Prognostic value of lung ultrasound in chronic stable ambulatory heart failure patients

SUPPLEMENTARY DATA

Table 1 of the supplementary data

Univariable Cox regression analysis for the composite endpoint and for all-cause death

	Composite endpoint[a]			All-cause death		
	HR	95% CI	*P*	HR	95% CI	*P*
Total B-lines sum	1.05	1.03–1.08	<.001	1.06	1.04–1.09	<.001
Age, y	1.05	1.04–1.08	<.001	1.07	1.05–1.09	<.001
Female sex	1.12	0.80–1.58	.52	1.15	0.77–1.73	.49
Ischemic etiology	1.83	1.33–2.50	<.001	1.97	1.35–2.87	<.001
HF duration, y[b]	1.27	1.06–1.54	.01	1.20	0.97–1.50	.10
NYHA class	2.83	2.12–3.78	<.001	2.99	2.12–4.21	<.001
LVEF, %	0.98	0.97–0.99	.002	0.98	0.97–0.99	.02
Diabetes	1.75	1.28–2.39	<.001	1.67	1.15–2.43	.007
Hypertension	1.75	1.25–2.46	.001	1.79	1.19–2.69	.005
COPD	1.31	0.83–2.08	.25	1.28	0.74–2.21	.37
Atrial fibrillation/flutter	1.72	1.21–2.43	.002	1.57	1.04–2.39	.03
Anemia[c]	2.17	1.58–2.98	<.001	2.82	1.94–4.10	<.001
Renal insufficiency[d]	2.87	2.05–4.02	<.001	2.66	1.78–3.97	<.001
BMI, kg/m^2	0.97	0.94–1.00	.09	0.95	0.92–1.00	.03
NT-proBNP, ng/L[e]	2.10	1.80–2.45	<.001	2.25	1.87–2.72	<.001
Treatments						
ACEI or ARB	0.37	0.26–0.51	<.001	0.38	0.26–0.56	<.001
Beta-blocker	0.68	0.42–1.16	.13	0.51	0.30–0.86	.01

MRA	1.20	0.87–1.66	.26	1.20	1.15–1.68	0.79
Sacubitril/valsartan	0.94	0.30–2.96	.92	0.43	0.06–3.06	.40
Loop diuretic	2.22	1.49–3.31	<.001	2.04	1.28–3.26	.003
Digoxine	1.30	0.89–1.89	.18	1.00	0.62–1.61	.99
Ivabradine	0.84	0.53–1.31	.43	0.86	0.51–1.46	.58
Hydralazine	2.79	1.96–3.96	<.001	3.40	2.28–5.06	<.001
Nitrates	2.53	1.84–3.49	<.001	2.58	1.77–3.77	<.001
CRT	1.14	0.76–1.70	.54	1.37	0.86–2.16	.18
IDC	0.93	0.64–1.34	.69	0.83	0.53–1.31	.42

ACEI, angiotensin converting enzyme inhibitor; ARB, angiotensin II receptor blocker; BMI, body mass index; COPD, chronic obstructive pulmonary disease; CRT, cardiac resynchronization therapy; HF, heart failure; ICD, implantable cardiac defibrillator; LVEF, left ventricular ejection fraction; MRA, mineralocorticoid receptor antagonist; NYHA, New York Heart Association; NT-proBNP, N-terminal pro-brain natriuretic peptide.

[a] Composite of all-cause death or HF hospitalization.

[b] Log-transformed and in months.

[c] According to WHO criteria (< 13 g/dL in men and < 12 g/dL in women).

[d] Estimated glomerular filtration rate (Chronic Kidney Disease Epidemiology Collaboration equation) <60 mL/min per 1.73 m^2.

[e] Log-transformed and for 1 standard deviation.

Table 2 of the supplementary data

Study design, LUS-specific components and results

Patients	• Heart failure clinic • Ambulatory stable HF patients • Excluded patients: pulmonary fibrosis or radiological diffuse pleural fibrosis
LUS image adquisition	• Pocket device (V-scan simple model with a single sector probe, General Electric) • Phased array transducer, perpendicular to the ribs and an imaging depth of 14 cm • Patient in a supine position • Protocol: 8 areas
Lus image analysis	• Off-line analysis • Sonographer and reader blinded to clinical data, NT-proBNP and echocardiogram • Number of B-lines in each thoracic area • The sum of B-lines across all lung areas and the quartiles of such addition were used for the analyses
Data analyses	• Main clinical outcomes: composite endpoint of all-cause death or HF hospitalization and mortality from any cause • Follow-up: mean 31 ± 7 mo • Mean number of B-lines: 5 ± 6 • Q1, 0; Q2, 1-3; Q3, 4-7; Q4, ≥ 8 • Survival curves: having ≥ 8 B-lines (Q4) doubled the risk of experiencing the composite endpoint ($P <$ .001) and increased by 2.6-fold the risk of death from any cause ($P <$ .001) • Multivariable analysis: sum of B-lines across all lung areas remained as an independent prognostic factor of the composite endpoint and all-cause death, independently of the inclusion of NT-proBNP in the model

LUS, lung ultrasound; NT-proBNP, N-terminal pro-brain natriuretic peptide.

FIGURES OF THE SUPPLEMENTARY DATA

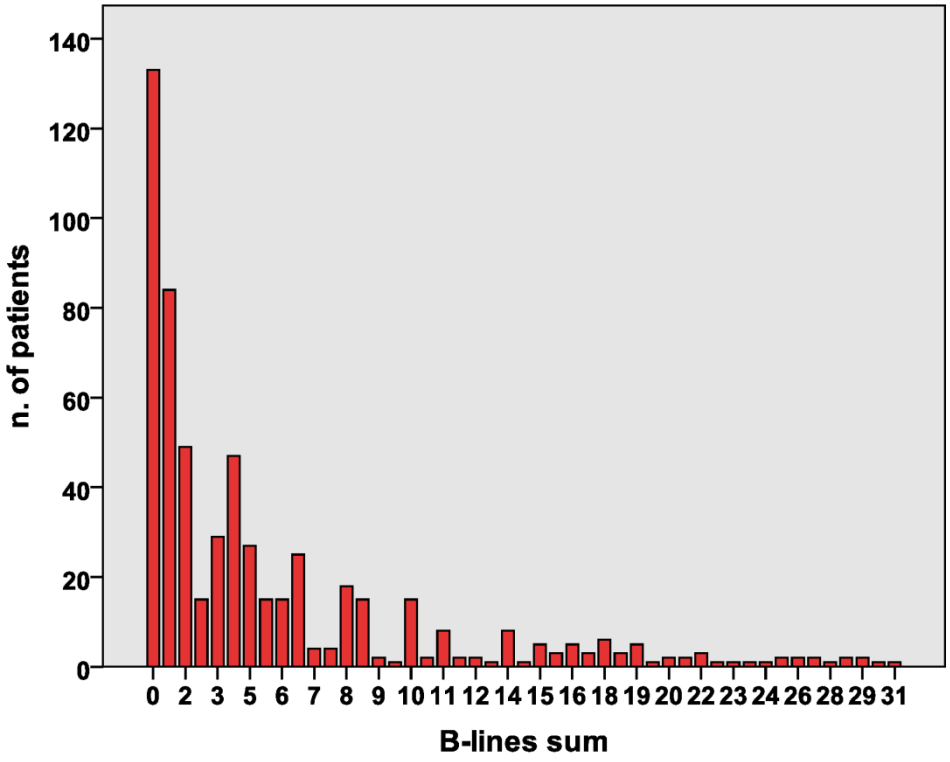

Figure 1 of the supplementary data. Distribution of sum of B-lines across all lung areas per patient in the total cohort. Around one fourth of the patients had 0 B-lines.

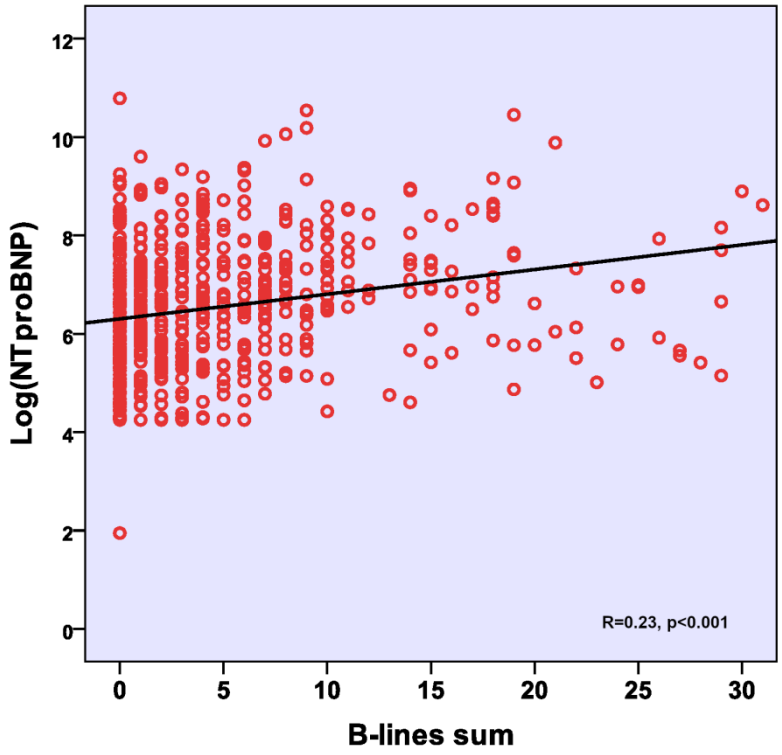

Figure 2 of the supplementary data. Scatter-plot representing the sum of B-lines (X axis) and logNTproBNP (X axis). A statistically significant but rather modest correlation was found.

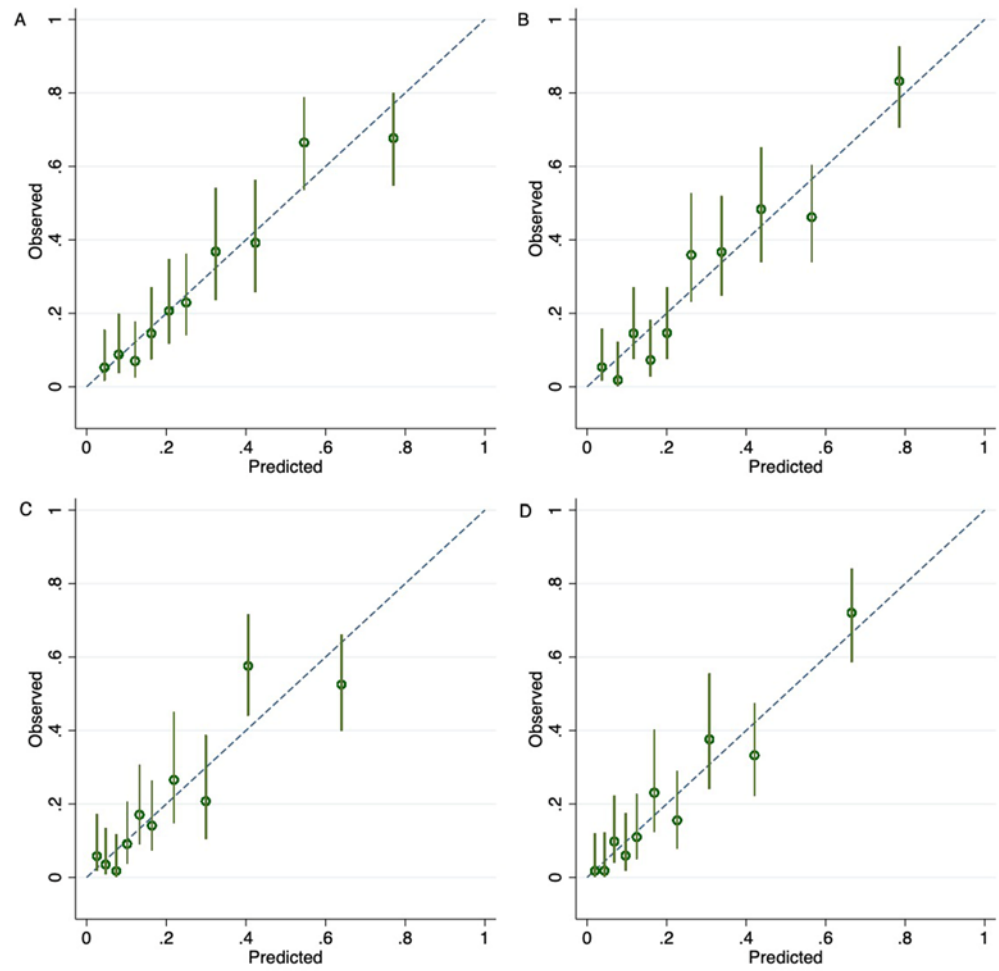

Figure 3 of the supplementary data. Calibration plots for the composite endpoint in predictive models with and without NT-proBNP (A and B) and for all-cause death in both models (C and D, respectively). Calibration was assessed by plotting the predicted probability of the clinical endpoint against the observed frequency.