Does vocational training in family medicine have an impact on antibiotic prescribing pattern?

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Background. Antibiotics overuse is common and is the major cause of antibiotic resistance. Rational use of antibiotics by GPs is essential as most health problems are exclusively dealt within primary care. Postgraduate family medicine (FM) training has become established in various countries over the last few decades but little is known about the effect of FM training on antibiotic prescribing.

Objective. To determine whether GPs with FM training prescribe less antibiotics than those without training.

Methods. GPs working in a pluralistic primary health care system took part in the 2007–08 primary care morbidity and management survey in Hong Kong and collected information of all consecutive patient encounters during predetermined weeks of data collection. Characteristics of GPs, training status, patient morbidity and antibiotic prescribing pattern were compared using multivariate regression analyses.

Results. One hundred and nine GPs, of whom 67 had FM training, participated in the study and recorded 69 973 health problems. The overall antibiotic prescribing rate was 8.5% and that of GPs with FM training was 5.4% compared with the 13.3% among those without. Multivariate logistic regression showed that GPs with FM training were less likely to prescribe antibiotics (odds ratio 0.68, \( P < 0.05 \)). They had lower antibiotic prescribing rates when managing upper respiratory tract infections, acute bronchitis and cough but higher in treating infective conjunctivitis and acute laryngitis.

Conclusions. Postgraduate FM training in Hong Kong is associated with significantly lower antibiotic prescribing rates. This supports the importance of FM training in rationalizing the use of antibiotics in Hong Kong.

Keywords. Antibiotics, family medicine, GPs, primary care, training.

Introduction

Antibiotics continue to be used inappropriately and unnecessarily despite an alarming growth of global antibiotic resistance. This not only increases health care costs but also increases the severity of infections due to the emergence of newer and more resistant strains of microorganisms and mortality rates from certain infections. Antibiotic resistance has become one of the major public health concerns in the world and the call for action and prevention has been made at national and international levels. The 58th World Health Assembly held in 2005 has adopted a resolution to promote rational use of antibiotics and to improve the control of antibiotic resistance.

Most antibiotics are prescribed in primary care and studies have shown that they are often prescribed for conditions, which are almost always viral. Both medical and non-medical factors contributing to the inappropriate use and overuse of antibiotics have been identified and various strategies have been put forth. Two systematic reviews have examined the effectiveness of various educational interventions that aimed to promote the prudent use of antibiotics, such as printed education materials for physicians, audit and feedback, educational meetings, educational outreach visits and multifaceted interventions. Both found that no single approach was sufficient and more complex interventions provided in a variety of formats may have a larger impact on antibiotic prescribing.

Hong Kong has a dual health care system in which medical care is provided by both private and public sectors. While the public sector is heavily subsidized by the government, the private sector, like the USA
and many other countries in Asia, has a pluralistic fee-for-service primary care system. Medical graduates from the two medical schools in Hong Kong are required to work as an intern for a year upon graduation to become fully registered doctors; furthermore, postgraduate training is not obligatory. They can either engage in general practice or choose to undergo further training in various specialties. Thus, primary care in Hong Kong is provided by registered doctors with either no postgraduate training or having different levels of postgraduate training or specialization. There is a lack of regular monitoring or quality assurance system in the private primary care sector; thus, the standard of care in this sector is highly variable.

The Hong Kong College of Family Medicine introduced a formal structured 6-year vocational training (VT) programme (similar to residency training programmes in North America) in 1995 for registered doctors who are interested. It consists of 4 years of basic training in which doctors will rotate through various specialties in a hospital in the first 2 years and then work in a community clinic under supervision in the later 2 years. Doctors can then choose to sit for the conjoint examination held by the Hong Kong College of Family Physicians and Royal Australian College of General Practitioners that will lead to fellowships of these two colleges. After attaining the fellowships, these doctors can opt to go on a further 2 years of higher training in the community, which will ultimately lead to the fellowship of the Hong Kong Academy of Medicine.

Compared with other family medicine (FM) training programmes in the world, it appears to be more demanding and rigorous.\(^\text{19}\) While some studies have found that a fee-for-service system was associated with inappropriate antibiotic prescribing,\(^\text{2,20–22}\) the effects of postgraduate FM training on antibiotic prescribing remain equivocal\(^\text{22–25}\) and there is a relative paucity of research on effects of different levels of training on practice patterns. In 2003, Lam and Lam\(^\text{26}\) conducted a survey on family doctors in Hong Kong and found that VT and higher qualifications in FM had minimal effect on the attitudes towards prescribing antibiotics for upper respiratory tract infection. However, the actual antibiotic prescribing pattern of family doctors in Hong Kong is currently unknown.

We conducted a year-long primary care morbidity and management survey in Hong Kong in 2007 and this paper reports the differences in the antibiotic prescribing behaviour of GPs with and without VT.

Methods

This is a comparative analysis of data obtained from a year-long primary care morbidity and management survey in Hong Kong in 2007. As Hong Kong has a pluralistic primary care system and yet does not have a primary care doctor registry, the best possible way to identify a representative sample of primary care doctors would be having members of the Hong Kong College of Family Physicians as our sampling frame.

All 1597 members of the Hong Kong College of Family Physicians working in primary care were invited to take part in the study. Standardized recording sheets were provided to document all consecutive patient encounters during a data collection week every month between July 2007 and June 2008. Each GP could take part in ≥1 months. Information recorded included age, sex, health problems encountered and whether antibiotics were prescribed. The International Classification of Primary Care developed by the World Organization of Family Doctors\(^\text{27}\) was used to code the health problems. Personal particulars of GPs including their experiences of VT and qualifications in FM were recorded on a separate standard form.

Data were analysed using SPSS Version 16. Multivariable logistic regression was performed to determine the effect of VT on the antibiotic prescribing behaviour in primary care consultations. The analyses were adjusted for potential confounding variables including patients' age and sex, payment method for consultation, nature of problems encountered (whether acute, chronic, preventive or administrative), doctors' age and sex, number of years in general practice, practice sector and whether they possessed any type of diploma certification and postgraduate qualification in FM. All estimates were accompanied with a 95% confidence interval and a \(P\) value <0.05 was considered to be statistically significant.

Results

One hundred and nine GPs participated in the study and among them, 67 had undergone or were undergoing VT. The overall participation rate was 6.8%. According to the database from the Hong Kong College of Family Physicians, the male to female ratio was 2.4:1 and the mean age of members was 42.4 years old (±14.2). The percentage of members under the age of 45 was 62.8% and that of members aged ≥45 years was 37.2%. The age–sex characteristics were similar to the participants in the study.

Table 1 shows the demographic characteristics of participants and their patients. VT doctors were younger and had more females among them than non-VT doctors. They had fewer years (<10) in general practice and a higher percentage of them worked in the public sector. Patients attending VT doctors were older compared with those attending non-VT doctors although the male to female ratio was similar between the two groups. Differences in the payment method for consultation were observed between the two groups. A total of 9.1% of patients in the VT group received government assistance compared to only 2.8% of those in the...
non-VT group. The main reason was patients who had government assistance had medical fee payment totally waived when attending the public sector, where there were more VT doctors than in the private, but had to pay if they consulted private doctors.

Table 2 shows the consultation pattern and the overall antibiotic prescribing pattern of both groups. There were 69,973 health problems collected from 52,337 patient encounters. VT doctors dealt with more health problems per encounter than non-VT doctors and they encountered more patients with chronic health problems. The overall antibiotic prescribing rate regardless of the condition encountered was 8.5%. VT doctors had an overall antibiotic prescribing rate of 5.4% and it was significantly lower than the overall 13.3% among non-VT doctors.

The effect of VT on the overall antibiotic prescribing behaviour, with and without adjusting for confounding variables, is shown in Table 3. VT doctors were less likely than non-VT doctors to prescribe antibiotics (odds ratio 0.68, P < 0.05). As there was a strong correlation between age of doctors and number of years in general practice with VT doctors being younger and had fewer years of experience, we carried out additional regression analyses with the exclusion of these variables individually and together. Results showed that VT doctors were still significantly less likely to prescribe antibiotics than non-VT doctors.

Table 4 listed out the top 15 ranking of health problems with antibiotics prescribed. Among the 5970 health problems with antibiotics prescribed, upper respiratory tract infections top the list accounting for 34.7%. The conditions for which antibiotics were prescribed were similar between the two groups and both shared the same top five diagnoses. However, among the listed health problems, only half of the antibiotic prescriptions...
were issued for respiratory problems in the VT group while it was more than two-thirds in the non-VT group.

Table 5 shows the antibiotic prescribing rates for each of these health problems. VT doctors had a lower antibiotic prescribing rate than non-VT doctors when treating upper respiratory tract infections, acute bronchitis, acne, dermatitis, teeth/gum disease, asthma and cough but higher antibiotic prescribing rate than non-VT doctors when treating dermatitis, teeth/gum disease, asthma and cough but had a higher antibiotic prescribing rate when treating infective conjunctivitis and acute laryngitis/tracheitis.

Antibiotic prescribing rates for common respiratory infections and acute otitis media were compared with rates in other countries where VT is obligatory (e.g. Norway, the Netherlands, the USA, Australia, Canada and the UK) and where it is not obligatory (e.g. Malaysia, Taiwan and Japan) in Table 6. The overall antibiotic prescribing rate for upper respiratory tract infections in our study regardless of training status was 11.8% and was low compared with other countries.2,28–36 It was also lower than the 22.9% reported by Dickinson and Chan37 in a local study conducted in 2002. The antibiotic prescribing rate for upper respiratory tract infections was even much lower among VT doctors (6.4%) than non-VT doctors (16.8%).

The overall antibiotic prescribing rate for acute bronchitis in our study was 63.6% and was comparable to almost all other countries except Taiwan. It was also comparable to rates reported by Dickinson and Chan37 (>50% in children and >70% in adults). However, the 53.9% antibiotic prescribing rate for acute bronchitis among VT doctors was significantly lower than the 69.3% among non-VT doctors (Table 5). The antibiotic prescribing rates for sinusitis, acute tonsillitis and acute otitis media in our study were comparable to those in other countries as shown in Table 6 and there was no statistically significant difference with $P < 0.05$ between the two groups.
significant difference between VT and non-VT doctors in our study as shown in Table 5.

Discussion

We found that antibiotics were most commonly prescribed for respiratory problems in primary care and this was consistent with overseas findings.\textsuperscript{28–26} According to the National Institute for Health and Clinical Excellence (NICE) guideline\textsuperscript{38} on antibiotic prescribing in respiratory tract infections, antibiotics are not recommended for upper respiratory tract infections, acute cough/acute bronchitis and acute sinusitis; use of antibiotics in acute otitis media is controversial although it appears to be effective in reducing the duration of pain in children and antibiotics appeared to have symptomatic benefits in a subgroup of patients with acute sore throat/tonsillitis/pharyngitis. On the other hand, Matthys et al.\textsuperscript{39} have identified fundamental differences in the recommendations for the management of acute sore throat and the indication for antibiotics. As for acute laryngitis, the Cochrane review found no evidence to support the use of antibiotics in adults.\textsuperscript{40}

Our study found that GPs in Hong Kong prescribed fewer antibiotics for upper respiratory tract infections when compared with overseas studies and the rate was even much lower among those who went through VT. Those who had training also prescribed significantly fewer antibiotics for acute bronchitis than those without training. There were limited studies for our comparison regarding the use of antibiotics in treating cough, but the 1.5% antibiotic prescribing rate for cough among doctors with training in our study was much lower than the 34.8% for ‘cough/cold’ in a study conducted by Smith et al.\textsuperscript{41}

There are a few possible explanations for the lower use of antibiotics for such infections among doctors with training compared with those without. First, the FM training programme advocates the practice of evidence-based medicine, thus doctors with training may be more familiar with updated guidelines and therefore more stringent in prescribing antibiotics than those without training. Second, most doctors undergo their training at the general outpatient clinics in the public sector and these clinics have regular internal auditing regarding the use of antibiotics particularly in upper respiratory tract infections. This may have an influence on doctors’ prescribing behaviour. Third, there has been increased public awareness on the appropriate antibiotic use particularly in upper respiratory tract infections in Hong Kong.\textsuperscript{42,43}

In contrast to recommendations from various guidelines, antibiotics were still commonly prescribed for other respiratory infections such as sinusitis and acute tonsillitis and acute otitis media and our study did not show that VT result in any difference. There are several possible explanations for the failure to adhere to clinical guidelines. First, it may be difficult to differentiate bacterial from viral infections based on clinical grounds and a definitive identification of a bacterial cause is rarely sought in general practice before prescribing antibiotics. Furthermore, there is a lack of firm evidence on how to identify, which patients may benefit. Second, some beneficial effects of antibiotics have been observed and there are existing controversies in the treatment of acute tonsillitis and acute otitis media using antibiotics.\textsuperscript{39,44–46} Third, there are several non-biomedical reasons for prescribing antibiotics.\textsuperscript{47} Prescribing antibiotics in order to meet patients’ expectation, to help satisfy them and maintain good doctor–patient relationship and to keep patients in the practice are common reasons particularly within the private sector in Hong Kong where patients pay for service and are free to choose their own doctors.\textsuperscript{48} There may also be a higher incentive to prescribe antibiotics in the private sector as doctors’ income is linked to drugs dispensed.

The majority of acute infective conjunctivitis is caused by bacterial pathogens although most cases resolve spontaneously without serious adverse effects.\textsuperscript{49,50} We assumed that topical antibiotics were prescribed for acute infective conjunctivitis in our study instead of systemic antibiotics although this has not been stated during data collection. The overall antibiotic prescribing rate for acute infective conjunctivitis in our study was 39.6% and was much lower than the 85.4% reported by Petersen and Hayward\textsuperscript{52} in their UK study. However, we observed that doctors with VT had a rate of 47.5% that was higher than the 33.0% in doctors without training. This might be a reflection of a higher awareness of research evidence as those found by the Cochrane review that topical antibiotics were associated with significant improved rates of early clinical remission of acute infective conjunctivitis.\textsuperscript{51}

VT in FM encompasses the principles and concepts of FM. It emphasizes on a partnership model of patient–doctor relationship and a patient-centred approach in consultation with due regard to patients’ ideas, concerns and expectations; emphasizes on effective communication including negotiating skills and seeks to satisfy patients regarding their perception of medical needs yet also educates them on appropriate health seeking behaviour and empower them to engage in self-care.\textsuperscript{52,53} Training in FM requires doctors to reflect on their professional roles and ethics in making clinical judgements and prescribing. Apart from encouraging doctors to acquire broad medical knowledge, FM training also emphasizes on critical appraisal and application of evidence-based medicine and continuing medical education and professional development through a variety of educational activities.\textsuperscript{54}

Our results show that primary care doctors in Hong Kong who were trained in FM were vigilant in prescribing antibiotics in general and especially when
Limitations of the study

Our study has several limitations. First, Hong Kong has a pluralistic primary care system and as we only obtained our sampling frame from the Hong Kong College of Family Physicians, results of our study may not be generalizable to other doctors who were not members of the College such as specialists working in primary care. Second, the participation rate was low being only at 6.8%. This was understandable as the data collection process required doctors to collect information of all consecutive patient encounters, which was very demanding and could cause disturbance to daily clinic operation. Third, there might be self-selection bias as the participation of doctors in our study was entirely voluntary. Nevertheless, with information from >50 000 patient encounters collected by 109 primary care doctors has made our study the largest of its kind in Hong Kong. Any bias in this study was likely to be applicable equally to doctors with or without VT in FM, so we believe the results on the differences in antibiotics prescribing between the two groups were valid.

There could be under reporting by the doctors. Time constraints during consultation could have affected the documentation of information on the data collection form thus influencing the accuracy of our results. This could only be verified by confirmation with patients’ medical records and yet this was not possible. Misclassification of infection diagnoses could occur and diagnostic consistency across participating doctors could be another concern. It was also not feasible in our study for participating doctors to record the types of antibiotic prescribed, the dosages and duration which was important to note the appropriateness of prescribing.

Finally, our results were obtained from cross-sectional data. This can only suggest an association between VT and antibiotic prescribing behaviour but cannot determine a causal relationship. A causal relationship is ideally established with a prospective randomized controlled trial but this is unlikely to be feasible in a study like ours.

Further studies such as qualitative studies and record audits are warranted to provide a deeper understanding on the decision-making process underlying the antibiotic prescribing behaviour among primary care doctors and the effects of FM training on antibiotic prescribing.

Conclusions

Our study gave an overview of the antibiotic prescribing pattern in primary care in Hong Kong and among GPs with and without FM training. Although we cannot draw a definite conclusion that VT in FM leads to a more prudent use of antibiotics, nevertheless VT may be an effective way of assuring rational use of antibiotics. As countries with a primary care orientated health system and those with an increased family physician supply but not with other types of primary care providers, were linked with better health outcomes, policymakers and health administrators should consider putting forward a more uniform rather than the current pluralistic structure to build a strong primary care system in Hong Kong and VT in FM should be made mandatory to practice in primary care.

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