Should we get a chest x-ray in patients with bronchiolitis?

Schuh S et al. Evaluation of the utility of radiography in acute bronchiolitis. J Pediatr 2007; 150:429-33.

Take Home Message: Very few children with clinical bronchiolitis who undergo chest radiography have results inconsistent with bronchiolitis, and those who do undergo chest radiography are more likely to receive antibiotics.

Highlights: Given practice variability for bronchiolitis, Schuh et al. conducted this prospective cohort study[i] looking at the rate of an alternate diagnosis on chest x-rays in infants with acute bronchiolitis. 265 children with bronchiolitis underwent chest x-rays which were determined to reveal simple bronchiolitis (airway disease only), complex bronchiolitis (airway and airspace disease), or an inconsistent diagnosis (e.g., lobar consolidation or cardiomegaly). Only 2 children (0.75%) had a radiograph inconsistent with bronchiolitis. The authors calculated that 133 children with typical bronchiolitis would have to undergo radiography to identify 1 radiograph that showed an inconsistent diagnosis.

Additionally, the authors looked at the association between patient characteristics and the outcome of the chest x-ray. Children with oxygen saturation >92% and mild to moderate respiratory distress were significantly less likely to have an x-ray revealing complex bronchiolitis or an inconsistent diagnosis than those children who had more significant hypoxia and respiratory distress. Lastly, physicians were more likely to prescribe antibiotics after a chest x-ray (the physicians were planning to give 2.6% of the patients antibiotics pre x-ray vs. 14.7% post x-ray; 95% CI, 8-16). This study provides further evidence that routine chest radiography is unnecessary in children presenting with typical bronchiolitis, particularly in children with oxygen saturation > 92% and mild-to-moderate respiratory distress.

The Nitty-Gritty:

- **Design:**
    - Prospective cohort study
    - N= 265
        - Simple radiograph group (N=246)
        - Complex/inconsistent radiograph group (N=19)
    - Setting: Hospital for Sick Children in Toronto's ED
    - Enrollment: 2001-2005
    - Primary outcome: Rate of radiographic alternate diagnoses in infants with bronchiolitis
- **Population:**
    - **Inclusion Criteria:**
        - 2-23 months old
        - Typical presentation of acute bronchiolitis: non-toxic appearance with coryza, cough, and respiratory distress with wheezing for the first time
    - **Exclusion Criteria**

- § Previous wheeze/bronchodilator therapy
- § Previously diagnosed cardiopulmonary disease, aspiration, neuromuscular disease, or chronic systemic disease
- § Prematurity < 35 weeks gestation
- § Birth weight < 2500 grams
- § Neonatal ventilation > 24 hours
- § Children arriving with radiographs
- § Parents with insufficient command of English

- o **Baseline Characteristics:** Values are means +- SD
  - § Age: 7.7+-5.5 months
  - § Sex: 65% boys
  - § Respiratory Disease Assessment Instrument (RDAI) score: 8.9+-3.2 points
  - § Respiratory rate: 52.6 +-20.1 breaths per minute
  - § Heart rate: 144.2 +-22.1 beats per minute
  - § Oxygen saturation: 96.5% +-2.6%

- **Intervention**:
    - ED physicians were asked about their intended use of antibiotics and disposition prior to the patients undergoing chest x-ray
    - All patients underwent chest x-ray
    - Radiographs were interpreted by ED physicians according to predetermined criteria for simple bronchiolitis (prominent bronchial markings and peribronchial infiltrates with or without hyperinflation or atelectasis), complex bronchiolitis (airway disease and adjacent airspace disease but lacked lobar consolidation), or diagnoses inconsistent with bronchiolitis (lobar consolidation, cardiomegaly, and other features incompatible with bronchiolitis)
    - Subsequent disposition decision and antibiotic therapy was recorded
    - Radiographs were read at a later date by an expert radiologist and then validated by a second radiologist

- **Outcomes:**
    - **Primary outcome:** Rate of infants with a radiograph inconsistent with bronchiolitis: 0.75% (2 radiographs – 1 cardiomegaly and 1 lobar consolidation; 95% CI, 0-1.8).
    - **Secondary outcomes:**

§ Impact of radiography on therapy – Pre X-ray plan to use antibiotics vs. Post X-ray plan to use antibiotics: 2.6% vs. 14.7% (95% CI for difference 8-16)

§ Association between outcome of radiograph and patient characteristics – comparisons are simple radiograph vs. complex/inconsistent radiograph

- Age (months): 7.5 +-5.0 vs. 9.6+-4.8 (NS)
- Duration of respiratory distress (hours): 41.2+-31.9 vs. 46.1 +-28.5 (NS)
- Temperature (degrees Celsius): 37.7+-0.8 vs. 37.9+-1.0 (NS)
- Respiratory rate: 52.8 +-20.5 vs. 50.4 +-14.8 (NS)
- *Oxygen saturation 92%: 6.5 % vs. 26.3% (95% CI for the difference, -0.39-0.0)*
- Positive results for respiratory syncytial virus: 65% vs. 63.2% (NS)
- Crackles: 23.2% vs. 21.1% (NS)
- *RDAI score: 8.8+-3.2 vs. 10.4+-2.6 (95% CI for the difference, -3.2- -1.7)*

- **Criticisms**

o The effects of chest x-ray may be overestimated owing to an indication bias, since these children were not randomized to chest x-ray. Asking the question itself about whether the physicians were going to get a chest x-ray may have affected physicians' responses. [ii]

[i] Schuh S et al. Evaluation of the utility of radiography in acute bronchiolitis. J Pediatr 2007; 150:429-33.

[ii] Ecochard-Dugelay E et al. Impact of chest radiography for children with lower respiratory tract infection: a propensity score approach. PLoS One. 2014; 9:e96189.