



## Adherence of prescribing practices in streptococcal pharyngitis and acute otitis media to treatment guidelines

Marcelo Vivas Moresco<sup>a</sup>, Beatriz Barbarin Sorozabal<sup>b</sup>,  
Silvia García de Garayo Díaz<sup>c</sup>, José Tomás Ramos Amador<sup>d</sup>

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Marcelo Vivas Moresco:  
marcevivas@gmail.com

<sup>a</sup>Paediatrician. CS de Salvatierra. Araba. Spain • <sup>b</sup>Paediatrician. CS de San Adrián. Navarre. Spain  
• <sup>c</sup>Mathematician. OSI Araba, Osakidetza. Araba. Spain • <sup>d</sup>Department of Paediatrics. Hospital Clínico San Carlos. Madrid. Instituto de Investigación Sanitaria Hospital Clínico San Carlos (IdISSC). Universidad Complutense. Madrid. Spain.

### Abstract

**Background and objective:** to analyse the degree of adherence of primary care paediatricians to consensus treatment guidelines for acute pharyngotonsillitis and acute otitis media.

**Material and methods:** retrospective observational study with collection of data from the electronic health records of patients with suppurative AOM and streptococcal AP in patients aged 0 to 14 years residing in Araba over an 18-month period.

**Results:** in the group of patients with suppurative AOM, 238 episodes were evaluated, with a proportion of appropriate prescribing of 56.7% and underdosing as the main reason of inappropriate prescribing. In the group of patients with streptococcal AP, 1721 episodes were evaluated, with a proportion of appropriate prescribing of 57%, and the main causes of inappropriate prescribing being prescription of excessive doses and short-duration regimens.

**Conclusion:** in both suppurative AOM and streptococcal AP, the frequency of appropriate prescribing was somewhat lower compared to other studies. Achieving appropriate treatment for these diseases in primary care settings is of vital importance due to their high incidence. Ensuring correct documentation in patient health records is another opportunity for improvement.

### Key words:

- Acute otitis media
- Acute pharyngitis
- Treatment

## Adecuación de las prescripciones médicas en faringitis estreptocócicas y otitis media aguda a las guías terapéuticas

### Resumen

**Fundamento y objetivo:** analizar el grado de adecuación a las guías terapéuticas de consenso de las prescripciones por parte de los pediatras de Atención Primaria (AP) en casos de faringoamigdalitis aguda (FAA) y otitis media aguda (OMA).

**Material y métodos:** estudio observacional retrospectivo con obtención de datos de los registros electrónicos de las historias clínicas de los pacientes con OMA supurada y FAA estreptocócica en pacientes de 0 a 14 años que residen en Álava (País Vasco, España), en 18 meses de estudio.

**Resultados:** en el grupo de pacientes con OMA supurada han sido evaluados 238 episodios obteniendo un grado de adecuación terapéutica del 56,7% y siendo la infradosificación la principal causa de inadecuación. En el grupo de pacientes con FAA estreptocócica han sido evaluados 1721 episodios obteniendo un grado de adecuación terapéutica del 57%, siendo las principales causas de inadecuación la sobredosificación y las pautas de corta duración.

**Conclusiones:** tanto en OMA supurada como en FAA estreptocócica el grado de adecuación terapéutica es algo más bajo comparado con otros estudios analizados. Ambos procesos infecciosos son de frecuentes diagnóstico y tratamiento en AP, razón por la cual es de vital importancia la mejora en su adecuado tratamiento. Otro punto de mejora es el correcto registro en la historia clínica de los pacientes.

### Palabras clave:

- Faringitis aguda
- Otitis media aguda
- Tratamiento

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## INTRODUCTION

Acute otitis media (AOM) and acute pharyngitis/ tonsillitis (APT) are two of the most commonly diagnosed and managed diseases in primary care (PC) paediatric practice. Therefore, it is of utmost importance that treatment guidelines for these diseases are correctly implemented, to ensure antibiotics are only prescribed when their use is indicated and adhering to the recommended dose and duration. In the study presented in this article we analysed the degree of adherence to treatment guidelines for APT and AOM by PC paediatricians, as it is widely believed that errors in antibiotic prescribing occur relatively frequently. To this end, we made a retrospective assessment of the appropriateness of treatment for streptococcal APT and suppurative AOM in paediatric services at the PC level in the province of Araba (Basque Country, Spain) over an 18-month period, using as reference the guidelines for the management of these diseases published by the Asociación Española de Pediatría (AEP, Spanish Association of Pediatrics).

## MATERIAL AND METHODS

We designed a retrospective observational study of anonymised data collected from electronic health records, after obtaining consent, dividing patients in 2 groups: patients with a diagnosis of streptococcal AP and patients with a diagnosis of suppurative AOM. Cases were selected using the codes of the International Statistical Classification of Diseases and Related Health Problems, 10<sup>th</sup> revision (ICD-10). The codes used for suppurative AOM were H66011 (suppurative AOM, right ear), H66012 (suppurative AOM, left ear), H66013 (bilateral suppurative AOM) and H66019 (suppurative AOM, unspecified ear), and the codes used for streptococcal APT were J020 (streptococcal pharyngitis) and J0300 (acute streptococcal tonsillitis). The age range in both groups was 0 to 14 years. The included patients resided in the province of Araba (Basque Country, Spain) and received a diagnosis

for either of these diseases between September 1, 2021 and March 1, 2023 (18 month period).

In each group, we assessed the adherence to current treatment recommendations based on the consensus document for the diagnosis and treatment of APT published by the AEP in 2011<sup>1</sup> (and its update published in 2020<sup>2</sup>) for APT and the consensus document on the aetiology, diagnosis and treatment of AOM published by the AEP in 2012.<sup>3</sup>

The variables analysed in both groups were: age at diagnosis (in the case of more than 1 episode occurring during the study period, we recorded the age at the time of the earliest diagnosis), sex, most recently recorded weight at time of prescribing, active ingredient of the antibiotic, daily dose, interval between doses, daily dose divided by most recently recorded patient weight, adherence of treatment to guidelines used as the standard of good clinical practice, performance (or lack thereof) of a rapid diagnostic test (RDT) for group A beta-haemolytic *Streptococcus* (GABHS) in cases of streptococcal APT, collection of exudate and microbial isolation.

To determine whether the age distribution was normal, we used the Kolmogorov-Smirnov test in both groups, and found that the distribution was not normal in either.

## RESULTS

The number of episodes of suppurative AOM initially included in the study was 353, of which 115 had to be excluded from the analysis because of insufficient information. The median age was 4 years (interquartile range, 2-6), with a mild predominance of male patients (male to female ratio, 1.11). The most frequently prescribed oral antibiotic was amoxicillin (n = 175), followed by amoxicillin-clavulanic acid (n = 80) (Figure 1). The antibiotic treatment of 56.7% of the episodes adhered correctly to the treatment guidelines used as reference (135 of the total of 238 cases of suppurative AOM). Underdosing was the main reason that prescribing was inappropriate (82.5%). In 145 cases of

suppurative AOM, culture of ear drainage was ordered, with positive isolation in 88.2% (n = 128), and the most frequently isolated pathogen was *Haemophilus influenzae* (n = 61; 47.6% of the total positive ear drainage cultures), followed by *Staphylococcus aureus* (n = 21; 16.4% of the total positive ear drainage cultures). **Table 1** presents the main results of the analysis of the appropriateness of antibiotic treatment in suppurative AOM.

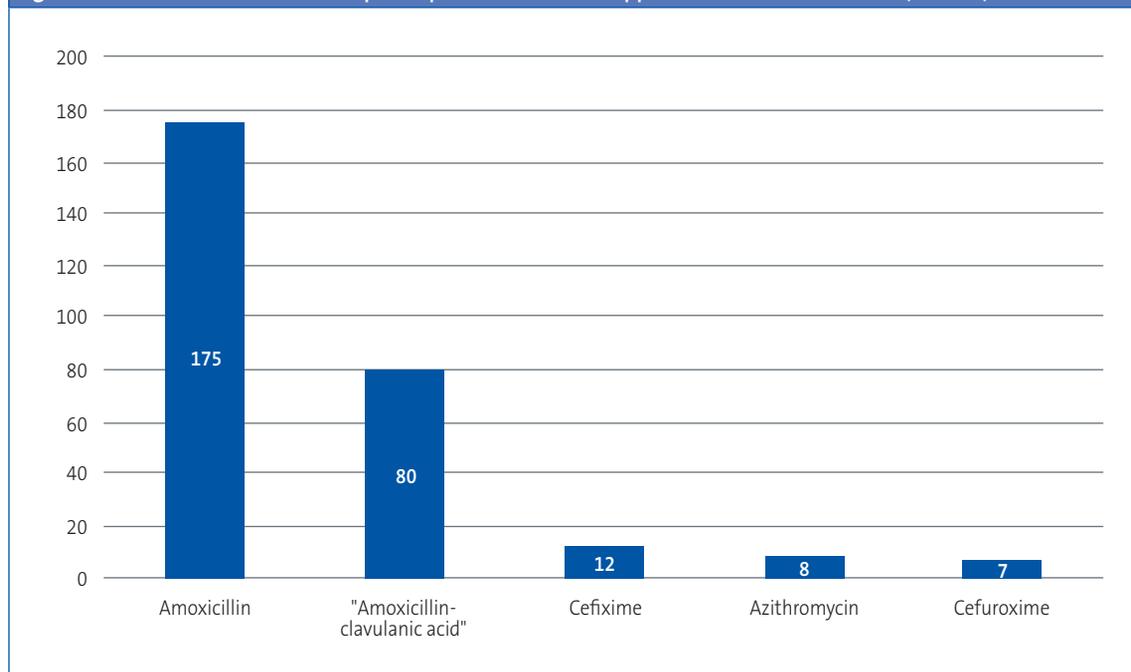
As regards cases of streptococcal APT, 1721 were included in the study analysis, with hardly a difference in frequency based on sex (male to female ratio, 1.08). The median age was 6 years (interquartile range, 5-9). The most frequently prescribed antibiotic was amoxicillin (n = 606; 35% of episodes), which was used at the recommended dose in 74.2% of the episodes. Phenoxymethylpenicillin (n = 487; 28.2%) and benzathine phenoxymethylpenicillin (n = 454; 26.3%) followed in frequency (**Figure 2**). Phenoxymethylpenicillin was prescribed at an appropriate dose in 99% of cases and benzathine phenoxymethylpenicillin in 81.4%. A RDT for detection of GABHS was performed in 1123

episodes, of which 729 (64.3%) turned out positive. Throat cultures were performed in 833 patients (surprisingly, only in 166 patients with a negative RDT), and the results were positive in 495 cases (59.4%). Of the total episodes of streptococcal APT, 981 (57%) were treated correctly, and the main reasons that prescribing was inappropriate was excessive dose of the active ingredient (23.1%) and shorter than recommended duration (23.3%). **Table 1** presents the main results of the analysis of the appropriateness of antibiotic treatment in streptococcal APT.

## DISCUSSION

Acute pharyngitis/tonsillitis is a frequently diagnosed infectious disease in paediatric care, both in PC and hospital emergency settings. The aetiology in the paediatric population is usually viral, but the impact of streptococcal APT is particularly important on account of the potential short- and long-term complications if it is not treated correctly.<sup>4,5</sup>

**Figure 1.** Total number of antibiotic prescriptions in cases of suppurative acute otitis media (n = 238)

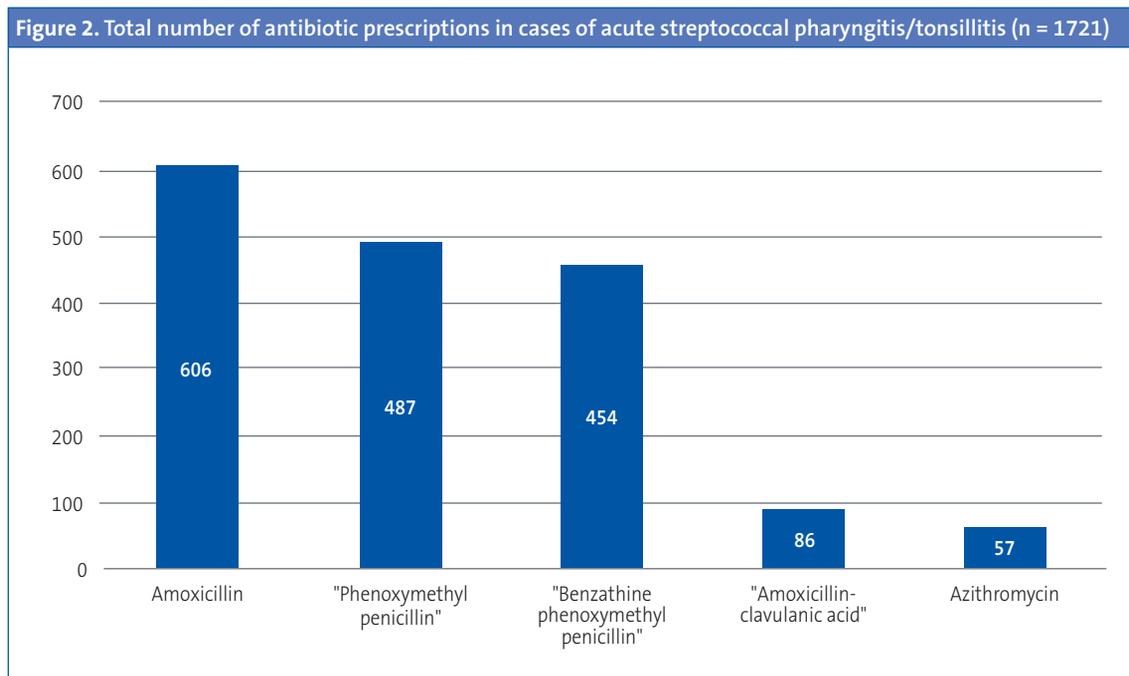


	Suppurative AOM	Streptococcal APT
Total cases under study	238 analysed episodes (115 excluded due to missing data)	1721 analysed episodes (295 excluded due to missing data)
Total appropriate regimens prescribed	n = 135	n = 981
Total inappropriate regimens prescribed	n = 103 82.5% underdosing 7.7% excessive dose 7.7% inappropriate antibiotic	n = 740 23.1% excessive dose 23.3% too short course 11.2% too long course

AOM: acute otitis media; APT: acute pharyngitis/tonsillitis.

When it comes to its management, the use of a clinical rule is recommended to determine whether performance of a RDT for GABHS. For instance, a score of 3 points in the Mclsaac score offers a positive predictive value of 28-35% and a score of 4 points a positive predictive value of 51-53%.<sup>6,7</sup> The consensus document on APT of the AEP from 2011 recommends performance of a RDT for GABHS if the Mclsaac score is 2 points or greater in the absence of manifestations suggestive of viral infection. If there is a high suspicion and the RDT is negative or not available, performance of throat

culture is recommended.<sup>1,8</sup> The Asociación Española de Pediatría de Atención Primaria (AEPap, Spanish Association of Primary Care Paediatrics), on the other hand, recommends performance of a RDT if the patient has a score of 3 or 4 points in the Centor scale.<sup>9</sup> As for treatment, penicillin V (potassium or benzathine phenoxymethylpenicillin) and amoxicillin continue to be the first-line antibiotics in 10-day courses, and benzathine phenoxymethylpenicillin can be given as a single daily dose or split in 2 daily doses without affecting the rate of GABHS at the end of treatment.<sup>2,10</sup> In the case of



poor adherence to oral treatment or vomiting, the best choice is penicillin G benzathine as a single intramuscular dose (which has been established as the first-line treatment in some countries to improve adherence).<sup>1,11</sup>

Studies on the appropriateness of antibiotic prescribing in APT have yielded contradictory results. An evaluation of antibiotic prescribing conducted at the PC level in the region of Aragon, Spain, in patients aged 0 a 14 years with a diagnosis of upper respiratory tract infection published in 2014, found that the group with the highest proportion managed with antibiotherapy corresponded to patients with APT (75%).<sup>12</sup> In 2015, Piñeiro<sup>13</sup> reviewed all the discharge reports and diagnostic tests conducted in children aged less than 14 years with a diagnosis of APT in a paediatric emergency department and concluded that the proportion treated with antibiotherapy was 46.3%. All patients who received antibiotherapy had undergone microbiological testing with correct antimicrobial selection, and the duration of treatment and dose interval were appropriate in more than 85% of prescriptions.

Ochoa<sup>14</sup> carried out a prospective multicentre study in 11 Spanish hospitals published in 2003, and found that the proportion of cases treated with the first-line antibiotic agent for streptococcal APT was low.

A study conducted in the United States analysed 184 032 outpatient visits conducted in 2010 and 2011 using data collected by the Centers for Disease Control and Prevention (CDC), finding that antibiotherapy was prescribed in 12.6% of the visits. Cases of APT were third in terms of antibiotherapy prescribing frequency and the proportion in which prescribing was appropriate was 65.9%.<sup>15</sup> Another study assessed appropriateness of antibiotic prescribing in APT between 2014 and 2019 in 3 paediatric emergency departments in Italy and found a reduction in the unnecessary use of broad-spectrum antibiotics after implementation of certain measures.<sup>16</sup> **Table 2** presents the main findings of these studies of APT.

When we compared the findings of the aforementioned studies regarding the appropriateness of

**Table 2. Summary of studies on the appropriateness of prescribing, results for cases of acute pharyngitis/tonsillitis**

Study	Setting	Outcomes analysed to assess appropriateness	Results
Malo <sup>12</sup>	Primary care	Antibiotic (active ingredient)	63% of APT cases managed with first-line antibiotics
		Percentage of APT cases managed with antibiotherapy	75% of APT cases managed with antibiotics
Piñeiro <sup>13</sup>	Hospital ED	Antibiotic (active ingredient)	Appropriate antibiotic selection in 100%
		Dose.	Appropriate antibiotic dose in 100%
		Duration of antibiotherapy	Appropriate duration of treatment in 85.2%
Ochoa <sup>14</sup>	Hospital ED	Percentage of APT cases managed with antibiotherapy	81.5% of APT cases managed with antibiotherapy
		Antibiotic (active ingredient) indicated for APT	Appropriate prescribing in 45.2%
Fleming-Dutra <sup>15</sup>	Outpatient	Percentage managed with antibiotherapy	56.2% of APT cases managed with antibiotherapy
		Percentage of APT cases managed with antibiotherapy with a positive RDT for GABHS	Positive RDT for GABHS in 65.9% of APT cases managed with antibiotherapy
Barbieri <sup>16</sup>	Hospital ED	Antibiotic (active ingredient)	Percentages varied between centres and semesters
		Dose	Improvement in antibiotic prescribing after implementation of measures

APT: acute pharyngitis/tonsillitis ED: emergency department; GABHS: group A beta-haemolytic *Streptococcus*; RDT: rapid diagnostic test.

antibiotic prescribing in streptococcal APT compared to ours, we found frequencies that were slightly smaller in our study (keeping in mind the heterogeneity of the results of the previous studies). A key factor in the assessment of the appropriateness of antibiotic prescribing is the correct documentation of the patient's weight before but not too far from the date of the prescription. Due to the COVID-19 pandemic, many of the check-ups scheduled in the routine healthy child programme, during which anthropometric measurements are taken, were delayed. In addition, the substantial workloads of PC paediatricians hinder the appropriate documentation of the weight used for the purpose of antibiotic prescribing. Taking this into consideration, the frequency of appropriate prescribing may actually be higher than estimated based on the available data. On the other hand, it is clear that errors in the duration of the antibiotic course can only be interpreted as poor adherence to current guidelines.

Otitis media (OM) is another infectious disease frequently encountered in PC paediatrics.<sup>17,18</sup> It chiefly affects children under 5 years and its incidence is greater in developing countries.<sup>19</sup> In terms of its aetiology, we ought to underscore the decrease in the frequency of *Streptococcus pneumoniae* as the leading causative agent due to the inclusion of the pneumococcal conjugate vaccine in the routine immunization schedule.<sup>20</sup> The spectrum of otitis media includes 3 forms of disease: AOM, suppurative AOM and chronic suppurative AOM.<sup>21</sup> The diagnosis is based on the development of characteristic signs and symptoms (earache, abnormal otoscopy findings and fever or malaise), classifying AOM cases as confirmed or possible based on whether all criteria are met or just some.<sup>22</sup> The indication of antibiotherapy depends on the age and history of the patient and the severity of disease, and amoxicillin is currently the first-line treatment.<sup>23</sup> The most recent guidelines of the AEP, published in 2023, expand the group of patients in whom watchful waiting with analgesia is indicated for initial management, followed by re-evaluation within a short time period.<sup>24</sup>

The findings of previous studies regarding the appropriateness of antibiotic prescribing in AOM in paediatric care have also been heterogeneous. Malo<sup>12</sup> analysed antibiotic prescribing at the PC level in Aragon over a 1-year period in patients with a diagnosis of AOM and concluded that 72% of cases were treated with antibiotherapy and that appropriate prescribing was infrequent. Croche<sup>25</sup> assessed the appropriateness of antibiotic prescribing in the emergency department of a regional hospital in 2013, concluding that 51.9% of prescriptions were inappropriate and that AOM was the disease in which the inappropriate prescribing was most frequent (47.6%). García-Moreno<sup>26</sup> analysed the appropriateness of antibiotic prescribing in a paediatric emergency department over a 1-year period in patients with infectious disease. The authors concluded that 49.3% of prescriptions were appropriate, and that inappropriate prescribing was most frequent in patients with AOM (chiefly in those aged less than 2 years), urinary tract infection and acute conjunctivitis. Csonka<sup>27</sup> analysed outpatient antibiotic prescriptions in paediatric patients with AOM between 2014 and 2020 in Finland and concluded that antibiotic selection was correct in 80.1% of cases when the prescriber was a paediatrician, 67% when the prescriber was a general practitioner and, strikingly, 55.1% when it was an otorhinolaryngologist. Dube<sup>28</sup> analysed the impact of 5 interventions implemented to improve prescribing in terms of the correct duration of antibiotherapy in patients with AOM in the emergency care setting, and found improvements ranging from 39% to 67% in the analysed outcomes. **Table 3** presents the main findings of these studies in the management of AOM.

When we compared our data on appropriate prescribing to previous studies, the results were similar to the average findings, yet could improve significantly. The main limitation in the assessment of the appropriateness of the dosage involved the correct documentation of the weight of the patient in the records, which, had it been in place, could have led to better results. Another limitation concerned adequate diagnosis and its complexity

**Table 3. Summary of studies on the appropriateness of prescribing, results for cases of acute otitis media**

Study	Setting	Outcomes analysed to assess appropriateness	Results
Malo <sup>12</sup>	Primary care	Correct antibiotic selection.	Appropriate in 41% of episodes
Croche <sup>25</sup>	Hospital ED	Correct antibiotic selection. Dose. Course duration.	47.6% of regimens were inappropriate
García Moreno <sup>26</sup>	Hospital ED	Correct antibiotic selection. Dose. Course duration.	55% of regimens for AOM were inappropriate
Csonka <sup>27</sup>	Private outpatient clinics	Correct antibiotic selection	Percentage of appropriate selection stable through time (31.9% in 2014 to 31.3% in 2020).
		Percentage of AOM cases managed with antibiotherapy.	Reduction in percentage of AOM cases managed with antibiotherapy (From 48.3% in 2014 to 41.4% in 2020)
Dube <sup>28</sup>	Hospital ED	Course duration	39% of appropriate prescribing at baseline increased to 67% after the implementation of 5 measures to support correct prescribing

AOM: acute otitis media; ED: emergency department.

(especially in the interpretation of otoscopy findings). To avoid potential bias due to the incorrect classification of serous otitis cases as suppurative AOM cases, we decided that the sample would only include patients with a diagnosis of suppurative AOM. Lastly, other limitations worth noting are that we did not verify adequate administration of antibiotherapy (actual consumption of the drug for the prescribed duration of treatment), the retrospective design of the study and the potential for erroneous data in the health records. Despite these limitations, the study also had strengths like the large number of included episodes and the inclusion of episodes through the review of electronic health records, which reduces the heterogeneity in data collection and is more objective.

Lastly, it is important to highlight that this study was conducted in the PC system of Araba, so the results may not be generalised to other geographical areas or to the hospital setting.

## CONCLUSION

Analysing the adherence of antibiotherapy to current consensus-based guidelines in paediatric primary care is of utmost importance, as the PC setting is the initial point of contact of the paediatric

population with the health care system. Poor adherence in the treatment of diseases for which there is evidence of antibiotic overuse, such as AOM and APT, will have a negative impact in the future in terms of antimicrobial resistance.

Despite the limitations of the study and the flaws in the data that could be improved, it provides a foundation to build on. Last of all, we ought to underscore the crucial importance of correct documentation in the PC electronic health records, to which end paediatricians should be given the necessary tools to facilitate the task, given the considerable workloads that they manage daily, so that in the future there will be more accurate data with which to carry out this kind of large-scale study.

## CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare in relation to the preparation and publication of this article.

## AUTHORSHIP

Author contributions: design and performance of the study, data analysis, writing and revision of the manuscript (MVM, JTRA), writing and revision of the manuscript, translation of the title, abstract and keywords (BBS), data collection and analysis, statistical analysis (SGGD).

## ABBREVIATIONS

**AEP:** Asociación Española de Pediatría • **AEPap:** Asociación Española de Pediatría de Atención Primaria • **AOM:** acute otitis media aguda • **APT:** acute pharyngitis/tonsillitis

• **GABHS:** group A beta-haemolytic *Streptococcus* • **ICD-10:** International Statistical Classification of Diseases and Related Health Problems, 10<sup>th</sup> revision • **OM:** otitis media • **PC:** primary care • **RDT:** rapid diagnostic test.

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