Antibiotics for coughing in general practice: a qualitative decision analysis
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**Background.** In family practice, medical decisions are prompted most often by complaints about coughing. There is no single yardstick for the differential diagnosis of respiratory tract infections (RTIs). In 80% of cases, the excessive use of antibiotics in the treatment of RTIs is caused by the prescription behaviour of GPs.

**Objective.** Our aim was to explicate GPs’ diagnostic (and therapeutic) decisions regarding adult patients who consult them with complaints about coughing, and to investigate what determines decision making.

**Methods.** Exploratory, descriptive focus groups were held with GPs. Hypotheses were generated on the basis of ‘qualitative content analysis’.

**Results.** Twenty-four GPs participated in four semi-structured group discussions. In order to differentiate RTIs from other possible diagnoses, less likely diagnoses were not ruled out explicitly. In the case of suspected RTI, there was a low degree of certainty in the differentiation between RTIs (e.g. between bronchitis and pneumonia). Clinical signs and symptoms, which determine the probability of disease, often left GPs with reasonable diagnostic doubt. In the end, the decision whether or not to prescribe antibiotics was taken. GPs’ prescription behaviour was also determined by doctor- and patient-related factors (e.g. having missed pneumonia once, patient expectations). The ‘chagrin factor’ explains why these factors lead to a shift in the action threshold, in favour of antibiotics.

**Conclusion.** This inductive research method enabled the generation of meaningful hypotheses regarding the complex decision processes pursued by GPs. The authors are developing an educational intervention that builds on these findings, focusing on the prescribing decision.

**Keywords.** Antibiotics, family practice, focus groups, medical decision making, respiratory tract infections.

Introduction

Medical decision analysis regarding respiratory tract infections (RTIs) focuses mainly on the differential diagnosis between viral and bacterial RTIs, between upper and lower RTIs and between different clinical syndromes such as bronchitis and pneumonia. Establishing the appropriate treatment is linked directly to the diagnosis of RTIs. However, researchers such as Melbye et al. have recognized that there is no single yardstick for these diagnoses. Thus, it may be questioned whether GPs can work in this way in actual practice.

More than 80% of the excessive use of antibiotics in RTIs is caused by GPs’ prescription behaviour. This not only results in a medicalizing effect, but also has enormous financial implications and contributes significantly to an increase in bacterial resistance.

In general practice, complaints about coughing very often constitute the starting point of medical decision making regarding RTIs. Therefore, this study examines the diagnostic decisions of GPs based on complaints about coughing by adult patients. The determinants of these decisions were derived from an exploratory, descriptive focus group investigation.
Methods

In order to generate a discussion of the topic among GPs on the basis of their own experience, a focus group investigation was set up.\(^7\) This research method generates the rich details of complex experiences and the reasoning behind actions, beliefs, perceptions and attitudes of people.

By means of snowball sampling,\(^8\) 139 GPs from the Antwerp area in Belgium were recruited. They were contacted by telephone in order to find out whether they would be willing to participate. Eventually, a purposeful sample of 60 GPs were invited to the university campus in order to collect the determinants from a broad spectrum of GPs, in terms of sex, general practice experience as well as university of graduation, instead of just from a representative sample.

The number of focus groups was determined by content saturation, i.e. the moment at which answers to the questions provided did not contain any new elements. For the purpose of flexibility, six focus groups were put forth, but in the end four groups proved sufficient. For each focus group, a maximum of 12 GPs received a written invitation in order to ensure the participation of 4–8 GPs.

In order not to hinder the free exchange of views, the composition of the groups was homogeneous in terms of sex as well as general practice experience (Table 1). Each group also had a moderator (IH) and an observer (SC).

Each semi-structured discussion was guided by the moderator, lasted 90 minutes and centred on the following questions:

1. You are consulted by one of your adult patients who complains about coughing. Which diagnoses come to mind?
2. How do you differentiate between the various possibilities in your patient?
3. You suspect an infection of the respiratory tract. Do you differentiate in any way? Which distinctions do you make?
4. How do you differentiate between the various possibilities in your patient?

Non-verbal information regarding the discussion was logged by the observer on a specially designed scoring sheet\(^9,10\) and afterwards the observer conferred with the moderator. She, a psychologist, was familiar with the principles of general practice medical decision making.\(^11\)

The recordings were transcribed and subsequently analysed by two researchers (i.e. SC and EV) independently and in accordance with the principles of ‘qualitative content analysis’.\(^12\) All codes with their labels and definitions and the transcriptions were imported into QSR NUD*IST software for computerized analysis.\(^13\)

Interpretation of the coded texts enabled a classification of the codes and the establishment of relationships between the various codes or categories. This resulted in hypotheses on GPs’ decision making regarding complaints about coughing.

Results

In March 1998, four focus groups met in which 24 of the 48 invited GPs participated. The only excuse given for not participating was lack of time. The participants did not differ from those who declined in terms of age, sex and university of graduation (Table 1).

The interpretation of the coded texts enabled a classification of the codes. The categories to which the
most relevant codes for determinants were assigned are: epidemiology, prior knowledge, history, clinical examination, and doctor- and patient-related factors.

The process of generating hypotheses based on the relationship between these categories and the GPs’ decisions is illustrated by representative answers to the four key questions (Table 2).

**Possible diagnoses for adult patients with complaints about coughing**

Independently of prior knowledge of the patient, the first answer and diagnoses that came to mind was RTI in all focus groups (Table 2: text 1). Other possible hypotheses which emerged in all focus groups were obstructive lung diseases (COPD and asthma), allergy, (gastro-oesophageal) reflux, cardiac decompensation, pulmonary oedema, smoking and other irritations, side effects of angiotensin-converting enzyme inhibitors and tumours. Other hypotheses mentioned in three of the focus groups were psychogenic cough, pulmonary embolism and foreign body. These diagnoses were made based on prior knowledge of the patient (Table 2:2).

**Decision making in complaints about coughing**

In cases where these GPs had reason to suspect hypotheses other than infectious coughing, they had been able to check these hypotheses, but the questions asked were far from routine questions. The GPs believed that infectious coughing had the highest probability (Table 2:1) and, as a result, they ask routine questions to confirm this hypothesis (Table 2:3). GPs stated that they were better able to confirm certain hypotheses than to rule them out explicitly (Table 2:4).

**Possible diagnoses and decision making regarding complaints about coughing and suspected RTI**

In all focus groups, GPs made a distinction between upper and lower RTIs, viral and bacterial RTIs, chronic and acute RTIs, and between different clinical syndromes (e.g. bronchitis and pneumonia). In the analysis of the different texts coded as determinants, a distinction was made between those determining the probability of a particular condition, e.g. clinical signs and symptoms, and those only influencing the action thresholds, i.e. Pauker’s ‘Testing’ and ‘Test-treatment’ thresholds.

**Determining the probability.** GPs tried to make a distinction between the different types of RTIs on the basis of medical history and clinical examination, e.g. sputum colour (Table 2:5). Furthermore, it was argued that this can only lead to a suspected distinction between viral and bacterial RTIs, while it is difficult to distinguish between bronchitis and pneumonia (Table 2:6). The value or feasibility of technical investigations such as blood analysis, sputum examination (Table 2:5) or medical imaging was questioned.

**Determining the action thresholds.** Other determinants also play a role, such as patients’ expectations, time pressure during consultation or fear of losing patients (Table 2:7). A distinction can be made between patient-related (for instance the patient’s willingness to take medicines) and GP-related factors (for instance recent experiences) (Table 2:8 and 9). These factors are determinants of the decision whether or not to prescribe antibiotics (Table 2:7 and 8). GPs suggested that in the end they make this (therapeutic) decision in complaints about coughing and suspected RTI (Table 2:10).

Eventually the decision-making process is related to GPs’ diagnostic (un)certainty. Pain in the trachea for instance was regarded as a sure diagnosis of tracheïtis, and this argument provided certainty as to whether or not to prescribe antibiotics (Table 2:11). In the case of bronchitis, however, GPs were less certain of the diagnosis (Table 2:6), which caused uncertainty in prescription behaviour, and in a number of cases antibiotics were prescribed unnecessarily (Table 2:14). Such a decision in favour of antibiotics can be explained by qualitative decision analysis: prescribing antibiotics unnecessarily is considered less inappropriate (Table 2:13), i.e. caused GPs less chagrin, than inappropriately not prescribing antibiotics (Table 2:14).

From the above, it can be concluded that the decision to prescribe antibiotics is better explained by both types of determinants than by conventional diagnostic groups of RTIs. However, GPs explain this prescribing decision to the patient by referring to the diagnosis (Table 2:15).

In light of this interpretation of the texts, hypotheses were generated which constitute the actual results of this kind of investigation (Table 3).

**Discussion**

Qualitative research in general and focus group research in particular is not used often in medical research, where there is a clear preference for randomized controlled trials. Clinical researchers have a problem with the fact that qualitative methods replace testing hypotheses by generating hypotheses, that measurements are replaced by explanations and generalizations by interpretations.

The creation of an evidence-based medical culture will depend, however, on contributions from both quantitative and qualitative traditions. Qualitative methods allow the examination of areas inaccessible to quantitative methods. They are more suited to understanding complex topics than to showing their relevance. As a result, these methods are very useful to investigate medical decision making by exploring the explained as well as the implicit routines and rules adhered to by GPs. Focus group research yields data more quickly than participant observation. The interaction during discussions affords a better insight into the development of knowledge and ideas than in-depth interviews.
1. A: . . . The first thing that comes to mind is a common, simple, ordinary infection of the upper or lower respiratory tract.

2. MO: Is that all you think of when someone complains about coughing? Is there anything else?
K: No, I don’t think all these things come to mind; it rather depends on the person that comes in.

3. P: Consider whether there is an atopic constitution, in the family or whether they have a history of hay fever, asthma or eczema.
   [Several participants agree]
   MO: Do you always ask these questions or . . . ?
   P: No, it is directed you know, if your intuition . . . if you have a feeling, then you will ask questions about it, definitely not routine questions.
   MO: Which are the routine questions you ask a patient with complaints about coughing—an adult patient?
   P: How long have you had this cough? Do you cough up something, is it a dry cough, is it a cough that is productive? Are there any other symptoms, such as a fever?

4. MO: How do you know that it is not, that it is not asthma.
R: That it is not? [Laughter]
MO: Yes, I always say . . .
R: If, for example, the complaint is infectious, yes, then it can still be asthma but that is not your first diagnosis, you know. Yes, on the whole I can tell when it is asthma.

5. W: If you read about it, or hear about it, you can’t tell in advance that green is bacterial and white is viral, although you get the impression in general practice that it is possible to say this.
   P: This is a rough division you make, because as a general practitioner you don’t have the possibility to say “could you spit in this pot please” and I don’t immediately have a culture, so you have to use the means which you have at your disposal and otherwise, yes. You are somewhat limited.
   G: But if there are coloured sputa, you’re going to take it seriously?
   P: That is for instance a stronger argument than fever of course, for me at least [agreement].

6. MO: But can you tell the difference between bacterial or whether it is a virus? [Several participants shake their heads]
MO: This is not possible?
K: Only suspect, you know.
MO: Is there always a clear difference between bronchitis and pneumonia? [Several participants: no.]
A: No, this involves a bit of guesswork.

7. S: Often also things patients say, “Oh, with me it sinks very quickly [K agrees: yes].
   S: Or “I always take antibiotics” or “My other general practitioner prescribed antibiotics and it works well”. Then you already know, well, if I don’t prescribe antibiotics, then he will call back within 2 days.
   N: Or never again.

8. E: Nowadays, there are also adults who say “give me an antibiotic because I have to work”.
   K: You are not going to prescribe antibiotics, are you?
   E: And probably also a bit [depending] on your experience in the period before. For instance, I once missed pneumonia. Then you realise, you are not going to wait for those 3 weeks anymore, but more rapidly [agreement] and then it eases off again.

9. P: . . . Usually you have to say, I’m going to start something [antibiotics] here or I’m not going to start anything. You can’t say, I’m going to wait until something is cultured, because this will take 3 days. So, you have to rely on something in order to possibly start something. Well, this is not only the colour of the sputa, but a number of elements taken together which will push you across a certain threshold whether or not to prescribe antibiotics.

10. P: . . . And tracheitis, then the pain is situated low in the neck, right here, above the windpipe.
    MO: Yes.
    P: These are welcome diagnoses?
    G: If they tell you this, you are really satisfied.
    P: Yes. In such a complaint you are certain that you don’t have to prescribe antibiotics and it will be all right.

11. P: You don’t know this in bronchitis, you know. And you will conclude more easily that you have to prescribe something here. This is what I meant earlier when I said that antibiotics are frequently prescribed when not really necessary.
12. W: If it is bacterial, you have to prescribe antibiotics, if it is viral it doesn’t really matter whether you prescribe them or not.
   K: Eventually, you give . . . too much.

13. M: Yes, they blame you, yes. You are blamed for not prescribing antibiotics when necessary. I heard a colleague of mine saying: “I regret a couple of things, that is that I did not prescribe antibiotics, it was at a lecture . . . Someone from the emergency unit said that we prescribed far too many antibiotics. Yet, try not prescribing antibiotics and then having to find out afterwards that there was something.

14. K: We try to differentiate. We are already satisfied if we can establish the difference between bacterial and viral. Several participants agree.
   M: We explain why we don’t prescribe antibiotics.
   K agrees: Explain why we don’t. But to differentiate between all these different viruses, personally, I can’t do that.
The first diagnosis that comes to a GP’s mind is respiratory tract infection (RTI). This diagnosis is reached independently of the patient. Other hypotheses emerge only if they are considered plausible as a result of prior knowledge of the patient.

GPs ask routine questions to confirm only the most likely diagnoses. Explicitly ruling out other diagnoses is used less often in decision making.

In suspected RTI, GPs want to make a distinction between clinical syndromes such as bronchitis and pneumonia, viral and bacterial RTI and upper and lower RTI. This cannot be achieved with certainty on the basis of medical history and clinical examination. Dealing with diagnostic uncertainty, GPs’ decisions are directed at whether or not to prescribe antibiotics.

For this (therapeutic) decision, doctor- and patient-related factors also play a role. These factors give rise to a shift in the action thresholds in favour of antibiotics, a phenomenon explained by the ‘chagrin factor’. The decision to prescribe antibiotics is better explained by both types of determinants than by the conventional diagnostic groups of RTIs.

The weakness of qualitative research concerns bias and generalization. Compared with quantitative research, the methods are more valid but less reliable. In order to ensure the trustworthiness of the results, the data were analysed by two researchers, who worked blind and independently of each other. This made it possible to reach a consensus about the code book and the assignment of codes to the texts. Furthermore, the hypotheses are supported by the data. Presenting the results orally to Flemish and European GPs and researchers, their feedback confirmed our interpretation of the texts. For this written report, only the most representative texts have been translated.

In March 1998, there was an increase in the number of consultations for acute RTIs. For some GPs, the increased workload associated with this epidemic was probably the reason for not participating. As far as the participants were concerned, however, this epidemic created suitable conditions for this survey, and yielded valid information on the complex decision-making processes by participating GPs.

Our sampling method, composition of groups and working towards saturation provided a broad range of data. Non-verbal information showed that all group members were actively involved and clearly stated their opinions and disagreements. The latter concerned the importance of determinants for the prescribing decision. After content analysis, however, the evidence for two distinct categories of determinants emerged from all focus groups.

The survey was both exploratory and descriptive. Although the results do not represent the norm, it is possible on the basis of data in the literature to design an evidence-based decision-making model, which closely relates to the GPs’ way of thinking. As a result of the selection bias and the non-statistical nature of the sample, the results cannot be generalized. Hence, the results have to be quantified formally.

In order to test the validity of the hypotheses, they were compared against results of other research methods, a process commonly referred to as triangulation. It is clear that GPs only explicitly work on diagnoses which seem plausible, while collecting fewer arguments for less evident diagnoses (Table 3: hypotheses 1 and 2). It seems as if they can only confirm diagnoses. Gatekeepers, however, are expected mainly to be good at excluding diagnoses. Indeed, GP assessment is a relatively powerful excluder in patients suffering from RTIs. This apparent contradiction may be explained by the fact that the determinants to rule out hypotheses, such as a GP’s judgement, could not be made sufficiently explicit by means of the method used (Table 2:5).

According to the participants, the differentiation between RTIs was based on a low degree of certainty (Table 3:3). In coughing and suspected RTI, GPs can only provide weak arguments for the diagnosis of RTI, e.g. pneumonia, on the basis of medical history and clinical examination. GPs question the value and/or feasibility of technical investigations such as blood or sputum analysis, or X-ray examination. According to Kassirer, aiming for diagnostic certainty results in excessive testing, whereas certainty is not a pre-condition for good therapeutic decisions. Dealing with diagnostic uncertainty is related to the therapies available. If GPs consider antibiotics highly effective and almost risk free (Table 2:15), it is logical that they will decide to use them in treatments even if there is a certain degree of uncertainty.

In the prescription of antibiotics, other factors such as patients’ expectations also play a role (Table 3:4). If there is diagnostic uncertainty, this is almost unavoidable. In addition, Butler’s research has shown that irrational prescription behaviour regarding sore throats can be explained by the desire to avoid straining the doctor–patient relationship. The organization of health care in Belgium, where there is no official relationship between doctors and patients and where doctors are paid fee-for-service, may also account for the excessive use of antibiotics. All these factors fall within Feinstein’s ‘chagrin factor’. GPs considered it less appropriate not to have prescribed antibiotics when this proved to be necessary (Table 2:18), than having prescribed antibiotics when not necessary (Table 2:17). The latter caused less ‘chagrin’ to the GPs. Thus, ‘when necessary’ does not only mean ‘necessary’ to cure patients, but also ‘necessary’ to function as adequately as possible as a GP without losing
patients as a result of unfulfilled expectations or undetected serious diseases.

Finally, our results are in line with Howie’s hypothesis: although GPs’ therapeutic decisions are normally described using a diagnostic label, in reality it is often better to view them in terms of symptoms and signs and influenced by factors (Table 3:4). A diagnosis is then formulated as a justification for a therapeutic decision (Table 2:17).

In patients with complaints about coughing, GPs need manageable arguments to select patients who may or may not benefit from antibiotics. These data have to be collected in further research and lead to answers to the following questions derived from the hypotheses:

1. Does ruling out less likely diagnoses add something to merely trying to diagnose a (certain) RTI?
2. Do GPs prescribe antibiotics to a lesser degree and more adequately when they have stronger clinical evidence to support their decisions?
3. Are diagnostic syndromes on the basis of this strong clinical evidence more manageable in general practice than classical syndromes?

So far, such clinical evidence is unavailable both for patients with coughs and for bronchitis. Meta-analyses also show that in most cases antibiotics do not offer any benefits which outweigh the possible side effects. As a result, research into a more effective use of antibiotics has to pay special attention to the doctor- and patient-related factors in the relationship and communication between GPs and patients.

The authors are developing an educational intervention that builds on these findings, aiming to reduce antibiotic use and cost, while preserving patient outcomes.

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