

Awareness of Lung Ultrasound amongst Respiratory Therapists Working in Critical Care: A Prospective Study

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ABSTRACT

Introduction: Respiratory Therapists (RTs) are proficient experts taken part in respiratory treatment and are significant individuals from the patient's treatment group. Under the direction of specialists, they utilize proficient strategies to forestall, assess, analyse, treat, make due, instruct, and care for patients with cardiopulmonary deficiency or irregularities. A new report brought up the meaning of LUS for RTs.

Methodology: A structured questionnaire was designed to assess the awareness and knowledge of lung ultrasound among respiratory therapists, covering areas such as basic knowledge of lung ultrasound principles, clinical applications, and familiarity with interpretation of results.

Result: The study sample consisted of 112 respiratory therapists was collected, out of which 36% participants performed less than 100 LUS per month and 21% participants performed 600 and above LUS per month. 45.5% respondents are very knowledgeable about current knowledge of LUS. 46% participants strongly agree with LUS values in critical care. 54% participants believe "lack of training and education" is primary barriers to LUS and 46% participants believes "equipment unavailability".

Discussion: However, notable barriers to wider adoption of LUS were identified, "including lack of sufficient training" (30.4%), "equipment shortages" (27.7%), and "time constraints" (21.4%). The findings are similar to study [16] showing the potential barriers of LUS to be "poor reimbursement", "expensive ultrasound equipment costs", "lack of POCUS training", and the "requirement for specialized time for imaging and interpretation".

Conclusion: There is adequate knowledge about LUS in RTs but formal training would be required. Clinical Significance: The study highlights the need for conducting training, workshops of LUS and development of study material and training protocols for respiratory therapist working in critical care units as there is a growing recognition that LUS can be valuable in critical care settings.

Keywords: lung ultrasound, respiratory therapists, critical care, awareness, training programs, prospective study.

INTRODUCTION

Lung ultrasound has turned into a piece of the day-to-day assessment of doctors

working in concentrated, sub-serious, and general clinical wards. The simple admittance to hand-held ultrasound

machines in wards where they were not accessible in the past worked with the boundless utilization of ultrasound, both for clinical assessment and as a manual for methodology; among point-of-care ultrasound procedures, the lung ultrasound saw the best spread somewhat recently. The Coronavirus pandemic has given a lift to the utilization of ultrasound since it permits to get an extensive variety of clinical data with a bedside, not unsafe, repeatable assessment that is dependable [1]. Respiratory Therapists (RTs) are proficient experts taken part in respiratory treatment and are significant individuals from the patient's treatment group. Under the direction of specialists, they utilize proficient strategies to forestall, assess, analyze, treat, make due, instruct, and care for patients with cardiopulmonary deficiency or irregularities. A new report brought up the meaning of LUS for RTs.1 Nonetheless, RTs are less inclined to have clinical or ultrasound information than doctors. They have more clinical limitations and need more normalized preparing [2]. The headway of lung ultrasound (LUS) lately with better quality and spatial goal has come about in more noteworthy analytic accuracy. A portion of the upsides of LUS over chest radiograph and processed tomography incorporate accessibility, versatility, nonattendance of radiation, continuous imaging, documentation, and reproducibility of discoveries. Throughout the course of recent years, LUS has turned into an unmistakable demonstrative device for evaluation and dynamic in care of the ventilated patient [3]. During the most recent five years, lung sonography has formed into a center capability of escalated medical care. It is an exceptionally precise bed-side instrument, with clear symptomatic measures for most causes for respiratory disappointment (pneumothorax, pneumonic oedema, pneumonia, aspiratory embolism,

persistent obstructive pneumonic illness, asthma, and pleural emission). It helps in recognizing a hypovolemic from a cardiogenic, obstructive, or distributive shock. Notwithstanding diagnostics, it can likewise be utilized to direct ventilator settings, liquid organization, and, surprisingly, antimicrobial treatment, as well as to evaluate diaphragmatic capability [4]. Lung Ultrasound (LUS) had ended up being helpful in distinguishing respiratory problems at the bedside. We conducted a study to evaluate the current level of awareness and familiarity of lung ultrasound among respiratory therapists in critical care units.

MATERIALS & METHODS

The prospective study was conducted with the Respiratory Therapists working in critical care units of India. In this study mixed-methods approach combining quantitative surveys and qualitative was used. The sample size of the study is 112 Respiratory Therapists working in patient care and critical care settings. The study received approval from the Ethics Committee (IEC). A structured survey questionnaire was developed and validated by panel of experts. The questionnaire consisted of 16 questions. 6 questions were related to demographic details (age, gender, organization details, education qualification, working area, year of experience). The remaining 10 questions measured the level of Basic knowledge of LUS principles and applications, Frequency of LUS use in clinical practice, Training received in LUS (formal education, workshops, on-the-job training) in critical care. The inclusion criteria of this study are Respiratory Therapists working in critical care units and the exclusion criteria is Respiratory Therapists working outside critical care units.

RESULT

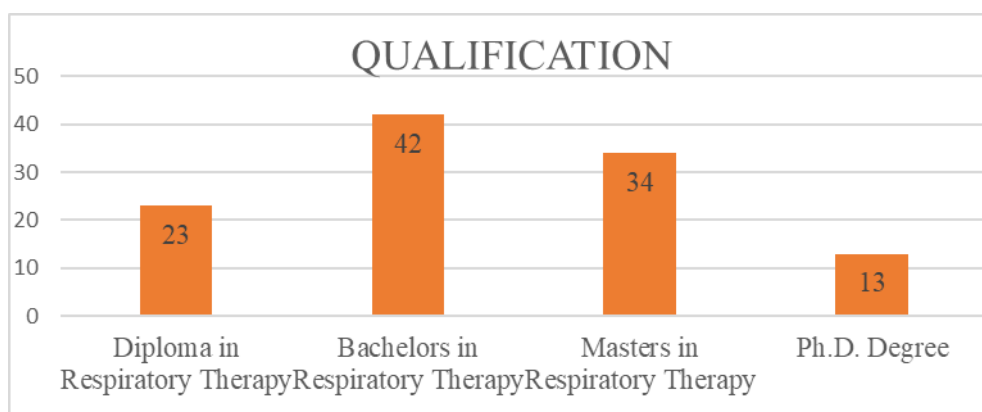


Figure No 1: Qualification of Participants.

In this study of 112 participants, we had majority of female participants (52%). The number of individuals holding various qualifications in the field of respiratory therapy. There are 23 individuals with a diploma in respiratory therapy. The number rises to 42 for those who have obtained a bachelor's degree in respiratory therapy. For those with a higher level of education, 34 individuals hold a master's degree in

respiratory therapy. At the highest level, there are 13 individuals who have achieved a Ph.D. degree in respiratory therapy. This breakdown highlights the distribution of educational attainment among professionals in the respiratory therapy field, with the largest group holding a bachelor's degree, followed by those with a master's degree, then a diploma, and finally, those with a doctoral degree.

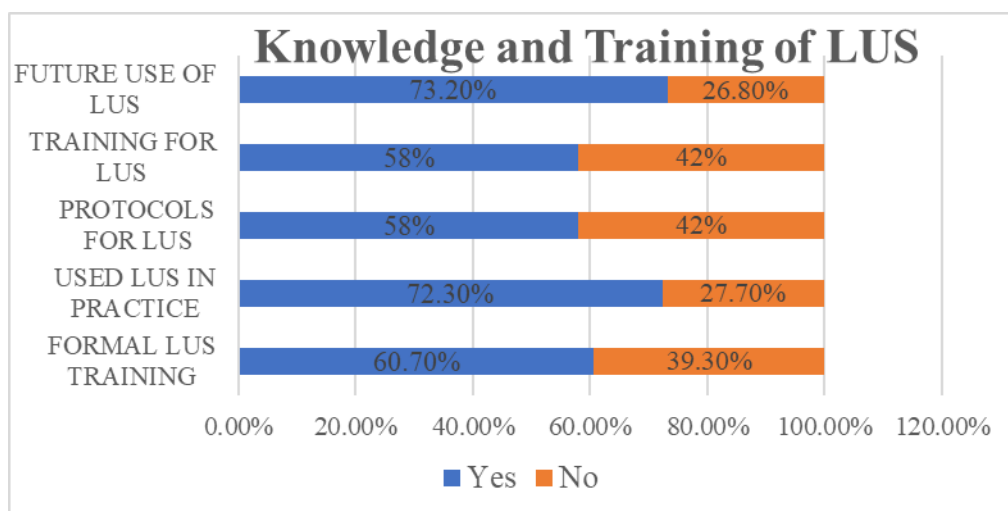


Figure No 2: Knowledge and Training of LUS

In our study, 60.7% participants had official LUS training and 39.3% did not receive any kind of training. 72.3% respondents actually use LUS in their daily practice and 27.7% do not use LUS. When participants were asked about "for what cases LUS is used" 58% participants responded yes for specific cases and 42% had no knowledge about specific use of LUS. The knowledge about

protocols for LUS was present in 58% participants and the knowledge about protocols for LUS was absent in 42% participants. The knowledge about the future use of LUS was present in 73.20% respondents and the knowledge about the future use of LUS was absent in 26.80% respondents.

Table no. 1: Awareness of LUS

Sr. No.	QUESTION		NUMBER OF PARTICIPANTS	PERCENTAGE
1.	LUS PERFORMED PER MONTH	100-400	23	21
		400-600	25	22
		600 and above	24	21
		less than 100	40	36
2.	CURRENT KNOWLEDGE OF LUS	Not at all knowledgeable	29	25.5
		Somewhat knowledgeable	32	29
		Very knowledgeable	51	45.5
3.	LUS VALUE IN CRITICAL CARE	Strongly Agree	52	46
		Agree	25	22.3
		Neutral	18	16
		Disagree	12	10.7
		Strongly Disagree	5	4
4.	PRIMARY BARRIERS TO LUS	Equipment Unavailability	51	46
		Lack of training and education	61	54

36% participants performed less than 100 LUS per month and 21% participants performed 600 and above LUS per month. 45.5% respondents are very knowledgeable about current knowledge of LUS. 46% participants strongly agree with LUS values in critical care and 4% participants are strongly disagree with LUS values in critical care. 54% participants believes that lack of training and education is primary barriers to LUS and 46% participants believes that equipment unavailability is the primary barriers to LUS.

DISCUSSION

The study findings shed light on the diverse levels of awareness and knowledge concerning lung ultrasound (LUS) among the respiratory therapists who participated in the survey. It was observed that a significant proportion of the surveyed therapists (60.7%) had undergone formal training in LUS techniques, an even higher percentage (72.3%) of participants indicated using LUS in clinical practice. Only 58% of respondents in our study claimed familiarity with specific cases and established protocols for lung ultrasound (LUS) application. However, the study also identified a noteworthy discrepancy: some therapists seemed to be utilizing LUS despite lacking formal training. This discrepancy raises concerns about the potential for improper application of LUS techniques in clinical

settings, in [2] majority of the participants had bachelor's degree and agreed to the need for formal training of LUS, only few participants (12.3%) had received LUS training. Among the study sample, those who received formal training of LUS rated their skills to be either average or excellent. The study also shows that 36% of respiratory therapist performed less than 100 LUS and only 21% performed more than 600 LUS per month. These differences likely stem from varying institutional protocols, the demographics of patient populations served, and the individual proficiency levels of therapists. This variability underscores the importance of targeted training initiatives aimed at addressing these disparities and ensuring consistent competence across the board. [5] shows that when naïve RTs performed LUS on patients, 35.5% of the lung ultrasonography findings that were judged by a supervisor were abnormal. The percentage of images needing supervisor assistance decreased significantly (Cuzick's $P < 0.001$) as RTs scanned more patients, while the percentage of correctly identified images increased, as RTs gained experience by scanning more patients, there was a significant improvement in their ability to correctly identify abnormal findings without supervisor assistance. The acknowledged norm for proving expertise and for credentialing, as per emergency medicine

recommendations, is 16–25 hours of didactic time followed by mentored and supervised scanning to teach 6–10 key applications.[6]

This variability underscores the need to develop standardizing education and training practices related to LUS. Standardization would not only promote a deeper understanding of when and how to apply LUS, which can be seen in [7] which shows that, in the group of patients who underwent ultrasound, 39 (78%) diagnoses were entirely accurate, compared to 23 (51.1%) diagnoses in the without POCUS use group (Pearson Chi Square Test: $P = 0.006$), suggesting a standardized approach would help in improving the quality and reliability of LUS. [8] talks about the diagnostic accuracy improvement after short training. Our result is also in-line with [9] wherein the authors saw increase in confidence and use of POCUS across all applications of ultrasound. By establishing uniform guidelines and protocols, healthcare institutions can ensure that respiratory therapists receive consistent and comprehensive instruction, and [11] reported 49 out of 58 residents (84%) were able to independently capture high-quality photos of the kidney and abdominal aorta on the postworkshop skills exam, while only 9 residents (16%) were able to do so on the preworkshop skills test. Similar results were obtained by the residents with both organ systems: on the post test, 90% of them (52 of 58) were able to image the aorta, and 88% of them (51 of 58) were able to image a kidney.

The residents acknowledged that their trust in using ultrasounds had increased. In the postworkshop survey, (98%) reported being somewhat or highly confident (rated 4 or 5 on a 5-point Likert scale) in their ability to identify the abdominal aorta, in contrast to (24%) on the preworkshop survey ($P < .001$). Conducting workshops, hands-on training and inclusion of POCUS in training of respiratory therapist is essential to improve skills and confidence [11]. Educational program conduction and hands

on training of ultrasound led to improvement of ultrasound expertise and reduction in number of X-rays performed by physicians and respiratory therapist throughout one year [12]. [13] compares 2 different peer-assisted learning models and shows that after completion of the course, the subjective competency evaluation increased for all topic complexes; however, both groups reported the most average improvement for the topic complex "transducer handling." Participants in the 10-week course model A showed considerably better increases for the topic complexes "technical knowledge" and "spatial orientation", suggesting creation of and testing of new learning models to improve learning and skilling of LUS. According to study [15] Eighty percent of lung areas were correctly diagnosed by trainees following twenty-five supervised assessments. After five vs twenty-five supervised exams, the mean time of the ultrasonography examination dropped from 19 to 12 minutes in trainees to 8 to 10 minutes in experts. The mean number of days spent in training was 52 (42, 82).

However, notable barriers to wider adoption of LUS were identified, "including lack of sufficient training" (30.4%), "equipment shortages" (27.7%), and "time constraints" (21.4%). The findings are similar to study [16] showing the potential barriers of LUS to be "poor reimbursement", "expensive ultrasound equipment costs", "lack of POCUS training", and the "requirement for specialized time for imaging and interpretation", which might eventually slow down patient flow in primary care offices. [17] also shows "lack of training and curriculum" to be the top barrier to implementation of LUS. Another study [18] also shows "lack of training", "lack of equipment" and "lack of time" to be the reasons for non-adaptation of LUS in primary care hospitals. [19] shows the barriers to ultrasound training, 41% said that their "staff lacked adequate ultrasonography training". Eighty-four percent of the participants agreed or strongly agreed that a

training hindrance was “coworker turnover”. Of those surveyed, 48% said cardiac echocardiography “needed extensive training”.

CONCLUSION

There is adequate knowledge and awareness about LUS amongst respiratory therapist along with familiarity about LUS and protocols. Formal training for respiratory therapist is required to enhance skills and confidence to practice LUS in daily practice

Declaration by Authors

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Conflict of Interest: The authors declare no conflict of interest.

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