

Dealing with patient expectations regarding the prescription of antibiotics in ambulatory care in Germany: A qualitative analysis

Anna Stuermlinger

University Hospital Heidelberg

Regina Poss-Doering (✉ regina.poss-doering@med.uni-heidelberg.de)

University Hospital Heidelberg <https://orcid.org/0000-0003-0618-4034>

Katharina Glassen

University Hospital Heidelberg

Michel Wensing

University Hospital Heidelberg

Martina Kamradt

Universita Hospital Heidelberg

Research article

Keywords: Antibiotics prescription, patient expectations, physician-patient communication, patient education, communication strategies, behavior change technique, qualitative research

Posted Date: December 3rd, 2019

DOI: <https://doi.org/10.21203/rs.2.18069/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background Antibiotics prescription rates are relatively high in primary care in Germany. Patients' expectations have frequently been mentioned as reason for high prescription rates. The extent to which patients' expectations play a role and the strategies that physicians use to deal with these expectations and prevent non-indicated prescriptions in acute, uncomplicated infections are the subject of this paper.

Methods In this qualitative study, twenty-seven semi-structured interviews with physicians were conducted in 2018. Data were audiotaped, pseudonymized and transcribed verbatim. The analysis was based on a framework analysis according to the Tailored Implementation in Chronic Diseases (TICD) checklist, and was expanded for deeper analysis and completed with the Behavior Change Techniques (BCT) taxonomy.

Results The data revealed that patients' expectations regarding the prescription of antibiotics can play an important role, although they may be ignored by physicians. If physicians respond to patients' expectations, they use various strategies to deal and communicate with patients. Successful communication is more often achieved, if the physician takes sufficient time with the patient and if this results in a cooperative conversation. Thus, patients get informed about antibiotics and antimicrobial resistance, and it is possible to discuss alternative treatments. Seven strategies from the BCT taxonomy were mentioned by physicians in this study.

Conclusion Constructive physician-patient communication was key to reducing antibiotic prescribing. The range of behavior change techniques mentioned by physicians was relatively limited and the use of a wider range of strategies could be the focus of future implementation strategies. Trial registration: ISRCTN, ISRCTN58150046. Registered 24 August 2017. Keywords Antibiotics prescription, patient expectations, physician-patient communication, patient education, communication strategies, behavior change technique, qualitative research

Background

The prevention of antibiotic resistance has been assigned high priority on both national and international political agendas. Therefore, the World Health Organization (WHO) global action plan on antibiotic resistance was adopted in 2015. One of its aims is to improve understanding and awareness of the issue in order to reduce antibiotic prescription rates [1]. Germany developed the German Antibiotics Resistance Strategy 2020 (DART), which also pursues the goals of counteracting the development of antibiotic resistance, suggesting a comprehensive set of implementing strategies to address the issue [2]. In relation to the total population in Germany, the consumption of antibiotics (AB) is highest in ambulatory medical care, where 85% of the total amount of antibiotics consumed within the human medicine sector is administered [3]. The inadequate use of antibiotics is considered to be the main cause for the development of anti-microbial resistance [4]. In primary care in Germany, antibiotics are prescribed by

primary care physicians in 41 % of patients of lower respiratory tract infections and only 52 % of these prescriptions comply with recommended guidelines [5].

The research project “Sustainable Reduction of antibiotic-induced antimicrobial resistance” (ARena) applied and evaluated a multifaceted implementation program, with the aim of achieving a sustainable reduction in antibiotic-induced antimicrobial resistance [6]. The effects were evaluated in a three-armed (non-blinded) cluster randomized trial, with an attached process evaluation. The latter involves interviews and surveys among the participating physicians, non-physician health professionals on the practice teams, and various stakeholders. Within the scope of the process evaluation, semi-structured interviews were conducted. One of the areas of exploration was the impact of patient expectations on antibiotics prescribing, which is the subject of this paper. More detailed information about the study can be found in the published study protocol [6].

Many patients with acute, uncomplicated infections expect their primary care physicians to prescribe antibiotics, albeit fewer than physicians may assume [7–11]. Patient-centered communication can help to address patient expectations and reduce inappropriate antibiotics prescribing. However, there is little research evidence on how physicians deal with patient expectations in their routine healthcare practice. For several decades, “patient-centeredness” and “patient-centered medicine” have been among the most discussed subjects in health care [12]. However, its implementation in routine healthcare practice has remained difficult. At the core of “patient-centeredness” is the communication between physicians and patients [13]. However, it can be challenging for physicians to act patient-centered, but refrain from prescribing antibiotics as desired by a number of patients [7–11]. This challenge is particularly large in children [14, 15]. A study showed that in none of 42 patients with acute cough, physicians actually explored the expectations of their patients. This may imply that prescription frequency might be reduced if physicians knew about the needs and preferences underlying expectations of their patients. In addition, the study found that pressure exerted to obtain antibiotics is often overestimated [16]. This is confirmed by other studies, which showed that the interpretation of patient expectations is difficult and leaves room for uncertainty [17, 18]. A Cochrane Review examined 10 studies on shared decision making (SDM) in antibiotic prescriptions for acute respiratory infections and found that it reduced the prescription of antibiotics by 40 % [19]. In 1997, Macfarlane et al. requested alternative strategies to support general practitioners in their decision to prescribe antibiotics. In this study, patients who demanded antibiotics received it three times as often as those who did not [20]. Overall, these studies support the assumption that communication with patients is crucial for reduction of antibiotics prescribing.

Currently, there is little research evidence on how attending physicians in routine practice deal with patients’ expectations regarding antibiotic therapy in order to prevent unnecessary prescribing in Germany. The aim of this study was to explore the role of patient expectations with regards to antibiotic prescriptions for acute, non-complicated infections and what strategies primary care physicians use to deal with these and prevent unnecessary antibiotics prescribing.

Methods

Study design

The ARena study was planned for 30 months and carried out in cooperation with 14 primary care networks in two German federal states (Bavaria (n = 12) and North Rhine-Westphalia (n = 2)) and 193 of their member practices. These networks are regional associations of physicians of different specializations, which can be registered by the National Association of Statutory Health Insurance Physicians according to § 87b Abs. 1 Nr 2 4 SGB V since 2013 [21]. Patients diagnosed with acute, non-complicated respiratory infections, non-complicated cystitis, or community-acquired pneumonia could be included in the study. They had to be insured with AOK Bavaria or AOK North Rhine-Westphalia and participate in a specific healthcare delivery program (§ 140a SGB V a.F. and § 140a Abs. 1. S. 2 Alt. 1 SGB V n.F.), jointly offered by AOK and the primary care networks [6].

A qualitative study, based on semi-structured interviews with physicians, was conducted. Qualitative research is essential for the study of clinical communication because it facilitates an exploration of complex and unknown domains [22]. The COnsolidated criteria for REporting Qualitative research (COREQ) checklist (Additional file 1) is a tool to support reporting on qualitative studies and therefore was applied in this study.

Study population

Between March and May 2018, study participants were purposively recruited through the ARena project leader (aQua Institute in Goettingen, Germany) and the research team at the Department of General Practice and Health Services Research, University Hospital Heidelberg. After potential interviewees sent back a signed letter of intent to participate in an interview, they received further material, and the study team contacted them by telephone. All interview partners were participants of the ARena study and members of one of the 14 participating primary care networks in Germany. The interviews were conducted with general practitioners, pediatricians, internists, and ear, nose and throat specialists. The participants were aware that the interviewers were members of the research team and responsible for the process evaluation. The research team had no contact with the participants before the study commenced.

Interview guide

The interview guide contained various topics: dealing with antibiotics, effects of the quality improvement program (ARena) on patient care and primary care networks. In this study, the focus was placed on the part of the interview guideline “Dealing with antibiotics”. The guideline was developed and pilot tested by the research team. Furthermore, before the interviews were conducted, all interview partners were required to complete a survey that asked for their sociodemographic data and information about their practices.

Data collection

Data were collected using individual telephone interviews with a semi-structured interview guide. The interviews were conducted from April until June 2018 by researchers of the interprofessional research team who had all conducted interviews in previous studies. All scheduled interviews were carried out; furthermore, no interview was repeated, and no participants dropped out. Participants were interviewed via telephone at their practices during or after their consulting hours. No other people were present during the interviews. Interviewers took additional notes during the interviews. All interviews were audiotaped, pseudonymized and transcribed verbatim with the transcription software f4. Transcripts were not returned to participants for comment or correction. However, participants will be informed about the findings of this study through interim and final reports of the ARena study. Finally, the research team concluded that data saturation was reached and no further participant recruitment was necessary.

Data analysis

Determinants of the implementation of recommended use of antibiotics were qualitatively analyzed using the TICD (Tailored Implementation in Chronic Diseases) checklist by Flottorp et al. [23] as a framework to identify determinants of practice regarding the relevance of patient expectations for the prescribing behavior of physicians. The TICD checklist consists of seven domains and 57 determinants. To ensure that all collected data were reflected by the analysis, the framework was complemented with new, inductive categories.

During the analysis, it became apparent that physicians used different behavioral strategies when dealing with patient expectations. Since the TICD framework is not specifically designed for analysis of these strategies, the Behavior Change Technique taxonomy [24] was used as a supplementary framework. It lists 93 techniques in 16 categories. The inductively categorized potential behavioral strategies were carefully compared with the BCT definitions of the techniques to determine whether they corresponded with BCT techniques. Figure 1 illustrates the final category system for the analysis focusing on communication strategies in connection with the identified BCT techniques (Additional file 2, Figure S1 provides the complete category system). The method of analysis as well as findings were regularly discussed in the study team. For this qualitative study, the focus of the data analysis was on the results of the inductively formed categories as well as the BCT strategies, not the results of the TICD framework. Transcripts were coded iteratively using MAXQDA Analytics PRO Version 18.0.3. In addition, participant characteristics were analyzed descriptively by using IBM SPSS Statistics Version 24.

AB = antibiotics

00

AB = antibiotics

Figure 1. Category system of the data analysis

Results

Description of participants

A total of 27 interviews with primary care physicians were conducted with an interview duration of 28:14 minutes on average. All physicians were members of a primary care network participating in the ARena study. Quotes extracted from the data and cited here with specific transcript position were translated into English with due diligence. Table 1 presents sample characteristics.

Table 1. Socio-demographic characteristics of primary care practices and physicians participating in this qualitative study (n=27)

Characteristics	Physicians (n=27)
Sex (f/m)	9/18
Age years (range) (mean)	43-66 (55.2)
Experience in current position in years (range) (mean)	10-38 (26.07)
Working in general practice (n) (%)	18 (66)
Type of practice: (n) (%)	
single practice	12 (44.4)
group practice	12 (44.4)
shared rooms*	2 (7.4)
medical center	1 (3.7)
Patients/quarter: (n) (%)	
500-1000	6 (22.2)
1,001-1,500	11 (40.7)
> 1,500	10 (37.0)

*separate financial entities and indemnity insurances, but shared rooms, equipment and staff

Overview

The results of the study indicate that most physicians were rarely asked directly by their patients for antibiotics. A few physicians were frequently asked for an antibiotic prescription. A predominantly

perceived reason for this demand was that patients would want to recover quickly and think that antibiotics could help them best. On closer examination, the data shows that physicians realized that their patients do not all demand antibiotics from them and that they may wrongly suspect this.

“Oh, thank God, I don't really want to.’ This is what the majority say, whereas before, you had the feeling that a certain attitude of expectation was [...] there.” (PH26)

When asked whether there are specific groups of patients with an increased demand for antibiotics, most of the participants felt that this occurred mainly among young people who were professionally committed, experienced stress and wanted to return to work as soon as possible. In addition, demands were reported to be more common in patients from countries where antibiotics are sold over the counter. The analysis identified initially three different strategies of dealing with patient expectations regarding the prescription of antibiotics: meet expectations uncontested, expectations have no perceived influence on a physician's prescribing decision and, the most frequently mentioned option, expectations are relevant and taken into consideration. When an influence of expectations was acknowledged, different strategies were reported. The most relevant strategy cited was physician-patient communication. Such communication strategies were identified by using BCT taxonomy and will be detailed below: re-attribution, pros and cons, comparative imagining of future outcomes, information about health consequences, information about social and environmental consequences, credible source and incompatible beliefs.

Some participants mentioned certain cases where they met patients requests for an antibiotics prescription even if they considered it non-indicated. This was explained with the assumption that patients otherwise would consult another physician who would prescribe antibiotics anyway. To prevent this, they rather prescribed it themselves. They also reported about patients who explicitly do not want antibiotics and want to be treated with alternative medications. Some physicians also met this type of patient expectation.

The described physicians differed from the group of physicians, who explained in the interviews that patient expectations had no influence on the prescription of antibiotics. If they considered an antibiotic to be unwarranted, then they would not prescribe it and accepted the risk of losing the patient to another physician over this.

Most physicians explained that they took patient expectations seriously and into consideration. There were different ways in which to proceed with those expectations. One of these approaches was based on the principle of delayed prescribing (DP), which almost all respondents applied in their practice. Delayed prescribing means that the physician issues an antibiotics prescription to the patient to take home with the instruction to use it only in case of a worsening state of health [15]. The most commonly reported reason for applying this strategy was an exceptional situation; for example, shortly before the weekend or when the patient wants to go on vacation. Further reasons given were diagnostic uncertainty and that the prescription provided the patient with a sense of security. An argument against the use of DP was the shift of the treatment decision to the patient, when it is actually the physician's job.

Communication

The results demonstrate that communication with the patient was the most important approach for addressing patient expectations in the decision-making process concerning prescription of antibiotics, as almost all strategies used were related to physician-patient communication. This is illustrated by the following statement.

“The crucial point is always the communication between physician and patient. If a corresponding relationship of trust is established at this point, and the patient [...] receives the corresponding information, he is then in a position to develop a strategy together with the physician that is individually tailored to the situation.” (PH04)

Physicians used communication to teach patients that an antibiotics prescription was not required in their case. Through the provision of information, patients could understand why it was not needed, and an unnecessary antibiotic prescription thus was prevented.

The physicians revealed various behaviors and strategies to deal with patient expectations, all of which can be assigned to the inductive main category "communication". The following six strategies were inductively derived from the main category "communication" (i) *taking time*; (ii) *taking the patient seriously*; (iii) *trusting conversation*; (iv) *address the topic of antibiotics openly*; (v) *alternative treatment* and (vi) *patient education*. These strategies could be linked to a total of seven strategies of the BCT taxonomy. The connections between the inductively formed categories and the linking with BCT strategies can be seen in figure 1. An overview of key quotes for the different categories of this analysis can be obtained in Additional file 3 (Table S1).

Taking time and taking patients seriously

To be able to discuss with patients their expectations and the adequacy of an antibiotic prescription, there were communication components the attending physicians had to meet. The majority of the physicians agreed that they had to take sufficient time to talk and listen to patients and to take them seriously.

“It is very important that the patient is also heard; i.e., not immediately blocking [...] but you also have to understand the patient, perceive his worries, perceive his complaints.” (PH01)

Taking time for communication and taking patients seriously also meant to gain a deeper understanding of the individual patient and to question behaviour. This approach reflected the BCT strategy "re-attribution". Some physicians used this strategy when they felt uncertain about reasons for a patient's desire for an antibiotic treatment other than the feeling of being ill. Potential reasons stated were that patients wanted to limit being absent from work to a short time or avoid that at all, because they absolutely had to go to work and therefore wanted to recover quickly.

"[...] maybe I have to take a look – is there a bit more behind it or is it a repression of the patient? You have to see that a little bit." (PH10)

Trusting conversation

If the patients felt accepted and met with understanding, they were more willing to listen to and be informed by physicians. If both aspects had been fulfilled, then a participative discussion, which the participants described as essential, could develop.

Further in-depth strategies of this approach are described by the BCT strategies "pros and cons", in which advantages and disadvantages of patient behavior are discussed, and "comparative imagining of future outcomes", in which it is discussed how the current behavior (here: expectation of an antibiotic) can affect the future of the patient.

Such a discussion could arise if, for example, the physician conveyed information to the patient necessary to weigh up the pros and cons of an antibiotic prescription.

"He may have a certain lack of information; I must provide him with the information to enable him to make a decision here, and this is usually the case when the patient understands that an antibiotic has more disadvantages than advantages." (PH04)

The BCT strategy 'Comparative imagining of future outcomes' aims to clarify how patients' current behavior will affect the future if not changed. A physician illustrated this strategy by talking about efforts of trying to show patients that it was not important to be fit again the next day, but to be healthy in the future, when they would be older and, therefore, an antibiotic should not always be used, but rather, for example, rest should be preferred to medication.

Address the topic antibiotics openly

An open discussion could also result from the strategy of asking the patient about his expectations and thus openly addressing the subject of antibiotics. The physicians reported that through this strategy, they confronted patients with the topic, and it did not remain unspoken. In addition, they sometimes observed whether the patient actually wanted an antibiotic or whether they had the wrong impression of the patient.

A suitable BCT strategy follows the approach of not only openly addressing the topic of antibiotics, but also making patients feel a little insecure, so that they realize that the expectation of an antibiotic has no discernible reason.

The BCT 'Incompatible beliefs' is a technique for dealing with a patient's demand for antibiotics. It demonstrates that a demand is unwarranted and in doing so, a slight discomfort is created. One of the physicians used this technique by asking patients which exact antibiotic they thought they needed if they were certain about the prescription. Patients then felt a little discomfort as they realized they could not answer the question and that their current behavior made little sense and probably did not reflect their actual self-image.

"[The] best line is always 'I need an antibiotic', and I ask back, 'Which one?' (laughs). Then the answer is, 'You must know that', and then I say, 'I know that you don't need one, I can't think of one that would help with your illness; you'll have to tell me, so I can write one down for you, because there isn't actually any.' [...] and then, 'yeah uhh' and then the thing is usually over." (PH17)

Alternative treatment

A further strategy to dissuade patients from their demand for antibiotics was to propose alternative treatments. If these did not cure the patient, then they could come back for a re-assessment and a new consideration regarding a potentially necessary antibiotic treatment.

Patient education

The most frequently cited strategy was patient education. All interviewed physicians made it clear that it was of fundamental importance to educate patients and explain why an antibiotic prescription was not indicated. If this information was provided in detail, then the probability of patients agreeing not to take an antibiotic was high.

"There's actually a lot of lack of knowledge, ok, you have to say that, but if you explain it a bit and also clearly say why I recommend it now, most people go along." (PH12)

The strategies used by the physicians to educate their patients reflect the BCT strategies 'Credible source', 'Information about health consequences' and '*Information about social and environmental consequences*'.

Using guidelines and theories as credible sources, physicians explained to patients that their diagnosis and treatment were correct so that patients did not feel they had been treated insufficiently in cases

where no antibiotics were prescribed. In addition, physicians explained they demonstrated to patients that an antibiotic would cause more harm than good in their case. Pointing out the effects of non-indicated antibiotic prescriptions on the environment was identified as a further strategy used by the physicians.

“And when I have the feeling [...] that I don't want to prescribe an antibiotic at this point [...] I prepare a bit of the theory, so that he doesn't have the feeling that he is being treated wrongly, but that this is correct according to probability.” (PH16)

“I also explain to the patient that an antibiotic given in the wrong place changes the microbiome in the intestine in any case and that this can then also have a negative influence on the immune system, on the intestinal flora. So, to describe it amateurishly, an antibiotic given in the wrong place can also cause damage to the body; I have always said so.” (PH14).

“[...] that if it really proves to be an uncomplicated infection, it does more harm than good, and at some point, we won't have any antibiotics left to work.” (PH20)

Discussion

Through the analysis of the interviews with the TICD and BCT frameworks, determinants and strategies could be identified that ascertain how physicians deal with patient expectations with a focus on identifying behavioral strategies of physicians. This could be achieved by extending the TICD framework and involving the BCT framework. The study showed that primary care physicians use different strategies to deal with patient expectations regarding antibiotics prescriptions for acute, non-complicated infections. Communication with patients was the most important approach for dealing with patient expectations. This category and several related subcategories were most prominent as it was the one most frequently addressed by respondents on the one hand, and on the other hand several important subcategories could be derived from it. Through a conversation in which the patient feels taken seriously and for which the physician takes time, patient education can be successful. The interviewed physicians' further BCT strategies for patient education were as follows: refer to scientific sources such as scientific guidelines, present information about health consequences or provide information about social and environmental consequences. They also used the strategy of slightly unsettling patients (cf. Incompatible belief) by critically questioning their demand for antibiotics. A total of 7 BCT strategies have been identified, which were already used by physicians: re-attribution, pros and cons, comparative imagining of future outcomes, information about health consequences, information about social and environmental consequences and credible source. Interpretation and relevant literature When asked whether their patients demand antibiotics directly or indirectly from them, many physicians replied they were aware

that patients did not actually expect antibiotics and they often misinterpreted. Such a misinterpretation of the demand for antibiotics has also been found in other studies [25, 26]. In a German study by Altiner et al. [27], primary care physicians received communication training, and it became apparent that they interpreted expectations too early. An important reason to prescribe an antibiotic, although it is not indicated, was the fear that patients otherwise would switch to another physician. This was also mentioned as a reason for prescription in a study that dealt with physicians views of interventions to promote prudent antibiotics use [7, 28]. Physicians used DP to ensure possible antibiotic treatment in exceptional situations, for example before the weekend or holidays. On the other hand, they use it to meet diagnostic uncertainty and patient dissatisfaction. A Cochrane Review of 2017 [29] suggests that DP can be an appropriate strategy to reduce antibiotic consumption while not harming the physician-patient relationship. Nearly as many patients were satisfied with DP as they were with a direct antibiotic prescription and there was still a lower consumption of antibiotics. Hoyer et al. explain that the use of DP as a strategy is only successful if patients are motivated for SDM and understand the effect of antibiotics [30]. Other interviewed physicians refer to the strategy of “waiting and make a new appointment with the patient”. This is only possible if there is a continuous relationship between the physician and the patient. If this is not the case, as in on-call duty, then physicians tend to prescribe antibiotics more frequently, which was also confirmed by O'Connor in 2018 [31]. It has been shown that national and international studies from the field of “reducing antibiotic prescription for acute, uncomplicated infections” demand research on better physician-patient communication and strategies for better patient education [26, 31-39]. A qualitative study conducted in nine European countries with 121 patients revealed that most are aware of the antibiotic resistance problem but cannot explain it in detail [35]. The fact that patients are poorly informed and do not understand how an antibiotic works is also demonstrated by a study in Germany, in which more than one third of the interviewed participants answered “yes” to the question of whether an antibiotic works against the common flu [26]. The communication misunderstandings between physicians and the parents of sick children are particularly strong. In an observational study from England, primary care consultations were recorded and analyzed. They discovered that parents believe that an antibiotic is only used for severe diseases, and they do not understand that while a viral infection can also be serious, it does not benefit from an antibiotic [33]. An earlier study demonstrated similar results [25]. Parents want to talk to their physician about the severity of their children's illness, justify their visit and feel taken seriously by them. However, this should not be interpreted as a demand for antibiotics. The present study demonstrates that the interviewed physicians partly share similar experiences and applied strategies, since many of them adopted strategies involving DP or taking the patient seriously. Several physicians also use the method of openly addressing the topic of antibiotics, which is associated with positive experiences – not only in this study [40]. For a successful and balanced conversation, it is important that physician-patient communication is individually adapted to the respective situation and patient, depending on what the situation requires [41]. When physicians have sound communication strategies, a significant correlation can be established between patient adherence and physician communication skills. This means that patients react more adherent in their therapy if they understand, with the physician's help, why treatment is important or not indicated [42]. Effective communication between physicians and patients paves the way for the best possible health

outcomes. This involves an open and honest physician-patient conversation, wherein feelings are discussed and patients receive all the information they need to take a decision about their treatment together with the physician [42, 43]. More importance should be placed on strategies that have been used only occasionally, such as unsettling the patient if he unnecessarily insists on an antibiotic, or on educative approaches physicians might use in individual situations. Furthermore, it would be possible to have a more detailed look at the BCT taxonomy. There are further strategies for behavioral change that could be used by physicians to make patients aware that antibiotic prescription is not necessary and to emphasize the risk of antibiotic resistance. This includes the BCT category "salience of consequences", which in this case clarifies the danger of resistances to the patients. In the strategy "behavioral experiments", physicians should give evidence-based advice instead of prescribing an antibiotic directly. They should examine how their patients react to it and whether they accept this approach well or do not understand it. The strategy "exposure" aims at confronting the patient with a feared stimulus, in this case the danger that the patient himself could become immune to various antibiotics. A final and simple BCT strategy is "identification of self as a role model", in which patients are educated about the topic in a way that they could act as role models other potential patients and for their social environment and know and share the correct use of antibiotics [24].

Strengths and limitations of the study One strength of the present study is that it was conducted as part of a large pragmatic randomized trial. 193 practices from 14 primary care networks in Germany participated in this study, 27 physicians of those practices were interviewed. Data analysis was conducted with the help of the established TICD framework and extended by the BCT taxonomy. The use of framework analysis enables the comparability of results from qualitative studies and increases the quality of the analysis [44-47]. Data analysis and interpretation was discussed with the ARena research team and thus different opinions and perspectives could be included. The analysis of the data with the help of the TICD framework formed a suitable framework. However, it did not specify all relevant issues so we added categories on the basis of inductive analysis of the interviews. It is possible that a selection bias is present because the participants of the interviews were not randomly selected; instead, interested physicians participated voluntarily. Potentially, they were physicians to whom the topic of antibiotic resistance was important already, and who generally had low prescription rates. In this study sample, no differences could be found between the various specialist groups involved or due to membership in the respective primary care network. This was to be assumed, since specialists are often visited only at an advanced stage of a disease, whereas general practitioners are usually the first point of contact. Physicians thus meet patients with illnesses at different stages and hence possibly also with different expectations [48]. It would also be relevant to explore the patients' perspective with regard to the way in which their expectations are dealt with in terms of antibiotic prescription.

Implications for practice, policy and research The results indicate that all identified strategies are based on physician-patient communication. This should be taken into further research, as intermediate outcomes such as trust or adherence can be achieved through communication, which in turn can be associated with better health outcomes [43, 49]. The BCT taxonomy provides an overview of 93 behavioral change strategies, 7 of which have been identified in this study. For future interventions to improve physician-patient communication on acute, non-complicated infections, the BCT taxonomy could serve as a basis for further behavioral strategies that could be tested by physicians. The 7 BCT strategies

already used by physicians as well as the additional strategies found in the taxonomy could serve this purpose.

Conclusions

This study reveals that physicians use different strategies to deal with patient expectations regarding antibiotic treatment for acute, non-complicated infections. These strategies have in common that physician-patient communication is the underlying approach. Various international studies have called for appropriate communication strategies in dealing with patient expectations. Further research can be based on the results of this study which suggest that currently few strategies of BCT taxonomy are used by physicians. However, these may be helpful in dealing with patients regarding the prescription of antibiotics which could be tested in future intervention studies.

Abbreviations

aQua	Institute for Applied Quality Improvement and Research in Health Care
ARena	Sustainable Reduction of antibiotic-induced antimicrobial resistance
BCT	Behavior Change Technique
DP	Delayed Prescribing
PH	Physician
SDM	Shared Decision Making
TICD	Tailored Implementation in Chronic Diseases
WHO	World Health Organization

Declarations

Acknowledgements

We would like to thank all participating interview partners of this study and the aQua Institute, which supported recruitment of the participating physicians.

Availability of data and materials

All data generated and analyzed during this study are not publicly available since the information and consent procedure does not facilitate secondary use of the data.

Authors' contributions

MK, RPD and AS conducted the interviews for this study. The data analysis method was developed by AS and designed together with MK and MW. AS carried out the data analysis and results and wrote this paper independently, in consultation with MK, MW, RPD and KG who all contributed to the revision of the original draft. All authors read and approved the manuscript.

AS – Anna Stürmlinger

MK – Martina Kamradt

MW – Michel Wensing

RPD – Regina Poss-Doering

KG – Katharina Glassen

Competing Interests

The authors declare that they have no competing interests.

Funding

The Federal Joint Committee (G-BA), Innovation Fund, (funding code 01NVF16008) funded the ARena study. The funder had no role in the design, data collection, data analysis, interpretation or writing of the paper. We acknowledge financial support by Deutsche Forschungsgemeinschaft within the funding programme Open Access Publishing, by the Baden-Württemberg Ministry of Science, Research and the Arts and by Ruprecht-Karls-Universität Heidelberg.

Ethics approval and consent to participate

The ARena study has received ethical approval by the ethics committee of the Medical Faculty of the University of Heidelberg (ref. number S-353/2017) as well as the ethics committee of the Medical Association Baden-Württemberg (ref. number B-F-2017-104). Written informed consent for participation was obtained from all participants prior to conducting the interviews.

Consent for publication

Not applicable.

References

1. WHO: **Antimicrobial resistance: global report on surveillance**. In.: World Health Organization 2014.
2. BMG: **DART 2020 - Antibiotika-Resistenzen bekämpfen zum Wohl von Mensch und Tier**. In., vol. 1. Berlin: Bundesministerium für Gesundheit; 2015.
3. Bundesamt für Verbraucherschutz und Lebensmittelsicherheit, Chemotherapie P-E-Gfr: **GERMAP 2015 – Bericht über den Antibiotikaverbrauch und die Verbreitung von Antibiotikaresistenzen in der Human- und Veterinärmedizin in Deutschland**. In. Rheinbach: Antiinfectives Intelligence Gesellschaft für klinisch-mikrobiologische Forschung und Kommunikation mbH; 2016.
4. Darai G, Sonntag H: **Resistenzentwicklung**. . In: *Lexikon der Infektionskrankheiten des Menschen: Erreger, Symptome, Diagnose, Therapie und Prophylaxe. Volume 3*, edn. Edited by Darai G, Handermann M, Sonntag H, Tidona C, Zöller L. Heidelberg: Springer Berlin Heidelberg; 2009: 703-706.
5. Kraus EM, Pelzl S, Szecsenyi J, Laux G: **Antibiotic prescribing for acute lower respiratory tract infections (LRTI) - guideline adherence in the German primary care setting: An analysis of routine data**. *PloS one* 2017, **12**(3):e0174584-e0174584.
6. Kamradt M, Kaufmann-Kolle P, Andres E, Brand T, Klingenberg A, Glassen K, Poß-Doering R, Uhlmann L, Hees K, Weber D *et al*: **Sustainable reduction of antibiotic-induced antimicrobial resistance (ARena) in German ambulatory care: study protocol of a cluster randomised trial**. *Implementation science : IS* 2018, **13**(1):23-23.
7. Tonkin-Crine S, Yardley L, Little P: **Antibiotic prescribing for acute respiratory tract infections in primary care: a systematic review and meta-ethnography**. *Journal of Antimicrobial Chemotherapy* 2011, **66**(10):2215-2223.

8. Teixeira Rodrigues A, Roque F, Falcão A, Figueiras A, Herdeiro MT: **Understanding physician antibiotic prescribing behaviour: a systematic review of qualitative studies.** *International Journal of Antimicrobial Agents* 2013, **41**(3):203-212.
9. Scott JG, Cohen D, Diccico-Bloom B, Orzano AJ, Jaén CR, Crabtree BF: **Antibiotic use in acute respiratory infections and the ways patients pressure physicians for a prescription.** *Journal of Family Practice* 2001, **50**(10):853-858.
10. Kotwani A, Wattal C, Katewa S, Joshi PC, Holloway K: **Factors influencing primary care physicians to prescribe antibiotics in Delhi India.** *Family Practice* 2010, **27**(6):684-690.
11. Petursson P: **GPs' reasons for "non-pharmacological" prescribing of antibiotics A phenomenological study.** *Scandinavian Journal of Primary Health Care* 2005, **23**(2):120-125.
12. Bensing J: **Bridging the gap.: The separate worlds of evidence-based medicine and patient-centered medicine.** *Patient Education and Counseling* 2000, **39**(1):17-25.
13. Pluut B: **Differences that matter: developing critical insights into discourses of patient-centeredness.** *Medicine, health care, and philosophy* 2016, **19**(4):501-515.
14. Rose M, Jochim J: **Antibiotika-Therapie bei Kindern in kinder- und jugendärztlichen Praxen.** *Hessisches Ärzteblatt* 2010(10):544-548.
15. Ryves R, Eyles C, Moore M, McDermott L, Little P, Leydon GM: **Understanding the delayed prescribing of antibiotics for respiratory tract infection in primary care: a qualitative analysis.** *BMJ Open* 2016, **6**(11).
16. Altiner A, Knauf A, Moebes J, Sielk M, Wilm S: **Acute cough: a qualitative analysis of how GPs manage the consultation when patients explicitly or implicitly expect antibiotic prescriptions.** *Family Practice* 2004, **21**(5):500-506.
17. Rollnick S, Seale C, Rees M, Butler C, Kinnersley P, Anderson L: **Inside the routine general practice consultation: an observational study of consultations for sore throats.** *Family Practice* 2001, **18**(5):506-510.
18. Abbas S, Ihle P, Heymans L, Küpper-Nybelen J, Schuber I: **Unterschiede im Verschreibungsverhalten von Antibiotika bei Allgemein und Kinderärzten in Hessen.** *Dtsch Med Wochenschr* 2010, **135**(37):1792-1797.
19. Coxeter P, Del Mar CB, McGregor L, Beller EM, Hoffmann TC: **Interventions to facilitate shared decision making to address antibiotic use for acute respiratory infections in primary care.** *Cochrane Database of Systematic Reviews* 2015(11).
20. Macfarlane J, Holmes W, Macfarlane R, Britten N: **Influence of patients' expectations on antibiotic management of acute lower respiratory tract illness in general practice: questionnaire study.** *BMJ* 1997, **315**(7117):1211.
21. Gabriel J: **Praxisnetze im Wandel – Chancen und Stärken eines Versorgungsmodells.** In: *Management von Gesundheitsregionen III: Gesundheitsnetzwerke zur Optimierung der Krankenversorgung durch Kooperation und Vernetzung.* edn. Edited by Pfannstiel MA, Focke A, Mehlich H. Wiesbaden: Springer Fachmedien Wiesbaden; 2017: 13-24.

22. Salmon P, Young B: **Qualitative methods can test and challenge what we think we know about clinical communication if they are not too constrained by methodological.** *Patient Education and Counseling* 2018, **101**(9):1515-1517.
23. Flottorp SA, Oxman AD, Krause J, Musila NR, Wensing M, Godycki-Cwirko M, Baker R, Eccles MP: **A checklist for identifying determinants of practice: A systematic review and synthesis of frameworks and taxonomies of factors that prevent or enable improvements in healthcare professional practice.** *Implementation Science* 2013, **8**(1):35.
24. Michie S, Richardson M, Johnston M, Abraham C, Francis J, Hardeman W, Eccles MP, Cane J, Wood CE: **The Behavior Change Technique Taxonomy (v1) of 93 Hierarchically Clustered Techniques: Building an International Consensus for the Reporting of Behavior Change Interventions.** *Annals of Behavioral Medicine* 2013, **46**(1):81-95.
25. Cabral C, Horwood J, Hay AD, Lucas PJ: **How communication affects prescription decisions in consultations for acute illness in children: a systematic review and meta-ethnography.** *BMC Family Practice* 2014, **15**:63-63.
26. Faber M, Heckenbach K, Velasco E, Eckmanns T: **Antibiotics for the common cold: expectations of Germany's general population.** *Euro Surveill* 2010, **15**(35):1-7.
27. Altiner A, Brockmann S, Sielk M, Wilm S, Wegscheider K, Abholz H-H: **Reducing antibiotic prescriptions for acute cough by motivating GPs to change their attitudes to communication and empowering patients: a cluster-randomized intervention study.** *Journal of Antimicrobial Chemotherapy* 2007, **60**(3):638-644.
28. Tonkin-Crine S, Yardley L, Coenen S, Fernandez-Vandellos P, Krawczyk J, Touboul P, Verheij T, Little P: **GPs' views in five European countries of interventions to promote prudent antibiotic use.** *The British journal of general practice : the journal of the Royal College of General Practitioners* 2011, **61**(586):e252-e261.
29. Spurling GKP, Del Mar CB, Dooley L, Foxlee R, Farley R: **Delayed antibiotic prescriptions for respiratory infections.** *Cochrane Database of Systematic Reviews* 2017(9).
30. Høye S, Frich J, Lindbæk M: **Delayed prescribing for upper respiratory tract infections: a qualitative study of GPs' views and experiences.** *The British journal of general practice : the journal of the Royal College of General Practitioners* 2010, **60**(581):907-912.
31. O'Connor R, O'Doherty J, O'Regan A, Dunne C: **Antibiotic use for acute respiratory tract infections (ARTI) in primary care; what factors affect prescribing and why is it important? A narrative review.** *Irish Journal of Medical Science (1971 -)* 2018, **187**(4):969-986.
32. Gaarslev C, Yee M, Chan G, Fletcher-Lartey S, Khan R: **A mixed methods study to understand patient expectations for antibiotics for an upper respiratory tract infection.** *Antimicrobial Resistance & Infection Control* 2016, **5**(1):39.
33. Cabral C, Ingram J, Lucas PJ, Redmond NM, Kai J, Hay AD, Horwood J: **Influence of Clinical Communication on Parents' Antibiotic Expectations for Children With Respiratory Tract Infections.** *Annals of Family Medicine* 2016, **14**(2):141-147.

34. Butler CC, Rollnick S, Pill R, Maggs-Rapport F, Stott N: **Understanding the culture of prescribing: qualitative study of general practitioners and patients; perceptions of antibiotics for sore throats.** *BMJ* 1998, **317**(7159):637.
35. Brookes-Howell L, Elwyn G, Hood K, Wood F, Cooper L, Goossens H, Ieven M, Butler CC: **'The Body Gets Used to Them': Patients' Interpretations of Antibiotic Resistance and the Implications for Containment Strategies.** *Journal of General Internal Medicine* 2012, **27**(7):766-772.
36. Al-Homaidan HT, Barrimah IE: **Physicians' knowledge, expectations, and practice regarding antibiotic use in primary health care.** *International Journal of Health Sciences* 2018, **12**(3):18-24.
37. Fletcher-Lartey S, Yee M, Gaarslev C, Khan R: **Why do general practitioners prescribe antibiotics for upper respiratory tract infections to meet patient expectations: a mixed methods study.** *BMJ Open* 2016, **6**(10):e012244.
38. Bakhit M, Del Mar C, Gibson E, Hoffmann T: **Shared decision making and antibiotic benefit-harm conversations: an observational study of consultations between general practitioners and patients with acute respiratory infections.** *BMC Family Practice* 2018, **19**(1):165.
39. Tonkin-Crine SKG, Tan PS, van Hecke O, Wang K, Roberts NW, McCullough A, Hansen MP, Butler CC, Del Mar CB: **Clinician-targeted interventions to influence antibiotic prescribing behaviour for acute respiratory infections in primary care: an overview of systematic reviews.** *Cochrane Database of Systematic Reviews* 2017(9).
40. Coenen S, Francis N, Kelly M, Hood K, Nuttall J, Little P, Verheij TJM, Melbye H, Goossens H, Butler CC *et al.*: **Are Patient Views about Antibiotics Related to Clinician Perceptions, Management and Outcome? A Multi-Country Study in Outpatients with Acute Cough.** *PLoS ONE* 2013, **8**(10):e76691.
41. Ishikawa H, Hashimoto H, Kiuchi T: **The evolving concept of "patient-centeredness" in patient-physician communication research.** *Social Science & Medicine* 2013, **96**:147-153.
42. Haskard Zolnieriek KB, DiMatteo MR: **Physician Communication and Patient Adherence to Treatment: A Meta-analysis.** *Medical care* 2009, **47**(8):826-834.
43. Street RL, Jr., Makoul G, Arora NK, Epstein RM: **How does communication heal? Pathways linking clinician-patient communication to health outcomes.** *Patient Education and Counseling* 2009, **74**(3):295-301.
44. Ward DJ, Furber C, Tierney S, Swallow V: **Using Framework Analysis in nursing research: a worked example.** *Journal of Advanced Nursing* 2013, **69**(11):2423-2431.
45. Dixon-Woods M: **Using framework-based synthesis for conducting reviews of qualitative studies.** *BMC Medicine* 2011, **9**(1):39.
46. Dunger C, Schnell MW: **Was ist die Framework Analysis?** In: *30 Gedanken zum Tod: Die Methode der Framework Analysis.* edn. Edited by Schnell MW, Schulz-Quach C, Dunger C. Wiesbaden: Springer Fachmedien Wiesbaden; 2018: 27-39.
47. Ritchie J, Lewis J: **Qualitative Research practice: a guide for social science students and researchers.** London: Sage; 2003.
48. Riedl B, Peter W: **Basiswissen Allgemeinmedizin.** Berlin, Heidelberg: Springer Berlin Heidelberg; 2017.

49. Little P, Stuart B, Francis N, Douglas E, Tonkin-Crine S, Anthierens S, Cals JWL, Melbye H, Santer M, Moore M *et al*: **Effects of internet-based training on antibiotic prescribing rates for acute respiratory-tract infections: a multinational, cluster, randomised, factorial, controlled trial.** *The Lancet* 2013, **382**(9899):1175-1182.

Figures

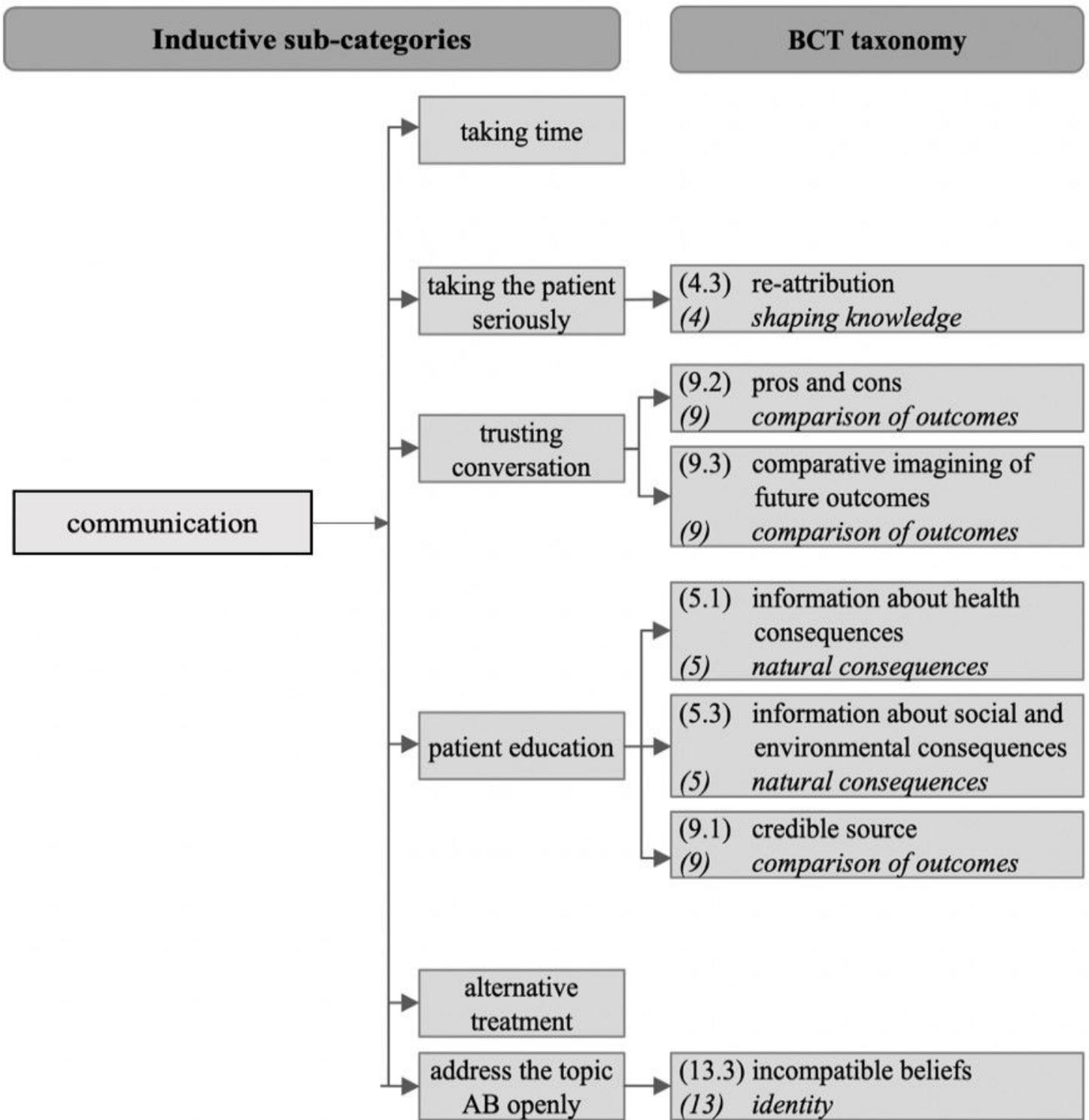


Figure 1

Category system of the data analysis

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Dealingwithadditionalfile1.docx](#)
- [Dealingwithadditionalfile3.docx](#)
- [Dealingwithadditionalfile2.docx](#)