

First Line Antibiotics in Acute Otitis Media: Are There Differences Between Specialties?

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Abstract

Introduction: Acute otitis media is the most common diagnosis for the prescription of antibiotics in children. In the Portuguese national health authority guideline, updated in 2014, the use of amoxicillin as the first-line antibiotic is recommended. The option is supported by the fact that amoxicillin is the most effective oral antibiotic against the most frequently responsible pathogen in acute otitis media, *Streptococcus pneumoniae*.

Methods: Between July 1 and December 31, 2016, we e-mailed pediatricians, general practitioners, and otolaryngologists (specialists and residents) a clinical case of acute otitis media in a child, giving six options of antibiotic therapy. We analyzed the answers obtained.

Results: 240 answers were obtained, of which three were eliminated due to a computer error, from 102 general practitioners (47 specialists), 74 otolaryngologists (33 specialists), and 61 pediatricians (28 specialists): 96.7% of pediatricians (confidence interval 95% 100%-84.2%; n = 58), 77.8% of general practitioners (confidence interval 95% 87.4%-68.2%, n = 78), and 32.4% of otolaryngologists (confidence interval 95% 43.1%-21.7%; n = 24) prescribe amoxicillin as first line antibiotic. The prescription of amoxicillin is significantly different between otolaryngologists and general practitioners ($p < 0.02$) and between otolaryngologists and pediatricians ($p < 0.01$).

Discussion: There are significant differences between specialties concerning the choice for amoxicillin as the first line antibiotic. Pediatricians came close to 100% and otolaryngologists chose otherwise, preferring amoxicillin with clavulanate. The preference shown by the otolaryngologists towards a second line antibiotic in an uncomplicated acute otitis media lacks justification in this study. Further efforts are required to promote the adherence to evidence-based guidelines.

Keywords: Acute Disease; Anti-Bacterial Agents/therapeutic use; Child; Drug Prescriptions; Otitis Media/drug therapy; Portugal; Surveys and Questionnaires

Introduction

Acute otitis media (AOM) is defined as the abrupt start of signs and symptoms of inflammation of the middle ear with effusion,¹ and it is the most common diagnosis for the prescription of antibiotics in children.^{2,3}

It is a very common condition in children accounting for 82.1% of the otologic diagnoses in United States emergency departments in 2015.⁴

The clinical relevance and incidence of this entity in Portugal justified the elaboration of a clinical guideline in 2012 by the Portuguese national health authority (Directorate-General of Health), updated in 2014, where amoxicillin is recommended as the first line antibiotic, 80-90 mg/kg/day, five to seven days, according to the severity criteria, such as the age of the child, recurring AOM, or initial therapeutic failure.⁵ This option is supported by the fact that amoxicillin is the most effective oral antibiotic against the most frequently responsible pathogen in AOM, *Streptococcus pneumoniae*. The most recent national data, from 2014, on invasive pneumococcal infection in children showed high resistance to penicillin in 7.1% of cases.⁶

The main objective of our work was to identify the possible differences in the first-line antibiotic prescription profile by general practitioners (GP), otolaryngologists (ENT), and pediatricians, the three specialties that most commonly diagnose and treat AOM, and check if the profile differed from the published guideline. As a secondary objective, we searched for the differences between the prescription profile of residents and attending physicians (specialists) in each specialty.

Methods

We created a theoretical clinical case in which we describe the clinical history of a 5-year-old, 20 kg, with fever (38.7°C), anorexia, otalgia, and mucous rhinorrhea with a diagnosis of AOM 48 hours earlier and since then treated with paracetamol. Due to the maintenance of

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the symptoms, the child is re-evaluated and, in this case, the participants are questioned which oral antibiotic should be given. Each participant could choose one out of six options (amoxicillin, amoxicillin-clavulanate, azithromycin, clarithromycin, cefuroxime, or another one, which they had to specify).

In order to reach the greatest number of physicians, we created a Google form (Table 1). To fulfill the form, physicians were obliged to identify themselves as a GP, ENT or pediatrician and their graduation level - attending physician or resident (and year of residence) - and, optionally, could identify their workplace. To advance and complete the form, the identification and antibiotic

choice would have to be filled.

The form was submitted to and approved by the ethics commission of the Administração Regional de Saúde (Proc. 073/CES/INV/2016). We then sent the form by e-mail to every primary health care center, otolaryngology, and pediatric hospital department of Portugal. The responses were received between July 1 and December 31, 2016 and collected automatically in an excel file for posterior statistical analysis.

To calculate the inferential statistic margin of error in the sample obtained from each specialty, the Ordem dos Médicos provided the official number of attending physicians and residents in each specialty. We calculated

Table 1. Anonymous query for specialists and residents of general and family medicine, pediatrics and otolaryngology about the first line treatment of acute otitis media

Treatment of Acute Otitis Media (AOM)

The main objective is to characterize the prescription profile and identify the possible differences between the above-mentioned specialties. There will be no discrimination of the results by hospital department or primary health care center.

Identification

1. What is your specialty?* (Only one answer)

- General practitioner
 Pediatrician
 Otolaryngologist

2. What is your level of graduation?* (Only one answer)

- 1st year resident
 2nd year resident
 3rd year resident
 4th year resident
 5th year resident
 Attending physician/specialist

3. At what hospital or health care center do you work? (Optional answer)

Example: health care center in Lisbon, hospital in Porto;

Clinical case

Ana is a 5-year-old child, 20 kg, previously healthy, with no known allergies, who, 72 hours ago, has presented with fever (38.7°C), anorexia, otalgia, and mucous rhinorrhea. In the first day of symptoms, she sees her family physician and it is diagnosed as acute otitis media in her right ear. The attending physician prescribes hydration, paracetamol, and recommends re-evaluation in 48 hours or less if her condition worsens. Two days later, there is no clinical improvement.

4. Which antibiotic do you usually prescribe in this situation?* (Choose only one)

- Amoxicillin
 Amoxicillin-clavulanate
 Azithromycin
 Clarithromycin
 Cefuroxime
 Other: _____

* Compulsory answers

the margin of error with the proportion method for a 95% confidence interval (95% CI) ($\epsilon = z\sqrt{(p(1-p))/n}$), in which $z = 1.96$, $p =$ proportion, and $n =$ sample size.

We grouped the answers by specialty and compared the choice of amoxicillin against any other antibiotic using chi-square statistical test between ENT and GP as well as ENT and pediatricians. Afterwards, we subdivided every sample in residents and specialists, comparing the preference for amoxicillin through the chi-square test, defining $p < 0.05$ as the significance value.

Results

240 answers were obtained, of which three were eliminated due to a computer error: 102 GP (47 attending physicians, 46%), 74 ENT (33 attending physicians, 45%), and 61 pediatricians (28 attending physicians, 46%) (Table 2). All of the participants chose to identify their workplace, giving, at least, the geographic location, allowing us to verify a nationwide response (Fig. 1).

On June 30, 2016, according to the Ordem dos Médicos, there were 6,498 GP, 635 ENT, and 2,028 pediatricians working in Portugal. The margins of error, calculated for each sample by the previously described method, are 9.63%, 10.62%, and 12.36% for GP, ENT, and pediatricians, respectively.

From the six possible answers, only three were chosen by all of the participants: amoxicillin, amoxicillin-clavulanate, and cefuroxime. Amoxicillin was the first line antibiotic option for 96.7% of pediatricians (95% CI 84.2%-100%, $n = 58$), 77.8% of GP (95% CI 68.2%-87.4%, $n = 78$), and 32.4% of the ENT (95% CI 21.7%-43.1%, $n = 24$) (Fig. 2).

To verify the difference between specialties, we used chi-square test assuming as the null hypothesis (H_0) that there is no difference in prescribing amoxicillin as the first line antibiotic. There was a significant difference in the prescribed antibiotic between ENT and GP ($p < 0.02$) and between ENT and pediatricians ($p < 0.01$).

Subsequently, we checked the difference between the residents and attending physicians in each specialty. In every sample, the proportion of specialists was similar (45%-46%). In ENT, 11 out of 33 attending physicians and 13 out of 41 residents chose amoxicillin as well

as 33 out of the 47 GP specialists and 45 out of 55 GP residents. These differences between the residents and attending physicians were not statistically significant using a chi-square test ($p = 0.88$ and $p = 0.166$, respectively, in ENT and GP). Twenty five out of 28 pediatric attending physicians and all of the pediatric residents chose amoxicillin. Using Fisher exact test these proportions were significantly different ($p < 0.0001$).

Discussion

The difference in the choice of the first line antibiotic for AOM attains statistical significance when comparing ENT with both pediatricians ($p < 0.01$) and GP ($p < 0.02$), with ENT preferring not to prescribe amoxicillin, being instead in favor of the association between amoxicillin and clavulanate, which is a second-line antibiotic in the clinical guideline issued in our country. On the other hand, almost 100% of the answering pediatricians chose amoxicillin, following the evidence-based guideline. This difference could, at first sight, be explained by the bias of ENT being used to observe and follow-up the most complicated or refractory cases of AOM. However, we are dealing with a theoretical case of an uncomplicated AOM and, therefore, the ENT preference for a second line antibiotic lacks justification. Since it was a closed answer multiple choice form, participants could not justify their option, which comes as a limitation of this study, as it is impossible to determine if the favoring of amoxicillin-clavulanate is a result of ENT unawareness of or disagreement with the evidence-based guideline. The adherence of health care professionals to the clinical guidelines varies with the physicians' age.⁷ However, we cannot assume that we are facing an age bias in the results, since the participants did not mention their age on the form and the difference between attending physicians and residents was found in pediatricians alone, as smallest sample with the largest margin of error, and only three out of 28 attending physicians did not opt for amoxicillin.

The use of antibiotics generates selective pressure both in pathogenic agents and in commensal ones, inevitably resulting in adaptive processes of antimicrobial resist-

Table 2. Number of answers attained by specialty and graduation level

Specialty	Total (n)	Attending physicians (n)	Residents per year (n)				
			1 st	2 nd	3 rd	4 th	5 th
General Practitioners	102	47	17	8	12	18	-
Otolaryngologists	74	33	9	5	8	9	10
Pediatricians	61	28	11	5	12	1	3

ance, which constitutes a public health problem not only in Portugal but also internationally.⁸ The results of this study encourage the search for methods of verifying the prescription of antibiotics in AOM and the need for thinking about the measures that avoid second line antibiotic prescriptions first-hand.

Although facing statistically significant results in this study, the margin of error for each group is not negligible, around 10% for all groups, since the samples represent one tenth of the target population. Despite being below the expected rate of response, the percentage

of participants is not different from what is expected of online queries in Portugal.⁹ Direct contact with the hospital departments and the primary health care centers may pose as a more effective way of getting a more representative sample of the population, serving simultaneously as a means of raising awareness for the evidence-based guideline.

WHAT THIS STUDY ADDS

- A simultaneous online query directed to three specialties gave indirect data about the tendency of antibiotic prescription in acute otitis media.
- In such a common entity as the acute otitis media, we see that the treatment offered by the three specialties that deal with it the most is not the same. Otolaryngology is the specialty that deviates the most from the national published clinical guideline.
- It is necessary to devise efforts and promote adhesion to evidence-based guidelines, so they can become the foundation of every health care worker's daily practice.

Conflicts of Interest

The authors declare that there were no conflicts of interest in conducting this work.

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Provenance and peer review

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Consent for publication

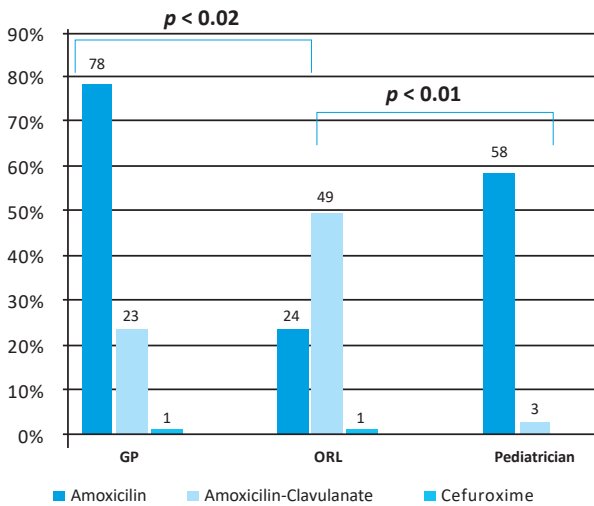
Consent for publication was obtained.

Confidentiality of data

The authors declare that they have followed the protocols of their work centre on the publication of patient data.



Figure 1. Geographic distribution of the attained answers.



GP - general practitioner; ENT - otolaryngologist.

Figure 2. Distribution of the antibiotic choices according to specialty (n).

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Antibioterapia de Primeira Linha no Tratamento da Otite Média Aguda: Diferenças Entre Especialidades?

Resumo:

Introdução: A OMA é a razão mais frequente de prescrição de antibiótico em idade pediátrica. A Direção Geral de Saúde elaborou uma Norma de Orientação Clínica (NOC) em 2012, atualizada em 2014, onde recomenda a utilização de amoxicilina como antibiótico de primeira linha. A opção fundamenta-se no facto da amoxicilina ser o antimicrobiano oral mais eficaz contra o microorganismo mais frequente na etiopatogénese da OMA, o *Streptococcus pneumoniae*.

Métodos: Entre 1 Julho e 31 Dezembro de 2016 enviámos por *e-mail*, a um número de médicos de MGF, ORL e Pediatria, um caso fictício de OMA em idade pediátrica, dando a escolher cinco opções de antibioterapia. Fizemos o estudo estatístico das respostas.

Resultados: Obtivemos 240 respostas, três eliminadas por erro informático. 102 de MGF (47 especialistas), 74 de ORL (33 especialistas) e 61 de Pediatras (28 especialistas). 96,7% dos Pediatras (IC 95%; 84,2-100%; n=58), 77,8% dos MGF (IC 95%

68,2-87,4%, n=78) e 32,4% dos ORL (IC 95% 21,7-43,1%; N=24) prescrevem amoxicilina como antibiótico de primeira linha. A prescrição de amoxicilina é significativamente diferente entre ORL e MGF ($p<0,02$) e entre ORL e Pediatras ($p<0,01$).

Discussão: Há diferença estatisticamente significativa na escolha da amoxicilina como primeira linha no tratamento da OMA. Os Pediatras aproximam-se dos 100% e os Otorrinolaringologistas afastam-se mais dessa opção, e favorecem a Amoxicilina+Ácido Clavulânico. A preferência dos ORL por um antibiótico de 2ª linha num caso de OMA não complicada carece de justificação. É necessário envidar esforços e promover a adesão a NOC baseadas na evidência.

Palavras-Chave: Antibacterianos/uso terapêutico; Criança; Doença Aguda; Inquéritos e Questionários; Otite Média/tratamento farmacológico; Portugal; Prescrição de Medicamentos