

# A Consolidation of Signs of Symptoms of Pediatric Pneumonia

**Urgent message:** Relatively few studies have sought to determine the signs and symptoms that help to predict occult bacterial pneumonia in children. Awareness may assist the urgent care provider in proceeding more quickly to a correct diagnosis.

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## Case Presentation

A 5-year-old male with no significant past medical history presented to urgent care with his father, with a chief complaint of fever for the past 2 days (Tmax 104°F), controlled with acetaminophen. ROS positive for increased irritability when febrile, minimal clear rhinorrhea, pharyngitis, two episodes of non-bloody emesis, and intermittent abdominal pain on deep inspiration. Patient is still eating, drinking, urinating, and defecating normally. Denied cough, shortness of breath, wheezing, ear pain, ear drainage.

## Exam

### Vital signs

- Pulse: 136 beats/minute
- Temperature: 101°F (38.3°C)
- SpO<sub>2</sub>: 97% on room air

The patient is pleasant, cooperative, and talking in complete sentences. Minimal generalized abdominal pain is elicited on deep palpation, but the abdomen is soft, nondistended, without guarding and rigidity. Posterior pharynx is slightly erythematous, without exudates or petechiae. Lungs are clear to auscultation bilaterally. Exam of TMs are normal bilaterally.

### Urgent care work-up

- Rapid COVID: negative
- Rapid flu: negative
- Rapid strep: negative
- PCR COVID: negative



- Throat culture: negative for growth
- Urine analysis: WNL

The patient's diagnosis was presumed viral illness as no bacterial etiology had been found during the visit. He was discharged home with instructions for symptomatic management, strict return precautions, and instructions to monitor for new symptoms and to return to UC or go to the emergency room if symptoms worsened.

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### Case Continuation

Patient presented to the local ED 3 days later. The only changes in his condition were a decrease in appetite, a rash on the left palm noticed the day before that had since resolved, and intermittent pain on the dorsum of both feet and low back.

An ultrasound was ordered to visualize the appendix but was unable to visualize. CT scan of abdomen/pelvis was then obtained. Appendix was read as normal, but the CT scan revealed a left lower lobe consolidation. Bacterial pneumonia was confirmed with chest x-ray.

*Diagnosis:* Bacterial community-acquired pneumonia.

### Discussion

In the United States, the highest rates of pediatric pneumonia occur in children aged 1 year to 5 years of age; outpatient visit rates range from 16.9 to 22.4 per 1,000 population.<sup>1</sup>

Many studies have attempted to determine the signs and symptoms that, when present in conjunction with signs and symptoms of lower respiratory tract infection, have the highest likelihood of predicting bacterial pediatric pneumonia; however, significantly fewer studies have tried to determine the signs and symptoms that help to predict occult bacterial pneumonia.

Occult CAP is defined as radiographically confirmed pneumonia that is present without signs of respiratory distress or lower respiratory tract involvement (such as tachypnea or the presence of any adventitious sound on lung auscultation).<sup>2</sup> While the prevalence of occult pediatric CAP decreased after the invention of the heptavalent pneumococcal vaccine, the incidence of occult pneumonia in pediatric patients who are febrile but do not have physical exam findings of pneumonia is around 5%.<sup>2</sup>

#### *Symptoms of pneumonia*

One of the most critical tools in diagnosing pediatric bacterial pneumonia is the patient's history of present illness. One systematic review found that the presence of chest pain and symptom duration of longer than 3 days were the only historical factors that increased the likelihood of pediatric CAP.<sup>1</sup> Other factors, including cough, difficulty breathing, vomiting, and diarrhea, were not shown to have an increased likelihood of pediatric CAP; this was true across all pediatric age groups.<sup>1</sup>

Another prospective observational study that looked only at pediatric patients with suspected occult pneumonia found the rate of occult pneumonia to be similar to the rate of pneumonia suspected due to auscultatory

findings or signs of respiratory distress.<sup>2</sup>

There was no one symptom that showed a significant increased likelihood of occult pediatric CAP.<sup>2</sup> However, most patients in this study who were found to have occult pediatric CAP did have symptoms of an upper respiratory infection.<sup>2</sup>

These researchers also found that duration of fever greater than 1 day in conjunction with worsening cough did increase the likelihood of pneumonia.<sup>2</sup> Subsequently, patients who present without a cough and with a fever duration of less than 1 day were at low risk for pneumonia, and the researchers discouraged chest radiography in these patients.<sup>2</sup> This is supported by a retrospective cross-sectional study which found that prolonged cough and fever increased the likelihood of occult pediatric CAP.<sup>3</sup>

#### *Signs of pneumonia (exam)*

While the patient's history is crucial in determining the likelihood of pneumonia, findings during the physical exam also play a vital role in accurate diagnosis. A systematic review found that the presence of hypoxemia and increased work of breathing (ie, grunting, nasal flaring, or chest retractions/indrawing), especially in conjunction with cough and fever, were helpful in predicting pneumonia.<sup>1</sup> It is worth noting that the degree of hypoxia did not correlate to an increased likelihood of pneumonia, as most patients who were diagnosed with pneumonia experienced only mild hypoxemia (96% or less).<sup>1</sup>

Presence of fever and tachypnea were not found to increase the likelihood of pneumonia, but their absence did decrease the likelihood of pediatric CAP.<sup>1</sup>

Surprisingly, the presence of abnormal sounds on lung auscultation has equivocal results across different studies. Some research shows that the presence of abnormal lung sounds (including crackles, rales, wheeze, rhonchi, and diminished breath sounds) did not correlate with an increased risk of pneumonia.<sup>1</sup>

Other studies show that in febrile patients, the presence of rales or decreased breath sounds had an increased likelihood of pediatric CAP, and the presence of wheezing decreased the likelihood of pediatric CAP.<sup>3</sup> It is possible that the variation in results between the studies is due to both the subjective nature of this finding and compliance difficulty in young patients.<sup>1</sup>

#### Treatment

Amoxicillin is used as the first-line antibiotic in pediatric patients who are otherwise healthy, are of school age, and have mild-to-moderate typical bacterial CAP.<sup>4</sup> If

pathogen, a macrolide antibiotic is considered first-line.<sup>4</sup> When discussing duration of treatment, a 10-day course is the most studied regimen, but it is possible that a shorter duration of treatment (7 days or less) could be used for those with mild pneumonia.<sup>4</sup> Children who are being treated on an outpatient basis should show improvement within 48–72 hours.<sup>4</sup>

#### When to advance to inpatient treatment

Treatment guidelines recommend the hospitalization of pediatric patients with pneumonia in the following circumstances: oxygen saturation <90%, infants younger than 3-6 months of age, pneumonia suspected or confirmed to be caused by pathogens with increased virulence, and where outpatient treatment compliance may not be feasible.<sup>4</sup>

#### Case Resolution

The patient described at the outset of was treated on an outpatient basis with PO, weight-based amoxicillin for 10 days. Patient followed up with his pediatrician 3 days after his ED visit; fever resolved after 24–48 hours after treatment began. At the time of visit with the pediatrician, all symptoms had resolved.

#### Take-Home Points

- No one sign or symptom can be used to determine the presence of pediatric pneumonia. Rather, the entire clinical picture as a whole must be taken into account.
- Chest pain, prolonged fever, and prolonged cough may all be symptoms that indicate increased likelihood of pediatric CAP.
- Hypoxemia and increased work of breathing may be signs that indicate increased likelihood of pediatric CAP. Adventitious sounds on lung auscultation are not a reliable way to predict pneumonia as results vary across studies.
- Amoxicillin is used as the first-line treatment for typical pediatric CAP, and macrolides are used as first-line treatment for atypical pediatric CAP. ■

#### References

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