

# Evidenza dell'Applicazione dell'Ecografia Toracica nell'Anziano - Gruppo GRETA 2023 -

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## **Il razionale (ormai storico)....**

**Performance comparison of lung ultrasound and chest x-ray for the diagnosis of pneumonia in the ED**

**They found a sensitivity of 0.95 for the ultrasound examination against 0.6 for radiography (P < .05).**

**The negative predictive value was 0.67 against 0.25 for radiography (P < .05).**

**Bourcier JE., et al., Am J Emerg Med. 2014 Feb;32(2):115-8**

**...dipende soprattutto dal timing dell'esecuzione.**

# The value of lung ultrasound in COVID-19 pneumonia, verified by high resolution computed tomography assessed by artificial intelligence

**Yitu Healthcare** | 20210204 | 1 series | CT 560 imgs | Detection completed 1 | 0.60mm | 560

**Lesion analysis** | Lung analysis

**Inflammation density analysis**

Current

CT

	Right lung	Left lung	Both lungs
Average(HU)	-631.84	-611.62	-623.96
Median(HU)	-697.00	-683.00	-692.00
Peak(HU)	-811.05	-817.69	-815.27
Standard deviation(HU)	283.51	294.52	288.02
Skewness	0.98	0.83	0.92

**Inflammation volume table**

	Both lungs (%)	Right lung (%)	Left lung (%)	Both lungs (cm <sup>3</sup> )	Right lung (cm <sup>3</sup> )	Left lung (cm <sup>3</sup> )
Lesion	24.54	29.97	19.11	1222.87	746.69	476.17
Ground glass	21.37	26.40	16.33	1064.70	657.77	406.93
Consolidation	3.17	3.57	2.78	158.17	88.92	69.25

SE4 | HFS | IM 282/560 | SIEMENS | Klatka pluca HRCT 0.6 Br57 | SOMATOM Definition Edge | 20210204 | T: 0.6 mm

**COVID-19 Evaluation** | Suspected pneumonia: Critical

	R1	R2	R3	L1	L2
Consolidation	2.01%	0.59%	6.75%	0.61%	6.05%
Ground glass	22.80%	13.97%	36.86%	12.38%	22.51%

**Finding** | Advice for treatment

IM: 0.6mm

Consolidation and ground glass were seen in both lungs, and the lesions involved the upper lobe, middle lobe, inferior lobe of the right lung, upper lobe, inferior lobe of the left lung. The volume of both lungs was 4983.31cm<sup>3</sup>, the total volume of the lesions was: 1222.87cm<sup>3</sup>, accounting for about 24.54% of the volume of both lungs. The trachea and bronchi were all through. Size and shape of both pulmonary hili were normal, without marked thickening of bilateral pleuras.

W: 1500, C: -400  
X: 52, Y: 68, Val: -954

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# **Le evidenze scientifiche nell'utilizzo dell'ecografia toracica**

# Evolution of Point-of-Care Ultrasonography (POCUS) during the Past Decade

The NEW ENGLAND JOURNAL of MEDICINE

REVIEW ARTICLE

Julie R. Ingelfinger, M.D., Editor

## Point-of-Care Ultrasonography

José L. Díaz-Gómez, M.D., Paul H. Mayo, M.D., and Seth J. Koenig, M.D.

**P** OINT-OF-CARE ULTRASONOGRAPHY (POCUS) IS DEFINED AS THE ACQUISITION, interpretation, and immediate clinical integration of ultrasonographic imaging performed by a treating clinician at the patient's bedside rather than by a radiologist or cardiologist. POCUS is an inclusive term; it is not limited to any specialty, protocol, or organ system.<sup>1</sup> With the advent of smaller and more affordable ultrasound machines, combined with evidence that nonradiologists and noncardiologists can become competent in the performance of POCUS, it is now used in many practice settings and in all phases of care — from screening and diagnosis to procedural guidance and monitoring — and has become associated with changes in clinical decision making in medical practice.<sup>2,3</sup> A recent study showed that POCUS facilitated confirmation of the suspected clinical diagnosis in up to 50% of cases and supported a change in the initial diagnosis in 23% of cases.<sup>4</sup> In this review, we discuss key trends in POCUS technology, advances in its

# Evolution of POCUS during the Past Decade

## Acute Pulmonary Edema

Sensitivity: 88%

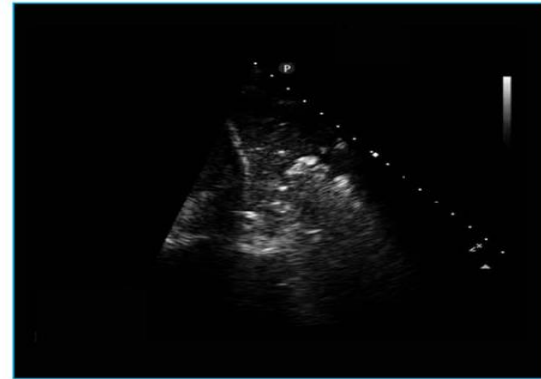
Specificity: 90%



## Pneumonia

Sensitivity: 88%

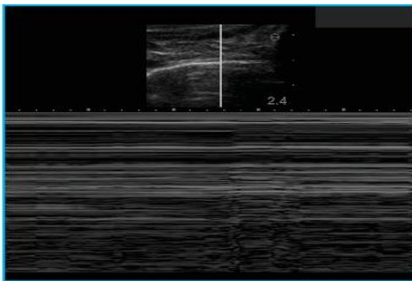
Specificity: 93%



## Pneumothorax

Sensitivity: 81%

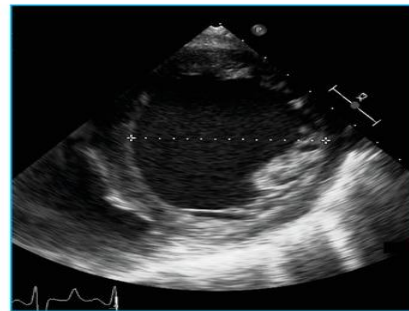
Specificity: 100%



## Left Ventricular Dysfunction

Sensitivity: 69–94%

Specificity: 88–96%



## Thoracoabdominal Trauma

Sensitivity: 74%

Specificity: 96%



# **Le evidenze scientifiche nell'utilizzo dell'ecografia toracica in Pronto Soccorso**

# ECOGRAFIA TORACICA IN URGENZA

Meta-analisi degli studi pubblicati sino al 2019

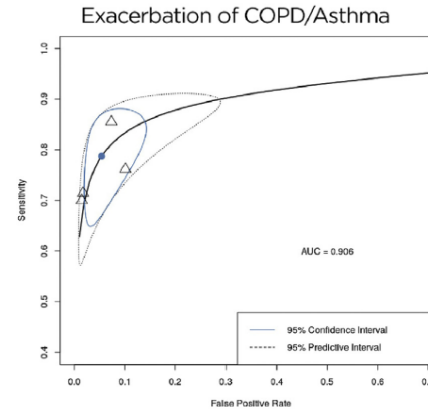
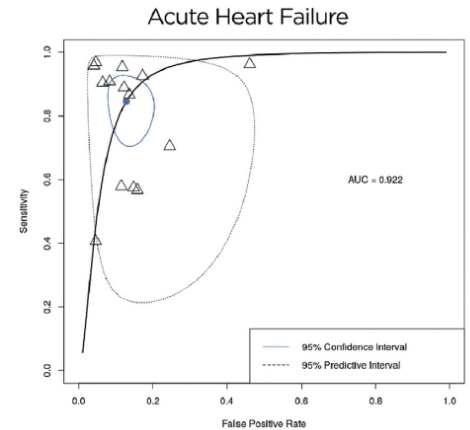
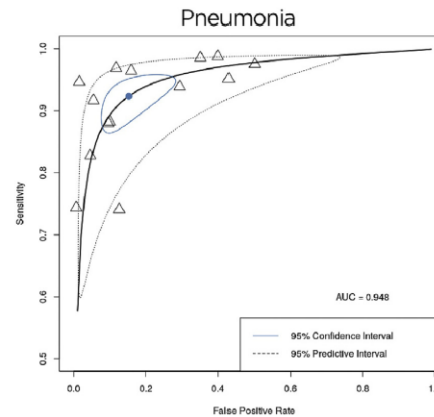
## Ultrasound in Emergency Medicine

Check for updates

LUNG ULTRASOUND FOR THE EMERGENCY DIAGNOSIS OF PNEUMONIA, ACUTE HEART FAILURE, AND EXACERBATIONS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE/ASTHMA IN ADULTS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Leonardo Jönck Staub, MD, PhD,\* Roberta Rodolfo Mazzali Biscaro, msc,† Erikson Kaszubowski, PhD,‡ and Rosemeri Maurici, MD, PhD§||

The Journal of Emergency Medicine, Vol. 56, No. 1, pp. 53–69, 2019  
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0736-4679/\$ - see front matter



**Accuratezza  
diagnostica  
elevatissima per le  
principali cause di  
dispnea acuta che si  
rilevano in un  
contesto di Pronto  
Soccorso  
(AUC>0.90)**



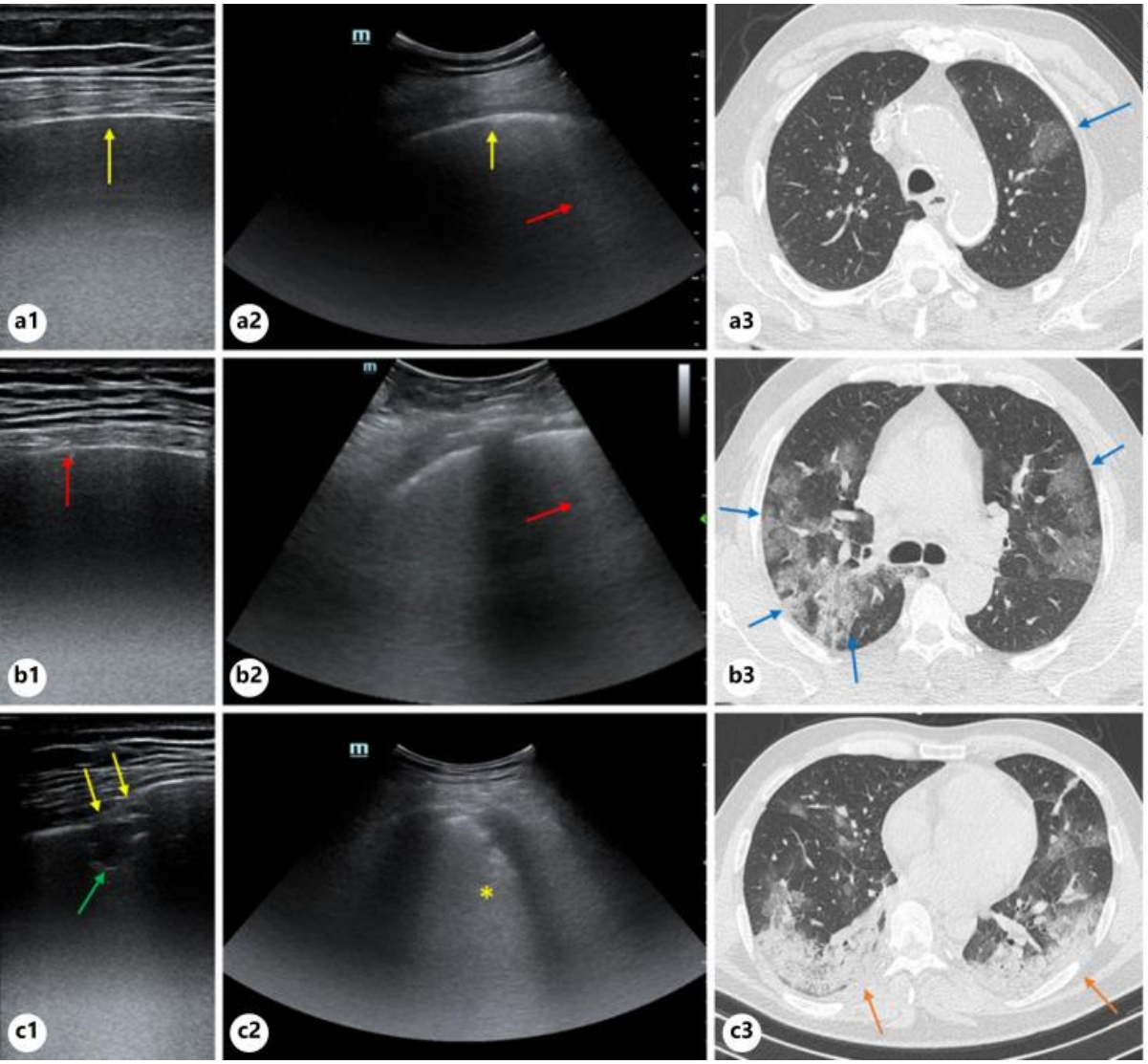
# **Le evidenze scientifiche nell'utilizzo dell'ecografia toracica nel COVID-19**

# Prognostic Significance of Chest Imaging by LUS and CT in COVID-19 Inpatients: The ECOVID Multicenter Study

Claudio Tana<sup>a</sup> Fabrizio Ricci<sup>b,c,d</sup> Maria Gabriella Coppola<sup>a</sup> Cesare Mantini<sup>b</sup>  
Fulvio Lauretani<sup>e,g</sup> Daniele Campanozzi<sup>h</sup> Giulia Renda<sup>b</sup> Sabina Gallina<sup>b</sup> Marina Lugarà<sup>a</sup>  
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Color version available online

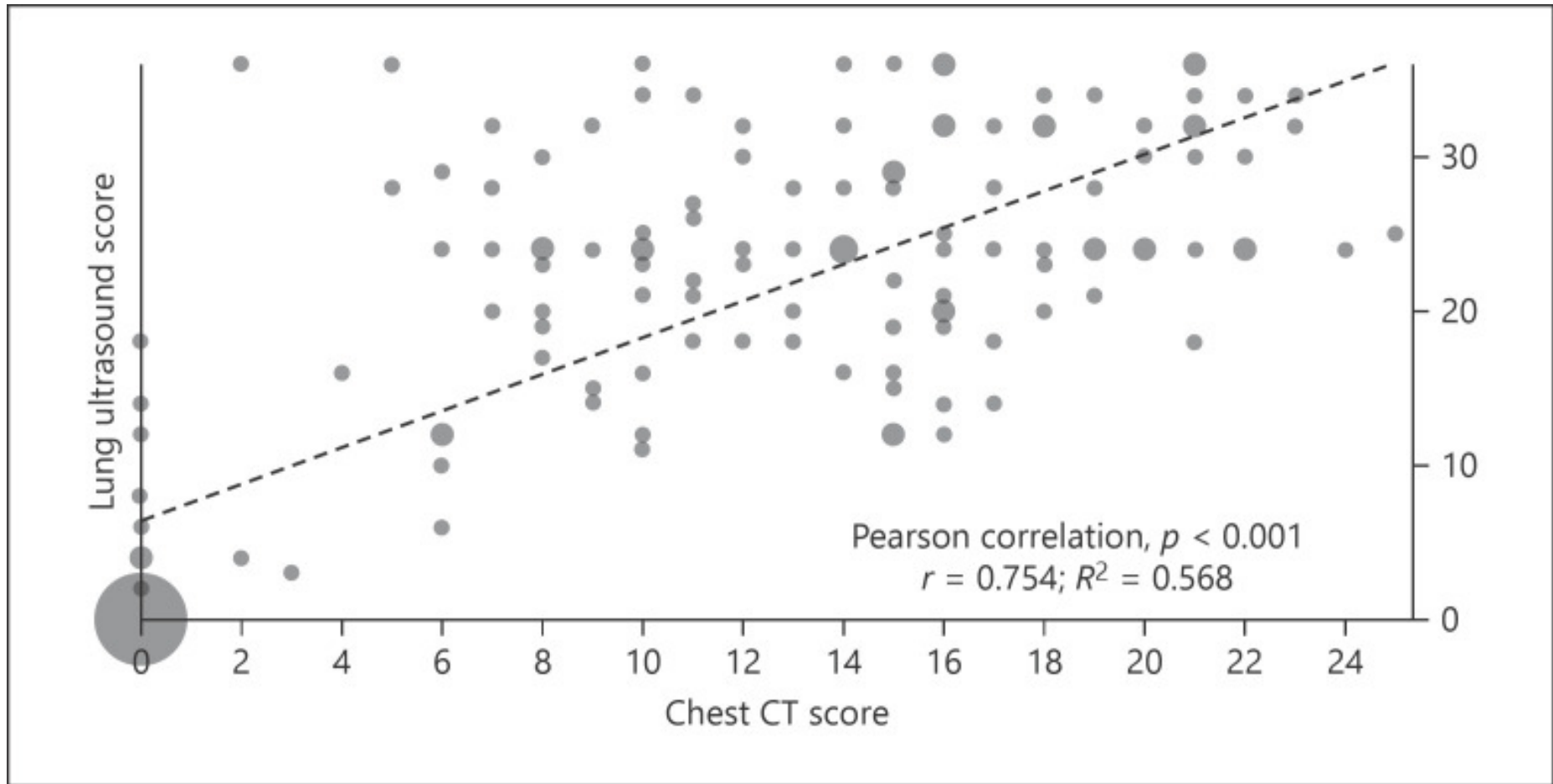


a1, a2: normal pleural line (yellow arrows) and focally visible B-line artifacts (red arrow); a3: corresponding lung CT scan showing focal area of ground-glass opacity (blue arrow)

b1, b2: irregular pleural line and B-line (red arrows), b3 corresponding lung CT scan showing bilateral peripherally located ground-glass opacities (blue arrows)

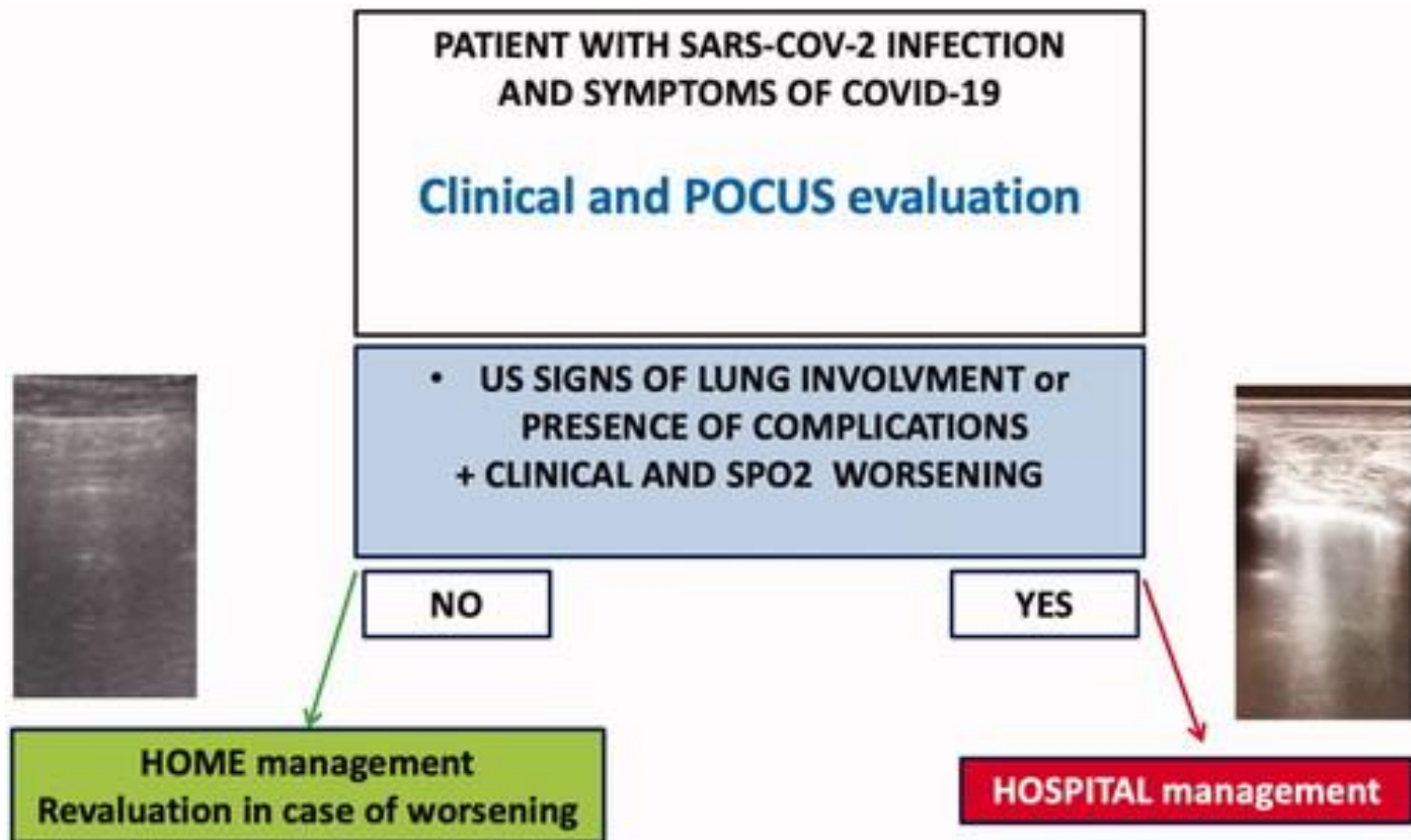
c1: broken pleural line (yellow arrows), and below the breaking point, there is a subpleural consolidation (darker area) (green arrow); c2: largely extended white lung; c3: corresponding lung CT scan showing large consolidated areas (orange arrows)

Pearson's correlation analysis. Scatter diagram demonstrating a strong positive linear correlation between LUS and chest CT scores.



# Ultrasound assessment of SARS-CoV-2 pneumonia: a literature review for the primary care physician

D'Ardes D., et al., Ann Med. 2022; 54(1): 1140–1149.



# **Le evidenze scientifiche nell'utilizzo dell'ecografia toracica nel Setting Geriatrico**

# Perché utilizzare l'Ecografia Toracica

**L'ecografia polmonare è stata tradizionalmente considerata poco utile dal punto di vista diagnostico per la sua incapacità di fornire immagini anatomicamente fedeli delle strutture respiratorie**

JAMDA 21 (2020) 447–454



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JAMDA

journal homepage: [www.jamda.com](http://www.jamda.com)



Special Article

## The Geriatric Patient: The Ideal One for Chest Ultrasonography? A Review From the Chest Ultrasound in the Elderly Study Group (GRETA) of the Italian Society of Gerontology and Geriatrics (SIGG)



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Fulvio Lauretani MD, PhD<sup>a,b</sup>, Raffaele Antonelli Incalzi MD<sup>c</sup>, Andrea Ungar MD, PhD<sup>d</sup>,  
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**Nel soggetto anziano la presenza di fragilità e di multiple comorbidità rende tuttavia la diagnosi delle patologie respiratorie particolarmente intricata**

# LIMITI DELLA RADIOGRAFIA

**Nell'anziano con multimorbidità, la radiografia toracica presenta alcuni limiti nella diagnostica differenziale dei sintomi respiratori acuti**



**Situazione ideale**



**Situazione reale**

- ✓ Difficoltà nel mantenimento della postura eretta
- ✓ Disabilità motoria
- ✓ Demenza e/o mancanza di collaborazione
- ✓ Agitazione psicomotoria
- ✓ Ridotta forza muscolare
- ✓ Severità dei sintomi



**Perdita di accuratezza diagnostica**



# UTILIZZO DELLA ECOGRAFIA TORACICA

L'ecografia polmonare è recentemente entrata nella pratica clinica per la diagnostica differenziale della dispnea acuta in Pronto Soccorso



- ✓ **Metodica immediatamente disponibile anche al letto del malato**
- ✓ **Velocità di esecuzione senza necessità per il paziente di mantenere la postura per lungo tempo**
- ✓ **Possibilità di esecuzione anche durante l'esame obiettivo**
- ✓ **Nessuna necessità di trasporto del paziente nei servizi di radiologia**
- ✓ **Tecnica facile da imparare anche per operatori poco esperti**
- ✓ **Interpretazione dei risultati immediata in base al quesito clinico**

# La nostra esperienza

Diagnostic Accuracy Study

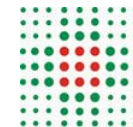
Medicine®

OPEN

## Lung ultrasound and chest x-ray for detecting pneumonia in an acute geriatric ward

Andrea Ticinesi (MD)<sup>a,b,\*</sup>, Fulvio Lauretani (MD)<sup>a,b</sup>, Antonio Nouvenne (MD, PhD)<sup>a,b</sup>, Giulia Mori (MD)<sup>a,b</sup>, Giulia Chiussi (MD)<sup>a</sup>, Marcello Maggio (MD, PhD)<sup>b</sup>, Tiziana Meschi (MD)<sup>a,b</sup>










Medicine (Baltimore) 2016; 95(27): e4153.



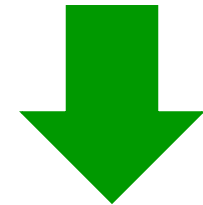
SERVIZIO SANITARIO REGIONALE  
EMILIA-ROMAGNA  
Azienda Ospedaliero - Universitaria di Parma

# SCREENING DELLA FRAGILITA' FISICA NELL'ANZIANO

## ROCKWOOD CLINICAL FRAILTY SCALE

-  1 – **Ottima forma fisica** (E' in grado di svolgere attività sportiva regolarmente, non presenta segni di disabilità cognitiva né sintomi cronici)
-  2 – **Buona forma fisica** (E' occasionalmente in grado di svolgere attività sportiva, autonomo nella vita quotidiana, non ha disabilità cognitiva)
-  3 – **In salute** (Autonomo nella vita quotidiana ma non svolge attività fisica, ha una o più patologie croniche ben controllate, non ha disabilità cognitiva)
-  4 – **Vulnerabile** (Autonomo nella vita quotidiana, anche se alcuni sintomi come astenia, ridotta forza muscolare e ridotta velocità del cammino limitano le sue attività; non ha evidenti sintomi di deterioramento cognitivo)
-  5 – **Lievemente fragile** (E' dipendente dagli altri per alcune IADL, non esce di casa da solo, ha una velocità di cammino ridotta e può aver bisogno di ausili nella deambulazione, può avere lievi sintomi di deterioramento cognitivo)
-  6 – **Moderatamente fragile** (E' dipendente dagli altri per buona parte delle attività domestiche, ha bisogno di assistenza per lavarsi e vestirsi, normalmente non esce di casa, ha segni di deterioramento cognitivo)
-  7 – **Severamente fragile** (E' completamente dipendente dagli altri per tutte le attività domestiche, ha bisogno di assistenza continuativa, è fortemente limitato nella mobilità, ha segni di demenza severa)
-  8 – **Estremamente fragile** (Completamente allettato e dipendente anche nell'alimentazione, quadro clinico complessivamente precario)
-  9 – **Terminale** (Ha un'aspettativa di vita inferiore a 6 mesi a causa di una ben documentata patologia, non necessariamente neoplastica, indipendentemente dalla performance funzionale, cognitiva e motoria)

**I partecipanti sono stati stratificati sulla base del grado di performance funzionale e di fragilità fisica e cognitiva**



**ROCKWOOD CLINICAL FRAILTY SCALE**

**1-3: IN SALUTE**

**4: PRE-FRAGILI**

**5-9: FRAGILI/DISABILI**

Rockwood K, et al. CMAJ  
2005

# RISULTATI

## ACCURATEZZA DIAGNOSTICA E PERFORMANCE FUNZIONALE DEL PAZIENTE

	Ecografia polmonare	RX torace
Soggetti non fragili (Rockwood 1-3)	0.98 [0.93-1.00]	0.81 [0.70-0.93]
Soggetti pre-fragili (Rockwood 4)	<b>0.89 [0.79-0.99]*</b>	<b>0.65 [0.50-0.81]*</b>
Soggetti fragili/disabili (Rockwood 5-9)	<b>0.91 [0.86-0.98]*</b>	<b>0.59 [0.49-0.70]*</b>

\* $p < 0.05$  con il test di McNemar (eco vs Rx)



## Advancing healthcare through thoracic ultrasound research in older patients

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Received: 27 September 2023 / Accepted: 8 October 2023  
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### Abstract

This paper reports the proceedings of a meeting convened by the Research Group on Thoracic Ultrasound in Older People of the Italian Society of Gerontology and Geriatrics, to discuss the current state-of-the-art of clinical research in the field of geriatric thoracic ultrasound and identify unmet research needs and potential areas of development. In the last decade, point-of-care thoracic ultrasound has entered clinical practice for diagnosis and management of several respiratory illnesses, such as bacterial and viral pneumonia, pleural effusion, acute heart failure, and pneumothorax, especially in the emergency–urgency setting. Very few studies, however, have been specifically focused on older patients with frailty and multi-morbidity, who frequently exhibit complex clinical pictures needing multidimensional evaluation. At the present state of knowledge, there is still uncertainty on the best requirements of ultrasound equipment, methodology of examination, and reporting needed to optimize the advantages of thoracic ultrasound implementation in the care of geriatric patients. Other issues regard differential diagnosis between bacterial and aspiration pneumonia, objective grading of interstitial syndrome severity, quantification and monitoring of pleural effusions and solid pleural lesions, significance of ultrasonographic assessment of post-COVID-19 sequelae, and prognostic value of assessment of diaphragmatic thickness and motility. Finally, application of remote ultrasound diagnostics in the community and nursing home setting is still poorly investigated by the current literature. Overall, the presence of several open questions on geriatric applications of thoracic ultrasound represents a strong call to implement clinical research in this field.