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Review

Antimicrobial treatment of ENT infections

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ABSTRACT

Ear, nose and throat (ENT) or upper respiratory tract infections (URTI) are the most common infections in children and the leading causes of antibiotic prescriptions. In most cases, these infections are due to (or are triggered by) viruses and even when bacterial species are implicated, recovery is usually spontaneous. The first imperative is to refrain from prescribing antibiotics in a large number of URITs: common cold, most cases of sore throat, laryngitis, congestive otitis, and otitis media with effusion. On the contrary, a decision to treat sore throats with antibiotics is based primarily on the positivity of the Group A Streptococcus (GAS) rapid antigen diagnostic tests. For ear infections, only (a) purulent acute otitis media in children under 2 years of age and (b) complicated or symptomatic forms of purulent acute otitis media (PAOM) in older children should be treated with antibiotics. Amoxicillin is the first-line treatment in the most cases of ambulatory ENT justifying antibiotics. Severe ENT infections (mastoiditis, epiglottitis, retro- and parapharyngeal abscesses, ethmoiditis) are therapeutic emergencies necessitating hospitalization and initial intravenous antibiotic therapy.

ENT infections are the most frequent infections in children and in many countries the leading reasons for antibiotic prescriptions [1,2]. The vast majority are viral in origin or triggered by viruses. Furthermore, even if bacterial species are implicated, most are self-limited diseases [3–5]. This explains why antibiotics are most often unnecessary, except in the most severe forms, for which diagnosis and treatment must begin at an early stage. The first message in the recommendations of the *Groupe de Pathologie Infectieuse Pédiatrique de la Société Française de Pédiatrie* (GPIP-SFP) and the *Société de Pathologie Infectieuse de Langue Française* (SPILF), which were included in the 2021 Haute Autorité de Santé (HAS) guidelines, is that antibiotics should not be prescribed in cases of common cold, non-streptococcal tonsillopharyngitis, laryngitis, congestive acute otitis media or otitis media with effusion [6,7]. The second message is that in most cases, prescription of “critical antibiotics” (“watch” and “reserve” antibiotics in the WHO classification) should be avoided. They include:

- 2nd and 3rd generation cephalosporins, which favor the emergence of extended-spectrum β -lactamase-producing enterobacterales,
- amoxicillin-clavulanate (amox/clav), of which the spectrum is unnecessarily broad,
- azithromycin, with half-life inducing prolonged selective pressure [8,9].

A decision to treat sore throat with antibiotics is based mainly on the results of rapid diagnostic antigen tests (RADT) for group A streptococcus (CAS). While positive GAS-RADT justifies antibiotic prescription, negative GAS-RADT most often does not [6,7]. With regard to otitis, only purulent acute otitis media (PAOM) in children under 2 years of age and symptomatic or complicated forms of PAOM in older children should be treated with antibiotics [6,7].

Decreased antibiotic resistance largely ascribable to pneumococcal conjugate vaccines and reduced antibiotic prescriptions for the two most frequently involved bacterial species (*S. pneumoniae* and *H. influenzae*) explain why antibiotic choices have been restricted in recent years and, more specifically why, in most cases, amoxicillin is now the first-line treatment [6–8]. However,

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Table 1
Antibiotic therapy for outpatient ENT and stomatological infections.

Clinical situations and <i>Bacteriological target</i>	Recommended regimens	Alternatives (contra-indicated preferred treatment)	Comments
Common cold	No antibiotics		Viral infection.No demonstrated efficacy of antibiotic treatment
Congestive acute otitis media	No antibiotics		Viral infection.No demonstrated efficacy of antibiotic treatment
Otitis media with effusion	No antibiotics		No proven medium or long-term effectiveness of antibiotics
Purulent acute otitis media	Amoxicillin (oral) 80–100 mg/kg/day in 2 divided doses (maximum 3 g/day)	Cefpodoxime (oral) 8 mg/kg/day in 2 divided doses (maximum 400 mg/day)	Properly diagnosed purulent AOM should be treated with antibiotics until the age of 2 years.From the age of 2, only the most severe forms (high fever, intense otalgia) or complicated forms (otorrhea, recurrent otitis...) should be treated with antibiotics.
Main targets of antibiotic treatment			
<i>S. pneumoniae</i>			
<i>H. influenzae</i>			
Other bacteria	Treatment duration	Treatment duration	For other conditions, a wait-and-see attitude is recommended. Antibiotics are indicated in case of persistent symptoms (over 48 hours).
– <i>M. catarrhalis</i>	– 5 days for children older than 2 years	– 5 days for children older than 2 years	In 2022, in France, fewer than 7% of pneumococcal strains and fewer than 20% of <i>H. influenzae</i> strains isolated from the nasopharynx of children with ear infections were resistant to amoxicillin (ACTIV data).
– <i>S. pyogenes</i>	– 10 days for children under 2 years and after this age, only for	– 10 days for children under 2 years and after this age, only for	Reserve ceftriaxone for exceptional situations of digestive intolerance or strong suspicion of resistant pneumococcus.
	• otitis-prone children (recurrent AOM)	• otitis-prone children (recurrent AOM)	
	• otitis media with otorrhea	• otitis media with otorrhea	
Otitis + conjunctivitis syndrome	Amoxicillin (oral) 80–100 mg/kg/day in 2 divided doses (maximum 3 g/day)	Cefpodoxime (oral) 8 mg/kg/day in 2 divided doses (maximum 400 mg/day)	Decreased resistance to amoxicillin due to the production of <i>H. influenzae</i> β -lactamases in recent years support the use of amoxicillin, even for otitis-conjunctivitis syndrome.
Main target of antibiotic treatment			Ceftriaxone is reserved for exceptional situations of digestive intolerance or strong suspicion of resistant pneumococcus.
<i>H. influenzae</i>	or Amox/clav (oral) 80 mg/kg/day in 2 divided doses (maximum 3 g/day)		
	Treatment duration	Treatment duration	
	– 5 days for children older than 2 years	– 5 days for children older than 2 years	
	– 10 days for children under 2 years and after this age only for	– 10 days for children under 2 years and after this age only for	
	• otitis-prone children (recurrent AOM)	• otitis-prone children (recurrent AOM)	
	• otitis media with otorrhea	• otitis media with otorrhea	
Otitis with otorrhea	RADT + Amoxicillin (oral) 50 mg/kg/day in 2 divided doses (maximum 3 g/day)	Cefpodoxime (oral) 8 mg/kg/day in 2 divided doses (maximum 400 mg/day)	Before the age of 3 years, the most frequent bacterial species is <i>H. influenzae</i> . It is often involved in recurrent otorrhea [13]. After 3 years of age, GAS is the first species found [13].
Main target of antibiotic treatment			
<i>H. influenzae</i>			
<i>S. pyogenes</i>			
<i>S. pneumoniae</i>			
	RADT - Amoxicillin (oral) 80–100 mg/kg/day in 2 divided doses (maximum 3 g/day)	Cefpodoxime (oral) 8 mg/kg/day in 2 divided doses (maximum 400 mg/day)	After relaxation of NPIs imposed by COVID-19 pandemic, GAS has increased, including in children under 3 years old [17]. Because GAS remains susceptible to all β -lactams, GAS-RADT could help to guide antibiotic treatment. Furthermore, the low MICs of amoxicillin for GAS allow lower doses than <i>H. influenzae</i>
	or Amox/clav (oral) 80 mg/kg/day in 2 divided doses (maximum 3 g/day)		
	Duration of treatment 10 days regardless of age	Duration of treatment 10 days regardless of age	The sensitivity and specificity of these tests in this situation is close to 100%. In addition, GAS is rarely associated with other bacteria in ear infections.

Table 1 (continued)

Clinical situations and <i>Bacteriological target</i>	Recommended regimens	Alternatives (contra-indicated preferred treatment)	Comments
<u>Acute otitis media after failure of first antibiotic treatment</u>	<u>Failed after 1st treatment:</u>	Second line	Definition of failure Persistence or recurrence of clinical signs during treatment or within 72 hours of discontinuation. Treatment failures with amoxicillin treatment are mainly due to <i>H. influenzae</i> .
Main target of antibiotic treatment <i>H. influenzae</i> <i>S. pneumoniae</i>	Amoxicillin (oral) →	Amox/clav (oral) 80 mg/kg/day in 2 divided doses (maximum 3 g/day) Duration of treatment 10 days	
	Cefpodoxime (oral) →	Cefpodoxime (oral) 8 mg/kg/day in 2 divided doses (maximum 400 mg/day) Duration of treatment 10 days Amoxicillin (oral) 150 mg/kg in 3 divided doses (maximum 3 g/day) Duration of treatment 10 days	Treatment failures with cefpodoxime treatment are due to penicillin-resistant pneumococcus.
	Amox/clav (oral) →	Ceftriaxone 50 mg/kg/in 1 dose (IV or IM) (3 days)	Both bacteria can be involved in (very rare) failure of amox-clavulanate. Tympanocentesis for bacterial examination should be considered.
<u>Maxillary or frontal sinusitis</u>	Amoxicillin (oral) 80–100 mg/kg/day in 2 divided doses (maximum 3 g/day) Duration of treatment 10 days	Cefpodoxime (oral) 8 mg/kg/day in 2 divided doses (maximum 400 mg/day) Duration of treatment 10 days	Treatment is indicated: – in frontal sinusitis or in the following situations of maxillary sinusitis: • In the “severe-acute” form, the rarest with fever > 39 °C, headaches, purulent rhinorrhea, evolving > 3–4 days • In any clinical form with risk factors: asthma, heart disease, sickle cell anemia. – Without these risk factors, in both forms of the most common maxillary sinusitis (rhinopharyngeal symptoms lasting more than 10 days with no sign of improvement or secondarily aggravating), treatment should be discussed or delayed according to intensity of symptoms, their duration, and failure of symptomatic treatment.
Main target of antibiotic treatment <i>S. pneumoniae</i> <i>H. influenzae</i> <i>M. catarrhalis</i>			The vast majority of sore throats are viral in origin. The only important bacterial species for ambulatory patients in childhood is GAS. It is no longer acceptable to treat patients with antibiotics without first obtaining positive RDT.
<u>Tonsillo -pharyngitis</u>			
Main target of antibiotic treatment <i>S. pyogenes</i> (GAS)	No antibiotics	No antibiotics	
GAS-RADT -	Amoxicillin (oral) 50 mg/kg/day in 2 doses (maximum 2 g/day)	Cefpodoxime (oral) 8 mg/kg/day in 2 doses (maximum 400 mg/day) Duration of treatment 5 days or	All GAS strains remain susceptible to β-lactams. Resistance to macrolides varies depending on the area and the times. Over the last 5 years, the rate of resistance has been very low (less than 5%) in the strains isolated in children with GAS pharyngitis.
GAS-RADT+ <i>S. pyogenes</i> (GAS)	Duration of treatment 6 days	Clarithomycin (oral) 30 mg/kg/day in 2 divided doses (maximum 500 mg/day) Duration of treatment 5 days	

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Table 1 (continued)

Clinical situations and <i>Bacteriological target</i>	Recommended regimens	Alternatives (contra-indicated preferred treatment)	Comments
Recurrent GAS Tonsillo-pharyngitis GAS carrier state GAS eradication in invasive GAS infections	Cefalexin (oral) 50 mg/kg/day in 2 divided doses (maximum 2 g/day) For 10 days		For GAS carriage state and GAS eradication in invasive GAS infections, antibiotics are only exceptionally indicated [19]. Penicillin V, Penicillin G or amoxicillin are not the optimal treatments. Alternative treatments give better results in terms of GAS eradication. Several hypotheses have been raised to explain these differences (biofilms, internalization, bacterial interferences...)
	----- Amox/clav (oral) 50 mg/kg/day in 2 divided doses (maximum 2 g/day) For 10 days		
	----- Azithromycin (oral) In one daily dose 20 mg/kg/day for 3 days		
	----- Amoxicillin (oral) 50 mg/kg/day in 2 doses (maximum 2 g/day) For 10 days + Rifampicin (oral) 20 mg/kg/day in 2 doses The last 4 days of amoxicillin treatment		
Cervical lymphadenitis	If GAS-RADT +: Amoxicillin (oral) 50 mg/kg/day in 2 doses (maximum 2 g/day)	If GAS-RADT + or - Clarithromycin (oral) 15 mg/kg/day in 2 divided doses (maximum 500 mg/day) or	Rapid diagnostic tests for GAS are recommended in cervical adenitis if antibiotic therapy is considered: if positive, an antibiotic targeting this bacterial species may be prescribed [19]. If the infection is severe and hospitalization is indicated, prescribe the same antibiotics as for peri-pharyngeal abscesses, if possible after puncture.
<i>S. pyogenes</i> <i>S. aureus</i> (SAMS)	If GAS-RADT -: Amox/clav (oral) 80 mg/kg/day in 2 doses (maximum 2–3 g/day) Duration of treatment 10 days	Clindamycin (oral) 30 mg/kg/day in 3 divided doses (after 6 years) (maximum 1.8 g/day) Duration of treatment 10 days	
Uncomplicated dental abscess	Amoxicillin (oral) 50 mg/kg/day in 2 divided doses (maximum 3 g/day) Duration of treatment days	Clarithromycin (oral) 15 mg/kg/day in 2 divided doses (maximum 500 mg/day) Duration of treatment 6 days	
Main target of antibiotic treatment <i>Streptococcus viridans and anginosus</i> <i>and other anaerobes</i>	Amox/clav (oral) 80 mg/kg/day In 2 divided doses (maximum 3 g/day) Duration of treatment 10 days	Clarithromycin (oral) 15 mg/kg/day in 2 divided doses (maximum 500 mg/day) + Metronidazole (oral) 30 mg/kg/day in 2 divided doses, (maximum 1500 mg/day) Duration of treatment 10 days	
Dental abscess complicated by cellulitis Main target of antibiotic treatment Cover in addition <i>Bacteroides species</i>			

Table 1 (continued)

Clinical situations and Bacteriological target	Recommended regimens	Alternatives (contra-indicated preferred treatment)	Comments
Laryngitis	No antibiotics		Viral infection.No proven effectiveness of antibiotics.
Acute parotitis of bacterial origin (except in neonates)	Amox/clav (oral) 80 mg/kg (oral) or 100–150 mg/kg IV in 3 doses (maximum 4 g/day) Duration of treatment 10 days	Cotrimoxazole (oral) 30 mg/kg/day of Sulfamethoxazole in 2 divided doses (maximum 1600 mg/day)	Outside of the neonatal period, most parotitis is viral in origin, particularly mumps virus (at over 10 years of age, effectiveness of the vaccine, even after 2 doses, does not exceed 85%), and enterovirus. In a parotitis of bacterial origin, pus is retained at the orifice of Stensen canal, an inflammatory aspect of the parotid gland (suggesting abscessation and high inflammatory biological parameters (CRP and/or PCT). Recurrences are frequent [20].
Main target of antibiotic treatment		Clindamycin (oral) 30–40 mg/kg/day in 3 divided doses (maximum 2,4 g/day)	
<i>S. aureus</i> meti S (SAMS) Anaerobes			
		Duration of treatment 10 days	

IV: Intravenous.

IM: Intramuscular.

RADT: Rapid Antigen diagnostic test.

Amox-clavulanate: Amoxicillin-clavulanate combination.

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Table 2

Antibiotic therapy for serious ENT and stomatological infections.

Clinical situations and Bacteriological target	Recommended regimens	Alternatives (contra-indicated preferred treatment)	Comments
Peri-pharyngeal or retropharyngeal abscess Severe acute suppurative adenitis	Amox/clav (IV) 150 mg/kg/d IV in 3 divided doses (maximum 6 g/day)	Cefotaxime (IV) 200 mg/kg In 3 divided doses (maximum 12 g/day) +	Oral relay after the clinical improvement
Essential target of the treatment	Duration 10–14 days	Metronidazole 30 mg/kg/d in 2–3 IVL (maximum 1.5 g/day) or Clindamycin 40 mg/kg/d in 4 IVL (maximum 2.4 g/day)	
<i>S. pyogenes</i> SASM <i>S. pneumoniae</i> <i>Fusobacterium</i> spp. <i>Bacteroides</i> spp.		Duration 10–14 days	
Ethmoiditis			Even if the bacterial etiologies are identical, antibiotic treatment depends on the severity of the clinical picture and CT imaging. The Chandler-Hubert classification defines 5 stages of increasing severity: Stage 1: Inflammatory eyelid edema, with or without orbital edema.Stage 2: Subperiosteal abscess, (a) with edema of the eyelids and orbit, (b) spread of pus to the eyelids. Stage 3: orbital abscess.Stage 4: orbital cellulitis, (a) severe, (b) mild.
Essential target of the treatment			
<i>S. pneumoniae</i> <i>H. influenzae</i> <i>Peptostreptococcus</i> <i>S. aureus</i> <i>Fusobacterium Necrophorum</i>			

(continued on next page)

Table 2 (continued)

Clinical situations and <i>Bacteriological target</i>	Recommended regimens	Alternatives (contraindicated preferred treatment)	Comments
Minor pre-septal forms (Chandler-Hubert Stage 1)	Amox/clav (oral) 80 mg/kg/d in 3 divided doses (maximum 3 g/day) Duration of treatment 10 days	Ceftriaxone (IV or IM) 50 mg/kg/d in 1 daily dose (maximum 2 g/day) Duration of treatment 5 days	Stage 5: Thrombosis of the cavernous sinus.
Ethmoiditis usual forms (Chandler-Hubert Stages 2 and 3)			Even if the bacterial etiologies are the same, the use of amoxicillin-amoxicillin in the pre-septal or usual forms is justified by its good microbiological activity and the need to avoid cephalosporins more inductive of extended-spectrum enterobacterales β -lactamases.
Ethmoiditis (Chandler-Hubert stage 4 and 5) (Chandler Stage 4 and 5)	Amox/clav (IV) 150 mg/kg/d in 3 divided doses (maximum 4 g/day) or Cefotaxime (IV) 200 mg/kg/d 3 or 4 divided doses + Metronidazole (IV) 40 mg/kg/d in 3 divided doses Duration of treatment 10 days	Cefotaxime (IV) 200 mg/kg/d 3 or 4 divided doses (maximum 12 g/day) + Metronidazole (IV) 40 mg/kg/d in 3 divided doses Duration of treatment 10 days	However, for stage 4 and 5 forms, the risk of lessened diffusion of clavulanic acid renders preferable the cefotaxime-metronidazole association.
Acute mastoiditis Simple form <i>Essential target of the treatment</i> <i>S. pneumoniae</i> <i>S. pyogenes</i>	Amoxicillin (IV) 150–200 mg/kg/day in 3 or 4 divided doses (maximum 8 g/day) Duration 10–14 days	Cefotaxime (IV) 200 mg/kg/day in 3 or 4 divided doses ⁶ (maximum 12 g) or Ceftriaxone (IV) (75 mg/kg/day) in 1 daily dose (maximum 2 g/day) Duration 10–14 days	The choice of amoxicillin as a first-line treatment is justified by the low proportion of amoxicillin-resistant pneumococci, which was less than 7% in 2022 (ACTIV Data) Duration of treatment must be adapted to clinical and biological evolution.
Acute mastoiditis Dragging form (>5 days) <i>Essential targets of treatment</i> <i>S. pneumoniae</i> <i>S. pyogenes</i> <i>Fusobacterium sp</i>	Amox/clav (IV) 150 mg/kg in 3 or 4 in divided doses (max 4 g/day) Duration 10–14 days	Cefotaxime (IV) 200 mg/kg/day in 3 or 4 divided doses (maximum 12 g/day) + Metronidazole (IV) 40 mg/kg/d in 3 divided doses (maximum 1.5 g/day) or Ceftriaxone (IV) (75 mg/kg/day) in 1 daily dose (maximum 2 g/day) + Metronidazole (IV) 40 mg/kg/d in 3 divided doses	
Acute mastoiditis Complicated form (neurological damage, thrombosis)	Cefotaxime (IV) 200 mg/kg/d 3 or 4 divided doses (max 12 g/day) + Metronidazole 40 mg/kg/day in 2–3 IVL (max 1,5 g/day)	Advice on Pediatric Infectious Diseases is required	

Table 2 (continued)

Clinical situations and <i>Bacteriological target</i>	Recommended regimens	Alternatives (contraindicated preferred treatment)	Comments
Epiglottitis Essential targets of treatment <i>S. pneumoniae</i> <i>H. influenzae</i> serotype b	Cefotaxime (IV) 200 mg/kg/d 3 or 4 divided doses Duration 5–7 days (maximum 12 g/day) or Ceftriaxone (IV) 50 mg/kg in 1 injection (maximum 2 g/day) Duration 5–7 days	Advice on Pediatric Infectious Diseases is required	
Bacterial laryngotracheobronchitis Essential targets of treatment <i>S. aureus</i> <i>S. pneumoniae</i> <i>S. pyogenes</i>	Amox/clav (IV) 100–150 mg/kg in 3 divided doses followed by oral relay	Cefazolin (IV) 100 mg/kg in 3 divided doses followed by oral relay	A rare disease, it is an infection of the trachea causing dyspnea and stridor. Most children have symptoms of viral respiratory infection for 1–3 days before severe symptoms appear. Diagnosis is based on clinical, laryngoscopy and/or imaging. In addition to antibiotics, treatment is based on airway control.
Acute bacterial parotitis of the newborn (no meningitis) <i>Streptococcus agalactiae</i> (Group B <i>Streptococcus</i>) SASM	Amox-clav (IV) 100–150 mg/kg in 3 divided doses + Gentamicin 5 mg/kg/day in one IV (30 minutes) for 48 hours if septicemic form Duration of treatment 10 days		

Table 3
Oral relay according to the molecule initially administered in IV.

Initial antibiotic	Oral relay
<ul style="list-style-type: none"> - Amoxicillin: 150–200 mg/kg/day in 3–4 IVL - Amox/clav: 150 mg/kg/day IV in 3–4 divided doses - Cefotaxime: 200 mg/kg/day IV in 3–4 divided doses. - or Ceftriaxone: 75 mg/kg/day in 1 IVL 	<ul style="list-style-type: none"> - Amoxicillin: 100 mg/kg/day in 3 doses - Amox/clav: 80 mg/kg/day in 3 divided doses. - Amox/clav: 80 mg/kg/day in 3 divided doses - Penicillin allergy: <ul style="list-style-type: none"> Cefalexin[†]: 100 mg/kg/day in 3 divided doses Cefpodoxime-proxetil^{††}: 8 mg/kg/day in 2 divided doses^{††} - Clindamycin: 30–40 mg/kg/day in 3 divided doses - Metronidazole: 40 mg/kg/day in 3 doses.
<ul style="list-style-type: none"> - Clindamycin: 40 mg/kg/day in 3–4 IVL - Metronidazole: 40 mg/kg/day in 2–3 IVL 	

IV: Intravenous.

[†] Target spectrum restricted to Gram-positive cocci (SGA, SAMS) possible cross-allergy with penicillin (to be avoided in case of severe allergy and in the absence of allergological exploration).

^{††} No activity on *S. aureus* even meti-S.

it cannot be ruled out that these favorable trends be reversed in the coming years [10,11]. The therapeutic choices proposed in this manuscript are in line with the latest GPIP-SFP-SPLIF recommendations, which were adopted in the 2021 HAS guidelines [6,7].

As for PAOM complicated by otorrhea or cervical lymphadenitis, GAS-RADT is recommended. In extra-pharyngeal infections as well, studies have shown excellent sensitivity and specificity and justify GAS-RADT. When antibiotic therapy seems called for, it is possible prescribe a narrow-spectrum compound targeting GAS only [12–14].

The COVID-19 pandemic and the non-pharmaceutical interventions (NPIs) imposed so as to control SARS-CoV-2 spread have had dramatic impacts on epidemiology in many ambulatory pediatric infectious diseases, including URTI (Upper respiratory tract infections). When NPIs were massively applied, sharply decreased URTI frequency was observed, but after the relaxation of COVID-related restrictions, extensive “COVID rebound” was reported [15,16]. The changes concerned not only incidence or frequency, but also the distribution of pathogens in different clinical situations [13,17].

Severe ENT infections (mastoiditis, epiglottitis, retro- and parapharyngeal abscesses, ethmoiditis) represent therapeutic emergencies that most often justify hospitalization and intravenous (IV) antibiotics [14,18]. No data are available on the recommended duration of treatment for these severe forms. That said, total duration of 10–14 days, depending on the initial severity and the rapidity of therapeutic response, seems reasonable by extrapolation from other clinical situations. An oral relay may reduce hospitalization duration when certain conditions are met: clear clinical improvement in fever, pain and local signs; markedly reduced biological inflammatory syndrome. These clinical and biological objectives are generally achieved after 2–5 days of initial IV treatment. If this is not the case, a medical-surgical re-evaluation of the situation must be considered in view of identifying a complication (an abscessed focus. . .).

As regards ambulatory ENT infections, Table 1 presents, in different clinical situations: the pathogens most often involved (targets of antibiotic treatment), the preferred choice of treatment and the alternatives in case of contra-indication (allergy. . .).

As regards serious ENT infections requiring hospitalization, Table 2 likewise presents, in different clinical situations: the pathogens most often involved (targets of antibiotic treatment), the preferred choice of treatment and the alternatives in case of contra-indication (allergy, etc.).

Table 3 presents the proposed oral relays according to the compounds initially administered by intravenous (IV) route.

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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