

## Supplementary Digital Content

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## 2. Supplementary data

eTable 1: Baseline and intraoperative characteristics unmatched cohort (sensitivity analysis)

	<b>Anaemia</b> ♀: Hb < 12 ♂: Hb < 13 (n = 1644)	<b>No anaemia</b> ♀: Hb ≥ 12 ♂: Hb ≥ 13 (n = 6617)	<b>P value</b>
Age, years	59.0 [43.0 to 73.0]	53.0 [40.0 - 65.0]	<0.001
Female gender	906 (55.1)	3663 (55.4)	0.878
Body mass index, kg m <sup>-2</sup>	25.3 [22.5 to 28.7]	26.5 [23.6 to 30.1]	<0.001
ASA	2.0 [2.0 to 3.0]	2.0 [1.0 to 2.0]	<0.001
Anaemia category			<0.001
No anaemia (Hb >12♀; >13♂)	0 (0.0)	6617 (100.0)	
Mild anaemia (Hb 11–11.9♀; 11–12.9♂)	1009 (61.4)	0 (0.0)	
Moderate anaemia (Hb 8–10.9)	608 (37.0)	0 (0.0)	
Severe anaemia (Hb<8)	27 (1.6)	0 (0.0)	
ARISCAT	26.0 [15.0 to 40.2]	15.0 [3.0 to 26.0]	<0.001
Functional status			<0.001
Independent	1351 (82.3)	6237 (94.3)	
Partially dependent	240 (14.6)	319 (4.8)	
Totally dependent	51 (3.1)	59 (0.9)	
COPD	127 (7.7)	396 (6.0)	0.011
Cancer	171 (10.4)	203 (3.1)	<0.001
Chronic kidney failure	154 (9.4)	134 (2.0)	<0.001
Heart failure	188 (11.4)	363 (5.5)	<0.001
Preoperative red blood cell transfusion	69 (4.2)	5 (0.1)	<0.001
Preoperative haemoglobin, g dL <sup>-1</sup>	11.3 [10.4 to 11.8]	14.1 [13.3 to 15.1]	<0.001
Condition surgery			<0.001
Elective	1295 (78.8)	5959 (90.1)	
Urgency	268 (16.3)	510 (7.7)	
Emergency	81 (4.9)	146 (2.2)	
Surgical technique			<0.001
Open	523 (31.9)	1109 (16.8)	
Laparoscopic	243 (14.8)	1222 (18.5)	
Laparo-assisted	26 (1.6)	108 (1.6)	
Peripheral	285 (17.4)	1171 (17.7)	

	<b>Anaemia</b>	<b>No anaemia</b>	
	♀: Hb < 12	♀: Hb ≥ 12	<b>P value</b>
	♂: Hb < 13	♂: Hb ≥ 13	
	<b>(n = 1644)</b>	<b>(n = 6617)</b>	
Other	565 (34.4)	3000 (45.4)	
Use of epidural anaesthesia	154 (9.4)	297 (4.5)	<0.001
Antibiotic prophylaxis	1286 (78.3)	4628 (70.0)	<0.001
Duration of anaesthesia, minutes	120.5 [80 to 195]	105.0 [70 to 160]	<0.001
Duration of surgery, minutes	90.0 [55 to 153]	75.0 [45 to 123]	<0.001
Total fluid intake, L	1.5 [1.0 to 2.0]	1.0 [0.8 to 1.6]	<0.001
Crystalloids, L	1.1 [1.0 to 2.0]	1.0 [0.8 to 1.5]	<0.001
Colloids, L	0.5 [0.3 to 0.5]	0.5 [0.0 to 0.5]	<0.001
Red blood cell transfusion during surgery	173 (10.5)	144 (2.2)	<0.001

Data presented as median [IQR 25 – 75] or N (%). The group with anaemic patients includes all anaemic patients. ARISCAT, Assess Respiratory Risk in Surgical Patients in Catalonia score; COPD, chronic obstructive pulmonary disease; Hb, haemoglobin. RBC, red blood cell; ♀, female patients; ♂, male patients.

eTable 2: Baseline and intraoperative characteristics matched cohort (sensitivity analysis)

	<b>Anaemia</b> ♀: Hb < 12 ♂: Hb < 13 (n = 900)	<b>No anaemia</b> ♀: Hb ≥ 12 ♂: Hb ≥ 13 (n = 1636)	<b>P value</b>
Age, years	57.0 [43.0 to 70.0]	56.5 [43.0 to 67.0]	0.039
Female gender	381 (42.3)	735 (44.9)	0.224
Body mass index, kg m <sup>-2</sup>	25.5 [22.6 to 29.0]	25.9 [23.0 to 29.4]	0.029
ASA	2.0 [2.0 to 3.0]	2.0 [2.0 to 3.0]	0.023
Anaemia category			<0.001
No anaemia (Hb >12♀; >13♂)	0 (0.0)	1636 (100.0)	
Mild anaemia (Hb 11–11.9♀; 11–12.9♂)	626 (69.6)	0 (0.0)	
Moderate anaemia (Hb 8–10.9)	268 (29.8)	0 (0.0)	
Severe anaemia (Hb<8)	6 (0.7)	0 (0.0)	
ARISCAT without anaemia	18.0 [11.0 - 34.0]	18.0 [8.0 - 31.2]	0.163
Functional status			0.400
Independent	799 (88.8)	1478 (90.3)	
Partially dependent	88 (9.8)	134 (8.2)	
Totally dependent	13 (1.4)	24 (1.5)	
COPD	72 (8.0)	109 (6.7)	0.242
Cancer	71 (7.9)	105 (6.4)	0.189
Chronic kidney failure	63 (7.0)	78 (4.8)	0.024
Heart failure	88 (9.8)	125 (7.6)	0.075
Preoperative red blood cell transfusion	2 (0.2)	4 (0.2)	1.000
Preoperative haemoglobin, g dL <sup>-1</sup>	11.4 [10.7 to 11.9]	14.0 [13.2 to 15.0]	<0.001
Condition surgery			0.959
Elective	767 (85.2)	1400 (85.6)	
Urgency	105 (11.7)	188 (11.5)	
Emergency	28 (3.1)	48 (2.9)	
Surgical technique			0.938
Open	262 (29.1)	459 (28.1)	
Laparoscopic	147 (16.3)	267 (16.3)	
Laparo-assisted	17 (1.9)	37 (2.3)	
Peripheral	153 (17.0)	273 (16.7)	
Other	321 (35.7)	600 (36.7)	
Use of epidural anaesthesia	82 (9.1)	130 (7.9)	0.348
Antibiotic prophylaxis	691 (76.8)	1215 (74.3)	0.176

	<b>Anaemia</b>	<b>No anaemia</b>	
	♀: Hb < 12	♀: Hb ≥ 12	<b>P value</b>
	♂: Hb < 13	♂: Hb ≥ 13	
	<b>(n = 900)</b>	<b>(n = 1636)</b>	
Duration of anaesthesia, minutes	120.0 [80.0 to 190.0]	120.0 [78.0 to 190.0]	0.320
Duration of surgery, minutes	90.0 [55.0 to 148.0]	87.0 [54.0 to 149.8]	0.314
Total fluid intake, L	1.5 [1.0 to 2.0]	1.1 [1.0 to 2.0]	0.122
Crystalloids, L	1.1 [1.0 to 2.0]	1.0 [1.0 to 2.0]	0.095
Colloids, L	0.5 [0.8 to 0.5]	0.5 [0.3 to 0.5]	0.158
Red blood cell transfusion during surgery	47 (5.2)	84 (5.1)	0.999

Data presented as median [IQR 25 – 75] or N (%). The group with anaemic patients includes all anaemic patients. ARISCAT, Assess Respiratory Risk in Surgical Patients in Catalonia score; COPD, chronic obstructive pulmonary disease; Hb, haemoglobin. RBC, red blood cell; ♀, female patients; ♂, male patients.

eTable 3: Patient outcomes and adverse events unmatched cohort (sensitivity analysis)

	<b>Anaemia</b>	<b>No anaemia</b>	
	♀: Hb < 12	♀: Hb ≥ 12	<b>P value</b>
	♂: Hb < 13	♂: Hb ≥ 13	
	<b>(n = 1644)</b>	<b>(n = 6617)</b>	
Hospital length of stay, days	4.0 [2.0 to 8.0]	3.0 [1.0 to 5.0]	<0.001
In-hospital mortality	25 (1.7)	28 (0.5)	<0.001
Intraoperative adverse events <sup>a</sup>	652 (39.7)	2161 (32.7)	<0.001
Hypotension	517 (31.5)	1641 (24.8)	<0.001
Need of vasopressor	451 (27.5)	1353 (20.5)	<0.001
Arrhythmia	15 (0.9)	38 (0.6)	0.173
PPCs <sup>b</sup>	264 (16.4)	633 (9.7)	<0.001
Need of oxygen	207 (12.9)	516 (7.9)	<0.001
Respiratory failure	50 (3.1)	102 (1.6)	<0.001
Need of mechanical ventilation	36 (2.2)	65 (1.0)	<0.001
ARDS	5 (0.3)	4 (0.1)	0.022
Pneumonia	14 (0.9)	22 (0.3)	0.007
Barotrauma	3 (0.2)	8 (0.1)	0.802

Data presented as median [IQR 25 to 75] or number (*n* (%)). <sup>a</sup> Total intraoperative AEs: number and proportion of patients who developed at least one AE. <sup>b</sup> Total PPCs: number and proportion of patients who developed at least one PPC. AEs, adverse events; ARDS, adult respiratory distress syndrome; Hb, haemoglobin; PPCs, postoperative pulmonary complications; ♀, female patients; ♂, male patients.

eTable 4: Patient outcomes and adverse events matched cohort (sensitivity analysis)

	<b>Anaemia</b>	<b>No anaemia</b>	
	♀: <b>Hb &lt; 12</b>	♀: <b>Hb ≥ 12</b>	<b>P value</b>
	♂: <b>Hb &lt; 13</b>	♂: <b>Hb ≥ 13</b>	
	<b>(n = 900)</b>	<b>(n = 1636)</b>	
Hospital length of stay, days	4.0 [2.0 to 6.0]	3.0 [1.0 to 6.0]	<0.001
In-hospital mortality	6 (0.7)	8 (0.5)	0.764
Intraoperative AEs <sup>a</sup>			
Hypotension	340 (37.8)	610 (37.3)	0.833
Need of vasopressor	268 (29.8)	463 (28.3)	0.455
Arrhythmia	232 (25.8)	416 (25.4)	0.879
	4 (0.4)	13 (0.8)	0.436
PPCs <sup>b</sup>			
Need of oxygen	141 (15.7)	215 (13.2)	0.091
Respiratory failure	116 (12.9)	166 (10.2)	0.042
Need of mechanical ventilation	24 (2.7)	38 (2.3)	0.688
ARDS	15 (1.7)	21 (1.3)	0.546
Pneumonia	1 (0.1)	2 (0.1)	1.000
Barotrauma	5 (0.6)	13 (0.8)	0.660
	2 (0.2)	4 (0.2)	1.000

Data presented as median [IQR 25 to 75] or number (*n* (%)). <sup>a</sup> Total intraoperative AEs: number and proportion of patients who developed at least one AE. <sup>b</sup> Total PPCs: number and proportion of patients who developed at least one PPC. AEs, adverse events; ARDS, adult respiratory distress syndrome; Hb, haemoglobin; PPCs, postoperative pulmonary complications; ♀, female patients; ♂, male patients.

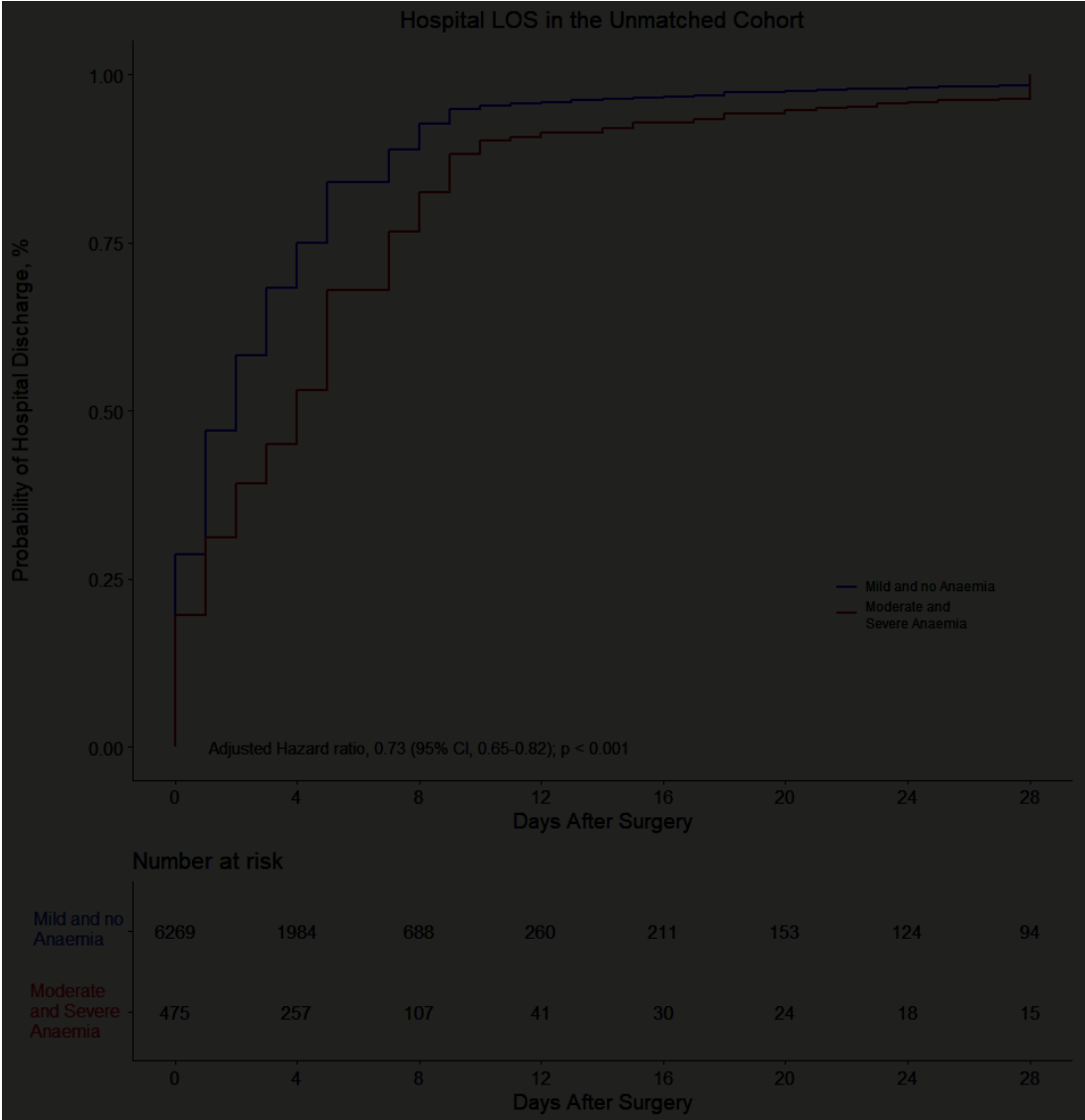


eTable 5: Different models evaluating preoperative anaemia and length of hospital stay in the matched cohort of moderate and severe anaemia

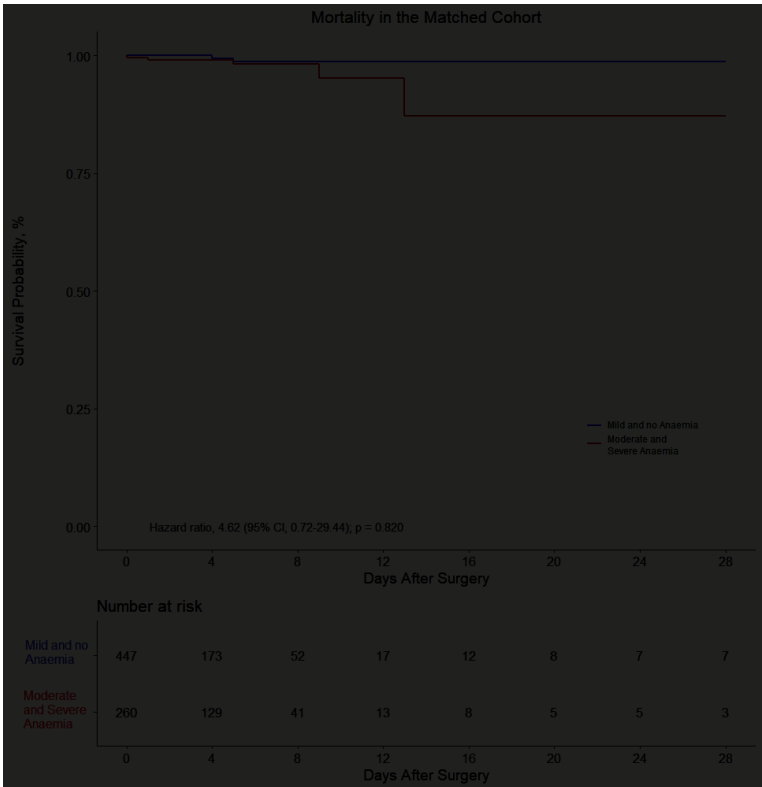
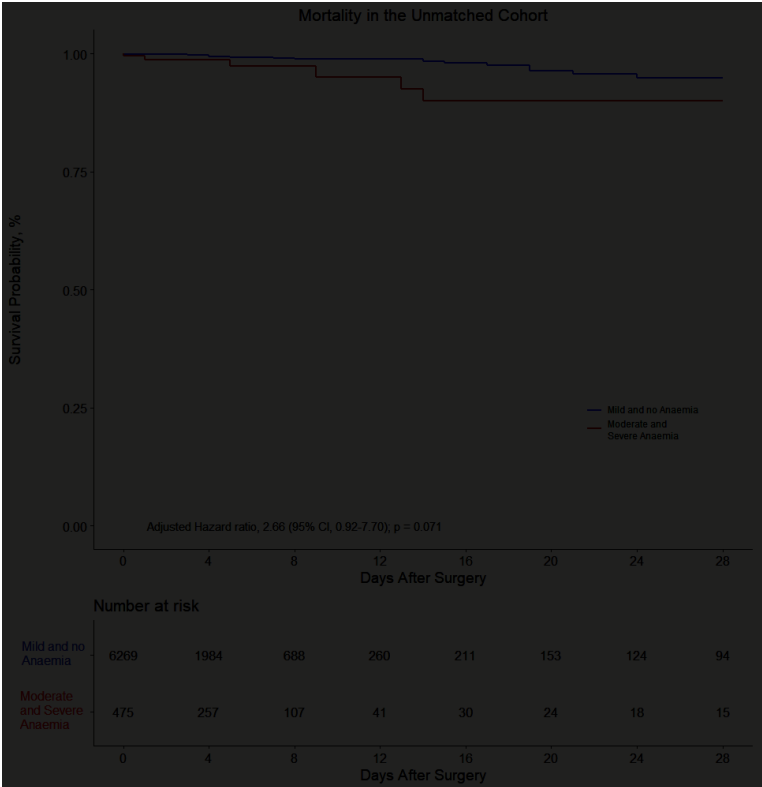
<b>Model</b>	<b>Mean difference (95%CI)</b>	<b>P value</b>
Mixed-effect linear regression model adjusted for the CBPS as a linear term	1.12 (0.57 to 1.68)	< 0.001
Mixed-effect linear regression model adjusted for the CBPS as decile categories	1.10 (0.57 to 1.63)	< 0.001
Inverse-probability-of-treatment-weighted mixed-effect linear regression model with the weights $1/cbps$ for anaemic individuals and $1/(1 - cbps)$ for non-anaemic individuals	2.48 (2.47 to 2.48)	< 0.001
Standardized mortality ratio-weighted mixed-effect linear regression model with weights of 1 for anaemic and $cbps/(1 - cbps)$ for non-anaemic individuals	0.95 (0.95 to 0.96)	< 0.001
Mixed-effect linear regression model in the matched cohort	1.48 (0.13 to 2.82)	0.031

CBPS, covariate balanced propensity score

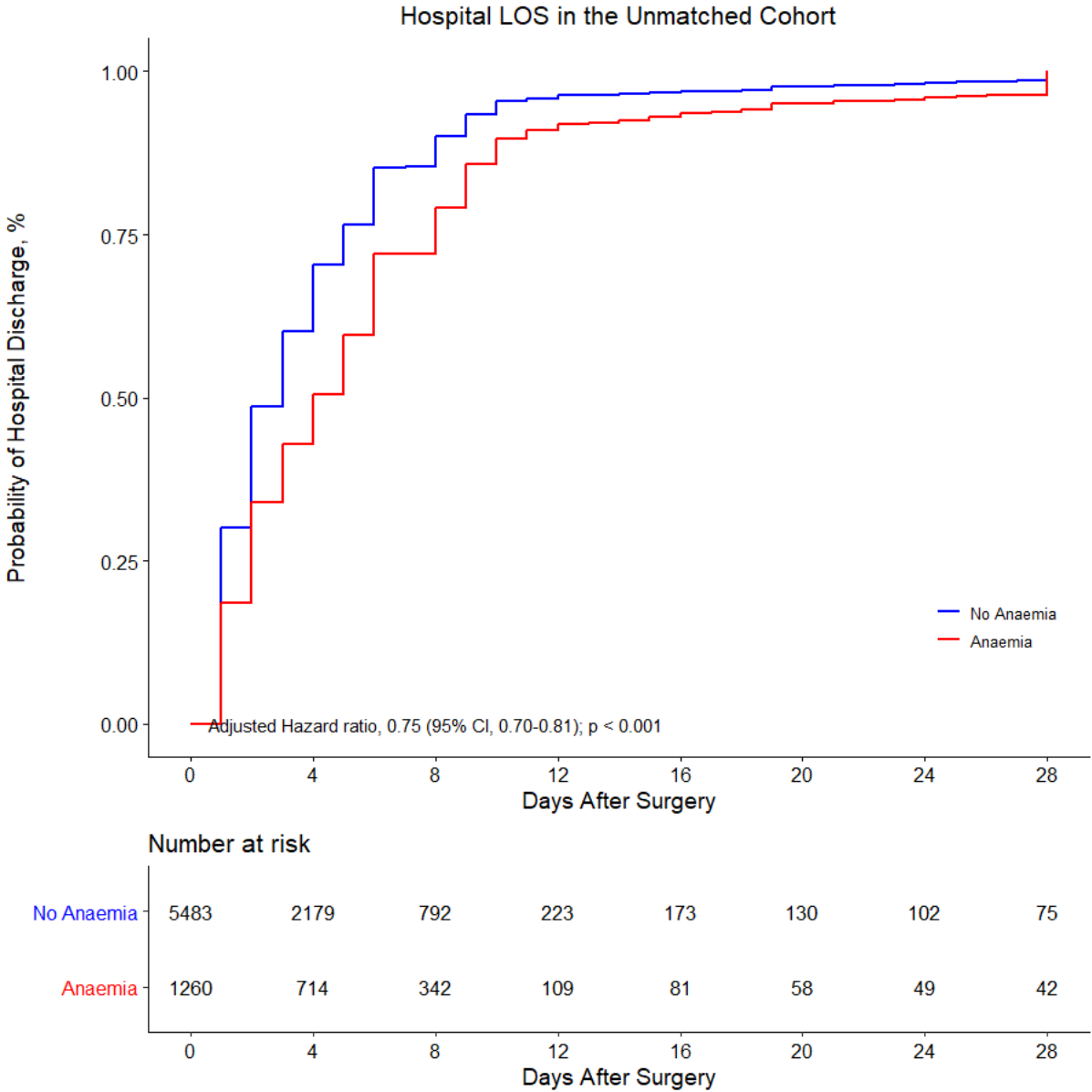
eFigure 1: Probability of hospital discharge in the unmatched cohort



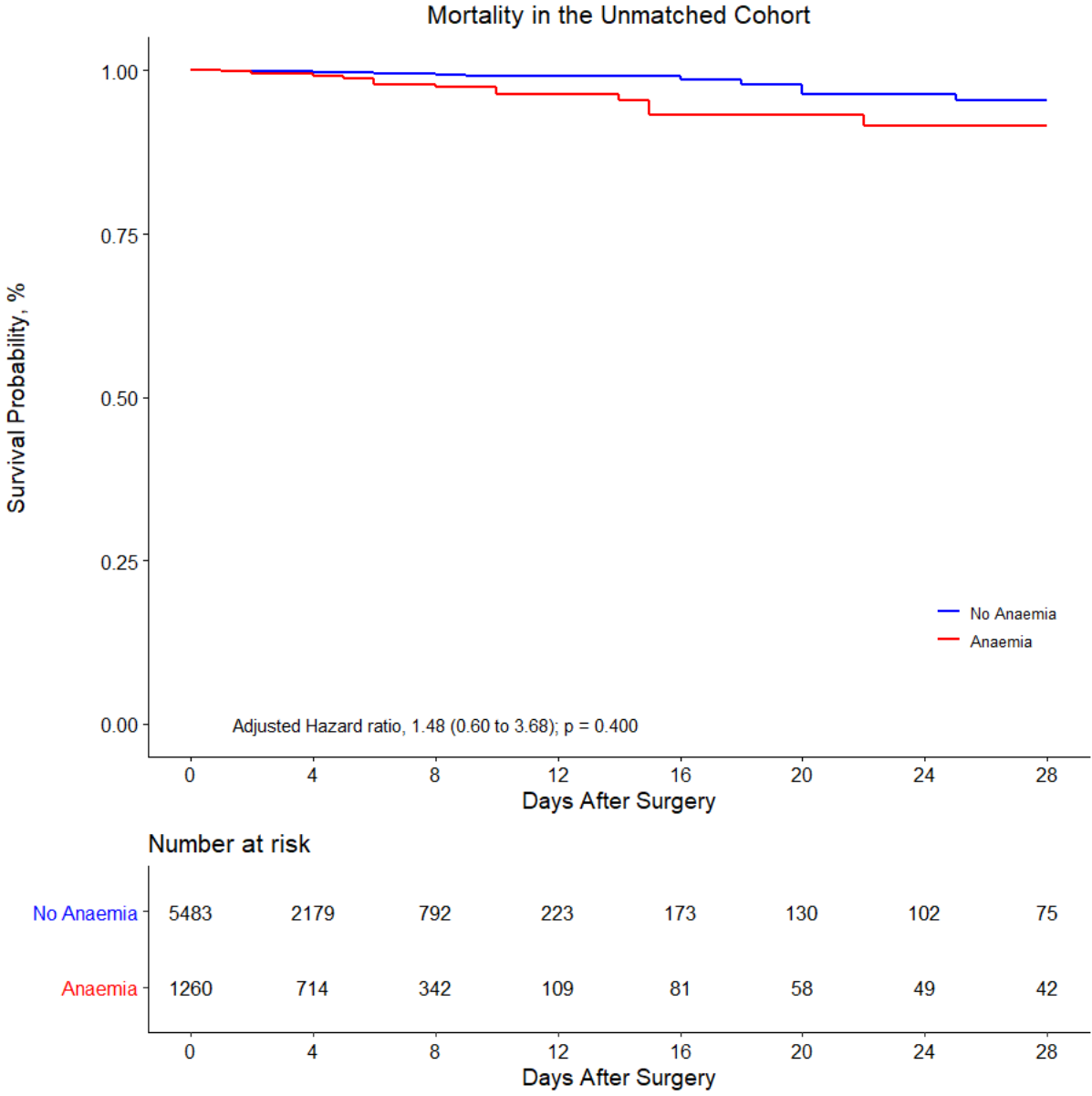
eFigure 2: Probability of survival in unmatched and matched anaemic and non-anaemic patients



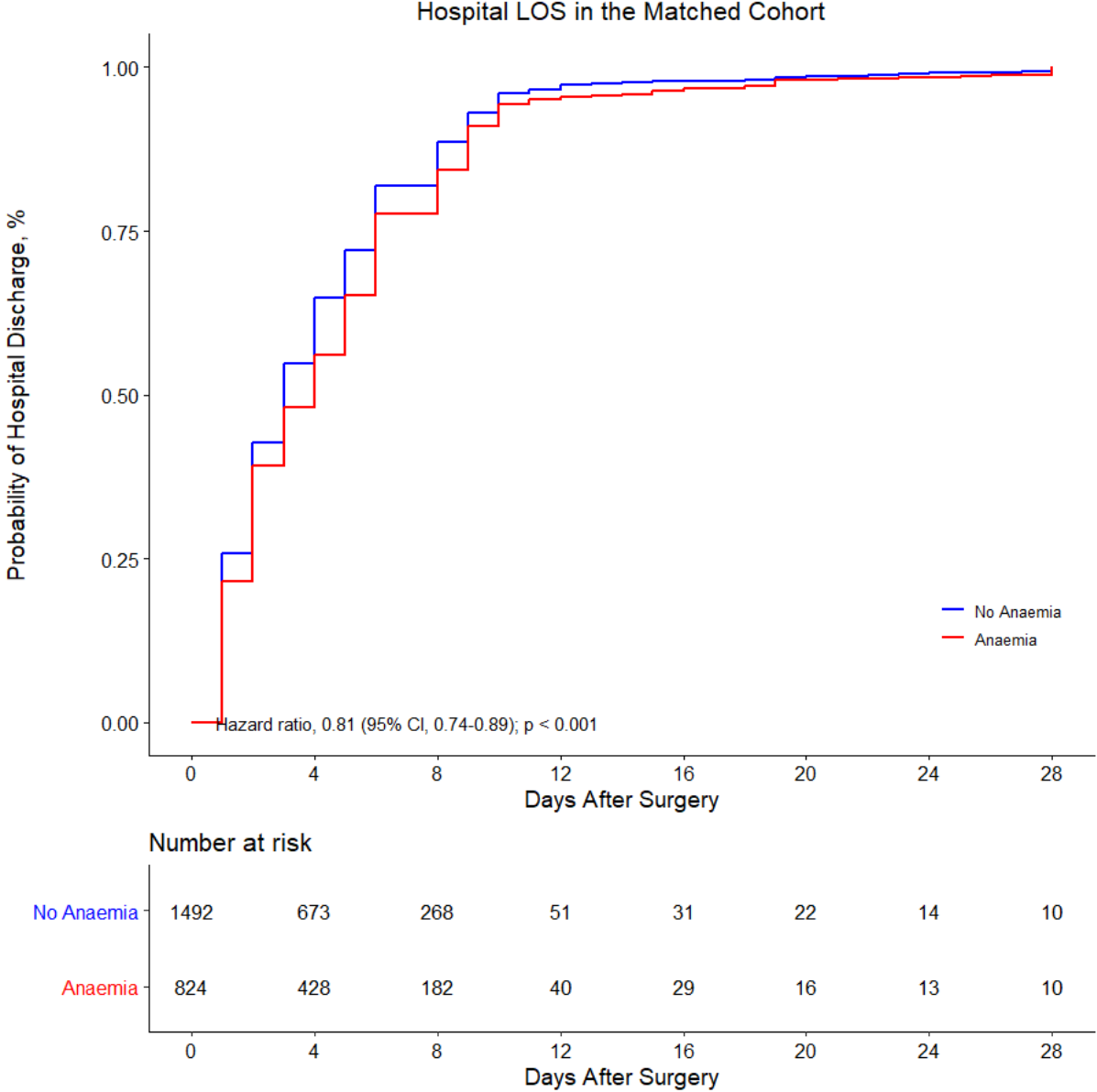
eFigure 3: Probability of hospital discharge in the unmatched cohort (sensitivity analysis)



eFigure 4: Probability of survival in unmatched anaemic and non-anaemic patients (sensitivity analysis)



eFigure 5: Probability of hospital discharge in the matched cohort (sensitivity analysis)



eFigure 6: Probability of survival in matched anaemic and non-anaemic patients (sensitivity analysis)

