



Lung ultrasound national report (LUNARE PROJECT) by the Italian Society of Internal Medicine (SIMI)

Costantino Mancusi¹ · Carla Serra² · Maria Lorenza Muiesan^{3,5} · Chiara Cogliati⁴

Received: 14 September 2022 / Accepted: 27 October 2022
© The Author(s), under exclusive licence to Società Italiana di Medicina Interna (SIMI) 2022

Dear Editor,

The use of lung ultrasound (LUS) has become a fundamental tool in the management of patients both in the Internal Medicine (IM) wards and in the Emergency Department (ED).

The routine use of LUS has offered advantages in the management of patients with heart failure, pneumonia and other interstitial lung diseases [1]. Its use has now entered in routine clinical practice for the differential diagnosis of acute dyspnea in IM and ED [2]. During COVID-19 pandemic, LUS proved to be a valid method for diagnosis and prognostic stratification of patients with interstitial pneumonia [3].

However, it remains unclear what is the real rate of use of LUS in Italian hospitals and how many hospitals are equipped with a dedicated service and devices.

We aim to explore the clinical use and barriers to LUS utilization among Italian physicians working in IM and ED who are members of the Italian Society of Internal Medicine (SIMI).

The survey, based on the SIMI web platform, was sent by e-mail to all the SIMI members (Table 1). The first aim

of the survey was to collect scientific data to understand the real use of LUS in clinical practice. The second objective was to provide useful elements to support future training on LUS through some questions focused on the level of knowledge regarding the diagnostic accuracy of this tool, as derived by literature, for some common clinical conditions such as pleural effusion, pneumothorax (PNX) and pneumonia.

The collection, treatment, and conservation of the data was carried out anonymously in accordance with the current provisions of the General Data Protection Regulation (EU Regulation 2016-679 of the European Parliament and Council, of April 27, 2016).

Two-hundred-ninety-five answers have been collected from January 13th to April 30th, 2022. Mean age of the participants was 37.2 ± 10.4 years, 48% women. Responders were working mostly in IM and ED, mainly in public university hospitals.

LUS was commonly performed by 79% of the participants, more often in non-university hospitals (88 vs 75%, $p < 0.05$), using portable ultrasound devices in 78% of the cases. Regular use of LUS was more common in ED than in IM (92 vs 72%), with higher number of LUS per months performed (62 vs 32) (both $p < 0.05$). Both convex and sector probe were used. Mean number of LUS performed per month was 39 ± 56 , with 26% of the responders performing less than 10 LUS/month (Fig. 1). Dedicated services for in hospital LUS were extremely rare and performed usually by radiologist involved in the pneumological department. Most of the interviewed (93%) declared to be willing to improve their knowledge in the field of LUS. Regarding the knowledge on the potential use and diagnostic accuracy of LUS, most of the responders recognized the good diagnostic accuracy of LUS for pleural effusion while more doubts exist on the potential use for the diagnosis of PNX and pneumonia.

The present survey shows lights and shadows on the use of LUS among SIMI affiliated physicians. The first point to highlight is that LUS is performed by more than 70% of the

✉ Costantino Mancusi
costantino.mancusi@unina.it

¹ School of Emergency Medicine and Department of Advanced Biomedical Science, Federico II University Hospital, Via Sergio Pansini 5, 80131 Naples, Italy

² Surgical and Medical Department of Digestive, Hepatic and Endocrine-Metabolic Diseases, Diagnostic and Therapeutic Interventional Ultrasound Unit, IRCCS Azienda Ospedaliero-Universitaria di Bologna, Bologna, Italy

³ Department of Clinical and Experimental Sciences, University of Brescia, Brescia, Italy

⁴ Department of Biomedical and Clinical Sciences, University of Milano and Medicina Generale, Ospedale L.Sacco, ASST-Fatebenefratelli-Sacco, Milan, Italy

⁵ 2^a Medicina ASST Spedali Civili di Brescia, Piazzale Spedali Civili 1, 25123 Brescia, Italy

Table 1 Questions

Gender

Age

Hospital: university/non-university

Public/private

Number of beds

Department

Internal Medicine

Emergency Medicine

Other (specify)

Regularly performs lung ultrasound yes/no

What kind of echo machine do you use? fixed/portable

What ultrasound probes do you have available? linear/convex/sector

How many exams do you perform per month?

There is a chest ultrasound service in your hospital

If so, who is responsible for it

Internist

Cardiologist

Radiologist

Would you like to improve your knowledge of chest ultrasound?

Yes

No

In what way?

Fad course

Face-to-face course

Mixed modality course

Here are some questions on the diagnostic accuracy in different pathologies and on the strength and limits of the ultrasound method of the thorax

(1) The lung ultrasound has a diagnostic accuracy higher than the standard chest X-ray for the identification of pleural effusion

True

False

(2) The specificity of the lung point for the diagnosis of pneumothorax

80%

60%

100%

70%

(3) The lung ultrasound has a diagnostic accuracy comparable to the standard chest X-ray for the identification of pneumothorax

True

False

(4) The accuracy of the lung ultrasound for the diagnosis of pneumonia in the community is approximately equal to

20%

50%

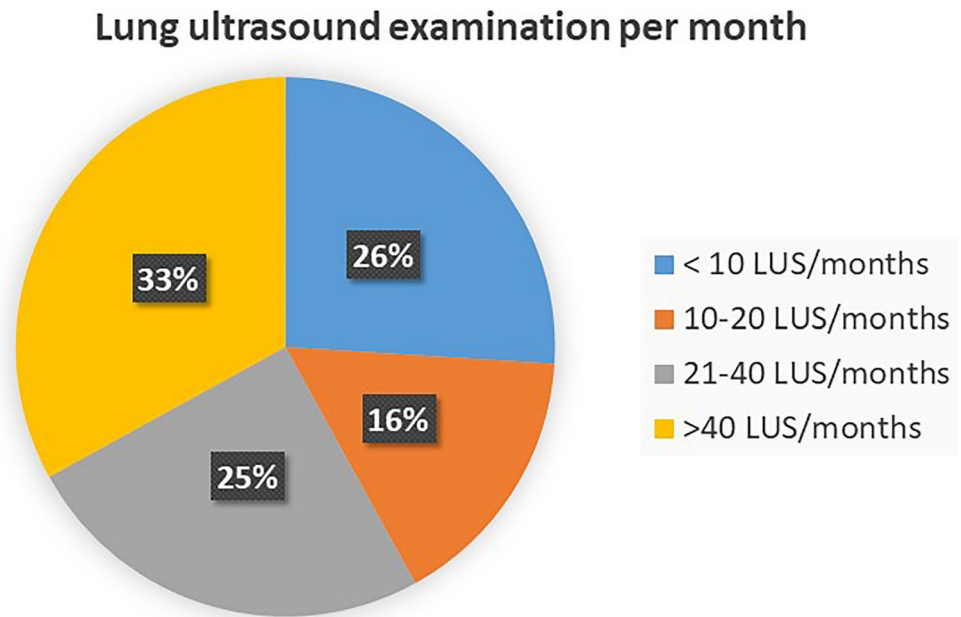
70%

90%

participants, an encouraging finding taking into account a previous study from Australia that reported that only 40% of the different specialist managing critically ill patients performed routinely LUS [4]. More recent surveys involving Italian and Spanish pneumologist in 2020 reported that more than 70% of the responders use routinely LUS and this data is in line with our results [5]. It should be also underlined

that the use of LUS was more frequent among physician working in the ED, due to its ability to speed up the diagnostic process in patients with acute dyspnea. The convex probes are the most universally used for LUS, thanks to the characteristics of its US beam frequency and shape which allow the visualization of the pleural line and sub-pleural space, without losing the chest overview. In our survey

Fig. 1 Number of lung ultrasound examinations performed per month



sector probe was more commonly used, probably because LUS is usually performed as an extension of the echocardiographic examination. Younger age of the physicians involved in the survey reflects the relatively recently introduction of LUS with first report in 1995 and wider dissemination after 2000.

Despite the large diffusion of LUS, the average number of LUS performed by physicians was relatively low: more than 40% of all LUS users perform less than 20 exams per months, in line with previous results [5].

The accuracy of LUS for identification of pleural effusion is recognized by 99% of the participants, being the detection of pleural fluid the most common indication for its use and at the same time the easiest pattern to recognize. Differently, most of the responders do not recognize the role of LUS for the diagnosis of PNx and pneumonia that are instead important indications, which requires longer training for their correct assessment. This underlines the diffuse lack of knowledge regarding the evidence present in the recent literature supporting indication for LUS taking into account its diagnostic accuracy and limitations.

Pearson correlation analyses was performed to assess the correlation between the level of knowledge of the physician involved in the investigation (measured by correct answers to the last 4 questions) and the number of examination performed. Higher number of correct answers to the questions was significantly associated with higher number of LUS performed per month ($\rho = 0.150$, $p = 0.017$) demonstrating that knowledge of LUS is higher among physicians whom routinely performed the study.

The main limitation of this current study included the low percentage of enrolled physicians; at the same time,

we cannot exclude that IM specialists not familiar with LUS do not take part to the survey. Nevertheless, we think that these data may be considered a stimulus to initiatives aimed to promote the diffusion of this technique taking into consideration the importance of building up dedicated frameworks for education among IM specialists, comprehending knowledge, competence and clinical implication of LUS findings. In this regard, SIMI has recently boosted its framework of national ultrasound schools and affiliated tutoring network with the aim to provide a more diffuse theoretical and practical learning pathway to improve knowledge and competence on ultrasonography among IM specialist (<https://www.simi.it/certificazione-nazionale-ecografia/informazioni>). A follow-up of the impact of educational programs on the diffusion and appropriateness of use of LUS among IM specialists is desirable considering the advantages of this diagnostic tool in the management of patients in IM and ED wards.

Declarations

Conflict of interest The author(s) declare that they have no conflict of interest.

Human and animal rights statement This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent For this type of study formal consent is not required.

References

1. Cogliati C, Ceriani E, Gambassi G, De Matteis G, Perlini S, Perone T, Muiesan ML, Salvetti M, Leidi F, Ferrara F, Sabbà C, Suppressa P, Fracanzani A, Montano N, Fiorelli E, Tripepi G, Gori M, Pitino A, Pietrangelo A (2022) Phenotyping congestion in patients with acutely decompensated heart failure with preserved and reduced ejection fraction: the decongestion during therapy for acute decompensated heart failure in HFpEF vs HFrEF-DRY-OFF study. *Eur J Intern Med* 97:69–77
2. Mancusi C, Carlino MV, Sforza A (2019) Point-of-care ultrasound with pocket-size devices in emergency department. *Echocardiography* 36(9):1755–1764
3. Bosso G, Allegorico E, Pagano A, Porta G, Serra C, Minerva V, Mercurio V, Russo T, Altruda C, Arbo P, De Sio C, Dello Vicario F, Numis FG (2021) Lung ultrasound as diagnostic tool for SARS-CoV-2 infection. *Intern Emerg Med* 16(2):471–476
4. Lam K, Canty D, Royse C, Royse A (2012) Hospital survey of point-of-care lung ultrasound use in the assessment of peri-operative and critically ill patients. *Crit Care* 16(3):437
5. Zanforlin A, Tursi F, Marchetti G, Pellegrino GM, Vigo B, Smargiassi A, Inchingolo R, Centanni S, Gasparini S, Blasi F, Soldati G, Sferrazza Papa GF, Group., AdET Study (2020) Clinical use and barriers of thoracic ultrasound: a survey of Italian pulmonologists. *Respiration* 99(2):171–176

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.