



20^e Journée de pathologie infectieuse pédiatrique ambulatoire

COMMENT FAIRE LE DIAGNOSTIC DE PNEUMONIE ?

Fouad Madhi
Olivier Romain



Raphael 22 mois, vient pour fièvre à 40° depuis moins de 12 heures. Il tousse gras ; la fréquence respiratoire est à 36 et vous avez un doute sur l'existence de crépitations à droite. Il est en bon état général. Que faites-vous ?



Je demande une radio de thorax



Je fais une CRP

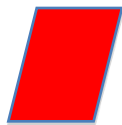


Je le mets sous antibiotiques sans radio



Je demande une échographie pulmonaire

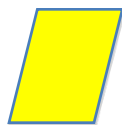
**Le médecin consulté avait demandé une CRP qui est à 30 mg/l
et une radio de thorax, normale**



Ces résultats permettent d'éliminer une pneumonie bactérienne, je ne prescris pas d'antibiotique



Ce n'est pas suffisant, je prescris un antibiotique



Ce n'est pas suffisant, je ne prescris pas d'antibiotique et je le revois 24 à 48 heures après



Je demande une échographie pulmonaire

Comment s'y retrouver ?



2005

Le recours à la radio thoracique initiale
est recommandé pour confirmer le diagnostic
Accord professionnel



2011

Routine chest radiographs are not necessary
for the confirmation of suspected CAP in patient
Well enough to be treated in the outpatient ...
CRP, PCT not recommended...



2015

Strong recommendation; high quality

Prise en charge CRP (microméthode) guidée



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Safety of reduced antibiotic prescribing for self limiting respiratory tract infections in primary care: cohort study using electronic health records

Martin C Gulliford,¹ Michael V Moore,² Paul Little,² Alastair D Hay,³ Robin Fox,⁴ A Toby Prevost,¹ Dorota Juszczak,¹ Judith Charlton,¹ Mark Ashworth¹

Cite this as: *BMJ* 2016;354:i3410

<http://dx.doi.org/10.1136/bmj.i3410>

Accepted: 07 June 2016

Comparaison de l'incidence des complications en fonction du profil de prescription

Table 2 | Distribution of general practices and person years follow-up for registered patients from 2005 to 2014 for 610 general practices contributing to the UK Clinical Practice Research Datalink

Variables	Fourths of proportion of RTI consultations with antibiotics prescribed			
	High $\geq 58\%$	51-57%	44-50%	Low $< 44\%$
No of general practices	152	153	152	153
No of person years from registered patients	10 573 885	12 135 183	12 109 005	10 647 128
Median (95% range) proportion of RTI consultations with antibiotics prescribed	65 (58-79)	54 (51-57)	48 (45-50)	38 (29-44)
Infective complications*:				
Pneumonia	119.2 (117.0 to 121.3)	129.1 (126.9 to 131.2)	156.4 (154.0 to 158.7)	156.6 (154.0 to 159.1)
Peritonsillar abscess	12.9 (12.8 to 13.0)	13.2 (13.1 to 13.3)	14.1 (13.9 to 14.2)	15.6 (15.5 to 15.8)
Mastoiditis	3.48 (3.37 to 3.60)	3.31 (3.21 to 3.42)	3.32 (3.19 to 3.46)	3.38 (3.25 to 3.51)
Empyema	3.64 (3.27 to 4.01)	4.00 (3.63 to 4.37)	3.66 (3.31 to 4.01)	4.00 (3.61 to 4.40)
Bacterial meningitis	2.19 (1.90 to 2.47)	2.16 (1.90 to 2.42)	2.24 (1.97 to 2.51)	2.45 (2.15 to 2.75)
Intracranial abscess	0.37 (0.25 to 0.48)	0.35 (0.24 to 0.46)	0.55 (0.42 to 0.69)	0.42 (0.29 to 0.55)
Lemierre's syndrome	4 cases	3 cases	2 cases	5 cases



Echographie pulmonaire pour le diagnostic de pneumonie

Très nombreuses publications ces dernières années, dont plusieurs récentes dans des journaux de Rang A

Intensive Care Med (2012) 38:577–591
DOI 10.1007/s00134-012-2513-4

CONFERENCE REPORTS AND EXPERT PANEL

Giovanni Volpicelli
Mahmoud Elbarbary
Michael Blaivas
Daniel A. Lichtenstein
Gebhard Mathis
Andrew W. Kirkpatrick
Lawrence Melniker

**International evidence-based
recommendations for point-of-care
lung ultrasound**

2012

**Feasibility and Safety of Substituting Lung
Ultrasonography for Chest Radiography
When Diagnosing Pneumonia in Children**
A Randomized Controlled Trial



Brittany Pardue Jones, MD; Ee Tein Tay, MD; Inna Elikashvili, DO; Jennifer E. Sanders, MD; Audrey Z. Paul, MD, PhD;
Bret P. Nelson, MD; Louis A. Spina, MD; and James W. Tsung, MD, MPH

2016

Chest

Pediatrics
April 2015, VOLUME 135 / ISSUE 4

Lung Ultrasound for the Diagnosis of Pneumonia in Children: A Meta-analysis

Maria A. Pereda, Miguel A. Chavez, Catherine C. Hooper-Miele, Robert H. Gilman, Mark C. Steinhoff, Laura E. Ellington, Margaret Gross, Carrie Price, James M. Tielsch, William Checkley

Article

Figures & Data

Supplemental

Info & Metrics

Comments

2015

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ORIGINAL
ARTICLES

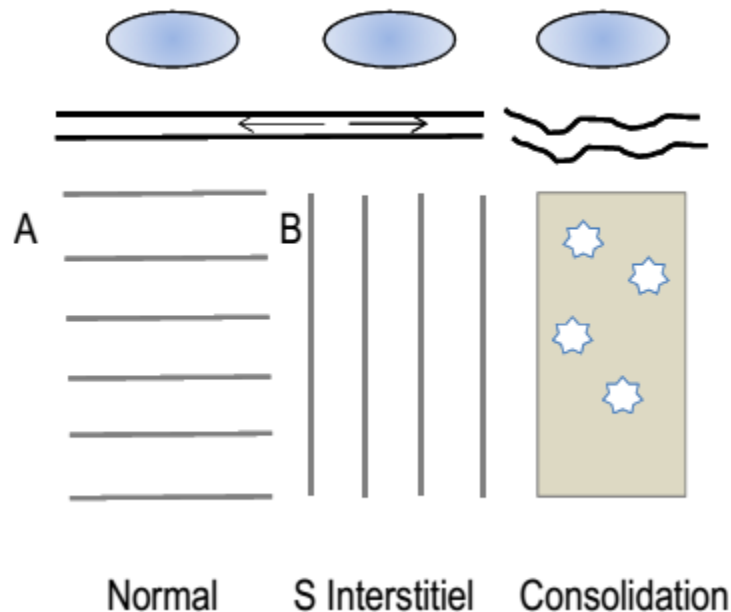
**Lung Ultrasonography: A Viable Alternative to Chest Radiography in
Children with Suspected Pneumonia?**

Lilliam Ambroggio, PhD, MPH^{1,2,3}, Heidi Sucharew, PhD^{2,3}, Mantosh S. Rattan, MD^{3,4}, Sara M. O'Hara, MD^{3,4},
Diane S. Babcock, MD^{3,4}, Caitlin Clohessy, BA¹, Mark C. Steinhoff, MD^{3,5}, Maurizio Macaluso, MD, DrPH^{2,3},
Samir S. Shah, MD, MSCE^{1,3,6}, and Brian D. Coley, MD^{3,4}

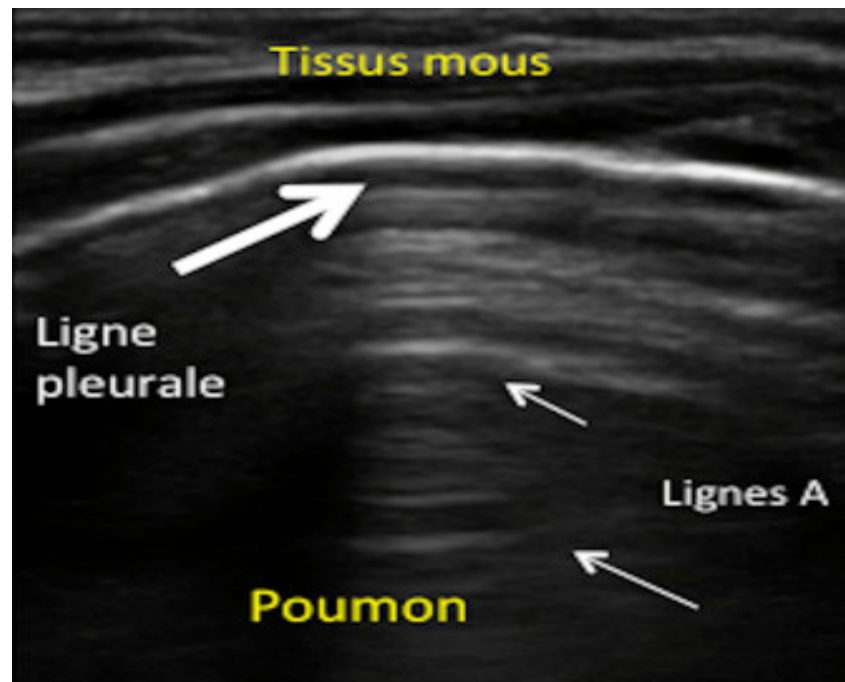
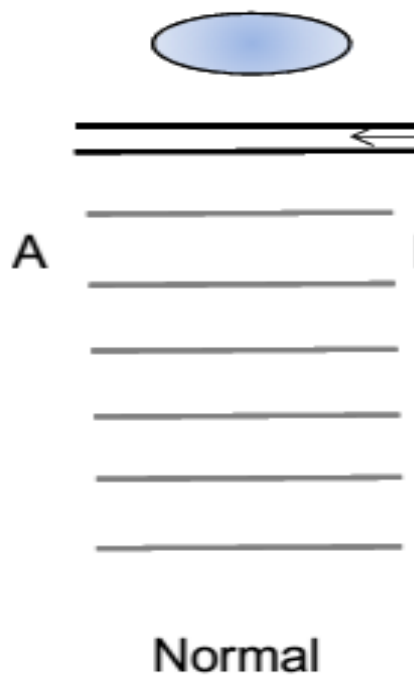
2016

Une séméiologie échographique simple et indépendante de l'anatomie

- Repérer les côtes
- Repérer la ligne pleurale (et ses anomalies éventuelles)
- Connaître l'aspect normal
- Reconnaître les images « interstitielles »
- Reconnaître les aspects de « consolidation »



Poumon normal (coupe horizontale)



Images « interstitielles ».

Lignes B « queues de comètes »

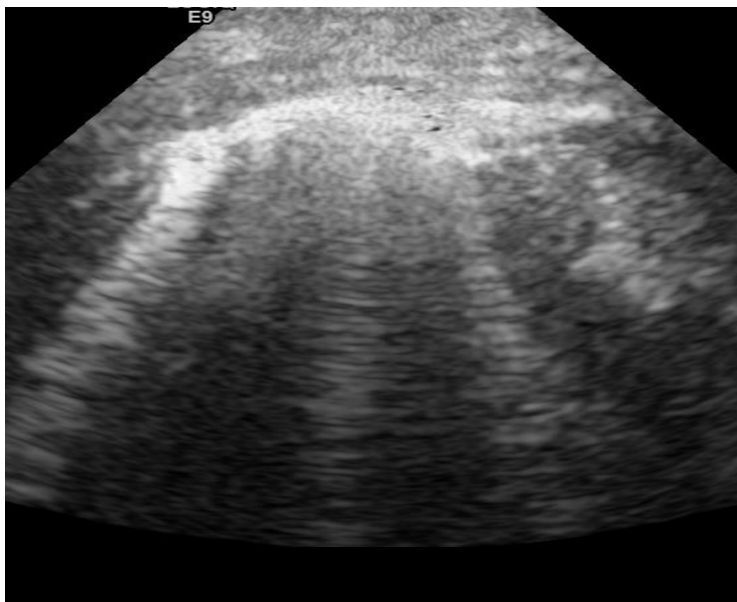
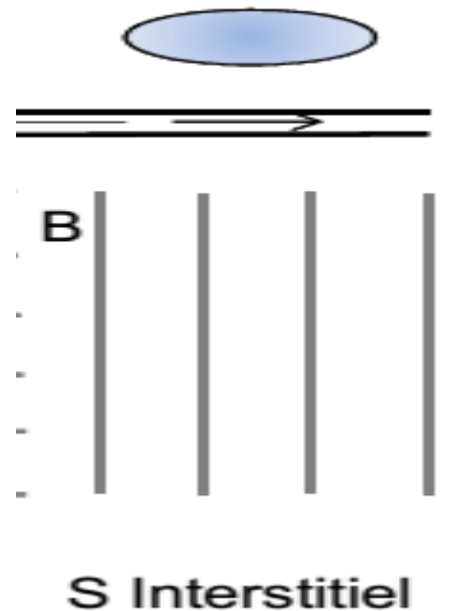
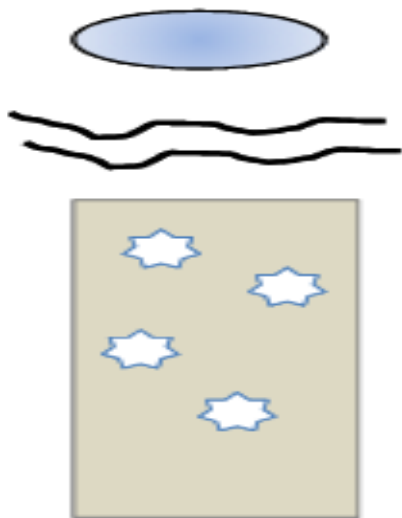


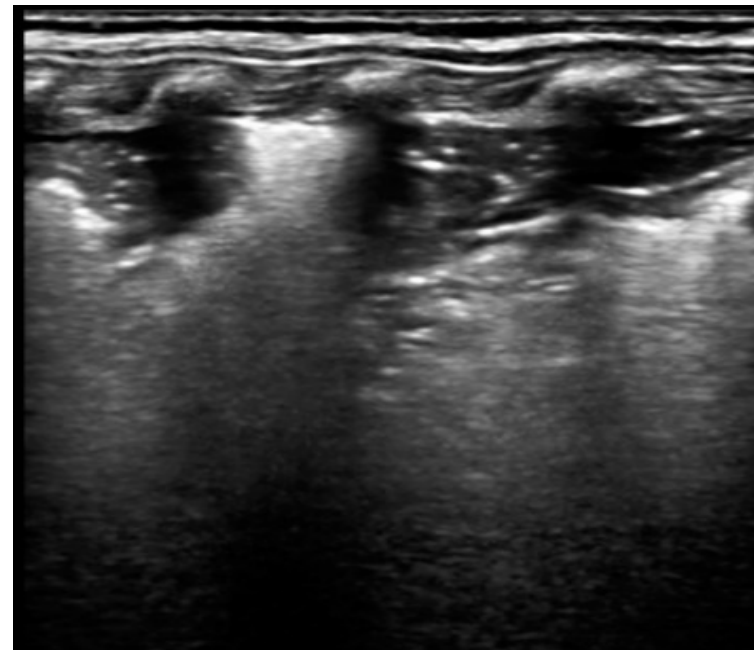
Image de Ph Durand



Images de “Consolidation”



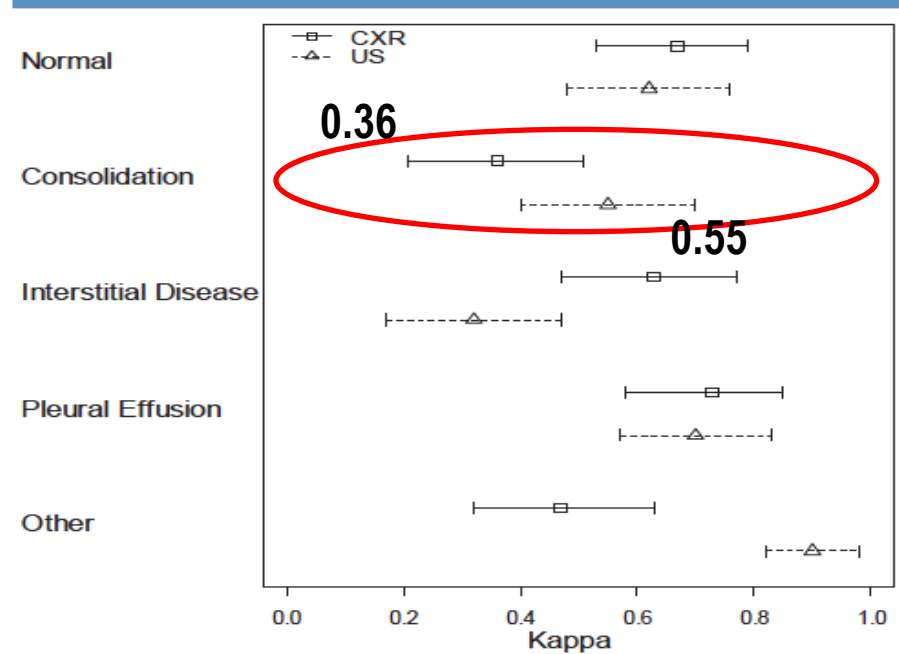
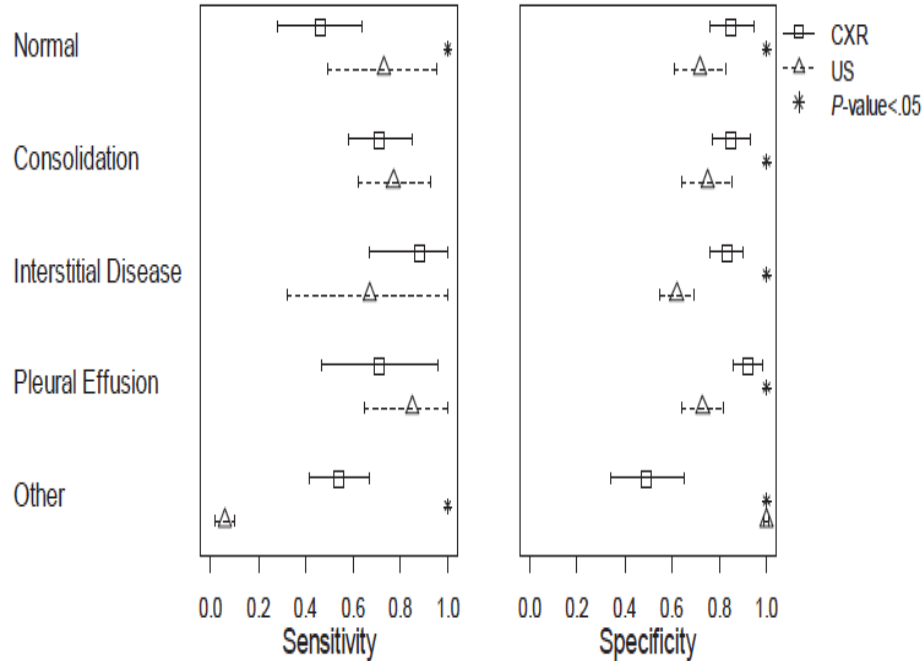
Consolidation



Jing Liu, Fang Liu, Ying Liu, Hua-Wei Wang, Zhi-Chun Feng Lung Ultrasonography for the Diagnosis of Severe Neonatal Pneumonia Chest, Volume 146, Issue 2, 2014, 383–388



Lung Ultrasonography: A Viable Alternative to Chest Radiography in Children with Suspected Pneumonia?



VPN similaire pour LUS et CRX (86/85%)

Ambroggio L J Pediatr sep 2016

Figure 2. Free-marginal multirater κ statistic (and 95% CI) for each binary imaging finding and for each type of imaging modality, LUS and CXR.

Méta-analyse

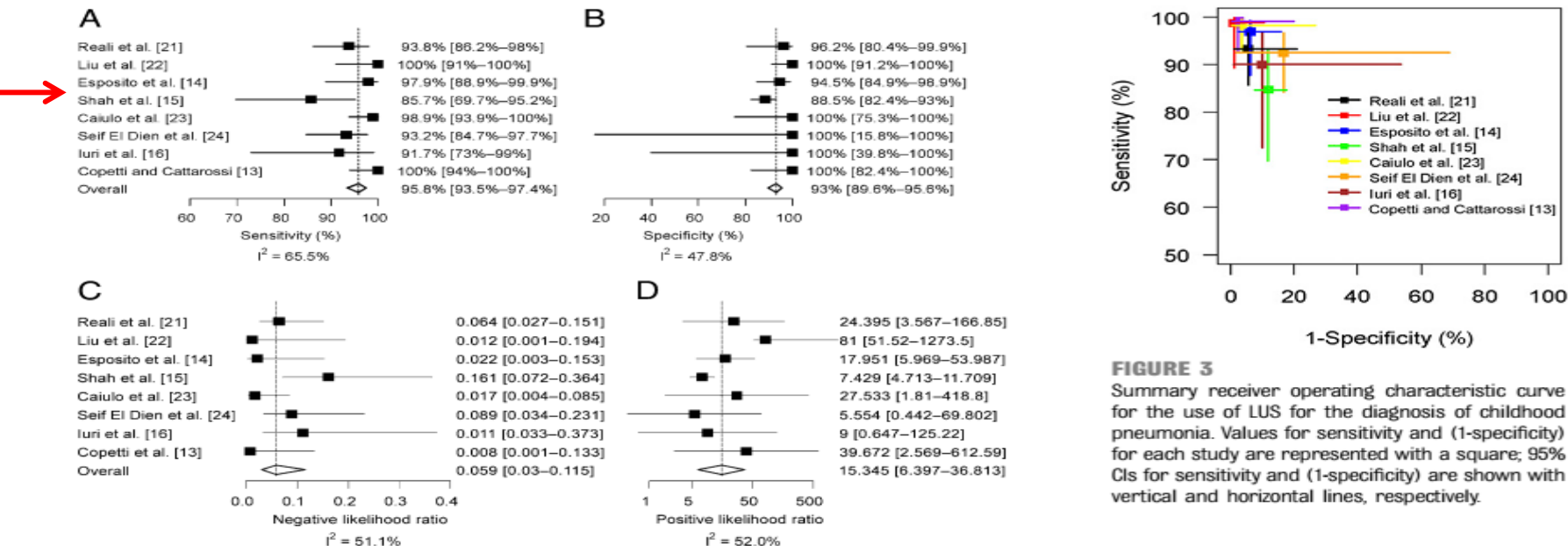


FIGURE 3

Summary receiver operating characteristic curve for the use of LUS for the diagnosis of childhood pneumonia. Values for sensitivity and (1-specificity) for each study are represented with a square; 95% CIs for sensitivity and (1-specificity) are shown with vertical and horizontal lines, respectively.

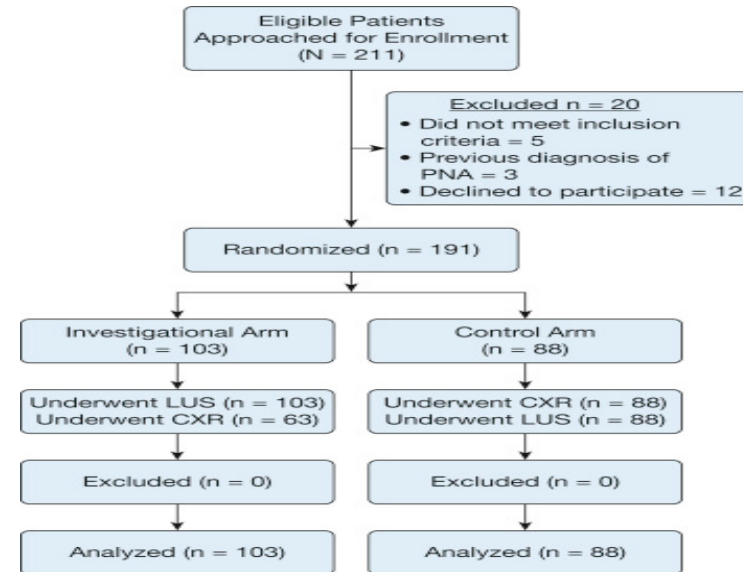
Feasibility and Safety of Substituting Lung Ultrasonography for Chest Radiography When Diagnosing Pneumonia in Children

A Randomized Controlled Trial



Brittany Pardue Jones, MD; Ee Tein Tay, MD; Inna Elikashvili, DO; Jennifer E. Sanders, MD; Audrey Z. Paul, MD, PhD;
Bret P. Nelson, MD; Louis A. Spina, MD; and James W. Tsung, MD, MPH

**Objectif principal:
diminuer le nombre de radiographies**

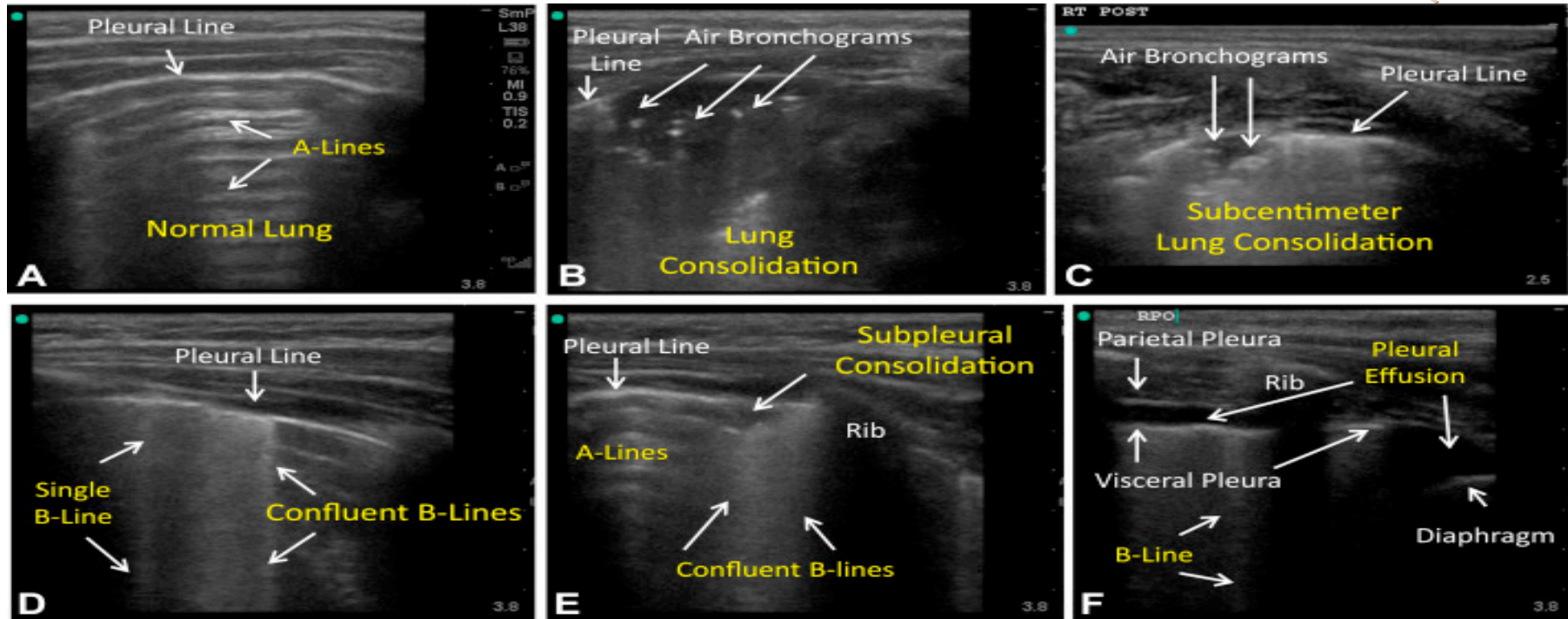


Main Outcomes

We found a 38.8% (95% CI, 30.0%-48.9%) reduction in CXR use in the investigational arm compared with no reduction (95% CI, 0.0%-3.6%) in the control arm. The

TABLE 2] Secondary Outcomes

Secondary Outcome Measure	Investigational Group (n = 103)	Control Group (n = 88)
Missed pneumonia	0.0 (0.0-2.9)	0.0 (0.0-3.0)
Unscheduled health-care visits	8.7 (3.3-14.1)	11.4 (4.8-18.0)
Antibiotic use at index ED visit	37.9 (28.5-47.2)	27.3 (17.9-36.6)
LUS or CXR confirmed pneumonia	28.2 (20.0-36.9)	18.1 (10.1-26.1)
CXR positive for pneumonia	13.6 (6.9-20.2)	13.6 (6.4-20.8)
LUS positive for pneumonia (≤ 1 cm)	14.6 (7.8-21.4)	4.5 (0.2-8.8)



Lung ultrasonographic images. **A**, Normal lung (A-lines). **B**, Focal pneumonia, radiographically apparent (≥ 1 cm lung consolidation with air bronchograms). **C**, Focal pneumonia, radiographically occult (< 1 cm lung consolidation with air bronchograms). **D-E**, B-lines, confluent B-lines, subpleural consolidation more commonly associated with viral pneumonia or bronchiolitis; note subpleural consolidations (< 0.5 cm) without sonographic air bronchograms visible. **F**, Pleural effusion (anechoic space between lung and chest wall or diaphragm).

Proposition d'algorithme

Lung ultrasound in the diagnosis of pneumonia in children: proposal for a new diagnostic algorithm

Giulio Iorio¹, Maria Capasso², Giuseppe De Luca¹, Salvatore Prisco¹, Carlo Mancusi¹, Bruno Laganà¹ and Vincenzo Comune¹

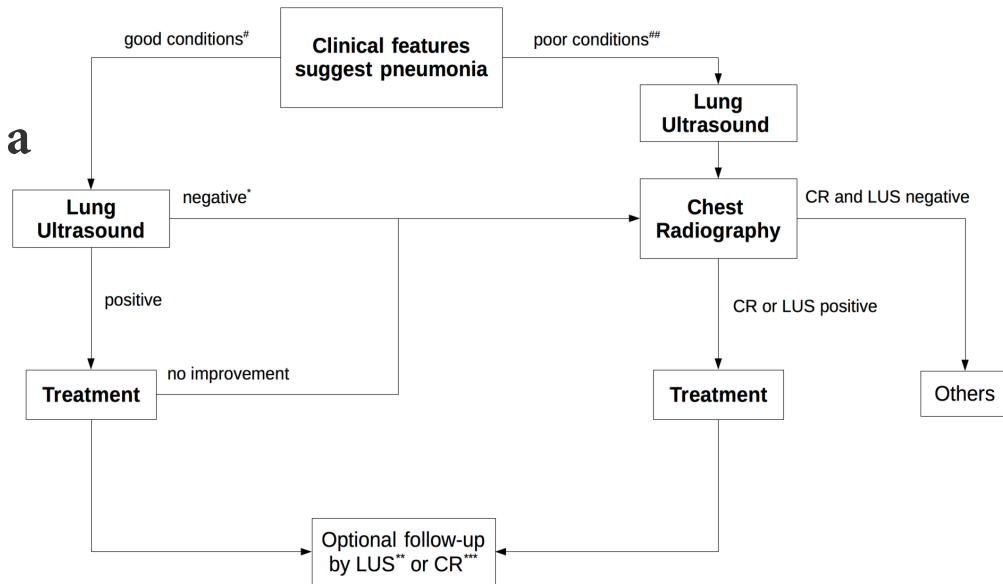


Figure 4 New diagnostic imaging algorithm for diagnosis of pneumonia. #Nil or mild increase in effort to breathe, temperature <38.5 C, respiratory rate <50 breaths/min, mild recession or breathlessness, taking full feeds, no vomiting, oxygen saturation $\geq 95\%$ in room air. ## Temperature >38.58 C, respiratory rate >70 breaths/min, moderate to severe recession, nasal flaring, cyanosis, intermittent apnoea, grunting respiration, not feeding, tachycardia, capillary refill time >2 s, oxygen saturation $\leq 95\%$ in room air. * If conditions are good after 24–48 h the lung ultrasound can also be repeated or improvement after therapy can be checked. ** In all cases. *** In cases provided for by guidelines. CR, Chest Rx; LUS, Lung Ultrasound.

Take-home messages

- **Echographie pulmonaire plus que prometteuse :**
 - Simple (pas besoin de connaître l'anatomie...séméiologie simple)
 - Formation relativement rapide
 - Sensible, spécifique
 - Au lit du malade
 - Moins de variation inter et intra-observateurs
- **Non irradiante**
- **Appareil peu couteux**
- **A intégrer à la clinique et à la CRP (ou PCT)**
- **Nouveaux algorithmes à inventer**

Où se former ?



**L'échographie pulmonaire
en néonatalogie et pédiatrie :
formation théorique et pratique**
1^{er} édition 27-28 mars
2^{ème} édition 22-23 mai



GFRUP

Initiation à l'échographie aux urgences
pédiatriques, 9 mars 2017 - Paris
(inscription prochainement)

Jeudi 30 juin 2016



Journée
Echocardiographie en Réanimation
Pédiatrique et Néonatale

Séminaire de Formation Continue Professionnelle



Atelier Echographie Thoracique de la SPLF
Mardi 4 octobre 2016

Maison du Poumon, 66 Boulevard Saint-Michel 75006 Paris





L'échographie pulmonaire en néonatalogie: une pratique quotidienne

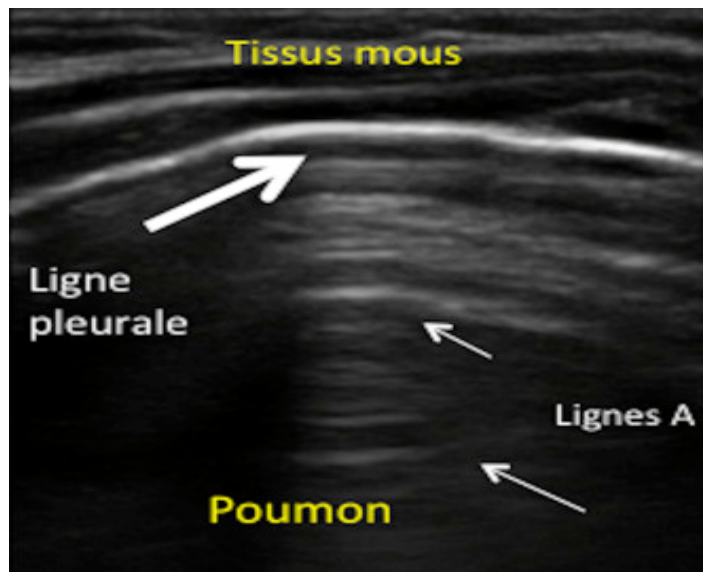
- Peut-elle distinguer une DRT d'une MMH ?
- Peut-elle éviter une radiographie ?
- Peut-elle diagnostiquer un pneumothorax ?
- Peut-elle diagnostiquer une pneumonie ?

Monitorages non invasifs en réanimation néonatale



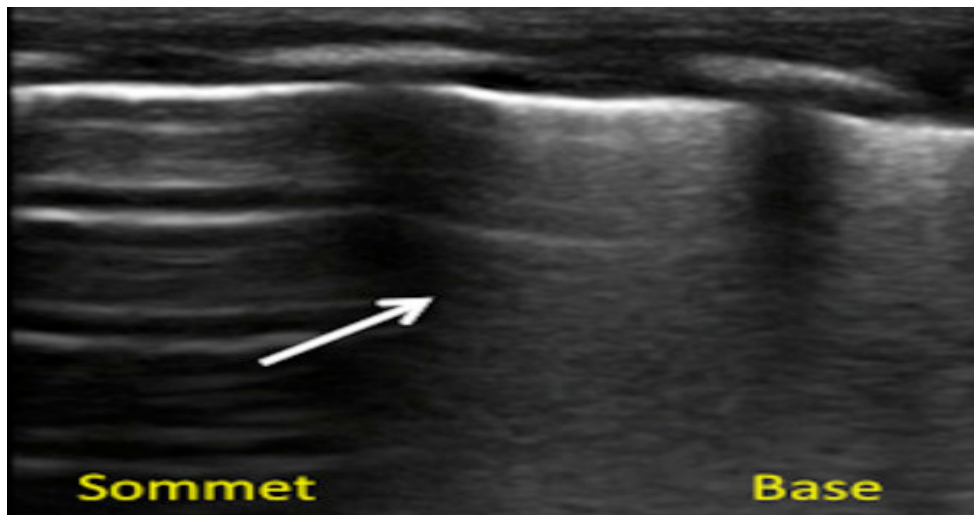
D. De Luca, O. Romain, et al Journal de Pédiatrie et de Puériculture, Volume 28, Issue 6, 2015, 276–300

Poumon normal (coupe horizontale)



Visualisation de la ligne pleurale sur une distance plus importante, sans être gêné par les cônes d'ombres. La ligne pleurale est régulière et bien définie. Les lignes A sont des artéfacts.

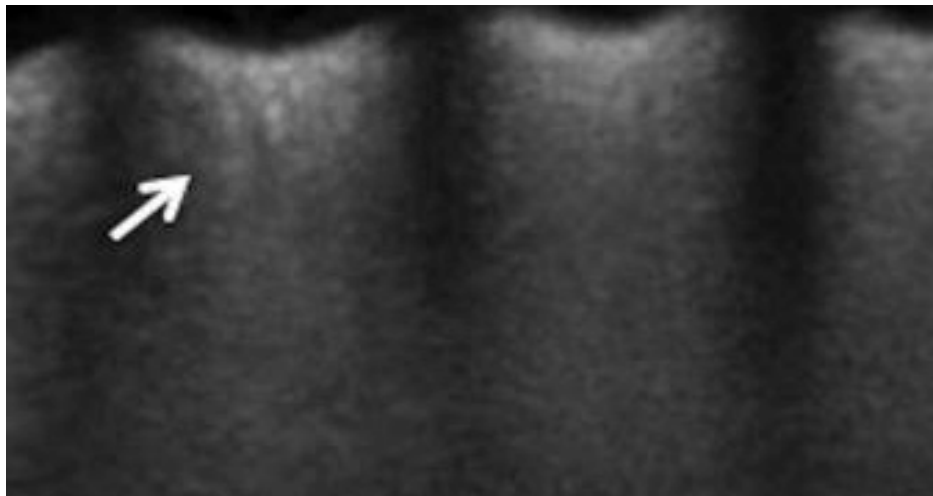
Tachypnée transitoire du nouveau-né



Bases du poumon: blanches, compactes
Sommets: aspect normal ou quasi normal

N. Yousef L'échographie pulmonaire chez le nouveau-né. Archives de Pédiatrie, Volume 23, Issue 3, 2016, 317–321

Maladie Membranes Hyalines (coupe verticale)



Poumon: complètement blanc, sans zone saine visible

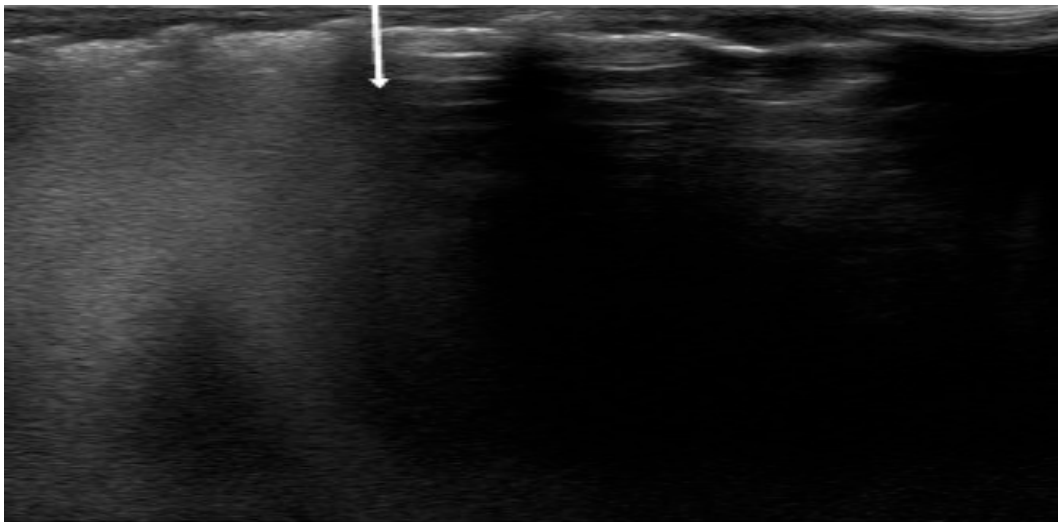
Ligne pleurale: épaissie, irrégulière et mal limitée

Lung Ultrasound Score « LUS »

utilisé en routine en réanimation à A.Béclère

R. Brat et al. Lung ultrasound score to evaluate oxygenation and surfactant need in neonates treated with continuous positive airway pressure. JAMA Pediatr, 169 (2015)

Pneumothorax

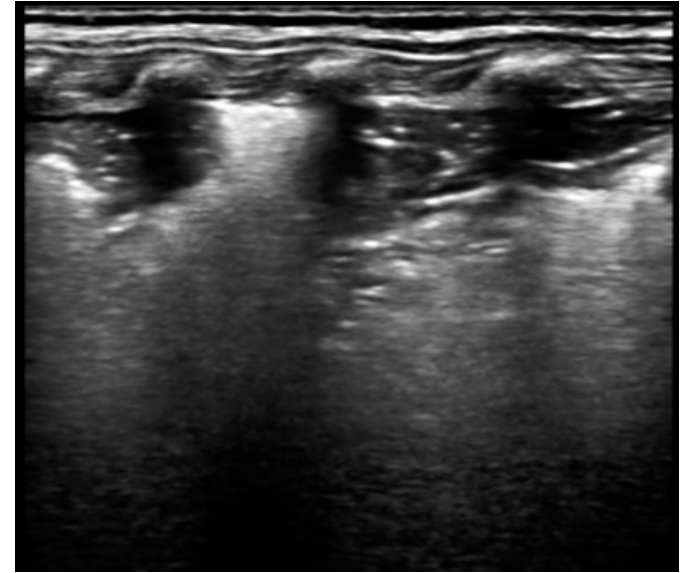


Lung point (downward pointing vertical arrow) is the transition from the B-lines area (left side) to a hypoechoic area with horizontal reverberations of the pleura.

Raimondi et al. Lung Ultrasound for Diagnosing Pneumothorax in the Critically Ill Neonate The Journal of Pediatrics, 2016.

Lung ultrasound findings of pneumonia in a neonate

(gestational age, 38 wk; birth weight, 4,000 g)
signs of respiratory distress and a 3-d history of fever.
Dense moist rales on chest auscultation,
Lung ultrasound: large areas of lung consolidation:
irregular margins and heterogeneous echogenicity.



Jing Liu, Fang Liu, Ying Liu, Hua-Wei Wang, Zhi-Chun Feng Lung Ultrasonography for the Diagnosis of Severe Neonatal Pneumonia Chest, 2014, 383–388.