

Is Antibiotic Therapy the Best Course of Care?

A story about how ubiquitous point of care ultrasound could challenge the status quo in the care pathway of pediatric pneumonia.

A Case Study by

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Introduction

Pediatric pneumonia accounts for approximately 2 million outpatient visits per year in the United States. Antibiotics are routinely prescribed for children with cough and fever, however the diagnosis of pneumonia is often not as clear cut as clinicians hope. For generations, lung auscultation has been considered reliable in identifying pediatric pneumonia yet findings such as rhonchi, wheezing and decreased breath sounds don't reliably identify bacterial pneumonia.

Chest X-rays (CXR) are considered the gold standard. However, they utilize ionizing radiation to which children are particularly sensitive due to the rapidly dividing cells and early onset of lifetime accumulation. And CXRs are typically not a one time test. Children, on average, get 7-10 colds a year; often associated with fever. Imagine the potential radiation load that would accumulate if every one of those illnesses was investigated with CXR. Add those to other imaging for suspected appendicitis and head injuries and the radiation load can quickly accumulate for our little patients.

CXR does a good job ruling in disease but results are lackluster in ruling out disease. X-rays lack the ability to distinguish between atelectasis and infiltrate. Clinicians are often frustrated with an equivocal radiology report and use antibiotics "just in case" it's pneumonia. This collection of limited diagnostic tools likely contributes to unnecessary over prescribing of antibiotics and subsequent antibiotic resistance.

Over the past years, studies have consistently shown point of care ultrasound with comparable ability to rule out pneumonia and an even better ability to rule in pneumonia. Ultrasound does not use ionizing radiation, saves time and can reliably distinguish between atelectasis and pneumonia. Using focal B lines, lung hepatization and dynamic air ultrasound can reliably be diagnosed pneumonia.

Case History

5 y/o F with cough and tactile temperature x 4 days.

PE: T 38 RR 30 Pulse ox 98%

Well appearing without respiratory distress

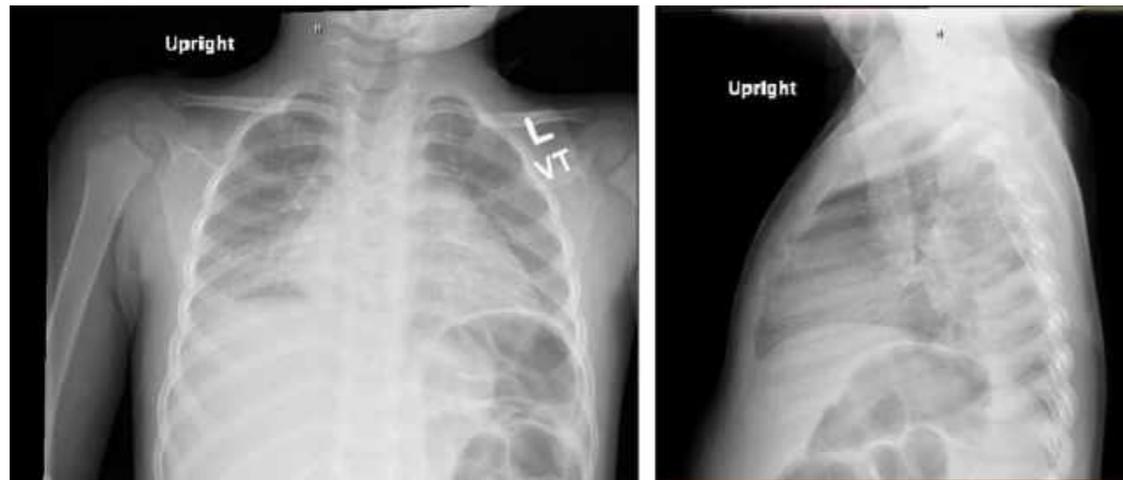
Chest: child cries during exam so auscultation is limited but no focal sounds identified.

No retractions or other signs of distress

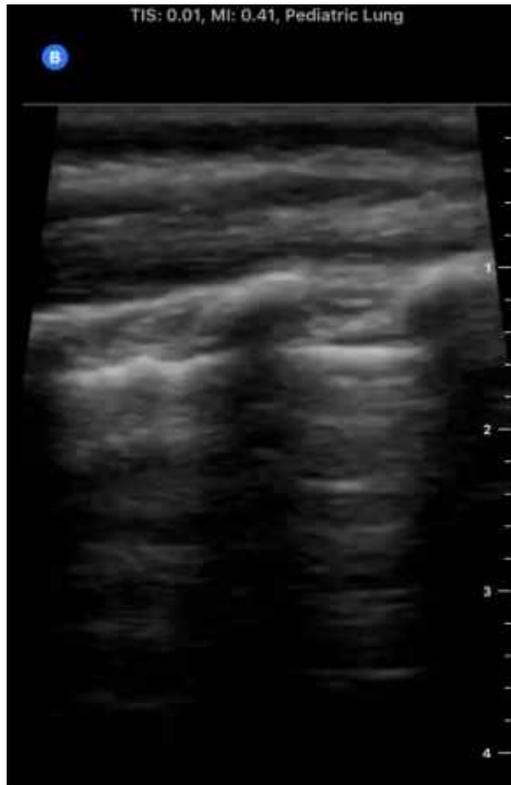
Imaging exam

With its customized settings for Pediatric Lung, Butterfly iQ demonstrates classic diagnostic ultrasound features of pneumonia:

1. Focal B-lines with lung hepatization (lung resembling liver)
2. Dynamic air bronchograms (bouncing little white dots)



Left: AP CXR. Right: Lateral CXR.



Normal Side. Pediatric Lung setting, demonstrates clear pleural line with sliding and z lines (aka comet tails). No indication of B lines; normal appearing lung

[Link to video](#)



Abnormal Side. On left of image: few B lines indicating presence of fluid in lung, irregularly appearing pleural line with sub pleural consolidation (~ 2 cm in depth). Consolidated lung area looks like liver hence the term, lung hepatization. Echogenic dots are air bronchograms; these collections move with respiration therefore they are called dynamic air bronchograms. (Note: dynamic air bronchograms = pneumonia; static air bronchogram - no movement with respiration = atelectasis)

[Link to video](#)



Abnormal side. Additional air bronchograms further identifying the consolidated lung region. With respiration consolidated lung is partially obscured by B lines. Consolidated lung with dynamic air bronchograms

[Link to video](#)

What does this teach us?

“Ultrasound can distinguish between atelectasis and infiltrate, and therefore challenges CXR as the gold standard for pediatric pneumonia. Ultrasound can help support unequivocal diagnosis, and therefore support the decision to prescribe antibiotics only when necessary, and avoid unnecessary radiation to our kids.”

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