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LETTER

UltraNurse: teaching point-of-care ultrasound to intensive care nurses

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Dear Editor,

Point-of-care ultrasound (POCUS) is extensively used to better manage critically ill patients at the bedside but relies heavily on skilled operator availability [1]. Teaching POCUS to intensive care nurses could greatly improve this availability and could upgrade POCUS to a more continuous monitoring technique. Therefore, we developed, implemented and analyzed the UltraNurse training and certification program.

In our 24-bed mixed university hospital intensive care unit, we enrolled eight intensive care nurses without prior ultrasound knowledge. They attended two 4-h mixed theoretical and practical training sessions. Our UltraNurse protocol consisted of lung ultrasound (LUS) [2] and determination of the left ventricular outflow tract velocity time integral (LVOT-VTI), a proxy for the cardiac index [3]. After performing five bedside ultrasound examinations under direct supervision, nurses were then supervised at the bedside every third examination until full proficiency was reached, defined as five correctly interpreted independent examinations. Supervisors graded overall proficiency, assistance required and image quality using 5-point Likert scales. Both nurses and supervising ultrasound-certified intensivists reported their findings using structured electronic forms. We constructed learning curves for overall proficiency and image quality with the level of assistance required deducted. We then performed one-phase decay curve fitting and tested for differences in the learning rate. Finally, we used surveys to identify possible barriers and facilitators for implementation of the UltraNurse program.

All eight nurses reached full proficiency. This required a median of 13 [IQR 12–18] examinations in 21 [14–26] weeks for LUS and 13 [11–16] in 26 [20–29] weeks for LVOT-VTI. UltraNurse progress for overall proficiency and image quality adjusted for assistance required can be found in Fig. 1. Fitted learning curves indicated that the plateau phase was reached after 7 (95% CI 3–19) examinations for LUS and 15 (8–25) examinations for LVOT-VTI. Program duration was 7 months in which 123 patients were scanned in 230 examinations. There were no statistically significant differences between the learning rate for LOS and LVOT-VTI. Concordance between supervisors and nurses was high from the start. Intensivist enthusiasm and availability ranked first among the facilitators and barriers to the program, respectively.

This is the first report to show that POCUS may readily be taught to ultrasound-naive intensive care nurses. Their learning rate is fast and similar to that of respiratory therapists and physicians [4]. Ultrasound by non-physicians is common in cardiology but novel for intensive care medicine. Therefore, the UltraNurse program may disrupt clinical practice allowing POCUS deployment as a more continuous monitoring technique. This may aid diagnosis and therapy by serial assessment of lung ultrasound profiles and may be of great help to assess fluid responsiveness by serial assessment of LVOT-VTI [5]. Thus, benefit for critically ill patients may be substantial. Therefore, clinical and possible legal implications of nurse-driven POCUS should be rapidly evaluated. Additionally, nursing staff job satisfaction may increase and true team work may be stimulated. Although the program requires perseverance and time, no other investments are needed

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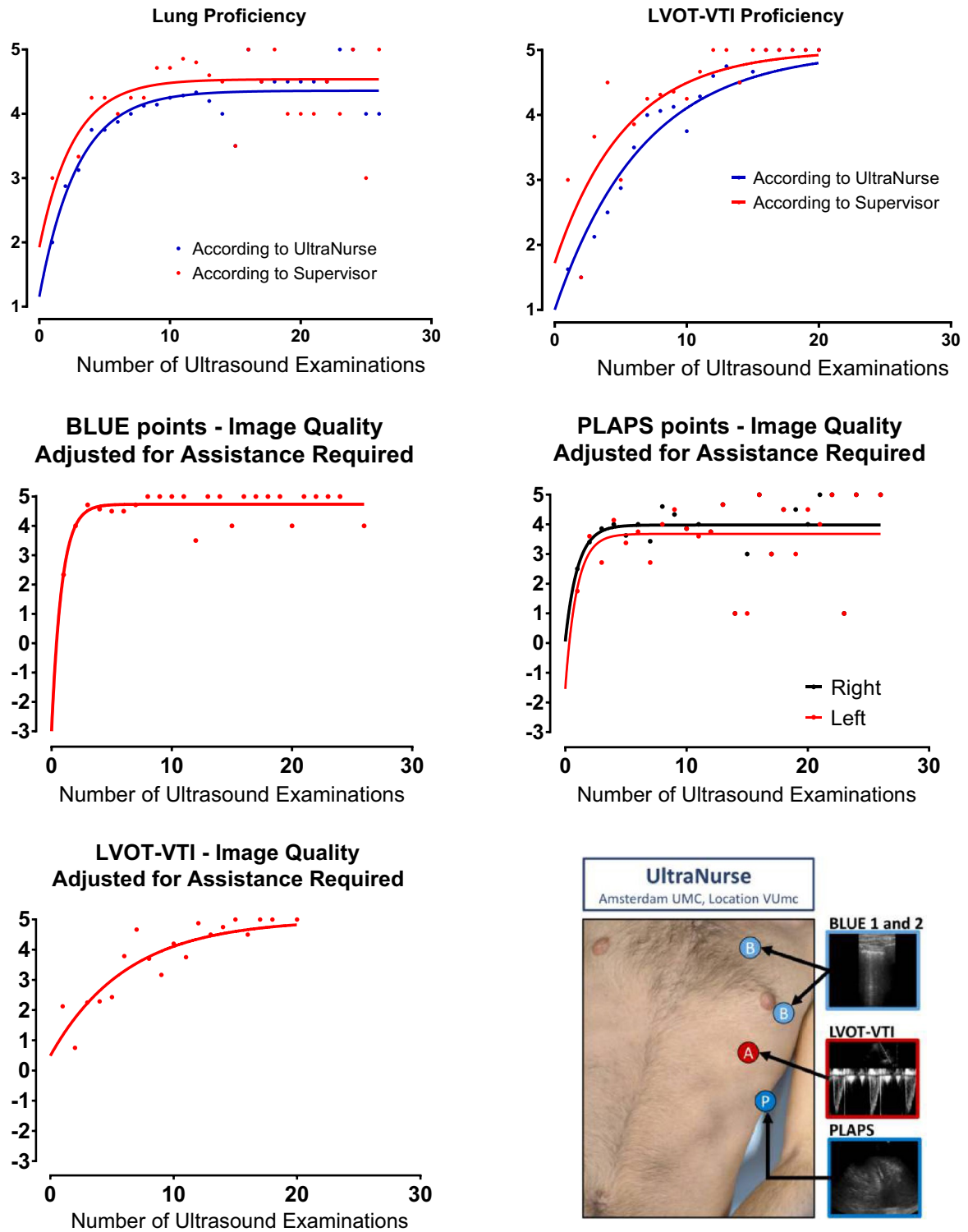

Fig. 1 UltraNurse overall proficiency and image quality after deduction of level of assistance required for LUS and LVOT-VTI as assessed by nurses and supervisors. Plotted are the average scores at each number of examinations performed. Solid lines represent the fitted learning curves. The right lower corner shows an overview of the UltraNurse scanning protocol. For clarity, only the left-side lung ultrasound scanning points are shown. Typical examples of ultrasound images are given for each point. The BLUE point image shows a typical example of multiple B lines. The LVOT-VTI shows a typical example of left ventricular outflow tract flow by pulsed wave Doppler. The PLAPS point shows a typical example of both pleural effusion and consolidation

provided ultrasound equipment is already present. We therefore recommend widespread consideration.

Please consult the Electronic Supplemental Material for detailed findings, discussion and recommendations.

Electronic supplementary material
The online version of this article (https://doi.org/10.1007/s00134-018-05512-x) contains supplementary material, which is available to authorized users.

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Compliance with ethical standards

Conflicts of interest
The authors declare that they have no competing interest.

Ethical approval
The local ethics committee permitted a waiver for informed consent for patient data processing (METc 2018.239). However, written informed consent by participating intensive care nurses was required and obtained.

Publisher's Note

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