

Supplementary Appendix

Supplement to: “Point-of-care lung ultrasound predicts severe disease and death due to COVID-19: a prospective cohort study.”

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Table S1. Cox proportional hazard regression adjusted models for risk of invasive mechanical ventilation or death by 28-days (N=215).

Covariates	Adjusted for age and sex			Adjusted for age, sex, and baseline severity*		
	aHR (95% CI)	p-value	Concordance (SE)	aHR (95% CI)	p-value	Concordance (SE)
Baseline HFNC or NIPPV	4.576 (1.388, 15.081)	0.013	0.795 (0.075)	—	—	—
Duration of symptoms (days)	1.033 (0.987, 1.081)	0.160	0.749 (0.070)	1.020 (0.975, 1.066)	0.397	0.793 (0.075)
Ultrasound characteristics						
mLUSS	2.990 (0.812, 11.018)	0.100	0.743 (0.067)	1.963 (0.503, 7.669)	0.332	0.789 (0.072)
A-lines (% lung fields)	0.223 (0.016, 3.060)	0.262	0.732 (0.065)	0.411 (0.021, 7.934)	0.556	0.796 (0.070)
B-lines (% lung fields)	2.137 (0.264, 17.325)	0.477	0.757 (0.070)	0.826 (0.093, 7.379)	0.864	0.794 (0.074)
Consolidation (% lung fields)	58.289 (0.853, 3981.290)	0.059	0.766 (0.049)	27.876 (0.287, 2709.998)	0.154	0.796 (0.064)
Pleural effusion (% lung fields)	16.418 (0.351, 768.695)	0.154	0.755 (0.046)	64.985 (0.894, 4725.88)	0.056	0.821 (0.045)
Any pleural line abnormalities (% lung fields)	21.779 (1.296, 365.951)	0.032	0.758 (0.049)	19.402 (1.217, 309.382)	0.036	0.806 (0.057)
Thick (≥ 0.5 cm) pleural line (% lung fields)**	87.333 (1.657, 4603.092)	0.027	0.736 (0.060)	99.762 (1.559, 6384.813)	0.030	0.795 (0.062)
Irregular pleural line (% lung fields) **	16.633 (0.522, 529.664)	0.111	0.751 (0.049)	18.701 (0.569, 614.480)	0.100	0.803 (0.058)
Fragmented pleural line (% lung fields)**	907.255 (11.899, 69172.625)	0.002	0.793 (0.042)	2759.267 (26.320, 28940)	0.001	0.841 (0.043)
Clinical parameters						
Oxygen saturation (min.), %	0.909 (0.866, 0.953)	0.000	0.807 (0.079)	0.918 (0.871, 0.968)	0.002	0.812 (0.079)
Oxygen saturation <92%	2.309 (0.667, 7.995)	0.187	0.765 (0.074)	1.368 (0.347, 5.395)	0.654	0.799 (0.074)
Respiratory rate (max.), breaths per minute	1.061 (1.009, 1.115)	0.021	0.784 (0.053)	1.042 (0.981, 1.108)	0.185	0.803 (0.060)
Respiratory rate (>20 breaths per minute)	2.691 (0.709, 10.211)	0.146	0.750 (0.067)	1.472 (0.323, 6.713)	0.618	0.797 (0.072)

Heart rate, beat per minute (max.)	1.008 (0.980, 1.038)	0.564	0.730 (0.069)	1.010 (0.983, 1.035)	0.483	0.789 (0.076)
Heart rate, >90 beats per minute	0.937 (0.285, 3.079)	0.914	0.735 (0.070)	1.324 (0.381, 4.602)	0.659	0.783 (0.075)
Temperature (max.), °C	1.088 (0.456, 2.593)	0.850	0.736 (0.071)	1.355 (0.543, 3.386)	0.515	0.787 (0.073)
Temperature, >38.0°C	1.882 (0.401, 8.847)	0.423	0.737 (0.073)	2.642 (0.547, 12.754)	0.226	0.794 (0.077)
Temperature (min.), °C	1.539 (0.318, 7.440)	0.592	0.741 (0.072)	2.305 (0.456, 11.652)	0.312	0.792 (0.077)
Temperature, <36.0°C	1.173 (0.333, 4.127)	0.804	0.732 (0.070)	0.951 (0.273, 3.310)	0.937	0.793 (0.075)
White blood count (max.), x10 ⁹ cells/L	0.978 (0.856, 1.117)	0.741	0.727 (0.072)	0.954 (0.808, 1.127)	0.578	0.795 (0.076)
White blood count, >12x10 ⁹ cells/L	0.000 (0.000, Inf)	0.998	0.776 (0.062)	0.000 (0.000, Inf)	0.998	0.829 (0.066)
White blood count (min.), x10 ⁹ cells/L	0.994 (0.858, 1.152)	0.940	0.730 (0.071)	0.979 (0.827, 1.159)	0.808	0.795 (0.075)
White blood count, <4x10 ⁹ cells/L	1.069 (0.225, 5.071)	0.933	0.729 (0.070)	1.469 (0.296, 7.285)	0.638	0.797 (0.077)
SIRS (continuous)	1.220 (0.688, 2.165)	0.497	0.734 (0.067)	1.138 (0.612, 2.116)	0.683	0.792 (0.074)
SIRS, ≥2 points	1.011 (0.307, 3.328)	0.986	0.734 (0.070)	0.886 (0.265, 2.967)	0.844	0.797 (0.076)

Note: *Adjusted for requirement of high flow nasal cannula or non-invasive positive pressure ventilation at or by baseline. HFNC: high flow nasal cannula; HFNC: non-invasive positive pressure ventilation; SIRS: systemic inflammatory response syndrome. **There were a limited number of non-zero observations: thick (≥0.5cm) pleural line, 53 (19.70%); irregular pleural line, 108 (40.15%); fragmented pleural line, 48 (17.84%). Max.: maximum value on day of ultrasound; Min.: minimum value on day of ultrasound.

Table S2. Cox proportional hazard regression adjusted models for risk of death by 28-days (N=264).

Covariates	Adjusted for age and sex			Adjusted for age, sex, and baseline severity**		
	aHR (95% CI)	p-value	Concordance (SE)	aHR (95% CI)	p-value	Concordance (SE)
Baseline HFNC or NIPPV	2.301 (0.384, 13.808)	0.362	0.850 (0.034)	—	—	—
Baseline invasive mechanical ventilation requirement	10.502 (2.770, 39.816)	0.001		—	—	—
Duration of symptoms (days)	1.031 (1.008, 1.054)	0.009	0.798 (0.043)	1.009 (0.982, 1.037)	0.524	0.854 (0.033)
Ultrasound characteristics						
mLUSS	3.104 (1.285, 7.500)	0.012	0.760 (0.047)	1.512 (0.569, 4.018)	0.407	0.848 (0.036)
A-lines (% lung fields)	0.103 (0.017, 0.631)	0.014	0.753 (0.061)	0.572 (0.067, 4.852)	0.609	0.849 (0.035)
B-lines (% lung fields)	13.444 (1.240, 145.762)	0.033	0.769 (0.045)	4.312 (0.381, 48.769)	0.238	0.851 (0.037)
Consolidation (% lung fields)	6.471 (0.464, 90.253)	0.165	0.719 (0.058)	0.948 (0.053, 17.044)	0.971	0.851 (0.034)
Pleural effusion (% lung fields)	13.835 (2.080, 92.023)	0.007	0.761 (0.053)	3.874 (0.569, 26.398)	0.167	0.855 (0.033)
Any pleural line abnormalities (% lung fields)	20.933 (3.338, 131.297)	0.001	0.768 (0.059)	4.668 (0.537, 40.565)	0.162	0.849 (0.034)
Thick (≥ 0.5 cm) pleural line (% lung fields)	39.849 (2.011, 789.843)	0.016	0.752 (0.057)	5.911 (0.201, 174.147)	0.303	0.849 (0.035)
Irregular pleural line (% lung fields)	32.222 (4.118, 252.120)	0.001	0.768 (0.059)	7.233 (0.753, 69.502)	0.087	0.852 (0.035)
Fragmented pleural line (% lung fields)	90.577 (3.078, 2664.971)	0.009	0.716 (0.060)	10.184 (0.269, 385.220)	0.211	0.844 (0.037)
Clinical parameters						
Oxygen saturation (min.), %	0.975 (0.916, 1.036)	0.410	0.724 (0.051)	0.989 (0.921, 1.062)	0.758	0.852 (0.032)
Oxygen saturation <92%	2.210 (0.736, 6.635)	0.158	0.752 (0.048)	1.726 (0.554, 5.384)	0.347	0.850 (0.035)
Respiratory rate (max.), breaths per minute	1.034 (0.992, 1.078)	0.111	0.730 (0.057)	1.009 (0.966, 1.054)	0.686	0.849 (0.035)

Respiratory rate (>20 breaths per minute)	3.148 (0.875, 11.325)	0.079	0.740 (0.064)	1.948 (0.505, 7.505)	0.333	0.848 (0.038)
Heart rate, beat per minute (max.)	1.023 (1.002, 1.046)	0.035	0.770 (0.052)	1.014 (0.990, 1.038)	0.261	0.849 (0.043)
Heart rate, >90 beats per minute	2.327 (0.728, 7.437)	0.154	0.738 (0.052)	1.688 (0.490, 5.821)	0.407	0.847 (0.040)
Temperature (max.), °C	1.561 (0.820, 2.972)	0.175	0.749 (0.040)	1.200 (0.614, 2.348)	0.594	0.849 (0.035)
Temperature, >38.0°C	1.956 (0.534, 7.161)	0.311	0.724 (0.046)	1.275 (0.332, 4.891)	0.724	0.851 (0.034)
Temperature (min.), °C	1.126 (0.336, 3.768)	0.848	0.709 (0.052)	0.777 (0.294, 2.054)	0.611	0.842 (0.039)
Temperature, <36.0°C	1.314 (0.430, 4.014)	0.632	0.708 (0.060)	1.631 (0.522, 5.100)	0.400	0.847 (0.039)
White blood count (max.), x10 ⁹ cells/L	1.009 (0.925, 1.101)	0.844	0.708 (0.055)	0.930 (0.822, 1.052)	0.250	0.858 (0.034)
White blood count, >12x10 ⁹ cells/L	0.648 (0.144, 2.916)	0.572	0.707 (0.060)	0.297 (0.064, 1.371)	0.120	0.865 (0.033)
White blood count (min.), x10 ⁹ cells/L	1.023 (0.932, 1.124)	0.630	0.714 (0.053)	0.948 (0.839, 1.070)	0.384	0.857 (0.034)
White blood count, <4x10 ⁹ cells/L	0.526 (0.068, 4.077)	0.539	0.714 (0.051)	1.515 (0.158, 14.517)	0.719	0.848 (0.036)
SIRS (continuous)	1.510 (0.931, 2.448)	0.095	0.745 (0.056)	1.157 (0.713, 1.879)	0.554	0.852 (0.036)
SIRS, ≥2 points	2.752 (0.767, 9.876)	0.120	0.742 (0.054)	1.855 (0.507, 6.793)	0.351	0.846 (0.040)

Note: *Adjusted for requirement of high flow nasal cannula or non-invasive positive pressure ventilation, or invasive mechanical ventilation at or by baseline. HFNC: high flow nasal cannula; HFNC: non-invasive positive pressure ventilation. SIRS: systemic inflammatory response syndrome. Max.: maximum value on day of ultrasound; Min.: minimum value on day of ultrasound.

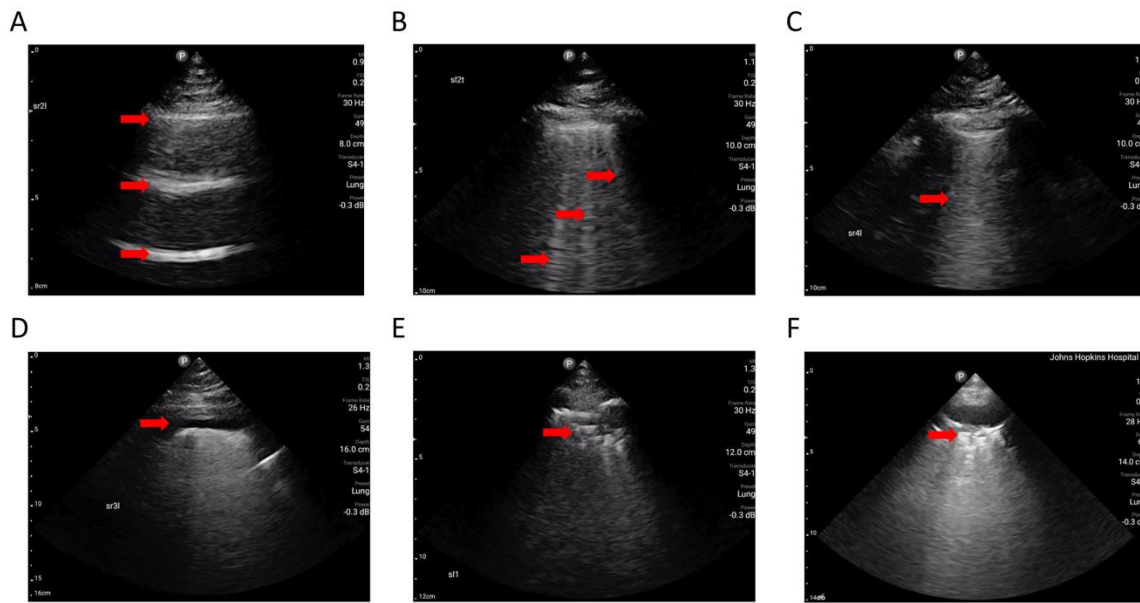


Figure S1. Lung ultrasound characteristics. 1A: A lines (arrows) are shown indicating normal lung aeration; 1B: discrete B lines (arrows), implicating subpleural interstitial edema; 1C: a coalesced B line (arrow); 1D: a small pleural effusion (arrow); 1E: fragmented pleural line (arrow); 1F: a subpleural consolidation (arrow).

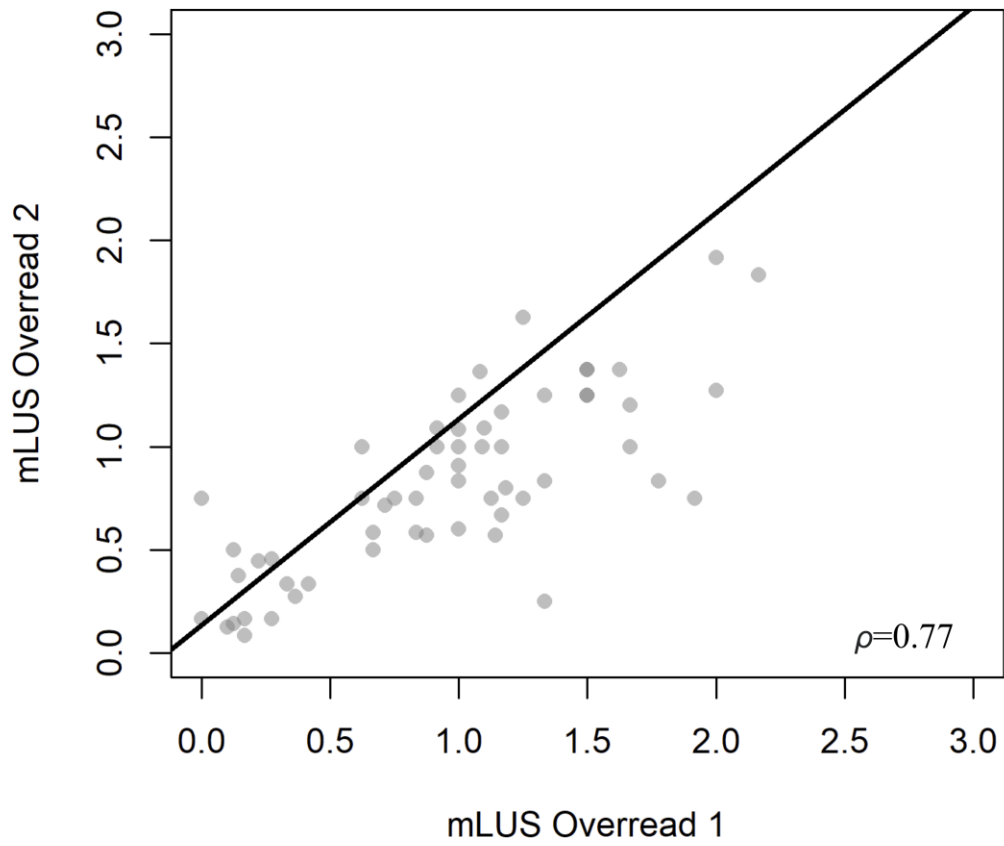


Figure S2. Correlation between two independent ultrasound clip readers for mLUSS (Pearson's $\rho=0.77$).