

A new approach to optimising hospital antimicrobial use

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One of the posters displayed in the hospital and designed to promote the prudent use of antibiotics

Expanding hospital clinical pharmacy services is one of the solutions proposed by the Government to the increasing problem of antimicrobial resistance. This article outlines initiatives undertaken at one teaching hospital in England using funding from the Department of Health's clinical pharmacy initiative

The Department of Health launched its UK antimicrobial resistance strategy and action plan in June 2000 following several expert reports on the problems of antimicrobial resistance.^{1,2} As part of this strategy a national clinical pharmacy initiative to promote the prudent prescribing of antibiotics was launched in England in 2003.

Antibiotics can represent around 25 per cent of a hospital's total drug expenditure and studies have estimated that up to 50 per cent of hospital antibiotic prescriptions may be inappropriate.^{3,4} A number of studies have demonstrated the value of optimising the use of antibiotics through the promotion of formularies, closer liaison

with microbiology departments⁵ and the success of multidisciplinary, education-based antibiotic resistance management programmes.^{6,7,8}

This article describes how the teaching hospitals of South Manchester University Hospitals NHS Trust (SMUNHT) spent two years using a multidisciplinary, multifaceted team approach to develop and implement a strategy to promote the prudent use of antibiotics.

Local background

SMUNHT is a 900-bed typical university teaching hospital with additional regional specialties, including interventional cardiology, cardiothoracic surgery, respiratory medicine, burns and plastic surgery, and vascular surgery. Among its staff, it has three consultant microbiologists, an infectious diseases physician and 30 whole-time equivalent pharmacist posts, of which one is an antimicrobial pharmacist post taken up in March 2004.

In April 2003, one of the authors, Jonathan Cooke, took up the position of chair of the prescribing sub-group of the

Specialist Advisory Committee on Antimicrobial Resistance (SACAR). This led to SMUNHT developing its strategy to optimise antibiotic use before the announcement of the Department of Health's monies for improving antimicrobial use. Staff at SMUNHT were keen to optimise antimicrobial use and therefore launched an antimicrobial initiative within the trust.

Strategy

So what have we done to optimise antimicrobial use at SMUNHT? In April 2003, a team of senior pharmacists, pharmacy technicians and consultant microbiologists agreed a strategy in consultation with clinical experts from key directorates. The three main elements of the strategy were to be education and training, restriction of certain intravenous (IV) antibiotics and monitoring. It was decided that a whole systems (ie, multifaceted) approach needed to be taken to achieve a fine balance of proactive educational measures versus reactive "strong arm policing". Although the initiative was to be

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led by pharmacy and microbiology, with the introduction of an antimicrobial subcommittee of the trust's medicines management committee, it was acknowledged that ownership of the strategy by clinicians was crucial to its success (ie, a multidisciplinary approach).

Implementation

August to December 2003 After four months of planning, the campaign went "live" on 1 August 2003 to coincide with the new intake of junior doctors. That month, new evidence-based antibiotic guidelines with simplified guidance for junior doctors on the appropriate selection, dosing, route and duration of antibiotics were agreed with clinicians. As part of the guidelines, microbiological approval was required for certain key antibiotics, eg, piperacillin and tazobactam (Tazocin) and linezolid.

The restriction of key IV antibiotics at high risk of inappropriate use was managed by the pharmacy department restricting the supply to 48 hours only (72 hours at the weekend), unless the indication and duration had been established or been approved by microbiology. Ward stock lists were also reviewed and certain IV antibiotics (eg, meropenem, Tazocin, teicoplanin, ciprofloxacin) were removed from wards. In addition, the pharmacy aseptic unit also redesigned its Centralised Intravenous Additive service so that clinical pharmacists had to review daily, together with the medical team, all patients on IV antibiotics to ensure that any wastage of antibiotics was minimised.

The microbiology department reviewed culture and sensitivity reports and, where possible, only reported sensitivity to first and second-line antibiotics to ensure that otherwise unnecessarily used broad-spectrum antibiotics were kept in reserve — this is known as selective microbiological reporting.

January 2004 to April 2005 Specialist areas such as intensive care and paediatrics developed their own antibiotic guidelines with assistance from both microbiology and pharmacy. Agreement from all hospital consultants was reached about the introduction of a policy for clinical pharmacists to be able to switch patients with respiratory infections from IV to oral antibiotics using a patient group direction. This was later extended to a trust-wide IV to oral switch policy, with pharmacists using special tick box stickers in medical notes to ask clinicians to review antibiotic therapy once all the specified criteria had been met. A poster listing the criteria was displayed around the hospital.

Work also started on the difficult task of producing a much needed hospital-wide surgical antibiotic prophylaxis policy.

Education and training

August to December 2003 It was thought from the start that the level of training and understanding about clinical microbiology and the use of antibiotics, particularly in terms of the junior doctors who carried out most of the prescribing, was limited. With this in mind, an education and training campaign was planned to underpin the whole initiative and was targeted at different health care professionals for maximum impact. This included a "Guess what" poster campaign to get prescribers to think about getting the empirical antibiotics right first time and a "Get RID of unnecessary antibiotics" poster to encourage documentation of the route, indication and duration (RID) of antibiotics (see poster on p321).

Formal teaching sessions for junior doctors were provided by both pharmacy and microbiology, particularly on induction, and an "antibiotics roadshow" initiated to tackle individual directorate issues and get them signed up to the initiative.

All pharmacy staff were fully briefed about their roles in the campaign and the clinical pharmacists given a series of refresher teaching sessions about antibiotics and their use in common infections. Closer liaison between clinicians, microbiologists and clinical pharmacists about individual patients on the ward was promoted.

In addition, the role of nurses, in particular their ability to make recommendations to doctors about reviewing IV antibiotics over the weekends, was discussed with modern matrons and the campaign ideas published in the trust's nurses newsletter.

January 2004 to April 2005 Further trust publications and presentations, including those made at meetings of medical staff, continued and new posters about the treatment of respiratory infections and the IV to oral switch policy were circulated to all wards.

Innovative ideas to highlight the new antibiotic guidelines were developed from August 2004. These included:

- Pocket A6 and house officer handbook versions of guidelines
- A hospital intranet version easily accessible by a single click of a "bug" icon on all trust desktop computers
- PDA/pocket PC version, written in HTML by the chief IT technician — we believe this is the first of its kind in the UK
- A summary of guidelines printed on stickers for the backs of British National Formularies and on computer mouse mats which were circulated to all wards

Monitoring

The plan was to collect quantitative data such as antibiotic expenditure and data for defined daily doses (DDDs). In addition, the aim was to perform a selection of audits and drug use evaluations, including a regular IV to oral point prevalence study to measure compliance with the new guidelines.

Achievements

So what have we achieved? Two trust-wide IV to oral point prevalence studies have been carried out and show that, since introducing the strategy, there has been a reduction in both the number of patients on IV therapy for more than 48 hours and the number of patients on inappropriate IV antibiotics, according to the trust criteria for switching to oral antibiotics. The results of the IV to oral point prevalence studies are given in Table 1.

An audit in November 2004 on the medical admissions unit found that for 70 per cent of patients admitted, the initial antibiotic choice was in line with the new antibiotic guidelines. In March this year, a Tazocin drug use evaluation established that 37 out of 50 patients (74 per cent) had been prescribed Tazocin following microbiology approval, which indicates that the ward clinical pharmacists are ensuring that the restriction is being enforced.

Table 1: Results of IV to oral point prevalence studies

Patient groups	November 2004 Number (%)	March 2005 Number (%)
■ Total studied	576*	582*
■ On IV antibiotics	91 (16)	110 (19)
■ On IV antibiotics for >48 hours	59/91 (65)	44/110 (40)
■ On IV antibiotics for >48 hours and have conditions that exclude IV to oral switch	33/59 (56)	26/44 (59)
■ On IV antibiotics for >48 hours with potential for IV to oral switch	26/59 (44)	18/44 (41)
□ With clinical criteria precluding switch	4/26 (16)	10/18 (56)
□ Meeting criteria for oral switch	10/26 (38)	3/18 (16)
□ With incomplete switch data	12/26 (46)	5/18 (28)

*Adult cystic fibrosis patients were excluded

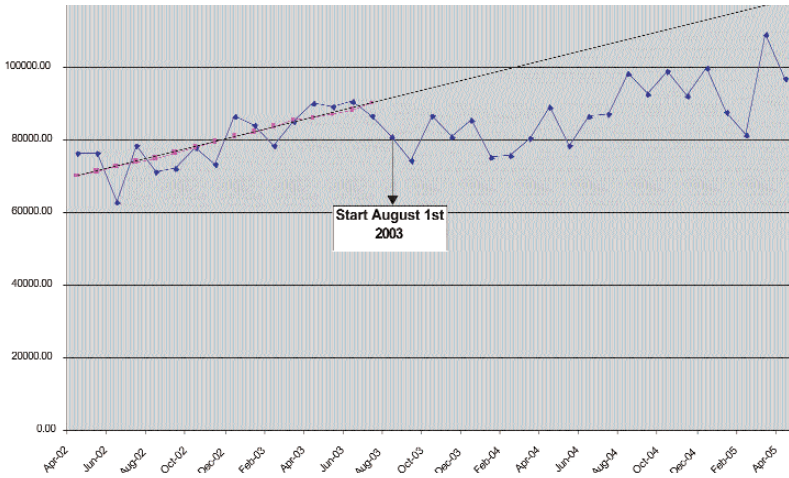


Figure 1: Monthly antibiotic costs (£) including actual monthly costs of antibiotics (April 2002 to April 2005 inclusive) (blue line), the trends up to July 2003 (pink line) and the expected linear rise in costs predicted from April 2002 to end of July 2003 (black line)

Numerous mini audits have also been carried out indicating where extra pharmacist input was required eg, IV fluconazole, ciprofloxacin and meropenem.

Antibiotic expenditure

It was decided that adult cystic fibrosis patients, and later heart and lung transplant patients, would not be included in the trust-wide antibiotics initiative figures as

they were unique groups of patients with complex antibiotic needs and already had direct specialist pharmacist input.

Although the trust's annual antibiotic expenditure has continued to rise (up by 10 per cent in the year 2004/05 to £1.1m), growth has slowed down significantly compared with predicted expenditure. This is despite increases in hospital activity, key antibiotic price pressures and rising antibiotic costs nationally.

These expenditure data are presented in Figure 1.

It is estimated from these data that cost savings have been made of around £350,000 since the start of the initiative in August 2003. However, antibiotic cost "goal posts" have kept changing since the start of the campaign and the IV broad spectrum anti-pseudomonal penicillin, Tazocin — which costs £55 per day and accounts for 21 per cent of the total antibiotic expenditure — is a good example of where an antimicrobial agent's popularity with microbiologists has grown with an increased evidence base. Thus costs continue to rise despite the formulary restriction. The costs of linezolid are increasing in a similar way.

Defined daily doses

Numbers of DDDs is an internationally recognised method of measuring antibiotic consumption and enables surveillance of antibiotic use for comparison both within the UK and worldwide. The World Health Organization (WHO) defines the DDD value of any drug as the average dose per day used to treat an average adult patient (see www.whocc.no/atcddd). The number of DDDs is calculated as the total number of grams of drug issued divided by the WHO designated value.

SMUNHT database At SMUNHT, a database has been set up by the chief IT pharmacy technician and data for all inpatient DDDs, including that for adult cystic fibrosis and heart and lung transplant patients, are recorded on a monthly basis on an Excel spreadsheet. This is then used to look at medium to long-term trends in antibiotic use.

Since August 2003, the patterns of DDDs indicate that for most classes of antibacterials (British National Formulary, section 5.1) the consumption of antibiotics has either remained the same or been reduced, particularly in the case of IV cephalosporins. The exceptions are the big increases in the use of penicillin and smaller increases in tetracycline use. However, all these changes in part reflect the major changes made in the trust's antibiotic guidelines from August 2003 onwards and suggest that the antibiotic guidelines are being followed — for example, oral co-amoxiclav and bigger doses of penicillins were recommended for treating pneumonia and cellulitis respectively and doxycycline was recommended for chronic bronchitis infections. The total number of DDDs has also increased but the proportion of IV DDDs has fallen each year from 42 per cent in 2002/03 to 34 per cent in 2004/05, again suggesting the success of the IV to oral policy.

Lessons learned

The high level multidisciplinary planning that went into the initial strategy was the backbone of the success of the initiative. In addition, the team's innovative ideas, enthusiasm and desire to succeed have been vital in maintaining the momentum of the campaign, particularly after the initial six-month "honeymoon period".

Future developments

The trust's new antibiotic guidelines, expected to be published in August, will include a trust-wide surgical prophylaxis policy. As a result of both the dialogue with directorates about this prophylaxis policy and the antibiotics roadshow (mentioned earlier), it is hoped that all directorates will now include antibiotic use in their annual audit programmes.

The introduction of a joint antibiotic pharmacist and microbiologist ward round is also now planned to assist in the quicker de-escalation from broad spectrum IV antibiotics on general wards. Another important issue in need of attention is a better link between antibiotic consumption and alert organism reporting — such as for methicillin resistant *Staphylococcus aureus*, *Clostridium difficile* and Extended Spectrum

Beta-Lactamase producing bacteria — to help monitor any changes in local resistance patterns.

References

1. House of Lords select committee on science and technology. Resistance to antibiotics and other antimicrobials. London: House of Lords; 1998.
2. Standing Medical Advisory Committee subgroup on antimicrobial resistance. Path of least resistance. London: Department of Health; 1998.
3. Jarvis WR. Preventing the emergence of multidrug-resistant micro-organisms through antimicrobial use controls the complexity of the problem. Infection Control and Hospital Epidemiology 1996;17:490–5.
4. John JF Jr, Fishman NO. Programmatic role of the infectious diseases physician in controlling antimicrobial costs in the hospital. Clinical Infectious Diseases 1997;24:471–85.
5. Cooke J, Calvert R, Lacey R. Developing an antibiotic strategy in a large teaching hospital. Pharmaceutical Journal 1984;233:423.
6. Yates R. New intervention strategies for reducing antibiotic resistance. Chest 1999;115:245–275.
7. Cook PP, Catrou PG, Christie JD, Young PD, Polk RE. Reduction in broad-spectrum antimicrobial use associated with no improvement in hospital antibiogram. Journal of Antimicrobial Chemotherapy 2004;53:853–9.
8. Feucht CL, Rice LB. An interventional programme to improve antibiotic use. Annals of Pharmacotherapy 2003;37:646–51.