Ultraljudsanvändning vid undersökning av lungor

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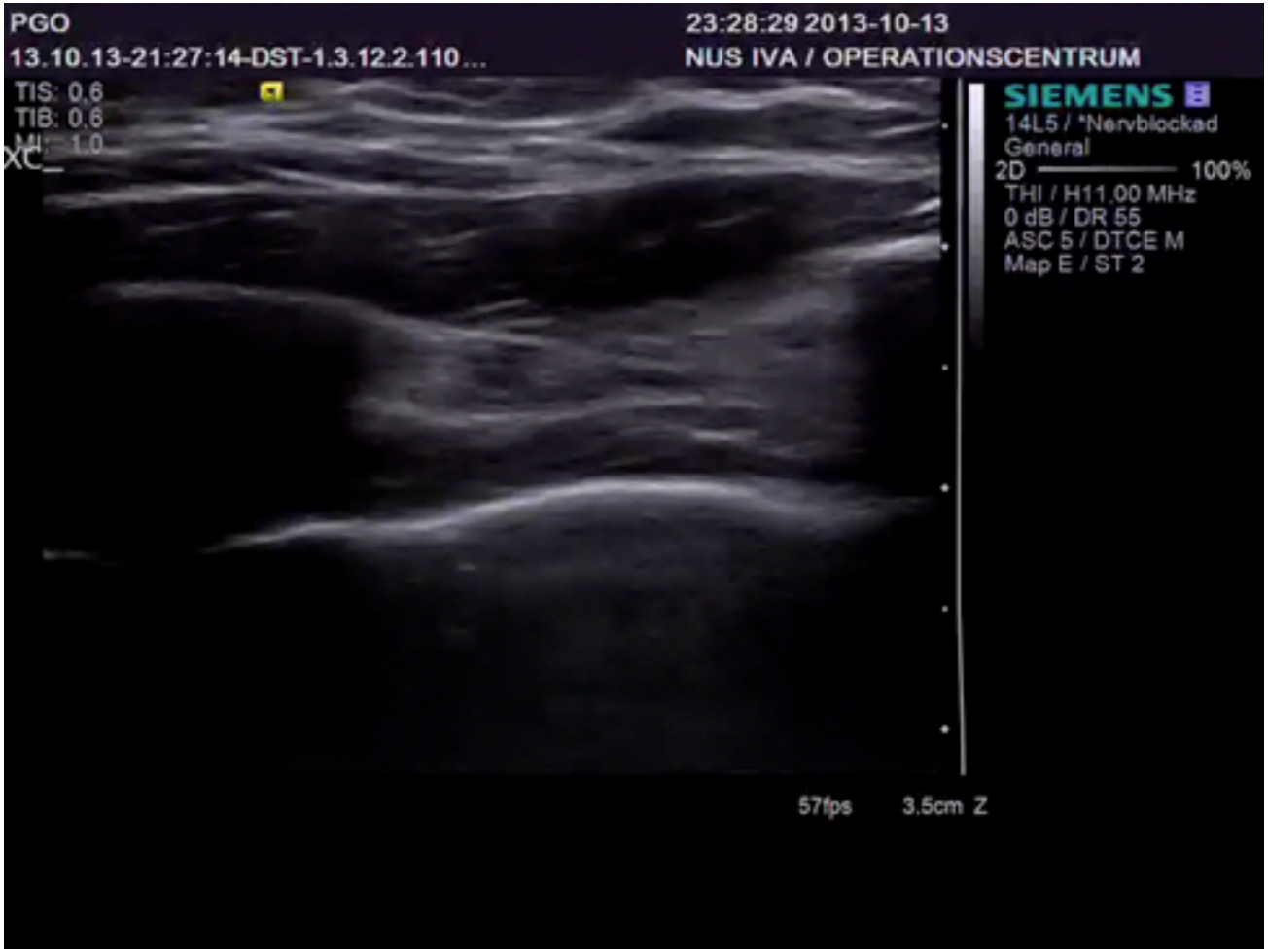
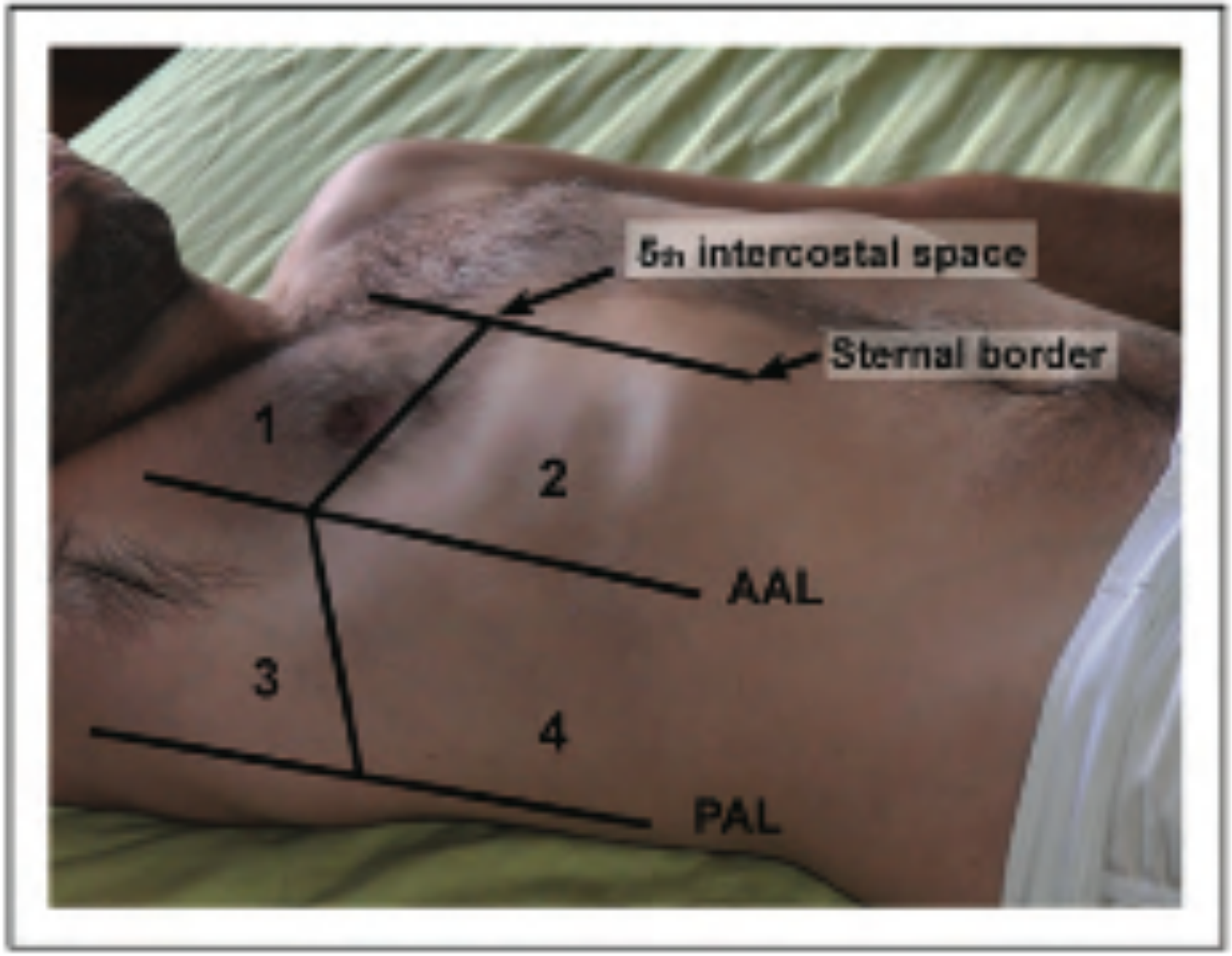
Patientfall

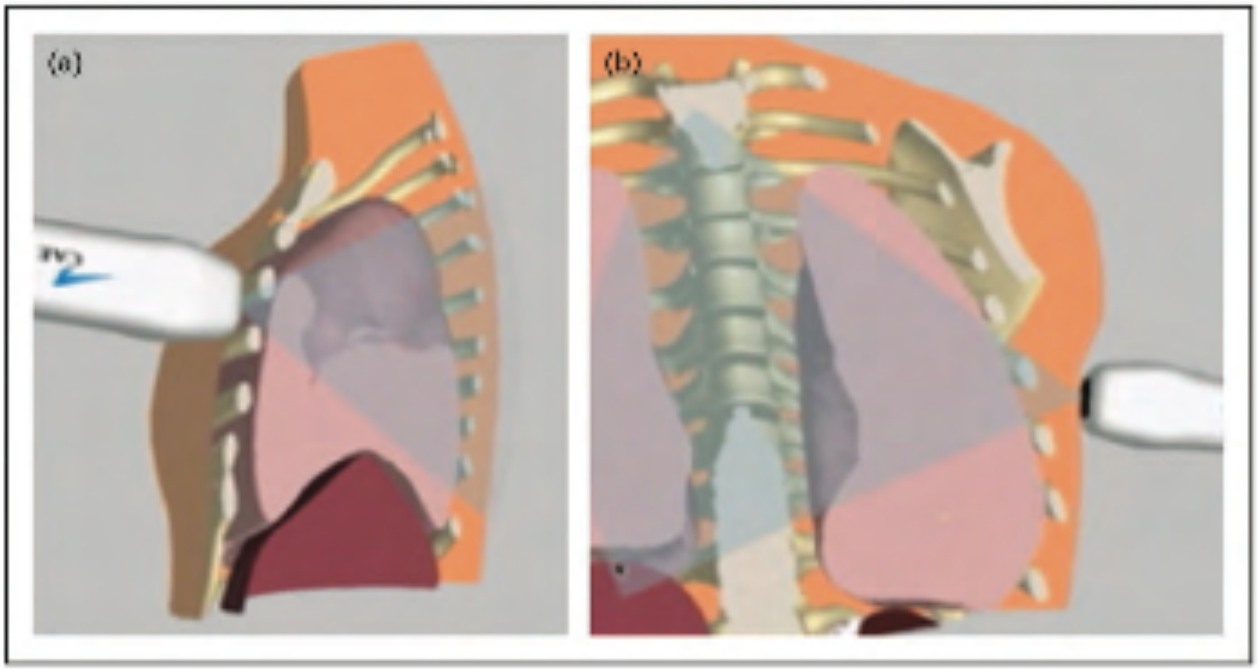




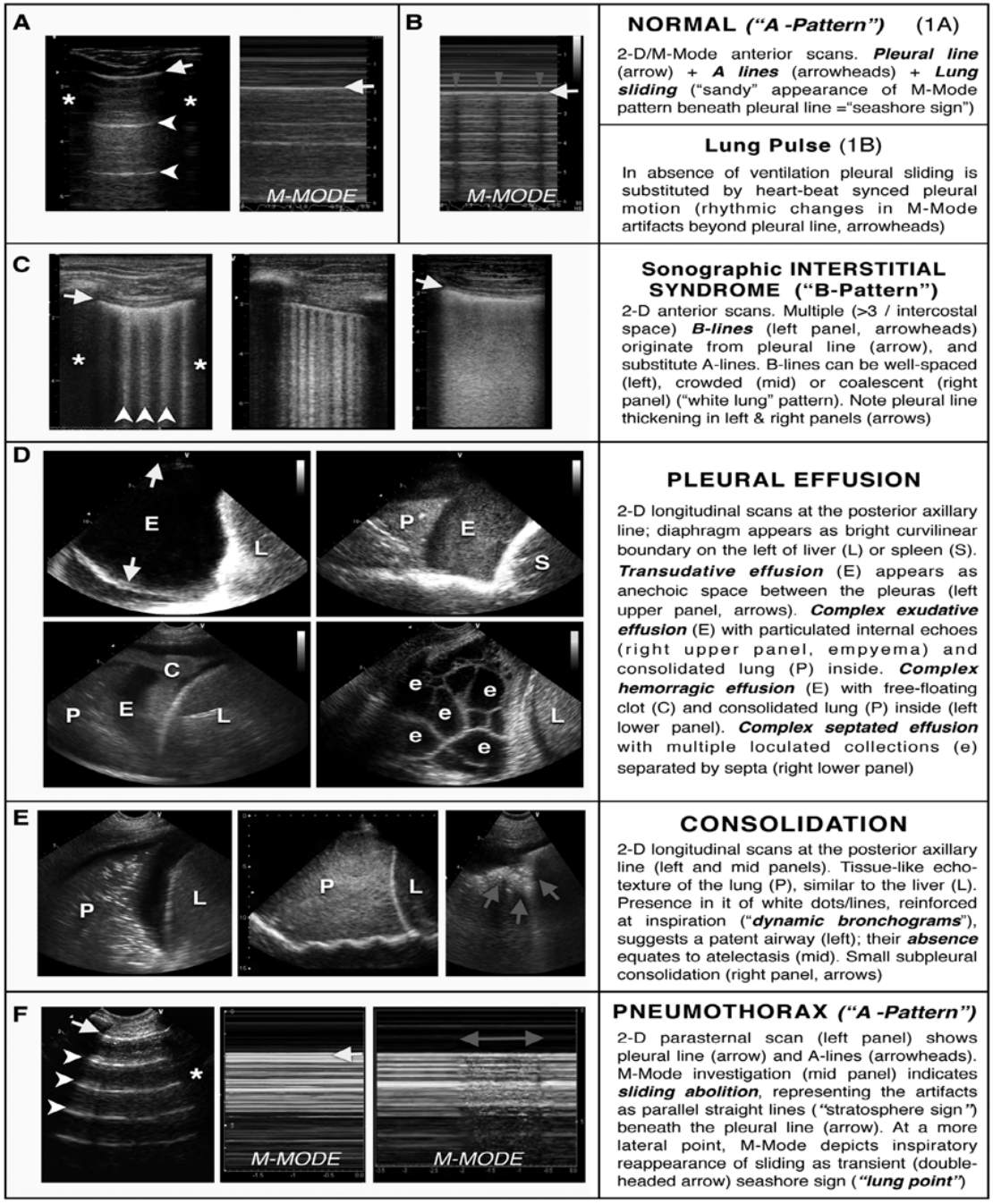
Curr Opin Anaesthesiol. 2013 Feb;26(1):20-30

VAD ÄR DET MAN KAN SE?

- Pleura
- ”Vätska”
  - I lungan
  - I lungsäcken
- Artefakter
  - A-linjer
  - B-linjer

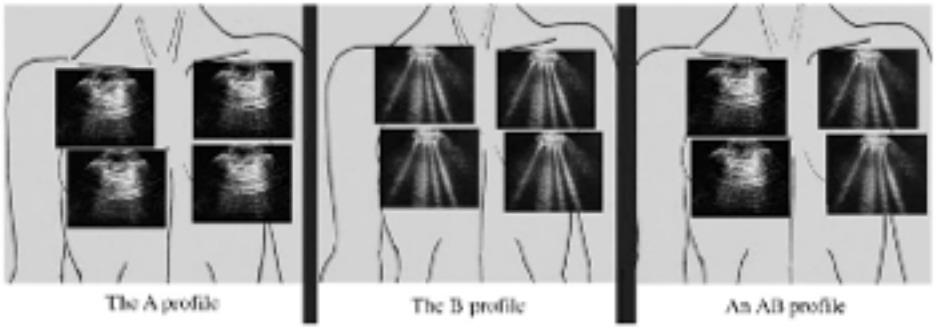


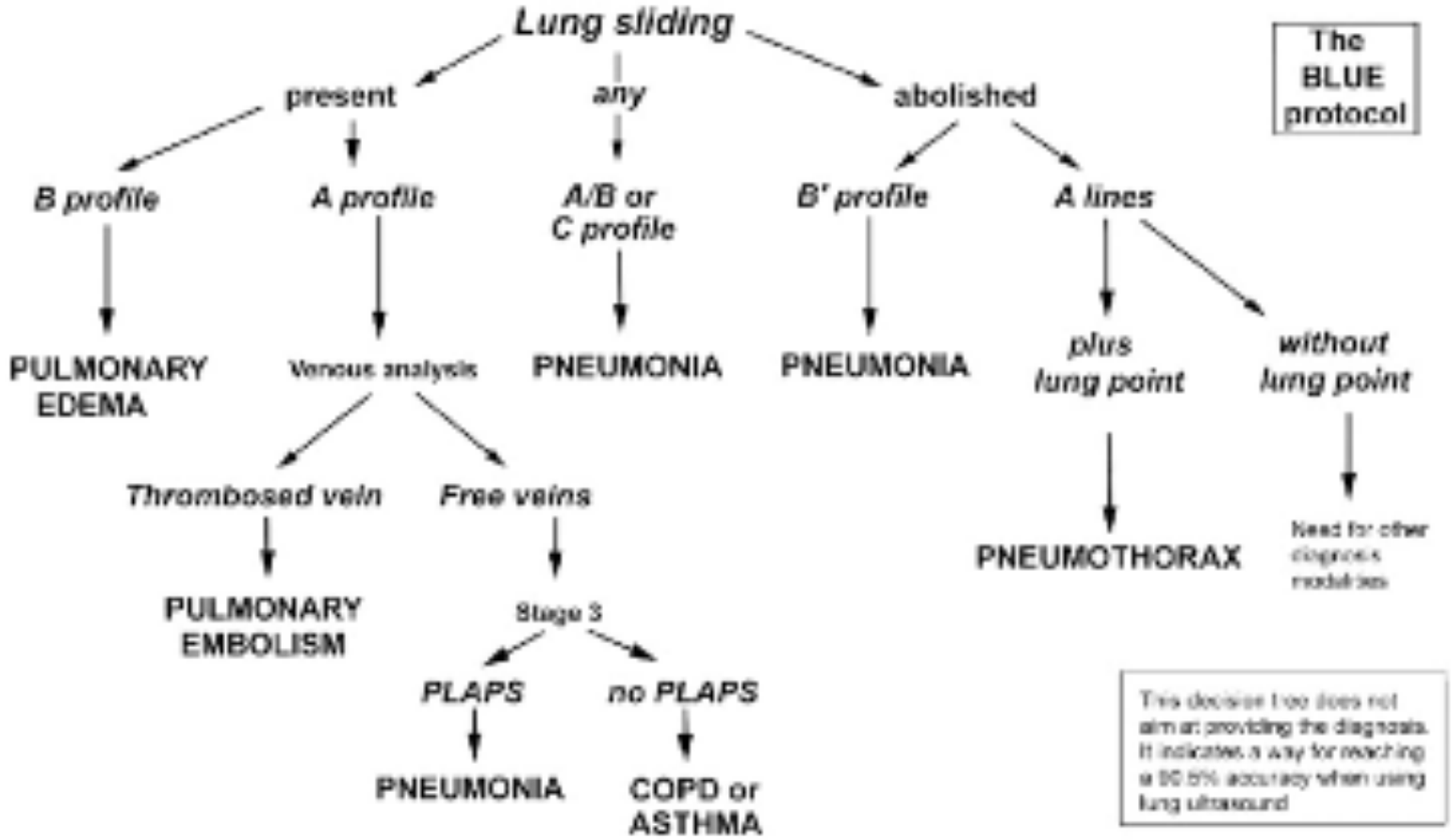
Curr Opin Anaesthesiol. 2013 Feb;26(1):20-30



Minerva Anestesiol 2012;78:1282-96

The BLUE protocol





CHEST 2008; 134:117–125

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

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

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Michael Blaivas
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Gebhard Mathis
Andrew W. Kirkpatrick
Lawrence Melniker
Luna Gargani
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Gabriele Via
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International Liaison Committee on Lung Ultrasound (ILC-LUS) for the International Consensus Conference on Lung Ultrasound (ICC-LUS)

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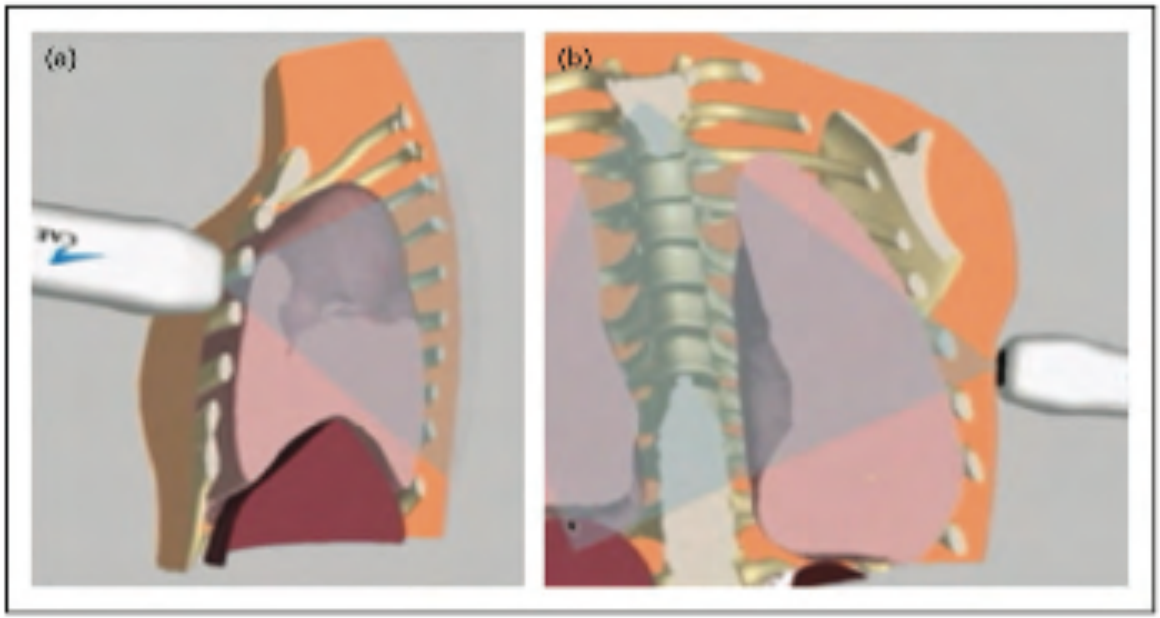

- Pleura
- ”Vätska”
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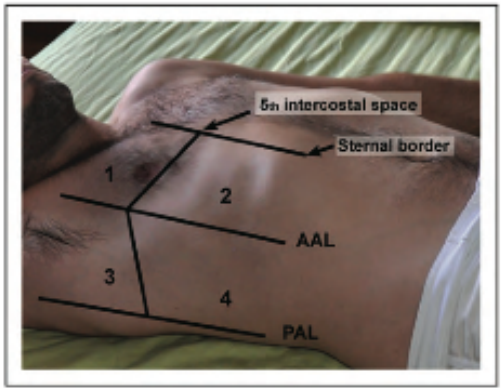
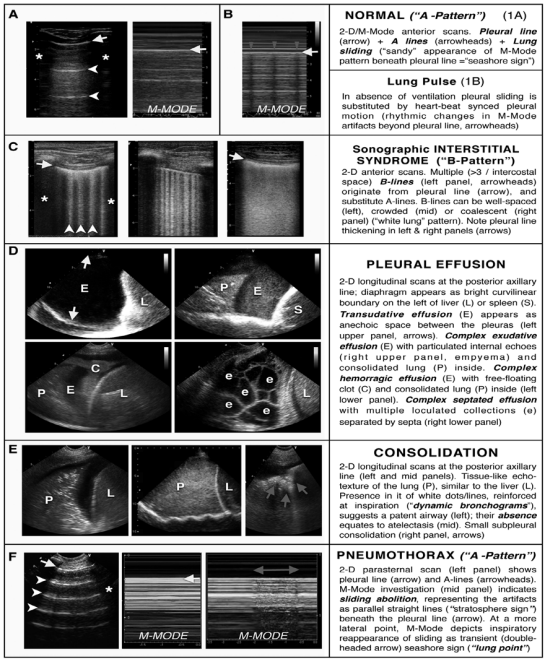
Curr Opin Anaesthesiol. 2013 Feb;26(1):20-30



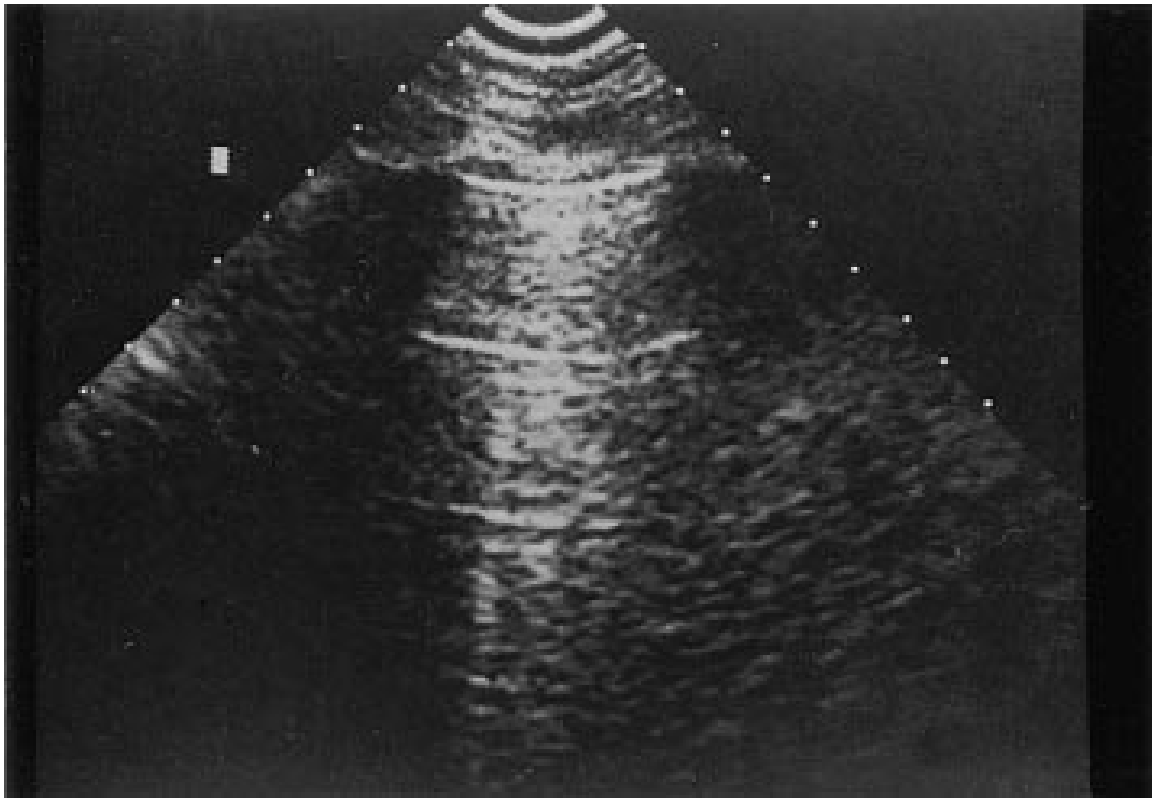
Curr Opin Anaesthesiol. 2013 Feb;26(1):20-30



Minerva Anestesiol 2012;78:1282-96

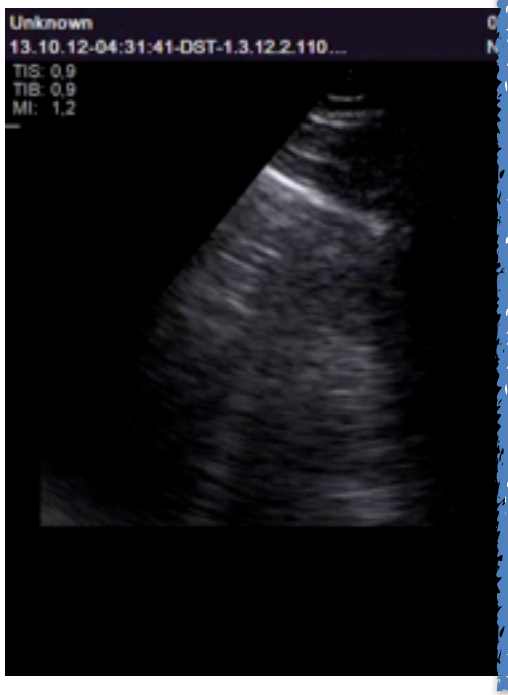
A-linjer

A.OLSON, ULTRAVIEW 2006

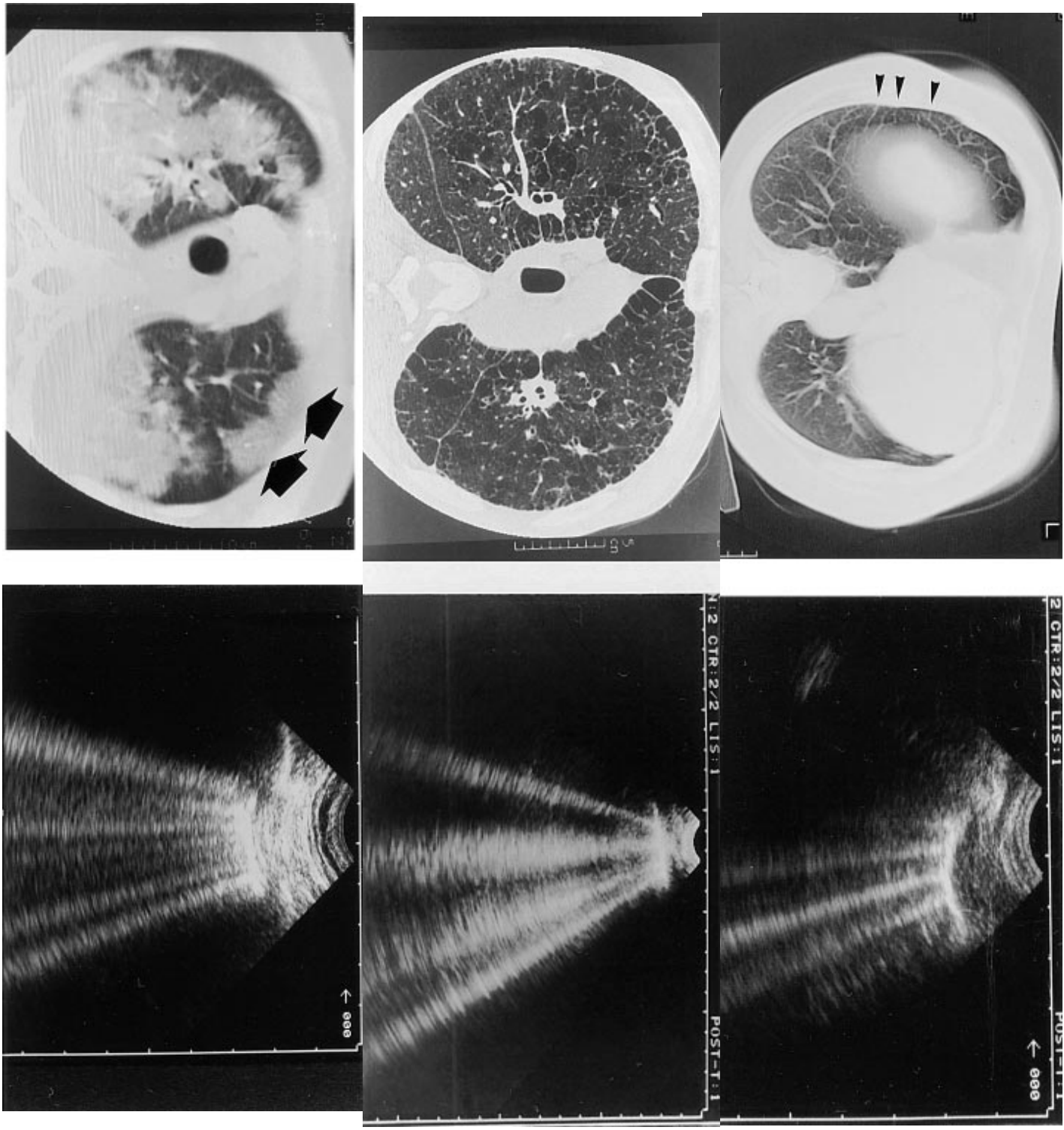


AM J RESPIR CRIT CARE MED 1997;156:1640–1646.

B-linjer

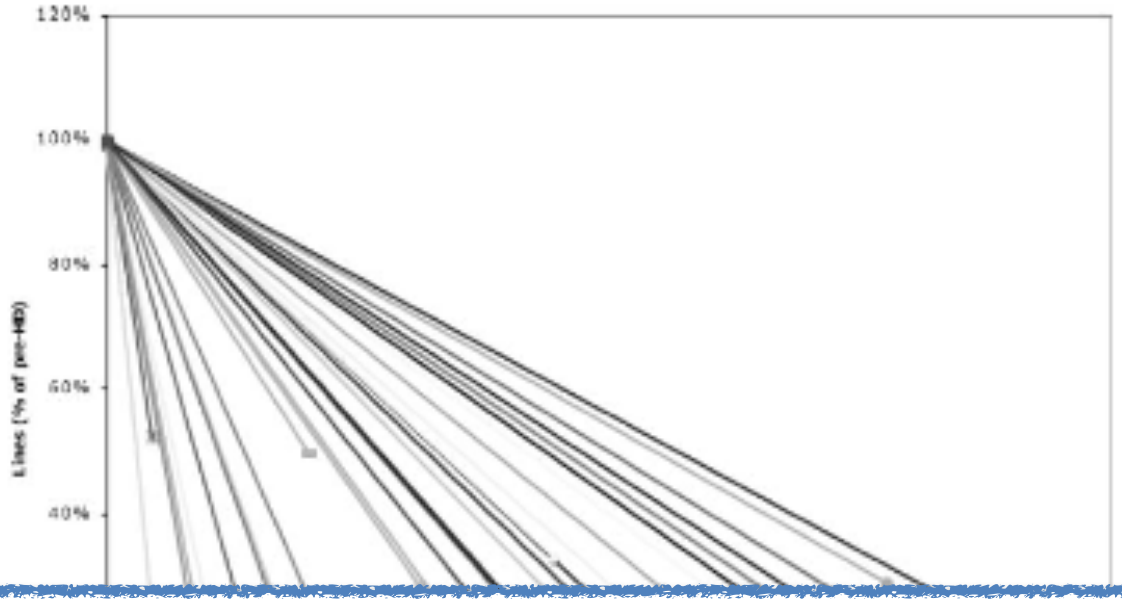


Vertikal kometsvans
Hyperekogen
Löper genom hela bilden
Laserlik (Avtar ej i intensitet)
Utgår ifrån pleura
Rör sig med pleurarörelsen.
<3 per intercostalrum normalt



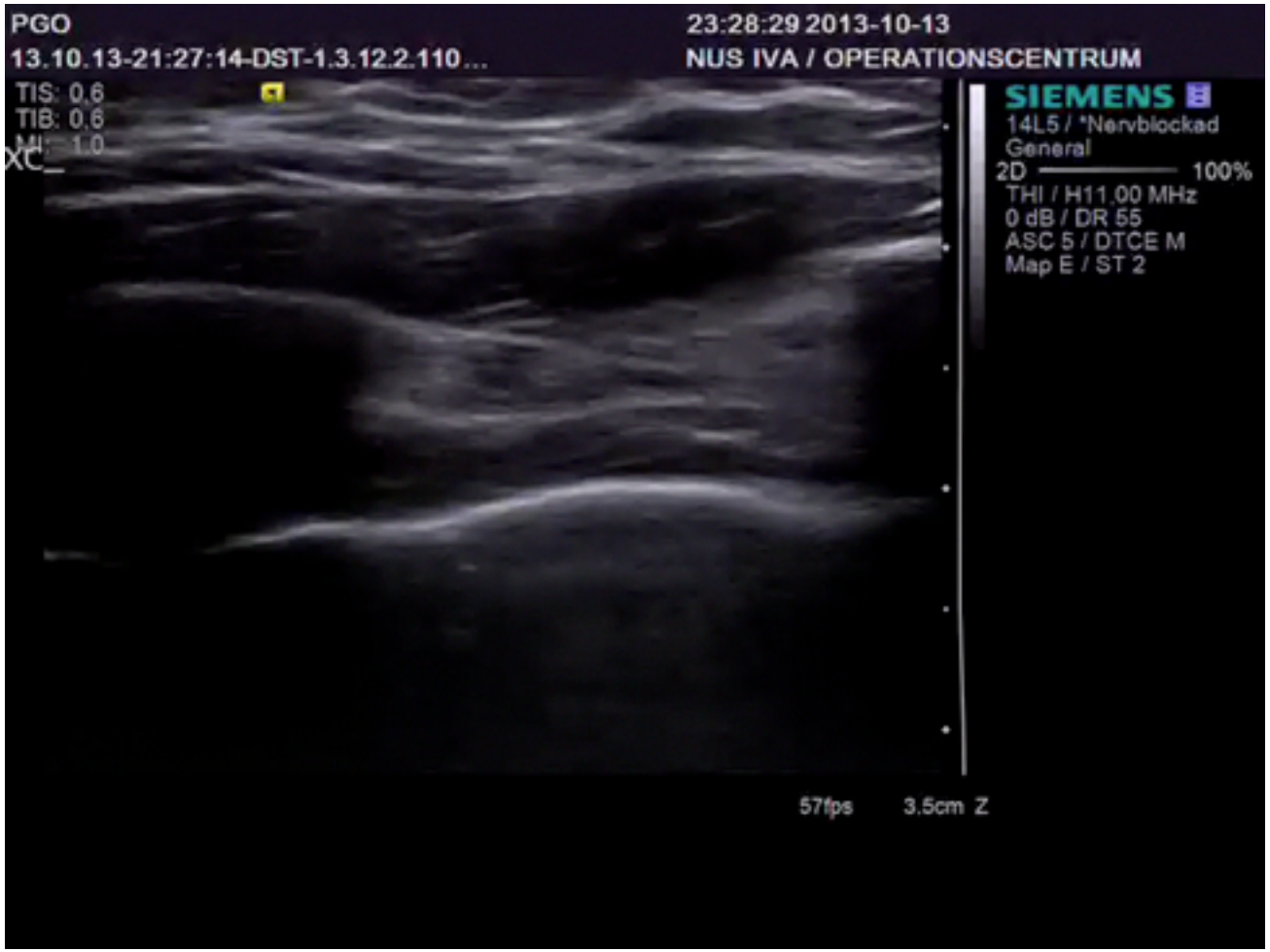
AM J RESPIR CRIT CARE MED 1997;156:1640–1646.

B-linjenantalet före och efter hemodialys



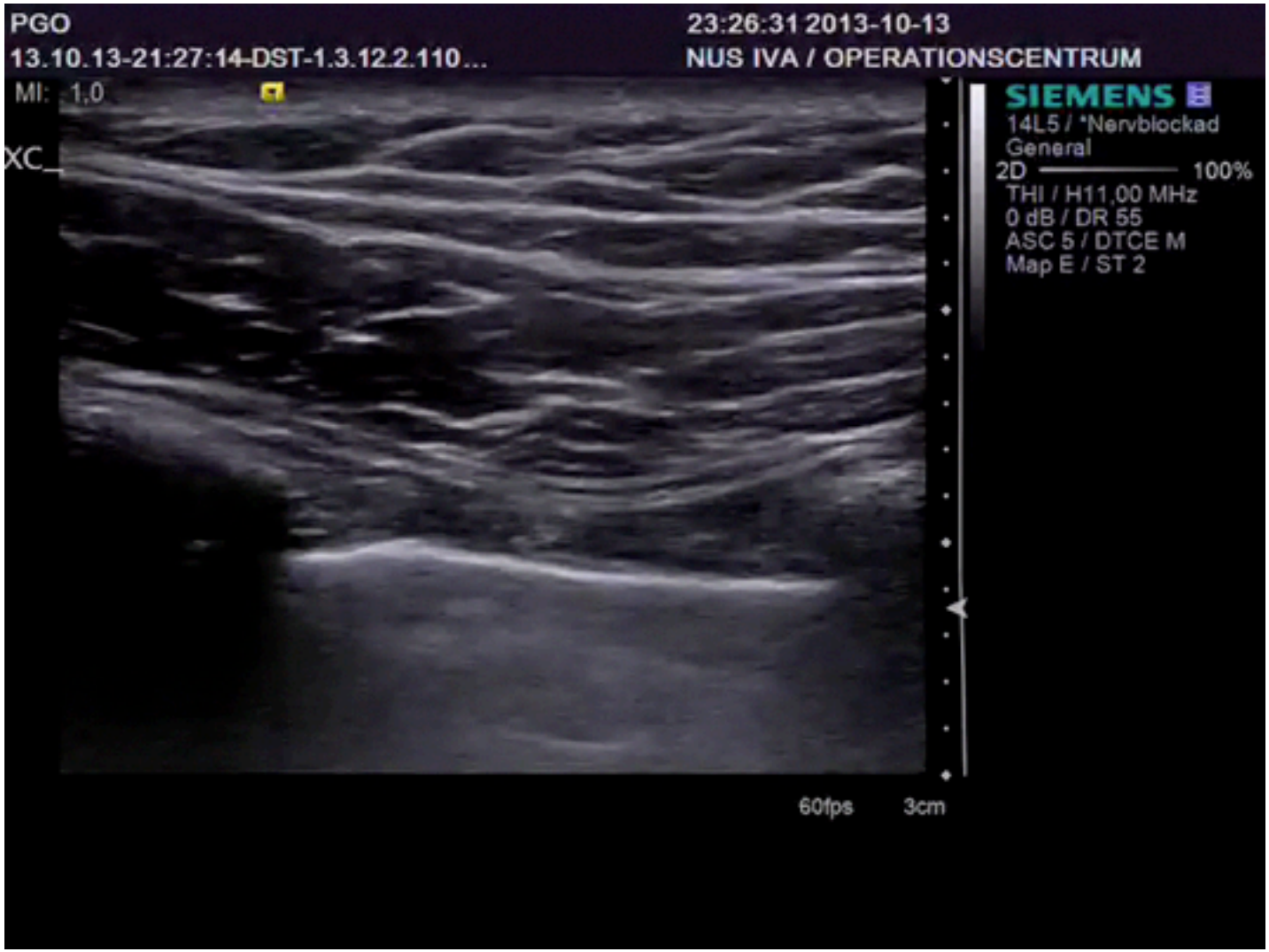
Septisk chock.
Caltabeloti et al. Critical Care 2014, 18:R91

Normalfynd vid ultraljudsundersökning

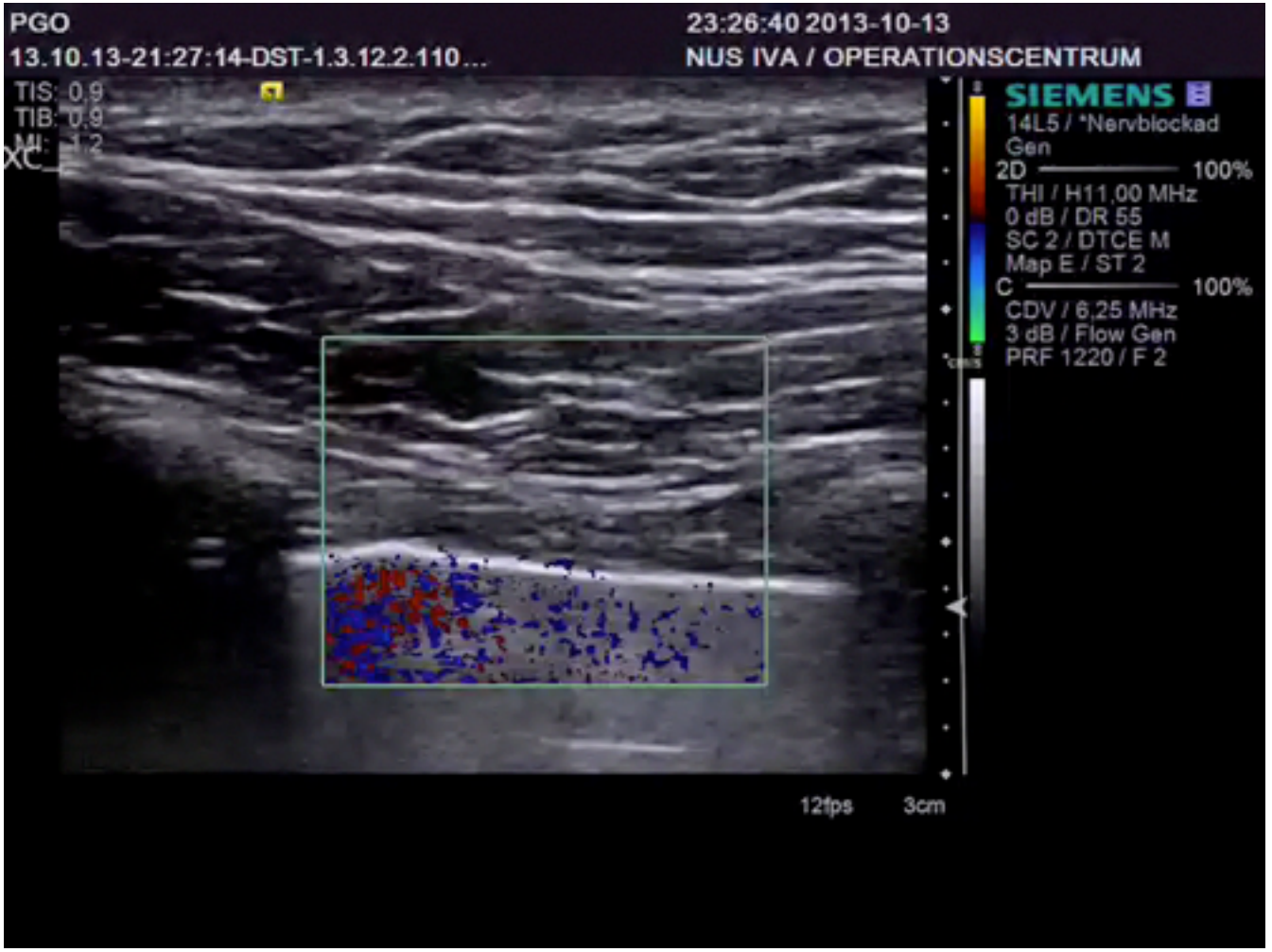


Normalfynd vid ultraljudsundersökning

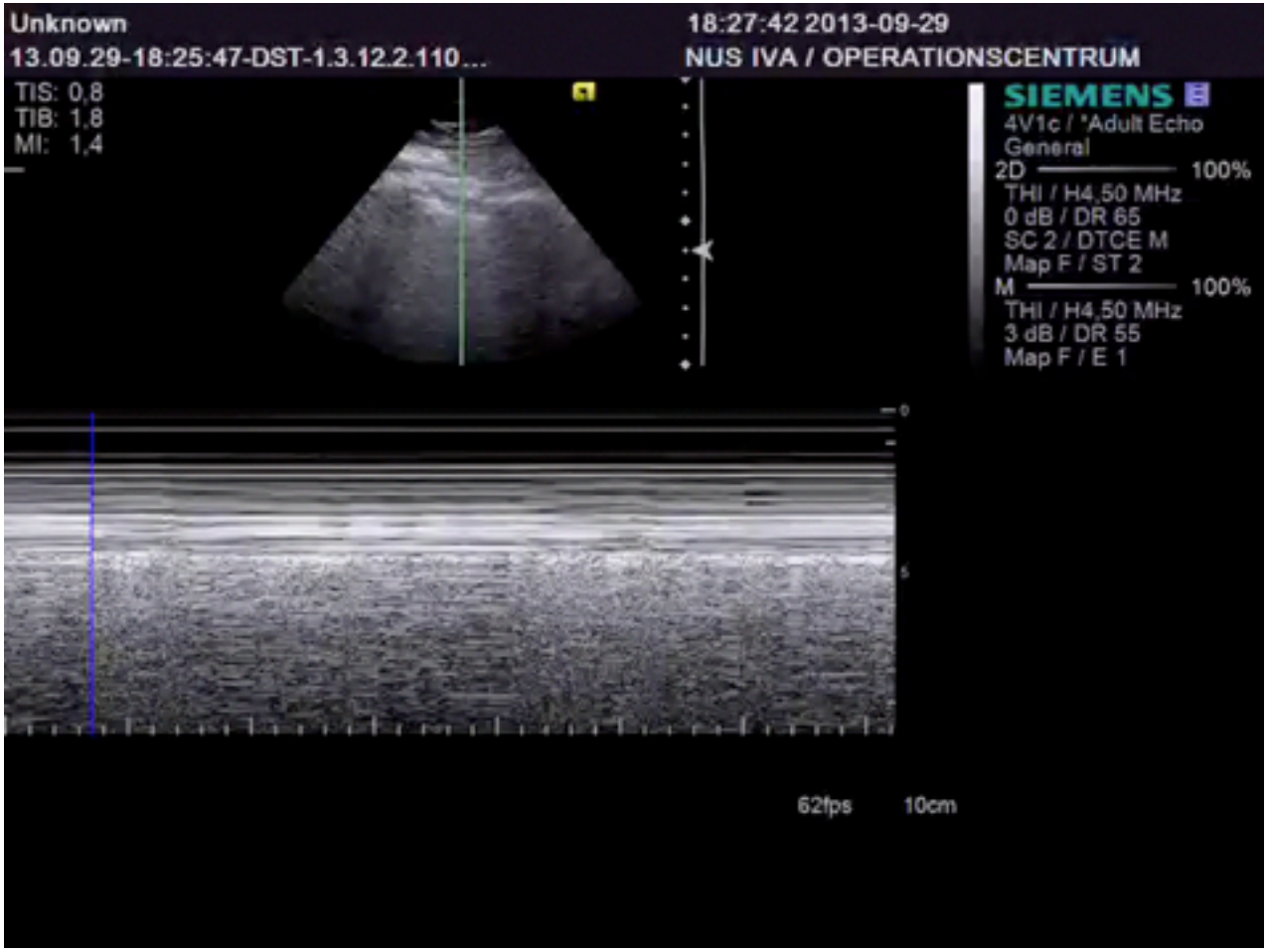
Lungpuls


PGO
13.10.13-21:27:14-DST-1.3.12.2.110...
23:26:31 2013-10-13
NUS IVA / OPERATIONSCENTRUM
MI: 1,0
SIEMENS
14L5 / *Nervblockad
General
2D
100%
THI / H11,00 MHz
0 dB / DR 55
ASC 5 / DTCE M
Map E / ST 2
60fps
3cm

Lungpuls

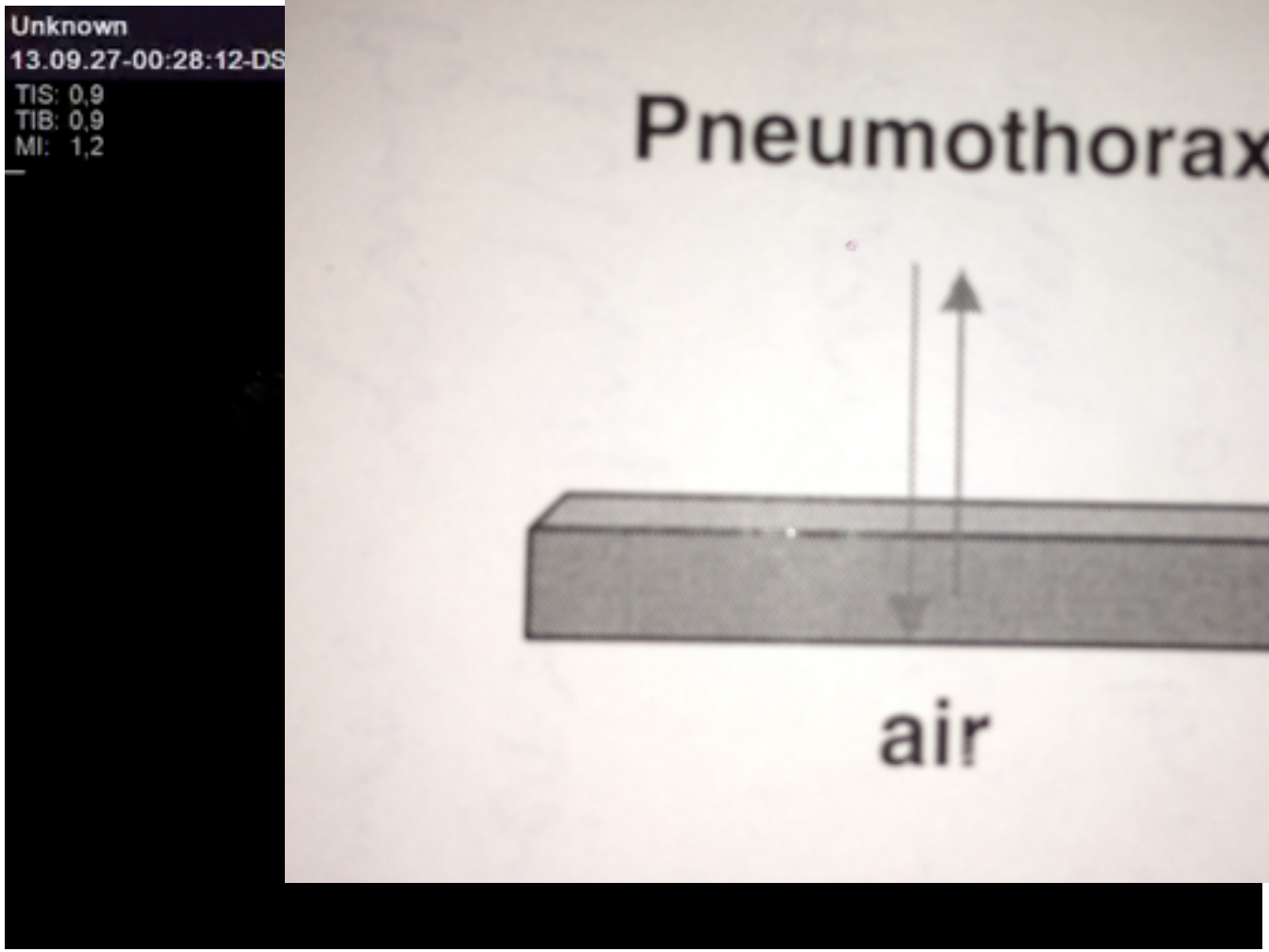

PGO
13.10.13-21:27:14-DST-1.3.12.2.110...
23:26:40 2013-10-13
NUS IVA / OPERATIONSCENTRUM
TIS: 0,9
TIB: 0,9
MI: 1,2
SIEMENS
14L5 / *Nervblockad
Gen
2D 100%
THI / H11,00 MHz
0 dB / DR 55
SC 2 / DTCE M
Map E / ST 2
C 100%
CDV / 6,25 MHz
3 dB / Flow Gen
PRF 1220 / F 2
12fps
3cm

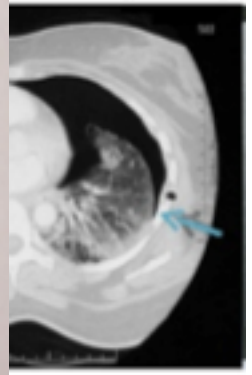
Normalfynd


Unknown
13.09.29-18:25:47-DST-1.3.12.2.110...
18:27:42 2013-09-29
NUS IVA / OPERATIONSCENTRUM
TIS: 0,8
TIB: 1,8
MI: 1,4
SIEMENS
4V1c / *Adult Echo
General
2D
100%
THI / H4,50 MHz
0 dB / DR 65
SC 2 / DTCE M
Map F / ST 2
M
100%
THI / H4,50 MHz
3 dB / DR 55
Map F / E 1
62fps
10cm

Pneumothorax

Avsaknad av pleurarörelse och B-lines. A-lines kan förekomma

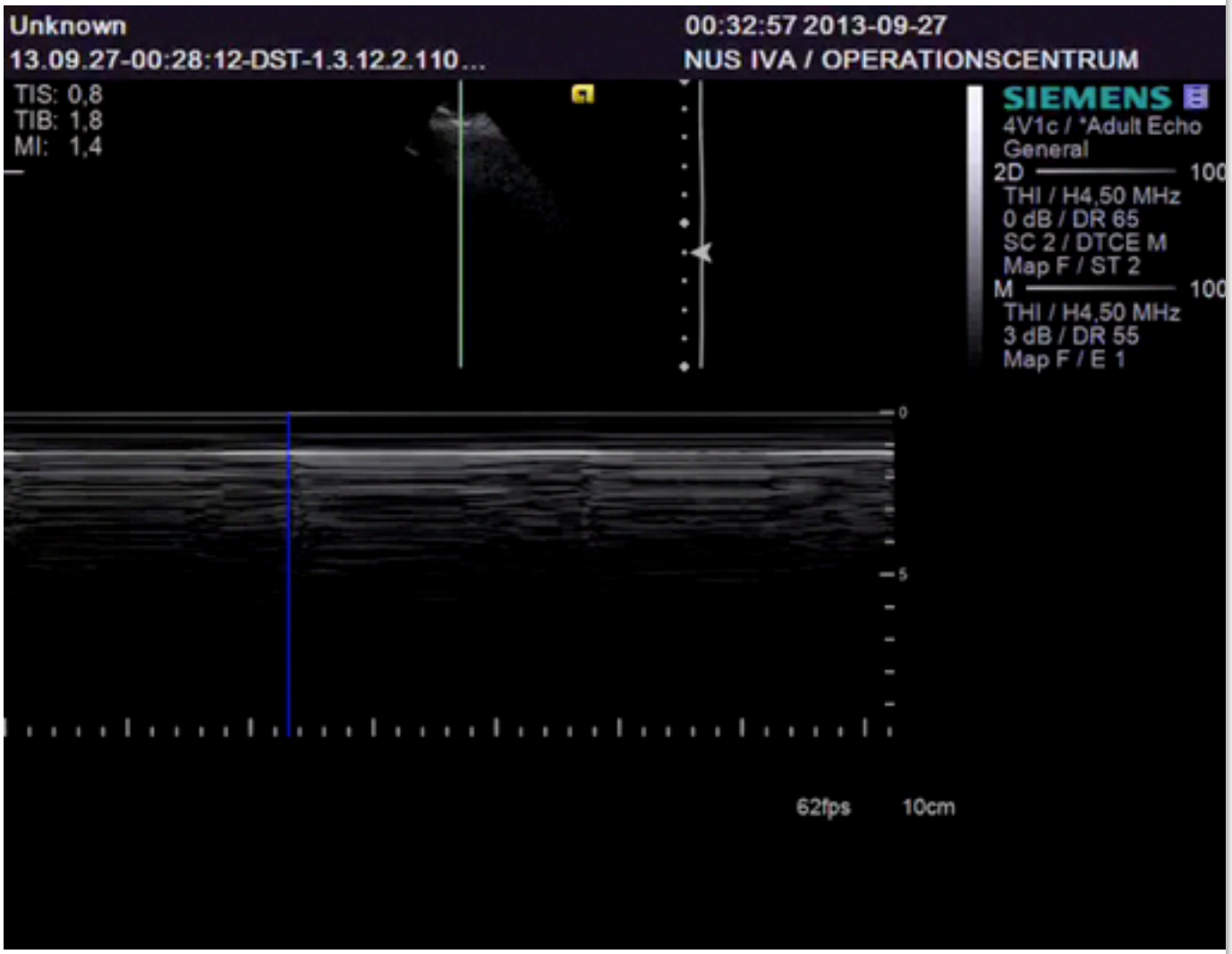




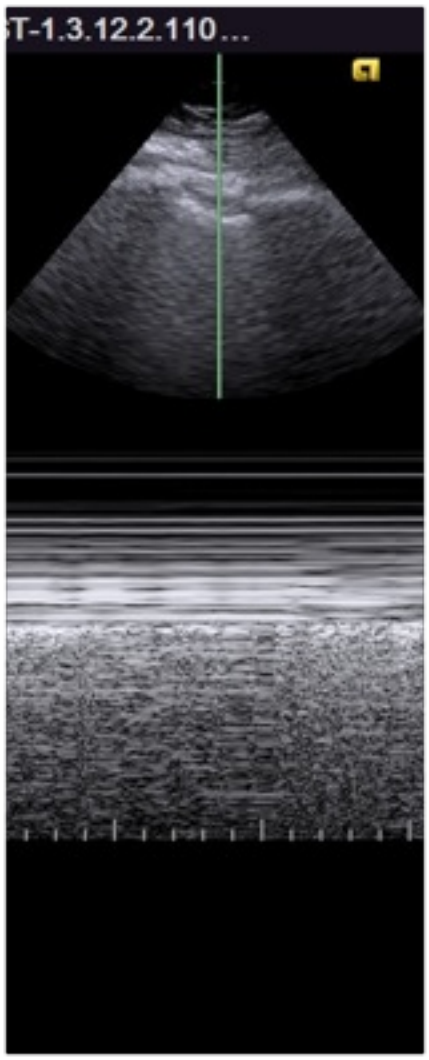
Intensive Care Med 2000;26:1434 – 1440.

Pneumothorax

M-mode



Normal



Alveolo-Interstitiellt syndrom

B-linjer i alla lungfält

-Pulmonary edema of various causes

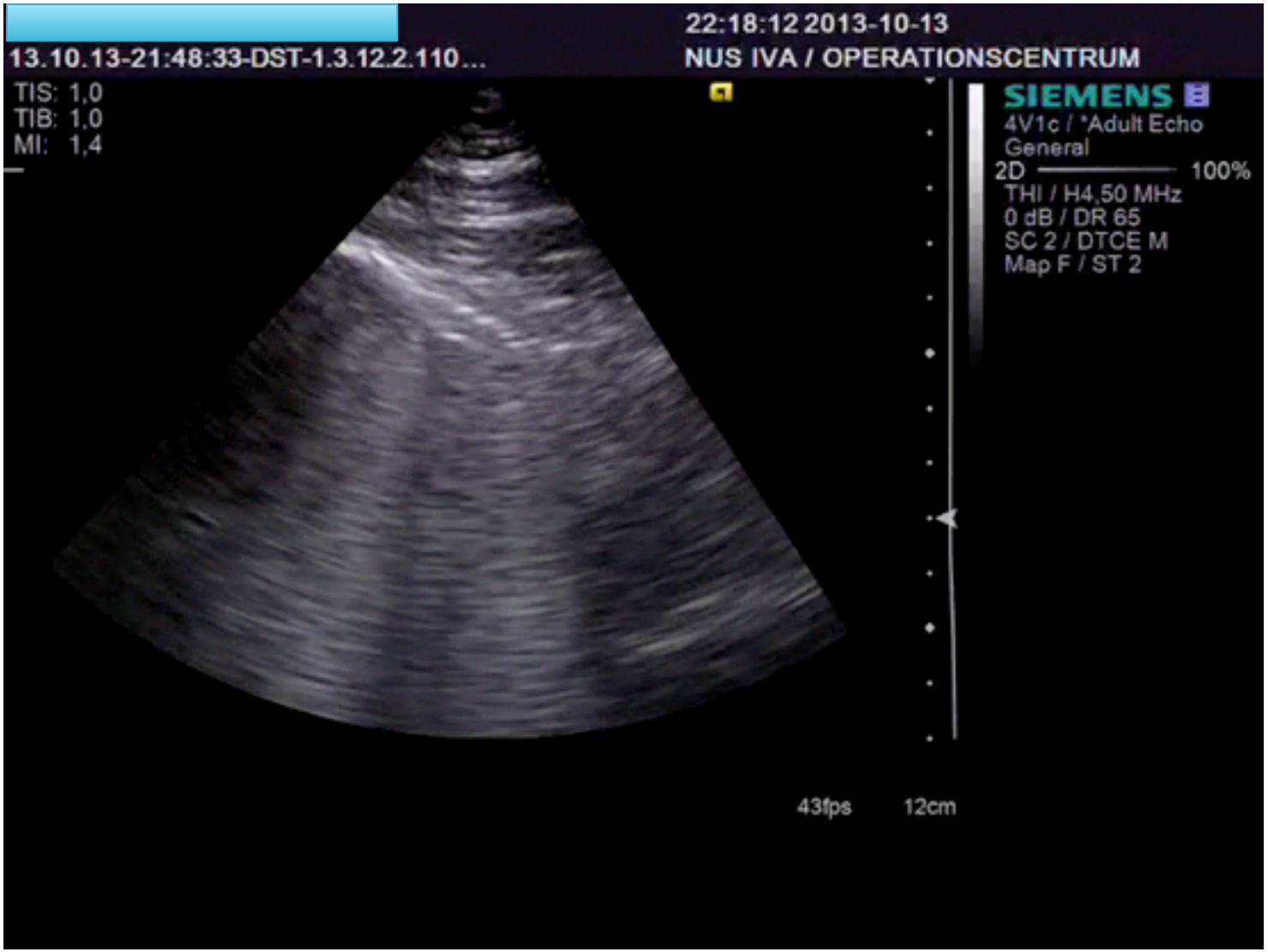
- Interstitial pneumonia or pneumonitis
- Diffuse parenchymal lung disease (pulmonary fibrosis)

B-linjer ojämnt fördelat

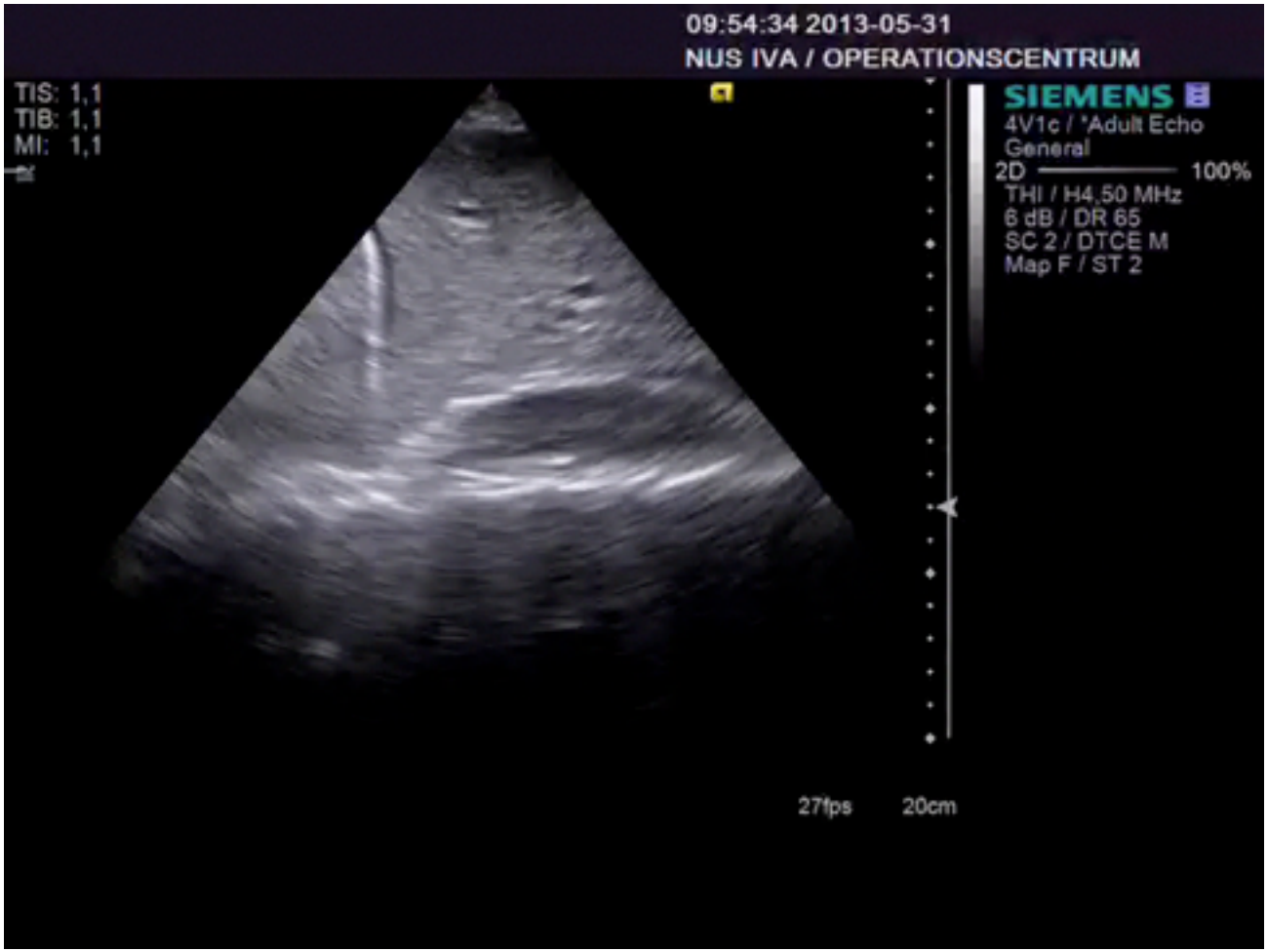
- Pneumonia and pneumonitis
- Atelectasis
- Pulmonary contusion
- Pulmonary infarction
- Pleural disease
- Neoplasia

Intensive Care Med (2012) 38:577–591

Alveolo-Interstitiellt syndrom



Konsolidering



Konsolidering

CLINICAL INVESTIGATIONS

Anesthesiology 2004; 100:9–15

Comparative Diagnostic Performances of Auscultation, Chest Radiography, and Lung Ultrasonography in Acute Respiratory Distress Syndrome

Daniel Lichtenstein, M.D., Ivan Goldstein, M.D.,† Eric Mourgeon, M.D.,† Philippe Cluzel, M.D., Ph.D.,‡ Philippe Grenier, M.D.,§ Jean-Jacques Rouby, M.D., Ph.D.‖*

Anesthesiology 2004; 100:9 –15

■ CLINICAL INVESTIGATIONS

Anesthesiology 2004; 100:9–15 © 2004 American Society of Anesthesiologists, Inc. Lippincott Williams & Wilkins, Inc.

Comparative Diagnostic Performances of Auscultation, Chest Radiography, and Lung Ultrasonography in Acute Respiratory Distress Syndrome

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	SENSITET SPECIFICITET	SENSITET SPECIFICITET	SENSITET SPECIFICITET
PLEURAVÄTSKA	42% 90%	39% 85%	92% 93%
INFILTRAT (alveolar consolidation)	8% 100%	68% 95%	93% 100%
ÖKAD INTERSTITIELL VÄTSKA (alvoelar-interstitial syndrome)	34% 90%	60% 100%	98% 88%

Anesthesiology 2004; 100:9 –15

CRITICAL CARE

RESEARCH Open Access

Pleural ultrasonography versus chest radiography for the diagnosis of pneumothorax: review of the literature and meta-analysis

Saadah Alrajab[1,5*], Asser M Youssef[2,5], Nuri I Akkus[3,5] and Gloria Caldito[4,5]

Abstract

Introduction: Ultrasonography is being increasingly utilized in acute care settings with expanding applications. Pneumothorax evaluation by ultrasonography is a fast, safe, easy and inexpensive alternative to chest radiographs. In this review, we provide a comprehensive analysis of the current literature comparing ultrasonography and chest radiography for the diagnosis of pneumothorax.

Methods: We searched English-language articles in MEDLINE, EMBASE and Cochrane Library dealing with both ultrasonography and chest radiography for diagnosis of pneumothorax. In eligible studies that met strict inclusion criteria, we conducted a meta-analysis to evaluate the diagnostic accuracy of pleural ultrasonography in comparison with chest radiography for the diagnosis of pneumothorax.

Results: We reviewed 601 articles and selected 25 original research articles for detailed review. Only 13 articles met all of our inclusion criteria and were included in the final analysis. One study used lung sliding sign alone, 12 studies used lung sliding and comet tail signs, and 6 studies searched for lung point in addition to the other two signs. Ultrasonography had a pooled sensitivity of 78.6% (95% CI, 68.1 to 98.1) and a specificity of 98.4% (95% CI, 97.3 to 99.5). Chest radiography had a pooled sensitivity of 39.8% (95% CI, 29.4 to 50.3) and a specificity of 99.3% (95% CI, 98.4 to 100). Our meta-regression and subgroup analyses indicate that consecutive sampling of patients compared to convenience sampling provided higher sensitivity results for both ultrasonography and chest radiography. Consecutive versus nonconsecutive sampling and trauma versus nontrauma settings were significant sources of heterogeneity. In addition, subgroup analysis showed significant variations related to operator and type of probe used.

Conclusions: Our study indicates that ultrasonography is more accurate than chest radiography for detection of pneumothorax. The results support the previous investigations in this field, add new valuable information obtained from subgroup analysis, and provide accurate estimates for the performance parameters of both bedside ultrasonography and chest radiography for pneumothorax evaluation.

Introduction

Chest ultrasonography (US) is gaining more attention in critical care and emergency medicine literature. US has been used recently for evaluation of pneumothorax and other lung pathologies. Several early trials [1-3] by Litchenstein *et al.* established the diagnostic signs of pneumothorax on US and showed a strong superiority in favor of US over chest radiography (CXR). Despite those and other cumulating original research evidence favoring ultrasonography, US remained underused. In fact, the most recent British thoracic society guidelines on pleural procedures and thoracic ultrasound stated that "The utility of thoracic ultrasound for diagnosing a pneumothorax is limited in hospital practice due to the ready availability of chest x-rays and conflicting data from published reports" [4]. During the years 2011 and 2012, an increasing number of original research publications compared US with CXR for pneumothorax evaluation,

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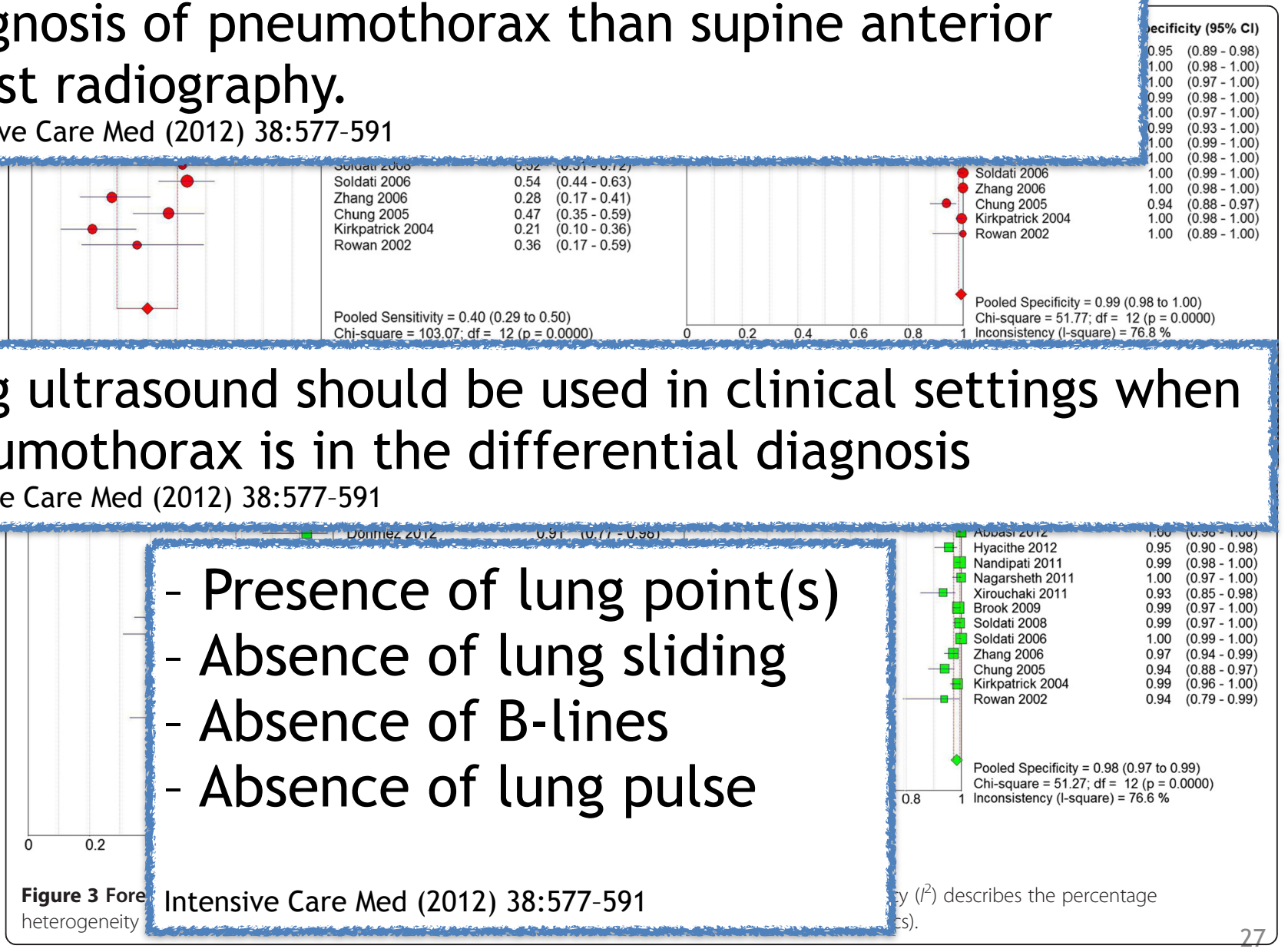
Full list of author information is available at the end of the article

Lung ultrasound more accurately rules out the diagnosis of pneumothorax than supine anterior chest radiography.

Intensive Care Med (2012) 38:577-591



Lung ultrasound should be used in clinical settings when pneumothorax is in the differential diagnosis

Intensive Care Med (2012) 38:577-591

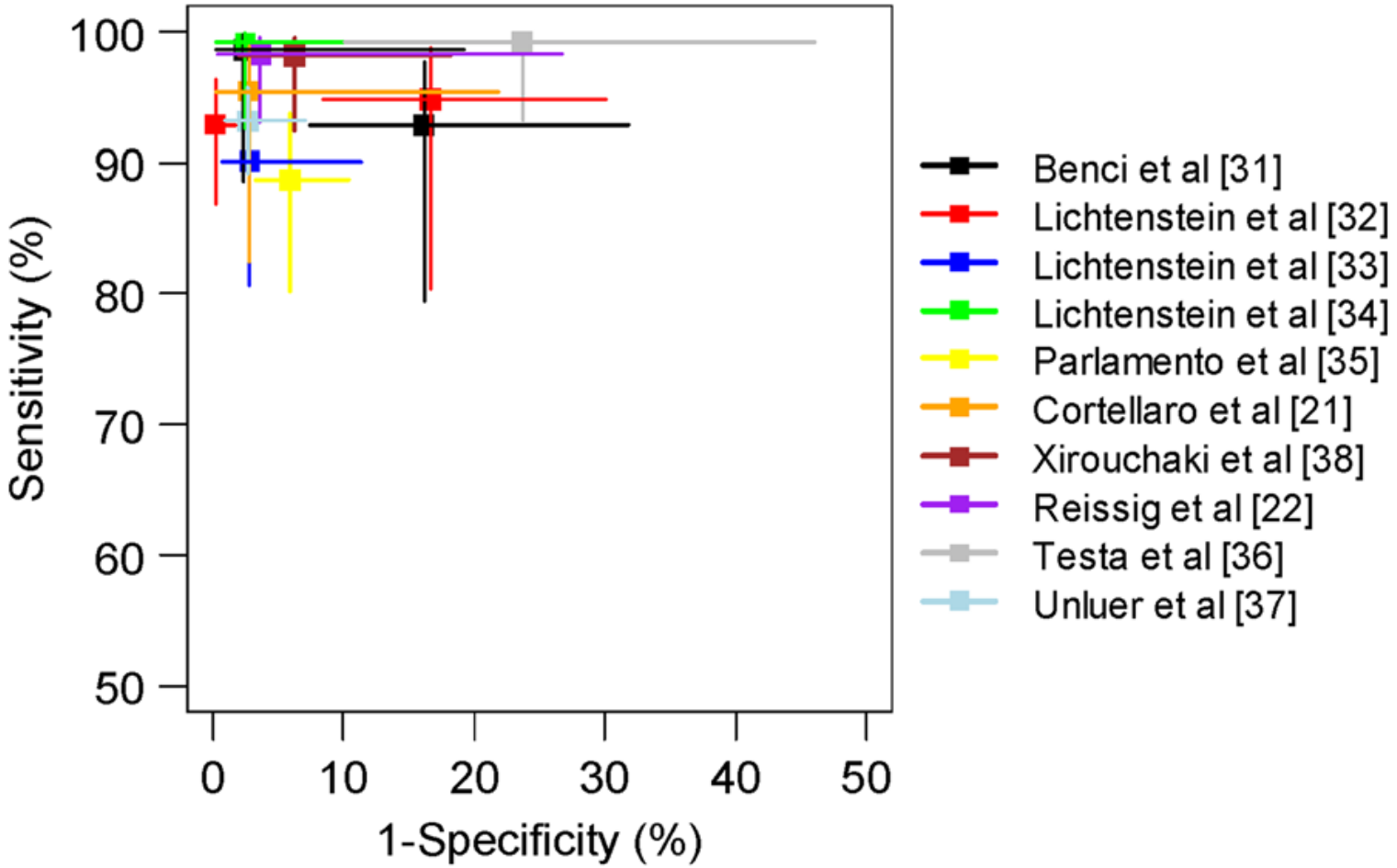
- Presence of lung point(s)
- Absence of lung sliding
- Absence of B-lines
- Absence of lung pulse

Intensive Care Med (2012) 38:577-591

Figure 3 Fore
heterogeneity
cy (I^2) describes the percentage
cs).

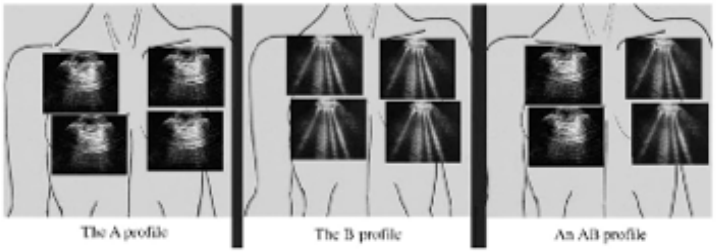
Alrajab et al. Critical Care 2013, 17:R208

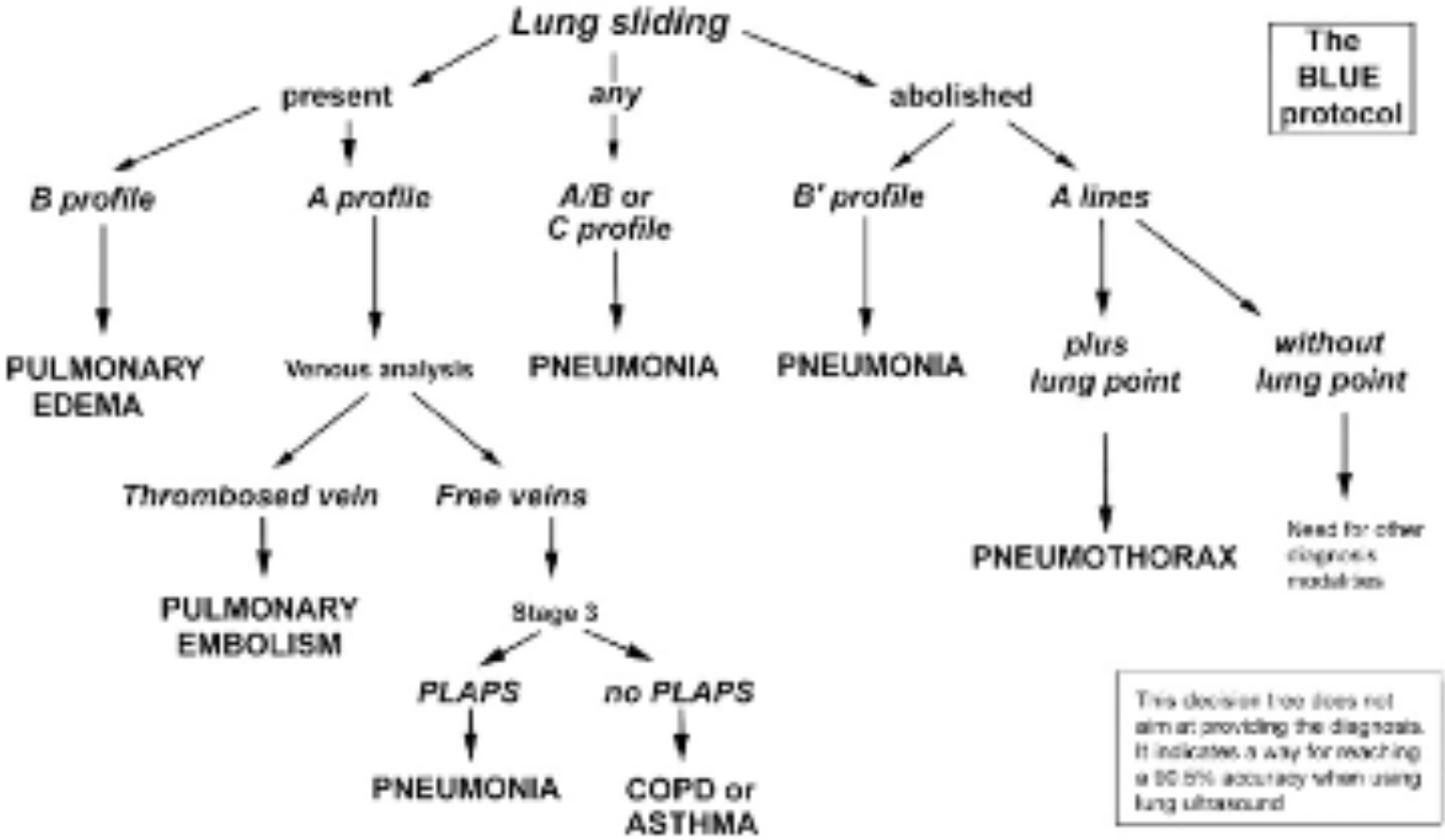
Pneumoni



Chavez et al. Respiratory Research 2014, 15:50

The BLUE protocol





CHEST 2008; 134:117–125

The BLUE protocol

SENS

Pneumothorax 88%, KOL/astma 89%, Kardiellt lungödem 97% samt pneumoni 89%

SPEC

Pneumothorax 100%, KOL/astma 97%, Kardiellt lungödem 95% samt pneumoni 94%

Table 4—*Accuracy of the Ultrasound Profiles**

Disease	Ultrasound Signs Used	Sensitivity, %	Specificity, %	Positive Predictive Value, %	Negative Predictive Value, %
Cardiogenic pulmonary edema	Diffuse bilateral anterior B + lines associated with lung sliding (B profile)	97 (62/64)	95 (187/196)	87 (62/71)	99 (187/189)
COPD or asthma	Predominant anterior A lines without PLAPS and with lung sliding (normal profile), or with absent lung sliding without lung point	89 (74/83)	97 (172/177)	93 (74/79)	95 (172/181)
Pulmonary embolism	Predominant anterior bilateral A lines plus venous thrombosis	81 (17/21)	99 (238/239)	94 (17/18)	98 (238/242)
Pneumothorax	Absent anterior lung sliding, absent anterior B lines and present lung point	88 (8/9)	100 (251/251)	100 (8/8)	99 (251/252)
Pneumonia	Diffuse bilateral anterior B + lines associated with abolished lung sliding (B′ profile)	11 (9/83)	100 (177/177)	100 (9/9)	70 (177/251)
	Predominant anterior B + lines on one side, predominant anterior A lines on the other (A/B profile)	14.5 (12/83)	100 (177/177)	100 (12/12)	71.5 (177/248)
	Anterior alveolar consolidation (C profile)	21.5 (18/83)	99 (175/177)	90 (18/20)	73 (175/240)
	A profile plus PLAPS	42 (35/83)	96 (170/177)	83 (35/42)	78 (170/218)
	A profile plus PLAPS, B′, A/B or C profile	89 (74/83)	94 (167/177)	88 (74/84)	95 (167/176)

*Data in parenthesis indicate No. of patients (total).

CHEST 2008; 134:117–125

Impact of lung ultrasound on clinical decision making in critically ill patients

- 189 mekaniskt ventilerade patienter.
- Lungultraljud ordinerades av ansvarig läkare vid behov tex pnemothoraxmisstanke, försämrad blodgas,etc
- Hos 188 hittades patologi, varav hos flertalet sågs bilateralt posteriort konsolidering, interstitiellt syndrom samt pleuravätska.

INTENSIVE CARE MED (2014) 40:57-65

The Use of Point-of-Care Bedside Lung Ultrasound Significantly Reduces the Number of Radiographs and Computed Tomography Scans in Critically Ill Patients

Adriano Peris, MD,* Lorenzo Tutino, MD,* Giovanni Zagli, MD,* Stefano Batacchi, MD,* Giovanni Cianchi, MD,* Rosario Spina, MD,* Manuela Bonizzoli, MD,* Luisa Migliaccio, MD,* Lucia Perretta, MD,* Marco Bartolini, MD,† Kevin Ban, MD,‡ and Martin Balik, MD, PhD§

”A significant reduction in the total number of chest radiographs obtained (-26%; $P < 0.001$) and CT scans (-47%; $P < 0.001$) in comparison with the comparison group”

Beräknad kostnad för utbildning/utrustning 25000 Euro
Beräknad kostnadsbesparing i minskad CXR/CT 27000 Euro

(Anesth Analg 2010;111:687–92)

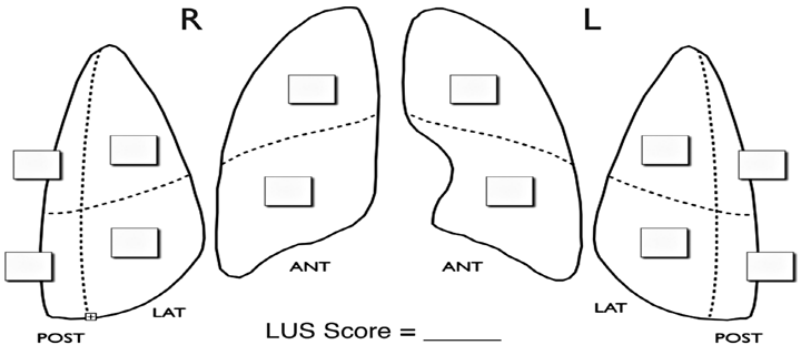
FONDAZIONE
IRCCS POLICLINICO "*SAN MATTEO*"
Istituto di Ricovero e Cura a Carattere Scientifico di diritto pubblico
C.F. 00303490189 - P. IVA 00580590180
V.le Golgi, 19 - 27100 PAVIA
S.C. di Anestesia e Rianimazione I - DIRETTORE *Prof. Antonio Braschi*

LUNG ULTRASOUND

Report Form

PATIENT NAME: ..... GENDER: ☐ M ☐ F DATE OF BIRTH: .....
OPERATOR: ..... EXAM DATE: ..... HOUR ..... STORAGE CODE ....
HISTORY: ....
.....
SPONT VENTILATION: RR = ... Resp Distress: ☐ Yes ☐ No DECUBITUS: ☐ Sup ☐ Lat ☐ Pron ☐ Semirec
MECH VENTILATION: a) Modality: ☐ PCV ☐ DuoPAP ☐ ASV ☐ PSV ☐ SIMV ☐ NIV ☐ CPAP
b) Settings/Pattern: PEEP/Ps = ... /..... Ppeak ..... Pplat ..... RR ..... I:E ..... VT .....
EGA/EAB: pH ..... pCO2 ..... HCO3- ..... BE ..... PO2 ..... P/F ..... SpO2% ..... Hb .....

INDICATION: ☐ DIAGNOSTIC ☐ SCR.EENING ☐ MONITORING ☐ PROCEDURAL GUIDANCE
TYPE OF EXAM: ☐ simplified ☐ comprehensive ☐ focused (ANT / POST)



Legenda: 0 = A-Pattern (or nearly normal); **1** = B-Pattern (B-lines >3/field, well spaced); **2** = B-Pattern (crowded, coalescent +/- subpleural consolidations) **3** = Consolidation* **E**= Effusion*; **Pn** = Pneumothorax**; **NS**= Sliding Abolition; **LP**=Lung Pulse *(3 and E: characterize below in description) **(lindicate Lung Point(s))

DESCRIPTION .....
.....
.....

DIAGNOSIS .....

☐ Suspected ☐ Not made ☐ Second Opinion needed ----------
Signature

Figure 2.—*Simplified report form for lung ultrasound in the ICU.* With simple check-boxing and minimal typing, it allows for rapid reporting of diagnostic, screening, monitoring and procedure-guidance examinations. Visual representation of different explored regions (2 anterior, 2 lateral, 2 posterior, according to anatomical landmarks set by axillary lines) and number-coded rating of findings provide instantaneous perception of the overall lung ultrasound representation. Calculation of a lung ultrasound (LUS) score allows semi-quantification of the state of aeration of the entire lung. Additional free-text description and presumptive diagnosis complete the report. The examamination can be conducted in a simplified manner (inspection at a single representative point per region), as comprehensive investigation (each intercostal space entirely inspected, with the worst finding per region considered for rating), or even as a focused, single-region examination (for example, just dorsal, to quantify a known effusion). For the purpose of correct interpretation, detailed history, clinical conditions, and ventilation are reported. Storage code for retrieval of images from an archive is indicated.

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