


## LETTER TO THE EDITOR

# Simplified 8-site lung ultrasound examination to assess fluid overload in children on haemodialysis

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A recent article found the simplified 8-site assessment to correlate well with a classical full 28-site examination in the evaluation of volume overload, supporting its use in adult haemodialysis patients [1].

Assessment of fluid status is clinically important yet challenging in children on dialysis, and we previously reported the utility of lung ultrasound for this purpose [2]. Lung ultrasound is a non-invasive, bedside and emerging technique for the diagnosis of hypervolemia and quantifying the number of B-lines. Various scoring systems have been proposed to quantify the extent of extravascular lung water in children, but there is no

standardized system. Studies in paediatric haemodialysis patients use a 28-site examination [2, 3], or a 14-site scanning method for patients with weight <20 kg [2]. Four-zone [4] and 6-zone scores [5] have been also proposed in children not on dialysis. Using linear or convex probes to measure B-lines at 28 sites in neonates or young children can result in overlap between the different scanning sites. These technical challenges, and difficulties for some children cooperating with a 28-site examination, have hampered clinical uptake of lung ultrasound in paediatric dialysis.

**Table 1. Patient characteristics: clinical and epidemiological data**

	All patients on chronic haemodialysis (n = 15)
Age at onset of study, years	13.6 (4.1–16.4)
Gender distribution (M:F)	9:5
Duration of renal replacement therapy, months	8.5 (4.0–37.0)
Diagnosis of nephropathy	ANCA vasculitis (2), congenital FSGS, genetic FSGS, nephronophthisis (2), atypical haemolytic uraemic syndrome (2), SLE (2), immunoglobulin A nephropathy, bilateral hypodysplasia (3) and bilateral Wilms tumour
Percentage increase of interdialytic weight gain/dry weight	3.3 (0–8.6)
Oligoanuria, n (%)	3/15
Left ventricular hypertrophy, n (%)	9/15
NT-proBNP, mean	2906 (159–55 520)
Physical signs or symptoms of overt fluid overload, n (%)	12/42 (29) assessments 6/15 (40) patients

Data are presented as median and range.

ANCA, anti-neutrophil cytoplasmic autoantibody; FSGS, focal segmental glomerulosclerosis; F, female; M, male; NT-proBNP, N-terminal pro-brain natriuretic peptide; SLE, systemic lupus erythematosus.

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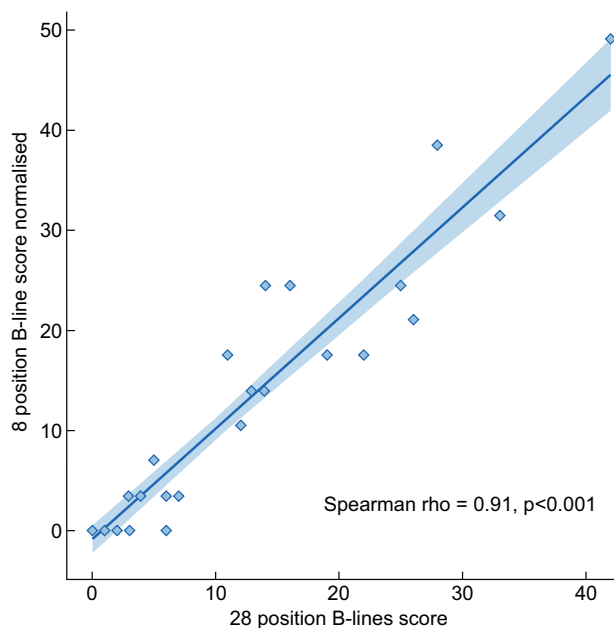


FIGURE 1: Comparison of 28-site versus 8-site B-line score in children on dialysis.

Recently, Loutradis *et al.* suggested that a simplified 8-site B-lines score technique should be adopted in the evaluation of volume overload in paediatric haemodialysis patients [6].

We therefore compared 28-site lung ultrasound assessments versus a simplified 8-site assessment in 15 children with a median (range) age of 13.6 (4.1–16.4) years and a median (range) duration on haemodialysis of 8.5 (4.0–37.0) months (Table 1). Children had examinations as part of clinical care, and parental consent for use of anonymized data was obtained. Each child had ultrasound examinations before dialysis, recording B-lines in 28 positions. An 8-position score was calculated by using the following eight sites only: four on the right and four on the left haemithorax (second and fourth rib spaces in the parasternal and anterior axillary positions). In order to facilitate comparison with 28-site scores, 8-site B-line scores were normalized by multiplying by 28/8. Correlation was assessed by Spearman's rho, and analyses were performed using R [RStudio Team (2020) RStudio: Integrated Development for R. RStudio, PBC, Boston, MA, USA; <http://www.rstudio.com/>].

We found a strong correlation between 28-site and 8-site B-line scores in children (Spearman's  $\rho=0.91$ ,  $P<0.001$ ; Figure 1). In 1 of 42 (2%) assessments, hypervolemia measured as six B-lines in the 28-site assessment was missed in the 8-site assessment (0 B-lines). In all other examinations, no clinically significant differences were observed.

Our data in children corroborate findings in adult haemodialysis patients, that 8-site B-line score is tightly related to the classical 28-site score, and this score holds an almost identical predictive power to the reference score. We therefore propose use of 8-site lung ultrasound assessments for children on dialysis with a view to broadening clinical uptake of the technique to optimize volume assessment in children. Further research in children should focus on optimizing both 28-site and 8-site B-lines scores to assess fluid overload, taking patients' age and body surface area into consideration.

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## CONFLICT OF INTEREST STATEMENT

None declared.

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