The Construction of Patient Understandings of Antibiotic use for Upper Respiratorytract Infections in Rural China.

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Abstract

Background: This paper seeks to identify the lay understandings concerning “anti-inflammatories”, their relation to antibiotics, and their utilization in treating upper respiratory tract infections (RTIs) among patients in rural Anhui Province, China.

Methods: In-depth semi-structured interviews were carried out with 30 patients from rural clinics who presented with RTI symptoms between December 2017 and May 2018. These patient-informants were purposively sampled for follow-up interviews from an original sample of 1,030 patients who completed preliminary structured interviews. All informants were over 18 years old and had consulted a doctor at village- or township-level government health facilities for symptoms of RTIs within two weeks preceding follow-up interviews. Data was collected until saturation was achieved. Responses were audiotaped, transcribed, and analyzed using a thematic framework via NVivo 12.0 software.

Results: A majority of informants reported that antibiotics such as cephalosporin, known colloquially as “anti-inflammation medicine”, are the preferred treatment for upper respiratory tract symptoms. These are commonly prescribed by township and village doctors, who are an important source of antibiotic-related information for patients. Approximately 87% (n=26) of patient informants reported that doctors neither revealed the name nor classification of their diagnosis. Only 13% (n=4) were specifically told they had an upper respiratory tract infection. However, all patients in this sample were treated with antibiotics regardless of diagnosis or pathogenic etiology.

Conclusion: The findings of the present study may provide important insights for designing future interventions to promote public health awareness concerning unnecessary and inappropriate use of antibiotics in China.

Background

Upper Respiratory Tract Infections (RTIs) are the most common group of infectious diseases and one of the most common health problems encountered in primary care settings worldwide [1,2]. Although the majority of acute respiratory tract infections are of viral origin and self-limiting, antibiotic treatment for such infections is common across the globe [3,4]. Unnecessary use of antibiotics contributes to antimicrobial resistance (AMR), which is a major threat to global public health [5,6].

Suboptimal use of antibiotics, stemming from both prescribed and self treatment, is reported to be high in rural China [7]. Studies have estimated that 70% – 90% of patients visiting village clinics in China with RTI symptoms were prescribed antibiotics [8]. Furthermore, a recent survey found that 17.2% of rural residents had used antibiotics purchased from retail pharmacies without a prescription, while 13% had used antibiotics that were left over from previous illnesses or provided by relatives to treat RTI symptoms [9].

Various possible causal factors for the unnecessary use of antibiotics have been identified, including demand and supply side factors and structural healthcare issues, such as medical insurance [10,11]. However there are inconsistencies between research findings from studies on the “demand side”, that focus

on patients, compared with those that seek to understand the “supply side”, with respect to prescribing practices. For example, in China physicians report that their prescribing is influenced by patient pressure for antibiotics and that it is difficult to communicate with patients due to patient lack of understanding of antibiotics [12,13]. Yet, a systematic review that examined international data sets identified that what physicians might have been misinterpreting to be pressure placed on them to prescribe antibiotics, was, in actuality, patients' concerns about their illness [14]. A study conducted in rural Anhui province found that nearly three quarters (72.7%) of respondents reported they would do as told, if their doctors let them leave a consultation without any prescription, and only 14.3% had ever requested that their doctors prescribe specific drugs [15]. These findings have also been corroborated by our research [16].

With respect to the demand side of antibiotic use, another paradox is evident. A low level of biomedical knowledge regarding antibiotics has been identified as one of the factors contributing to antibiotic misuse in Swedish residents [17]. However, a survey of 2,760 rural residents in 12 counties of Anhui province indicates that educational interventions for simple knowledge improvement does not lead to a change toward desired behaviors for antibiotics use; rather, self-perceived knowledge about antibiotics was associated with a higher reported use of leftover antibiotics [18]. Similarly, Wang et al. identified that a large sample of medical students across several provinces in China commonly self-prescribed antibiotics, purchased without a prescription from retail pharmacies [7]. Hence, we can question if lack of knowledge is really an underlying issue in antibiotic misuse in this context, when greater knowledge may, in actuality, foster greater confidence in the ability to judge the perceived appropriateness of one's antibiotic self-medication practices. And thereby we can also question the appropriateness and effectiveness of educational interventions for antibiotic misuse in such contexts.

Quantitative evidence regarding the types of medication taken for RTIs, as well as data concerning rural residents' knowledge about antibiotics has been gathered from a number of studies [9,15,18]. However, these studies are unable to explain the above mentioned inconsistencies. There is, therefore, a need to clarify the understandings and behaviors of rural residents in China concerning antibiotic use in greater depth, in order to build an evidence-base that supports the design of interventions that modify the current high levels of antibiotic use for RTIs.

This study aims to identify rural patients’ understandings of the treatment of RTI symptoms (particularly with regard to antibiotics) using in-depth semi-structured interviews, in addition to observation of doctors’ communications with patients and clinical documentation (patient records).

Methods

Study design

The research discussed in this paper is part of a larger mixed-method project described elsewhere [19]. In this section of the qualitative research, trained researchers conducted semi-structured interviews in addition to observation at village clinics and township health centers.

Setting

This study was conducted in six settings: one village clinic and one township health center in each of three rural counties in Anhui Province, located in the middle eastern area of China. As in most other Chinese provinces, there is no strict referral system for healthcare in Anhui and patients can choose from any level of healthcare or kind of caregiver. However, the *Fifth National Health Services Survey* illustrates, that in practice, 72.8% of initial medical care occurs in primary care settings (including village clinics, community clinics, township and community health centers); 16.9% occurs at county/city level hospitals; and 8.2% occurs at provincial hospitals [20].

Of the three township health centers studied, one maintained solely electronic records, one township kept both electronic and paper patient records, while the third kept neither electronic nor paper records. Only one of the village clinics studied maintained patient records in both electronic and paper form.

Sample Selection and Data Collection

Patients (> 18 years old) presenting to the selected clinical sites with RTI symptoms between December 2017 and May 2018 were included in this study (n = 1030). The observations conducted focused on patient treatment practices, which included: diagnostic testing, prescribing, and communication between practitioner and patient. A purposive sampling method was used to select a sample (n = 30), as a follow-up of in-depth, semi-structured interviews in informants' homes, one to two weeks following their initial clinic consultation. This purposive sampling sought to obtain a maximum amount of variation by seeking to capture a wide range of symptom presentations and initial responses to questions regarding treatment-seeking and prior antibiotic use, in addition to attempting to be representative of the local demography, particularly with respect to age and sex.

Data Analysis

Data was analyzed throughout the fieldwork in order to allow emergent themes to inform data collection, as well as to ascertain data saturation. NVivo 12.0 software was used to analyze interview transcripts in Chinese and English. Researchers reviewed all transcripts and performed initial line-by-line coding to identify emergent themes. Both UK and China-based researchers then engaged in an iterative process to decide the final coding list. Interviews were coded thematically using the agreed codes until all data had been coded.

Results

Informant demographic information is summarized in Table 1, along with information concerning diagnosis and treatment with antibiotics, derived from both interviews and observation.

Table 1
Characteristics of informants recruited into the study with information abstracted observations

Code number	Age (in years)	Sex	Education (in years)	Diagnosis or explanation doctor provides patient during consultation	Diagnosis documented by doctor in electronic system	Diagnosis documented by doctor on paper	Antibiotics prescribed
1-1-20170505-03	52	M	6	the trachea is inflamed on both sides	pulmonary disease	NA	Yes
1-1-20170604-1	40	M	16	both lungs are inflamed	acute bronchitis	NA	Yes
1-2-20170604-2	66	F	3	None	NA	NA	Yes
2-1-20171025-03-T	70	M	5.5	None	acute episode of chronic bronchitis	acute episode of chronic bronchitis	Yes
2-1-20171025-04-Y	45	M	2	None	upper respiratory infection	upper respiratory infection	Yes
2-1-20171101-01-T	70	M	4	blood shows high infection	acute attack of chronic bronchitis	acute attack of chronic bronchitis	Yes
2-1-20171103-01-Y	52	M	7	None	upper respiratory infection	acute upper respiratory tract infection	Yes
2-1-20171110-03-T	62	F	0	None	acute attack of chronic bronchitis	acute attack of chronic bronchitis	Yes
2-1-20171213-01-Y	52	M	11	Tonsil is inflamed	upper respiratory infection	upper respiratory infection	Yes

Table Note:

For Sex: M = male, F = female;

For Diagnosis: 'None' signifies the doctor provided no diagnosis or explanation to the patient;

For diagnosis documented by doctor in electronic system or on paper, ' NA ' means that the doctors in the health facilities did not generate any documentation; For antibiotics prescription, 'Yes' means the doctor prescribed antibiotics; 'No' means the doctor did not prescribe antibiotics.

Code number	Age (in years)	Sex	Education (in years)	Diagnosis or explanation doctor provides patient during consultation	Diagnosis documented by doctor in electronic system	Diagnosis documented by doctor on paper	Antibiotics prescribed
2-1-20171219-02-T	60	M	5	None	acute bronchitis	acute bronchitis	Yes
2-1-20180101-01-Y	72	M	5.0	None	NA	NA	Yes
2-1-20180103-03-Y	54	F	1.5	None	upper respiratory infection	upper respiratory infection	Yes
2-1-20180104-01-T	41	F	8.0	No fever	acute upper respiratory infection	acute upper respiratory infection	Yes
2-1-20180106-02-Y	24	F	11.0	It might be an inflammation	acute tonsillitis	acute tonsillitis	Yes
2-2-20171022-51-T	46	M	12.0	respiratory infection	upper respiratory infection	cold	Yes
2-2-20171104-51-T	46	M	2.0	upper respiratory infection	upper respiratory infection	upper respiratory infection	Yes
2-2-20171115-51-T	36	F	8.0	None	upper respiratory infection	upper respiratory infection	Yes
2-2-20180110-51-T	60	M	11.0	upper respiratory infection	cold	upper respiratory infection	Yes
2-2-20180124-51-T	44	F	4.0	upper respiratory infection and cold	cold	upper respiratory infection	Yes

Table Note:
For Sex: M = male, F = female;
For Diagnosis: 'None' signifies the doctor provided no diagnosis or explanation to the patient;
For diagnosis documented by doctor in electronic system or on paper, ' NA ' means that the doctors in the health facilities did not generate any documentation; For antibiotics prescription, 'Yes' means the doctor prescribed antibiotics; 'No' means the doctor did not prescribe antibiotics.

Code number	Age (in years)	Sex	Education (in years)	Diagnosis or explanation doctor provides patient during consultation	Diagnosis documented by doctor in electronic system	Diagnosis documented by doctor on paper	Antibiotics prescribed
3-1-20180324-01-T-	**27**	**F**	**10.0**	**None**	**NA**	**NA**	**Yes**
3-1-20180421-01-Y-	72	F	6.0	throat is red	NA	NA	Yes
3-1-20180426-04-T	32	M	4.5	None	NA	NA	Yes
3-1-20180503-01-Y	38	F	3.0	None	NA	NA	Yes
3-1-20180510-01-T	56	M	8.0	(throat) a little red	NA	NA	Yes
3-1-20180519-01-T	51	F	8.0	None	NA	NA	Yes
3-1-20180602-01-Y	45	F	2.5	None	NA	NA	Yes
3-2-20180315-52-T	52	F	2.0	None	NA	NA	Yes
3-2-20180409-51-Y	28	F	9.0	throat is red	NA	NA	Yes
3-2-20180413-51-Y	30	F	9.0	None	NA	NA	Yes

Table Note:
For Sex: M = male, F = female;
For Diagnosis: 'None' signifies the doctor provided no diagnosis or explanation to the patient;
For diagnosis documented by doctor in electronic system or on paper, ' NA ' means that the doctors in the health facilities did not generate any documentation; For antibiotics prescription, 'Yes' means the doctor prescribed antibiotics; 'No' means the doctor did not prescribe antibiotics.

Code number	Age (in years)	Sex	Education (in years)	Diagnosis or explanation doctor provides patient during consultation	Diagnosis documented by doctor in electronic system	Diagnosis documented by doctor on paper	Antibiotics prescribed
3-2-20180515-51-T	45	F	3	None	NA	NA	Yes
Table Note:							
For Sex: M = male, F = female;							
For Diagnosis: 'None' signifies the doctor provided no diagnosis or explanation to the patient;							
For diagnosis documented by doctor in electronic system or on paper, ' NA ' means that the doctors in the health facilities did not generate any documentation; For antibiotics prescription, 'Yes' means the doctor prescribed antibiotics; 'No' means the doctor did not prescribe antibiotics.							

Discussing and documenting diagnoses

Slightly more than half of our informants (n = 17) reported not having any discussion with their doctor concerning their diagnosis. Among the remaining informants, four patients (13% of sample) were told they had an upper respiratory tract infection, and five (17%) were told they demonstrated inflammation in a part of their respiratory tract. Three patients (10%) were told that their throat was red. One patient was told their blood test indicated a severe infection, and another patient was told they had no fever.

Electronic and paper documentation of diagnoses was similarly mixed. Upper respiratory tract infection and acute upper respiratory tract infection were the most common diagnoses (appearing for 30% of the patients, n = 9) on electronic and/or paper records; followed by acute bronchitis or acute episode of chronic bronchitis (17% or n = 5), pulmonary disease (7% or n = 2), and acute tonsillitis (3% or n = 1).

On three of the patient records (10%) the diagnosis of “cold” and “upper respiratory infection” were used interchangeably on the paper and electronic documentation. There was a complete lack of documentation in clinic records for 43% (n = 13) of the interviewed patients. Furthermore, no diagnosis specified whether an infection was of bacterial or viral origin, rather, diagnoses specified an *infection* or *inflammation* of a particular body location.

The Concept of Inflammation

Nearly all patient informants used the word “*yan*”, (炎, *inflammation)* to describe their RTI symptoms, which included cough, sore throat, and/or fever. For example, about one third of informants (n = 10) perceived a [bad] cough or a sore throat/itchy throat to be a sign of inflammation:

“Cough means you are inflamed.” [2-1-20171110-03-T]

“When you’ve got a sore throat, there is definitely an inflammation which needs to be diminished!” [2-1-20180103-03-Y]

“A sore throat is inflammation. When you don’t feel good in your respiratory tract, it's also inflammation.” [3-2-20180315-52-T]

Some participants explained their rationale supporting this understanding:

“Inflammation means a little swollen, or to fester. When you cough, your throat has to be swollen, as well as appearing red, that means you’ve got some inflammation.”

[3-2-20180515-51-T]

One quarter of informants (n = 7) understood colds (*ganmao*,□□) explicitly as a sign of inflammation:

“Colds are also inflammation in the body.” [3-1-20180503-01-Y]

“Let’s say if you have a cold, what you need to do is to use anti-inflammation, when the inflammation goes away, you can recover.” [2-2-20180124-51-T]

However, two informants asserted the opposite view. One informant stated:

“Common cold (*ganmao*) should not be considered inflammation.” [3-1-20180324-01-T]

While another informant argued that whether a cold is an inflammation is dependent on the presence of a fever:

“Cold sometimes manifests with a fever. Once you've got a fever, it definitely means you’ve got an inflammation.” [3-1-20180519-01-T]

Notably, both of these informants were better educated (with 10 and 8 years of education respectively) than most of the informants in this study. Yet, for the second informant, the symptoms of the common cold coupled with a fever is still understood as a sign of inflammation.

What's in a Name: The Language of Treatment for RTIs

Multiple terms were used by both patients and doctors to describe the biomedical treatment for inflammation and infection, including the colloquial term “anti-inflammation medicine” (*xiaoyan yao*, □□), the biomedical term “antibiotic” (*kangsheng su*, □ □□; literally, anti-life element) and the more specific “antibacterial medicine” (*kangjun yao*, □□) [16]. In general, commonly used antibiotics, such as amoxicillin and cephalosporin, were described by the colloquial term *xiaoyan yao* (□□) and were considered anti-inflammatory in their action:

“Amoxicillin is an anti-inflammatory.”[1-1-20170505-03-M RTI]

“What we normally take for our family is amoxicillin, which is anti-inflammatory, along with cephalosporin.” [2-1-20171213-01-Y]

Interviewer: “What other words do you usually use to call this kind of medicine besides anti-inflammatories?”

Informant: “No other words.” [2-1-20180104-01-T]

Patient informants also identified that others in their network shared this same understanding of anti-inflammatories.

Interviewer: “What do people around you think anti-inflammatory drugs are?”

Informant: “Just include cephalosporin, amoxicillin and so on.” [2-1-20180104-01T]

One informant spontaneously mentioned “antibiotics” and was clear that antibiotics and anti-inflammatories are considered the same. This informant, who had previously been hospitalized for three months due to a threatened abortion, stated:

“They are the same, they are all penicillin. Cephalosporin was used a lot in our local area and also amoxicillin.” [3-1-20180324-01-T]

Several informants had heard the term for “antibiotics” but were not sure of its meaning;

“Antibiotics? Is it anti-inflammatories?” [2-1-20171101-01-T]

“Antibacterial agents (*kang jun yao*, □□) are used to kill bacteria, […] regarding antibiotics I don’t know, anti-inflammatories are the same as antibacterials I think. Anyway in our countryside, for cold, what you need to do is to eliminate inflammation.” [2-2-20171115-51-T]

In general, informants perceived that the use of antibiotics (such as amoxicillin and cephalosporin) to treat RTI symptoms of inflammation, including common colds, coughs, and sore throat, is a matter of common sense. For example, one informant said:

“If I had a cough, or a upper or lower respiratory tract infection, I may take some [antibiotics].” [2-1-20171213-01-Y]).

Some informants also mentioned taking traditional Chinese medicine remedies concurrently with antibiotics for RTIs.

“Take a bit of it (refers to *Sanjiu cold cure*; a TCM cold medicine), while also taking some amoxicillin or cephalosporin.” [2-1-20180103003-Y]

Hence, the majority of informants understood RTI symptoms as indications of inflammation, which should be treated with antibiotics, such as amoxicillin and cephalosporin, because they are considered ‘anti-inflammatory’.

Sources of patient's rationale for using 'anti-inflammatories' for RTIs

The rationale for informants' use of 'anti-inflammatories' to treat RTIs arises mainly from 1) the patients' previous consultation or treatment experience, and 2) local culture.

Most informants specified that their understanding of antibiotics as anti-inflammatories was based on information from township doctors, village doctors (ie; trained community health workers), drug store staff, and/or healthcare seeking experiences.

Interviewer: "How do you know amoxicillin is anti inflammatory?"

Informant: "The doctors said so."

Interviewer: "How do you know, that when you have a cold or a cough, that you need to take anti-inflammatories?"

Informant: "Everyone knows it. When you go to the drug store, drug salespersons or pharmacists will tell you this; if you go to clinics, doctors will tell you this."

Interviewer: "Tell you what? That you need anti-inflammatories?"

Informant: "Yes. And they will treat you with anti-inflammatories."[1-1-20170604-1]

Another informant offered:

"He [the doctor] will say that if the inflammation isn't treated, then the patient will not recover from the cold." [3-1-20180519-01-T]

Rather than state the exact source of their information, some patient informants indicated that the understanding of antibiotics as anti-inflammatories was generally shared by the people they knew:

"This is known by everyone. For example, even my aunts know this. From my childhood

I knew this. For example, when you catch a cold, you buy cold medicines plus take anti- inflammatories. Wouldn't it better to take the two medicines together? That's it. Generally we all know that." [2-1-20180103-03-Y]

Although most of the informants discussed an understanding of anti-inflammatory use as described above, a few informants reported a different understanding. For example, one informant mentioned that a doctor had told them not to use antibiotics:

Interviewer: "You just mentioned that cephalosporin is an antibiotic, how did you know that?"

Informant: "I heard from other people."

Interviewer: "When you say other people, what do you mean?"

Informant: “Well, such as a doctor. He had told me that I should take cephalosporin as little as possible.”

Interviewer: “Which one of the doctors said so?”

Informant: “I cannot remember. Some doctors will prescribe, while some doctors don't.”

Interviewer: “So which type of doctors’ advice do you follow?”

Informant: “I will follow the advice of a doctor who I met with when I go to the hospital. Anyway, a cold is a minor disease and no matter who the doctor is, they can handle it well.”

[2-1-20171219-02-T]

It is also worth noting here that although this informant states that “a cold is a minor disease”, they are still seeking treatment in a hospital for their cold. Some informants referred to other channels of information:

Interviewer: “So how do you know how to recover from a cold?”

Informant: “I like to listen to the radio. There are lectures addressed by experts from big hospitals every afternoon on the radio.” [3-1-20180510-01-T]

One young female informant believed that patients should drink plenty of water for most colds and coughs, and take medicine only for serious symptoms. When asked about the source of her information, she replied:

“As a mother, we all know that. My family say so, and I also read such information on the internet.” [3- 1-20180324-01-T]

Discussion

Language and Antibiotic use

Language reflects a group's order of meaning and understanding of any given domain. In the biomedical domain in China, multiple terms can exist within and between biomedical professionals and the lay public to express related ideas. This is particularly evidenced in the terms used by our informants to describe the causality and treatment of RTIs. Rather than differentiate between particular etiologic pathogenic agents (eg; bacteria, virus, parasite, or fungi), causality in relation to RTIs was generally characterized by reference to inflammation (*yan*,炎) or infection (*ganran*,感), which can include any pathogen and may also encompass non-microbial, physical processes that result in inflammation.

If in practice the term “infection” is understood as representing a form of “inflammation”, then the overall concept of inflammation suggests a historical process of hybridization and accommodation, whereby inflammation can be understood to “function [here] as a boundary object which effectively mediates the interfaces between the popular knowledges of person-specific bodily illness, the biomedical sciences with immunological processes and microbiological conceptions of bacterial infection, and local medical practices” [16].

It can also be argued that these broad characterizations of pathological process may simply be easier for the lay public to understand, and thereby have served as an important means of communication between the lay public and their doctors. For example, in other sections of this study, doctors claimed to use the term “inflammation” (*yan*) in place of “infection” (*ganran*) simply to be more readily understood by patients [16]. And at the beginning of data collection for this study, when researchers used specific terms for antibiotics, such as *kangsheng su* or *kangjun yao* with informants, most informants didn't understand, or were not sure, what these terms meant, nor the kinds of medicine that would be grouped in these categories. However, all informants were familiar with the term *xiaoyan yao*, which they specifically identified as antibiotics, such as amoxicillin and cephalosporin.

In general, informants perceived the symptoms of upper respiratory infections as signs of inflammation that require treatment with anti-inflammatories. In addition to the apparent simplicity of a singular designation, where all RTI symptoms can be grouped under the umbrella of “inflammation”, there is also an overlap between the theory of traditional Chinese medicine (TCM) pattern diagnoses of wind-heat and wind-cold and many biomedical upper respiratory symptoms, which may also have influenced an understanding of RTIs as diseases of inflammation. Such hybridizations of biomedicine with TCM were observed by the frequent plural use of TCM in combination with antibiotics by both self-prescribing patient informants, as well as by practitioners.

China's National Action Plan to Contain AMR and the Education of the Lay Public

Antibiotic stewardship and rational use of antibiotics has been a central focus for the World Health Organization (WHO), and subsequently for global health overall, where it has been prioritized in conjunction with the development of essential medicines recommendations since the 1970s. China's *National Action Plan to Contain AMR (2016–2020)* was developed in response to the *WHO's 2015 Global Action Plan for AMR* containment; which called for all member States to develop their own action plans for AMR [21]. Among the myriad goals of China's Action Plan, is the education of “medical staff, veterinarians, animal producers, students, and members of the public about AMR” [22]. China's Action Plan specifies that public health education for AMR will be carried out by “education authorities” and “will include content about the rational use of antimicrobial agents and AMR in health education courses for primary and middle school students” [22]. Furthermore, the general population will be educated by “culture and media authorities [who] will widely disseminate information regarding AMR to the public via the major public media services” [22].

Given the findings of our research, it appears the success of this policy in reducing AMR may depend on educational programs that not only differentiate between the appropriate biomedical diagnosis and treatment of the symptoms of upper respiratory tract infections, but also problematize the depiction of antibiotics as part of an aggregated grouping of anti-inflammatories. However, the difficulty of replacing a straightforward understanding of inflammation with the more complex biomedical differentiation of pathogens is obvious. Regardless, public health campaigns that provide information about antibiotics in a persuasive and simple manner would be a priority for promoting optimal use of antibiotics. However, as

mentioned, China's National Action Plan not only prioritizes the education of the public, but also of healthcare practitioners, who serve as a primary source of patient information.

Communication and the role of rural doctors

It is clear from the findings of this research that promoting optimal use of antibiotics is not contingent on the understandings of the lay public alone, but must include village and township doctors; for the rural doctor was identified as one of the most important sources of antibiotic related information among our informants. During consultations, doctors used brief explanations to their patients, such as “lungs are inflamed”, “respiratory infection”, or more commonly, they conveyed no information to patients at all. In interviews, most patient informants stated that doctors told them they were using anti- inflammatories to treat inflammation, and some participants reported that they had acquired the knowledge that antibiotics (understood as “anti-inflammatories”) were appropriate forms of treatment for their RTI, from observing the medicines prescribed by doctors or from seeing “anti-inflammatories” written on prescriptions. Hence, antimicrobial resistance, under these circumstances identified in rural China, cannot simply be reduced to the non-compliance of patients, but more so may be an outcome of doctors’ prescribing habits that reinforce lay understandings.

Furthermore, the Chinese pharmaceutical industry must also be identified as playing a potential role in optimizing the use of antibiotics, particularly concerning labeling for the use, dosage and duration of the drug. Similarly, it is essential to enforce policies to regulate the relatively easy access to antibiotics purchased from retail pharmacies without a prescription. In other words, it is just as, if not more, important, to seek to optimize the use of antibiotics among the gatekeepers of antibiotics as it is among the lay public.

Gatekeeping theory identifies that in the process of information transmission, those who disseminate information, inevitably use their own positions and perspectives to screen and filter information [23]. In the context of the present study, doctors play a key role as gatekeepers. As professional communicators about pharmacotherapy, doctors hold the power to disseminate or withhold information and, thereby, exert an important influence on patients in the process of providing health information. Our findings indicate that in the settings examined, both village and township doctors choose an easy and time-saving “shorthand” to communicate with patients via the language of inflammation. Such shorthand in patient communication may be an outcome of the economic pressures hospital and clinic-based doctors in rural China face in needing to see an ever increasing volume of patients within a decreasing amount of time.

As prioritized in China's Action Plan, mass media, including television, radio, newspaper and the internet, is also an important information gatekeeper, though the power of the media may be limited in rural settings. A young patient informant mentioned that she had learned from the internet that biomedicine should only be used for serious symptoms. And one elderly informant reported learning that colds require time to recover after listening to the radio. However, among all the informants in this study, only these two informants referred to a different source of health information beyond their doctors. Informants stated that the majority of their medical information was from doctors at the clinics they visited, and secondarily from the people around them.

As important gatekeepers for antibiotic related information in China, rural doctors will need to take the responsibility to disseminate evidence-based information in order to promote the prudent use of antibiotics.

Conclusions

The practice of using antibiotics for the treatment of RTIs was not only identified in patient interviews, but in observing clinical prescribing practices, wherein every patient informant in this study received antibiotics for their RTI symptoms. This study suggests that antibiotic misuse in rural China may be an outcome of multiple factors, that include the understandings of the lay public and the reinforcement of these understandings by clinicians.

This knowledge builds on our previous work that demonstrated how the concept of “inflammation” can serve as a boundary object for translating between biomedical and local understandings of the disease process. In this paper we have demonstrated that lay understanding of RTI symptoms -as symptoms of inflammatory conditions that require treatment with antibiotics, perceived as a type of anti- inflammatory- is a widespread assumption among the patients studied in rural Anhui province.

Such understandings may result in the inadvertent overuse and misuse of antibiotics, particularly for RTIs commonly of viral origin, such as influenza and the common cold. Thus, any attempts toward antibiotic stewardship and rational antibiotic use will be insufficient without targeting the public, as well as the gatekeepers of antibiotics; namely doctors, pharmacists, and pharmaceutical suppliers.

Declarations

Ethics approval and consent to participate

This study was approved by the Research Ethics Committee of Anhui Medical University. Informants participated voluntarily and oral informed consent was obtained from all participants.

Consent for publication

Not applicable.

Availability of data and materials

Data may be available upon request to the corresponding author.

Conflicts of Interest

The authors declare no conflict of interest.

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Author Contributions

JCG, PK and HL conceptualized the study. HL, CC and DW designed and finalized the methodology. CC, XS and HL conducted data analysis employing Nvivo software. All authors contributed to the formal data analysis. JCG, JCI, and XS conducted data collection. CC and XS oversaw data curation. JCG Prepared the original draft. JCG, PK, CC, and HL completed revisions and editing. JCG completed Tables. HL Supervised the study. HL and DW administered the project and were responsible for funding acquisition and for all resources used in the project. All authors have read and approved the final version of the manuscript.

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