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STUDENT REPORT

Department of Clinical Medicine

The decision-making process in general practice of when to use antibiotics to treat acute rhinosinusitis

Master Thesis

5th semester medicine, candidate

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ABSTRACT

Purpose: The Danish primary care sector makes up most of the antibiotic prescriptions and upper respiratory tract infections (URTI), such as acute rhinosinusitis (ARS), account for a large part of it. The main purpose of the study was to explore the decision-making process of when to use antibiotics to treat patients with ARS, among general practitioners (GPs) and doctors in training (DIT) who worked in general practices.

Methods: In autumn 2023, 73 general practices were physically delivered an invitation for participation in the study. A total of 10 doctors were recruited and 9 semi-structured interviews were conducted. Systematic Text Condensation (SCT) was used to analyze data.

Results: Four analytical themes were developed: management of the patient, diagnosing the patient, treatment of the patient and future development of antibiotic resistance. Diagnosing ARS was fairly simple but distinguishing whether the infection was bacterial or viral remained challenging. C-reactive protein (CRP) was often used in the decision-making process but was not considered a completely trustworthy biomarker. Considerations when deciding to treat with antibiotics were benefits, risks, side effects, immunosuppression, comorbidity, medical history, and age. Antibiotics were rarely necessary at first but different factors could sometimes influence the decision. Patient education occasionally made it easier for the patients to understand the doctors' decisions and sometimes resulted in the patients not being interested in antibiotic treatment after all.

Conclusion: Factors such as patient expectations, insistence and doctor-patient relationship could influence the decision-making process and sometimes resulted in antibiotics being prescribed inappropriately. Developing clinical prediction rules and guidelines might help the doctors in their considerations of which patients will benefit the most from antibiotic treatment. Future research on whether CRP is appropriate to use for this group of patients may be beneficial for the doctors in general practices.

INTRODUCTION

Antimicrobial resistance (AMR) is a globally increasing problem and an important threat to global health [1]. Antibiotics are the main driver for AMR and when doctors use them to treat various infections the progressing of AMR increases and the infections become more difficult to treat ultimately leading to increased hospital stays and mortality [2]. To avoid the increasing development of AMR a reduction of antibiotic consumption is of high importance. In Denmark, the Danish primary care sector makes up approximately 90% of all antibiotic prescriptions with respiratory tract infections (RTI) and urinary tract infections accounting for the largest amount [3]. Furthermore, in 2015, a study revealed that doctors who worked in Danish general practices more commonly used antibiotics inappropiately to treat patients with URTI, primarily ARS [4]. ARS is a URTI with inflammation of the mucous membranes of the nose and paranasal sinuses and is divided into acute viral rhinosinusitis (AVRS), acute post-viral rhinosinusitis (APVR) and acute bacterial rhinosinusitis (ABRS) [5]. The diagnosis is typicaly made on the basis of clinical symptoms which include unilateral facial pain, sinus pain, purulent nasal discharge, postnasal drip, maxillary toothache, nocturnal cough, sore throat, nasal stenose, reduced sense of smell and sometimes fever [5]. Symptoms that last for less than 10 days is typically considered AVRS while increasing symptoms after 5 days or persistent symptoms after 10 days with a duration of less than 12 weeks is considered APVR [5]. Only a small proportion of the patients (0.5 – 2.0%) develop ABRS and in those cases the patients typicaly present with minimum three of the following symptoms and findings; discolored nasal discharge (with unilateral dominans) and purulent nasal secretion in cavum nasi, severe local pain (with unilateral dominans), fever, increased CRP or double sickening (worsening in the condition after temporary improvement) [5]. However, no symptoms can reliably establish or exclude the diagnosis of ARS [5]. Although ARS is generally harmless and one of the most common diagnosis in general practice, distinguishing between AVRS and ABRS has always been a clinical challenge [4, 6]. Yet, the antibiotic prescribing rate among Danish doctors was found to be more than 70% [4, 7]. Further, in the case of ABRS, antibiotics only have a limited and short-term increased symptom-relieving effect [6]. Restricted use of antibiotics to treat ARS have long been recommended and although persistent efforts are being made to reduce consumption to what is absolutely necessary the decision-making process among doctors on when to prescribe antibiotics to treat ARS remains unclear. To gain a deeper understanding of how future use of antibiotics can be reduced in general practice and thus prevent increased AMR the main purpose of this study was to explore the decision-making process among doctors working in general practice when using antibiotics to treat ARS. To

do so this study aimed to investigate how doctors working in general practices managed patients with symptoms of ARS as well as their considerations and attitudes towards the use of antibiotics in general practice to treat ARS.

METHOD

The study was designed as a qualitative interview study carried out among Danish doctors working in general practices.

SETTING

The study was conducted in Denmark where both GPs (doctors who are specialists in general medicine) and DIT (doctors who are yet to be specialists in general medicine) act as primary care providers in general practice, the front line of the Danish public healthcare system. The GPs and DIT can be accessed free of charge by the Danish citizens.

STUDY DESIGN

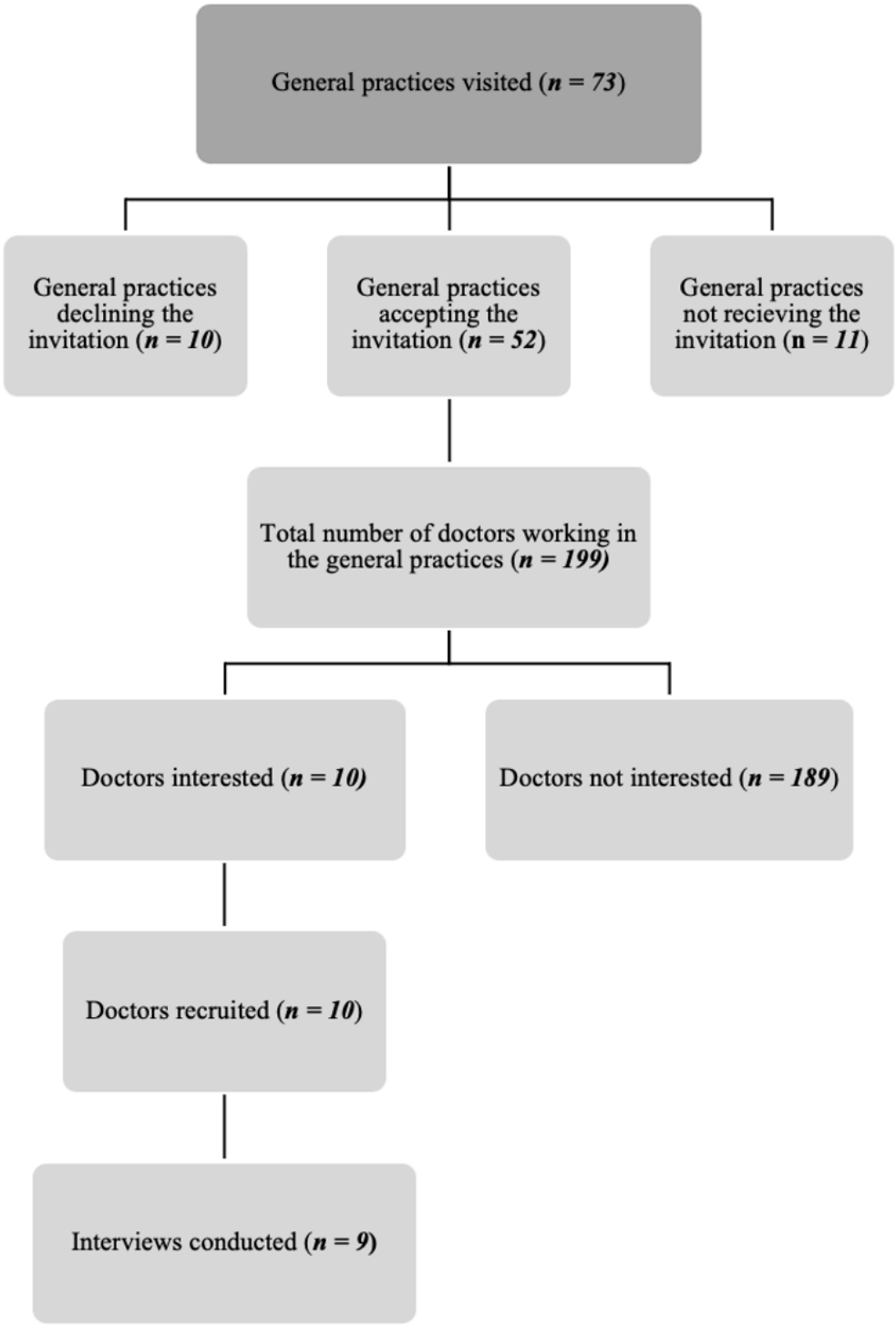
The main purpose of this study was to explore the decision-making process among doctors working in general practice when using antibiotics to treat ARS. A suitable method for this was the qualitative research method which had the potential to provide a detailed and personal insight into the subjects' practices and perceptions. Consequently, data were collected via semi-structured interviews with doctors who worked in general practices in The Capital Region of Denmark. The study followed the standards for reporting qualitative research (SRQR), which is a list of 21 items, that provide broad relevance in both framework and recommendations when reporting qualitative studies. This includes the article's title and abstract (items 1 and 2), problem formulation and research question (items 3 and 4), research design and methods of data collection and analysis (items 5 to 15), as well as results, interpretation, discussion, and integration (items 16 to 19), and other information (items 20 and 21) [8].

RECRUITMENT

Taking the concept of information power into account, it was estimated that between 5-15 doctors were needed for the study [9]. The recruitment took place in high population areas of people and general practices in Copenhagen and was based on a convenience sampling [10]. It was assessed that this could increase the number of doctors recruited for the study.

To recruit the doctors, the general practices were first located through the Danish website Sundhed.dk and then individually examined via their own website to assure practices with both GPs and DIT were included. Afterwards, planning and routes were made to locate the general practices and finally they were visited. At each visit the secretary of the practice was briefly informed about the project and interview and if accepted, an invitation with information was given and placed somewhere for the doctors to read. If the doctor wanted to participate in the interview, he or she wrote their name and email in the invitation. Exactly one week after the first visits, the general practices who accepted the invitation were visited again. If a doctor had shown interest, they were contacted the same day via email to schedule a meeting for the interview. If a doctor, for any reason, had not shown interest in the interview, the secretary was politely asked to contact the lead of the project (TVC) by email if a doctor at some later point, wished to participate. About 5-6 hours a day were spent delivering and collecting the invitations in the period 11 September – 22 September 2023 (**FIGURE 1**).

FIGURE 1: ILLUSTRATION OF THE RECRUITMENT PROCESS



General practices who declined the invitation was due to high traffic in the practice or lack of doctors. General practices who did not receive the invitation was due to either being closed or not having a secretary affiliated to the practice.

PARTICIPANTS

The study's focus on GPs and DIT management of patients with symptoms of ARS as well as considerations and attitudes towards the use of antibiotics in general practice determined the inclusion criteria for participation (**TABLE 1**). A total of 10 doctors participated in the study and 9 interviews were conducted, 1 being a group interview (**TABLE 2**).

TABLE 1: INCLUSIONS CRITERIA FOR THE RECRUITMENT

PARTICIPANTS		GENERAL PRACTICES	
Education level	GP or DIT	Location	Copenhagen
Gender	Female/Male	Type	Solo/Company
Age	25-79	Doctors	Minimum 1
Country of origin	All		
Language	Danish/English		

TABLE 2: CHARACTERISTICS OF DOCTORS AND GENERAL PRACTICES

DOCTOR	GENDER	AGE	EDUCATION LEVEL	EXPERIENCE	LOCATION	TYPE	NURSE
1	M	28	DIT	11 M	KBH	COMPANY	−
2*	F	43	GP	16 Y	KBH	SOLO	+
3*	F	34	DIT	4 Y	KBH	SOLO	+
4	M	75	GP	37 Y	KBH	COMPANY	−
5	F	29	DIT	2 Y	KBH	COMPANY	+
6	F	61	GP	30 Y	KBH	COMPANY	+
7	M	69	GP	40 Y	KBH	COMPANY	−
8	M	62	GP	35 Y	KBH	COMPANY	+
9	F	38	GP	7 Y	KBH	COMPANY	+
10	F	34	DIT	5 Y	KBH	COMPANY	−

M = Months, Y = Years, + = Nurse may see the patients with ARS, − = Only doctors see the patients
*** = Part of the group interview**

INTERVIEWS

The semi-structured interviews followed an interview guide and were conducted in the end of September and throughout October 2023. Each interview was audiotaped for later transcription. The duration of the interviews was 15-55 minutes, with an average of 30 minutes. All participants choose to have the interview take place in the general practice they worked in. Before the interview began the participants were informed that in order to protect their confidentiality all data would be pseudonymized and processed in accordance with the provisions of the GDPR. Finally, informed consent was obtained in written form from each participant before the interview was started. All interviews were conducted by TVC and throughout the interviews, open-ended questions encouraging reflexive, descriptive and lengthy answers were posed. In the development of the interview guide Svend Brinkmann's book *"Kvalitative metoder"* was used for information and inspiration. Existing literature on the subject was drawn on as well. Subsequently, the interview guide was developed in cooperation with the study's main supervisor and co-supervisors to ensure that it could answer the questions that the study wanted to investigate. The interview guide addressed several themes related specifically to the use of antibiotics in general practices: (1) management of patients with symptoms of ARS, (2) doctors' considerations towards the use of antibiotics to treat ARS and (3) doctors' attitudes towards the use of antibiotics in general.

ANALYSIS OF DATA

All transcriptions were conducted by TVC and during the stages of transcription, clear procedural guidelines were set up and followed to ensure that each transcription was as consistent as possible. STC was used to analyze the transcribed interviews and is a method for thematic cross-case analysis which can be used when working with qualitative data such as interview studies [11]. The purpose of STC is to identify patterns in the data that are interesting and important and then use them to address the research [11] (**FIGURE 2 & 3**). All steps of the analysis were managed by TVC and supervised by the main supervisor and co-supervisors. The interviews, transcriptions and analysis were conducted in Danish. Only quotes from the transcriptions were afterwards translated into English.

FIGURE 2: STEP 1 TO 4 IN STC

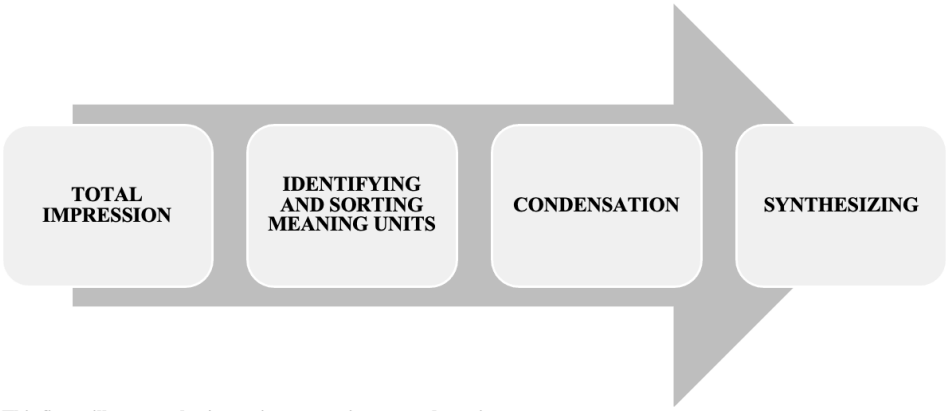
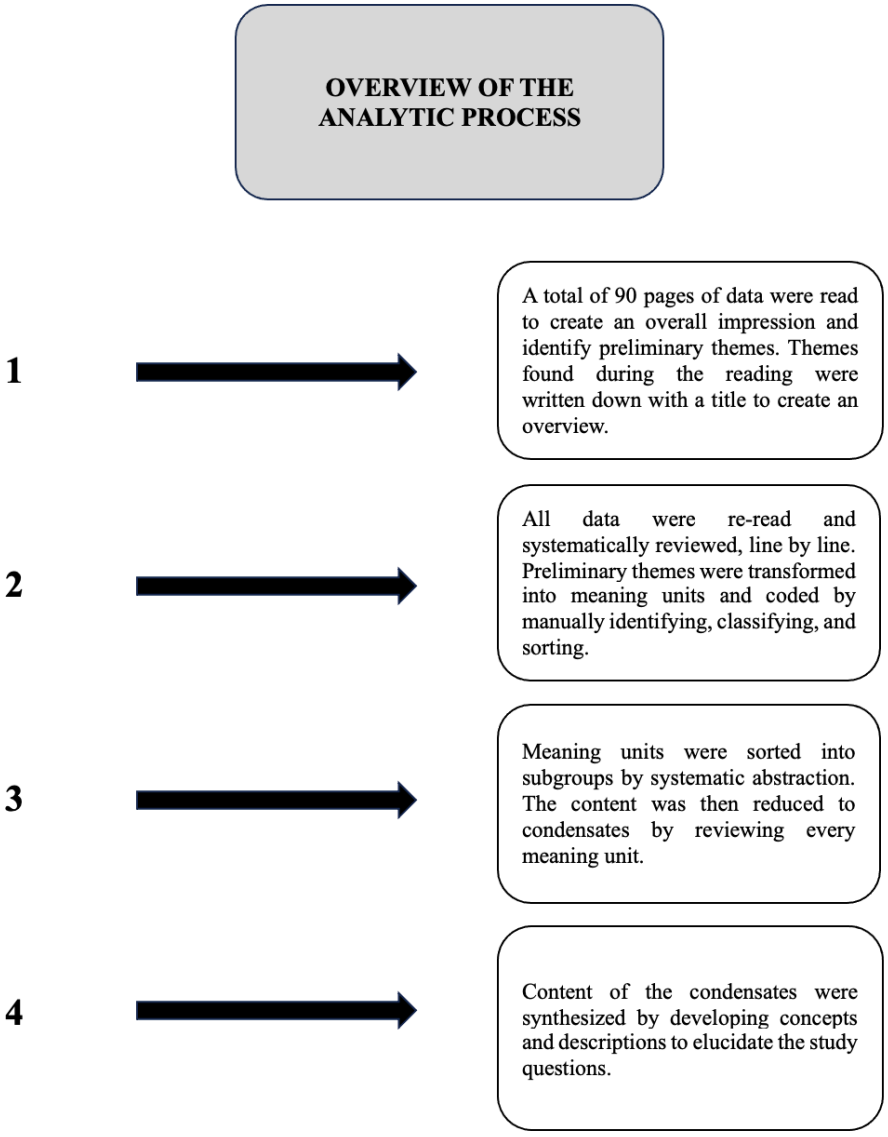


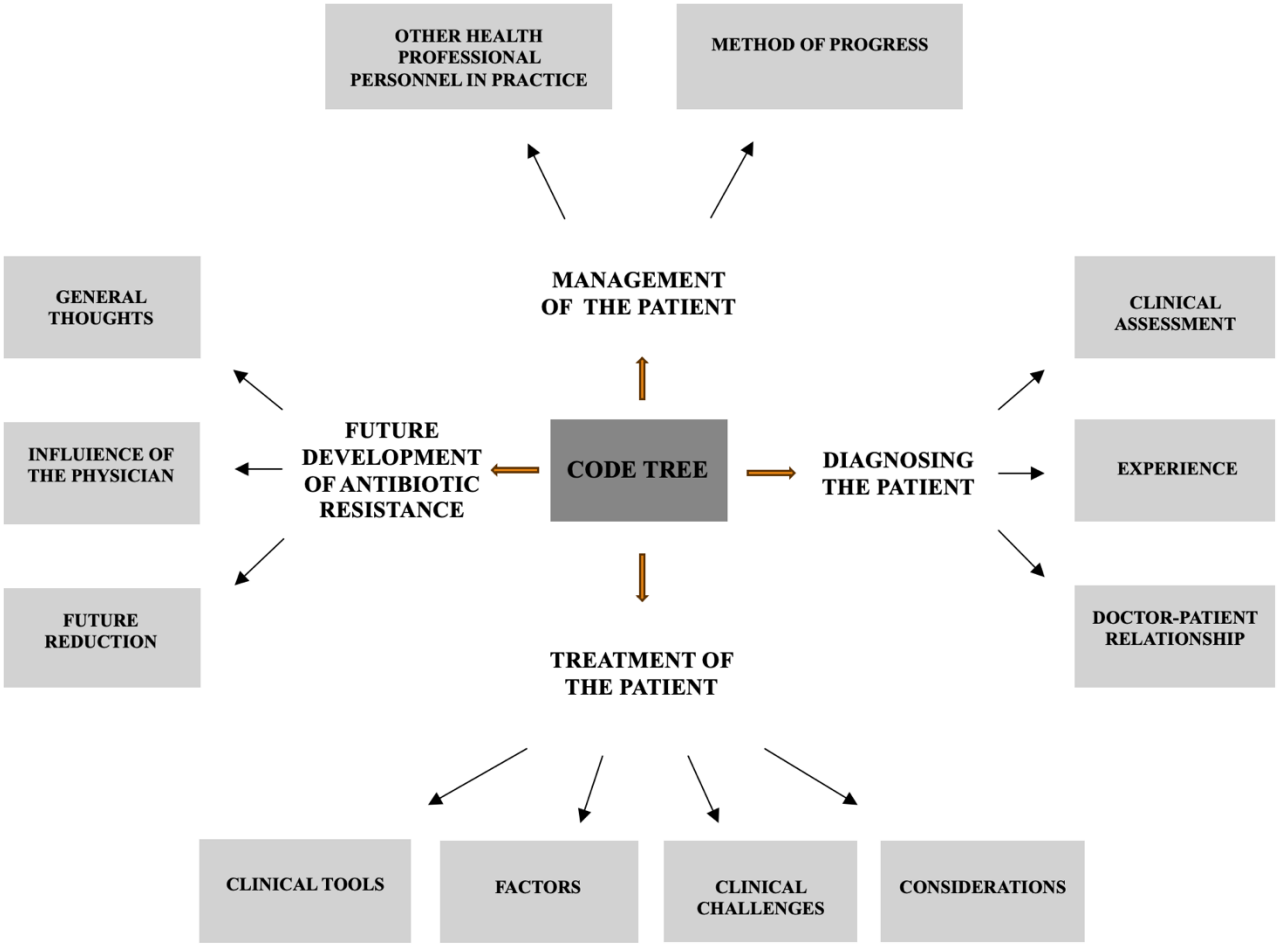
FIGURE 3: OVERVIEW OF THE ANALYTIC PROCESS



RESULTS

The analysis of data developed 4 analytical themes (**FIGURE 4**).

FIGURE 4: CODING TREE OF ANALYTICAL THEMES AND SUBGROUPS



MANAGEMENT OF THE PATIENT

The doctors clarified that the management of the patient usually began with the patient contacting their professional health care personnel, such as secretaries, nurses, or medical students, either through the phone or at the desk in the clinic. This practice staff also carried out the visitation process of the patient and not every patient would necessarily get an appointment. The doctors described their staff as skilled at assessing and guiding the patients and did not worry that the patients were being treated incorrectly. The visitation process was the same for all the practices.

"When the patients explain they have been sick for several days without improvement in their condition, an appointment within a few days is scheduled. If the condition has just occurred, it is usually sufficient for the practice staff to instruct them to take over-the-counter medicine and rest."

Some mentioned that due to time pressure and lack of doctors more specific instructions were made for their staff. The nurse carried out the entire consultation and the doctor only saw the patients if the nurse was in doubt. If confirmation on prescribing antibiotics was required, the doctor would normally just prescribe it without further assessment of the patient.

"The instruction is created by our GPs and based on what we believe is relevant to assess the patients in the best way possible. It describes the questions to ask and how to examine correctly and are not any different than the ones we use ourselves. With the instructions, we believe the nurse assess the patient just as well as the DIT."

In other practices only the doctors had consultations with the patients. This was due to the nurse not having the same education level and background as they did and clinical tools to help them diagnose the patient correctly were missing. To avoid misunderstandings the doctors felt it was easier to just see the patients themselves.

"While ARS can be fairly easy to diagnose, it can also be rather complex. Patients can present with diffuse symptoms and several differential diagnosis must be considered.

DIAGNOSING THE PATIENT

The routines and methods to diagnose the patients varied between the doctors. Most of the GPs said they had created their own methods to assess the patients because they felt it was easier to do it the same for each consultation.

"Creating routines for your patients makes the job easier but most importantly, it makes you feel confident that you have not overlooked something afterwards. I believe it benefits both the patient and I, even if it means slightly more examinations than are necessary for the symptoms the patient is presenting with."

However, some also said they had created their own methods naturally through their level of experience but not planned it to be that way.

"Setting the diagnose does not take me very long. I have seen these patients so many times and I know exactly what to do. That is also why the method of progress always ends up being the same, whether I have it on a piece of paper or not."

The DIT felt their lack of experience forced them to use guidelines and said they used them before the consultation to make sure they knew how to assess the patient correctly.

"*In general practice we meet patients who present with nothing and everything. Patients who seem simple to assess are often the ones who are more complex and vice versa."*

The doctor-patient relationship was also something that especially the more experienced GPs spoke about. Because they already knew their medical history, these patients rarely required a full anamnesis and examination which was in complete contrast to the newcomers who both the GPs and DIT agreed required a full anamnesis, inspection, and examination to diagnose correctly.

"*When it is the same patients you see, the job as a doctor becomes simpler. The conversation is continued from consultation to consultation. You get to know them and sometimes their family. You know their medical history and you know their expectations. They trust your decisions. With new patients you have to build everything from the beginning."*

During the anamnesis, information about allergies, previous cases of sinusitis and recent RTI was important. The symptoms of interest varied but particularly headache, purulent nasal discharge, postnasal drip, coughing, nasal stenose and fever were mentioned. Inspecting the patients' general condition to get an indication of the severity was also necessary. When examining the patient all doctors considered it to be standard to confirm pain by palpating the sinuses and ask the patient to bend their head forward. Common for all was the confidence about the diagnosis if the patient had just experienced a URTI and now presented with clinical symptoms and findings, such as facial pain, headache and postnasal drip, sinus pain and pain when bending their head forward.

"Patients respond differently to being sick and the symptoms they present with may vary. You cannot make the diagnosis on one finding alone. You must put everything together and consider carefully."

Uncertainty about the diagnose usually only occurred if the patient came to consultation early and the symptoms were mild and diffuse. In those situations the doctors would normally just send the patient home with some advice and tell them to come back if their condition persisted or worsened. Patients not responding to treatment and continuing to get worse could also cause doubt and usually resulted in a referral to a specialist in otorhinolaryngology.

"As a doctor you should never feel completely convinced but leaning towards a diagnosis and stick with it until you are proven differently is okay and something that happens daily."

TREATMENT OF THE PATIENT

Distinguishing between AVRS and ABRS was the greatest challenge among the doctors. Lack of diagnostic tools available in general practice made it difficult to decide whether antibiotic treatment should be started or not.

"*When the patients complain about a sore throat, we can do a Strep-A-Test, but with ARS it is different. You cannot just do an inoculation or CT of the patient and then it becomes a clinical diagnosis we must make."*

While CRP was often used in the decision-making progress, the cut-off limit (11-60 mg/L) and opinions among the doctors differed. Some found it to be a reasonably clinical tool to distinguish between the infections. Others felt it was not very reliable and mainly used it to calm the patient and as an argument for why treatment was not necessary. Though, all doctors agreed that it was not a completely trustworthy biomarker for distinguishing between AVRS and ABRS.

"*I have seen patients with CRPs below 5 who still had ABRS. If the symptoms and findings correlate with ABRS the CRP becomes irrelevant."*

Although most felt it was difficult to distinguish between AVRS and ABRS, most doctors believed treatment with antibiotics was rarely necessary at first. Only immunosuppressive patients or patients

whose general condition was bad and had worsened with fever, were prescribed antibiotics immediately. Most of the time, advising the patients with over-the-counter medications, such as nasal sprays and pain relievers was sufficient. However, the doctors did not hesitate with prescribing antibiotics if the patients returned.

"You must try and remember that in most situations, ARS is not a life threating condition."

Expectations for antibiotic treatment was another challenge and several reasons, such as other origins and backgrounds, being used to treatment with antibiotics, finding it difficult to understand that a virus cannot be treated, refusing to leave empty-handed, were mentioned. Creating some sort of alliance with the patients could sometimes be helpful in those situations the doctors said.

"*Sometimes it becomes a negotiation with the patients where you must try to make them feel they are getting something but without compromising with what you think is right."*

When deciding to treat with antibiotics considerations such as benefits, risks, side effects, immunosuppression, comorbidity, medical history, and age were mentioned.

"*You have to try to balance the risk and benefits against each other and ask yourself what the patient achieves by getting the medicine*".

For some doctors, different factors such as insistent patients, time pressure, stress, time of the day, doctor-patient relationship, complaints and keeping a good tone, could influence the decision-making process of when to choose antibiotics as treatment.

"*It can be very annoying when your patient gets frustrated with you. I cannot say I have not ever prescribed antibiotics to someone because of an argument."*

Conversely, some did not feel that these factors influenced them at all and believed it only made them feel surer in their decision when the patients changed attitude and started to insist or complain.

"With those patients it is a battle we must fight, and I think we do."

Though, a couple of doctors also told that it was important for them to meet the expectations of their patients and did not mind prescribing antibiotics if that was what the patient wanted.

"*The first thing you must do when the patients with ARS arrive is to find out whether they expect penicillin or just want an explanation. Either way, they expect me to help them, and that is what I will do.*"

FUTURE DEVELOPMENT OF ANTIBIOTIC RESISTANCE

The doctors' attitude towards using antibiotics in their working lives varied a lot. Some felt that the increasing problems with AMR affected them by having to be more careful with their treatment decisions while others hardly thought of it during the day. However, all doctors agreed that it must not affect the patient.

"*While AMR is a serious concern, we should always treat the patient before we treat the society.*"

Important thoughts towards AMR were to ask themselves if the medication made a difference for the patient, to always inoculate before treatment, when possible, and to always choose a narrow-spectrum antibiotic in the beginning of the treatment.

"*Everything in our medical lives must be decided upon. Why do we do it? Is it because we expect to win something? There has to be a valid reason instead of thinking "That is what we usually do". Is it the right treatment for the patient and is it the right diagnosis, we have considered*? *Could it all be done differently?"*

Some of the GPs with more years of experience stated that using antibiotic to treat ARS was not given too many thoughts and had always been normal for them to do. In contrast, the DIT felt that antibiotics should be used with caution and only when absolute necessary.

"*In the early days AMR was not something you really talked about, and I have probably been more open to prescribe antibiotics compared to the younger doctors today who are trained through medical school to only prescribe antibiotics when necessary and therefore probably also more careful in their*

decisions."

To reduce the prescribing of antibiotics in general practice the doctors mentioned that patient education in topics such as anatomy, physiology, pathogenesis and antibiotic side effects and resistance, could be helpful. Occasionally it made it easier for the patients to understand their decision and sometimes resulted in the patients not being interested in the treatment after all.

"*Spending a couple of extra minutes with your patient will benefit both you, the patient, and the society. Once they understand it, they never forget it, and sometimes that is all it takes."*

DISCUSSION

PRINCIPLE FINDINGS

The visitation process for all of the general practices was identical. However, creating instructions for the practice staff to assess the patients differed. In most practices the patients were assessed by the nurse alone while in others, only the doctor carried out the assessment. Although GPs had their own routines for the patients the DIT felt that official guidelines were a necessary supplement. When diagnosing ARS the symptoms of interest varied but the examination of the patient was the same. The major challenge with ARS was to distinguish between AVRS and ABRS and while CRP was often used the attitude towards it fluctuated and all doctors agreed that it was not considered a completely trustworthy biomarker. Important considerations in the decision-making process of when to use antibiotics were benefits, risks, side effects, immunosuppression, comorbidity, medical history, and age. While most doctors agreed that antibiotics were rarely necessary at first some were more likely to prescribe them than others. Factors such as patient expectations, insistence and doctor-patient relationship could influence the decision-making process for when to prescribe antibiotics. However, some also said that these factors did not matter at all. The attitude towards the increasing problem with AMR differed between the doctors but all agreed that it must never affect the patient. Occasionally, patient education made it easier for the patients to understand the doctors' decisions and sometimes resulted in the patients not being interested in antibiotic treatment after all.

STRENGTHS AND LIMITATIONS

The qualitative resarch method gave an understanding of the doctors' personel experiences as well as attitudes, opinions and considerations and using the semi-structured interview as design allowed for

flexibility to follow up on questions by elaborating, clarifying and rephrasing. While other designs, such as questionnaires and structured interviews, could have been approached, the open-ended nature in semi-structured interviews introduced more detail, richness and freedom in the doctors' answers making it more appropriate for this study. The fact that all interviews were physically conducted in the doctors' office ensured that nonverbal information was not overlooked and provided an opportunity to clarify whether the doctors had understood the interview questions or not. However, being new to exploring qualitative research studies and thus also lacking experience with the interview discipline, the risk of having overlooked other nuances of the subject was relatively high and may have influenced the results of the study. Also, one interview was conducted as a group interview and may not have given enough time and space for recalling experiences and reflections possibly resulting in the answers not being completely open, safe and honest and the interview becoming superficial with divergent views prevented.

Although the study managed to recruit 10 doctors, which was within the estimate of 5-15 needed to achieve sufficient information power, recruiting more doctors may have enlightened other relevant nuances of the issue and revealed further variations and considerations in the doctors' working lives. Only the secretary of the practice was given an invitation and asked to place it somewhere for the doctors to see. Whether this instruction was followed by the secretary remains unknown and might have excluded a number of doctors from the recruitment process. The recruitment being limited to Copenhagen in the The Capital Region of Denmark may have resulted in other trends and nuances to the issue not being found.

When analyzing the data STC was a suitable choice because of its purpose of giving beginners in qualitative research the opportunity to do thematic cross-cutting analysis by guiding in specific approaches that ensured systematicity and affordability. Though, during the analysis several quotes were identified and translated from Danish to English which might have resulted in words being misinterpreted and creation of statements that were not intended by the doctors. To make the analysis more nuanced two or more researchers are usually recommended to analyze the data. However, this being a Master's thesis, data was analyzed by the main author alone and nuances may have been missed.

DISCUSSION OF FINDINGS

A Danish report from 2017 revealed that doctors were only involved in RTI patients in approximately 40% of the nurses' consultations [12]. In this study 6 out of 9 practices had nurses assess the patients alone and if a prescription for antibiotic was needed the doctor would normally just make the prescription without further assessment. While most GPs considered their nurses to be in line with the DIT some also choose not to use nurses due to not having the same education level and background. Whether nurses possess the same knowledge as doctors in the field of diagnosing, using antibiotics and resistance development are unknown but studies from other countries found that a large proportion of nurses only had moderate knowledge of the subjects [13, 14]. Without further research it cannot be said whether inappropriately use of antibiotic increases when doctors prescribe antibiotics without being part of the decision-making but may be an interesting subject in the future.

Among the doctors, symptoms and findings differed but particularly sinus pain and headache, pain when bending the head forward, purulent nasal discharge, postnasal drip, coughing, nasal stenose and fever were key when diagnosing the patients. Similar results were found in older studies and corresponds well to todays guidelines [7, 15, 16]. CRP was used by every doctor in the decision-making process for when to prescribe antibiotics but their opinions towards it varied and all agreed that it was not completely trustworthy. A study from Norway who investigated the same topic correlated with these results and another Danish study found CRP to only be used 75% of the time for these patients [7, 17]. In 2021 a Danish study revealed that the CRP cut-off limit for prescribing antibiotics to patients with RTI were 40 mg/L [18]. For ABRS, this study found that the cut-off limit varied between 11-60 mg/L with an average of 50 mg/L. Though, cut-off limits as low as 10 mg/L may indicate ABRS [15, 19]. Discrepancy in CRP cut-off limits may rise confusion and make it difficult to decide when antibiotic treament should be prescribed possibly leading to some patients being treated incorrectly. Using the CRP without finding it entirely reliable might also be one of the reasons for why some choose not to trust it in the first place and is likely due to lack of anything better available in general practice. Cultivation of sinus secretion by puncture of a maxillary sinus would be preferable but this is normally not an option and also a time-consuming process.

Rather than trying to diagnose the patient some doctors seemed to be more interested in giving the patient antibiotic treatment. While this may be an option, depending on the patient, diagnosing should usually come first. Overuse and misuse of antibiotics have long been an issue and studies have found

that without them 46% were cured after a week and 64% after two weeks which should lead to careful thoughts whether treatment is necessary or not [6]. Also, being focused on the treatment may put the patient at risk of important differential diagnosis being missed possibly resulting in other conditions. Going from symptoms to treatment instead of symptoms to diagnosis to treatment was already being discussed back in 1972 [20]. Several reasons, such as higher levels of doctor experience, ingrained habits, patient satisfication, doctor-patient relationship and liberal and restrictiv personalities have been found to impact whether patients with URTI would receive antibiotics without the recommended guidelines being followed [21, 22, 23]. In this study, three out of four GPs with high experience levels said they were more inclined at prescribing antibiotics because of ingrained habits and that the doctor-patient relationship and patient satisfication also mattered to them. Conversely, the DIT said they were educated to be cautious and would normally only consider prescribing antibiotics if they felt confident about the diagnosis.

A Danish study from 2017 found that 32% of patients in Denmark with RTI expected antibiotic treatment and that they were more than 8 times likely to be prescribed one [24]. A Norwegian and Australian study revealed that factors such as time of the day, time pressure, insistence and stress often influenced the doctors to meet the patients expectations of being prescribed antibiotics and that it was mainly parents with young children, recent migrans and people with other origins and culturally backgrounds who had this expectation at consultation [17, 25]. These findings were in line with the results of this study where the same factors influenced 6 out of 10 doctors in their decision-making process often resulting in antibiotics being prescribed although not feeling comfortable about it. Studies outside of Denmark have revealed the same results and found it to increase the doctors antibiotic prescriptions by as much as 10 times [26, 27]. Patients being misformed about appropriate use of antibiotics has been seen several times and one study found that 78% of patients in general practice believed antibiotics were effective against viruses [28]. To lower the antibiotic prescription rate the doctors in this study believed patient education, by discussing the topic with the patients, was useful, which other studies have confirmed as well [29]. While this seems practical, factors such as time pressure and lack of communication skills could make this difficult for some. Educational banners and written information in general practices are not as effective as discussing the topics during consultations but have also shown to lower the antibiotic prescription rate and may be a good solution [30, 31, 32, 33].

CONCLUSION

Symptoms and findings cannot definitely confirm whether ARS is a bacterial or viral infection and doctors managed the patients differently. Several factors could influence the treatment decision and may occasionally have resulted in inappropriate use of antibiotics. More focus on developing clinical prediction rules and guidelines might help the doctors in their considerations of which patients will benefit the most from antibiotic treatment. The CRP test served different purposes but was not found reliable for ARS. Future research on whether CRP is appropriate to use for these patients may be beneficial for the doctors in general practices.

REFERENCES

1. Antibiotic resistance - World Health Organization [website]. [cited 2023, May 16]. Available from: https://www.who.int/news-room/fact-sheets/detail/antibiotic-resistance
2. Infographic – five reasons to care about antimicrobial resistance (AMR) [website]. [cited 2023, July 31]. Available from: https://www.consilium.europa.eu/en/infographics/antimicrobial-resistance/
3. DANMAP 2022 - Use of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from food animals, food and humans in Denmark - Statens Serum Institut og Technical University of Denmark, 2020 [website]. [cited 2023, May 16]. Available from: https://www.danmap.org/reports/2022
4. Rún Sigurðardóttir N, Nielsen AB, Munck A, Bjerrum L, Appropriateness of antibiotic prescribing for upper respiratory tract infections in general practice: comparison between Denmark and Iceland. Scandinavian Journal of Primary Health Care 2015;33(4):269-74, PubMed
5. Akut rhinosinuit – dsam [website]. [cited 2023, August 1]. Available from: https://www.dsam.dk/vejledninger/luftvejsinfektioner/akut-rhinosinuit
6. Lemiengre MB, van Driel ML, Merenstein D, Liira H, Mäkelä M, De Sutter AI, Antibiotics for acute rhinosinusitis in adults. Cochrane Database Syst Rev 2018, 9, CD006089, PubMed
7. GH Jens, Management of acute rhinosinusitis in Danish general practice: a survey. Clin Epidemiol, 2011, 3, 213-216, NIH
8. O'Brien BC, Harris IB, Beckman, T.J, Reed DA, Cook DA, Standards for reporting qualitative research: A synthesis of recommendations. Acad. Med 2014, 89, 1245-1251, CrossRef
9. Malterud K, Siersma VD, Guassora AD, Sample Size in Qualitative Interview Studies: Guided by Information Power. Qual. Health Res 2016, 26, 1753-1760, PubMed
10. Andrade C, The Inconvenient Truth About Convenience and Purposive Samples, Indian J Psychol Med 2021, 43, 86-88, PubMed
11. Malterud K, Systematic text condensation: A strategy for qualitative analysis. Scand. J. Public Health 2012, 40, 795-805, PubMed
12. Diagnostik og behandling af luftvejsinfektioner i almen praksis - APO [website]. [cited

2023, December 2]. Available from: https://www.apo-danmark.dk/_files/ugd/43637f_e4e288240fa84a92bbcb473937aabc36.pdf

13. Lalithabai DS, Hababeh MO, Wani TA, Aboshaiqah AE, Knowledge, Attitude and Beliefs of Nurses Regarding Antibiotic use and Prevention of Antibiotic Resistance. SAGE Open, 2022, Nurs, PubMed
14. Nair M, Tripathi S, Mazumdar S, Mahajan R, Harshana A, Pereira A, Carolina J, Halder D, S. Burza, Knowledge, attitudes, and practices related to antibiotic use in paschim bardhaman district: A survey of healthcare providers in west bengal, India, 2019, PLoS One, 14, PubMed
15. Hansen JG, Schmidt H, Rosborg J, Lund E, Predicting acute maxillary sinusitis in a general practice population. BMJ 1995, 31, 233–236, PubMed
16. Lindbæk M, Hjortdahl P, The clinical diagnosis of acute purulent sinusitis in general population – a review. Br J Gen Pract 2002, 52, 491–495, PubMed
17. Thaulow J, Eide TB, Høye S, Skjeie H, Decisions regarding antibiotic prescribing for acute sinusitis in Norwegian general practice. A qualitative focus group study. Scand J Prim Health Care, 2023, 41, 469-477, PubMed
18. Lykkegaard J, Olsen JK, Sydenham RV, Hansen MP, C-reactive protein cut-offs used for acute respiratory infections in Danish general practice. BJGP Open, 2021, 5. PubMed
19. Young J, Bucher H, Tschudi P, Périat P, Hugenschmidt C, WE A, The clinical diagnosis of acute bacterial rhinosinusitis in general practice and its therapeutic consequences, J Clin Epidemiol, 2003, 56, 377-8. PubMed
20. Howie, J.G, Diagnosis—The Achilles heel? J. R. Coll. Gen. Pract, 1972, 22, 310–315. PubMed
21. Akkerman AE, Kuyvenhoven MM, van der Wouden JC, Verheij TJ, Prescribing antibiotics for respiratory tract infections by GPs: management and prescriber characteristics. Br J Gen Pract, 2005, 55, 114–118, PubMed
22. Lundkvist J, Åkerlind I, Borgquist L, Mölstad S, The more time spent on listening, the less time spent on prescribing antibiotics in general practice. Fam Pract, 2002, 19, 638-40, PubMed
23. Cars H, Håkansson A, To prescribe--or not to prescribe--antibiotics. District physicians' habits vary greatly, and are difficult to change. Scand J Prim Health Care, 1995, 13, 3-7, PubMed

24. 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 PubMed
25. Laurdisen GB, Sørensen MS, Hansen MP, Rathe JØ, Jarbøl DE, Consultation expectations among patients with respiratory tract infection symptoms, Dan Med 2017, 64. PubMed
26. Sirota M, Round T, Samaranayaka S, Kostopoulou O, Expectations for antibiotic increase their prescribing: causal evidence about localized impact, Health Psychol 2017, 36, 402-9. PubMed
27. Kianmehr H, Sabounchi NS, Sabounchi SS, Cosler LE, Patient expectation trends on receiving antibiotic prescriptions for respiratory tract infections: A systematic review and meta-regression analysis, Int J Clint Pract 2019, 73, 7. PubMed
28. Darius STP, Joyce HH, Magdalene HML, Yue Y, Mark IC, Ee HG, Lili J, Joash WCC, Yee SL, Tau HL, Chia SW, Victor WKL, Adrian ZP, Tat YT, Wei MW, Fong SL, Knowledge, attitudes, and practices towards antibiotic use in upper respiratory tract infections among patients seeking primary health care in Singapore, BMC 2016, 3, 7, 148. PubMed
29. Ngadimon IW, Islahudin F, Sha NM, Hatah EMD, Makmor-Bakry M, Improving shared decision-making in adolescents through antibiotic education, Int J Clin Pharm 2017, 39, 129-125 PubMed
30. Ho HJ, Tan YR, Cook AR, Koh G, Tham TY, Anwar E, Hui Ching GS, Lwin MO, Chen MI, Increasing influenza and pneumococcal vaccination uptake in seniors using point-of-care informational interventions in primary care in Singapore: a pragmatic, cluster-randomized crossover trial, Am J Public Health 2019, 109, 12, 1776-1783. PubMed
31. Maskell K, Mcdonald P, Paudval P, Effectiveness of health education materials in general practice waiting rooms: a cross-sectional study, BR J Gen Pract 2018, 68, 677. PubMed
32. O'Sullivan JW, Harvey RT, Glasziou PP, McCullough A, Written information for patients (or parents of child patients) to reduce the use of antibiotics for acute upper respiratory tract infections in primary care, Cochrane Database Syst Rev 2016, 11, 1, 33. PubMed
33. Chriswell E, Hampton D, Okolo CTC, Effect of Patient and Provider Education on Antibiotic Overuse for Respiratory Tract Infections, J Healthc Qual 2019, 41, 3. PubMed