ANESTHESIA AND INTENSIVE CARE

Self-assessment of P.O.C.U.S. use in the clinical practice of anesthesia and intensive care by medical residents after completion of simulation training on a high-fidelity simulator

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Abstract

Background. Simulation based education and training (SBET) is an important part of formal medical education and training, with anesthesia and intensive care domains being among the first to use this teaching method. Implementation of SBET into anesthesia and intensive care training is included in the recommendations lists of the European Society of Anesthesia and Intensive Care, with Point of Care Ultrasound (POCUS) being on the list of procedures that residents should be trained in using SBET.

Objectives. In this study the objective is to assess the clinical use of POCUS by trainees in Anesthesia and Intensive Care that finished a simulation program on a high-fidelity simulator.

Methods. We developed a questionnaire comprised of seven sections that evaluates the use of POCUS in clinical practice related to airway, lung, cardiac ultrasound, the availability of POCUS, possible barriers that create limitations, as well as scoring and feedback regarding the simulation sessions and distributed it to trainees that finished the simulation sessions.

Results. Over 90% of respondents declare using POCUS in their daily clinical practice, with more use of pulmonary evaluations than cardiac evaluations. Most of the responders declared good or very good knowledge and ability to diagnose most of the critical conditions described in the curriculum for lung and cardiac POCUS.

Conclusions. Self-assessment methods may be used alongside traditional methods to offer a wider view on POCUS competency and maintenance of skills of trainees in anesthesia and intensive care.

Keywords: point of care systems, simulation based medical training, intensive care, ultrasound protocol, self-assessment, medical education, surveys and questionnaires.

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Background

Simulation based education and training (SBET) is an important part of formal medical education and training, with anesthesia and intensive care domains being among the first to use this teaching method. Implementation of SBET into anesthesia and intensive care training is on the recommendations lists of the European Society of Anesthesia and Intensive Care, with Point of Care Ultrasound (POCUS) being on the list of procedures that residents should be trained in using SBET [1]. Medical training in Anesthesia and Intensive Care should be competence based not time based or count based according to the Union Europeenne des Medecins Specialistes (UEMS) and The European Board and Section of Anesthesiology (EBA) [2]. There is growing evidence that supports the value of SBET in residency training [3-5] even if there is heterogeneity regarding access to simulation sessions during residency training in Anesthesia and Intensive Care around Europe [1].

We demonstrated in a recent study that a curriculum based on an ABC (airway, breathing and circulation) can be used to teach trainees the basics in POCUS for airway, lung and cardiac assessment in the critically ill patient using a high-fidelity simulator in a three-session, each two hours long, simulation program [6].The aim of SBET is to obtain competency while increasing patient safety and patient related outcome. The transition from simulation to clinical practice is difficult, thus self-perceived competence and knowledge may play an important role that can facilitate this transition.

In this study the objective is to assess the clinical use of POCUS by trainees in Anesthesia and Intensive Care that finished a simulation program on a high-fidelity simulator, using a self-assessment form.

Methods

Study design

We developed a questionnaire comprised of seven sections that evaluates the use of POCUS in clinical practice related to airway, lung, cardiac ultrasound, the availability of POCUS, possible barriers that create limitations and also scoring and feedback regarding the simulation sessions. The simulation program was based on an earlier ABC protocol proposal for evaluation of the critically ill patient [7].The questionnaire can be found at Appendix A. The questionnaire was then transmitted using Google forms, set to anonymous answers, to 58 trainees in Anesthesia and Intensive Care from Cluj-Napoca, years 2 to 4 of training, who previously finished 3 sessions - 2 hours each – of a simulation program in SimLAB simulation laboratory for Anesthesia and Intensive Care at Iuliu Haţieganu University of Medicine and Pharmacy in Cluj-Napoca. A period of 7 days was granted to anonymously answer the questionnaire. After this period only 44 out of 58 trainees completed the form.

Statistical analysis

Data were analyzed for distribution followed by appropriate statistical analysis. Numerical values were expressed as mode and median. To assess correlations between number of evaluations and self-perceived knowledge on diagnosis or perceived frequency of use, Spearman's and Kendall's correlation coefficients were calculated and regression analysis was performed using Microsoft Excel and JASP.

For Spearman's correlation coefficient interpretation:

<0.1 no correlation.

0.1<0.3 weak correlation.

0.3<0.5 moderate correlation.

0.5<0.7 strong correlation.

0.7<1 very strong correlation.

For Kendall's correlation coefficient interpretation:

<0.06 weak correlation.

0.06<0.26 moderate correlation.

0.26<0.49 strong correlation.

0.49<0.71 very strong correlation.

Significant correlations are marked with:

$p < .05$ if the correlation is significant at alpha=.05 level.

$p < .01$ if the correlation is significant at alpha=.01 level.

$p < .001$ if the correlation is significant at alpha=.001 level.

Results

The anonymous form was sent out to 58 trainees that had completed the simulation sessions. From the total of 58, a number of 44 (75.86%) responded within the given period. Characteristics of responders are shown in table I.

Tables II and III represent the answers given by the responders regarding the use of POCUS for specific diagnosis in the critically ill patients and the perceived frequency of POCUS use. Correlation between number of evaluations and self-perceived knowledge or self-perceived frequency of use is represented in table IV. Responses regarding current POCUS use in clinical practice and evaluation of the simulation sessions are represented in tables V and VI.

Table I. Characteristics of responders.

Age (years)	26	27	28	29	30	31	32	Total
n	4	11	10	10	3	4	2	44
%	9	25	22.72	22.72	6.81	9	4.54	100%
Year of residency	**2**	**3**	**4**					
n	14	12	18					
%	31.81	27.27	40.9					
Time passed since simulation (months)	**4**	**>12**	**>24**					
n	14	12	18					

Table II. Use of POCUS in clinical practice.

		YES	NO	Total
Do you use POCUS in your current practice?	n	40	4	44
	%	90.9	9.1	100
Do you routinely use POCUS to evaluate pleuro-pulmonary pathologies in the critically ill patient?	n	40	4	44
	%	90.9	4	100
Do you routinely use POCUS for cardiac assessment in the critically ill patient?	n	31	13	44
	%	70.45	29.55	100

Table III. Self-perceived knowledge and frequency of POCUS use.

	Score	1	2	3	4	5	Mode	Median
How often do you use POCUS in your current practice? (1-never; 5-always)	n	1	8	14	13	8	3	3
	%	2.27	18.18	31.82	29.55	18.18		
How do you consider your knowledge regarding POCUS use in airway confirmation? (1 - very poor; 2 - poor; 3 - not poor not good; 4 - good; 5 - very good)	n	4	6	15	13	6	3	3
	%	9.09	13.64	34.09	29.55	13.63		
How often do you use POCUS for confirmation of correct placement of endotracheal tube? (1 - never; 5 - always)	n	31	10	2	1	0	1	1
	%	70.45	22.73	4.55	2.27	0		
How would you rate your training in using POCUS to diagnose pneumothorax? (1 - very poor; 2 - poor; 3 - not poor not good; 4 - good; 5 - very good)	n	0	1	11	17	15	4	4
	%	0	2.27	25	38.64	34.09		
How would you rate your training in using POCUS to diagnose interstitial syndrome? (1 - very poor; 2 - poor; 3 - not poor not good; 4 - good; 5 - very good)	n	1	4	17	12	10	3	3.5
	%	2.27	9.09	38.64	27.27	22.73		
How would you rate your training in using POCUS to diagnose condensation syndrome? (1 - very poor; 2 - poor; 3 - not poor not good; 4 - good; 5 - very good)	n	1	1	20	15	7	3	3.5
	%	2.27	2.27	45.45	34.09	15.91		
How would you rate your training in using POCUS to diagnose pleural effusions? (1 - very poor; 2 - poor; 3 - not poor not good; 4 - good; 5 - very good)	n	0	0	0	12	32	5	5
	%	0	0	0	27.27	72.73		
How often do you use POCUS for pleuro-pulmonary assessment in the critically ill patient in current practice? (1 - never; 5 - always)	n	0	1	5	20	18	4	4
	%	0	2.27	11.36	45.45	40.91		
How does pleuro-pulmonary POCUS evaluation in the critically ill patient influence your clinical decision? (1 - no influence; 5 - very big influence)	n	0	0	6	18	20	5	4
	%	0	0	13.64	40.91	45.45		
How would you rate your training in using POCUS to diagnose severe left ventricular dysfunction? (1 - very poor; 2 - poor; 3 - not poor not good; 4 - good; 5 - very good)	n	0	15	16	10	3	3	3
	%	0	34.09	36.36	22.73	6.82		
How would you rate your training in using POCUS to diagnose cardiac tamponade/pericardial effusion? (1 - very poor; 2 - poor; 3 - not poor not good; 4 - good; 5 - very good)	n	0	3	8	21	12	4	4
	%	0	6.82	18.18	47.73	27.27		

Table III. Self-perceived knowledge and frequency of POCUS use (continuation).

	Score	1	2	3	4	5	Mode	Median
How do you rate your training in the use of POCUS for the diagnosis of acute cor pulmonale? (1 - very poor; 2 - poor; 3 - not poor not good; 4 - good; 5 - very good)	n	2	12	19	8	3	3	3
	%	4.55	27.27	43.18	18.18	6.82		
How would you rate your training in using POCUS to evaluate the inferior vena cava? (1 - very poor; 2 - poor; 3 - not poor not good; 4 - good; 5 - very good)	n	0	0	5	24	15	4	4
	%	0	0	11.36	54.55	34.09		
How often do you use POCUS for cardiac assessment in the critically ill patient in current practice? (1 - never; 5 - always)	n	0	9	13	18	4	4	3.5
	%	0	20.45	29.55	40.91	9.09		
How does cardiac POCUS assessment in the critically ill patient influence your clinical decision? (1 - no influence; 5 - very big influence)	n	0	3	11	21	9	4	4
	%	0	6.82	25	47.73	20.45		

Table IV. Correlation between number of evaluations and self perceived ability to use POCUS.

Nr. Of evaluations - specific POCUS diagnose/frequency of POCUS use in clinical practice	Spearman		Kendall	
	rho	p	tau B	p
Nr. Evaluations - endotracheal tube confirmation	0.126	0.414	0.098	0.420
Nr. Evaluations - perceived frequency of POCUS use airway confirmation	0.532	< .001	0.467	< .001
Nr. Evaluations - pneumothorax	0.302	0.046	0.255	0.040
Nr. Evaluations - interstitial syndrome	0.199	0.195	0.152	0.212
Nr. Evaluations - pulmonary consolidation	0.171	0.267	0.124	0.320
Nr. Evaluations - pleural effusion	0.280	0.065	0.243	0.066
Nr. Evaluations - perceived frequency of POCUS use for pleuro-pulmonary evaluation	0.493	< .001	0.402	0.001
Nr. Evaluations - severe left ventricular dysfunction	0.543	< .001	0.431	< .001
Nr. Evaluations - cardiac tamponade	0.535	< .001	0.452	< .001
Nr. Evaluations - acute core pulmonale	0.474	0.001	0.362	0.003
Nr. Evaluations - inferior vena cava assessment	0.319	0.035	0.270	0.032
Nr. Evaluations - perceived frequency of POCUS use for cardiac evaluation	0.441	0.003	0.351	0.004

Spearman's: <0.1 no correlation; 0.1<0.3 weak correlation; 0.3<0.5 moderate correlation; 0.5<0.7 strong correlation; 0,7<1 very strong correlation.
Kendall's: <0.06 weak correlation; 0.06<0.26 moderate correlation; 0.26<0.49 strong correlation; 0.49<0.71 very strong correlation.
$p < .05$ if the correlation is significant at alpha=.05 level; $p < .01$ if the correlation is significant at alpha=.01 level; $p < .001$ if the correlation is significant at alpha=.001 level.

Table V. Use of POCUS in current clinical practice.

Please rate which of the following statements contribute to the use of POCUS in your current practice	Score	1	2	3	4	5	Mode	Median
In current practice I have constant access to an ultrasound machine that I can use on the critically ill patient (1 - totally disagree; 2 - partially disagree; 3 - neither agree nor disagree; 4 - partially agree; 5 - totally agree)	n	0	0	5	10	29	5	5
	%	0	0	11.36	22.73	65.91		
Time allows me to perform POCUS on critical patients most of the time (1 - totally disagree; 2 - partially disagree; 3 - neither agree nor disagree; 4 - partially agree; 5 - totally agree)	n	2	7	18	13	4	3	3
	%	4.55	15.9	40.91	29.55	9.09		
Performing POCUS is easy to introduce and apply in current clinical practice (1 - totally disagree; 2 - partially disagree; 3 - neither agree nor disagree; 4 - partially agree; 5 - totally agree)	n	0	3	10	16	15	4	4
	%	0	6.82	22.73	36.36	34.09		

Table V. Use of POCUS in current clinical practice (continuation).

Please rate which of the following statements contribute to the use of POCUS in your current practice	Score	1	2	3	4	5	Mode	Median
Ultrasound evaluation of the critically ill patient should be routinely performed by the intensive care physician and not by the radiologist (1 - totally disagree; 2 - partially disagree; 3 - neither agree nor disagree; 4 - partially agree; 5 - totally agree)	n	0	0	7	19	18	4	4
	%	0	0	15.91	43.18	40.91		
The use of POCUS for critical patient assessment should be performed routinely, regardless of location (emergency department, intensive care, operating room, ward, etc.) (1 - totally disagree; 2 - partially disagree; 3 - neither agree nor disagree; 4 - partially agree; 5 - totally agree)	n	0	1	3	14	26	5	5
	%	0	2.27	6.82	31.82	59.09		
Adequate theoretical personal knowledge (1 - totally disagree; 2 - partially disagree; 3 - neither agree nor disagree; 4 - partially agree; 5 - totally agree)	n	0	3	15	17	9	4	4
	%	0	6.82	34.09	38.64	20.45		
Confidence in the results obtained personally from the assessment (1 - totally disagree; 2 - partially disagree; 3 - neither agree nor disagree; 4 - partially agree; 5 - totally agree)	n	1	1	14	23	5	4	4
	%	2.27	2.27	31.82	52.28	11.36		
I receive regular feedback from specialist medical supervisors (1 - totally disagree; 2 - partially disagree; 3 - neither agree nor disagree; 4 - partially agree; 5 - totally agree)	n	3	10	20	9	2	3	3
	%	6.82	22.73	45.45	20.45	4.55		
I have a good possibility to follow the examinations performed by other doctors (1 - totally disagree; 2 - partially disagree; 3 - neither agree nor disagree; 4 - partially agree; 5 - totally agree)	n	0	7	11	18	8	4	4
	%	0	15.91	25	40.91	18.18		

Table VI. Evaluation of the simulation sessions.

	Score	1	2	3	4	5	Mode	Median
The simulation sessions for POCUS were helpful in establishing the basics for airway, lung and heart POCUS in the critical ill patient (1 - totally disagree; 2 - partially disagree; 3 - neither agree nor disagree; 4 - partially agree; 5 - totally agree)	n	0	0	1	10	33	5	5
	%	0	0	2.27	22.73	75		
The transition from the simulation manikin to performing POCUS in clinical practice was (1 - very difficult; 2 - difficult; 3 - neither difficult nor easy; 4 - easy; 5 - very easy)	n	0	9	25	9	1	3	3
	%	0	20.45	56.83	20.45	2.27		
The simulation sessions for POCUS within SimLab Cluj increased my interest in the clinical applications of ultrasonography in the critically ill patient (1 - totally disagree; 2 - partially disagree; 3 - neither agree nor disagree; 4 - partially agree; 5 - totally agree)	n	0	0	5	11	28	5	5
	%	0	0	11.36	25	63.64		
The simulation sessions for POCUS within SimLab Cluj increased my number of assessments performed on critical patients (1 - totally disagree; 2 - partially disagree; 3 - neither agree nor disagree; 4 - partially agree; 5 - totally agree)	n	0	1	2	12	29	5	5
	%	0	2.27	4.55	27.27	65.91		
The concepts presented in the POCUS simulation sessions were useful and relevant to clinical practice (1 - totally disagree; 2 - partially disagree; 3 - neither agree nor disagree; 4 - partially agree; 5 - totally agree)	n	0	1	2	12	29	5	5
	%	0	2.27	4.55	27.27	65.91		

Discussion

In a previous study, we have concluded that a proposed ABC (Airway, Breathing and Circulation) protocol [7] is suitable in a high-fidelity simulation setting for trainees to learn to evaluate a critical patient for major causes of acute respiratory failure or shock [6]. Self-assessment scores in this study tend to reflect the scores achieved by experienced users, which leads us to think that high self-assessment scores are perceived after the transition of ultrasound skills from the simulation laboratory to clinical practice.

Over 90% of respondents declare using POCUS in their daily clinical practice, with more use of pulmonary evaluations than cardiac evaluations. Most of the responders declared good or very good knowledge and ability to diagnose most of the critical conditions described in the curriculum for lung and cardiac POCUS.

Equipment availability, time to perform evaluations, adequate knowledge on the subject and possibility to follow more experienced users were reported. Most trainees agree that POCUS is easy to be introduced in clinical practice and should be performed whenever available regarding the setting when it comes to critical patients although some declared that transition to clinical practice is "neither difficult nor easy".

Most declared that previews simulation sessions were useful in establishing the basics and the information provided were relevant for clinical practice. Attending the simulation sessions increased their interest in POCUS and the number of further POCUS evaluations.

A review of assessments methods that categorized different methods according to Miller's pyramid for clinical assessment [8] has found that most assessments methods in literature rely on theoretical evaluation and technical skills evaluation in a controlled manner, and few articles focus on workplace clinical performance assessment and preservation of skills over the years [9].

Assessment should be made with the learner and by the learner with the aim of improving and encouraging learning. Multiple ways of assessment should be included in evaluating trainees [10]. The use of documentation and reflection on their learning and progress can have an important impact on trainee's progress and improvement of clinical skills [11]. Debriefing sessions are conducted immediately after simulation scenarios and guide the learner towards understanding and knowledge reinforcement. However, no further evaluations are generally performed a longer time after the simulation training and the learner is responsible for the use of knowledge and skills taught during the simulation sessions in clinical practice.

The method of informed self-assessment where trainees should take information from external credited sources and internal sources should be made to guide and facilitate learning [12].

Self-assessment method during residency programs alongside traditional means of evaluation of competency can offer different perspectives on continuous learning and retention of skills and to barriers that may be present in day-to-day clinical practice of trainees after finishing a simulation curriculum. Some older articles conclude that self-assessment of physicians may be unreliable due to multiple factors [13-15]. Adult learning differs from traditional learning and can be comprised of self-directed learning, experiential learning and goal orientated learning with assessment of competency being an important factor in the learning process [16]. Reflection and self-assessment could offer a new, wider perspective on the learning process and the ways that new skills can be included in clinical practice. Some of the principles for the implementation of competency based medical education and training set out by the International Competency based Medical Education Collaborator are that assessment requires the application of multiple tools and methods that should be used to enhance learning and to determine progression for trainees and the promotion of reflective practice [17]. One method of self-assessment is by retrospectively reviewing providers' own images once definite diagnosis or other imaging studies were performed, thus leading the way for the provider to learn from wrong image interpretation or clinical integration of the results [18].

Transition from a simulation setting to clinical practice and obtaining competence is difficult. As shown in other studies, there is a steep learning curve for POCUS skills in different areas followed by a leaner curve towards obtaining new skills, data that reflect previews publications results regarding learning curves in POCUS based on expert reviews [19]. Our current results show that for most responders the transition to clinical practice can be easily done if they have enough time to perform POCUS. At the same time self-assessment does not correlate with self-confidence. Having specific training in POCUS during residency programs can help improve self-confidence. As shown in one study, the participants presented high confidence in performing focused assessment with ultrasonography in trauma (FAST) and low confidence in cardiac ultrasound before attending the course. After finishing the course, the self-confidence increased in all applications of POCUS [20]. Most of our responders declared an easy transition from simulation to clinical practice with most of them confirming/agreeing that good theoretical knowledge on the subject and good levels of self-confidence in their results facilitate the use of POCUS in clinical practice. The current results correlate with previous results from one of our studies done in the simulation setting for POCUS.

Self-assessment is a difficult task, and one study defined that low-self assessment scores and confidence are reported in two groups: the least experienced and the more experienced. At the same time there are reduced number of examinations regarding POCUS with the increase in

resident training year [21].

The number of procedures does not always correlate with competency [22]. This can be seen in our results, when looking at self-assessed knowledge regarding lung evaluations, most of our responders reported good or very good knowledge on diagnosing pneumothorax and pleural effusion but we found only low to moderate correlation between number of evaluations and self-assessed knowledge. A particular finding is when talking about severe left ventricular dysfunction where most of the responders reported a poor or average knowledge on the diagnosis. In this skill we found good correlation on the number of evaluations performed and the self-assessed knowledge. Other studies found that improvement in image acquisition and diagnosis in POCUS, especially in the case of FAST ultrasound and cardiac POCUS improves over time with more evaluations performed [23].

Respondents declared an increased interest in POCUS and number of evaluations performed after they participated in the simulation training. These findings correlate well with data from literature where others described an increase in 44%-61% of POCUS use in different domains after attending a course [24]. Most of our responders believe that POCUS should be performed by the intensive care specialist in different environments (intensive care unit, ward, emergency department etc.). Although most of the trainees have access to an ultrasound machine ready to use at the patient's bedside, time is still a limiting factor regarding the frequency of POCUS use. Feedback received from experienced users is inconstant, unlike the possibility to follow more complex evaluations done by consultants or other experienced physicians. One study found that access to ultrasound machines, having a partner to learn together and department support were among top facilitators for performing POCUS, while limited time, poor availability of specific training and poor access to ultrasound machines were among the most frequent barriers [24]. Other studies that investigate barriers in highly developed countries found that lack of training and equipment, machine dysfunction and lack of maintenance were the top barriers in performing constant POCUS evaluations [25].

The same study found that 74% of respondents wished to have future training and 82% were open to achieve distant learning and training [25] which may imply distant evaluation and constant reevaluation of the obtained skills. This may impose future problems related to ways in which POCUS can be thought and evaluation of competency performed. Transition from a classical way of teaching before the COVID-19 pandemic to an online teaching brought to view new challenges not encountered before by university professors. One study concluded that digital native university professors had a higher self-concept of their digital competence and their ability to adapt to virtual learning conditions and methods that involve some kind of virtual environment [26].

In low- and middle-income countries responders reported that 22% received no education and 44% were self-thought through online courses and media resources, papers books and other resources. Despite this, 90% feel confident in performing US examinations but only 20% declared being experienced with most of them being "somewhat experienced" [27]. Similar findings were reported in other studies with improved image-based assessment scores after the course during the clinical phase, and job satisfaction improved [28].

Most of our responders have declared that they have good access to ultrasound machines in their clinical practice, which may correlate well with preservation of skills and knowledge over time, after participating in a course [29]. The fact that most of our responders agree with the affirmation that the simulation curriculum was useful in clinical practice and declared an increased used of POCUS after attending the simulation program may indicate an increased interest in POCUS for the trainees, which in turn can have an impact on the self-assessment results.

Conclusions

Self-assessment methods may be used alongside traditional methods to offer a wider view on the POCUS competency and maintenance of skills of trainees in anesthesia and intensive care and to identify barriers and facilitators to enhance long term learning and skill preservation, as well as to evaluate the ease of implementing POCUS in clinical practice.

In this study we found that over 90% of responders use POCUS in clinical practice, with increased interest and number of evaluations after attending previews simulation sessions. Most of them have a good or very good perceived knowledge on most of the critical diagnoses done with POCUS while having easy access to equipment and enough time evaluate patients. Self-perceived knowledge does not correlate with number of evaluations performed in most of the diagnoses and is only statistically significant on some diagnosis. Feedback regarding previews simulation sessions is good with most respondents declaring its usefulness in establishing the basics and enhancing interest and increasing the number of POCUS evaluations. Our results correlate well with previous findings when assessment after a simulation curriculum was performed by experienced physicians. Future research is needed to see how self-assessment can be integrated in establishing and maintaining competence in POCUS in the critically ill patient.

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Iuliu Hateiganu University of Medicine and Pharmacy of Cluj-Napoca, Romania (approval document nr AVZ75/14.03.2022).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study. Consent was considered when accepting to anonymously submit de form.

Author Contributions

Conceptualization, R.S. and C.P.; methodology, R.S. and C.P.; formal analysis, R.S.; investigation, R.S.; resources, R.S., C.P. and H.N.V.; writing – original draft preparation, R.S.; writing – review and editing, C.P., O.A. and I.C.P; visualization, R.S.; supervision, C.B. and I.C.P. All authors have read and agreed to the published version of the manuscript.

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Annex 1

POCUS self-assessment

* Indicates required question

1. Age *

2. Year of training *

Mark only one oval.

- 1
- 2
- 3
- 4
- 5

3. 1. Year and month of previews POCUS simulation session in SimLAB Cluj-Napoca, Romania? *

4. Do you use POCUS in clinical practice? *

Mark only one oval.

- YES
- NO

5. If the answer was no, please comment

Check all that apply.

- I don't know how
- I don't have enough time
- I rely on other methods
- Other:

6. How often do you use POCUS in your current practice? *

Mark only one oval.

1 2 3 4 5

Nev ◯ ◯ ◯ ◯ ◯ Always

Airway

Please answer the next questions regarding your ability to use POCUS for airway management

7. How do you consider your knowledge regarding POCUS use in airway confirmation? *

Mark only one oval.

1 2 3 4 5

Very ◯ ◯ ◯ ◯ ◯ Very good

8. How often do you use POCUS for confirmation of correct placement of endotracheal tube? *

Mark only one oval.

1 2 3 4 5

Nev ◯ ◯ ◯ ◯ ◯ All the time

9. How many evaluations for airway confirmation have you performed since the simulation? (estimative number) *

Lung POCUS in the critical ill patient

Please answer the next questions regarding your ability to use POCUS for lung evaluation in the critical patient

10. Do you routinely use POCUS to evaluate pleuropulmonary pathologies in the critically ill patient?

Mark only one oval.

YES
NO

11. How would you rate your training in using POCUS to diagnose pneumothorax? *

Mark only one oval.

1 2 3 4 5
Very ◯ ◯ ◯ ◯ ◯ Very good

12. How would you rate your training in using POCUS to diagnose interstitial syndrome? *

Mark only one oval.

1 2 3 4 5
Very ◯ ◯ ◯ ◯ ◯ Very good

13. How would you rate your training in using POCUS to diagnose condensation syndrome? *

Mark only one oval.

1 2 3 4 5
Very ◯ ◯ ◯ ◯ ◯ Very good

14. How would you rate your training in using POCUS to diagnose pleural effusions? *

Mark only one oval.

1 2 3 4 5
Very ◯ ◯ ◯ ◯ ◯ Very good

15. How often do you use POCUS for pleuropulmonary assessment in the critically ill patient in current practice? *

Mark only one oval.

1 2 3 4 5
Nev ◯ ◯ ◯ ◯ ◯ Always

16. How many lung evaluations have you performed since the simulation? (estimative number) *

17. How does pleuro-pulmonary POCUS evaluation in the critically ill patient influence your clinical decision? *

Mark only one oval.

1 2 3 4 5
No i ◯ ◯ ◯ ◯ ◯ Very big influence

Cardiac POCUS in the critical ill patient

Please answer the next questions regarding your ability to use POCUS for cardiac evaluation in the critical patient

18. Do you routinely use POCUS for cardiac assessment in the critically ill patient? *

Mark only one oval.

YES
NO

19. How would you rate your training in using POCUS to diagnose severe left ventricular dysfunction? *

Mark only one oval.

1 2 3 4 5
Very ◯ ◯ ◯ ◯ ◯ Very good

20. How would you rate your training in using POCUS to diagnose cardiac tamponade/pericardial effusion? *

Mark only one oval.

1 2 3 4 5
Very ◯ ◯ ◯ ◯ ◯ Very good

21. How do you rate your training in the use of POCUS for the diagnosis of acute cor pulmonale? *

Mark only one oval.

1 2 3 4 5
Very ◯ ◯ ◯ ◯ ◯ Very good

22. How would you rate your training in using POCUS to evaluate the inferior vena cava? *

Mark only one oval.

1 2 3 4 5
Very ◯ ◯ ◯ ◯ ◯ Very good

23. How often do you use POCUS for cardiac assessment in the critically ill patient in current practice? *

Mark only one oval.

1 2 3 4 5
Nev ◯ ◯ ◯ ◯ ◯ Always

24. How many cardiac evaluations have you performed since the simulation? (estimative number) *

25. How does cardiac POCUS assessment in the critically ill patient influence your clinical decision? *

Mark only one oval.

	1	2	3	4	5	
No i	◯	◯	◯	◯	◯	Very big influence

Conditions affecting POCUS use in clinical practice

26. In current practice I have constant access to an ultrasound machine that I can use on the critically ill patient *

Mark only one oval.

	1	2	3	4	5	
Tota	◯	◯	◯	◯	◯	Totally agree

27. Time allows me to perform POCUS on critical patients most of the time *

Mark only one oval.

	1	2	3	4	5	
Tota	◯	◯	◯	◯	◯	Totally agree

28. Performing POCUS is easy to introduce and apply in current clinical practice *

Mark only one oval.

	1	2	3	4	5	
Tota	◯	◯	◯	◯	◯	Totally agree

29. Ultrasound evaluation of the critically ill patient should be routinely performed by the intensive care physician and not by the radiologist *

Mark only one oval.

	1	2	3	4	5	
Tota	◯	◯	◯	◯	◯	Totally agree

30. The use of POCUS for critical patient assessment should be performed routinely, regardless of location (emergency department, intensive care, operating room, ward, etc.) *

Mark only one oval.

	1	2	3	4	5	
Tota	◯	◯	◯	◯	◯	Totally agree

Please rate which of the following statements contribute to the use of POCUS in your current practice

31. Adequate theoretical personal knowledge *

Mark only one oval.

	1	2	3	4	5	
Tota	◯	◯	◯	◯	◯	Totally agree

32. Confidence in the results obtained personally from the assessment *

Mark only one oval.

	1	2	3	4	5	
Tota	◯	◯	◯	◯	◯	Totally agree

33. I receive regular feedback from specialist medical supervisors *

Mark only one oval.

	1	2	3	4	5	
Tota	◯	◯	◯	◯	◯	Totally agree

34. I have a good possibility to follow the examinations performed by other doctors *

Mark only one oval.

	1	2	3	4	5	
Tota	◯	◯	◯	◯	◯	Totally agree

Evaluation of the simulation sessions

Please answer the following questions and note the following statements related to the simulation sessions carried out in SimLab Cluj

35. The simulation sessions for POCUS were helpful in establishing the basics for airway, lung and heart POCUS in the critical ill patient *

Mark only one oval.

	1	2	3	4	5	
Tota	◯	◯	◯	◯	◯	Totally agree

36. The transition from the simulation manikin to performing POCUS in clinical practice was *

Mark only one oval.

- ◯ Very difficult
- ◯ Difficult
- ◯ Neither difficult nor easy
- ◯ Easy
- ◯ Very easy

37. The simulation sessions for POCUS within SimLab Cluj increased my interest in the clinical applications of ultrasonography in the critically ill patient *

Mark only one oval.

	1	2	3	4	5	
Tota	◯	◯	◯	◯	◯	Totally agree

38. The simulation sessions for POCUS within SimLab Cluj increased my number of assessments performed on critical patients *

Mark only one oval.

	1	2	3	4	5	
Tota	◯	◯	◯	◯	◯	Totally agree

39. The concepts presented in the POCUS simulation sessions were useful and relevant to clinical practice *

Mark only one oval.

	1	2	3	4	5	
Tota	◯	◯	◯	◯	◯	Totally agree