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Sale of antibiotics without a prescription at community pharmacies in urban China: a multicentre cross-sectional survey

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Objectives: To quantify sales of antibiotics without a medical prescription and to assess the quality of pharmacy services in relation to the antibiotics sold in community pharmacies in urban China.

Methods: A multicentre cross-sectional survey of community pharmacies was undertaken in 2015 using the simulated client method. Two clinical case scenarios (paediatric diarrhoea and adult acute upper respiratory infection) were presented at systematically sampled community pharmacies in Eastern (Nanjing), Central (Changsha) and Western China (Xi'an).

Results: Of 256 pharmacies, antibiotics were obtained without a prescription from 55.9% (95% CI: 49.5%–62.0%) when paediatric diarrhoea was simulated and from 77.7% (95% CI: 72.1%–82.7%) when adult respiratory infection was simulated. Of the pharmacies where antibiotics were dispensed, 83.9% and 66.3% dispensed after the simulated clients requested or insisted in the case of paediatric diarrhoea and adult respiratory infection, respectively. Significant differences ($P < 0.001$, χ^2 test) in inappropriate antibiotic dispensing were found among cities, with 57.7%, 37.3% and 73.7% in the case of paediatric diarrhoea and 60.8%, 80.7% and 96.1% in adult respiratory infection in Nanjing, Changsha and Xi'an, respectively. Pharmacists were available in only 14.8% (95% CI: 10.7%–19.8%) of the pharmacies. The performance of pharmacy staff regarding the provision of information and advice was unsatisfactory.

Conclusions: Antibiotics were easily obtained without a prescription in community pharmacies in urban China. Measures to enhance the enforcement of prescription-only regulations and training programmes for pharmacy staff to promote the appropriate use of antibiotics are warranted.

Introduction

Antibiotic resistance is a growing global public health problem. The WHO developed the theme of 'Combat drug resistance: no action today, no cure tomorrow' for World Health Day 2011.[1] In 2014, a WHO report showed high proportions of resistance to common treatments for bacteria causing infections in both healthcare and community settings in all regions of the world.[2]

As the major driver of antibiotic resistance, the global consumption of antibiotics is continually on the rise,[3] particularly in developing countries. The largest increases in rates of antibiotic use are found in BRICS countries (Brazil, Russia, India, China and South Africa), which account for 76% of the global increase between 2000 and 2010.[4] Meanwhile, the inappropriate use of antibiotics has become an extremely serious global problem,[5] with multiple adverse consequences, including not only an accelerated global emergency and spread of antibiotic resistance, but also increased treatment costs and drug adverse events.

Community pharmacies represent one of the main sources of antibiotics worldwide.[5] A recent multi-country survey conducted by the WHO showed that 93% of people obtained their most recently taken antibiotics from a pharmacy or medical store.[6] In contrast to northern European and North American countries where antibiotics for ambulatory use are strictly restricted to prescription-only,[5] previous studies have shown that the non-prescription access to antibiotics in community settings is common in eastern and southern Europe, Africa, South America and Asia because of the absence of prescription-only regulations or the lack of their enforcement where they do exist.[5,7–9] The availability of antibiotics

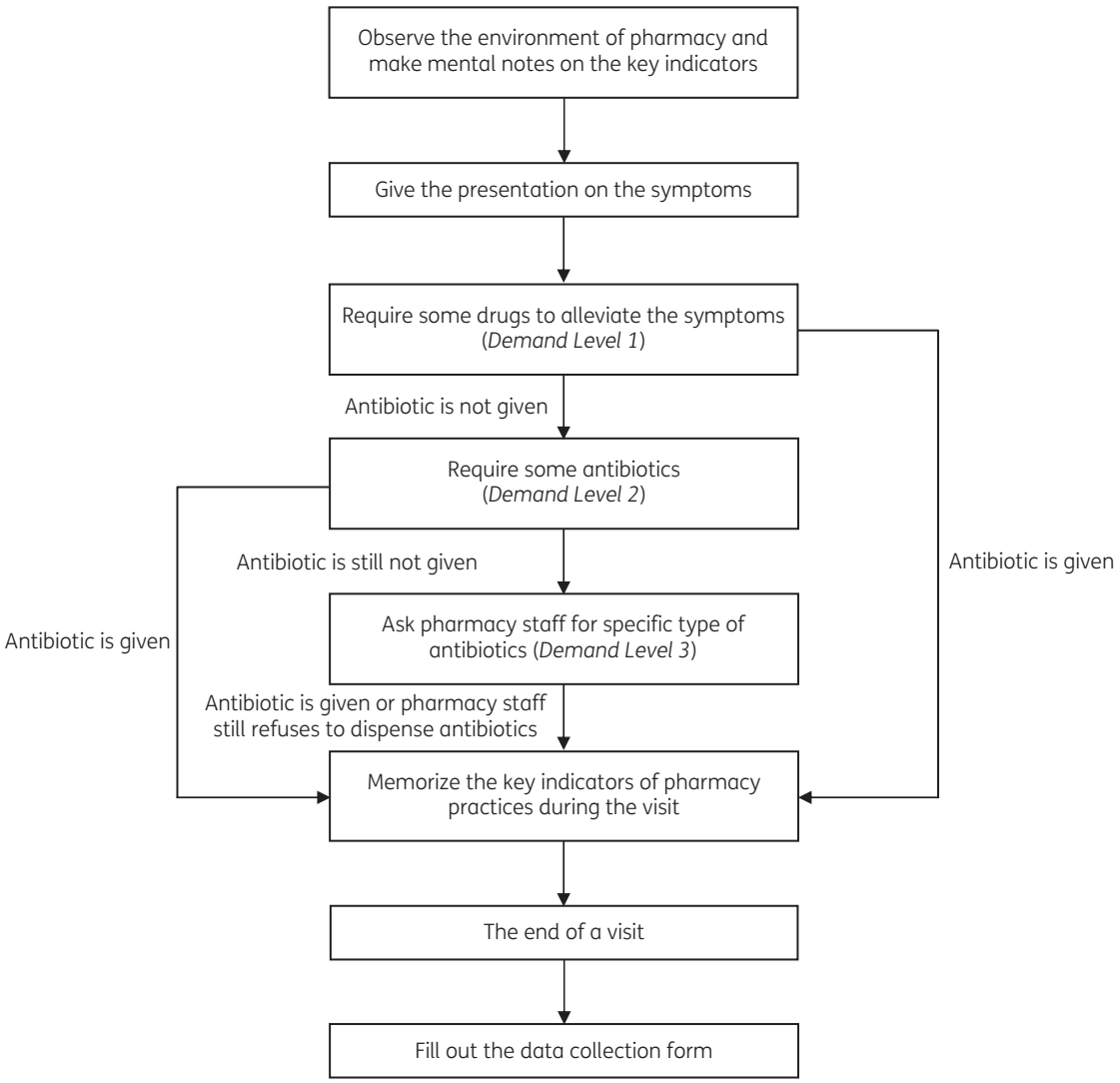

Figure 1. Visit process.

without a prescription, coupled with the general public's positive attitudes and poor knowledge about these drugs, has driven the phenomenon of self-medication with antibiotics, which, in turn, has raised the risk of the inappropriate use of antibiotics.

In China, purchasing antibiotics without a prescription from community pharmacies remains common,[10,11] despite the fact that sales of antibiotics in these locations have been restricted to prescription-only by the China Food and Drug Administration since 2004.[12] Evidence of ongoing antibiotic resistance throughout the country has made the Chinese government aware of the urgency of curbing the irrational use of antibiotics. Since 2011, accompanied by new healthcare reforms, many measures to ensure the appropriate use of antibiotics in public hospitals have been efficiently carried out.[13,14] However, to this point, strategies confronting the problem of easy access to antibiotics in communities have seldom been implemented.[13,14]

Using the simulated client method (SCM), the present study aimed to quantify the proportion of antibiotics sales without a prescription and to assess the quality of pharmacy services provided when dispensing these drugs in urban China. The findings of this study, based on a multicentre cross-sectional survey, help to address the scarcity of empirical knowledge about sales of antibiotics in community pharmacy settings in urban areas of China.

Methods

Study design and sampling

A multicentre cross-sectional survey of community pharmacies was conducted from 1 May to 15 June 2015, using the SCM. To represent better the community pharmacies in urban areas of China, we selected Nanjing, Changsha and Xi'an—three provincial capital cities located in the eastern, central and western regions of China, respectively—as our study areas. The social economic development levels of the three cities are different, with Nanjing having the highest GDP per capita and Xi'an having the lowest.[15–17]

The surveyed community pharmacies were selected systematically. All the districts in the major urban centre of each city were selected. In each selected district, the planned sample size was determined as 15% of the total number of community pharmacies in the district according to the statistics of the Provincial Food and Drug Administration. Then, starting from a

At the beginning of each encounter, SCs need to observe the setting of the pharmacy and make mental notes on following conditions: store size; presence of a pharmacist; presence of a special counter for antibiotics; presence of a sign of prescription on antibiotic counter.	
In the clinical case of paediatric diarrhoea, the SC posing as the aunt of a 5-year-old child seeks care for the child who has had diarrhoea. The SC first says to the pharmacy staff 'My sister's 5-year-old son has had diarrhoea and loose stools, could you give me some medicine to alleviate the symptom?' *Answers to questions likely to be asked by the pharmacy staff were predefined as follows:* In response to questions about symptoms, the SC answers 'The child has been having diarrhoea for one day. The child is somewhat tired and weak. There is no high fever, no headache, no nausea or vomiting and no blood in the stool.' In response to questions about drug allergy history, the SC answers 'None'. In response to questions about medical history, the SC answers 'None'. In response to questions about whether the patient has visited a doctor, the SC answers 'Hasn't'. In response to a request for a prescription, the SC says 'I do not have prescription'. In response to advice to visit a doctor/clinic, the SC says 'It's just minor illness. It might not require a visit to a doctor. Could you just give me some advice on medication?'	**In the clinical case of adult acute upper respiratory infections,** the SC posing as the friend of a 25-year-old college student seeks care for the student who has had an acute upper respiratory infection. The SC first says to the pharmacy staff 'My friend asked me to buy him some medicine. He has a fever, muscle pain and runny nose. Could you give some medicine to alleviate the symptoms?' *Answers to questions likely to be asked by the pharmacy staff were predefined as follows:* In response to questions about symptoms, the SC answers 'He has had slight fever for 2 days. He is somewhat tired and weak. He has a cough and no headache.' In response to questions about drug allergy history, the SC answers 'None'. In response to questions about medical history, the SC answers 'None'. In response to questions about whether the patient has visited a doctor, the SC answers 'Hasn't'. In response to a request for a prescription, the SC says 'I do not have prescription'. In response to advice to visit a doctor/clinic, the SC says 'It's just minor illness. It might not require a visit to a doctor. Could you just give me some advice on medication?'

Figure 2. Predesigned protocol for the SC client visit.

random site in the central area of each district, the surveyed community pharmacies were selected at random in four distinct directions—north, west, south and east—from those within a 1 h drive. As a result, 256 community pharmacies were identified (97 in five districts of Nanjing, 83 in six districts of Changsha and 76 in nine districts of Xi'an) as the quota needed to represent the combination of location (the 20 districts of three cities), type of pharmacy (independent and chain community pharmacies) and scale of pharmacy (large-, medium- and small-scale community pharmacies). The actual number of surveyed community pharmacies was larger than the planned sample size.

Procedures

SCM is an effective method of deriving valid measures of health providers' actual practices, which are challenging to achieve through any other method.[18,19] Simulated clients (SCs) were trained to play the role of healthcare seekers by enacting predetermined, fictitious scenarios, while being indistinguishable from genuine clients. Therefore, the health service providers were unaware that their behaviours were being monitored as they interacted with these 'clients'.[18]

Four female graduate pharmacy students aged 20–24 were recruited as SCs. They organized in fixed pairs to visit the selected community pharmacies, presenting two different clinical scenarios strictly according to a predesigned standardized visiting process and predetermined transcripts (see Figures 1 and 2). Each SC always presented the same scenario. In the paediatric diarrhoea scenario, the SCs posed as the aunt of a 5-year-old child and sought care for the child, who was suffering from diarrhoea. In the adult acute upper respiratory infection scenario, the SCs posed as the friend of a 25-year-old college student and sought care for the student, who was suffering from an acute upper respiratory infection.

Three levels of demand were used sequentially until an antibiotic was dispensed or refused:[20,21] (i) 'Can you give me something to alleviate the symptoms?'; (ii) 'Can you give me some antibiotics?'; and (iii) 'I would like some amoxicillin or cefaclor'. To avoid purchasing any antibiotics or other medicines when everything was 'solved', the SCs were trained to say: 'I forgot to bring money right now, I'll come back later, thank you very much', or 'I have to call my relative/friend to confirm the medicine(s) now, I'll come back later, thank you very much'. After each visit, the SCs filled in a standard on-site summary form containing information on whether the antibiotics were dispensed, questions asked, advice given and other details. These forms were completed out of sight of the pharmacy staff within 15 min of each visit.

Quality control procedures

To obtain the maximum standardization and maintain the consistency of the simulations, several efforts were made before the survey was conducted. First, the SCs underwent sufficient group instruction during which they received instructions on the transcript and how to behave, dress and other particulars. Second, the SCs rehearsed and practised with the researchers, who are familiar with the clinical cases and community pharmacy setting. Third, to build the SCs' familiarity and confidence, the researchers and the SCs visited 10 community pharmacies in Xi'an together before the survey began.

Table 1. Perceived characteristics of the visited pharmacies and respondent pharmacy staff

Perceived characteristics	Nanjing ($N = 97$)	Changsha ($N = 83$)	Xi'an ($N = 76$)	Total ($N = 256$)
Pharmacy size				
large ($\geq$100 m^2)	14 (14.4)	8 (9.6)	11 (14.5)	33 (12.9)
medium (50–100 m^2)	65 (67.0)	53 (63.9)	37 (48.7)	155 (60.5)
small (<50 m^2)	18 (18.6)	22 (26.5)	28 (36.8)	68 (26.6)
Licensed pharmacist on duty	24 (24.7)	8 (9.6)	6 (7.9)	38 (14.8)
Characteristics of respondent pharmacy staff in paediatric diarrhoea case				
Gender				
male	5 (5.2)	8 (9.6)	7 (9.2)	20 (7.8)
female	92 (94.8)	75 (90.4)	69 (90.8)	236 (92.2)
Age (years)				
<30	18 (18.6)	38 (45.8)	48 (63.2)	104 (40.6)
30–50	66 (68.0)	44 (53.0)	28 (36.8)	138 (53.9)
>50	13 (13.4)	1 (1.2)	0 (0)	14 (5.5)
Characteristics of respondent pharmacy staff in adult acute upper respiratory infection case				
Gender				
male	5 (5.2)	6 (7.2)	9 (11.8)	20 (7.8)
female	92 (94.8)	77 (92.8)	67 (88.2)	236 (92.2)
Age (years)				
<30	37 (38.1)	47 (56.6)	47 (61.8)	131 (51.2)
30–50	40 (41.2)	36 (43.4)	29 (38.2)	105 (41.0)
>50	20 (20.6)	0 (0)	0 (0)	20 (7.8)

All data are *n* (%).

Statistical analysis

The data were double entered by two people using EpiData version 3.1 and were managed and analysed using Stata 12.0 (StataCorp, College Station, TX, USA). Descriptive statistical analyses were reported as frequencies (percentages); χ^2 tests were used to compare categorical variables. Differences were considered statistically significant if $P < 0.05$.

Ethics

Our study protocol has received ethics approval from Ethics Committee for Medical Research of Xi'an Jiaotong University (Approval number 2015-018).

Results

General information

The characteristics of the 256 community pharmacies surveyed and of the observed pharmacy staff members are reported in Table 1. Most of the community pharmacies were medium size, and a licensed pharmacist was on duty during working hours in only 14.8% (95% CI: 10.7–19.8%) of the visited pharmacies. Most of the observed pharmacy staff were women. In Xi'an and Changsha, most observed staff members were <30 years old, whereas most were aged 30–50 years in Nanjing.

Paediatric diarrhoea

Antibiotics were obtained from 143 [55.9% (95% CI: 49.5%–62.0%)] of the 256 pharmacies when the paediatric diarrhoea scenario was presented. Of the 143 pharmacies where antibiotics were obtained, 83.9% dispensed antibiotics after the SC's insistence for antibiotics under the second and third levels of demand (see Table 2). Of the 113 pharmacies from which antibiotics were not obtained, there were four main reasons that the pharmacy staff refused to dispense antibiotics: belief that the condition did not require antibiotics (56 pharmacies, 49.6%), belief that antibiotics must be used cautiously in children (25 pharmacies, 22.1%), requesting a medical prescription (14 pharmacies, 12.4%), and recommending referral to a physician (12 pharmacies, 10.6%).

Bivariate analysis results are shown in Table 3. The difference across cities in non-prescription sales of antibiotics for the paediatric diarrhoea case was significant ($P < 0.001$), with the highest percentage observed in Xi'an (73.7%) and the lowest in Changsha (37.3%). However, there was no significant difference across cities in the initial dispensing of antibiotics ($P = 0.092$), but a significant difference was observed across cities in dispensing antibiotics on demand ($P < 0.001$), with the highest percentage shown in Xi'an (60.5%) and the lowest in Changsha (26.5%). There was no significant difference across different pharmacy sizes ($P = 0.418$). The percentage of pharmacies selling antibiotics without a prescription with a licensed pharmacist on duty was significantly lower than pharmacies without a licensed pharmacist on duty ($P = 0.004$). It is also shown that for initial dispensing of antibiotics, there was no significant difference between pharmacies with a licensed pharmacist on duty and those without ($P = 0.385$); however, the percentage of dispensing antibiotics on demand with a licensed pharmacist on duty was significantly lower than without a licensed pharmacist on duty ($P = 0.016$).

Table 2. Sale of antibiotics without a prescription under different levels of demand

Levels of demand (statement)	Clinical case presented, *n* (%) of pharmacies dispensing	
	paediatric diarrhoea (*n* = 256)	adult acute upper respiratory infection (*n* = 256)
1. Can you give me some drugs to alleviate the symptoms of disease?	23 (9.0)	67 (26.2)
2. Can you give me some antibiotics?	96 (37.5)	110 (43.0)
3. I would like some amoxicillin or cefaclor	24 (9.4)	22 (8.6)
Total	143 (55.9)	199 (77.7)

Adult acute upper respiratory infection

Pharmacy staff in 199 [77.7% (95% CI: 72.1%–82.7%)] of the 256 pharmacies surveyed dispensed antibiotics without a prescription when the adult respiratory infection scenario was presented. This percentage was higher than for the paediatric diarrhoea scenario ($P < 0.001$). Of the 199 pharmacies where antibiotics were obtained, 66.3% dispensed antibiotics after the SC's insistence under the second and third levels of demand (see Table 2). Of the 57 pharmacies that did not dispense antibiotics, the main observed reasons were that the pharmacy staff believed there was no need to use antibiotics (37 pharmacies, 64.9%) and the pharmacy staff requested a prescription for dispensing antibiotics (14 pharmacies, 24.6%).

The differences in the non-prescription sale of antibiotics across the selected cities were significant ($P < 0.001$) according to the bivariate analysis (see Table 3), with the highest percentage observed in Xi'an (96.1%) and the lowest in Nanjing (60.8%). Significant differences were also observed across cities in the initial dispensing of antibiotics ($P = 0.018$) and dispensing only on demand ($P = 0.001$). The percentage of pharmacies selling antibiotics without a prescription was lower for pharmacies with a licensed pharmacist on duty; however, there was no significant difference ($P = 0.135$).

Pharmacy services

In the case of paediatric diarrhoea, of the 143 pharmacies that did sell antibiotics, 58 (40.6%) asked further questions about the patient's condition after the SC's presentation. Follow-up questions were asked about possible drug allergies in 85 (59.4%) pharmacies; only 6 (4.2%) enquired about other symptoms, and only 3 (2.1%) asked whether the patient had taken other drugs. Patient medication counselling was given in only 25 (17.5%) of the pharmacies (see Table 4).

Of the 199 pharmacies selling an antibiotic when an adult respiratory infection was simulated, 160 (80.4%) enquired about the patient's condition: 82 (41.2%) asked about the patient's drug allergy history; 64 (32.2%) asked about other symptoms; and only 13 (6.5%) asked whether the patient had taken other drugs. Only 19 (9.5%) of the observed pharmacy staff members provided advice on medication (see Table 4).

Discussion

Previous studies in which SCM was used to assess pharmacy staff member dispensing of antibiotics in response to specific clinical scenarios in community pharmacy settings have been conducted in the United States, Europe, the Middle East, Africa and other Asian countries.[5,20–24] However, to the best of our knowledge, the current study is the first of its type to be conducted in urban areas in different regions of China. The study provides valuable information for the enforcement of regulations on the sale of antibiotics in community pharmacies in China. Easy acquisition of antibiotics for the treatment of common childhood and adult infectious diseases from community pharmacies without a prescription was observed in urban areas in three cities located in eastern, central and western China. Pharmacy staff members' adherence to the existing prescription-only regulation was found to be low in urban China.

The inappropriate use of antibiotics in community settings is prevalent in China.[10,11] Our results raise serious concern regarding the role that community pharmacies play in this phenomenon. Antibiotics are believed to be a panacea by China's general public.[13] Misunderstandings about which conditions can be treated with antibiotics and over-expectations of the drugs' power to treat common childhood and adult symptoms are widespread across China. It has been reported that 64% of Chinese citizens incorrectly consider viruses such as colds and influenza to be treatable using antibiotics.[6] Moreover, a substantial proportion of Chinese people obtain antibiotics from community pharmacies.[6]

Most previous studies that have used SCM to assess community-based antibiotic use in developing countries have found high percentages of pharmacies making non-prescription sales of antibiotics.[5] SCM studies have also shown that antibiotics can be bought from pharmacies without a prescription in some European countries. In Greece, antibiotics were purchased from >70% of pharmacies when a rhinosinusitis case was simulated.[24] In Spain, antibiotics were obtained after insistence from 79.7% pharmacies when a urinary tract infection was simulated and from 34.8% pharmacies when a sore throat was simulated in 2008,[20] and the situation was found to be even worse in the recent follow-up survey.[25] Although the simulated clinical scenarios were different in these studies, together with our study, they document

Table 3. Sale of antibiotics without a prescription, stratified by characteristics of retail pharmacy and pharmacy staff

	Paediatric diarrhoea presented						Adult acute upper respiratory infections presented					
	dispensing antibiotics without prescription		dispensing under level 1 of demand		dispensing under levels 2 and 3 of demand		dispensing antibiotics without prescription		dispensing under level 1 of demand		dispensing under levels 2 and 3 of demand	
Characteristics	*n* (%)	*P*	*n* (%)	*P*	*n* (%)	*P*	*n* (%)	*P*	*n* (%)	*P*	*n* (%)	*P*
City		<0.001		0.092		<0.001		<0.001		0.018		0.001
Nanjing	56 (57.7)		4 (4.1)		52 (53.6)		59 (60.8)		17 (17.5)		42 (43.3)	
Changsha	31 (37.4)		9 (10.8)		22 (26.5)		67 (80.7)		30 (36.1)		37 (44.6)	
Xi'an	56 (73.7)		10 (13.2)		46 (60.5)		73 (96.1)		20 (26.3)		53 (69.7)	
Pharmacy size		0.418		0.783		0.649		0.262		0.839		0.172
large	15 (45.5)		2 (6.1)		13 (39.4)		22 (66.7)		10 (30.3)		12 (36.4)	
medium	88 (56.8)		14 (9.0)		74 (47.7)		123 (79.4)		40 (25.8)		83 (53.5)	
small	40 (58.8)		7 (10.3)		33 (48.5)		54 (79.4)		17 (25.0)		37 (54.4)	
Gender of pharmacy staff		0.583		0.869		0.521		0.416		0.685		0.749
male	10 (50.0)		2 (10.0)		8 (40.0)		17 (85.0)		6 (30.0)		11 (55.0)	
female	133 (56.4)		21 (8.9)		112 (47.5)		182 (77.1)		61 (25.8)		121 (51.3)	
Age of pharmacy staff (years)		0.279		0.152		0.057		0.282		0.738		0.251
<30	58 (55.8)		13 (12.5)		45 (43.3)		101 (77.1)		37 (28.2)		64 (48.9)	
30–50	80 (58.0)		8 (5.8)		72 (52.2)		85 (81.0)		25 (23.8)		60 (57.1)	
>50	5 (35.7)		2 (14.3)		3 (21.4)		13 (65.0)		5 (25.0)		8 (40.0)	
Licensed pharmacist		0.004		0.385		0.016		0.135		0.115		0.886
in pharmacy	13 (34.2)		2 (5.3)		11 (28.9)		26 (68.4)		6 (15.8)		20 (52.6)	
not in pharmacy	130 (59.6)		21 (9.6)		109 (50.0)		173 (79.4)		61 (28.0)		112 (51.4)	

All data other than *P* values are *n* (%) of pharmacies.

Table 4. Questions and advice from the pharmacy staff to the simulated patient at the pharmacies in which the antibiotic was dispensed

	Clinical case presented, *n* (%) of pharmacies providing antibiotic	
Pharmacy staff statement	paediatric diarrhoea	adult acute upper respiratory infection
Further enquired regarding patient's condition	58 (40.6)	160 (80.4)
Asked whether had other symptoms or not	6 (4.2)	64 (32.2)
Asked whether had taken other drugs or not	3 (2.1)	13 (6.5)
Asked about the drug allergy history	85 (59.4)	82 (41.2)
Provided medication advice	25 (17.5)	19 (9.6)

the continuing occurrence of high rates of inappropriate antibiotic provision for common infectious diseases from community pharmacies across broad regions of the world.

Our results also revealed the disparity in practices of antibiotic dispensing between scenarios based on a different age group of patients and symptoms. The percentage of dispensing antibiotics in the scenario of paediatric diarrhoea was much lower than in the scenario of adult acute upper respiratory infection. The finding supports the trend towards more cautious and lower rates of antibiotic prescribing for children due to a higher fear of undesirable outcomes in children.[26] The difference in the nature of the symptoms also could contribute to the difference in practices, which has been shown in previous SCM studies.[5,24]

The absence of prescription-only policies, or, more commonly, the absent or lax enforcement of existing policies, is the main cause of pervasive non-prescription access to antibiotics in pharmacies in many parts of the world.[5] In north European and North American countries, unregulated outpatient antibiotic availability is largely restricted by well-enforced regulations.[5] Despite the presence of the desire to self-medicate with antibiotics, the opportunities to do so are limited.[8] In some low-income countries, the

strengthened regulations have also greatly lowered the illegal dispensing of antibiotics. For example, one SCM study conducted in Zimbabwe showed that very few private pharmacies dispensed antibiotics without a prescription after the effective enforcement of a regulation on antibiotic sales.[27] In China, nationwide mandatory management strategies to promote rational use of antibiotics in healthcare institutions have been initiated by the Chinese Ministry of Health since 2011, which mainly included setting targets for antibiotic management and the development of audit and inspection systems.[13,14] In the near future, measures such as establishing a penalty system for the illegal sales of antibiotics and developing national surveillance on antibiotic sales in community pharmacies are urgently needed.

Patient demand has been shown to play a critical role in the prescription and dispensing of medicines.[28] Research has shown that health professionals tend to fulfil patients' and parents' expectations to obtain antibiotics regardless of whether it is appropriate.[29] Our findings confirm this. For both simulated clinical cases, only a minority of the observed pharmacy staff members primarily dispensed antibiotics. However, for both clinical scenarios, a large percentage of the observed pharmacy staff members agreed to sell antibiotics after the SCs insisted. Health professionals tend to balance clinical appropriateness against perceived patient expectations and satisfaction.[30] The role that demand plays in the non-prescription dispensing of antibiotics is a cause for concern, particularly in a culture characterized by over-expectations of antibiotics.[13,30] Notably, there was no significant variance across cities in initial antibiotic recommendations in the case of paediatric diarrhoea; however, the dispensing of antibiotics on demand differed across three cities. This interesting finding indicates that the difference in the percentage of non-prescription sales of antibiotics among cities is mainly attributed to the difference in pharmacy staff response to patient demand, which suggests a disparity in professionalism of pharmacy staff and regulatory capacity across cities.

The presence of a licensed pharmacist was found to be a protective factor for the inappropriate dispensing of antibiotics. However, a licensed pharmacist was only available in a small fraction of the pharmacies for visits made during working hours. The absence of professional pharmacists in community pharmacies has also been reported in other developing countries such as Vietnam.[31] In China, licensed pharmacists' recruitment and retention in community pharmacies has been a long-term problem. Despite regulations that all community and hospital pharmacies must have licensed pharmacists to oversee the rational use of drugs by 2015,[32] this has not proved an easy goal to achieve. There are nearly 448 057 community pharmacies in China,[33] but only 211 033 licensed pharmacists were registered in community pharmacies by the end of 2015.[34]

The results of the present study also demonstrate that the quality of current pharmacy services is far from acceptable. Only a small percentage of the observed pharmacy staff members gave advice on medication, and very few asked about the patients' other symptoms or other medication that they were taking during the dispensing process. Deficiencies in the quality of pharmacy services has been reported in many regions in the developing world.[22] In China, pharmacy service provision is still in a nascent stage, and there is a long way to go. If pharmacy services in community settings are to contribute effectively to primary healthcare, more efforts are needed to attract licensed pharmacists to work in community pharmacies and to educate pharmacy staff members on their roles in dispensing drugs.

There are several limitations to our study. First, the survey community pharmacies were selected only from three cities, and so our results may not be generalized to other cities and rural areas in China. However, we tried to enhance the representativeness by drawing a sample stratified by geographical locations, socio-economic status, and type and scale of community pharmacies. Moreover, additional research is needed on the practices in relation to antibiotics in community pharmacies in rural areas. Second, it is challenging to know whether an SC represents a realistic and typical case. However, no perceived indication of suspicion about the authenticity of the SC was reported during the visits. Third, we did not differentiate the drugs and services dispensed by a pharmacist from those provided by other pharmacy staff members. However, this is close to a real-life scenario, in which whether a client is attended by a pharmacist or other pharmacy staff member is determined by random chance. Fourth, to construct standardized scenarios, we limited our simulations to two specific clinical cases and could thus only assess a small part of the current status of pharmacy services.

In conclusion, although it is forbidden by existing regulations, a high level of non-prescription access to antibiotics prevails in urban areas in different regions of China. Moreover, the quality of pharmacy services is deficient, and there is a lack of presence of licensed pharmacists in most community pharmacies. Future policies need to target enhancing the enforcement of existing prescription-only regulations. Public education and training programmes for pharmacy staff to promote the appropriate use of antibiotics are warranted.

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Transparency declarations

None to declare.

Author contributions

The idea for the research came from the authors, who all participated in planning and reporting. Y. F., J. C. and M. J. designed the study. J. C. and D. Y. did the statistical analyses. J. C. did the analysis of the literature and wrote the manuscript. D. Y., B. L., S. Z., K. Y. and Y. T. participated in the data collection. Y. F. co-ordinated the study. All authors have read and approved the final manuscript.

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