

**COMMUNITY-ACQUIRED PNEUMONIA IN
CHILDREN 3 MONTHS OF AGE OR OLDER**

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This optimal usage guide is mainly intended for primary care health professionals. It is provided for information purposes only and should not replace the clinician's judgement. The recommendations were developed using a systematic approach and are supported by the scientific literature and the knowledge and experience of Quebec clinicians and experts. For more details, go to inesss.qc.ca.

GENERAL INFORMATIONS

IMPORTANT CONSIDERATIONS

Viruses are the most frequently encountered pathogens in the first two years of life (respiratory syncytial virus, influenza, human metapneumovirus, parainfluenza virus, adenovirus, coronavirus).

- **Risk factors** of *Streptococcus pneumoniae* resistance :
- Daycare attendance
 - Children < 2 years of age
 - Recent hospital stay
 - Recent antibiotic treatment (< 30 days)

MOST FREQUENTLY INVOLVED PATHOGENS BASED ON THE AGE OF THE CHILD*
(the pathogens encountered from 0 to 3 months of age are provided for information purposes only)

UNDER 1 MONTH OLD	1 TO 3 MONTHS OLD	PRESCHOOL AGE	SCHOOL AGE AND ADOLESCENCE
Respiratory viruses	Respiratory viruses	Respiratory viruses	<i>Streptococcus pneumoniae</i>
Group B streptococcus	<i>Streptococcus pneumoniae</i>	<i>Streptococcus pneumoniae</i>	<i>Mycoplasma pneumoniae</i>
<i>Haemophilus influenzae</i> (non-typable)	<i>Chlamydia trachomatis</i>	<i>Mycoplasma pneumoniae</i>	<i>Chlamydia pneumoniae</i>
Gram-negative bacteria	<i>Bordetella pertussis</i>	<i>Chlamydia pneumoniae</i>	Respiratory viruses

**Haemophilus influenzae* type b has all but disappeared thanks to the vaccine. This infection occurs mainly in unvaccinated children.

PREVENTIVE MEASURES

- Living in a smoke-free environment
- Following the recommended vaccination schedule under the Québec Immunisation Program
- Treating asthma appropriately

DIAGNOSIS

Pneumonia is diagnosed based on the following signs and symptoms :

- Fever
- Tachypnea
- Chest indrawing
- Crepitant rales
- Cough
- Desaturation
- Grunting
- Diminished breath sounds

Abdominal pain can also be a classic sign of pneumonia.

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AGE-SPECIFIC CRITERIA FOR TACHYPNEA (taken from the Canadian Paediatric Society, 2015)		
Age	Approximate normal respiratory rates (breaths/minute)	Upper limit that should be used to define tachypnea (breaths/minute)
< 2 months	34 to 50	60
2 to 12 months	25 to 40	50
1 to 5 years	20 to 30	40
> 5 years	15 to 25	30

The symptoms of pneumonia may be non-specific, especially in infants and younger children.

Abrupt onset of rigors favours a bacterial cause.

Mycoplasma pneumoniae is typically characterized by malaise and headache for 7 to 10 days before the onset of fever and cough, which then predominate.

MEDICAL IMAGING

A chest x-ray is **generally** recommended to confirm the pneumonia diagnosis and avoid overdiagnosis. However, it is **sparsely useful** in children experiencing wheezing with typical presentation of bronchiolitis or asthma, because bacterial pneumonia is then very unlikely.

The [Canadian Paediatric Society](#) provides some information regarding medical imaging.

POTENTIAL INDICATIONS FOR HOSPITALIZATION :

- Age < 3 to 6 months
- Toxic or lethargic appearance
- Severe respiratory distress
- Oxygen requirement
- Underlying cardiac or pulmonary disease
- Immunodeficiency
- Complicated pneumonia (effusion, empyema, abscess, etc.)
- Epidemiological context of a virulent/multidrug-resistant pathogen
- Dehydration, inability to feed
- Vomiting
- Failure to respond to oral antibiotics
- Low parental involvement to ensure treatment compliance

TREATMENT PRINCIPLES

SUPPORTIVE TREATMENTS

- ▶ It is important to reduce pain and fever by using an analgesic/antipyretic (acetaminophen or ibuprofen*), especially in the first few days.
- ▶ It is important to maintain adequate hydration.
- ▶ Antitussives are not recommended for children under 6 years of age.

*Ibuprofen is not recommended for children under 6 months of age.

HISTORY OF ALLERGIC REACTION TO A PENICILLIN ANTIBIOTIC

- ▶ True penicillin allergy is uncommon. For 100 children with a history of penicillin allergy fewer than 6 will be **CONFIRMED** to have a true diagnosis of allergy and the reactions will be mostly delayed non-severe rashes.
 - It is therefore important to carefully assess the allergy status of a patient who reports a history of allergic reaction to penicillin, before considering using alternatives to beta-lactams. For help, consult [the decision-making tool in case of allergy to penicillins](#).


**FIRST-LINE TREATMENT OF COMMUNITY-ACQUIRED PNEUMONIA
IN CHILDREN 3 MONTHS OF AGE OR OLDER**

IF VIRAL PNEUMONIA PRESUMED

In children in good condition overall whose clinical presentation and imaging (if applicable) points to viral infection :

- Supportive treatments
- No indication for antibiotics

IF BACTERIAL PNEUMONIA PRESUMED¹

Antibiotic	Daily dosage ²	Maximum dosage	Treatment duration
Amoxicillin	90 mg/kg/day PO ÷ TID	1 000 mg PO TID	7 to 10 day
If antibiotics have been used in the last 30 days or If the child has not been vaccinated against <i>Haemophilus influenzae type b</i>	Amoxicillin-clavulanate³ (7:1 formulation)	90 mg/kg/day PO ÷ TID	7 to 10 day
	or Amoxicillin + Amoxicillin-clavulanate³ (7:1 formulation)	or 45 mg/kg/day PO ÷ TID + 45 mg/kg/day PO ÷ TID	
If history of allergic reaction to a penicillin antibiotic	Click here  to view the community-acquired pneumonia in children algorithm for help in choosing an antibiotic therapy		

IF ATYPICAL PNEUMONIA PRESUMED⁴

Antibiotic	Daily dosage	Maximum dosage	Treatment duration
Clarithromycin	15 mg/kg/day PO ÷ BID	500 mg PO BID	7 to 10 days
Azithromycin	10 mg/kg PO daily on day 1, then 5 mg/kg PO daily x 4 days	500 mg PO daily, on day 1, then 250 mg PO daily x 4 days	5 days

1. For school-aged children in whom it is not possible to eliminate atypical pneumonia, a macrolide (clarithromycin or azithromycin) can be added to first-line antibiotic treatment.
2. Although the Canadian Paediatric Society and several clinicians prefer TID administration, BID administration remains an alternative if there is a suspected risk of non-compliance with treatment.
3. The 7:1 formulation (BID) of amoxicillin-clavulanate is preferred due to its higher digestive tolerance. The 200 mg/5 ml and 400 mg/5 ml formulations and 875 mg tablets contain the correct ratio of amoxicillin and clavulanic acid. Some clinicians use a combination of amoxicillin (45 mg/kg/day) and amoxicillin-clavulanate (7:1 formulation) (45 mg/kg/day) to reduce adverse effects (total of 90 mg/kg/day, 14:1 equivalent); volumes of amoxicillin and amoxicillin-clavulanate to be given could be different.
4. Subacute onset, cough-dominant, minimal leukocytosis and non-lobar infiltrates, generally in school-aged children.

If the patient has a fever that persists for more than 48 to 72 hours after the start of treatment or if there is clinical deterioration: reassess the patient and repeat the x-ray to look for complications that would require hospitalization.

MAIN REFERENCES

Bradley JS, Byington CL, Shah SS, Alverson B, Carter ER, Harrison C, *et al.* "Executive summary: the management of community-acquired pneumonia in infants and children older than 3 months of age: clinical practice guidelines by the Pediatric Infectious Diseases Society and the Infectious Diseases Society of America." *Clin Infect Dis* 2011;53(7):e25–76.

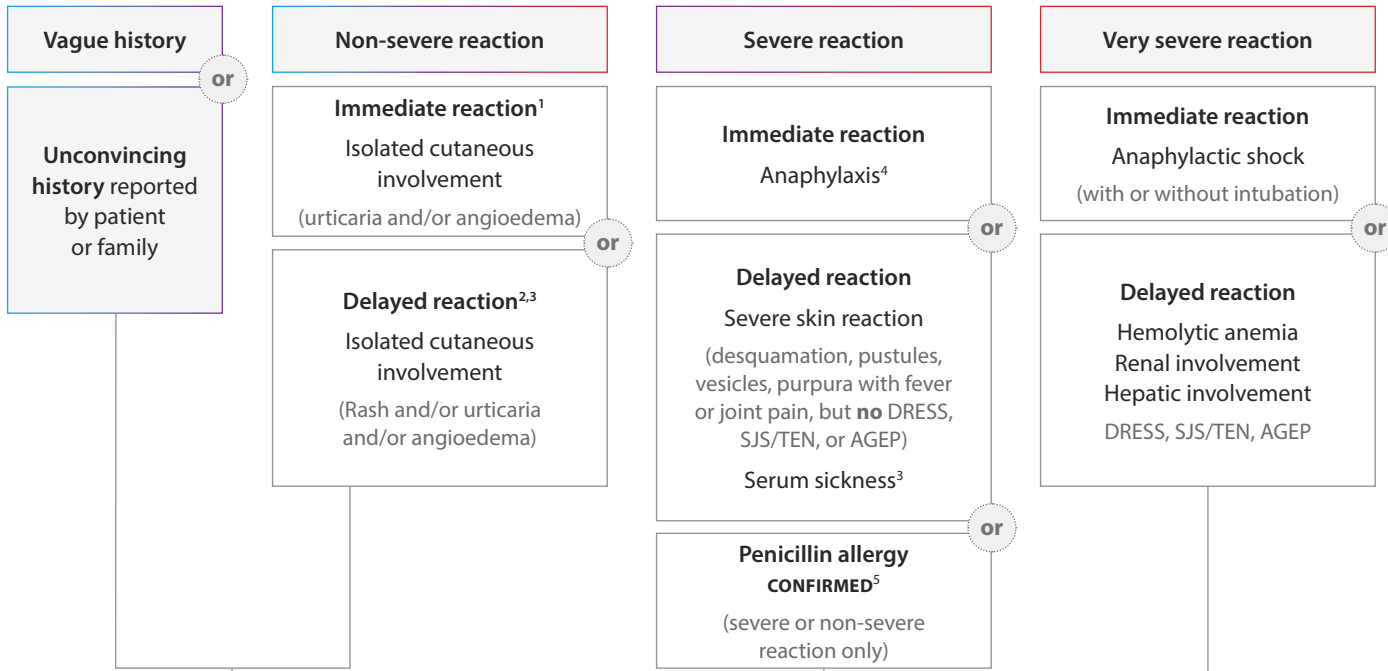
Harris M, Clark J, Coote N, Fletcher P, Harnden A, McKean M, Thomson A. "British Thoracic Society guidelines for the management of community acquired pneumonia in children: update 2011." *Thorax* 2011;66(Suppl 2):ii1–23.

Le Saux N and Robinson JL. "La pneumonie non compliquée chez les enfants et les adolescents canadiens en santé: points de pratique sur la prise en charge." *Paediatr Child Health* 2015;20(8):446–50.

Please note that other references have been consulted.

SEVERITY OF PREVIOUS ALLERGIC REACTION TO PENICILLIN ANTIBIOTICS

ASSESS THE SEVERITY OF THE INITIAL REACTION



THE FOLLOWING CAN BE PRESCRIBED SAFELY

DISSIMILAR cephalosporins
Cefuroxime axetil⁶

SIMILAR cephalosporins
Cefprozil⁷ if history of allergy does not suggest an immediate reaction...

If in doubt about the possibility of an immediate reaction...
a 1-hour observation period after the administration of the 1st dose of Cefprozil⁷ under the supervision of a health professional could be advised according to the clinician judgment.

PRESCRIBE THE FOLLOWING WITH CAUTION

Penicillins
Amoxicillin +/- Clavulanate

The 1st dose should **always** be administered under medical supervision.

If history of:

- **Immediate reactions**, a drug provocation test should be performed;
- **Delayed reactions**, the patient or his/her family should be informed of the possible risk of recurrence in the days following initiation of the antibiotic.

PRESCRIBE THE FOLLOWING WITH CAUTION

DISSIMILAR cephalosporins
Cefuroxime axetil⁶

SIMILAR cephalosporins
Cefprozil⁷ **ONLY** if serum sickness-like reactions occurred in childhood³.

The 1st dose should **always** be administered under medical supervision.

If history of:

- **Immediate reactions**, a drug provocation test should be performed;
- **Delayed reactions**, the patient or his/her family should be informed of the possible risk of recurrence in the days following initiation of the antibiotic.

AVOID PRESCRIBING

Penicillins
Amoxicillin +/- Clavulanate

SIMILAR cephalosporins
Cefprozil⁷ for all other clinical situations (with the exception of children with a history of serum sickness-like reactions³, as described above).

IF A BETA-LACTAM⁸ CANNOT BE ADMINISTERED, THE FOLLOWING CAN BE PRESCRIBED...

Clarithromycin OR Azithromycin

AVOID PRESCRIBING

Beta-lactams⁸
Choose another class of antibiotics.

PRESCRIBE THE FOLLOWING

Clarithromycin OR Azithromycin

1. Immediate reaction (type I or IgE-mediated): usually occurs within one hour after taking the **first dose** of an antibiotic.
2. Delayed reaction (types II, III and IV): may occur at any time from one hour after administration of a drug.
3. Delayed skin reactions and serum sickness-like reactions that occur in children on antibiotic therapy are generally non-allergic and may be of viral origin.
4. Anaphylaxis without shock or intubation: requires an extra level of vigilance.
5. With no recommendations concerning other beta-lactams.
6. Cefuroxime axetil as an oral suspension is not widely used due to its unpleasant taste. See the product monograph to learn how to improve the taste of this medication.
7. Cefprozil has not been approved by Health Canada for the treatment of pneumonia. However, it is frequently prescribed for this purpose, and experts agree that this antibiotic is an acceptable treatment option for pneumonia.
8. Penicillins, cephalosporins and carbapenems.

For further information, see [the interactive tool](#) and [the decision-making tool](#).

AGEP : acute generalized exanthematous pustulosis;
DRESS : drug reaction with eosinophilia and systemic symptoms;
SJS : Stevens–Johnson syndrome;
TEN : toxic epidermal necrolysis.

DECISION-MAKING FOR CHOOSING A BETA-LACTAM AND THE CONDITIONS OF ADMINISTRATION

**FIRST-LINE ANTIBIOTIC THERAPY FOR BACTERIAL PNEUMONIA PRESUMED¹
IF HISTORY OF ALLERGIC REACTION TO A PENICILLIN ANTIBIOTIC**

	Antibiotic	Daily dosage ²	Maximum dosage	Treatment duration
Beta-lactams ⁶ recommended, according to the clinical judgement support algorithm	Cefuroxime axetil³	30 mg/kg/day PO ÷ BID	500 mg PO BID	7 to 10 days
	Cefprozil⁴			
	Amoxicillin	90 mg/kg/day PO ÷ TID	1 000 mg PO BID	
	Amoxicillin/Clavulanate⁵ (7:1 formulation) OR Amoxicillin + Amoxicillin-Clavulanate⁵ (7:1 formulation)	90 mg/kg/day PO ÷ TID OR 45 mg/kg/day PO ÷ TID + 45 mg/kg/day PO ÷ TID	1 000 mg PO TID OR 500 mg PO TID + 500 mg PO TID	
Alternative if a beta-lactam ⁶ cannot be administered	Clarithromycin	15 mg/kg/day PO ÷ BID	500 mg PO BID	7 to 10 days
	Azithromycin	10 mg/kg PO daily, on day 1, then 5 mg/kg PO daily x 4 days	500 mg PO, daily, on day 1, then 250 mg PO daily x 4 days	5 days

- For school-aged children in whom it is not possible to eliminate atypical pneumonia, a macrolide (clarithromycin or azithromycin) can be added to first-line antibiotic treatment.
 - Although the Canadian Paediatric Society and several clinicians prefer TID administration, BID administration remains an alternative if there is a suspected risk of non-compliance with treatment.
 - Cefuroxime axetil as an oral suspension is not widely used due to its unpleasant taste. See the product monograph to learn how to improve the taste of this medication.
 - Cefprozil has not been approved by Health Canada for the treatment of pneumonia. However, it is frequently prescribed for this purpose, and experts agree that this antibiotic is an acceptable treatment option for pneumonia.
 - The 7:1 formulation (BID) of amoxicillin-clavulanate is preferred due to its higher digestive tolerance. The 200 mg/5 ml and 400 mg/5 ml formulations and 875 mg tablets contain the correct ratio of amoxicillin and clavulanic acid. Some clinicians use a combination of amoxicillin (45 mg/kg/day) and amoxicillin-clavulanate (7:1 formulation) (45 mg/kg/day) to reduce adverse effects (total of 90 mg/kg/day, 14:1 equivalent); volumes of amoxicillin and amoxicillin-clavulanate to be given could be different.
 - Penicillins, cephalosporins and carbapenems.
- !** If the cautious administration of penicillin is the option chosen, opt for amoxicillin/clavulanate instead of amoxicillin alone if the following applies: antibiotics used in the past 30 days.