

# PATTERN OF ANTIBIOTIC USAGE IN HOSPITALS IN MALAYSIA

V K E Lim, Y M Cheong, A B Suleiman

## ABSTRACT

*A prospective survey of antibiotic prescribing patterns in six Ministry of Health general hospitals in Malaysia was undertaken. Information on antibiotic prescriptions including the types of antibiotics used and the purposes for prescription was obtained through the use of questionnaires. A total of 1,918 antibiotic prescriptions were available for analysis. About two-thirds of prescriptions were for therapeutic purposes. The most common infections treated were lower respiratory infection (31%), followed by skin and soft tissue infection (17%), and urinary tract infection (8%). Only 20% of therapeutic prescriptions were based on microbiological test results. Prophylactic prescriptions were issued for a variety of indications, the most common being toilet and suture of wounds. Only 5% of prophylactic prescriptions were of less than 3 days duration. There was great diversity in antibiotics and antibiotic regimens employed. It was evident that there was a lack of compliance with guidelines on antibiotic use issued by the Ministry of Health.*

*Keywords: antibiotic prescribing survey, antibiotic prescriptions*

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## INTRODUCTION

Antibiotics are one of the most common drugs prescribed in hospitals today. It has been estimated that up to a third of all patients receive at least one antibiotic during hospitalisation<sup>(1)</sup>. The cost involved is therefore correspondingly high and up to 40% of a hospital's drug expenditure may be devoted to the purchase of antibiotics<sup>(2)</sup>. There have been numerous studies on patterns of antibiotic usage in hospitals. Many of these studies were however conducted in developed countries. Data from developing countries are scarce. Malaysia is a rapidly developing country in South East Asia. In view of increasing antibiotic resistance as well as the escalating cost of antibiotic therapy, the Ministry of Health of Malaysia embarked on a project to assess antibiotic usage in its hospitals in 1989. The main objectives of this study were to (i) ascertain pattern of use of antibiotics, (ii) identify deficiencies and implement remedial measures, and (iii) evaluate the effectiveness of these remedial measures. This paper describes the pattern of use of antibiotics in six general hospitals in Malaysia.

## MATERIALS AND METHODS

This was a prospective, descriptive and cross-sectional survey of antibiotic prescriptions issued for inpatients at six general hospitals situated in various parts of the country. These are fairly large

government run hospitals varying in size from 800 – 1,000 beds. All hospitals have facilities for bacteriological culture and sensitivity tests but neither medically qualified microbiologists nor infectious diseases specialists. The sampling unit was an antibiotic prescription regardless of whether the prescription issued was for a single agent or a combination of antibiotics. A target size of 350 prescriptions per hospital was set and was to comprise prescriptions from the various disciplines as follows: medicine (100), surgical disciplines (100), obstetrics and gynaecology (50), paediatrics (75) and intensive care (25). Each department was requested to collect data on all consecutive antibiotic prescriptions starting from a designated date until the required number of prescriptions was obtained. The data were collected over the months of November and December 1990.

Data for each antibiotic prescription were obtained from two sources, namely the patient's case records and the prescriber. To collect the information, two forms were specially designed. One form to be completed by the nursing staff was designed to collection information on:

- (1) patient identification data,
- (2) details of the prescription including intended duration of prescription but not the actual duration the antibiotic was administered,
- (3) prescriber's data,
- (4) investigations done prior to prescription,
- (5) concomitant medications.

The second form to be completed by the prescriber within 24 hours of making the prescription was designed to obtain information which included:

- (1) whether this was the doctor's own prescription or one made upon instruction from a more senior doctor,
- (2) whether the prescription was for treatment or prophylaxis,
- (3) the nature and severity of the infection treated,
- (4) the reason for prophylaxis and the nature of operation in cases of surgical prophylaxis,
- (5) whether microbiological confirmation has been obtained,
- (6) where there was no microbiological confirmation, the most likely infecting pathogen(s) or the potential infecting pathogen(s) against which prophylaxis was directed,
- (7) some patient characteristics like the presence of fever, pregnancy status, allergy, renal and hepatic function.

The data obtained were stored in and analysed by a personal computer using the Paradox Version 3.0 (Borland International) software programme.

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## RESULTS

A total of 1,918 prescriptions were available for analysis. There were 691 (36%) prescriptions from the medical departments, 669 (35%) from surgical departments (including general surgery, orthopaedics, otorhinolaryngology and ophthalmology), 344 (18%) from paediatrics and 214 (11%) from obstetrics and gynaecology.

A total of 34 different antibiotics alone or in 136 different combinations were prescribed. These included 7 penicillins, 5 cephalosporins, 4 aminoglycosides and 2 tetracyclines. There were 1,063 (55%) single antibiotic prescriptions and 855 (45%) prescriptions of combination antibiotics. In 705 (37%) of these, the prescription involved two antibiotics; in 132 (7%), three antibiotics were prescribed and in 18 there were 4 or more antibiotics. Ampicillin was the most common antibiotic prescribed, being given in 798 (42%) prescriptions either as a single agent (40%) or in combination with other antibiotics (60%). The most commonly prescribed antibiotics are shown in Table I.

**Table I – Commonest antibiotics prescribed**

Antibiotic	Number of prescriptions issued		
	Single agent	Combination	Total (%*) (n = 1918)
Ampicillin	309	489	798 (42%)
Cloxacillin	83	338	421 (22%)
Gentamicin	40	293	333 (17%)
Penicillin	123	204	327 (17%)
Metronidazole	22	202	224 (12%)
Cotrimoxazole	163	15	178 ( 9%)
Cefoperazone	76	45	121 ( 6%)
Netilmicin	13	90	103 ( 5%)
Cefuroxime	41	32	73 ( 4%)
Erythromycin	42	11	53 ( 3%)

\*% of total prescriptions.

A total of 1,701 (89%) prescriptions were issued by the junior doctors (house officers and medical officers) and 137 by senior doctors (registrars and consultants). In 81 instances the rank of the prescriber was unknown. In 1,186 (70%) of the prescriptions made by junior doctors, the prescriber indicated that the prescription was issued upon instruction of a more senior doctor.

The purpose for prescribing antibiotics was therapeutic in 1,263 (66%) prescriptions and in 614 (32%) the intention was prophylactic. Prophylactic antibiotic prescriptions were more commonly encountered in surgical and obstetrics and gynaecology departments (Table II). In 41 prescriptions the purpose was unknown. Prophylactic prescriptions were also more commonly combinations of antibiotics (Table III).

**Table II – Purpose of prescription**

Discipline	No of prescriptions issued			
	Therapeutic	Prophylactic	Unknown	Total
Medicine	623	58	10	691
Surgery	283	357	29	669
O&G	96	118	0	214
Paediatrics	261	81	2	344
Total	1,263	614	41	1,918

**Table III – Single agent and combination antibiotic prescriptions**

Type of prescription	Number of prescriptions issued (%)		
	Single agent	Combination	Total
Therapeutic	771 (40%)	492 (26%)	1,263 (66%)
Prophylactic	271 (14%)	343 (18%)	614 (32%)
Intent unknown	21	20	41
Total	1,063 (55%)	855 (45%)	1,918 (100%)

Of the 1,263 therapeutic prescriptions, only 255 (20%) were based on microbiological test results. The microbiological tests which were performed were cultures in 240 instances and serological tests in 9, the nature of the tests being unknown in the remainder. Cultures were taken prior to treatment in only 743 (59%) prescriptions. In 131 (13%) of the 1,008 empirical prescriptions, the prescribers were unable to state the most likely infecting pathogen.

The duration of the prescriptions ranged from one day to three weeks but in 1,192 (62%) prescriptions the duration was unspecified. The mean durations of therapeutic and prophylactic prescriptions were 6.54 days (SD 2.76) and 5.50 days (SD 3.1) respectively.

The most common infection treated was lower respiratory infection, accounting for 390 (31%) therapeutic prescriptions. Skin and soft tissue infections (19%) ranked second, followed by urinary tract infections (8%). The common infections that were treated are shown in Table IV. For pneumonia alone a total of 22 antibiotics in 56 different regimens were employed.

Of the 614 prescriptions intended for prophylaxis, 430 (70%) were for surgical prophylaxis and the rest for other purposes. Toilet and suture of wounds was the common surgical procedure where antibiotics were given for prophylaxis. The list of the more common surgical procedures for which antibiotic prophylaxis was given is shown in Table V. There were 59 different surgical prophylactic regimens involving 17 antibiotics. The duration of prescriptions for surgical prophylaxis ranged from one day to 3 weeks. As many as 242 (56%) of such prescriptions did not specify the duration. Only 21 prescriptions (5%) were of less than 3 days duration. Prescriptions were also made for non-surgical prophylaxis with the intention of preventing a wide variety of infections including pneumonia (36 prescriptions), neonatal sepsis (25) and septicaemia (15).

**Table IV – Common infections treated**

Infection	No. of prescriptions (%) (n = 1,263)
Lower respiratory infections	390 (31%)
Skin and soft tissue infections	220 (17%)
Urinary tract infections	104 ( 8%)
Septicaemia	73 ( 6%)
Upper respiratory infections	42 ( 3%)
Neonatal infections	30 ( 2%)
Meningitis	29 ( 2%)
Pyrexias (unspecified)	27 ( 2%)
Typhoid fever	19 (1.5%)
Infective endocarditis	16 (1.3%)
Others	313 (25%)

**Table V – Common indications for surgical antibiotic prophylaxis**

Type of procedure	Number of prescriptions issued
Toilet and suture	74
Appendicectomy	32
Laparotomy	31
Open reduction of fractures	30
Other orthopaedic procedures	29
Dilatation and curettage	26
Hysterectomy	19
Simple excision of tumour	11
Perineal repairs	10
Herniorrhaphy	8
Skin grafts	8
Ovarian cystectomy	8
Biliary tract operations	7
Others	137
<b>Total</b>	<b>430</b>

## DISCUSSION

The Ministry of Health of Malaysia manages a total of 16 general hospitals and 79 district hospitals in the country. The total number of beds exceeds 26,000 and about 1.2 million inpatients received treatment in 1989<sup>(3)</sup>. Reports of antibiotic use in these hospitals prior to this survey had been largely anecdotal. This survey has identified a number of problems associated with antibiotics usage in Malaysian hospitals. Although the Ministry had issued guidelines on antibiotic use, the most recent in 1988, it was clear that compliance with these guidelines was lacking.

That the guidelines were often not adhered to was evident from the great diversity of antibiotics and antibiotic regimens employed for both therapeutic and prophylactic purposes. Ampicillin, cloxacillin and penicillin were the most popular antibiotics. This followed the pattern described in surveys conducted in both developed as well as developing countries<sup>(4-6)</sup>. The use of gentamicin was however higher than that reported from Australia<sup>(5)</sup> or the United Kingdom<sup>(4)</sup>, but lower than that reported from Brazil<sup>(7)</sup> and Thailand<sup>(8)</sup>. The high usage of gentamicin had probably contributed to the high rate of gentamicin resistance in Malaysian hospitals<sup>(9)</sup>. The high proportion of combination antibiotic prescriptions was also a matter of concern. The proportion of prescriptions of antibiotic combinations was higher than that reported in surveys conducted in the United Kingdom<sup>(4)</sup>, the Netherlands<sup>(10)</sup> and the United States<sup>(11)</sup>. The proportions of combination prescriptions in those surveys were only 18%, 13% and 20% respectively compared to 45% in this survey.

Approximately two-thirds of all prescriptions were for purpose of treatment and the rest for prophylaxis. This was quite similar to patterns described elsewhere<sup>(5,12)</sup>. The most common indication for treatment was lower respiratory infection. The pattern of infections encountered was quite similar to that described in developed countries. Typhoid fever, a classical tropical infection only accounted for about 1.5% of therapeutic prescriptions. Although all hospitals have microbiological culture facilities, a significant number of therapeutic prescriptions were issued without taking prior cultures, and only 20% of these were based on microbiological reports. This proportion is lower than that reported in a survey in the Netherlands where up to 35% of antibiotic prescriptions were based on susceptibility reports and an additional 19% on the Gram stain<sup>(10)</sup>. The majority of prescriptions were therefore made on an empirical basis. More-

over, 89% of prescriptions were made by less experienced doctors. Even though the majority (70%) indicated that their prescriptions were issued upon instruction of a more senior doctor, this was difficult to verify, thus further emphasising the need for compliance with guidelines.

The pattern of prophylactic prescriptions again reflected the lack of compliance with the issued guidelines. Prophylaxis was given for surgical procedures or medical conditions where the value of prophylaxis is doubtful. Antibiotics were also prescribed for periods longer than what is universally accepted. A large number of prescriptions, both therapeutic and prophylactic, were made without specifying the intended duration of administration. Since not all hospitals practise automatic prescription stop orders, antibiotics could have been given for longer than was necessary.

The doctors in the study hospitals were aware of the survey that was being carried out. This by itself would have influenced the prescribing practices of the doctors. Despite this, the lack of compliance with issued guidelines was very evident. There may be several reasons for this. Although the guidelines were sent to every hospital, the dissemination of the information within each hospital was less than satisfactory. Many doctors were not even aware that the guidelines existed. The guidelines were formulated by a small group of senior physicians at the main hospital of the capital city with little consultation with the doctors in the peripheral hospitals. A consensus document is more likely to gain acceptance than the promulgation of a select group of people<sup>(13)</sup>. The lack of an audit system for antibiotic usage in hospitals could also have contributed to the lack of compliance.

There is a need to conduct discussions with the doctors in the peripheral hospitals on an antibiotic policy and this project has already been started. It may be more desirable to formulate one national policy than to have different policies in each hospital. This is because drugs are purchased by a central agency. All doctors are employed directly by the Ministry of Health and are transferred from one hospital to another. Recent surveillance of antibiotic resistance have also shown that the pattern of resistance is fairly similar among all the general hospitals. The method of dissemination of information has to be improved upon and it has been suggested that the antibiotic prescribing guidelines be printed in a pocket-sized booklet and be given to every doctor working for the Ministry of Health. Regular antibiotic audits should also be conducted in all hospitals and it is proposed that antibiotic use be made one of the indices in the Ministry's quality assurance programme. The diversity of antibiotics used may be due in part to the large number of antibiotics which are made available for use in the government hospitals. Since most drugs are purchased by a central agency, appropriate measures should be taken to limit the number of available antibiotics. Finally, the teaching of antibiotics both at undergraduate and continuing medical education levels in the country will have to be reviewed and improved upon. This is especially important in a situation where neither medically qualified microbiologists nor infectious diseases physicians are available for routine consultation,

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## **3RD MOH-MAYO CLINIC FOUNDATION UPDATE THEME: GASTROINTESTINAL MALIGNANCIES**

Dates: 19 (Saturday) & 20 (Sunday) February 1994

Venue: Auditorium, College of Medicine Building

16 College of Medicine Road

Singapore 0316

Saturday, 19 February 1994: 10.30 am – 5.30 pm

Symposium I – Multi-disciplinary Approach to Cancer Care

Symposium II – Upper GI Cancer

Sunday, 20 February 1994: 2.00 pm – 5.00 pm

Symposium III – Lower GI Cancer

Symposium IV – Screening and Early Detection/Prevention Management

Symposium V – Management of Metastatic Disease

Mayo Clinic Faculty: Dr John Donohue

Consultant

Division of Surgical Oncology

Dr Joseph Rubin

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