



Alfred ICU Journal Club Review of "Laursen CB, et al. Point-of-care ultrasonography in patients admitted with respiratory symptoms: a single-blind, randomised controlled trial."

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Article Reviewed

Laursen CB, Sloth E, Lassen AT, Christensen Rd, Lambrechtsen J, Madsen PH, Henriksen DP, Davidsen JR, Rasmussen F. Point-of-care ultrasonography in patients admitted with respiratory symptoms: a single-blind, randomised controlled trial. *Lancet Respir Med*. 2014 Aug;2(8):638-46. doi: 10.1016/S2213-2600(14)70135-3. Epub 2014 Jul 3. PMID: [24998674](#).

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THE QUESTION

In patients admitted to the emergency department with respiratory symptoms and signs, does point-of-care ultrasonography (POCUS) of the heart, lungs, and deep veins, in addition to the usual initial diagnostic testing, improve the percentage of correct diagnoses 4 hours after admission?

STUDY DESIGN

TYPE OF STUDY

Prospective, single centre, single-blinded randomised controlled trial

POPULATION

n=315 patients admitted to the medical emergency department (ED) at Odense University Hospital, Denmark, with respiratory symptoms and signs

Inclusion criteria

1. Respiratory rate > 20/min
2. Oxygen saturation <95%
3. On oxygen therapy
4. Dyspnoea,
5. Cough, or

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6. Chest pain

Exclusion criteria

1. Permanent mental disability
2. Age younger than 18 years, or
3. POCUS not done within 1 h after the primary assessment

INTERVENTIONS/ COMPARISONS

Intervention (n=158)

POCUS of the heart, lungs, and deep veins performed within 1 h after the primary clinical assessment in the ED, in addition to the standard initial diagnostic testing.

Control (n= 57)

Standard initial diagnostic tests, including blood samples, blood gases, electrocardiogram and chest radiography.

OUTCOMES

Primary endpoint

1. 88.0% (95% CI: 82.8-93) in the intervention group versus 63.7% (56.1-71.3) in the control group had correct presumptive diagnoses ($p < 0.0001$).
2. The absolute effect was 24.3% (95% CI: 15.0 to 33.1)
3. This gives an NNT of 4; i.e. 4 people needed POCUS for an additional correct presumptive diagnosis to made within 4 hours in the ED

Secondary endpoints

1. Appropriate treatment was initiated 4h after ED admission in a significantly larger percentage of patients in the intervention group than the control group (78% versus 56.7%, p value < 0.0001)
2. No significant difference for the percentage of patients with correct presumptive diagnoses after the primary clinical assessment by an ED physician
3. No significant differences in
 - the number of patients transferred to the intensive care unit
 - the number of readmissions
 - length of hospital stay
 - hospital free days
 - in-hospital mortality
 - 30 days mortality
4. Slightly increased number of advanced diagnostic testing ordered for the intervention group during stay in the ED: 63 (6.6%) versus 34 (3.6%); but not during the hospital stay
5. No significant difference in the time to diagnostic or therapeutic thoracocentesis

COMMENTARY AND CRITICISMS

Criticisms

1. Masked auditing of discharged patients' hospital data was used to establish the final diagnoses and the appropriateness of the initial treatment. Although a protocol was used to reduced bias, this method remains subjective and there was inter-auditor variability.
2. This is a single center study with one physician that did all the sonographic examinations

the results might not be applicable or reproducible to other EDs or physicians, especially given that ultrasonography findings are very operator dependent
3. Patients were enrolled according to the availability of the investigator/ultrasonographer, rather than consecutive
4. There were many more diagnoses made by the masked auditors than the actual number of patients

It is not clear whether all the diagnoses had contributed to the patients' presenting symptoms and signs, or were associated findings only, e.g. pleural effusion, pericardial effusion, systolic & diastolic failures, and parapneumonic effusion
5. Anaemia and malignancy were included in the auditor's diagnoses, for anaemia, in particular, it is unclear how this might be diagnosed by POCUS
6. It is possible that diagnostic accuracy might improve when a physician is prompted to reconsider the diagnosis by another physician, irrespective of whether the other physician has performed POCUS
7. The POCUS group had increased additional investigations performed in the ED. This was no longer statistically significant when the total number of investigations over the hospital stay were accounted for. Whether POCUS leads to more rapid further investigations, or that it leads to over investigation, is not clear from these results.
8. Despite the increased percentage of patients who were given a correct presumptive diagnosis and appropriate early treatment, no difference was noted in patients' morbidity and mortality outcomes. In fact, there was a trend in the opposite direction. However, this study was not powered to detect improvements in mortality or morbidity.
9. The authors recommended that POCUS of the heart, lungs, and deep veins in patients with respiratory symptoms should be implemented in ED, however there is insufficient data to support this conclusion, and the study is not generalisable to many other EDs. Although the study suggests POCUS leads to more accurate diagnoses, clinical outcomes were not improved and questions are raised about cost-effectiveness. The question remains...Could an increased ability to find disease mean more testing and more harm? (e.g. 'incidentalomas')

FINAL WORDS

POCUS in the emergency department, in the hands of a skilled practitioner, may lead to more accurate diagnosis in patients with respiratory presentations. This finding is not necessarily applicable to other settings and may not improve patient outcomes.