Adherence to guidelines of acute otitis media in children at Närhälsan Mariestad Health Centre

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Abstract

Background

Acute otitis media (AOM) is one of the most common cause of visits to health centres amongst children and infants, making it one of the most common bacterial childhood infections. The incidence of AOM worldwide is estimated to be approximately 709 million yearly, and in Sweden approximately 200,000 new cases yearly. Watchful-waiting, pain management as well as postponing antibiotic treatment are recommended for younger children and patients with uncertain AOM of any age in the absence of complicating factors. The good adherence to treatment guidelines is crucial to curb antibiotic resistance and while it is unclear to what extent current treatment guidelines are being followed. This study therefore focuses on mapping out the treatment pattern of young children with AOM and to monitor adherence to current treatment guidelines as well as investigate the pattern of antibiotic prescription at Närhälsan Mariestad health centre.

Method

This study is a retrospective review of medical records of patients aged 1-12 that sought care at Närhälsan Mariestad health care centre. Data collection was done by manually reviewing and analysing the medical records of all individuals between the ages of 1-12 that had acute otitis media and similar diagnoses between 2018-04-01 and 2019-12-31 in the AsynjaVisph medical record system.

Result

A total of 283 case records were identified. 164 cases included and 119 excluded. 55% male and 45% female. The result shows an over-prescription of antibiotic at Närhälsan Mariestad, but no statistically significant difference found in adherence to current treatment guidelines amongst all three categories of doctors studied.

Conclusion

The results show a low adherence to current treatment guidelines laid out by bodies like Stramanätverket (STRAMA). It shows that the low adherence to STRAMA's treatment guidelines is due to significant antibiotic over-prescription and the current guidelines not being followed accordingly by doctors at the health centre when making decisions on the type of treatment to give. However, we believe that there is room for improvement and that the results from this work can help serve as a reference in future reviews of quality work and in return can lead to an improvement process at Närhälsan Mariestad health centre.

Keywords

Acute otitis media, children, treatment guidelines, primary care, Phenoxymethylpenicillin.

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Appendix 1

Background

Acute otitis media (AOM) is one of the most common cause of visits to health centres amongst children, toddlers, and infants, making it one of the most common bacterial childhood infections. The incidence of AOM worldwide is estimated to be around 11 percent (approximately 709 million cases) yearly, which decreases with increasing age and is most common under the age of two [1-3]. It is believed that approximately 70 percent have had at least one episode of AOM in their lifetime, with half having had at least three episodes by age three [2-4].

In Sweden approximately 200,000 new cases are reported each year [5]. A large cohort study in England showed that more than a third of pre-school children sought medical care because of ear pain or ear drainage [6]. Other studies have shown that children who develop acute otitis media early, before six months of age, are more likely to have recurrent AOM [4]. In recent times, the incidence of AOM has been on the decline, this is partly because of the introduction of pneumococcal vaccine for children as well as the increasing general use of the influenza vaccine, as shown by several studies [7-9].

Pathogenesis and predisposing factors

AOM is a known common childhood infection that is often secondary to an upper respiratory tract infection. An eustachian tube dysfunction, caused by a blockage or obstruction of the eustachian tube leading to fluid build-up. The obstruction leads to disruption of microorganisms in the nasopharynx and middle ear, therefore creating an environment in which bacteria and viruses can thrive, grow and in return causing infection [10, 11]. Children having a shorter eustachian tube makes them more prone to AOM.

Different factors play a major role in the pathogenesis of AOM, the most common cause being infection, but other predisposing factors like genetics, male sex, race/ethnicity, immunological and environmental factors such as low socioeconomic status, exposure to tobacco smoke, all contribute to pathogenesis of AOM [12, 13].

Microbiology

Over 80 percent of AOM is caused by bacteria. In 10-20 percent of cases, viruses alone can be seen and sometimes in combination with other bacteria [14]. The most common bacteria globally are Streptococcus pneumoniae, Hemophilus influenzae, and Moraxella catarrhalis [15, 16]. As well as in 95 percent of AOM cases in Sweden [14-17]. Other bacteria such as group A Streptococcus and Staphylococcus aureus have been reported. Viruses such as Influenzas A and B, Respiratory syncytial virus (RSV), Adenovirus and Parainfluenza has also been reported [17].

Diagnostics and clinical findings

To diagnose AOM several key features need to be considered. Otoscopy is required to make correct diagnosis. Most patients present with acute onset of ear pain, either during or after a cold, toddler will usually show signs such as holding, pulling and/or rubbing their ears, fever maybe be present, as well as other symptoms like irritability and difficulty sleeping [18]. The presence of purulent discharge or fluid draining from the ear can be a sign of spontaneous perforation of the tympanic membrane (TM), and this can be seen in 15-20 percent of children with AOM [19].

In Sweden clinical findings in AOM are assessed in three subcategories as mentioned below: [20] Sure AOM which is the presence of purulent discharge and/or perforated or chagrined TM or bulging, opaque, colour-changed, immobile TM [20]. Uncertain AOM in which we see an opaque, colour-changed, immobile non-bulging TM or TM that cannot be assessed and lastly [20]. Non AOM in which we see a colour-changed, mobile TM or transparent, retracted or normally positioned, immobile TM [20].

Treatments and recommendation

Because of increasing antibiotic resistance worldwide, it is of importance that the right diagnosis be made since this helps in choosing a suitable treatment option. Studies have shown that AOM is a self-limiting infection and that children recover even without antibiotic treatment [21, 20]. Watchful-waiting, pain management as well as postponing antibiotic treatment are recommended for younger children and patients with uncertain AOM of any age in the absence of complicating factors like inner ear or craniofacial malformation, intense pain despite sufficient pain management, known sensorineural hearing loss, cochlear implants, increased susceptibility to infections, and other known middle ear disease etc [18, 20-22]. The good adherence to treatment recommendations is hence crucial to curb antimicrobial resistance. Thus, it is of importance to monitor that current guideline are being followed.

In the year 2000 watchful waiting was put in place as part of the national recommendations for treatment of AOM in children over 2 years of age in Sweden [23]. Study has shown that adequate pain management using pain medications like paracetamol and/or ibuprofen, relieve pain associated with AOM within twenty-four hours in contrast to antibiotic treatment alone [22, 24]. In Sweden, bodies like STRAMA (Strategy Group on Rational Use of Antibiotics and Reduction of Antibiotic Resistance) established in the mid-1990s are in place to develop and regulate different treatment recommendations for common out-patient infections [25].

This was brought about by the initiatives of the Swedish National Public Health Agency (Folkhälsomyndigheten), Reference Group on Antibiotic Issues (RAF) and The Swedish medical products Agency (Läkemedelsverket) [25]. Together they have been able to produce national guidelines that help in the treatment of common outpatient infections. This in turn is produced and distributed by the STRAMA groups. These recommendations aim to reduce over-treatment with antibiotics and therefore reducing increasing antibiotic resistance [25].

It is important to mention that in cases where observation is chosen, a scheduled follow-up within 48-72 hours in case of worsening or persisting symptoms despite adequate pain management is recommended, this should also be considered even when patients are being treated with antibiotics [18, 20]. A so-called safety-net antibiotic prescription (SNAP) together with adequate pain management has shown to help lower antibiotic prescription as shown by a study in the United States [26]. It is recommended that children below one year, adolescents above twelve years, children below two years with bilateral AOM, and anyone with perforated AOM of any age as well as adults be treated with antibiotics [20, 27].

In Sweden, phenoxymethylpenicillin (25 mg/kg x 3) is recommended as first line. In case of therapy failure or recurrent cases of AOM, amoxicillin (20 mg/kg x 3) is recommended in the absence of any known penicillin allergy [20]. Oral

erythromycin is recommended in case of known penicillin allergy in Sweden [20]. Duration of treatment depends on various factors. In Sweden the duration of treatment varies between five-ten days, with a treatment duration of five days recommended for uncomplicated AOM when phenoxymethylpenicillin was used, and seven-ten days in the case of complicated AOM, recurrent AOM, therapy failure or penicillin allergy [20]. Preventing complications remains one of the major indications for antibiotic treatment, although study has shown that the risk of serious complication, such as mastoiditis, was not seen to be more during the observation period in those children where antibiotic therapy was delayed and not initiated immediately [21]. Vaccination against known organisms as well as giving detailed information about self-care to parents are ways of preventing AOM [7-9]. Most common complications encountered include tympanic membrane rupture, recurrent AOM, acute mastoiditis, persistent middle ear effusion, chronic otitis media, labyrinthitis as well as intracranial complications like meningitis [2].

In conclusion, it is unclear to what extent current treatment recommendations are being followed at Närhälsan Mariestad health centre. This is important, because over-prescription of antibiotics is a growing public health concern associated with increasing antibiotics resistance. To investigate this, this study will be focusing on mapping out the treatment pattern of young children with AOM and to monitor whether current guidelines are followed.

Aim

The aim of this study is to describe the treatment of children aged 1-12, who seek care for acute otitis media related symptoms at Närhälsan Mariestad health care centre and to investigate whether current recommendations were followed during their care as well as investigate the pattern of antibiotic prescription.

Research questions

- How many children aged 1-12 sought care for AOM related symptoms?
- How many children aged 1-12 was diagnosed with AOM?
- What symptoms did the patients present with?
- Did they have any complicating conditions/factors that affected treatment option?
- What type of treatment option was chosen?
- What type of antibiotic was given?
- Pattern of antibiotic prescription, and did it follow current treatment guidelines?
- To what extent were current recommendations considered when choosing treatment options?

Method

Study design

The study is a retrospective review of medical records of patients aged 1-12 that sought care at Närhälsan Mariestad health centre. A public health care centre in Mariestad municipality with over 14,000 listed patients at the time of this study.

Sample

The patients studied were identified using the output tool of our medical record system known as MedRave. Data collection was then done by manually reviewing and analysing the medical records of all individuals between the ages of 1-12 that had acute otitis media and similar diagnosis between 2018-04-1 and 2019-12-31 in the AsynjaVisph medical record system. The diagnosis codes that were searched was H669, H660, H651, H920.

Data sampling and analysis

The electronic records of selected patients were screened for information and the following data were extracted from the medical records:

- Age
- Gender
- Symptoms for which the patient presented with, such as ear pain, fever, ear discharge etc.
- Findings during the medical examination.
- Diagnosis that motivated treatment. These were retrieved using ICD-10 (International Statistical Classification of Disease and related Health problems) coding system. Diagnosis searched includes: H669 Otitis media, unspecified, H920 Otalgia, H660 Acute suppurative otitis media and H651 Other acute nonsuppurative otitis media.
- Type of treatment received and in case of antibiotics treatment, the type prescribed.
- Adherence to guidelines, in cases where antibiotic treatment was chosen.
- The experience/category of the treating physician (specialists, residents, and locum).

Ethical considerations

This is a retrospective review of patient's medical records commissioned by the head of the clinic and conducted as part of my specialist training in general medicine. Applying for an ethical review to the ethics board was therefore not deemed necessary. Since this is a local retrospective study of medical records, and no patients were contacted, the risk of compromising patient privacy was therefore deemed low, and this was further ensured by removing the personal identity number of the studied group after reviewing the records. To avoid colleagues at the clinic felt scrutinized, the study was discussed in a meeting with the other doctors and approved by the medical team at the clinic. Overall, the risks associated with this project is considered small in relation to the benefits the project can lead to in terms of improved future treatment procedures.

Results

A total of 283 case records of children aged 1–12 with above listed diagnosis codes were identified in the period between 1 April 2018 and 31 December 2019. These cases were individually investigated and only 164 of these cases were included in the study, whilst a total of 119 excluded (figure 1). Patients were excluded if they had recurrent AOM, coming for planned ear control after previous AOM, have had earlier consultations with a physician during the same period of illness, medical-records with restricted access, if the diagnosis was set by a nurse or referred to specialist, and if presenting with other illnesses or condition such as acute tonsilitis, airway infections, viral infections etc that may have affected choice of treatment.

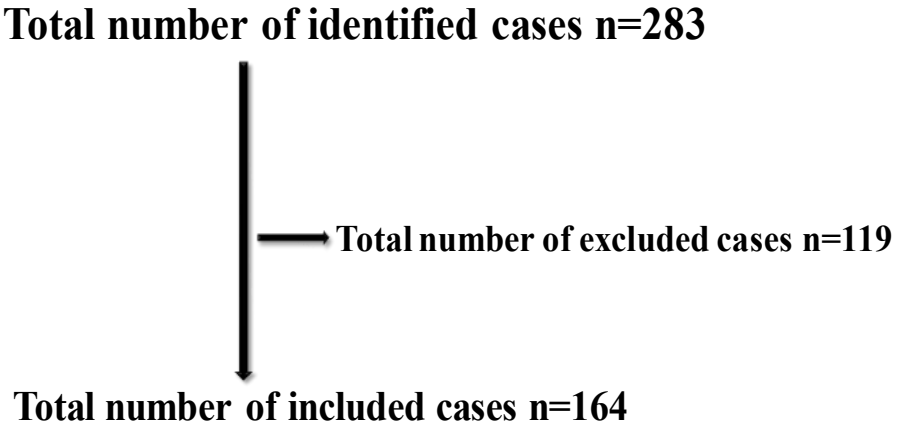

Figure 1. Identification of the studied cases.

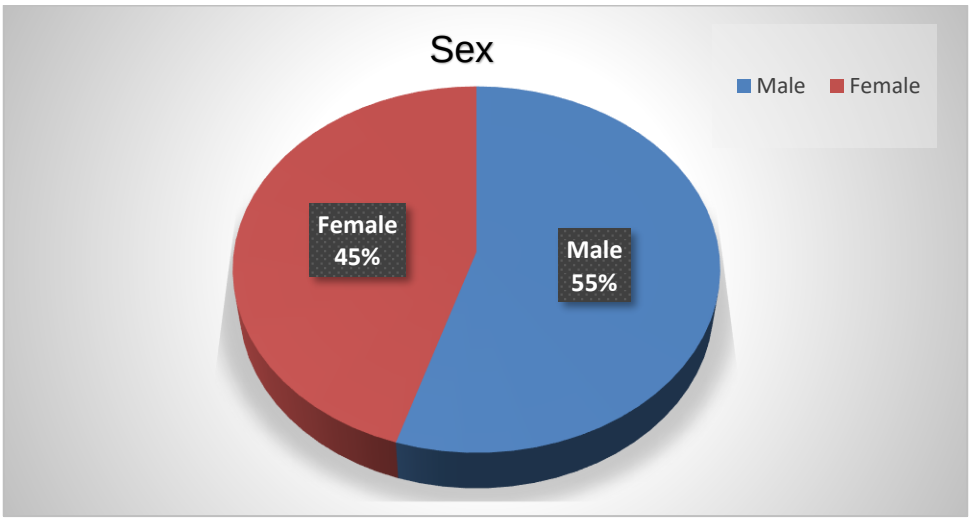

Figure 2. Gender distribution of the studied patients.

Shown above is the gender distribution of the groups studied (figure 2) and shown below is the incidence of AOM in different age groups. Majority (>35%) of the children presenting with AOM are aged two or below. While more than half (>60%) of the children studied are either aged four or below (figure 3).

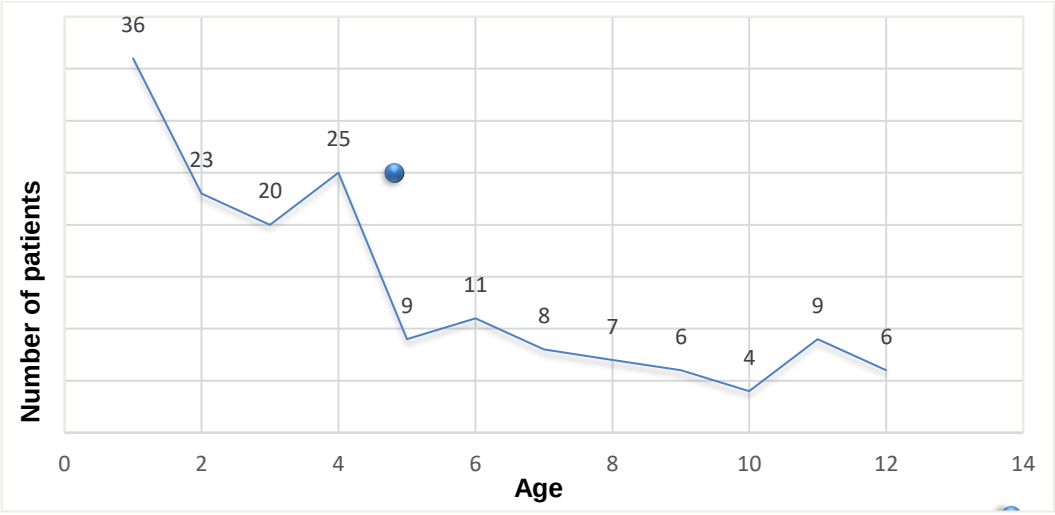

Figure 3. Incidence acute otitis media cases in the different age groups.

Table 1 below show the total number of cases reviewed, whether they adhered to current treatment guidelines or not. The total number of cases where the patients were treated with antibiotics, as well as how many of which adhered to current treatment guidelines. In those cases where antibiotics were prescribed, how many adhered to current guidelines and how many did not. As well as choice of antibiotic used and duration of treatment in cases where antibiotics was used (table 1).

Table 1. Adherence to treatment guidelines *

Adherence to guidelines	Yes	No	Total
Choice of antibiotic	126 (77%)	14 (8%)	164
Duration of treatment	118 (72%)	22 (13%)	164
Total number of cases	90 (55%)	74 (45%)	164

*When choosing the type of antibiotic to prescribe, number of cases that adhered to guidelines and the ability of treatment duration to adhere to guidelines.

The result shows that the total number of cases that adhered to current guidelines were slightly higher (55%) than those that did not (45%). Antibiotic treatment was chosen in eighty-five percent of all cases reviewed (n=140), and not chosen in only fifteen percent of all cases (n=24). Of these, the choice of antibiotic and duration of antibiotic treatment were adherent to current guidelines in seventy-seven percent (n=126) and seventy-two percent (n=118) respectively and not adherent in only eight percent (n=14) and thirteen percent (n=22), with phenoxymethylpenicillin, also known as penicillin V (PcV) clearly being the most prescribed antibiotic.

Another finding was that antibiotic treatment was used in all cases that did not adhere to current treatment guidelines (forty-five percent of total cases). While in those cases that followed current treatment guidelines, antibiotics was only used in about forty percent of the time (n=66).

The most common presenting signs and symptoms in children with AOM met within the studied timeline is shown in the graph below (figure 4).

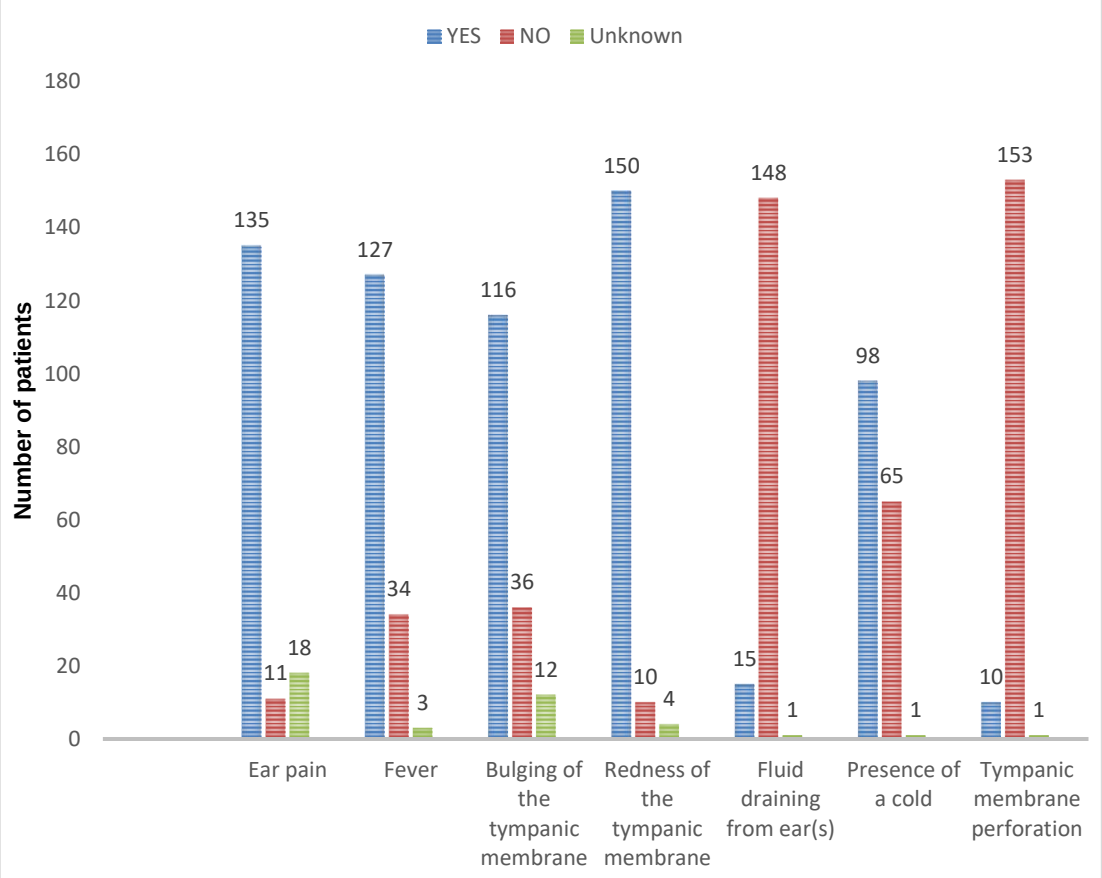

Figure 4. The most common presenting signs and symptoms registered in the medical records analysed.

The different categories of treating physicians, the number of patients they met, their prescription patterns, and their ability to adhere to current treatment recommendations when choosing a treatment option are all demonstrated below. In Figure 5, we see that majority of the patients studied met substitute doctors (locum), while the training physicians (residents) met only a fraction of the patients within the studied group. Even though not much of a difference is seen between the three categories of physicians, combined we still see that the residents and the specialist doctors (55% and 62% respectively) tend to adhere to current treatment guidelines slightly more than the substitute doctors, who according to the figure below (figure 5) were only able to adhere to the current treatment guidelines in about 48 percent of cases and not in 52 percent of the total cases they handled.

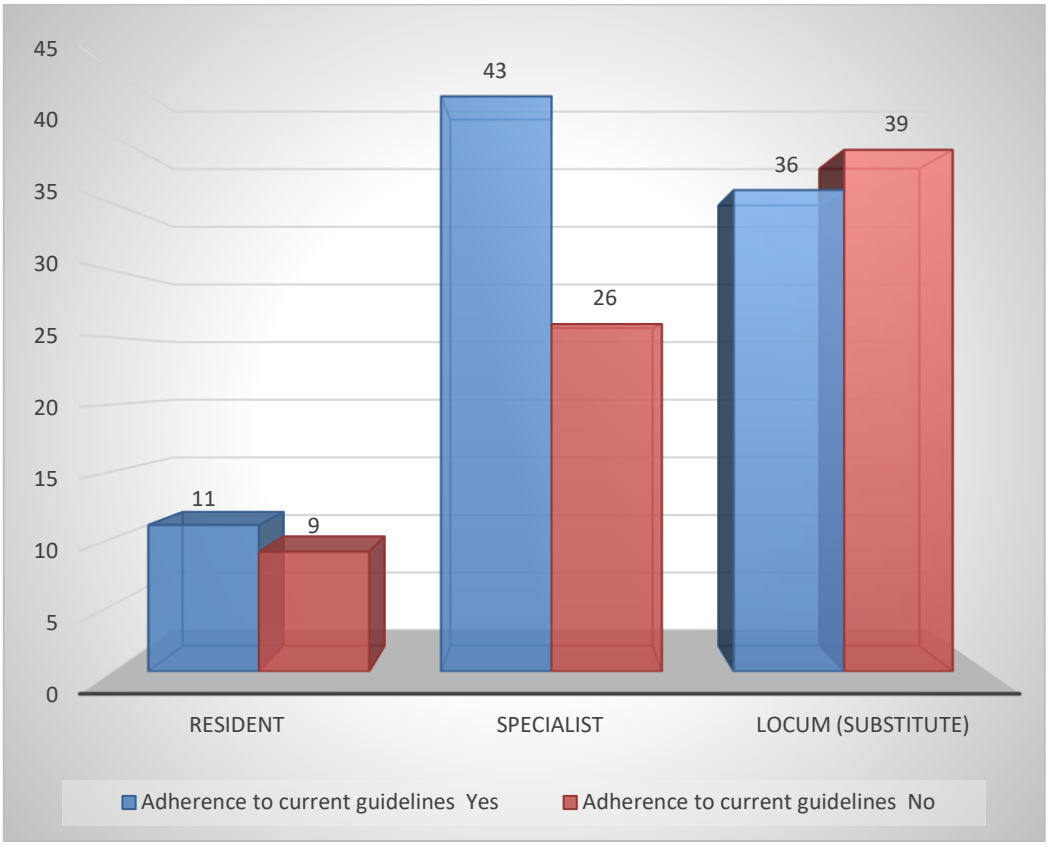

Figure 5. Category of treating physicians and their ability to adhere to current treatment guidelines.

The last figure (figure 6) demonstrates the pattern of antibiotic prescription by the different categories of doctors. Although not much of a difference is seen, the results still show that the locum doctors were more generous when it comes to antibiotic prescription. Their willingness to prescribe antibiotic even in cases where current treatment guidelines were not met, meant that they prescribed the most antibiotic, and were less eager to follow current treatment recommendations, as compared to other categories of doctors.

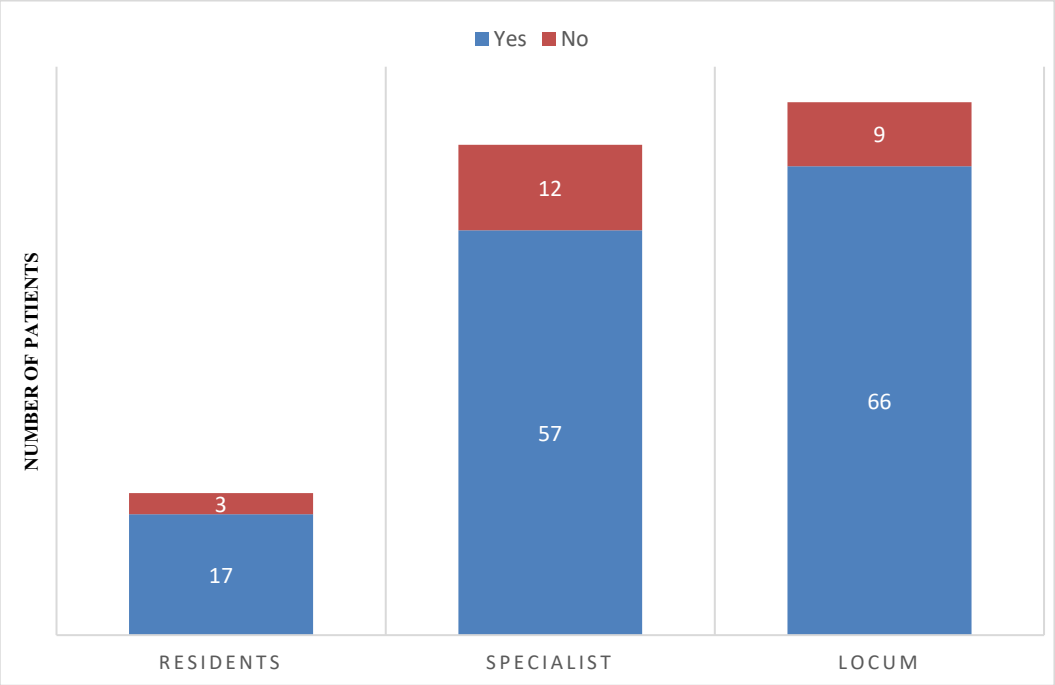

Figure 6. Category of treating physicians and their prescription pattern.

Discussion

Result discussion

Case records of children aged one to twelve were retrospectively investigated**.** Each case reviewed was considered to adhere to current treatment guidelines if any antibiotic prescribed was to a child below the age of two and with bilateral acute otitis media, or between the ages of one to twelve and presented with signs of complications such as persisting/worsening ear pain despite adequate pain management or other complicating factors mentioned above or presented with a ruptured tympanic membrane. Cases where patients in the studied group had neither of the complicating factors mentioned above at presentation and received no antibiotic or either received the so-called Safety-net antibiotic prescription (SNAP), were also considered to adhere to current treatment guidelines. Anything other than that were judged to not adhere to current treatment recommendations. Phenoxymethylpenicillin also known as penicillin V (PcV), remains the first-line course of antibiotic treatment in the absence of any known allergy. Dosage and duration of treatment were also considered. Thus, cases where other types of antibiotics were chosen as first-line without any reasonable explanation as to why it was chosen over phenoxymethylpenicillin were simply judged to not be in line with the current treatment recommendations.

It is interesting to note that fifty-five percent (n=90) of the patients studied were boys, and forty-five percent (n=74) girls. Making the incidence of AOM more common in males than females as shown by previous studies [12, 13]. Majority of the children presenting with AOM in the study are aged four or below. With AOM being most common under age two. Thus, showing a decreasing trend in the incidence of acute otitis media with increasing age as demonstrated by a previous large cohort study in Denmark [1]. The most common presenting symptom amongst the children in this study was ear pain and fever. With redness and bulging of the tympanic membrane being the most common presenting signs seen in those patients diagnosed with AOM in this study. Approximately sixty percent of the patients studied had symptoms of upper respiratory tract infection (common cold) at the time of presentation, as shown by a previous study where they found that more than sixty percent of episodes of symptomatic upper respiratory tract infections among young children were complicated by AOM [28]. Complications like rupture of the tympanic membrane was not commonly seen and only seen in less than ten percent of all cases reviewed. Other more serious complications like mastoiditis mentioned above was not seen at all, as demonstrated by an older prospective study [21].
In our study the antibiotic of choice in majority the cases were Phenoxymethylpenicillin. Which remains the first-line agent for treatment of acute otitis media in Sweden according to data from The Swedish medical products Agency (Läkemedelsverket) [29]. Which implies high adherence to current treatment recommendations when choosing antibiotic treatment. Of all the cases studied, safety-net antibiotic prescription (SNAP) was selected as a choice of treatment in only two cases. Which are cases where antibiotic was prescribed with specific instruction to only fill up their prescription and start treatment in case of worsening or persisting symptoms after 48-72 hours. Meaning that this method is not popular amongst healthcare professionals at Närhälsan Mariestad health centre. Even though a previous study demonstrated that this strategy when adopted well could help decrease antibiotic usage, therefore decreasing the risk for antibiotic

resistance [26]. The most common complicating factor seen that led to most antibiotic treatment was persisting ear pain despite adequate pain management.
A large proportion of cases had been managed by locum, but the better adherence to the recommendations was by specialists, then followed by residents. Even though locum doctors prescribed way more antibiotics than the other two categories of treating physicians, a significant statistical difference in the prescribing patterns of all three category of doctors was not seen and we can also not say that there is a significant statistical difference in adherence to current treatment recommendations amongst the different category of doctors since they all prescribed antibiotics in over eighty percent of cases they handled.

Even though the total number of cases that adhered to current treatment guidelines were shown to be slightly higher than those that did not. Antibiotic prescription remained significantly high. Despite previous studies demonstrating the importance of wait-and-see strategy and adequate pain relief, while postponing antibiotic treatment and how this helps reduce the risk for developing antimicrobial resistance and at the same time not increasing the risk for complications [21, 24]. These prescriptions were highest in cases that did not follow current treatment guidelines, as it was used in all cases that did not adhere to current treatment guidelines (forty-five percent of total cases). While in those cases that followed current treatment guidelines, antibiotic was only used in about forty percent of the time (n=66). Thus, a general over-prescription of antibiotics. Meaning that these antibiotics should not have been prescribed in the first place had the current treatment guidelines been followed accordingly.

Lastly, the overall result shows in general a low adherence to current treatment guidelines laid out by bodies like STRAMA in Sweden. It shows that the low adherence to STRAMA's treatment guidelines is due to significant antibiotic over-prescription and the current guidelines not being followed accordingly by doctors at Närhälsan Mariestad health centre when making decision on the type of treatment to give. It is still unclear as to why these guidelines are not thoroughly followed, but we believe that a general lack of knowledge or update about the current treatment guidelines/recommendations could be the main reason why we got such a poor result. As mentioned above, over-prescription of antibiotics is a growing public health concern associated with increasing antimicrobial resistance, as well as increased risk of adverse effects**,** and more frequent re-attendance. Which is why the good adherence to treatment recommendations is crucial to curb antimicrobial resistance.

Method discussion

A strength of the study was that a large representative sample of medical records of patients were reviewed and the fact that it reflects the actual treatment in clinical everyday practice. This made it possible to review every medical record individually and to determine whether current treatment guidelines were followed

or not. Having performed this study in my health care centre, it also meant that results of the study can have practical significance and can in the future be used to improve the quality work performed at our health care centre. Not having to apply for an ethical review to the ethics board and the fact that no patients were contacted meant that this study was not just time saving but cheap to perform.

A disadvantage or weakness met was that only a small group of patients in a health care centre was studied, meaning that the study was limited to one health centre in

a small town, which made it difficult to gather sufficient evidence to generalise the results. It also made it difficult to know the outcome of the result in larger groups or even in other regions around the country. In addition to that, many of the medical records studied did not contain some of the vital information regarding the diagnostic criteria that were needed to interpret the results, often the information provided was brief and several diagnostic criteria were missing, which made it a bit hard to interpret some of the results. Another possible weakness being the timeline, having a shorter study timeline meant that we could not ascertain what the results would have looked like had it been in another period.

Conclusion

In conclusion, the result from the study shows a low adherence to current treatment guidelines laid out by bodies like STRAMA. Irrespective of the result above, we still believe that there is a great room for improvement and that this can be achieved via hosting seminars, handing out pamphlets, review of current treatment guidelines as well as making sure that every doctor is updated on the current treatment guidelines/recommendations set out by bodies like STRAMA. We also believe that the results from this work can serve as a reference in future renewed review of quality work at Närhälsan Mariestad health centre, and in return can help lead to an improvement process at the health centre.

References

1. Todberg T, Koch A, Andersson M, Olsen SF, Lous J, Homøe P. Incidence of otitis media in a contemporary Danish National Birth Cohort. *PLoS One*. 2014;9(12): e111732.

2. Medibas. 2021. Akut mediaotit (AOM), by Remy Waardenburg, specialist i allmänmedicin, Vårdcentralen Hökarängen. URL: Akut mediaotit (AOM) - Medibas – Kunskapsstöd för hälso- och sjukvårdspersonal (vgregion.se) [Accessed 2022-02-13]

3. Monasta L, Ronfani L, Marchetti F, et al. Burden of disease caused by otitis media: systematic review and global estimates. *PLoS One*. 2012;7(4): e36226.

4. Teele DW, Klein JO, Rosner B. Epidemiology of otitis media during the first seven years of life in children in greater Boston: a prospective, cohort study. *J Infect Dis*. 1989;160(1):83–94.

5. Internetmedicin. 2021. URL: Otit (öroninflammation) - akut - Internetmedicin [Accessed 2022-02-13]

6. Hay AD, Heron J, Ness A; ALSPAC study team. The prevalence of symptoms and consultations in pre-school children in the Avon Longitudinal Study of Parents and Children (ALSPAC): a prospective cohort study. *Fam Pract*. 2005;22(4):367–374.

7. Tawfik KO, Ishman SL, Altaye M, Meinzen-Derr J, Choo DI. Pediatric Acute Otitis Media in the Era of Pneumococcal Vaccination. *Otolaryngol Head Neck Surg*. 2017;156(5):938–945.

8. Jansen AG, Hak E, Veenhoven RH, Damoiseaux RA, Schilder AG, Sanders EA. Pneumococcal conjugate vaccines for preventing otitis media. *Cochrane Database Syst Rev*. 2009;(2):CD001480.

9. Marchisio P, Esposito S, Bianchini S, et al. Efficacy of injectable trivalent virosomal-adjuvanted inactivated influenza vaccine in preventing acute otitis media in children with recurrent complicated or noncomplicated acute otitis media. *Pediatr Infect Dis J*. 2009;28(10):855–859.

10. Coticchia JM, Chen M, Sachdeva L, Mutchnick S. New paradigms in the pathogenesis of otitis media in children. *Front Pediatr*. 2013; 1:52.

11. Chonmaitree T, Alvarez-Fernandez P, Jennings K, et al. Symptomatic and asymptomatic respiratory viral infections in the first year of life: association with acute otitis media development. *Clin Infect Dis*. 2015;60(1):1–9.

12. Brennan-Jones CG, Whitehouse AJ, Park J, et al. Prevalence and risk factors for parent-reported recurrent otitis media during early childhood in the Western

Australian Pregnancy Cohort (Raine) Study. *J Paediatr Child Health*. 2015;51(4):403–409.

13. Macintyre EA, Karr CJ, Koehoorn M, et al. Otitis media incidence and risk factors in a population-based birth cohort. *Paediatr Child Health*. 2010;15(7):437–442.

14. Ruohola A, Meurman O, Nikkari S, et al. Microbiology of acute otitis media in children with tympanostomy tubes: prevalences of bacteria and viruses. *Clin Infect Dis*. 2006;43(11):1417–1422.

15. Ngo CC, Massa HM, Thornton RB, Cripps AW. Predominant Bacteria Detected from the Middle Ear Fluid of Children Experiencing Otitis Media: A Systematic Review. *PLoS One*. 2016;11(3): e0150949.

16. Kaur R, Adlowitz DG, Casey JR, Zeng M, Pichichero ME. Simultaneous assay for four bacterial species including Alloiococcus otitidis using multiplex-PCR in children with culture negative acute otitis media. *Pediatr Infect Dis J*. 2010;29(8):741–745.

17. Ruuskanen O, Arola M, Heikkinen T, Ziegler T. Viruses in acute otitis media: increasing evidence for clinical significance. *Pediatr Infect Dis J*. 1991;10(6):425–427.

18. Lieberthal AS, Carroll AE, Chonmaitree T, et al. The diagnosis and management of acute otitis media [published correction appears in Pediatrics. 2014 Feb;133(2):346. Dosage error in article text]. *Pediatrics*. 2013;131(3): e964-e999.

19. Smith L, Ewings P, Smith C, Thompson M, Harnden A, Mant D. Ear discharge in children presenting with acute otitis media: observational study from UK general practice. *Br J Gen Pract*. 2010;60(571):101–105.
20. Treatment recommendations for common infections by the STRAMA group, Swedish National Public Health Agency (Folkhälsomyndigheten) and Medical Products Agency (Läkemedelsverket). URL: Behandlingsrekommendationer för vanliga infektioner i öppenvård (folkhalsomyndigheten.se) [Accessed 2022-03-06]

21. Marchetti F, Ronfani L, Nibali SC, Tamburlini G; Italian Study Group on Acute Otitis Media. Delayed prescription may reduce the use of antibiotics for acute otitis media: a prospective observational study in primary care. *Arch Pediatr Adolesc Med*. 2005;159(7):679–684.

22. Venekamp RP, Sanders SL, Glasziou PP, Del Mar CB, Rovers MM. Antibiotics for acute otitis media in children. *Cochrane Database Syst Rev*. 2015;2015(6):CD000219.

23. Mölstad S. Consensus on acute otitis in children: antibiotic treatment of uncomplicated otitis is questioned. Lakartidningen. 2000 Sep 1;97(36):3854–8.

24. Bertin L, Pons G, d'Athis P, et al. A randomized, double-blind, multicentre controlled trial of ibuprofen versus acetaminophen and placebo for symptoms of acute otitis media in children. *Fundam Clin Pharmacol*. 1996;10(4):387-392.

25. Stramanätverket. URL: Strama | Stramanätverket [Accessed 2022-05-06]

26. Siegel RM, Kiely M, Bien JP, et al. Treatment of otitis media with observation and a safety-net antibiotic prescription. *Pediatrics*. 2003;112(3 Pt 1):527–531.

27. Shekelle PG, Takata G, Newberry SJ, et al. Management of Acute Otitis Media: update. *Evid Rep Technol Assess (Full Rep)*. 2010;(198):1-426.

28. Chonmaitree T, Revai K, Grady JJ, et al. Viral upper respiratory tract infection and otitis media complication in young children. *Clin Infect Dis*. 2008;46(6):815–823.

29. Läkemedelsverket. URL: Läkemedel vid otit – behandlingsrekommendation | Läkemedelsverket (lakemedelsverket.se) [Accessed 2022-11-19].

Protocol for review of medical records

Patient iD

Age / Birth year

Gender **Male: 1 Female:2**

Symptoms and otoscopic findings:

- Ear pain **Yes: 1** **No: 2**
- Bulging tympanic membrane (TM) **Yes: 1** **No: 2**
- Fever **Yes: 1** **No: 2**
- Purulent discharge **Yes: 1** **No: 2**
- Intense redness of TM **Yes: 1** **No: 2**
- Any complicating factor **Yes: 1** **No: 2**
- Presence of cold **Yes: 1** **No: 2**
- TM perforation **Yes: 1** **No: 2**
- Re-attendance **Yes: 1** **No: 2**
- Received antibiotics **Yes: 1** **No: 2**
- Followed actual treatment guidelines **Yes: 1** **No: 2**

Type of treatment plan chosen?

Type of antibiotic used and dosage?

Category of health care provider: **Spec: 1, Res: 2, Sub: 3**

ICD-10 code in the medical journal

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