

A CAREER AS . . . A SPECIALIST MICROBIOLOGY PHARMACIST

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Recent concern about the use of antibiotics in hospitals has resulted in the Government investing £12m in clinical pharmacy services. This article reviews the rapidly expanding opportunities for specialist microbiology pharmacists

Methicillin-resistant Staphylococcus aureus cells dividing, seen in a coloured transmission electron micrograph

Antibiotics are unique among medicines by virtue of the fact that their use in an individual patient can directly impact on the health and well-being of other patients, as well as society as a whole. They are used in most hospital specialities and approximately 20–25 per cent of patients in hospital have been noted to be taking an antibiotic at any one time — ranging from 40–50 per cent of patients on intensive care units to less than 10 per cent of patients having ear, nose and throat surgery.¹

One of the most significant challenges that the microbiology pharmacist (also referred to as an infectious diseases, antibiotic or infection management pharmacist) faces is gaining an understanding of what constitutes appropriate antimicrobial prescribing for different indications, including those as diverse as the prophylaxis of eye infections following facial trauma to the treatment of emerging fungal infections in stem cell bone marrow transplant recipients. Antibiotic prescribing, whether appropriate or inappropriate, applies evolutionary selection pressure to bacteria,

inevitably resulting in the phenomenon of antibiotic resistance. Thus, hospital “superbugs”, such as methicillin resistant *Staphylococcus aureus* (MRSA), are never far from front-page news and, in recent years, concern over the rising tide of antibiotic resistance has driven renewed efforts to improve the quality of antibiotic prescribing and preserve our antibiotic resources for future generations.

The microbiology pharmacist plays a vital role in developing, implementing and monitoring initiatives to promote prudent antibiotic use in hospitals.

PHARMACIST'S ROLE

In hospitals, microbiology pharmacists may provide a clinical pharmacy service to infectious diseases wards or to other areas of high antibiotic use, such as intensive care, renal or surgery units. They may also attend related ward rounds. However, whatever the ward commitment, the daily duties of a microbiology pharmacist are likely to include providing advice on management of patients with infections, monitoring antibiotic therapy and ensuring compliance with trusts' antibiotic prescribing policies.

Other tasks undertaken by the microbiology pharmacist will vary between hospitals but the typical spectrum of activities includes:^{2,3}

- Education
- Maintaining prescribing control systems
- Monitoring and audit of antibiotic use

Each of these will be considered in more detail below.

Education Educational initiatives undertaken by a microbiology pharmacist that are targeted at pharmacists, doctors and nurses may range from running formal lectures or tutorials to simply providing advice over the phone, face-to-face or by writing in medical notes either during a dedicated antibiotic ward round⁴ or while working as part of an antimicrobial management team.² Teaching strategies should emphasise not only the principles of therapeutically sound and cost-effective antibiotic prescribing, but also the concept of resistance and the importance of the judicious use of antibiotics. Clear communication of these issues on a regular basis to pharmacy colleagues and other health care professionals is likely to be the most effective, although time consuming, use of a microbiology pharmacist's time.

In addition, many prescribers rotate regularly through different hospitals and antibiotic policies may vary according to local sensitivity patterns. It is therefore important for microbiology pharmacists to communicate relevant antibiotic prescribing information specific to their trust early on in these prescribers' employment. Dissemination and implementation of evidence-based guidelines also gives an opportunity to educate the guideline user and reinforce good prescribing practice. Recently, pharmacy technicians have been

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employed to assist with rational antimicrobial use⁵ and they may also require training by a microbiology pharmacist.

Prescribing control systems Prescribing control systems are employed by the majority of acute trusts in the UK to encourage responsible antibiotic use.⁶ The basis of many control systems is having an antibiotic formulary that limits the number of antibiotics from a given class stocked by pharmacy. Choice of agent for inclusion in the formulary is governed by a number of criteria, including cost effectiveness, side effect profile and likelihood to cause resistance. Microbiology pharmacists are ideally placed to be involved in the review of evidence for new antibiotics considered for inclusion in such a formulary. The formulary of the future will undoubtedly be electronic and is likely to incorporate decision support software. Microbiology pharmacists will play an important role in designing and tailoring these electronic systems for local use as, ideally, prescribing information should be linked to microbiology sensitivity data.

The microbiology pharmacist is also accountable for implementing, reviewing, updating and auditing the “reserve” antibiotic policy. This policy is for agents that are typically either broad-spectrum, expensive or potentially toxic and are reserved for use when other agents are not suitable or have failed. Authorisation for use of these agents is usually required from a medical microbiologist or infectious diseases physician. Success of the policy ultimately depends upon rigorous enforcement by clinical pharmacist colleagues on the wards. The microbiology pharmacist is often called upon to advise in debates between ward pharmacists attempting to apply the policy and clinicians determined to exercise their clinical freedom. Consistent support from medical microbiology or infectious diseases colleagues is essential.⁷

A pragmatic approach to antibiotic stewardship at the “coal-face” adopted by some hospitals involves a system whereby ward pharmacists refer complex antibiotic-related queries to a microbiology pharmacist. Feedback is provided directly by the microbiology pharmacist following discussion with microbiology or infectious diseases colleagues and selected patients are reviewed on a dedicated weekly joint ward round involving the microbiology pharmacist and consultant microbiologist.⁸

Another means of antibiotic prescribing control is the implementation of treatment and prophylaxis guidelines. Many hospital formularies incorporate antibiotic guidelines based upon local pathogen sensitivity data, to encourage optimal infection management. The microbiology pharmacist is instrumental in co-ordinating development and updating guidelines, reviewing

the evidence base, and bringing together key opinion leaders within the trust to provide input and agree the final recommendations.

A further common method of controlling antibiotic prescribing is through selective reporting of organism identification and antibiotic sensitivities by the microbiology laboratory. The role of the microbiology pharmacist here is to liaise with the microbiologists to ensure that sensitivity testing is conducted with antibiotics from the hospital formulary. Regular review of trends in antibiotic sensitivity is essential to ensure that the trust formulary and guidelines are updated when the need arises.

Monitoring and audit of antibiotic use

Monitoring antibiotic use, and audit of antibiotic policies and guidelines are also fundamental roles for the microbiology pharmacist. Monitoring use may range from carrying out straightforward monthly financial reporting of expenditure on antibiotics to relatively sophisticated analysis of defined daily doses per 100 occupied bed days or per finished consultant episode.⁹ Data generated can be used to monitor trends in prescribing and identify unorthodox practice for further investigation. Use of recognised standards, such as the World Health Organization defined daily dose, allows benchmarking of antibiotic use between similar acute trusts and provides evidence of suspected antibiotic misuse when drafting business cases for implementing interventions to improve antibiotic prescribing.

The microbiology pharmacist may also undertake audits of antibiotic use as well as oversee more junior members of pharmacy staff in audit activity. An example of an audit is a point prevalence study on anti-infective use.¹⁰ This snapshot audit undertaken at one point in time can be used to evaluate outcomes such as percentage of total patients prescribed anti-infectives, number of anti-infectives per patient, combinations and durations used, duration of prophylaxis, etc.

Results can be fed back to an individual consultant, specialty or directorate. Such information also provides target activities for the microbiology pharmacist.

— OTHER ROLES

In addition to those roles mentioned above, microbiology pharmacists may also be involved in the following:

- Forums and committees
- Prescribing initiatives
- Risk management

Forums and committees Microbiology pharmacists may also be involved in attending microbiology “bench round” forums,

where significant bacterial isolates are reviewed on a daily basis by medical microbiologists and decisions taken on proposed treatment options for discussion with clinical teams. These forums also provide an opportunity to identify patients who may require a more focused pharmacist input and the microbiology pharmacist can then pass on relevant information to the ward pharmacist to help optimise antibiotic use.

Many trusts have an established antibiotic subcommittee of its drug and therapeutics committee with multidisciplinary representation.¹¹ The remit of this antibiotic committee will include overseeing initiatives to improve antibiotic prescribing. The microbiology pharmacist is an indispensable member of this group and will often take the lead on implementation of any recommendations issued by the group.

The microbiology pharmacist may also be a member of, and report to, the trust infection control committee as one of the infection control team, together with infection control nurses and medical microbiologists. This committee is responsible for promoting good infection control practice and reducing the risks of health care associated infection.

Prescribing initiatives The microbiology pharmacist may also co-ordinate targeted initiatives to influence infection management. Some specific examples of initiatives are outlined in Panel 1 (p 462). A Cochrane review is currently under way to evaluate the success of various interventions to improve antibiotic prescribing practice in hospitals and the outcome is likely to prove a valuable resource for the microbiology pharmacist.¹³

Risk management Microbiology pharmacists may also contribute to the design of risk reduction strategies involving antibiotics. Evaluation of antibiotic error data and results of intervention studies provide an insight into the cause of errors and near misses and the microbiology pharmacist is

Laboratory technician holding a petri dish culture of Staphylococcus aureus. Microbiology pharmacists may attend the “bench round” in the laboratory

Panel 1: Initiatives co-ordinated by the microbiology pharmacist to encourage rational antibiotic prescribing

- Intravenous-to-oral switch (stepdown or sequential) antibiotic policy
- Antibiotic stop order policy
- Therapeutic substitution of one antibiotic for another
- Streamlining therapy to narrow-spectrum agents when culture and sensitivity results are available
- Dealing with antibiotic referrals from ward pharmacists, eg, prolonged durations, inappropriate combinations and liaising with microbiology or infectious diseases teams to rationalise therapy
- Attending and advising on specialist ward rounds including infectious diseases, ITU, etc.
- Out-patient parenteral antimicrobial therapy (OPAT)¹²
- Antibiotic mandatory order forms to be completed prior to supply of specific antibiotics

responsible for taking appropriate action to eliminate or reduce the risk of errors in antibiotic prescribing and administration. A common example includes the administration of penicillin containing antibiotics to patients who are allergic to penicillins.

EXPERIENCE REQUIRED

All clinical pharmacists will have had experience with antibiotic prescribing before taking on a specialist infection management job. However, a more in-depth knowledge of antibiotic spectra is essential and it would be advantageous for the post-holder to have completed a diploma in clinical pharmacy or equivalent to help expand their overall clinical knowledge and skills.

In addition, good organisational, teaching and communication skills are desirable and pharmacists need to be able to work as part of a multidisciplinary team. Persuading prescribers to change antibiotic prescribing habits is challenging and so assertiveness and good negotiation skills are also highly desirable attributes in any candidate.

POSTGRADUATE EDUCATION

The majority of postgraduate clinical pharmacy courses in the UK incorporate an option to further develop knowledge and skills in the use of antibiotics, eg, modules or study days on diploma courses. However, a dedicated postgraduate course is available for pharmacists with an interest in infection management. This two-year, part-time MSc in "Infection Management for Pharmacists" is run jointly by the Academic Pharmacy Unit at Hammersmith Hospitals NHS Trust, Imperial College London, and the Health Protection Agency. The course covers a broad range of material. The first year consists of six taught modules ranging from the basic principles of microbiology, infectious diseases and antimicrobial chemotherapy to the management of viral haemorrhagic fevers and European Union initiatives to

control the spread of antibiotic resistance. A research project is undertaken in the second year. Details of the course can be found at the website www.imperial.ac.uk/p4578.htm.

In the US, the American Society of Health-System Pharmacists and the Society of Infectious Diseases Pharmacists have jointly established a specialised residency programme covering infectious diseases. The training lasts for at least 12 months and practice experience is directed and evaluated by a qualified practitioner-preceptor. Detailed goals can be found at the website www.ashp.org.

FUNDING

The Department of Health (DoH) announced in June 2003 that it was to provide £12m, over three years, to acute trusts to facilitate the development of clinical pharmacy services and provide a focus on antibiotic management.¹⁴

A number of new posts for microbiology pharmacists have been created as a result of this funding. Of a selection of 50 of these, 36 (72 per cent) were for D grade pharmacists, 11 (22 per cent) for E grade pharmacists and 3 (6 per cent) B grade.

SPECIALIST ORGANISATIONS

The DoH has established a Specialist Advisory Committee on Antimicrobial Resistance (SACAR) whose remit is to advise the government on its antimicrobial strategy.³ The committee has a prescribing subgroup, chaired by a pharmacist, that focuses on aspects of prudent prescribing of antimicrobials and oversees the recent funding for clinical pharmacists by the DoH outlined above.

A national organisation supporting microbiology pharmacists is the United Kingdom Clinical Pharmacy Association (UKCPA) Infection Management Pharmacists' Group. The Infection Management Pharmacists' Group was established in 2001 to provide a networking and educational

forum for pharmacists involved in infection management. There are over 130 members and support includes an annual national study day, electronic resource centre and active e-mail discussion group for members.¹⁵ The infection management group website includes references to relevant government papers, related organisations, journals, references, etc. The above information can be found at www.ukcpa.org.

There are similar active support networks that UK pharmacists can join which are in the US (www.sidp.org and www.accp.com), Canada (www.cshp.ca/cshpNetwork/psn/psn-list_e.asp) Europe (www.escpweb.org/site/cms/sigselect.asp) and Australia (www.asainc.net.au).

Interest in and support for the activities of the Infection Management Pharmacists' Group has also been expressed by a number of medical organisations in the field, including the British Society of Antimicrobial Chemotherapy (BSAC), British Infection Society (BIS), Alliance of Prudent Use of Antimicrobials (APUA) and Federation of Infection Societies (FIS). Links to these organisations can be found at the UKCPA infection management website.

More recently, since the establishment of the new posts funded by the DoH, many regions have set up their own local antibiotic networks to enhance sharing and benchmarking of information. These exist in Yorkshire, the North-West, Thames Valley, north-west London, London, the East and the South-East. Networks also exist in Scotland and Ireland.

ANTIBIOTIC GOVERNANCE

In 1997, the Chief Medical Officer (England) asked the Standing Medical Advisory Committee (SMAC) to investigate issues of antimicrobial resistance and the relationship to medical prescribing. As a result a SMAC subgroup on antimicrobial resistance produced a comprehensive document entitled "The path of least resistance".¹ This document, together with a number of others that followed from the DoH,¹⁶ including most recently the document entitled "Winning Ways — working together to reduce healthcare associated infection in England",¹⁷ highlighted the role of the pharmacist in assisting in the implementation of strategies to encourage responsible antimicrobial use.

NHS performance indicators for acute trusts in 2003 and 2004 included specific questions referring to antibiotic policies and audit, and require evidence demonstrating that prudent antibiotic prescribing in hospitals is supported by clinical pharmacists.¹⁸ Many acute trusts have recently recruited pharmacists to posts to address these requirements and the spotlight will rest upon these individuals in the coming

years as the Healthcare Commission audits progress in this area. The endorsement and support of the role has attracted many new pharmacists to the field.

FUTURE PROSPECTS

The role of the microbiology pharmacist is likely to continue to develop over the years to come as both pharmacist prescribing becomes established and more hospitals implement antibiotic ward rounds involving teams of pharmacists and microbiologists or infectious diseases physicians. The creation of consultant pharmacist posts in NHS trusts may provide an opportunity for microbiology pharmacists to further their careers along clinical pathways and achieve greater autonomy as independent practitioners and researchers.

The funding provided by the DoH offers a unique opportunity for pharmacists to demonstrate the positive impact they can have on the quality of antibiotic prescribing. Securing further funding may be dependent on providing evidence of value for money and it is therefore imperative that microbiology pharmacists publish outcome data to share best practice and advertise the fruits of their endeavours.

The role of the microbiology pharmacist is a dynamic and challenging one, but undeniably rewarding. Microbiology pharmacists can make a significant contribution to patient care, both as individual practitioners and as integral members of the multidisciplinary infection control team. The work is extremely satisfying from a professional and personal perspective and we would recommend the job unreservedly to any pharmacist with an interest in this field.

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