to improve antibiotic prescribing in hospitals provides an excellent evidence base for the most effective interventions related to improving prescribing in hospitals.[3] Our recommendations (http://www.Scotland.gov.uk/Publications/2005/09/02132609/26114; last accessed 31 March 2006) build on this work as well as supporting work currently being undertaken by the Specialist Advisory Committee on Antimicrobial Resistance (SACAR).

Introduction to recommendations

Prudent antimicrobial prescribing is at the core of the Scottish Action Plan on Antimicrobial Resistance,[4] alongside surveillance of resistance and control of healthcare associated infection (HAI). Prudent antimicrobial prescribing requires multidisciplinary collaboration with a rigorous approach to combining the best available research evidence with detailed knowledge of local clinical needs and antimicrobial resistance.[4–9]

Membership of the Scottish Medicines Consortium (SMC) has been derived from NHS Boards in Scotland and includes physicians, pharmacists, a nurse, health economists, finance directors, Board Chief Executives, representatives of remote Boards, Association of British Pharmaceutical Industry, and patient and voluntary group representatives. SMC's potential role in promoting prudent antimicrobial prescribing was explicitly recognized in the Scottish Action Plan in 2002.

The establishment of a new body, the SMC, brings together Area Drugs and Therapeutics Committees (ADTCs) and the pharmaceutical industry. This new body will co-ordinate across Scotland work done to evaluate (in terms of clinical and cost effectiveness) new medicines, new formulations and new indications for existing medicines, including antimicrobial agents. The possibility of it being used to provide a forum in which antimicrobial prescribing policies across Scotland can be co-ordinated

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will be explored. Drug and Therapeutics Committees are key in the development, implementation and review of formularies and policies on the management and appropriate use of antimicrobials. These formularies and policies will be informed by national initiatives including SIGN guidelines, the work of the Health Technology Board and the SMC.

In Scotland there are a number of challenges related to antimicrobial prescribing facing hospitals. These have been recognized by the Scottish Executive Health Department and SMC and relate to the following:

- Evidence of wide variation in antimicrobial prescribing policy and practice
- Concern about insufficient regular liaison between microbiologists, clinicians and pharmacists
- Concern about inadequate supervision of prescribing and inappropriate choice, duration and records of administration by junior doctors
- Need for work particularly on standardization of approaches to acute hospital prescribing of antimicrobials
- Evidence of suboptimal linkage between prescribing and infection expertise
- Need for hospital-wide multidisciplinary approaches to antimicrobial prescribing including role and limitations of medicines; knowledge of local susceptibility patterns; use of intravenous (iv) and oral routes; duration of treatment and prophylaxis; monitoring of levels; and routine collection of data in relation to outcomes, streamlining/rationalization and use of laboratory results

A short life project group (Antibiotic Prescribing Policies and Practice; APP&P) was set up to address the issue of antimicrobial prescribing policy and practice in Scottish acute hospitals and to advise the SMC on future strategy in this area.

Objective

The objective of this group was development of a set of Good Practice Recommendations for Antimicrobial Prescribing in Hospitals to be implemented at the national or local level.

Methodology, remit and implementation

It was agreed to adopt a consensus based approach using existing international,[5,7,8] national[4,6,9–15] and local evidence with expert opinion[16,17] represented within the multidisciplinary group. The important work of the Scottish Infection Standards and Strategy (SISS) Group on Antimicrobial Prescribing in Hospital,[17] other published literature related to investigating antimicrobial usage through selected indicators[18] and suggestions related to improving undergraduate education[19] were used as a valuable starting point for the APP&P group's deliberations. This group aims to further develop this work and produce a useful national and local framework for good antimicrobial prescribing in hospitals. It was not within the groups remit to (1) consider community antimicrobial prescribing or (2) provide a national template for hospital antimicrobial policies. However, as many of the principles defined in this document are generic and applicable to other healthcare settings, it would be reasonable to commend the development of such a framework for primary care. Furthermore, the development of guidance for preparation and revision of hospital and community antimicrobial policies is clearly desirable,[4,6,7,14] and the APP&P group support the development and Scottish adoption, after due consideration of the work currently being undertaken nationally by the SACAR (http://www.advisorybodies.doh.gov.uk/sacar/contact.htm).

Table 1. Summary of key areas

Key area	
1	Establish standard structures and lines of responsibility and accountability in NHS Boards across Scotland
2	Define structures and responsibility for multidisciplinary and generic undergraduate and postgraduate training related to antimicrobial prescribing
3	Define the minimum dataset requirements and standard procedures for collecting information related to antimicrobial resistance patterns
4	Define the minimum dataset requirements and standard procedures for collecting information related to antimicrobial consumption and quality of prescribing at an organizational level and/or ward-specific level
5	Define the key areas for acute hospital policy and recommendations for audit
6	Develop and define performance indicators that could be used to assess or gauge performance related to antimicrobial prescribing in hospitals

The recommendations given in this article should provide clear points of action for implementation by bodies or persons identified in this document. Some of these recommendations require national co-ordination and implementation while others lie at the NHS Board or local level. It is envisaged that the ongoing responsibility for monitoring the impact and effect of the processes identified, and future responsibilities, will be placed with an appropriate national body as part of the HAI Task Force strategy.

Six key areas of practice were identified (Table 1). Subgroups developed and categorized good practice recommendations for these areas. The Working Group regards all recommendations as essential unless otherwise indicated.

Key area 1: establish standard structures and lines of responsibility and accountability in NHS Boards across Scotland

Introduction

There are local structures and policies to facilitate clinical and cost-effective antimicrobial use within many hospitals in Scotland. However, the widespread use of antimicrobials across all clinical specialties means that often the infrastructure lacks leadership and co-ordination across the hospital to support the ongoing monitoring and development of Antimicrobial Prescribing Policy and Practice. Clear lines of communication and accountability between key professionals and with the organization's clinical governance framework may be absent. Existing structures should therefore be reviewed to ensure that the infrastructure is in place for effective local and national leadership, accountability and co-ordination of APP&P.

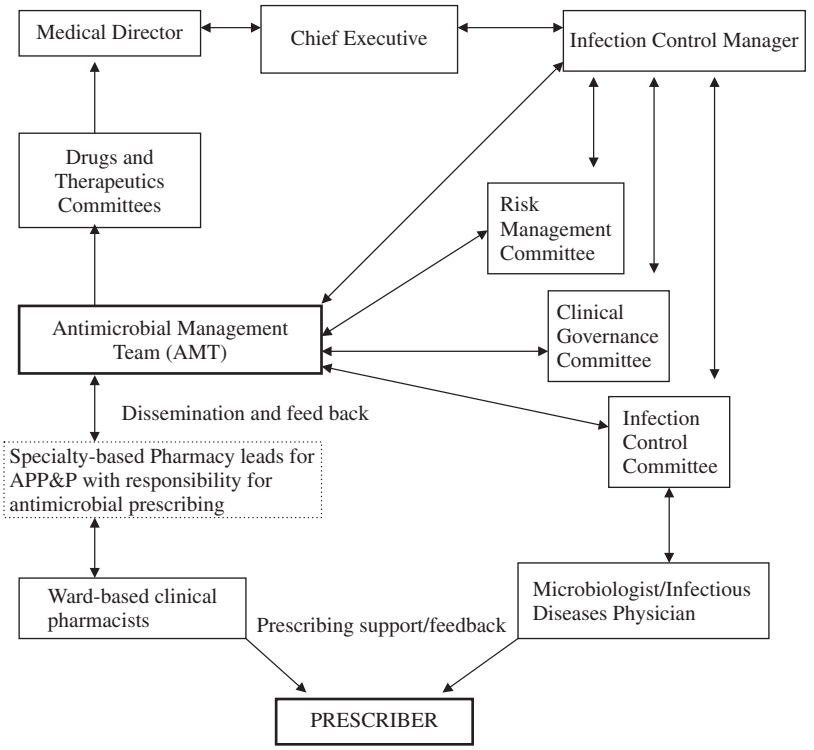

Figure 1. Model antimicrobial prescribing practice pathway in acute hospitals. *Note*: The above figure outlines a proposed pathway to monitor and influence antimicrobial prescribing within a hospital or healthcare organization's clinical governance structure. In particular, the multidisciplinary AMT should be a subgroup of and report to the DTC. There should also be a clear path of communication with the Infection Control Committee where there may be overlapping interests or expertise. An *Antimicrobial Pharmacist*[28] should take the lead in coordinating the implementation and audit of antimicrobial practice, and as such the use of existing pharmacy structures is essential to support this activity; the antimicrobial pharmacist should also report to the Chief Pharmacist. Local investment is likely to be required to support the establishment of lead antimicrobial pharmacists. In some hospitals there may be specialty-based lead pharmacists who could link with ward-based pharmacists.

Recommendation 1: national structure

A national organization should develop the national infrastructure to support implementation of APP&P. A national clinical forum should be established to facilitate networking across NHSScotland in APP&P.

Recommendation 2: NHS Board responsibility

2.1 Chief Executives of NHS Boards, who are responsible for clinical governance, should also have an overall responsibility for APP&P in acute hospitals within their NHS Boards. They should ensure that a local framework is in place for the implementation of the APP&P. Management processes relating to APP&P form part of the responsibilities of the Infection Control Manager [Health Department Letter HDL(2005)8].

2.2 The Board is responsible for establishing systems, including information technology (IT), for implementing key areas 2–6.

Recommendation 3: hospital structures

3.1 A lead acute hospital Doctor and Pharmacist for Antimicrobial Prescribing Policy and Practice in hospitals should be identified within each NHS Board.

3.2 A multidisciplinary antimicrobial management team (AMT) for antimicrobial prescribing should be formed. This should include the above Lead Doctor and Pharmacist, a microbiologist and/or infectious diseases physician, and a senior management representative (normally the Infection Control Manager). This team should be responsible for implementing the Antimicrobial Prescribing Policy and Practice. A model structure is described in Figure 1

3.3 All acute hospitals should have an antimicrobial policy and formulary (see Appendix 1). A recent template for hospital antimicrobial prescribing policies from SACAR may be helpful.[20]

Recommendation 4: hospital responsibility and accountability

4.1 Clear lines of accountability should be defined between the Chief Executive, the Lead Clinician/Pharmacist, the Drugs and Therapeutics Committee (DTC) and AMT.

4.2 The local AMT should maintain responsibility for antimicrobial policy and formulary management, in response to national guidance and local susceptibility data (see key areas 4 and 5).

4.3 The AMT should have clear responsibilities and ways of working with the DTCs and Infection Control Committee (Appendix 2).

4.4 All clinical practitioners have a responsibility to follow good Antimicrobial Prescribing Policy and Practice in keeping with Clinical Governance.

Key area 2: define structures and responsibility for multidisciplinary and generic undergraduate and postgraduate training related to antimicrobial prescribing

Introduction

Appropriate and prudent prescribing of antimicrobial agents requires a firm educational grounding for undergraduates consolidated with further training throughout the postgraduate years. The ongoing application of the principles of antimicrobial prescribing is essential. The following section provides guidance and recommendations for a postgraduate framework of antimicrobial education for all persons with prescribing responsibilities.

Recommendation 5

The AMT should take ownership for defining competencies and skills required for prudent antimicrobial prescribing, based where appropriate on national models.

Recommendation 6

There should be a structured multidisciplinary postgraduate teaching programme for any professional involved in antimicrobial prescribing or administration, designed to improve competence at all levels; regular repetition is required, where appropriate, due to the frequency of job changes with this group of prescribers. The Royal Colleges of Physicians, of Surgeons and of Nursing and the Scottish Branch of the Royal Pharmaceutical Society together with NES could play an important role in developing these programmes.

Recommendation 7

Teaching can be in any format but participation should be documented in a continuing professional development (CPD) portfolio. The *NHSScotland Code of Practice for the Local Management of Hygiene and Healthcare Associated Infection*[21] stipulates that healthcare workers must have specific HAI-related CPD objectives—this would include antimicrobial prescribing. There should be an assessment of competency for prescribing related to antimicrobials. Regular updates should also be built into a rolling educational programme for all staff.

Recommendation 8

Scottish Deans Curriculum Group should be asked to consider outcomes of undergraduate medical education on prudent antimicrobial prescribing.

Key area 3: define the minimum dataset requirements and standard procedures for collecting information related to antimicrobial resistance patterns

Introduction

Clinicians should make appropriate use of the local laboratory to guide antimicrobial therapy. Laboratories should perform susceptibility tests using appropriately rigorous methodology to provide clinically useful information for the clinician and epidemiological data to inform antimicrobial and infection control policies.

Recommendation 9

For the purpose of both appropriate patient management and antimicrobial resistance surveillance, blood cultures should be submitted before antimicrobial administration in all patients with possible bacteraemia, so long as clinical care is not compromised by significant delays in starting treatment. These data can be correlated with antimicrobial consumption at a ward or unit level to enable better benchmarking of prescribing.[22]

Recommendation 10

MICs or zone sizes must be measured for all clinically relevant bacterial isolates.[23]

Recommendation 11

Susceptibility to non-formulary or restricted agents should not be routinely reported.[24]

Recommendation 12

Standard systems should be in place for bringing antimicrobial resistance alerts to the notice of infection control team to enable rapid instigation of appropriate infection control precautions.[5]

Recommendation 13

The institution's laboratory susceptibility data should be published annually and used to inform prescribers, policies and formularies in different areas of the hospital. Duplicate isolates should be removed from the analysis.[25,26]

Key area 4: define the minimum dataset requirements and standard procedures for collecting information related to antimicrobial consumption and quality of prescribing at an organizational level and/or ward-specific level

Introduction

Monitoring of hospital consumption was one of the key recommendations of the 1998 House of Lords report on antimicrobial resistance. Six years later the UK still has no routine data about antimicrobial use in hospitals. In contrast, 23 of the 31 other countries in Europe were able to contribute hospital data to the 2003 ESAC (European Surveillance of Antimicrobial Consumption). A key finding of ESAC was significant variation in the interpretation of units of measurement of use (Defined Daily Doses, DDD) and clinical activity (bed days), which must be carefully standardized in order to compare use between hospitals.

Recommendation 14

A national agency should collate and report antimicrobial utilization trends across Scotland.

Recommendation 15

All acute hospitals should analyse and report antimicrobial use using the WHO DDDs (see http://www.escmid.org/sites/index_f.aspx?par=2.5; last accessed 31 March 2006) as the numerator and total occupied bed days as the denominator.

Recommendation 16

Responsibility for setting standards and reporting hospital antimicrobial use should be clearly identified and implemented within all acute hospitals.

Recommendation 17

In order to facilitate audits of antimicrobial prescribing there should be national co-ordination of minimum datasets for clinical records to support prescribing for common infections.

Key area 5: define the key areas for acute hospital policy and recommendations for audit

Introduction

Audit is a useful tool employed in strategies to promote and maintain the safe and cost-effective use of antimicrobials. Quantifying the volume or consumption of antimicrobials is useful but does not indicate the quality of antimicrobial use. The healthcare provider should develop and maintain the infrastructure to promote best antimicrobial practice.[27] Figure 1 outlines key components of this infrastructure and how they may interact with appropriate feedback mechanisms. Best practice should be introduced or maintained by individual prescribers. Evaluation of this should be the work of the AMT[28,29] and assessed through surveys of individual practice (e.g. point-prevalence surveys of antimicrobial use such as the one undertaken by the STRAMA group in Sweden[30]). A local example of such a tool is available as Appendix 3 [Supplementary data; available at JAC online (http://jac.oxfordjournals.org/)]. Such surveys can inform more detailed audits in key areas where potential anomalies in prescribing may be identified. On a day-to-day basis, ward-based clinical pharmacists, supported by the AMT, should be empowered to provide feedback concurrently to the prescribers (see Figure 1).

Recommendation 18

Hospital Prescribing Policy/Guidelines should be developed and implemented (Appendix 1.1).

Recommendation 19

Policies and guidelines should be reviewed annually (as a minimum) by the AMT.

(i) Adherence to guidelines should be monitored (Appendix 1.2).
(ii) A process for feedback of information to prescribers and to the AMT should be in place (Appendix 1.3).

Key area 6: develop and define performance indicators that could be used to assess or gauge performance related to antimicrobial prescribing in acute hospitals

Introduction

During our initial discussions about the remit of this group, there was unanimous support for developing a performance indicator to be considered by SEHD for inclusion in the Performance Assessment Framework and Health Action Plan for each NHS Board. It was felt that this would provide the incentive for ensuring a core marker of compliance with the APP&P recommendations. The aim was to develop an indicator to reflect an important, measurable, valid, reliable and evidence-based measure of antimicrobial prescribing in acute hospitals. Such an indicator presently exists for Primary Care, and while systems in hospitals may not exist presently to measure this readily, the group felt very strongly that these must be put into place in the near future (See key area 5). The other two recommendations[15,31] are based on existing national recommendations and reflect common and important indications for antimicrobial prescription.

Recommendation 20

Systems should be in place to measure the following:

(i) antimicrobial consumption by DDD/1000 bed days for key antimicrobials. Once such systems are developed and their interpretation refined they should be considered for assessment as an additional Board Performance Indicator.
(ii) the number of courses of antimicrobial therapy exceeding 24 hours, expressed as a percentage of the total number of courses in patients having clean surgery.
(iii) the number of antibiotic courses prescribed in line with hospital policy for community acquired pneumonia (CAP), expressed as a percentage of all antibiotic courses prescribed for CAP.

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Transparency declarations

None of the authors have declared any conflicts of interest relevant to this work.

Comment on editorial process

These recommendations were developed as described in the Introduction and were therefore not subject to the Journal's usual peer

review process. The article was revised by the author at the Journal's request in order that it comply with usual article style and explain the relevant background to readers.

Supplementary data

Appendix 3 is available as Supplementary data at JAC Online (http://jac.oxfordjournals.org/).

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Appendix 1

Antimicrobial prescribing policies and formularies

1.1 Acute hospital prescribing policy/guidelines. The following are the standards proposed to be met by hospitals and could form the basis for national audit.

(i) An antimicrobial formulary should be in place. A recent template for hospital antimicrobial prescribing policies from SACAR may be helpful.[20]
(ii) Guidelines should be in place for antimicrobial prescribing for common clinical scenarios (e.g. community acquired pneumonia (CAP), urinary tract infections (UTI), skin and soft tissue infections, intra-abdominal infections, central nervous system infections and sepsis of unknown source).
(iii) Guidelines should include the following:
  (a) Choice of an initial agent
  (b) Choice of the route of administration
  (c) Guidelines for intravenous to oral antimicrobial switch.
(iv) Guidelines should be in place for surgical prophylaxis
(v) There should be an 'alert' or restricted antimicrobial policy which should incorporate the following:
  (a) A list of restricted antimicrobials
  (b) Protocols for use
  (c) Monitoring of restricted antimicrobials
(vi) A means to quantify the usage and costs of selected antimicrobial agents should be in place (Defined daily dose)

1.2 Prescribers adherence to guidelines. The following are a list of auditable standards which should be met by prescribers:

(i) Information regarding infection should be recorded in *medical case notes* for patients receiving *intravenous or 'alert' antimicrobials*. This should include the following basic detail:
  (a) Diagnosis (site or nature of infection)
  (b) Evidence of an assessment of severity (may include temperature, heart rate, respiratory rate, blood pressure, white cell count, CRP)
  (c) Evidence of blood cultures being performed in patients with sepsis
  (d) Name of the antimicrobial prescribed.
(ii) Appropriate use of antimicrobials for selected common infections (e.g. respiratory tract infections, UTI, wound infection):
  (a) Appropriate agent(s) chosen
  (b) Appropriate route of administration (iv versus oral dependent on patient factors)
  (c) Appropriate timing of iv to oral switch
  (d) Appropriate choice of empiric oral switch agent (in absence of positive microbiology, e.g. in CAP)
  (e) Appropriate choice of streamlined (iv or oral) agent (in the presence of positive microbiology, e.g. *E. coli* or *S. aureus* bacteraemia)
(iii) Appropriate use (<24 h) of antimicrobials in surgical prophylaxis

1.3 Feedback of information to the AMT and to prescribers

(vii) Use of restricted agents:
  (a) Monitoring of clinical areas where restricted agents are used
  (b) Record of indications for use
  (c) Record of breaches of protocols

—feedback to antimicrobial group quarterly (at each meeting)

(viii) Audit of antimicrobial use; a point-prevalence survey should be performed at least annually (preferably twice yearly) to monitor trends in prescribing. Such surveys should inform more detailed studies of prescribing practice in specific areas. Results of audits should be provided to prescribers through the specialties.
(ix) Ward-based pharmacists should provide concurrent patient-specific feedback to prescribers.
(x) Feedback to individual unit specialties of information related to antibiotic consumption should also be promoted.

Appendix 2

Guidelines implementation checklist

A range of responsibilities has been identified for the implementation of APP&P recommendations. These can be summarized as follows:

2.1 An appropriate national organization

(i) Develop the infrastructure to support the implementation of APP&P
(ii) Establish a national Clinical Forum to facilitate networking across Scotland in APP&P
(iii) Facilitate audits of antimicrobial prescribing via national co-ordination of minimum clinical datasets to support prescribing for common infections
(iv) Collate and report antimicrobial utilization trends across Scotland

2.2 Chief Executive, Infection Control Manager and Clinical Governance Committee

(i) Ensure local framework is in place for implementation of APP&P
(ii) Establish systems for implementing APP&P recommendations, supported by appropriate information technology
(iii) Facilitate the appointment of a Lead Pharmacist and Lead Doctor for APP&P
(iv) Report antimicrobial performance indicators

2.3 Lead Doctor and Lead Pharmacist

(i) Establish an Antimicrobial Management Team (AMT) for APP&P.
(ii) Ensure that the membership of the Team includes a microbiologist and/or infectious diseases physician, the Infection Control Manager [HDL(2005)8], senior medical staff representation from the specialities of medicine and surgery and any other relevant stakeholders, depending on local circumstances. The Infection Control Manager has direct links with the Chief Executive and the Clinical Governance, Risk Management and Infection Control Committees.
(iii) Integrate the functions of the AMT with local Drugs and Therapeutics Committees.
(iv) Co-ordinate hospital analysis and report antimicrobial use using the ratio of WHO DDDs/occupied bed days.
(v) Identifying responsibility for setting APP&P standards, reporting hospital antimicrobial use and resourcing of this activity within all acute hospitals.

(vi) Ensure the availability of a process for feedback of information on antimicrobial prescribing to the AMT and to prescribers.
(vii) Report to the Chief Executive.

2.4 Drugs and Therapeutics Committees

(i) Establish a Formulary of approved antimicrobial therapy.
(ii) Co-ordinate a Register of Protocols/Policies to promote good prescribing practice for a range of prophylactic and therapeutic indications.
(iii) Support the activities of the AMT.
(iv) Receive results of antimicrobial audits, monitor adherence to guidelines, endorse relevant reports for the Clinical Governance Committee and disseminate recommendations to hospital personnel.
(v) Establish clear ways of working with the Infection Control Committee.

2.5 Antimicrobial Management Team (AMT)

(i) Ensure that all hospitals have an Antimicrobial Policy and that all relevant policies/guidelines are reviewed annually.
(ii) Maintain responsibility for antimicrobial formulary management and prescribing policy, in response to national guidance and local susceptibility data.
(iii) Take ownership for defining skills and competencies for prudent antimicrobial prescribing, in line with national frameworks where appropriate.
(iv) Ensure participation in a structured postgraduate CPD programme for all professionals involved in antimicrobial prescribing or administration.
(v) Ensure that guidelines are in place for prescribing of antimicrobials for surgical prophylaxis and for the treatment of common clinical infections.
(vi) Co-ordinate hospital systems to avoid routine reporting of susceptibility to non-formulary or restricted antimicrobial agents.
(vii) Promote the implementation of an 'alert' or restricted antimicrobial policy.
(viii) Co-ordinate the analysis and reporting of antimicrobial use in hospitals, in accordance with nationally agreed standards.
(ix) Define clear lines of accountability between the Chief Executive, the Lead Clinician/Pharmacist, Infection Control Manager, DTC and AMT.
(x) Clarify ways of working with the DTC and Infection Control Committees.
(xi) Feed back information to the DTC and individual medical/surgical specialties.
(xii) Establish systems to audit antimicrobial practice.

2.6 Lead Clinician

(i) Develop professional networking between the AMT, the Medical Director, Specialists in Medicine and Surgery, and all medical prescribers.

2.7 Lead Antibiotic Pharmacist

(i) Lead co-ordination of the implementation and audit of good antimicrobial practice.
(ii) Develop professional networking between AMT and specialty-based lead pharmacists/ward pharmacists.
(iii) Report to the Divisional Chief Pharmacist.

2.8 Microbiology

(i) Provide clinically useful information for the clinician and epidemiological data to inform antimicrobial and infection control policies.
(ii) Perform susceptibility tests using appropriately rigorous methodology.
(iii) Avoid routine reporting of susceptibility to non-formulary or restricted antimicrobial agents.
(iv) Measure MICs or zone sizes for all clinically relevant bacterial isolates.
(v) Support arrangements for submission of blood cultures before antimicrobial administration in all patients with possible bacteraemia.
(vi) Establish standard systems for flagging antibiotic resistant alerts to the infection control team.
(vii) Publish annual laboratory susceptibility data to inform prescribers, policies and formularies.

2.9 Clinical Teams

(i) Maintain responsibility for the overall management of sepsis and the infection control consequences of antimicrobial prescribing in specialist areas.
(ii) Make appropriate use of the laboratory to guide antimicrobial therapy.
(iii) Promote good practice in APP&P.

2.10 Clinical Practitioners

(i) Maintain responsibility for good antimicrobial prescribing policy and practice.
(ii) Understand the aims of the antimicrobial policy and monitoring framework.
(iii) Document participation in APP&P education/training in a CPD portfolio.
(iv) Record information regarding infection in medical case notes for patients receiving intravenous or 'alert' antimicrobials.

2.11 Ward-based pharmacists

(i) Provide immediate patient-specific feedback to prescribers.

2.12 Deans of the University Schools of Medicine

(i) Scottish Deans Curriculum Group should consider the influence of undergraduate medical education on prudent antimicrobial prescribing.

2.13 Postgraduate Education Providers

(i) Acute NHS hospitals in Scotland should demonstrate a structured series of educational opportunities on antimicrobial prescribing for junior prescribers. The various Royal Colleges with NES could have a key role in the development of such educational programmes.
(ii) Provide regular updates on antimicrobial prescribing as part of a rolling programme of CPD for all NHS hospital personnel involved in the prescribing and administration of antimicrobials.