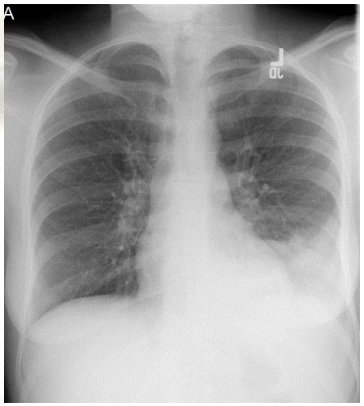
Hôpitaux Universitaires de Genève

UNIVERSITÉ DE GENÈVE

Pneumonie communautaire de l'enfant: prise en charge et traitement



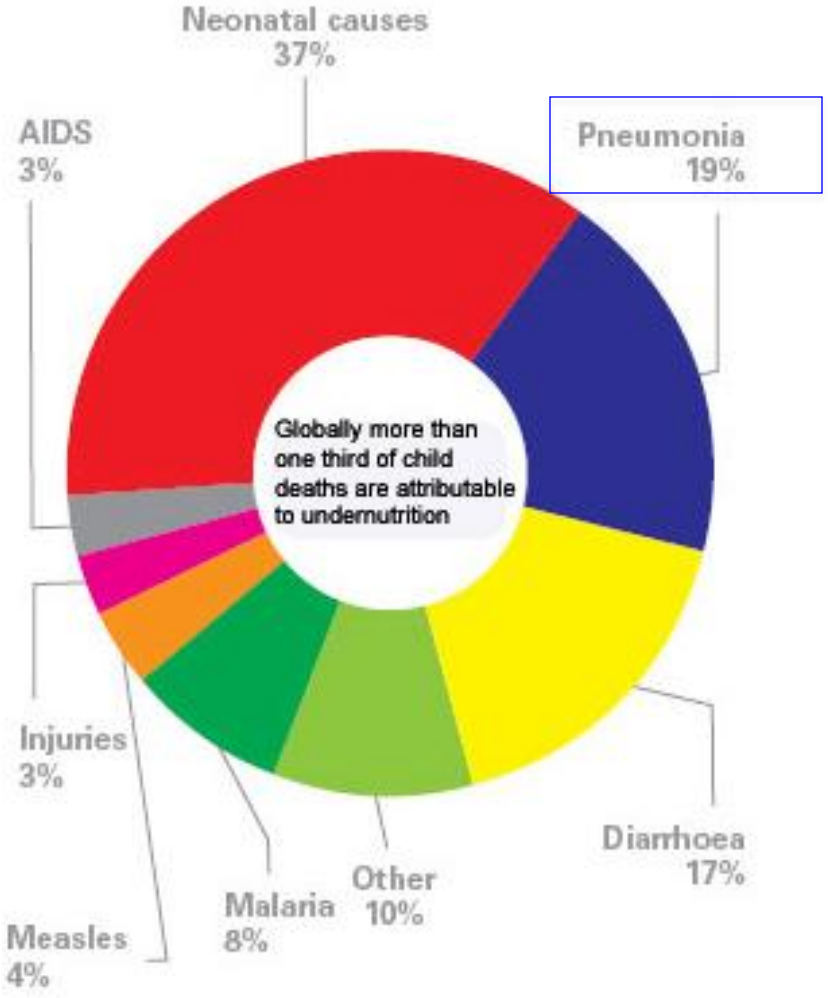
Prof. A. Gervaix

Epidémiologie

Pneumonie: première cause de mortalitéchez l'enfant de moins de 5 ans

Plus de 3 millions de décès chaque année

Plus que la malaria, la rougeole et le VIH ensemble



UNICEF 2010

Epidémiologie

Incidence des pneumonies (EU-USA):

- 3.4-4 cas / 100 enfants/ an

Lancet 2006

Incidence annuelle diminue avec l'âge :

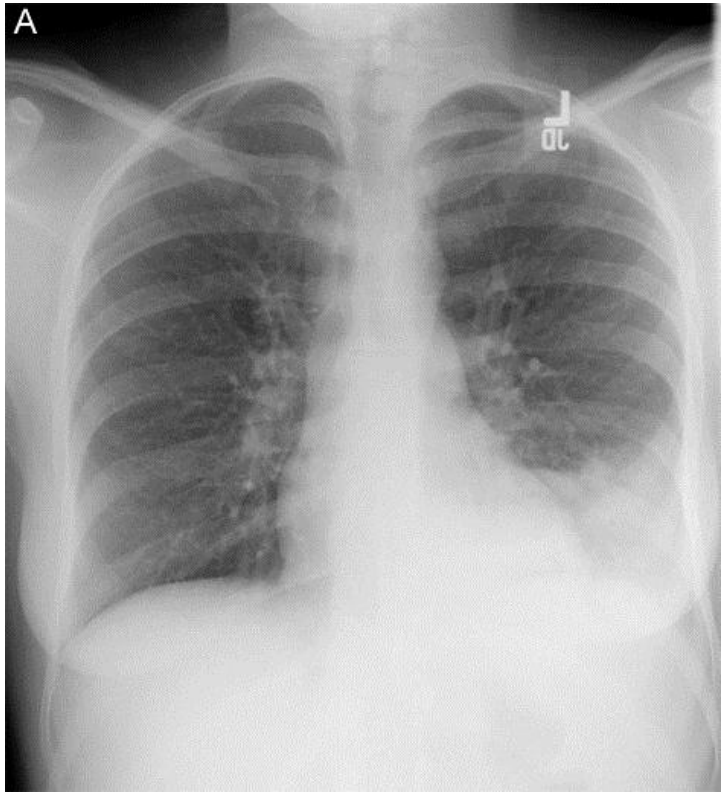
- <5a 4 cas / 100 enfants/ an
- 5-9a 2 cas / 100 enfants/ an
- 10-15a 1cas / 100 enfants/ an

J Pediatr 1986

The "killer" bugs

- *S. pneumoniae*
- RSV

Lancet 2010



Critères diagnostiques

Signes / symptômes /diagnostic

- Apparence générale
- Fièvre > 38.5^{0}C
- Toux
- Tachypnée
  - Age < 2 mois: 60 ou + respirations /min
  - Age 2-12 mois: 50 ou + respirations /min
  - Age 12 m à 5 ans: 40 ou + respirations /min
- Difficultés respiratoires

Peu spécifiques et ne permettent pas de distinguer une origine virale ou bactérienne

Pneumonie communautaire de l'enfant: prise en charge et traitement

IDSA GUIDELINES

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

BTS guidelines

British Thoracic Society guidelines for the management of community acquired pneumonia in children: update 2011

SYNOPSIS OF RECOMMENDATIONS

Clinical features

- Bacterial pneumonia should be considered in children when there is persistent or repetitive fever >38.5°C together with chest recession and a raised respiratory rate. [D]

- CID 2011:53 (1 October)

Thorax 2011;**66**:ii1–ii23.

Pneumonie communautaire de l'enfant: prise en charge et traitement

« Of all the common pediatric infectious diseases, pneumonia is the one for which a microbiologic diagnosis is most difficult to determine »

G.H. McCracken

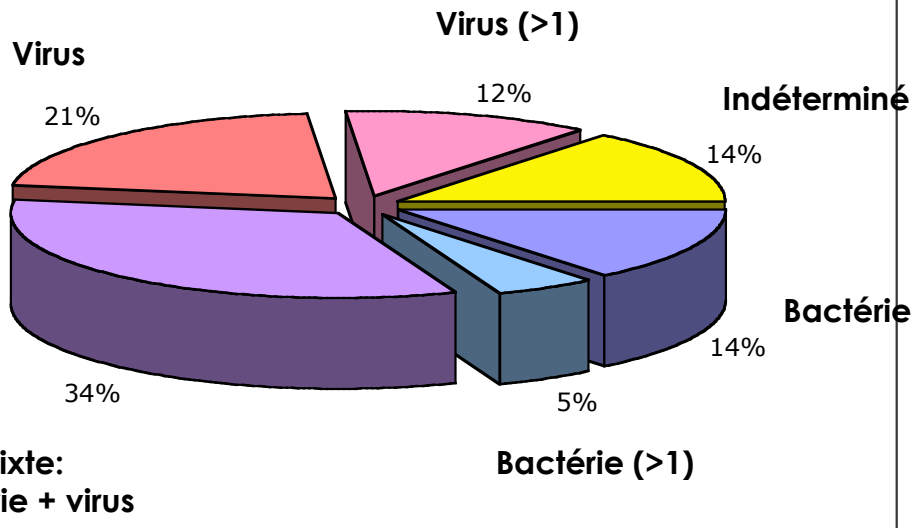
- Un bon traitement ne peut pas être appliqué sans un minimum de preuves sur l'origine de la maladie

Etiologie des pneumonies en CH

Etiology of community-acquired pneumonia in hospitalized children based on WHO clinical guidelines

Manon Cevey-Macherel · Annick Galetto-Lacour · Alain Gervaix · Claire-Anne Siegrist · Jacques Bille · Béatrice Bescher-Ninet · Laurent Kaiser · Jean-Daniel Krahenbuhl · Mario Gehri

Virus: 67%



Bactérie: 53%

Au moins 1 pathogène identifié dans 86% des cas

Eur J Pediatr (2009) 168:1429–1436

Etiologie des pneumonies en CH

Table 4 Pathogens identified in 99 hospitalized children with community-acquired pneumonia

Pathogen		No Co-infection	Co-infection with bacteria[a]	Co-infection with viruses[a]	Total no. of episodes, %
Bacteria	*S. pneumoniae*	12	10	28	45 (46) = 70%
(53%)	*S. Group A β hemolytic*	0	1	1	1 (1)
	M. pneumoniae	2	5	5	11(11)
	C. pneumoniae	0	6	6	7 (7)
Viruses	Influenza A or B	0	8	10	14 (14)
	Parainfluenza 1–3	2	8	8	13 (13)
	Rhinovirus	7	11	10	20 (20)
	hMPV	5	5	7	13 (13)
	RSV A or B	6	3	7	13 (13)
	Enterovirus	1	8	11	13 (13)
	Adenovirus	0	6	5	7 (7)
	Coronavirus	0	4	7	7 (7)

[a] The categories of co-infection with bacteria or with viruses are not mutually exclusive

Etiologie des pneumonies

	Estimated percentage*	Comments
Bacterial (20–50%)		
Streptococcus pneumoniae	17–37%	Estimates based on proportion of radiographically confirmed pneumonia prevented by vaccination with 7-valent and 9-valent vaccine (vaccine probe studies),[21,26,27] and supported by lung aspiration studies[25]
Haemophilus influenzae	0–31%	Increasing use of highly efficacious vaccine against disease by *H influenzae* type b may decrease its role as a pathogen Non-type b may play a greater role in non-severe pneumonia than type b[28] Found to be a significant cause of pneumonia in all vaccine probe studies,[29-31] except one,[32] and in lung aspiration studies[25]
Staphylococcus aureus	1–33%	Presents clinically as a severe, necrotising pneumonia with rapid progression[25]
Non-typhoidal salmonellae	0–28%	Bacteraemia may present with features consistent with a clinical diagnosis of pneumonia[33-35] Estimates are based on studies from tropical Africa[33,36] Associated with non-severe pneumonia in some malaria-endemic regions of Africa[34]
Mycoplasma pneumoniae	5%	Limited diagnostic capacities in low-income countries[37-40] Proportion of pneumonia associated with infection increases with age, the greatest burden is in children aged >3 years[41] Assumption that infections do not cause significant morbidity or mortality lacks evidence to be either validated or invalidated[42,43]
Chlamydophila pneumoniae	3–10%	Limited diagnostic capacities in low-income countries[37-39] Proportion of pneumonia associated with infection increases with age, the greatest burden is in children aged >3 years[41] Poor quality serological data for very young children[44]
Moraxella catarrhalis	0–9%	Often not the focus of pneumonia microbiological studies[45]
Klebsiella pneumoniae	0–4%	One study noted a higher proportion of 14% in children with previous antimicrobial use[45] Rare exception in malnourished children[46]
Viral (9–64%)		
Respiratory syncytial virus	1–39%	Particularly important in young infants[47]
Influenza viruses	0–22%	Important cause throughout age range[47] Increasingly documented in the tropics[48]
Adenoviruses	0–54%	Limited diagnostic testing and use of poor or insensitive tests[47]
Parainfluenza viruses	0–46%	Occurrence in alternating years means that single-year studies have limited value[49]
Human metapneumovirus	2–8%	Recent but well-documented cause of pneumonia[50-53]
Others (including bocavirus, coronaviruses, and rhinoviruses)	4–30%	Recent PCR-based studies more consistently identify new viruses, but their significance remains to be defined[54-56]

*These estimates of aetiological burden have wide ranges. Variation may be real, due to increased proportions of aetiologies due to high HIV prevalence, as well as seasonal (eg, influenza) and geographical (eg, *Salmonella*) variability. However, the primary source of variability may be due to measurement, either enrolment criteria (hospitalised versus outpatient enrolment), inadequate diagnostic testing of blood cultures with low yield (eg, blood culture), or misclassification (eg, urine antigen testing). Previous antimicrobial administration also may result in underestimation of some agents, and poor laboratory quality can also play an important part.[57] Zero percentages (except in the case of *Klebsiella*) are often due to lack of diagnostic testing and the use of poor or insensitive tests, which are the important reasons for failure to consistently identify these pathogens, although in some cases true seasonal or geographical variations may contribute.

Table 2: **Common pathogens that cause pneumonia in otherwise healthy children aged 2–59 months**

Pneumonie communautaire de l'enfant: prise en charge et traitement

DIAGNOSTIC TESTING FOR PEDIATRIC CAP

Marqueurs inflammatoires

27. Acute-phase reactants, such as the erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) concentration, or serum procalcitonin concentration, cannot be used as the sole determinant to distinguish between viral and bacterial causes of CAP. *(strong recommendation; high-quality evidence)*

28. Acute-phase reactants need not be routinely measured in fully immunized children with CAP who are managed as outpatients, although for more serious disease, acute-phase reactants may provide useful information for clinical management. *(strong recommendation; low-quality evidence)*

29. In patients with more serious disease, such as those requiring hospitalization or those with pneumonia-associated complications, acute-phase reactants may be used in conjunction with clinical findings to assess response to therapy. *(weak recommendation; low-quality evidence)*

IDSA GUIDELINES

- Acute phase reactants are not of clinical utility in distinguishing viral from bacterial infections and should not be tested routinely. [A–]

BTS guidelines

Pneumonie communautaire de l'enfant: prise en charge et traitement

DIAGNOSTIC TESTING FOR PEDIATRIC CAP

Urinary Antigen Detection Tests

19. Urinary antigen detection tests are not recommended for the diagnosis of pneumococcal pneumonia in children; false-positive tests are common. *(strong recommendation; high-quality evidence)*

Testing for Atypical Bacteria

23. Children with signs and symptoms suspicious for *Mycoplasma pneumoniae* should be tested to help guide antibiotic selection. *(weak recommendation; moderate-quality evidence)*

IDSA GUIDELINES

Pneumonie communautaire de l'enfant: prise en charge et traitement

Elevated Inflammatory Markers Combined With Positive Pneumococcal Urinary Antigen Are a Good Predictor of Pneumococcal Community-acquired Pneumonia in Children

Annick Galetto-Lacour, MD, Gabriel Alcoba, MD, MPH,* Klara M. Posfay-Barbe, MD,† Manon Cevey-Macherel, MD,‡ Mario Gehri, MD,‡ Martina M. Ochs,§ Roger H. Brookes,¶ Claire-Anne Siegrist, MD,† and Alain Gervaix, MD**

Pneumonie communautaire de l'enfant: prise en charge et traitement

Méthode

At admission, blood cultures were performed for all patients, and white blood cell (WBC) count, CRP and PCT values were also determined. Urine samples were also collected, and a rapid urinary pneumococcal test (BinaxNOW *S. pneumoniae* urinary antigen test: Binax, Portland, ME) was performed. Nasopharyngeal aspirates (NPAs) were obtained for viral and bacterial cultures, PCR analysis and viral antigen detection. RT-PCR assays for 13 viruses including influenza A and B, respiratory syncytial virus A and B, rhinovirus, parainfluenza 1–3, enterovirus, human metapneumovirus, coronavirus OC43, E229 and NL 63 and PCR for *Mycoplasma pneumoniae* and *Chlamydia pneumoniae* were performed, as described previously.[11–14] On admission day, blood samples also included pneumolysin-specific PCR (PLY-PCR) using real-time PCR with TaqMan method. The specific target was the pneumolysin gene, and the positive cutoff was defined as 1000 copies/mL.[15–17]

Pneumonie communautaire de l'enfant: prise en charge et traitement

DIAGNOSTIC TESTING FOR PEDIATRIC CAP

TABLE 1. Comparison of Different Indices for CAP With or Without Pneumococcal Etiology

	P-CAP n = 37	Without P-CAP n = 38	*P*
Gender (female)	19/37 (51.3%)	18/38 (47.4%)	NS
Age* (mo)	35.1 (18.1–46.9)	37.2 (16.2–55.4)	NS
Age (yr)			NS
0–<2	14 (36.8%)	14 (37.8%)	
2–<4	10 (26.3%)	15 (40.5%)	
4–6	14 (36.8%)	8 (21.6%)	
CRP* (mg/L)	200 (12–278)	78 (2–331)	0.0001
PCT* (ng/mL)	12.2 (0.3–62.1)	1.2 (0–29.2)	0.0001
WBC* (G/L)	17.4 (4.8–35.6)	10.75 (4.2–47.2)	0.0008
PUA positive	20/29 (69%)	12/35 (34.3%)	0.006
NPA culture positive	20/28 (71.4%)	8/27 (29.6%)	0.002
Virology positive	22/37 (59.5%)	31/38 (81.6%)	0.035

*Median (range).

Virology positive indicates positive viral PCR or antigen or culture or serology; NPA culture positive, positive NPA culture for *Streptococcus pneumoniae*; NS, nonsignificant.

Pneumonie communautaire de l'enfant: prise en charge et traitement

DIAGNOSTIC TESTING FOR PEDIATRIC CAP

TABLE 2. Univariate and Multivariate Associations (Adjusted for Age and Gender) of P-CAP With its Predictors

Predictors (Cutoff)	Univariate OR (95% CI)	*P*	Multivariate* OR (95% CI)	*P*
PCT (>1.5 ng/mL)	18.9 (4.0–90.0)	<0.0001	23.1 (4.6–117.0)	<0.0001
CRP (>100 mg/L)	17.4 (4.5–66.9)	<0.0001	18.8 (4.7–74.6)	<0.0001
WBC (>15 G/L)	4.0 (1.5–10.5)	0.005	4.7 (1.7–13.0)	0.003
Band (>1.5 G/L)	2.5 (0.99–6.5)	0.05	2.9 (1.1–7.6)	0.033
PUA (positive)	4.3 (1.5–12.1)	0.006	4.6 (1.6–13.5)	0.006
NPA culture (positive)	5.9 (1.9–19.0)	0.003	7.4 (2.1–26.7)	0.002
Virology (positive)	0.3 (0.1–0.95)	0.039	0.3 (0.1–0.97)	0.044

*OR adjusted for age and gender.

Virology positive indicates positive viral PCR or antigen or culture or serology; NPA culture, NPA culture for *Streptococcus pneumoniae*; NS, nonsignificant.

Pneumonie communautaire de l'enfant: prise en charge et traitement

TABLE 3. Diagnostic Accuracy of Predictors for P-CAP

Predictors (Cutoff)	Sensitivity	Specificity	NPV	PPV	LR+	LR–
PCT (≥1.5 ng/mL)	94.4	52.6	90.9	65.4	1.99	0.11
PCT (≥0.5 ng/mL)	97.2	36.8	93.3	59.3	1.54	0.08
CRP (≥100 mg/L)	91.9	60.5	88.5	69.4	2.33	0.13
CRP (>40 mg/L)	94.6	31.6	85.7	57.4	1.38	0.17
WBC (>15 G/L)	64.9	68.4	66.7	66.7	2.05	0.51
PUA	69.0	65.7	71.9	62.5	2.01	0.47
NPA culture	71.4	70.4	70.4	71.4	2.41	0.41
PCT* and PUA	65.5	85.7	75.0	79.2	4.59	0.40
CRP† and PUA	65.5	88.6	75.6	82.6	5.73	0.39
PCT* and NPA culture	70.4	88.5	74.2	86.4	6.10	0.33
CRP† and NPA culture	67.9	85.2	71.9	82.6	4.58	0.38
PCT* and virus (negative)	38.9	94.7	62.1	87.5	7.39	0.65
CRP† and virus (negative)	37.8	94.7	61.0	87.5	7.19	0.66

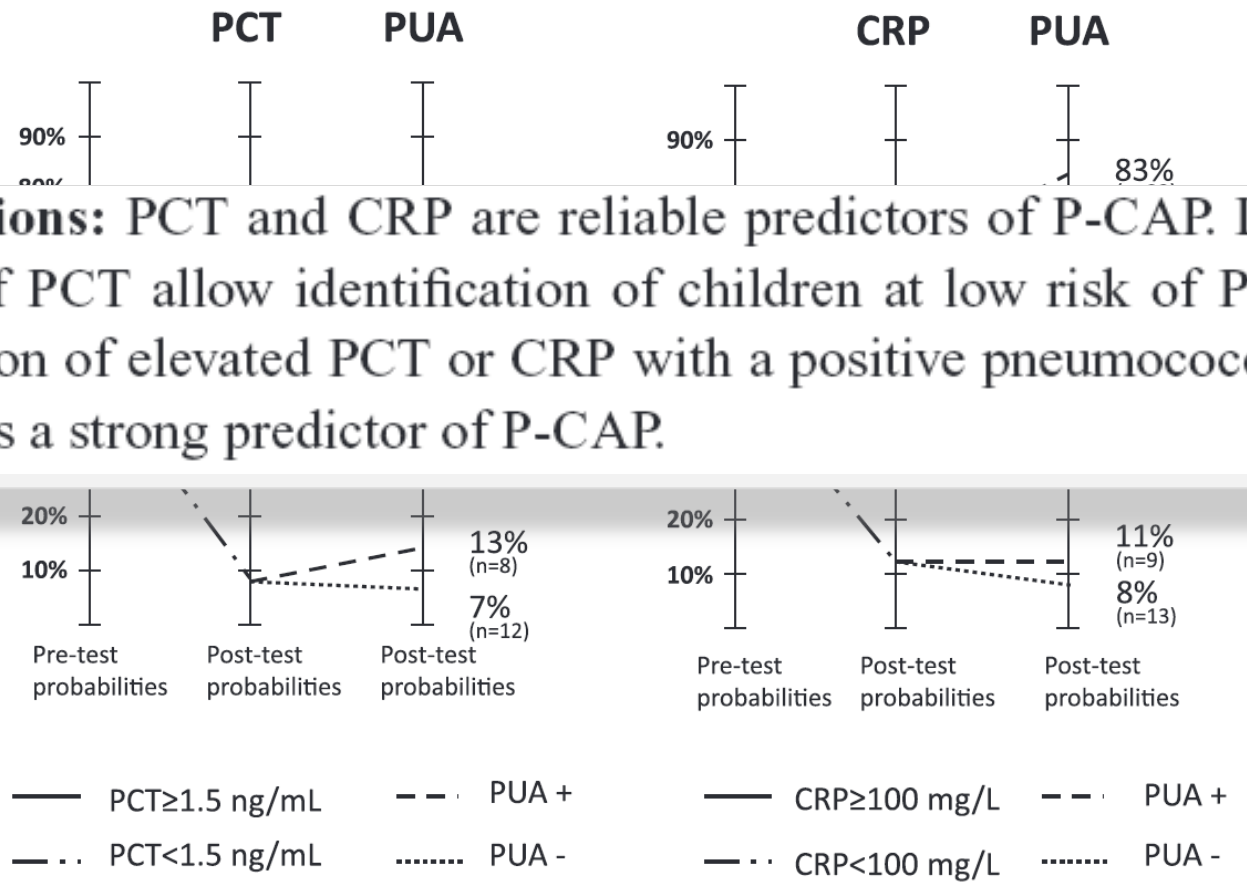
*>1.5 ng/mL.

†>100 mg/L.

NPV indicates negative predictive value; PPV, positive predictive value; LR+, positive likelihood ratio; LR–, negative likelihood ratio; NPA culture, positive NPA culture for *Streptococcus pneumoniae*; virus (negative), absence of virus detection by viral PCR or antigen or culture or serodiagnosis.

- On peut raisonnablement exclure une pneumonie à *S pneumoniae* si PCT/CRP basse
- On peut raisonnablement la confirmer si PCT/CRP élevée **ET** absence de virus ou PUA +

Pneumonie communautaire de l'enfant: prise en charge et traitement



Conclusions: PCT and CRP are reliable predictors of P-CAP. Low cutoff values of PCT allow identification of children at low risk of P-CAP. The association of elevated PCT or CRP with a positive pneumococcal urinary antigen is a strong predictor of P-CAP.

Post-test probability for pneumococcal CAP with PCT or CRP combined with the pneumococcal urinary antigen.

Prise en charge des pneumonies

DIAGNOSTIC TESTING FOR PEDIATRIC CAP

Table 2 Demographic and clinical results of 99 patients hospitalized for community-acquired pneumonia and correlation with etiology

Characteristics	Total	Bacterial	Viral	Mixed	Unknown pathogen	*P* Value
CRP mg/l[a]	167 (60; 200)	200 (100; 204)	88 (21; 194)	200 (117; 250)	142 (23; 192)	0.009[c,i]
PCT ng/ml[a]	6.0 (1; 14)	11.5 (5; 18)	2.0 (0.5; 7.5)	11.0 (3; 18)	3.0 (0.5; 4)	0.018[c,j]
WBC count (G/L)[a]	15.0 (9; 21)	15.0 (11; 19)	12.0 (7; 21)	16.0 (10; 21)	15.5 (11; 18)	0.591[c]
Band forms (G/L)[a]	1.85 (0.6–3.8)	2.65 (1.3; 3.8)	1.4 (0.5; 2.6)	1.82 (1.0; 4.0)	1.31 (0.6; 3.1)	0.417[c]

Eur J Pediatr (2009) 168:1429–1436

TABLE 2. Demographic and Clinical Characteristics of 154 Hospitalized Children With Community-Acquired LRIs Associated With Bacterial, Viral, or Unknown Pathogens

Characteristics	Type of Lower Respiratory Pathogens					*P* Value
	Typical Bacteria[a]	*M pneumoniae* or *C pneumoniae*[b]	Viruses[c]	Mixed Bacteria/ Viruses[d]	Unknown	
WBC count, × 10^9/L[e]	16.1	12.3	14.5	15.6	14.4	.76
Band forms, %[e]	6.5	1.5[f]	1.0[g]	11.5[fg]	3.0	.038
Band forms (proportion >10%)	39	8[f]	27	56[fg]	19[g]	.006
S pneumoniae NP colonization, %	20	12	35	22	22	.48
Procalcitonin, ng/mL[e]	2.4[f]	0.7[fg]	0.6[i]	2.6[gi]	1.3	.014
Procalcitonin, proportion ≥0.75 ng/mL	68[f]	41	32[fgi]	66[g]	67[i]	.012

PEDIATRICS Vol. 113 No. 4 April 2004

Pneumonie communautaire de l'enfant: prise en charge et traitement

DIAGNOSTIC TESTING FOR PEDIATRIC CAP

Testing For Viral Pathogens

20. Sensitive and specific tests for the rapid diagnosis of influenza virus and other respiratory viruses should be used in the evaluation of children with CAP. A positive influenza test may decrease both the need for additional diagnostic studies and antibiotic use, while guiding appropriate use of antiviral agents in both outpatient and inpatient settings. *(strong recommendation; high-quality evidence)*

IDSA GUIDELINES

Pneumonie communautaire de l'enfant: prise en charge et traitement

IDSA GUIDELINES

BTS guidelines

Radiologie

31. Routine chest radiographs are not necessary for the confirmation of suspected CAP in patients well enough to be treated in the outpatient setting (after evaluation in the office, clinic, or emergency department setting). *(strong recommendation; high-quality evidence)*

33. Chest radiographs (posteroanterior and lateral) should be obtained in all patients hospitalized for management of CAP to document the presence, size, and character of parenchymal infiltrates and identify complications of pneumonia that may lead to interventions beyond antimicrobial agents and supportive medical therapy. *(strong recommendation; moderate-quality evidence)*

- Chest radiography should not be considered a routine investigation in children thought to have community acquired pneumonia (CAP). [A–]

- Children with signs and symptoms of pneumonia who are not admitted to hospital should not have a chest x-ray. [A–]
- A lateral x-ray should not be performed routinely. [B–]

Pneumonie communautaire de l'enfant: prise en charge et traitement

DIAGNOSTIC TESTING FOR PEDIATRIC CAP

- **Radiologie**

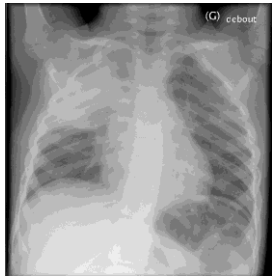
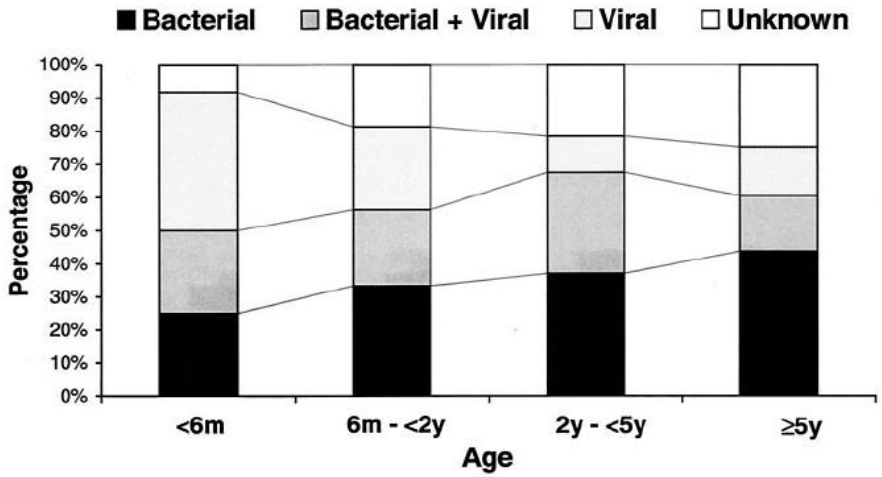


TABLE 2. Demographic and Clinical Characteristics of 154 Hospitalized Children With Community-Acquired LRIs Associated With Bacterial, Viral, or Unknown Pathogens

Characteristics	Type of Lower Respiratory Pathogens					*P* Value
	Typical Bacteria[a]	*M pneumoniae* or *C pneumoniae*[b]	Viruses[c]	Mixed Bacteria/ Viruses[d]	Unknown	
Lobar or segmental consolidation ± effusion, %	75	53	45	69	53	.06
Pleural effusion, %	50[fgi]	6[f]	10[g]	39	19[i]	.0002

Pneumonie communautaire de l'enfant: prise en charge et traitement

Distribution selon l'âge



PEDIATRICS Vol. 113 No. 4 April 2004

Age	*S. pneumoniae*	*M. pneumoniae*	*C. pneumoniae*	Viral
0-4 ans	24%	4%	1%	37%
5-9 ans	36%	30%	13%	21%
10-16 ans	31%	51%	35%	4%

Heiskanen et al. PIDJ, 1998

Pneumonie communautaire de l'enfant: prise en charge et traitement

Prise en charge minimale

- **Examen clinique**
- **CRP / PCT**
- **Rx du thorax**
- **Test rapide Influenza/ RSV en saison**

Début brutal
Fièvre élevée
CRP / PCT élevée
Consolidation Rx
TDR viral négatif

S. pneumoniae

Début progressif
Fièvre modérée
CRP / PCT basse
Pas de consolidation Rx
TDR viral positif
Age pré-scolaire

Virus

Début progressif
Fièvre modérée
CRP / PCT basse
Pas de consolidation Rx
TDR viral négatif
Age scolaire

M. pneumoniae

Prise en charge des pneumonies: TRAITEMENT

IDSA GUIDELINES

BTS guidelines

42. Amoxicillin should be used as first-line therapy for previously healthy, appropriately immunized infants and preschool children with mild to moderate CAP suspected to be of bacterial origin. Amoxicillin provides appropriate coverage for *Streptococcus pneumoniae*, the most prominent invasive bacterial pathogen. Table 5 lists preferred agents and

Oral therapy (step-down therapy or mild infection)
Preferred: amoxicillin (90 mg/kg/day in 2 doses or 45 mg/kg/day in 3 doses);

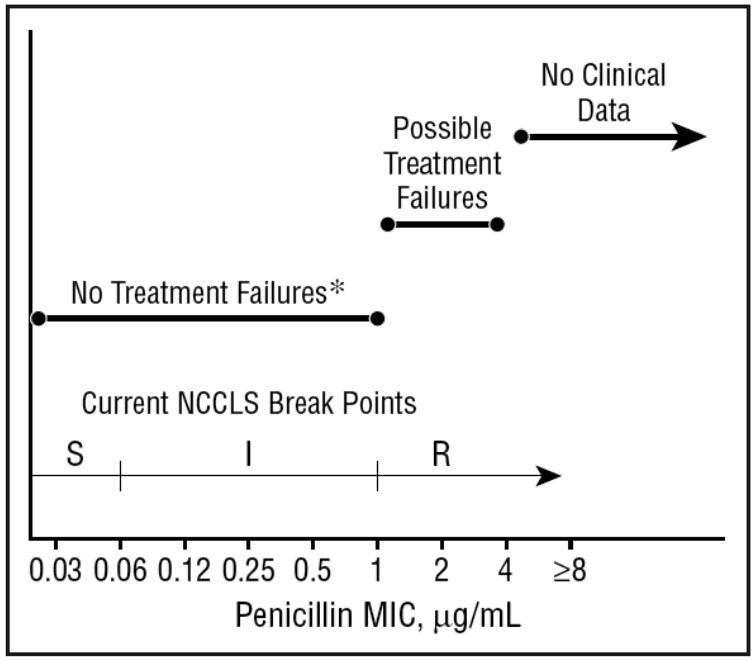
Prise en charge des pneumonies: TRAITEMENT

Recommendations

- Antibiotics administered orally are safe and effective for children presenting with even severe CAP. [A+]
- Intravenous antibiotics should be used in the treatment of pneumonia in children when the child is unable to tolerate oral fluids or absorb oral antibiotics (eg, because of vomiting) or presents with signs of septicaemia or complicated pneumonia. [D]
- Recommended intravenous antibiotics for severe pneumonia include amoxicillin, co-amoxiclav, cefuroxime, and cefotaxime or ceftriaxone. These can be rationalised if a microbiological diagnosis is made. [D]

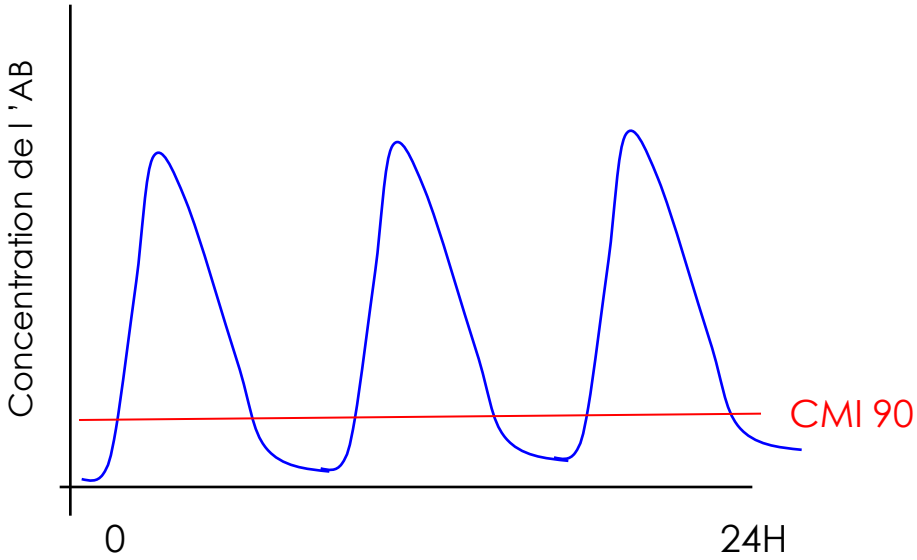
Prise en charge des pneumonies: TRAITEMENT

Management of Community-Acquired Pneumonia in the Era of Pneumococcal Resistance



The relationship between pneumococcal resistance and treatment outcomes for patients with pneumonia. Horizontal lines indicate the

Arch Intern Med. 2000;160:1399-1408



Pneumonie communautaire de l'enfant: prise en charge et traitement

Antibiotic Treatment of Children With Community-Acquired Pneumonia: Comparison of Penicillin or Ampicillin Versus Cefuroxime

- Inclusions: Tout enfant âgé de 3 mois à 2 ans hospitalisé pour une CAP non-compliquée et traité par pénicilline, ampicilline ou céfuroxime

- Définition de CAP basée sur le diagnostic posé par le médecin en charge du patient

Pediatric Pulmonology 48:52–58 (2013)

TABLE 1—Clinical Characteristics of Patients Aged 3 Months to 2 Years

	Penicillin (n = 50) or ampicillin (n = 16)	Cefuroxime (n = 253)
Means age, months	*14.2 (4.4)[a]	*11.7 (5.5)[a]
Mean weight percentile for age	23.5 (24.8)[a]	27.7 (26.6)[a]
Mean duration of cough before admission, days	3.7 (4.9)[a]	4.1 (4.7)[a]
Mean duration of fever before admission, days	3.5 (2.9)[a]	2.9 (2.6)[a]
Mean respiratory rate	48.7 (12.9)[a] [58][b]	46.6 (13.6)[a] [242][b]
Mean SaO_2 on room air (%)	95.1 (3.3)[a] [58][b]	94.1 (5.3)[a] [253][b]
% of patients with fever above 38°C	36.0 [65][b]	39.0 [251][b]
Mean WBC, 10^9/L	*25.0 (10.2)[a] [63][b]	*20.9 (9.7)[a] [250][b]
% of PMN	63.4 (15.7)[a] [62][b]	59.0 (17.3)[a] [240][b]
Mean CRP, mg/dl	16.3 (14.0)[a] [35][b]	14.0 (12.6)[a] [131][b]

[a]Standard deviation.
[b]Number of patients tested.
*$P < 0.01$ for comparison between penicillin\ampicillin to cefuroxime.

TABLE 2—Treatment Outcomes of Patients Aged 3 Months to 2 Years

	Penicillin (n = 50) or ampicillin (n = 16)	Cefuroxime (n = 253)
Mean duration of IV treatment, days	2.36 (1.2)[a]	2.59 (1.6)[a]
Mean duration of hospitalization, days	2.67 (1.4)[a]	2.96 (1.7)[a]
Mean duration of oxygen requirement, days	0.31 (1.2)[a]	0.64 (1.3)[a]
Decision to change antibiotic treatment, n	5 (7.6%)	12 (4.7%)
Patients hospitalized over 72 hr, n	23 (34.8%)	91 (36.0%)
Patients with fever above 38°C at 72 hr, n	3 (13.0%)	15 (16.5%)
Patients with oxygen requirement at 72 hr, n	2 (8.7%)	19 (20.9%)
Patients hospitalized over 1 week, n	2 (3.0%)	7 (2.8%)
Patients with fever above 38°C after 1 week, n	0 (0%)	1 (14.3%)
Patients with oxygen requirement after 1 week, n	0 (0%)	0 (0%)

[a]Standard deviation.

In previously healthy children, parenteral penicillin or ampicillin for treatment of non-complicated CAP in-hospital is as effective as cefuroxime, and should remain the recommended first-line therapy. **Pediatr Pulmonol. 2013; 48:52–58.**

Prise en charge des pneumonies: TRAITEMENT

Mycoplasma pneumoniae

Chlamydia trachomatis or *Chlamydophila pneumoniae*

Preferred: azithromycin (10 mg/kg on day 1, followed by 5 mg/kg/day once daily on days 2–5);

Alternatives: clarithromycin (15 mg/kg/day in 2 doses) or oral erythromycin (40 mg/kg/day in 4 doses); for children >7 years old, doxycycline (2–4 mg/kg/day in 2 doses; for adolescents with skeletal maturity, levofloxacin (500 mg once daily) or moxifloxacin (400 mg once daily)

Comparative Effectiveness of Ceftriaxone in Combination With a Macrolide Compared With Ceftriaxone Alone for Pediatric Patients Hospitalized With Community-acquired Pneumonia

JoAnna K. Leyenaar, MD, MPH, Meng-Shiou Shieh, PhD,† Tara Lagu, MD, MPH,*‡§*
Penelope S. Pekow, PhD,†¶ and Peter K. Lindenauer, MD, MSc‡§*

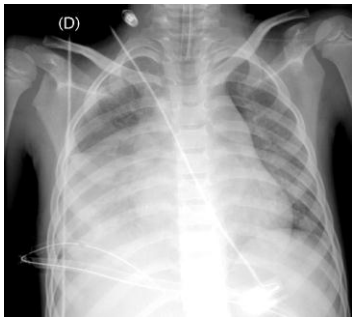
Conclusions: Combination therapy did not appear to benefit preschool children but was associated with higher costs. Among school-aged children, combination therapy was associated with a shorter length of stay without a significant impact on cost. Development of sensitive point-of-care diagnostic tests to identify children with *M. pneumoniae* infection may allow for more focused prescription of macrolides and enable comparative effectiveness studies of targeted provision of combination therapy.

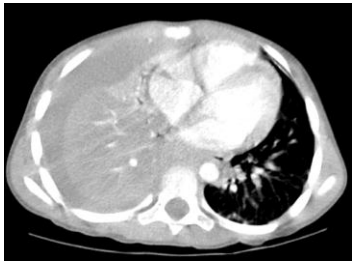
(*Pediatr Infect Dis J* 2014;33:387–392)

Pneumonie: quoi de neuf dans le diagnostic, le traitement et la prévention de cette infection ?

Si aucune amélioration dans les 48-72 heures, penser à:

- complications (épanchement pleural, abcès)
- germe résistant
- autre pathogène (virus, germe atypique…)





→ Examen clinique
CRP / PCT
Rx thorax

modifier le traitement ou adresser à l'hôpital

Pneumonie communautaire de l'enfant: prise en charge et traitement

Critères d' hospitalisation:

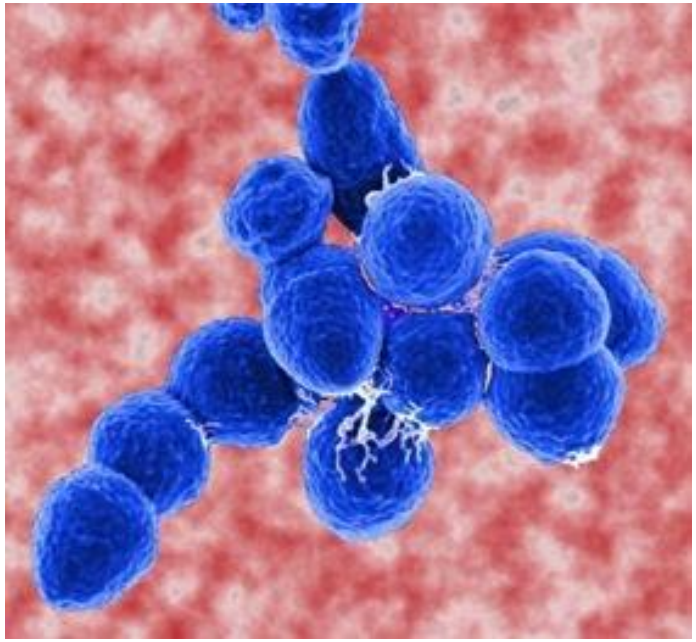
- hypoxémie ($Sa0_2$ ≤92% à l' AA)
- C/o nourrisson FR >70/min., dyspnée, grunting difficultés alimentaires
- C/o enfants: FR > 50/min., dyspnée, grunting, déshydratation
- Difficultés parentales à apporter des soins appropriés

Pneumonie communautaire de l'enfant: prise en charge et traitement

Critères d' hospitalisation en soins intensifs

- SaO2 < 92% sous 60% de FiO2
- Choc
- Détresse respiratoire rapide avec ou sans augmentation de la pCO2
- Apnées récurrentes ou respiration lente et irrégulière

Prévention des PAC: les vaccins anti-S. pneumoniae



Prévention des pneumonies: Effet du PCV-7

Decline in pneumonia admissions after routine childhood immunisation with pneumococcal conjugate vaccine in the USA: a time-series analysis

Carlos G Grijalva, J Pekka Nuorti, Patrick G Arbogast, Stacey W Martin, Kathryn M Edwards, Marie R Griffin

Revue des codes "diagnostic" (Nationwide inpatient sample) 1997-2004

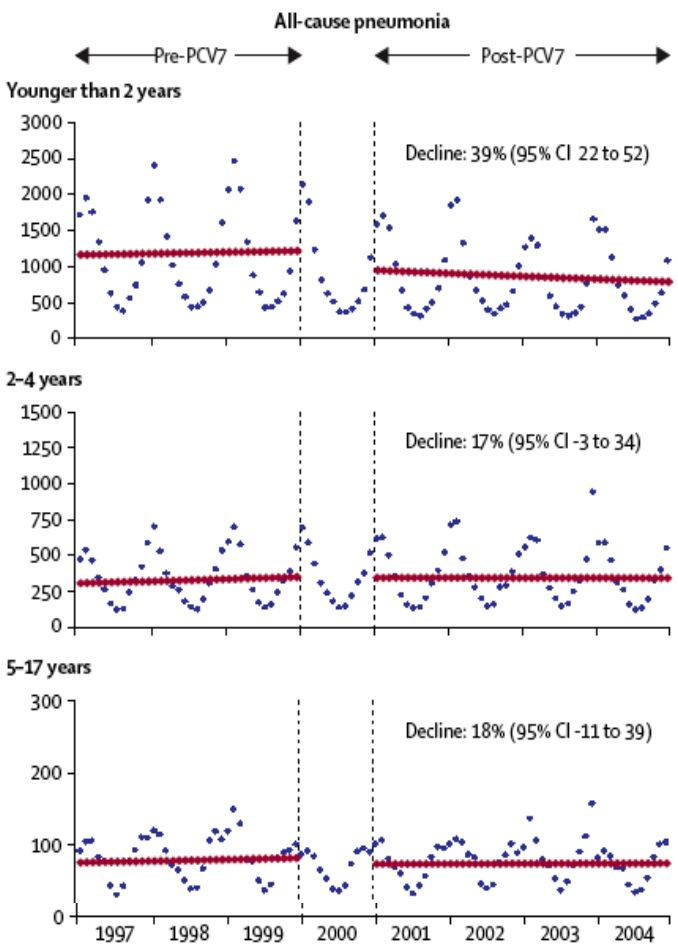
>293 x10^6 hospitalisations aux USA

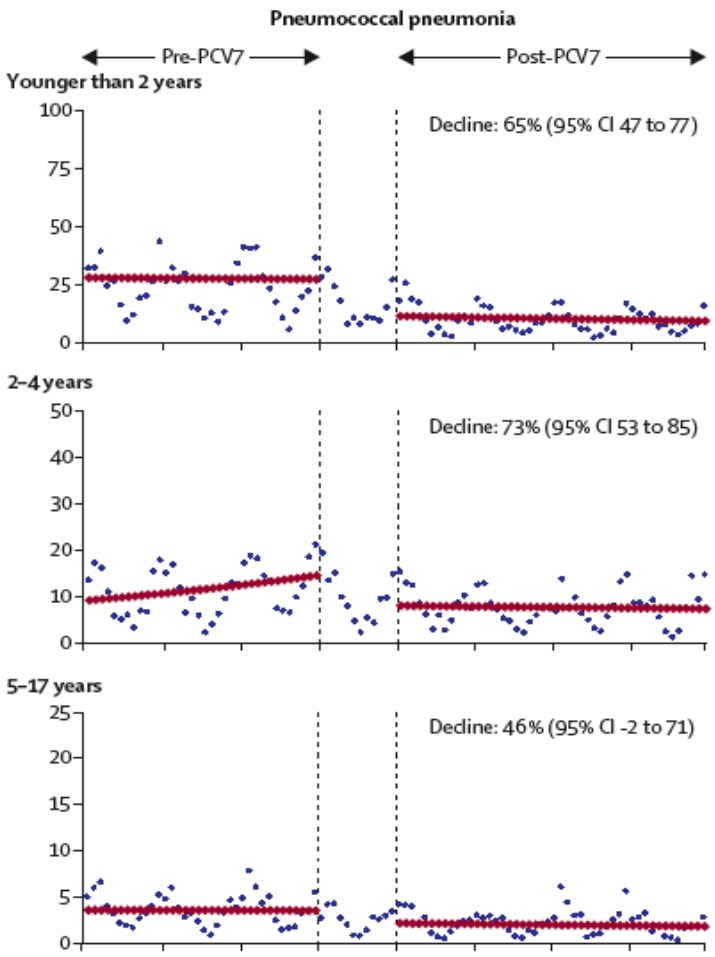
4% (>1x10^7) "Pneumonie"
4% (>4x10^5) "Pneumonie à *S. pneumoniae*"

Analyse des périodes 1997-1999 puis 2001-2004

Lancet 2007; 369: 1179–86

Prévention des pneumonies: Effet du PCV-7

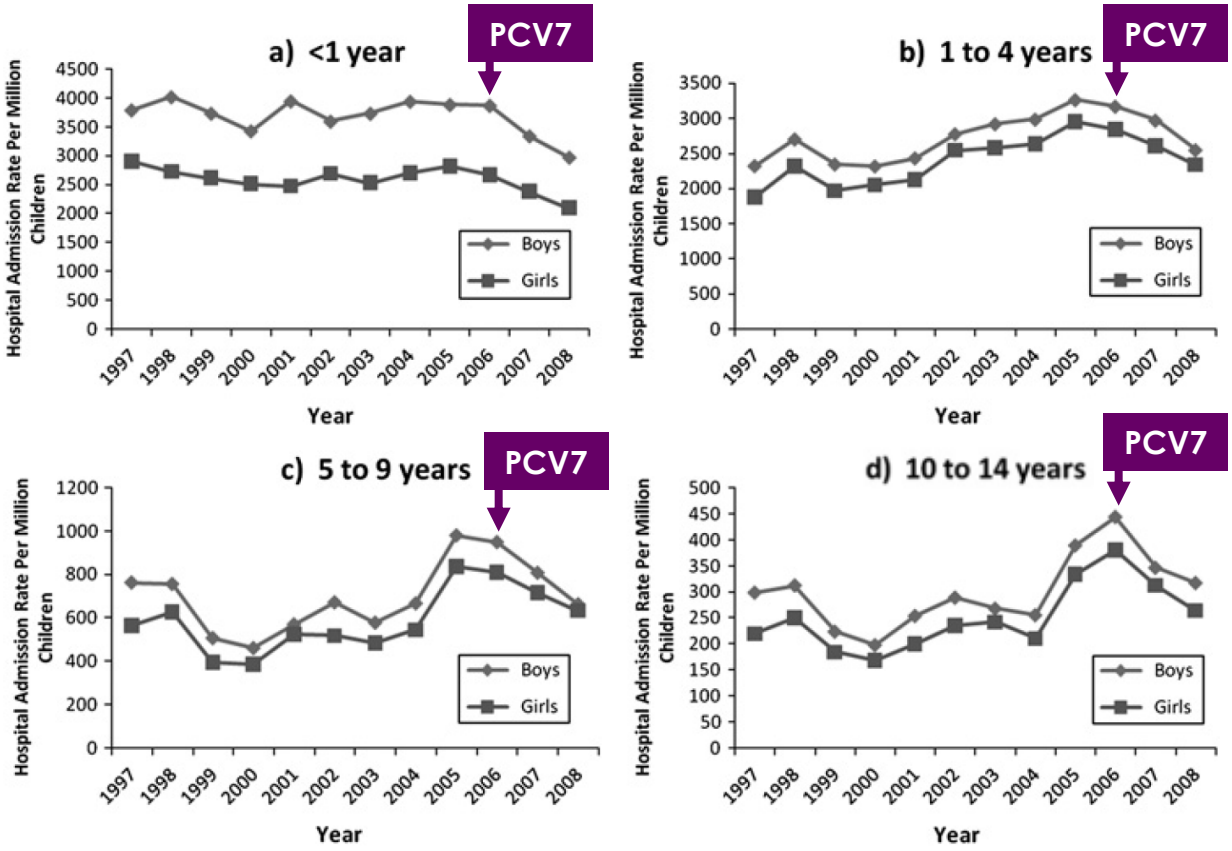




Sur 4 ans, 41'000 hosp. de moins que prévu

Lancet 2007; 369: 1179–86

Prévention des pneumonies: Effet du PCV-7



Two years after introduction of PCV7 to NIP, in children <15 years:

- 19% reduction in bacterial pneumonia-related hospitalization
- 22% reduction in empyema-related hospitalization

Retrospective observational study in England using data from The Hospital Episode Statistics database from 1997 to 2008. Cases of pneumonia identified, in patients of all ages, according to primary diagnosis using ICD-10 codes.

Koshy E *et al. Thorax* 2010; 65: 770–4.

Pneumonie communautaire de l'enfant: prise en charge et traitement

Conclusions (1)

- La pneumonie est une maladie dont la morbidité et la mortalité restent importantes

- L'absence de moyens diagnostiques (étiologie) rend le traitement empirique. Il doit être basé sur une approche:

✓ épidémiologique, clinique, radiologique et biologique

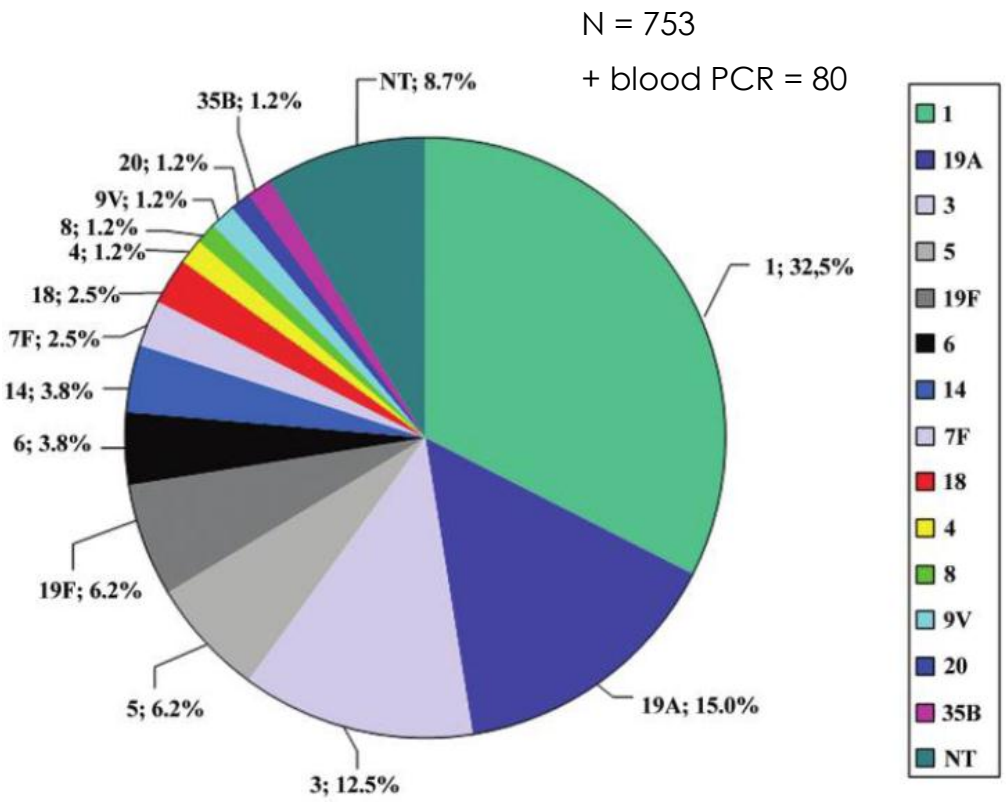
- Le traitement antibiotique doit cibler avant tout le *S. pneumoniae* chez l'enfant en âge pré-scolaire

- La prévention par les vaccins conjugués contre les pneumocoques a permis une réduction massive des pneumonies acquises dans la communauté et des hospitalisations

Pneumonie communautaire de l'enfant: prise en charge et traitement

Conclusions (2)

Le **Prevenar-13** augmentera encore cette efficacité en raison des sérotypes additionnels qu'il contient (1, 3, 5, 6A, 7F, 19A)



66% of serotypes were not PCV-7 types

Serotyping Pneumococcal CAP by RT-PCR • **CID 2010:51 (1 November)** • 1045

Pneumonie communautaire de l'enfant: prise en charge et traitement

Ouvert à toutes vos questions !

Merci