

Perceptions and Self-Reported Practice Patterns of Chest Radiography and Lung Ultrasound in the Intensive Care Unit

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ABSTRACT

Background: Chest radiography (CXR) remains widely used in intensive care units (ICUs). Lung ultrasound (LUS) has been proposed as an accurate, radiation-free, bedside alternative, but its real-life integration is variable. We aimed to describe self-reported perceptions and practice patterns of CXR and LUS among anesthesiologist-intensivists of a tertiary Moroccan hospital. This study did not measure diagnostic performance.

Methods: Single-centre descriptive cross-sectional survey conducted from September 2023 to January 2024 at Ibn Rochd University Hospital, Casablanca, reported according to the CHERRIES checklist. An anonymous, voluntary 18-item Google-Forms questionnaire was distributed to 180 anaesthesiologist-intensivists; the tool was pilot-tested on 10 residents and showed good internal consistency (Cronbach's $\alpha = 0.82$). Data were analysed with SPSS 26.0; proportions were compared with Fisher's exact test (two-sided $p < 0.05$). Because of the limited number of formally trained respondents, multivariable analysis was restricted to the primary outcome (LUS first-line use in acute dyspnea).

Results: One hundred and forty questionnaires were returned (response rate 77.7 %); 119 (85 %) were residents and 21 (15 %) specialists. CXR was prescribed on demand by 57 % and systematically by 43 %; no respondent had replaced CXR by LUS. LUS was perceived as more diagnostically performant than CXR by 64.3 % of respondents, yet only 7 % had received formal LUS training. Self-reported confidence with LUS decreased from pneumothorax and pleural effusion (94 %) to atelectasis (74 %), infectious syndrome (44 %), consolidation (21.4 %) and interstitial syndrome (5.7 %). In acute dyspnea, 17 % used LUS first-line; ultrasound devices were available at the bedside in only 35 % of ICUs. In multivariable logistic regression (overall $p < 0.001$; AUC 0.84), formal LUS training (aOR 11.8, 95 % CI 2.10 – 66.2; $p = 0.005$), ICU experience ≥ 3 years (aOR 2.4, 95 % CI 1.02 – 5.60; $p = 0.041$) and bedside availability of equipment (aOR 3.1, 95 % CI 1.20 – 8.10; $p = 0.019$) were associated with first-line LUS use in this multivariable model.

Conclusion: In this declarative survey, LUS was perceived as superior to CXR but remained clearly underused, with limited formal training and limited bedside equipment as the main reported barriers. These findings reflect perceptions and self-reported practice of a predominantly junior population and cannot be extrapolated to objective diagnostic performance. Structured

educational programmes and objective, multicentre performance studies are warranted before any recommendation to restrict CXR can be made.

Keywords: Lung ultrasound; Chest radiography; Intensive care unit; Point-of-care ultrasound; BLUE protocol; Medical education; Surveys and questionnaires; Morocco

Introduction

Since its introduction in the 1960s, chest radiography (CXR) remains one of the most frequently performed imaging examinations in intensive care units (ICUs). Its accessibility, low cost and ability to provide a rapid global view of the thorax have made it a cornerstone of daily critical-care practice^{1,2}. In many ICUs, CXR is still ordered systematically, often on a daily basis, following a long-established tradition of morning routine imaging^{1,3}.

Several randomised trials and meta-analyses have challenged this strategy, showing that an on-demand policy reduces the total number of radiographs without any adverse effect on ICU mortality, length of stay or readmission rates²⁻⁴. Beyond questionable diagnostic yield, bedside CXR is limited by modest sensitivity for frequent ICU conditions, by cumulative radiation exposure and by the logistical burden of mobilising unstable intubated patients^{1,4}.

Lung ultrasound (LUS), popularised by Daniel Lichtenstein, is a radiation-free, bedside and repeatable imaging tool performed by the intensivist at the point of care^{5,6}. The BLUE protocol yielded an accurate diagnosis in approximately 90 % of patients presenting with acute respiratory failure⁵. International recommendations support the use of LUS for pneumothorax, pleural effusion, interstitial syndrome, consolidation and guidance of invasive thoracic procedures⁷ and have been recently updated^{8,9}. The COVID-19 pandemic further accelerated the worldwide diffusion of LUS¹⁰. Despite this scientific endorsement, translation into daily ICU practice has been uneven and data describing real-life intensivist behaviour remain scarce in North African settings¹¹⁻¹³.

The objective of the present work was to describe self-reported perceptions and practice patterns of CXR and LUS among anesthesiologist-intensivists of Ibn Rochd University Hospital (Casablanca). This was a declarative survey; we did not measure diagnostic accuracy, image-interpretation performance or patient-level outcomes.

Materials and Methods

Study design and setting

Descriptive, single-centre cross-sectional survey carried out at the Anaesthesiology and Intensive Care Department of Ibn Rochd University Hospital in Casablanca, Morocco, from September 2023 to January 2024. The study was reported according to the CHERRIES checklist for internet surveys¹⁴.

Study population and sample size

All anesthesiologist-intensivists practicing in the polyvalent, surgical and medical ICUs were eligible. University professors were excluded. Based on an expected proportion of LUS-favourable perception of 50 %, a 5 % absolute margin of error and a 95 % confidence level, the minimum sample size

required was ≈ 97 respondents. A total of 180 questionnaires were distributed by convenience sampling through the department's internal communication channels; 140 complete responses were obtained (response rate 77.7 %).

Data collection tool

A self-administered 18-item Google-Forms questionnaire was used. The questionnaire was anonymous and voluntary and was pilot-tested on a separate sample of 10 residents (not included in the analysis). Internal consistency of the final instrument, assessed on the 140-respondent dataset, was acceptable (Cronbach's $\alpha = 0.82$). No incentives were provided and mandatory items could not be skipped; one reminder was sent after one month.

Variables studied

Four domains were explored: (i) prescription patterns of CXR and its perceived limitations; (ii) perception of the relative diagnostic value of LUS versus CXR and level of formal LUS training; (iii) self-reported confidence with LUS for six thoracic entities; and (iv) use of both modalities in acute dyspnea and chest-drain insertion, reported limitations of LUS and bedside availability of ultrasound equipment.

To minimise semantic overlap, ultrasound patterns were deliberately defined a priori in accordance with international consensus^{8,9} so as to test confidence with different aspects of lung sonography: (i) infectious syndrome - recognition of the indirect ultrasound signs of focal pneumonia, i.e. localised B-lines and pleural irregularity; (ii) consolidation pattern - recognition of the direct technical signs of alveolar hepatization, i.e. tissue-like lung pattern with dynamic air bronchograms; and (iii) interstitial syndrome - a diffuse B-pattern (cardiogenic oedema or ARDS). Infectious and consolidation syndromes were intentionally separated to explore participants' familiarity with indirect versus direct ultrasound signs of alveolar disease; the difference in self-reported confidence between these two items (44 % vs 21.4 %) is therefore interpretable as an information-content finding rather than a definitional artefact.

Statistical analysis

Data were analysed with IBM SPSS Statistics version 26.0. Continuous variables were described as mean \pm SD or median [IQR]; categorical variables as n (%) with 95 % Wilson-score confidence intervals (CI). Five pre-specified 2 \times 2 univariate subgroup comparisons were performed using Fisher's exact test (two-sided): (i) grade (specialist vs resident) \times formal LUS training; (ii) formal LUS training \times use of LUS as a first-line tool in acute dyspnea; (iii) formal LUS training \times self-reported confidence in interstitial syndrome; (iv) bedside availability of ultrasound equipment \times LUS first-line use; and (v) bedside availability of equipment \times self-reported confidence in interstitial syndrome. For each comparison, the unadjusted odds ratio (OR) with a 95 % confidence interval was computed by the log-OR standard error (Woolf's method).

A parsimonious multivariable logistic-regression model was then fitted for the primary outcome of LUS as first-line tool in acute dyspnea (24 events among 140 respondents, yielding 8 events per variable for three covariates, although below the conventional 10-events-per-variable threshold, consistent with an exploratory parsimonious approach). Adjusted odds ratios (aOR) were estimated for formal LUS training, ICU experience (≥ 3 vs < 3 years) and bedside availability of equipment. Model discrimination was assessed by the area under the receiver-operating-characteristic curve (AUC) and no calibration assessment was performed. No internal validation procedure (bootstrap or cross-validation) was performed and model performance may be overestimated; regression results should therefore be interpreted as exploratory. All analyses were pre-specified except for the exploratory multivariable modelling, which was conducted post hoc on the primary outcome. For the secondary outcome of self-reported confidence in interstitial syndrome (only 8 events), a multivariable model was considered underpowered and only univariate analyses are reported. A two-sided p-value < 0.05 was considered statistically significant.

Ethics

The study was a non-interventional, anonymous and voluntary survey of clinicians that did not involve patient data. According to local regulations, formal ethics committee approval was not mandatory for this anonymous, non-interventional survey; however, an institutional exemption statement is available and can be provided upon request. Participation implied informed consent.

Results

Characteristics of the study population

Of the 180 questionnaires distributed, 140 were returned complete (response rate 77.7 %). The population was predominantly female (78/140, 56 %) and junior: mean age 29.8 ± 3.5 years, median 29 years; residents accounted for 119/140 (85 %) and specialists for 21/140 (15 %), with a median ICU experience of 3¹⁻⁵ years. Respondents worked in polyvalent (70/140, 50 %), surgical (42/140, 30 %) and medical ICUs (28/140, 20 %); no complete response was obtained from the

cardiothoracic ICU. Baseline characteristics are summarised in (Table 1).

Table 1: Baseline characteristics of the 140 anesthesiologist-intensivists.

Characteristic	Value (n = 140)
Age, mean \pm SD (years)	29.8 \pm 3.5
Age, median [IQR] (years)	29 [27–33]
Sex — Male, n (%)	62 (44 %)
Sex — Female, n (%)	78 (56 %)
Grade — Residents, n (%)	119 (85 %)
Grade — Specialists, n (%)	21 (15 %)
ICU experience, median [IQR] (years)	3 [1–5]
Polyvalent ICU, n (%)	70 (50 %)
Surgical ICU, n (%)	42 (30 %)
Medical ICU, n (%)	28 (20 %)

Prescription patterns of chest radiography

Eighty of 140 respondents (57 %) reported prescribing CXR on demand, while 60/140 (43 %) prescribed it systematically as part of the morning round. Reported limitations of bedside CXR were irradiation (114/140, 81.4 %), risk of accidental extubation or catheter displacement (86/140, 61.4 %) and perceived low sensitivity (56/140, 40 %). No respondent reported having replaced CXR by LUS in their practice (0/140, 0 %).

Perception of lung ultrasound and level of training

LUS was perceived as more diagnostically performant than CXR by 90/140 respondents (64.3 %). Ten of 140 respondents (7 %) reported having received structured formal LUS training; the remaining physicians reported self-learning, short informal workshops or observation of colleagues as their sole exposure to the technique.

Self-reported confidence with LUS

Self-reported confidence with the ultrasound diagnosis of the six pre-specified thoracic entities is shown in (Table 2 and Figure 1). Reported confidence was highest for pneumothorax and pleural effusion (both 94 %), intermediate for atelectasis (74 %) and decreased sharply for infectious syndrome (44 %), consolidation (21.4 %) and interstitial syndrome (5.7 %).

Table 2: Self-reported confidence with lung ultrasound by thoracic entity (n = 140).

Thoracic entity	Respondents self-reporting confidence, n (%) [95 % CI]	Clinical relevance in the ICU
Pneumothorax	132 (94 %) [89–97]	Emergency diagnosis
Pleural effusion	132 (94 %) [89–97]	Quantification, drainage guidance
Atelectasis	104 (74 %) [67–81]	Differential of hypoxemia
Infectious syndrome (focal pneumonia)	62 (44 %) [36–52]	Focal pneumonia / VAP
Consolidation (hepatization / atelectasis)	30 (21.4 %) [15–29]	Ventilator-associated conditions
Interstitial syndrome (diffuse B-pattern)	8 (5.7 %) [3–11]	Cardiogenic edema vs ARDS

Self-reported strategy in acute dyspnea

In the evaluation of an ICU patient presenting with acute dyspnea, 105/140 respondents (75 %) reported a first-line strategy combining physical examination with CXR; 24/140 (17 %) reported a clinical + LUS + echocardiography strategy; and 11/140 (8 %) clinical examination alone. LUS was thus reported as a first-line tool by 17 % of respondents.

Self-reported use during pleural procedures

Ultrasound guidance during chest drain insertion was

reported by 72/140 respondents (52 %). Despite this intra-procedural use, 137/140 respondents (98 %) reported still relying on a post-procedural CXR to confirm drain position and rule out pneumothorax.

Reported limitations of LUS and availability of equipment

The main reported barrier to a wider use of LUS was lack of personal experience (124/140, 88.5 %). The other principal barriers, reported by 94/140 respondents (67 %), were limited bedside availability of ultrasound equipment and the presence

of subcutaneous emphysema; these two items were grouped together in the questionnaire as practical obstacles to LUS use. Ultrasound devices were available directly at the bedside in 35 % of the ICUs surveyed, while 65 % of respondents reported equipment sharing between services with consequent delays at the point of care.

Univariate and multivariable subgroup analyses

Five pre-specified univariate comparisons and one multivariable logistic-regression model were performed (**Table 3, Panels A and B**).

In univariate analysis (Panel A), formal LUS training was reported by 19.0 % of specialists versus 5.0 % of residents (unadjusted OR 4.43 [1.13 – 17.3]; $p = 0.043$). Nine of the 10 formally trained respondents (90 %) reported using LUS as a first-line tool in acute dyspnea, versus 15/130 untrained respondents (11.5 %) (OR 69.0 [8.2 – 583]; $p < 0.001$). Self-reported confidence in interstitial syndrome was reported by 7/10 (70 %) of trained versus 1/130 (0.8 %) of untrained respondents (unadjusted OR computed by Woolf's method: 301 [95 % CI 27.6 – 3277]; $p < 0.001$). Bedside availability of ultrasound equipment was also strongly associated with first-line LUS use: 15/49 respondents (30.6 %) with easy bedside access reported

using LUS first-line in dyspnea versus 9/91 (9.9 %) of those with shared or limited access (OR 4.02 [1.59 – 10.16]; $p = 0.004$). Conversely, no significant association was observed between equipment availability and confidence in interstitial syndrome (OR 2.8 [0.65 – 12.1]; $p = 0.165$).

The multivariable logistic-regression model for LUS first-line in acute dyspnea (Panel B) adjusted simultaneously for formal LUS training, ICU experience (≥ 3 vs < 3 years) and bedside equipment. The model was globally significant (overall $p < 0.001$) with good discrimination (AUC 0.84 [0.76 – 0.92]). All three covariates remained associated with the outcome within this multivariable model: formal LUS training (aOR 11.8 [2.10 – 66.2]; $p = 0.005$), ICU experience ≥ 3 years (aOR 2.4 [1.02 – 5.60]; $p = 0.041$) and bedside availability of ultrasound equipment (aOR 3.1 [1.20 – 8.10]; $p = 0.019$). For the outcome of confidence in interstitial syndrome (only 8 events), a multivariable model was considered underpowered and only univariate results are reported.

The odds ratios of the univariate comparisons involving the trained subgroup ($n = 10$) carry very wide confidence intervals - spanning in two cases more than two orders of magnitude - reflecting the small exposed group rather than the direction of effect.

Table 3: Univariate and multivariable subgroup analyses of LUS-related practice outcomes.

Panel A - Univariate analyses (unadjusted OR, Fisher's exact two-sided)			
Comparison	Exposed vs reference, n (%)	OR [95 % CI]	p
Grade \times Formal LUS training	Specialists 4/21 (19.0 %) vs Residents 6/119 (5.0 %)	4.43 [1.13 – 17.3]	0.043
Formal training \times LUS first-line (dyspnea)	Trained 9/10 (90 %) vs Untrained 15/130 (11.5 %)	69.0 [8.2 – 583]	< 0.001
Formal training \times Confidence in interstitial syndrome	Trained 7/10 (70 %) vs Untrained 1/130 (0.8 %)	301 [27.6 – 3277]	< 0.001
Bedside equipment \times LUS first-line (dyspnea)	Easy 15/49 (30.6 %) vs Limited 9/91 (9.9 %)	4.02 [1.59 – 10.16]	0.004
Bedside equipment \times Confidence in interstitial syndrome	Easy access vs limited access	2.8 [0.65 – 12.1]	0.165
Panel B — Multivariable logistic regression for LUS first-line in acute dyspnea (n = 140; events = 24; overall p < 0.001; AUC = 0.84 [0.76 – 0.92])			
Covariate	Reference	Adjusted OR [95 % CI]	p
Formal LUS training (yes)	No training	11.8 [2.10 – 66.2]	0.005
ICU experience (≥ 3 years)	< 3 years	2.4 [1.02 – 5.60]	0.041
Ultrasound equipment at bedside (yes)	Shared / limited	3.1 [1.20 – 8.10]	0.019

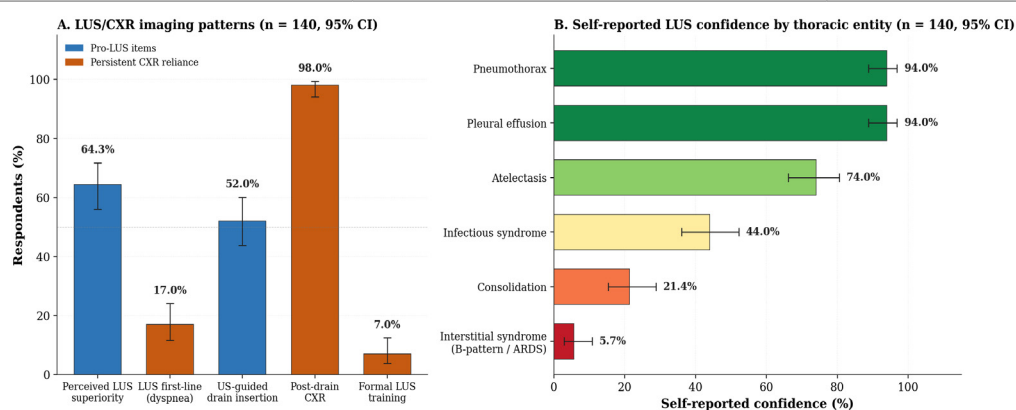


Figure 1: Self-reported imaging patterns and self-reported LUS confidence, with 95 % Wilson-score confidence intervals. (A) Only 17 % of respondents reported using LUS as a first-line tool in acute dyspnea and only 7 % had received formal LUS training, yet 64.3 % perceived LUS as superior to CXR and 98 % still ordered a post-procedural CXR after chest-drain insertion. (B) Self-reported confidence decreased from pneumothorax and pleural effusion (94 %) to consolidation (21.4 %) and interstitial syndrome (5.7 %). This figure is intended as a descriptive summary of key findings rather than an inferential analysis. No causal inference should be drawn from this descriptive representation and the figure does not account for potential confounding factors

Discussion

As a declarative survey, this study assesses perceptions and self-reported practices rather than objective diagnostic performance or patient outcomes. Findings primarily reflect the practice patterns of a predominantly junior population (85 % residents) of a single Moroccan tertiary centre and may not be generalisable to more experienced intensivists or to other institutions.

Within these limits, the central finding of this survey is a clear discrepancy between the perceived superiority of LUS and its actual use in clinical practice. Two thirds of respondents considered LUS more diagnostically performant than CXR, yet none had abandoned CXR and only 17 % used LUS as a first-line tool in acute dyspnea. This perception–practice gap, summarised in Figure 1, is the main message of this work.

The perception–practice gap

Our respondents' favourable perception of LUS is congruent with the published literature^{5,11,15-18}, but the clinical value of this perception in our sample is limited by the fact that only 7 % had received formal LUS training and self-reported confidence collapsed for the most demanding patterns (interstitial syndrome 5.7 %, consolidation 21.4 %). Similar perception–practice gaps have been documented in international surveys involving ICU-related professionals and emergency/critical-care physicians^{12,13}. The ceiling-effect observed for pneumothorax and pleural effusion (94 %) most probably reflects these being the two simplest and earliest-taught ultrasound patterns and should not be interpreted as evidence of objective proficiency.

Training, experience and equipment as independent determinants

In univariate analysis, formal LUS training was consistently associated with more favourable LUS-related behaviour (specialist status, LUS first-line use and confidence in interstitial syndrome). In our parsimonious multivariable logistic-regression model for LUS first-line use in acute dyspnea, three factors remained associated with the outcome within this multivariable model after mutual adjustment: formal training (aOR 11.8 [2.10 – 66.2]), ICU experience ≥ 3 years (aOR 2.4 [1.02 – 5.60]) and bedside availability of ultrasound equipment (aOR 3.1 [1.20 – 8.10]); the model had good discrimination (AUC 0.84) and these three predictors may represent plausible targets for educational and organisational interventions. By contrast, bedside equipment was not associated with confidence in the more advanced interstitial-syndrome pattern (univariate OR 2.8 [0.65 - 12.1]; $p = 0.165$), which may indicate that gains in LUS proficiency for advanced patterns rely more on training than on equipment, consistent with international evidence¹⁹. Given the small number of formally trained respondents ($n = 10$) and the absence of internal validation, these estimates should be interpreted as exploratory.

Persistence of CXR despite favourable attitudes

Ninety-eight percent of respondents reported still requiring a post-procedural CXR after chest-drain insertion, even though 52 % used ultrasound guidance during the procedure itself. This contradiction, declared by the same respondents in the same questionnaire, is the most robust finding of the survey and cannot be attributed to a lack of perceived value of LUS. It is

more likely to reflect institutional habit and the absence of local LUS-based verification protocols in our department.

Reported barriers

Lack of personal experience (88.5 %) and combined shortage of bedside equipment / subcutaneous emphysema (67 %) were the two principal reported barriers and only 35 % of ICUs had an ultrasound device immediately at the bedside. These barriers are consistent with those reported in European surveys^{12,13}, but their relative weight may be specific to resource-limited tertiary-care settings and should be verified in other North African centres.

What this survey cannot answer

This study does not address the diagnostic accuracy of LUS or CXR, nor image-interpretation performance, nor patient-level outcomes. Accordingly, no recommendation to restrict CXR in favour of LUS can be drawn from these data; such a recommendation would require prospective, objective performance studies, ideally randomised or pre/post-interventional, which we intend to conduct as a follow-up.

Strengths and limitations

Strengths include a high response rate (77.7 %) in a large, homogeneous sample of a tertiary-hospital department; a questionnaire with acceptable internal consistency (Cronbach's $\alpha = 0.82$); and the fact that this is, to our knowledge, the first Moroccan study of thoracic imaging behaviour in the ICU.

Several limitations must, however, be acknowledged and the reader is invited to interpret every result of this survey through their lens. First, selection and coverage biases: this is a single-centre convenience sample of one Moroccan tertiary hospital, with 85 % residents and a median experience of only 3 years; findings therefore primarily describe the practice of junior physicians and cannot be extrapolated to senior intensivists or to other institutions. Second, non-response bias: 22.3 % of eligible clinicians did not respond and their practice may differ systematically. Third, declarative and social-desirability bias: answers describe self-reported perceptions and behaviour, not measured performance; respondents may have over-reported attitudes considered desirable (such as pro-LUS views), particularly when answering a questionnaire on an academic topic. Fourth, a methodological ceiling effect for pneumothorax and pleural effusion (94 %) limits the sensitivity of comparisons for these two entities. Fifth, statistical fragility: a parsimonious three-covariate multivariable logistic-regression model was fitted for the primary outcome of LUS first-line use (24 events, i.e. 8 events per variable - acceptable for an exploratory model but below the conventional 10-events-per-variable threshold); the confidence intervals of some univariate estimates - in particular those involving the 10 formally trained respondents - span one to two orders of magnitude and must therefore be read as indicating the direction rather than the precise magnitude of the association. For the outcome of confidence in interstitial syndrome (only 8 events) a multivariable model was underpowered and was not attempted; results for this outcome are univariate only. Residual confounding cannot be excluded despite multivariable adjustment and model overfitting cannot be entirely excluded. Sixth, semantic overlap between 'infectious syndrome' and 'consolidation' may have introduced inter-respondent variability despite the a-priori definitions. Seventh, the absence of any objective measure of LUS or CXR performance means that the

survey cannot establish the clinical superiority of one technique over the other. Taken together, these limitations do not invalidate the central observation of a perception–practice gap consistent with international evidence^{12,13}, but they firmly delineate what this work can - and cannot – claim²⁰⁻²⁵.

Conclusion

Anesthesiologist-intensivists of Ibn Rochd University Hospital reported a favourable perception of LUS and a simultaneous persistent reliance on CXR, with limited formal training and limited bedside equipment as the most frequently reported barriers. These findings are declarative and apply primarily to a junior population of one Moroccan tertiary centre. They support the need for structured LUS training programmes and broader access to bedside equipment, which may help optimize the use of CXR without supporting its restriction based on the present data. A prospective pre/post-interventional study assessing the effect of a structured LUS training programme on actual CXR utilisation and, when possible, on patient-level outcomes is currently in preparation at our institution.

Declarations

Ethics approval and consent to participate

Non-interventional, anonymous, voluntary survey of clinicians; no patient data. Formal ethics committee approval was not required under local regulations; a written institutional exemption statement is available from the corresponding author and will be provided to the journal on request. Participation implied informed consent.

Consent for publication

Not applicable.

Availability of data and materials

The anonymised dataset supporting the conclusions of this article is available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions (CRediT taxonomy)

K.Z. – Conceptualization, Methodology, Investigation, Formal analysis, Data curation, Writing – original draft, Writing – review & editing, Project administration. [Co-authors to be completed] – Methodology, Validation, Supervision, Writing – review & editing. All authors read and approved the final version of the manuscript.

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References

- Hendrikse KA, Gratama JW, Hove W, Rommes JH, Schultz MJ, Spronk PE. Low value of routine chest radiographs in a mixed medical-surgical ICU. *Chest* 2007;132(3):823-828.
- Oba Y, Zaza T. Abandoning daily routine chest radiography in the intensive care unit: meta-analysis. *Radiology* 2010;255(2):386-395.
- Hejblum G, Chalumeau-Lemoine L, Ioos V, et al. Comparison of routine and on-demand prescription of chest radiographs in mechanically ventilated adults: a multicentre, cluster-randomised, two-period crossover study. *Lancet*. 2009;374(9702):1687-1693.
- Ganapathy A, Adhikari NKJ, Spiegelman J, Scales DC. Routine chest x-rays in intensive care units: a systematic review and meta-analysis. *Crit Care* 2012;16(2):R68.
- Lichtenstein DA, Mezière GA. Relevance of lung ultrasound in the diagnosis of acute respiratory failure: the BLUE protocol. *Chest* 2008;134(1):117-125.
- Mayo PH, Copetti R, Feller-Kopman D, et al. Thoracic ultrasonography: a narrative review. *Intensive Care Med*. 2019;45(9):1200-1211.
- Volpicelli G, Elbarbary M, Blaivas M, et al. International evidence-based recommendations for point-of-care lung ultrasound. *Intensive Care Med*. 2012;38(4):577-591.
- Demi L, Wolfram F, Klersy C, et al. New international guidelines and consensus on the use of lung ultrasound. *J Ultrasound Med*. 2023;42(2):309-344.
- Mongodi S, Cortegiani A, Alonso-Ojembarrena A, et al. ESICM–ESPNIC international expert consensus on quantitative lung ultrasound in intensive care. *Intensive Care Med*. 2025;51(6):1022-1049.
- Volpicelli G, Lamorte A, Villén T. What's new in lung ultrasound during the COVID-19 pandemic. *Intensive Care Med*. 2020;46(7):1445-1448.
- Xirouchaki N, Magkanas E, Vaporidi K, et al. Lung ultrasound in critically ill patients: comparison with bedside chest radiography. *Intensive Care Med*. 2011;37(9):1488-1493.
- Lau YH, Hayward S, Ntoumenopoulos G. An international survey exploring the adoption and utility of diagnostic lung ultrasound by physiotherapists and respiratory therapists in intensive care. *J Intensive Care Soc*. 2023;24(3):256-263.
- Villars N, Berlet T, Cioccarri L. Clinical use of lung ultrasound by emergency and intensive care physicians: a Swiss national survey. *J Clin Ultrasound* 2025.
- Eysenbach G. Improving the quality of web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). *J Med Internet Res* 2004;6(3):e34.
- Alrajab S, Youssef AM, Akkus NI, Caldito G. Pleural ultrasonography versus chest radiography for the diagnosis of pneumothorax: review of the literature and meta-analysis. *Crit Care* 2013;17(5):R208.
- Brogi E, Gargani L, Bignami E, et al. Thoracic ultrasound for pleural effusion in the intensive care unit: a narrative review from diagnosis to treatment. *Crit Care* 2017;21(1):325.
- Llamas-Álvarez AM, Tenza-Lozano EM, Latour-Pérez J. Accuracy of lung ultrasonography in the diagnosis of pneumonia in adults: systematic review and meta-analysis. *Chest* 2017;151(2):374-382.
- Orso D, Fonda F, Bove T. Lung ultrasound vs chest radiography for pneumonia diagnosis in critically ill patients in the intensive care unit: a systematic review and Bayesian network diagnostic meta-analysis. *eClinicalMedicine* 2025;89:103553.
- Oks M, Cleven KL, Cardenas-Garcia J, et al. The effect of point-of-care ultrasonography on imaging studies in the medical ICU: a comparative study. *Chest* 2014;146(6):1574-1577.
- Lichtenstein DA, Menu Y. A bedside ultrasound sign ruling out pneumothorax in the critically ill: lung sliding. *Chest* 1995;108(5):1345-1348.

21. Chiumello D, Mongodi S, Algieri I, et al. Assessment of lung aeration and recruitment by CT scan and ultrasound in acute respiratory distress syndrome patients. *Crit Care Med* 2018;46(11):1761-1768.
22. Bouhemad B, Brisson H, Le-Guen M, Arbelot C, Lu Q, Rouby JJ. Bedside ultrasound assessment of positive end-expiratory pressure-induced lung recruitment. *Am J Respir Crit Care Med* 2011;183(3):341-347.
23. Haddam M, Zieleskiewicz L, Perbet S, et al. Lung ultrasonography for assessment of oxygenation response to prone position ventilation in ARDS. *Intensive Care Med* 2016;42(10):1546-1556.
24. Mongodi S, De Luca D, Colombo A, et al. Quantitative lung ultrasound: technical aspects and clinical applications. *Anesthesiology* 2021;134(6):949-965.
25. Mercaldi CJ, Lanes SF. Ultrasound guidance decreases complications and improves the cost of care among patients undergoing thoracentesis and paracentesis. *Chest* 2013;143(2):532-538.