

## Treatment of infection: a cross-sectional survey of antibiotic drug utilisation in the Ramallah district of Palestine

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### Abstract

**Objective** To characterise the use of antibiotics in outpatients treated for infection in the Ramallah district of Palestine.

**Setting** A purposive sample of general and specialist outpatient clinics in the public and private sector in Ramallah.

**Method** A prospective, cross-sectional survey over 3 months (February–May 2000) of patients diagnosed with infection, conducted through questionnaires to treating physicians ( $n = 25$ ) and patients ( $n = 575$ ).

**Key findings** Infection associated with the respiratory tract was the most common type of infection diagnosed, accounting for over 80% of all infections, followed by urinary tract infection and otitis media (14% and 10%, respectively). Amoxicillin was the antibiotic prescribed most often, prescribed for 44% of all patients and for infection of all types and across all age groups. A wide variety of other antibiotics was prescribed, and in the private sector there was more use of newer, more expensive antibiotics. Antibiotic use was rated as appropriate in only 35% of patients, with inappropriate prescribing largely resulting from inappropriate indication (73%) and to a lesser extent choice of drug (17%) or cost (9%). Duration of therapy was seldom specified by the prescriber and depended on pack size dispensed. Seventy-six per cent of patients followed up at 1 week had recovered partially or completely, but lack of compliance was noted in 30%.

**Conclusions** There was considerable evidence of inappropriate use of antibiotics, including prescribing for likely self-limiting or non-bacterial infection and failure to specify duration of therapy. A number of patients failed to complete the course. Strategies to promote optimal antibiotic use should be targeted initially to respiratory tract infection, and both physicians and patients require educational input. The community pharmacist can play a lead role on account of both drug expertise and ability to advise health professionals and patients.

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### Introduction

Antibiotics are among the most commonly prescribed drugs worldwide, and while these drugs are undoubtedly effective in managing bacterial infection, their cost constitutes a highly significant part of healthcare budgets generally.<sup>1</sup> In addition, it has been recognised for many years that antibiotics are often prescribed inappropriately, leading to suboptimal treatment of individuals and excessive costs, and contributing to the emergence of antibiotic-resistant strains of bacteria.<sup>2–7</sup> As a result, many initiatives have been implemented to promote the safe, rational and effective use of antibiotics at local, national and international levels. These initiatives have embraced antibiotic guidelines, protocols and formularies, together with educational initiatives and training programmes.<sup>5,8–12</sup> While these have been partially successful in rationalising the use of antibiotics, it is clear that there is still considerable inappropriate use of antibiotics, and the problem of emergent multiresistant organisms shows no signs of abating.<sup>7,13,14</sup>

A key role for pharmacists has been recognised in promoting optimal antibiotic use.<sup>15–17</sup> Much of this work has taken place in secondary care, and specialist antibiotic pharmacist roles have been developed.<sup>18–20</sup> There is increasing involvement also of community

pharmacists in tackling the complex issues of antibiotic prescribing.<sup>15,21,22</sup> This is based on the unique blend of expertise on drug action and ability to offer advice to both health professionals and patients.

In Palestine, the government took over the running of the health service in 1994 and, despite the considerable difficulties caused by the ongoing conflict with Israel, efforts have been made to improve the service and to attempt to address the healthcare needs of the nation. There are four major health service providers for primary, secondary and tertiary care: the Ministry of Health (MOH), non-governmental organisations (NGOs), the private sector and the United Nations for Refugees and Works Agency (UNRWA) providing only primary care in refugee camps. The Ministry of Health spends about 26% of its pharmaceuticals budget on antibiotics, but little is known about whether this expenditure is appropriate or justified.<sup>23</sup> This project was initiated with a view to establishing a robust, multidisciplinary approach to ensuring rational antibiotic use. In the absence of baseline data it is necessary first to characterise the use of antibiotics in Palestine then to examine the knowledge, views and experiences of healthcare professionals and patients. We report here the results of a cross-sectional survey of antibiotic use in the district of Ramallah, conducted prospectively across a range of clinics covering both the public and private sectors. These data provide much-needed information on antibiotic utilisation and will form the basis for developing strategies to optimise use.

## Methods

### Study design

Clinics were recruited to the study on the basis of purposive sampling of those with which there was an established working relationship. The aim was to achieve approximately equal representation from the public and private sectors and a broad mix of types of clinic and specialties. The practicalities of the field workers' travel for field visits was also considered. The final sample comprised: two general practice public health department clinics and paediatrics, urology, respiratory outpatient clinics at the Ramallah Hospital; one general practice, paediatrics, urology, respiratory, internal medicine, gynaecology and ear, nose and throat (ENT) clinic at Arabcare Medical Services (selected as an example of a new and advanced type of private clinical setting in the Ramallah District).

Because of incomplete data in existing records, it was decided to conduct a prospective 3-month study (February–May 2000) to ensure completeness of data. There was no official ethics committee in Palestine at this time. Ethics review of the study was conducted instead by Palestine Ministry of Health senior managers and clinic directors and the Academic Council at the Institute of Community and Public Health at Birzeit University who approved the study. Twenty-five physicians participated in the study, 11 from the public and 14 from the private sector.

### Patients

The inclusion criteria for the patients into this study were: any patient, regardless of age, who was diagnosed with any type of infection after consultation at one of the participating clinics during the 3-month data collection period. A total of 575 patients was recruited. Twelve patients declined to participate as they were in a hurry (5), too ill (2), or did not wish to be involved (5).

### Data collection tools

Questionnaires were devised to obtain information from physicians and patients/carers, culture results and for follow-up. These were tested in two pilot studies involving 54 and 60 patients and finalised for the main study. Questionnaires were assessed for face and content validity by a panel of experts comprising: Deputy Minister of Health, Deputy General Director of Pharmacy Directorate, general practitioner, epidemiologist, paediatrician, statistician and academic supervisors.

A questionnaire was completed by the physician for each patient during the consultation, and concerned information about the patient, diagnosis and treatment.

A second questionnaire, with closed and open questions, was completed by a researcher during a structured interview immediately after the consultation and covered patient information, presenting complaint, diagnosis and treatment, concurrent medical problems and drug therapy, allergies and previous antibiotic use and whether a culture specimen had been requested. Patients were asked if they could be contacted a week after consultation for follow-up, and 506 agreed; from these, a random sample of 203 (40%) were contacted.

The follow-up questionnaire was completed by a researcher during a home visit (128, 63%) or telephone interview (75, 37%). Questions related to patient perception of effectiveness of therapy through symptom resolution, compliance and any adverse effects experienced were addressed.<sup>24,25</sup>

### Appropriateness of therapy

An attempt was made to assess appropriateness of therapy, according to criteria established by the research team (based on locally detected resistance patterns and developed guidelines, and patient factors including age, pregnancy, medical history and smoking status). The criteria for inappropriateness were: inappropriate indication; inappropriate choice of antibiotic; inappropriate duration of therapy (defined as <5 or >14 days); expensive antibiotic prescribed without documented reason. Most cases were assessed independently by one researcher on two separate occasions, at an interval of 2 months. The data were found to be highly reproducible with differences between original and second assessment in only 5 of 555 cases (0.9%). In addition, a sample of 20 cases, selected randomly, was reviewed independently by two paediatricians and one general practitioner (GP), to check for consistency. In two cases of infants with otitis media there was discussion as to whether or not it was appropriate to delay treatment, and both of these cases were part of the five assessed twice by the researcher who also found this hard to judge. There was complete agreement in the remaining 18 cases.

## Training of interviewers

One pharmacist and three bachelor degree level field workers with at least 5 years' experience at the Institute of Community and Public Health at Birzeit University participated in a training programme of four 3-h sessions, during which they were given information about the study and trained in interview technique through role-play and feedback sessions. In addition weekly feedback/follow-up sessions were held to ensure consistency of approach and to deal with any ongoing issues.

## Data analysis

Data were coded and entered into a database on SPSS, and entries double-checked for accuracy. Results were analysed using descriptive statistics of mean, frequency and percentage as appropriate. Significance of differences between groups was assessed by chi-squared test.

## Results

### Patient demographics

The sex and age distribution of the 575 patients between the public and private sectors is shown in Table 1. The number recruited was similar in the public and private sectors, but the percentage of females was higher in the private sector. There was a higher percentage of children, both under 1 year and aged 2–6 years, in the public sector and a corresponding higher percentage of adults (17–50 years) in the private sector. These differences must be considered in any comparisons made across the two sectors.

### Distribution of infection types

The distribution of types of infection diagnosed in the 575 patients is shown in Table 2, which indicates that pharyngitis was by far the most common infection diagnosed (44%), with other respiratory tract infections including bronchitis, pneumonia and sinusitis accounting for much of the remainder.

**Table 1** Distribution of patient number, sex and age in the study groups. Results are expressed as number (%) with *P* values derived from chi-squared analysis

	Total	Public sector	Private sector	<i>P</i> value
Number of patients (%)	575 (100)	313 (54)	262 (46)	
males (%)	270 (47)	160 (51)	110 (42)	<0.05
females (%)	305 (53)	153 (49)	152 (58)	
Age (years)				
0–1	72 (13)	58 (18)	14 (5)	<0.001
2–6	123 (21)	87 (28)	36 (14)	<0.001
7–12	57 (10)	31 (10)	26 (10)	>0.05
13–16	22 (4)	14 (5)	8 (3)	>0.05
17–50	253 (44)	97 (31)	156 (60)	<0.001
>50	48 (8)	26 (8)	22 (8)	>0.05

**Table 2** Types of infection diagnosed in all the study patients combined and in the public and private sectors for comparison. Results are expressed as number (%) with *P* values derived from chi-squared analysis

Diagnosis	Cases	Public sector	Private sector	<i>P</i> value
Pharyngitis	251 (44)	159 (51)	92 (35)	<0.001
Bronchitis	63 (11)	39 (13)	24 (9)	>0.05
Sinusitis	16 (3)	3 (1)	13 (5)	<0.01
Otitis media	60 (10)	24 (8)	36 (14)	<0.025
Pneumonia	21 (4)	17 (5)	4 (2)	<0.025
Flu/cold	27 (5)	5 (2)	22 (8)	<0.001
RAD <sup>a</sup>	11 (2)	7 (2)	4 (2)	>0.05
UTI	81 (14)	35 (11)	46 (18)	<0.05
Other <sup>b</sup>	45 (8)	24 (7)	21 (7)	>0.05
Total	575 (100)	313 (100)	262 (100)	

<sup>a</sup>RAD (reactive airways disease) included as infection by physicians;

<sup>b</sup>Other included conjunctivitis, skin, wound infection, female genitalia, mastitis, abscess, gastritis, umbilical cord infection, amoebiasis.

Urinary tract infection (UTI) and otitis media accounted for 14% and 10% of infections, respectively. A range of other infection types was seen in a small number of patients. The pattern of presenting infection showed some variation between the public and private sectors. Pharyngitis, for example, was diagnosed in a significantly higher percentage of patients in the public sector, whereas diagnosis of bronchitis did not differ between sectors, and sinusitis and flu/cold, were diagnosed more often in the private sector (Table 2). Infections occurred similarly in all age groups with pharyngitis the most common in all age groups. The exception was UTI which was significantly more common in those aged over 50 years (19% versus 2% in those aged 2–6 years).

### Culture data and other diagnostic tests

Culture analysis was requested in 69 of 575 patients (12%), 57 of whom were commenced on antibiotics empirically and 12 of whom received antibiotics only after results were known. Results were obtained for 59 patients of whom 56 were from the private sector and only three from the public sector. Bacterial infection was confirmed in 22 patients (37%), 21 from the private and one from the public sector.

Other diagnostic tests were requested for 125 patients (22%) and included blood (58 patients) and urine (64 patients) or stool (7 patients) analysis and imaging (X-ray or ultrasound, 39 patients) with a number of patients having a combination of tests requested. Requests for other tests did not differ between the public and private sectors.

### Antibiotics prescribed

Of the 575 patients diagnosed with infection, only 18 (3%) did not receive any antibiotic. In the remaining 557 patients a large range of antibiotics was prescribed, mostly by brand names, as shown in Table 3. Amoxicillin was the most frequently prescribed antibiotic, irrespective of type of

**Table 3** Antibiotics prescribed for the main infections in the study. Results are expressed as % of total prescribed for that infection

Antibiotic prescribed (n)	Total antibiotic prescribed (%)	% infections treated with specific antibiotics							
		Pharyngitis (n=24)	Otitis media (n=58)	Sinusitis (n=16)	Bronchitis (n=63)	Pneumonia (n=21)	RAD/asthma (n=11)	Flu/common cold (n=24)	UTIs (n=76)
Penicillin V (41)	7	15	–	–	2	5	–	4	–
Amoxicillin (246)	44	58	54	13	41	24	55	68	13
Ampicillin and flucloxacillin (7)	1	1	–	–	–	–	–	–	–
Co-amoxiclav (21)	4	1	3	50	2	14	–	4	–
Spiramycin (9)	2	1	–	–	3	–	–	8	3
Cephalexin (74)	13	11	5	6	22	42	9	4	9
Cefadroxil (28)	5	2	2	–	3	–	9	4	23
Cefaclor (25)	5	3	10	25	6	–	–	–	5
Cefuroxime axitel (6)	1	1	3	–	–	–	–	–	3
Doxycycline (4)	<1	–	–	–	–	–	–	–	1
Co-trimoxazole (24)	4	1	7	–	3	5	–	–	16
Erythromycin (19)	3	4	2	6	6	5	–	–	1
Clarithromycin (9)	2	–	–	–	8	5	27	4	–
Roxithromycin (3)	<1	1	–	–	2	–	–	–	–
Ciprofloxacin (11)	2	1	–	–	2	–	–	4	8
Ofloxacin (5)	1	–	5	–	–	–	–	–	3
Nitrofurantoin (6)	1	–	–	–	–	–	–	–	8
Nalidixic acid (4)	<1	–	–	–	–	–	–	–	5
Hexamine hippurate (2)	<1	–	–	–	–	–	–	–	1
Gentamicin (3)	<1	–	–	–	–	–	–	–	1
Chloramphenicol (3)	<1	–	2	–	–	–	–	–	–
Fusidic acid (2)	<1	–	2	–	–	–	–	–	–
Neomycin and polymyxin (3)	<1	–	5	–	–	–	–	–	–

Total number of infections = 513 and total number of antibiotics prescribed = 555 (note: total number of infections treated differs from total number of infections diagnosed in some cases because some patients were not prescribed antibiotics (pharyngitis (7), otitis media (2), flu (3) and UTI (5)).

infection, and was prescribed for 44% of all patients. Other drugs were used much less commonly with cephalexin prescribed for 13% of patients, penicillin V for 7%, co-trimoxazole for 4%, co-amoxiclav for 4%, erythromycin for 3% and ciprofloxacin for 2%. Numerous antibiotics made up the remaining 14%.

Amoxicillin was prescribed commonly for all infection types, e.g. pharyngitis 58%, otitis media 54%, bronchitis 41%, sinusitis 13%, influenza 68%, UTI 13%. Amoxicillin was also prescribed most in all the age groups, with cephalexin also used across the full range of age groups, but to a lesser extent. A wide range of antibiotics was used in all age groups, but certain antibiotics were not prescribed for those under 16, including chloramphenicol, ciprofloxacin, tetracycline, doxycycline, roxithromycin and clindamycin. In addition, a wide range of antibiotics was used for the different types of infection, including newer more expensive drugs such as clarithromycin, roxithromycin, ciprofloxacin and ofloxacin, mainly in the private sector.

A marked difference was observed in the pattern of antibiotic use in the public compared to the private sector as shown in Table 4. In particular there was far less use of amoxicillin and also cephalexin in the private sector. Co-amoxiclav and penicillin V, on the other hand, were prescribed more extensively in the private sector. In general

**Table 4** Antibiotics prescribed in the public and private sectors. Results are expressed as number (%) prescribed in each sector, with *P* values derived from chi-squared analysis

Antibiotic	Public sector	Private sector	<i>P</i> value
Penicillin V	9 (3)	32 (13)	<0.001
Amoxicillin	179 (58)	67 (27)	<0.001
Co-amoxiclav	1 (0.3)	20 (8)	<0.001
Cephalexin	67 (22)	7 (3)	<0.001
Cefadroxil	1 (0.3)	27 (11)	<0.001
Cefaclor	1 (0.3)	24 (10)	<0.001
Co-trimoxazole	20 (7)	4 (2)	<0.01
Erythromycin	18 (6)	1 (0.4)	<0.001
Clarithromycin	1 (0.3)	9 (4)	<0.01
Ciprofloxacin	1 (0.3)	10 (4)	<0.002
Other	9 (3)	47 (18)	<0.001
Total	248 (100)	307 (100)	

Note: a number of antibiotics included in the 'Other' category were only prescribed in the private sector including: ampicillin and flucloxacillin (2.8%), spiramycin (2.8%), cefuroxime (2.4%), nitrofurantoin (2%), ofloxacin (2%), doxycycline (1.6%) and roxithromycin (1.2%).

there was more use of first-line, older and cheaper antibiotics in the public sector and newer, more expensive antibiotics in the private sector.

### Duration of antibiotic therapy

It was difficult to characterise duration of treatment, as this was not specified in 86% of patients and was dictated rather by the standard unit of supply of 20 tablets or one bottle specifically in the Ministry of Health setting. This would lead to a 6/7-day course for amoxicillin, three times daily, but only 5 days for cephalexin, four times a day. In the private sector, where prescribing was by brand name only, the number of tablets available per pack of amoxicillin 500 mg varied between 10, 12 and 16, resulting in treatment for 3, 4, or 5 days respectively.

With amoxicillin dry suspension, 60 ml or 100 ml of 125 mg/ml packages were available, and this would lead to a difference of 3 days' treatment depending on which was dispensed. Also either 125 mg/ml or 250 mg/ml concentrations of amoxicillin were available, and in 32/66 (48%) of infants 5 ml of the 250 mg/ml concentration was prescribed, meaning they had double the required dose.

Overall duration of therapy (specified or calculated) was 5–7 days in 67% of cases, and 14 days in 14% of cases; the range was 3 days to 1 month.

### Appropriateness of treatment

Overall prescribing was considered appropriate at only 35% of patients. The appropriateness varied considerably between different types of infection as shown in Table 5. Only in sinusitis was prescribing found to be 100% appropriate ( $n=16$ ), and particularly poor appropriateness of 15–27% was observed in flu, pharyngitis, bronchitis and reactive airways disease. Appropriateness in pneumonia, otitis media and UTI was somewhat higher but still only 38–52%.

The reasons for inappropriate prescribing are shown in Table 5, which shows that the main reason was inappropriate indication in 73% of total inappropriate cases, and this occurred particularly in patients with flu, bronchitis, reactive airways disease, pharyngitis and UTI. Inappropriate choice of antibiotic occurred in 17% of cases, and most commonly within the pneumonia, UTI, pharyngitis and otitis media patients. Inappropriate dose was found in 5% of cases, short duration in a further 5%, and long duration in 14% of cases. Lastly in 9% of cases the antibiotic was more expensive than

necessary. Analysis of trends within groups showed that inappropriateness did not vary significantly between patient age groups, types of infection or type of service provider, but given the large spread of data and variability of numbers it is difficult to draw conclusions.

### The patient follow-up

The follow-up was conducted in a sample of 203 patients (35% of the original sample) and included the full range of types of infection and antibiotics prescribed. There were no significant differences between the follow-up group and the original sample in terms of place of residence, sex, age, occupation or level of education. Ninety-four patients (46%) indicated complete resolution of symptoms after antibiotic therapy, a further 65 (32%) had some improvement, and 44 (22%) no improvement. There were no significant differences in reported outcome between the public and private sectors. It was not possible to compare outcome for the different kinds of infection given the spread of data and small numbers in each group. Recovery among those reporting resolution had commenced after 2–3 days in 94 (58%) patients, and in 5–7 days in a further 40%. In addition, 26 (13%) patients reported experiencing side-effects which covered a range of reported symptoms. Those cited by more than one individual included diarrhoea (5 patients), pruritis (4 patients) and stomach ache (3 patients).

In the 44 patients who had no improvement, 26% had not done anything further in relation to their illness, 18% had seen the same physician again, and 14% had seen a different physician, with a further 32% intending to re-consult soon.

Patients were asked how they had used the antibiotics and whether or not they had completed the course. Based on this information, non-compliance was found in 30% of patients. Twenty-five per cent of patients reported not finishing the course, while 2% were still taking the antibiotic. Reasons given for not finishing the course were: having improved (25%), forgetting (29%), side-effects (17%), not improving (13%), did not like the taste (11%), and the remaining 5% were hospitalised before finishing the course.

**Table 5** Appropriateness or inappropriateness of antibiotic prescribing and reasons for inappropriateness in the different types of infection. Results are expressed as number and % (of infection type)

Type of infection	Total	Pharyngitis	UTI	Otitis media	Bronchitis	Flu	Pneumonia	RAD	Sinusitis
Number treated	530	251	81	60	63	27	21	11	16
Antibiotic appropriate	185 (35)	68 (27)	42 (52)	29 (48)	16 (25)	4 (15)	8 (38)	2 (18)	16 (100)
Antibiotic inappropriate	345 (65)	183 (73)	39 (48)	31 (52)	47 (75)	23 (85)	13 (62)	9 (82)	0
Reason antibiotic inappropriate									
indication	254 (73)	143 (78)	23 (59)	13 (42)	44 (94)	23 (100)	0	8 (89)	0
choice	59 (17)	25 (14)	16 (41)	4 (13)	2 (4)	0	11 (85)	1 (11)	0
dosage	16 (5)	7 (4)	0	4 (13)	1 (2)	0	4 (31)	0	0
duration (long or short)	66 (19)	44 (24)	0	14 (45)	7 (15)	0	0	1 (11)	0
cost	31 (9)	12 (7)	2 (5)	0	9 (19)	3 (13)	3 (23)	2 (22)	0

Note: some antibiotics were deemed inappropriate for more than one reason.

## Discussion

The results presented here are a first attempt to characterise antibiotic use in a systematic manner in Palestine, and have yielded a substantial body of data which will inform the approach to future management strategies and further research. It was found that respiratory infections were by far the most common infection type, accounting for 82% of the total and this indicates that rationalisation of the diagnosis and treatment of respiratory infection has the potential to have a major impact both on antibiotic use and individual patient care. In addition, the range of antibiotics used across the different types of infection was large and there is scope for limiting this range on the basis of both effectiveness and cost. Furthermore, it was evident that antibiotics are used widely in infections that are generally of viral origin or self-limiting, such as common cold, influenza, sore throat and bronchitis, again highlighting the need to adopt rational prescribing habits. A framework for promoting rational use of medicines has been developed by the World Health Organization (WHO), and core components are detailed in their policy document.<sup>26</sup>

Major strengths of this study include: the substantial number of cases sampled from a range of settings in both the private and public sectors; the detailed information obtained on patients and their treatment; the application of objective criteria to assessment of effectiveness; the inclusion of a follow-up phase to assess patient outcome. The range of infection type and antibiotic use was large and mirrored national and international trends. There are, however, some limitations of the work. Sampling was not random and was based on clinics that had co-operated with research in the past. Practices in other clinics may differ, but if anything it would be anticipated that the problems identified might be worse in settings where there is less willingness to engage with research aimed at improving patient care.

Another limitation is that this study was based on accepting the initial diagnosis of infection, and no attempt was made to verify this. It was observed, however, that terms used in diagnosis were variable and often lacked specificity, making it difficult, for example, to distinguish between upper and lower respiratory tract infection. Lack of consistent diagnostic terminology makes it difficult to draw conclusions about the apparently different pattern of infection diagnosed in the public and private sectors, and contributed to difficulties in assessing appropriateness of therapy. This is an issue that needs to be addressed.

The results are generally in keeping with those reported elsewhere in terms of the types of infection, range of drugs prescribed and common use of antibiotics in viral or self-limiting infections.<sup>2,27–30</sup> This suggests that the situation in Palestine does not differ significantly from that found in both developed and developing countries. Strategies developed elsewhere, therefore, should be applicable in Palestine, provided local factors, such as the cultural and political contexts, are taken into consideration.

While a large range of antibiotics was prescribed for the different types of infection, there was a very high level of use of amoxicillin in all types of infection in all age groups, and substantial use of cephalosporins. This is in keeping with reports from other countries.<sup>29</sup> The pattern of use of antibiotics differed in the public and private sectors and this may be attributable, in

part, to differences between the two groups of patients, in terms of type of infection, sex and age. It was observed, however, that in the public sector, where prescribing is limited by the presence of an essential drugs list, prescribers relied heavily on amoxicillin and older, less expensive antibiotics. The newer, more expensive drugs were prescribed more in the private sector. A number of factors may contribute to this, including private physician involvement with health insurance systems, and a perceived need to meet patient expectation in order to maintain reputation and a high patient turnover in private clinics.<sup>31–33</sup>

Overall appropriateness of prescribing was found to be very low in 35% of cases. The main reason for this was inappropriate indication where antibiotic therapy should not normally be initiated, because the infection is likely to be either non-bacterial or self-limiting. This mirrors results for other countries where over-prescribing for self-limiting conditions was reported.<sup>34–36</sup> There were differences reported here in terms of type of infection, as some infections were associated with a high level of inappropriate prescribing on the basis of indication, such as bronchitis and flu, while others were not, such as sinusitis, for which prescribing was deemed appropriate in all 16 cases. These results need to be viewed with caution, however, due to the small numbers in subgroups. Choice of antibiotic was also considered inappropriate in a number of infections, particularly pneumonia and UTI and, to a lesser extent, pharyngitis and otitis media. Inappropriate dose or duration of therapy was also noted. The reliance of physicians on pack size rather than specified duration of therapy is an issue that should be addressed.

Follow-up of patients was used to gain some indication of effectiveness of treatment and to gauge compliance. It was found that 46% of patients had recovered fully, and this is somewhat lower than recovery rates in other studies.<sup>24</sup> Self-reported non-compliance was found in 30% of the sample, with a variety of reasons given for stopping the antibiotic. Similar results have been reported in both developing and developed countries.<sup>6,37</sup> Although these findings are from a limited sample and are not robust measures of either parameter, they raise some important issues. The lack of recovery provides some evidence to support the notion that the prescribing of antibiotics was inappropriate in the first place. The compliance problems indicate that, even if antibiotics are warranted, their effectiveness is likely to be limited through patients not finishing the course.

It must be acknowledged that the situation in Palestine is likely to have deteriorated since September of 2000 for a number of reasons including restricted movement of people and disrupted supply lines of both drugs and other essential resources such as power supplies. Some of the types of difficulties have been reported recently.<sup>38</sup> Nonetheless, given the scale of the problem it is essential that the rationalisation process is begun without delay. As a starting point, guidelines for when and when not to initiate antibiotic therapy in respiratory infections, and a clear instruction that physicians should specify duration of therapy could greatly reduce the inappropriate use of antibiotics in the short term. In addition, well-structured in-field supervision and monitoring systems, using established indicators, should be implemented to facilitate evidence-based decisions and policies. This could be achieved through well-integrated continuing professional development schemes, as promoted by WHO.<sup>26</sup> The participation of the entire healthcare team is critical to the

success of any development. There is a key role for both the community pharmacist and the nurse, to advise and educate both other healthcare professionals and patients.

In conclusion, there is strong evidence of suboptimal use of antibiotics in the Ramallah district of Palestine, both in the public and private sectors. Given that the findings are based on over 500 patients and are similar to those reported in other countries, it is likely the results are generalisable to the country as a whole. A programme of antibiotic rationalisation is urgently needed, therefore, to address the problem.

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