



## **Supporting Information**

### **Supplementary tables**

**This appendix was part of the submitted manuscript and has been peer reviewed.  
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Appendix to: Darvall JN, Bellomo R, Paul E, et al. Frailty in very old critically ill patients in Australia and New Zealand: a population-based cohort study. *Med J Aust* 2019; doi: 10.5694/mja2.50329.

**Table 1. Baseline demographic characteristics and outcomes for intensive care unit (ICU) patients with recorded frailty scores (included in main analysis) or without recorded frailty scores**

Variable	Patients with frailty scores	Patients without frailty scores
Number	15 613	30 160
Age (years), median (IQR)	84.6 (82.1–87.8)	84.3 (81.9–87.4)
Sex (male)	8247 (52.8%)	16 388 (54.3%)
APACHE II score, median (IQR)	16 (13–20)	16 (13–21)
APACHE III-j score, median (IQR)	58 (48–71)	59 (49–73)
ANZROD, median (IQR)	4.9 (1.6–16.2)	5.0 (1.7–15.8)
Treatment limitations on admission	3103 (19.9%)	4885 (16.4%)
Admission type		
Non-surgical	6878 (44.1%)	13 338 (44.2%)
Elective surgical (planned ICU admission)	5988 (38.4%)	12 046 (40.8%)
Emergency surgical	2747 (17.6%)	4776 (15.8%)
ICU diagnostic category		
Sepsis	1422 (9.1%)	2539 (8.4%)
Trauma	631 (4.0%)	1321 (4.4%)
Cardiac surgery	1165 (7.5%)	2663 (8.8%)
Other cardiovascular	2887 (18.5%)	5231 (17.3%)
Respiratory	2125 (13.6%)	4045 (13.4%)
Neurological	1322 (8.5%)	2713 (9.0%)
Gastrointestinal	3170 (20.3%)	6297 (20.9%)
Other	2891 (18.5%)	5351 (17.7%)
Length of stay (days), median (IQR)		
ICU	1.7 (0.9–3.0)	1.8 (0.9–3.1)
Hospital (including ICU)	9.2 (5.4–5.9)	9.7 (5.6–17)
Deaths		
ICU	979 (6.3%)	2141 (7.1%)
Hospital (including ICU)	1859 (11.9%)	3895 (12.9%)

ANZROD = Australian and New Zealand Risk of Death; APACHE = Acute physiology and chronic health evaluation; IQR = interquartile range.

**Table 2. Mixed effects logistic regression analysis of hospital mortality adjusted for sex overall predicted risk of death (ANZROD), regional variation, and hospital type (with site as random effect)**

<b>Hospital mortality</b>	<b>Odds ratio (95% confidence interval)</b>	<b>P</b>
Sex (men)	1.18 (1.05–1.33)	0.005
ANZROD (per percentage point)	1.06 (1.06–1.06)	< 0.001
<b>Jurisdiction</b>		
Australian Capital Territory	1	
New South Wales	1.20 (0.61–2.37)	0.59
Northern Territory	0.96 (0.24–3.80)	0.95
New Zealand	1.13 (0.49–2.63)	0.77
Queensland	1.35 (0.68–2.71)	0.40
South Australia	1.52 (0.73–3.18)	0.27
Tasmania	1.04 (0.21–5.09)	0.97
Victoria	1.42 (0.71–2.81)	0.32
Western Australia	1.64 (0.77–3.48)	0.20
<b>Hospital type</b>		
Rural/regional	1	
Metropolitan	1.23 (0.92–1.63)	0.16
Tertiary	1.85 (1.41–2.44)	< 0.001
Private	1.10 (0.85–1.43)	0.46
Frailty	1.87 (1.65–2.11)	< 0.001

ANZROD = Australian and New Zealand Risk Of Death.

Total number of patients, 15 606; area under receiver operating characteristic curve, 0.87 (95% CI, 0.86–0.88).

**Table 3. Mixed effects logistic regression analysis of hospital mortality, adjusted for all individual components of ANZROD (age, ventilation status, elective surgical status, chronic comorbid conditions, acute physiological disturbance, diagnosis, source of admission to intensive care unit (ICU) and to hospital, time in hospital prior to ICU admission, treatment limitation), sex, regional variation, and hospital type (with site as random effect)**

Hospital mortality	Odds ratio (95% confidence interval)	P
Sex (men)	1.18 (1.04–1.35)	0.011
Age	1.03 (1.01–1.05)	< 0.001
Ventilated	1.59 (1.31–1.92)	< 0.001
Elective surgery	0.51 (0.38–0.68)	< 0.001
Chronic respiratory disease	1.26 (1.04–1.53)	0.017
Chronic cardiovascular disease	1.19 (1.01–1.40)	0.043
Chronic liver disease	1.30 (0.63–2.67)	0.48
Chronic renal disease	0.94 (0.73–1.20)	0.61
Immune disease	0.85 (0.52–1.39)	0.52
Immunosuppression	1.07 (0.78–1.47)	0.65
Lymphoma	1.40 (0.81–2.43)	0.23
Metastatic cancer	1.43 (1.04–1.95)	0.027
Leukaemia	1.76 (1.12–2.75)	0.014
Albumin score	1.07 (1.05–1.09)	< 0.001
Bilirubin score	1.05 (1.01–1.08)	0.006
Creatinine score	1.06 (1.03–1.08)	< 0.001
Glucose score	1.02 (0.98–1.05)	0.42
Haematocrit score	0.84 (0.79–0.90)	< 0.001
Heart rate score	1.04 (1.02–1.05)	< 0.001
Mean arterial pressure score	1.02 (1.01–1.04)	< 0.001
Sodium score	1.05 (0.98–1.13)	0.15
Neurological score	1.04 (1.03–1.04)	< 0.001
Oxygenation score	1.05 (1.03–1.06)	< 0.001
pH score	1.09 (1.06–1.11)	< 0.001
Respiratory rate score	1.02 (1.00–1.04)	0.015
Temperature score	1.03 (1.01–1.05)	< 0.001
Urea score	1.04 (1.01–1.06)	< 0.001
Urine output score	1.09 (1.07–1.10)	< 0.001
White cell count score	1.02 (0.99–1.06)	0.15
APACHE III diagnostic code		
100	1	
101	9.46 (2.23–40.1)	< 0.001
102	4.43 (1.06–18.6)	0.042
103	5.49 (0.95–31.5)	0.06
104	2.97 (0.72–12.3)	0.13
105	3.91 (0.42–36.4)	0.23
106	0.99 (0.23–4.36)	0.99
107	3.50 (0.80–15.3)	0.10
108	1.82 (0.22–14.7)	0.58
109	1.70 (0.39–7.33)	0.48
110	15.7 (1.54–160)	0.02
111	4.13 (0.31–54.6)	0.28
201	4.18 (0.98–17.9)	0.05
202	9.36 (1.41–61.9)	0.020
203	1.87 (0.30–11.8)	0.50
204	3.83 (0.84–17.4)	0.08
206	3.84 (0.93–15.9)	0.06
207	3.47 (0.74–16.4)	0.12

Hospital mortality	Odds ratio (95% confidence interval)	P
208	1.08 (0.14–8.17)	0.94
209	1.35 (0.11–15.8)	0.81
210	47.6 (2.51–903)	0.010
211	5.07 (1.22–21.0)	0.03
212	4.36 (1.07–17.8)	0.04
213	4.24 (0.97–18.6)	0.06
301	10.1 (1.63–62.5)	0.013
303	1.71 (0.10–28.3)	0.71
305	2.06 (0.47–9.11)	0.34
306	1.11 (0.21–5.78)	0.90
307	3.25 (0.67–15.9)	0.15
308	2.36 (0.42–13.3)	0.33
309	3.92 (0.84–18.2)	0.08
310	4.96 (0.71–34.6)	0.11
311	3.01 (0.60–15.1)	0.18
312	6.24 (0.51–75.7)	0.15
313	0.35 (0.04–2.83)	0.32
401	11.3 (2.46–52.3)	< 0.001
402	6.83 (1.23–38.0)	0.028
403	4.38 (1.02–18.9)	0.05
404	8.02 (1.03–62.6)	0.05
405	40.3 (3.56–455)	< 0.001
406	7.18 (0.98–52.57)	0.05
407	1.44 (0.30–7.00)	0.65
408	1.63 (0.26–10.4)	0.61
409	8.09 (0.98–67.0)	0.05
410	1.95 (0.40–9.43)	0.41
501	2.44 (0.60–9.99)	0.21
502	1.51 (0.35–6.55)	0.59
503	2.81 (0.69–11.5)	0.15
504	1.00 (0.23–4.42)	1.00
601	5.86 (1.27–27.0)	0.023
602	3.54 (0.83–15.2)	0.09
603	1.71 (0.13–23.3)	0.69
604	1.46 (0.12–17.1)	0.77
605	6.37 (0.43–95.2)	0.18
701	0.73 (0.06–8.88)	0.80
702	1.36 (0.24–7.77)	0.73
703	1.39 (0.28–6.84)	0.69
704	1.22 (0.27–5.43)	0.79
801	2.87 (0.41–20.1)	0.29
802	1.80 (0.24–13.2)	0.57
901	1.34 (0.31–5.78)	0.70
1101	1.46 (0.21–9.98)	0.70
1102	1.18 (0.14–10.3)	0.88
1202	2.50 (0.47–13.5)	0.29
1203	1.00 (0.14–7.18)	1.00
1204	2.01 (0.35–11.6)	0.44
1205	0.58 (0.07–4.59)	0.60
1206	0.71 (0.13–3.69)	0.68
1207	0.76 (0.15–3.91)	0.74
1208	1.30 (0.27–6.29)	0.75
1209	5.96 (0.90–39.4)	0.06
1210	2.04 (0.31–13.4)	0.46
1212	0.90 (0.16–4.99)	0.90
1213	1.05 (0.15–7.25)	0.96
1301	2.57 (0.30–22.4)	0.39
1302	2.27 (0.43–12.1)	0.34

<b>Hospital mortality</b>	<b>Odds ratio (95% confidence interval)</b>	<b>P</b>
1304	1.75 (0.33–9.22)	0.51
1401	2.79 (0.59–13.3)	0.20
1403	1.94 (0.39–9.57)	0.42
1404	1.81 (0.39–8.38)	0.45
1405	1.63 (0.34–7.72)	0.54
1406	0.26 (0.04–1.62)	0.15
1408	1.01 (0.20–5.04)	0.99
1409	0.39 (0.03–5.86)	0.49
1410	4.31 (0.83–22.4)	0.08
1411	0.97 (0.04–25.5)	0.98
1412	2.00 (0.32–12.5)	0.46
1413	0.32 (0.02–4.85)	0.41
1501	10.02 (1.41–71.2)	0.021
1502	4.96 (0.94–26.2)	0.06
1503	4.71 (0.40–55.1)	0.22
1504	1.13 (0.20–6.33)	0.89
1505	2.02 (0.29–14.1)	0.48
1506	2.19 (0.38–12.4)	0.38
1601	16.00 (2.44–105)	0.004
1602	1.78 (0.37–8.60)	0.47
1604	5.75 (0.39–84.7)	0.20
1605	53.7 (2.97–972)	0.007
1701	1.46 (0.23–9.16)	0.69
1703	2.19 (0.40–11.9)	0.37
1705	1.02 (0.16–6.44)	0.99
1801	1.68 (0.14–20.8)	0.69
1803	1.37 (0.10–18.4)	0.81
1902	0.99 (0.21–4.61)	0.99
1903	0.51 (0.04–6.22)	0.60
1904	3.26 (0.58–18.4)	0.18
2201	1.09 (0.09–13.3)	0.95
<b>Source of admission to ICU</b>		
Operating theatre	1	
Emergency department	1.04 (0.44–2.49)	0.93
Ward	1.00 (0.42–2.38)	1.00
ICU within the same hospital	0.41 (0.06–2.57)	0.34
Another hospital	1.13 (0.47–2.67)	0.79
ICU within another hospital	1.25 (0.40–3.90)	0.70
Unknown	0.55 (0.14–2.11)	0.38
<b>Source of admission to hospital</b>		
Home	Reference	
Other acute hospital (not ICU/ED)	0.78 (0.59–1.02)	0.07
Nursing home/chronic or palliative care	0.82 (0.60–1.12)	0.22
Other hospital ICU	1.04 (0.49–2.17)	0.92
Rehabilitation	1.11 (0.64–1.92)	0.71
Other hospital ED	0.86 (0.67–1.09)	0.21
<b>Hours in hospital prior to ICU admission</b>		
< 12	1	
12–23.9	1.09 (0.88–1.35)	0.43
24–47.9	1.11 (0.88–1.40)	
48–71.9	1.25 (0.93–1.69)	0.15
≥ 72	1.74 (1.41–2.14)	< 0.001
Missing data	1.00	

<b>Hospital mortality</b>	<b>Odds ratio (95% confidence interval)</b>	<b>P</b>
<b>Hospital type</b>		
Rural/regional	1	
Metropolitan	1.16 (0.89–1.50)	0.27
Tertiary	1.64 (1.26–2.14)	< 0.001
Private	1.65 (1.27–2.13)	< 0.001
<b>Jurisdiction</b>		
Australian Capital Territory	1	
New South Wales	1.11 (0.57–2.16)	0.76
Northern Territory	1.25 (0.32–4.93)	0.75
New Zealand	1.14 (0.50–2.61)	0.76
Queensland	1.16 (0.59–2.29)	0.67
South Australia	1.26 (0.62–2.58)	0.52
Tasmania	0.76 (0.16–3.63)	0.73
Victoria	1.23 (0.63–2.41)	0.55
Western Australia	1.35 (0.65–2.82)	0.43
Treatment limitation present at ICU admission	2.44 (2.10–2.82)	< 0.001
Frailty	1.74 (1.52–2.00)	< 0.001

ANZROD = Australian and New Zealand Risk of Death; ED = emergency department.

Total number of patients entered, 14 642; area under receiver operating characteristic curve, 0.88 (95% CI, 0.88–0.89).

**Table 4. Mixed effects logistic regression analysis of new discharge to chronic care/nursing home, adjusted for sex, overall predicted risk of death (ANZROD), regional variation and hospital type (with site as random effect); survivors only**

<b>New discharge to chronic care/nursing home</b>	<b>Odds ratio (95% confidence interval)</b>	<b>P</b>
Sex (men)	0.72 (0.60–0.86)	< 0.001
ANZROD (per percentage point)	1.02 (1.01–1.02)	< 0.001
<b>Jurisdiction</b>		
New South Wales	2.64 (0.55–12.7)	0.23
Northern Territory	1	
New Zealand	2.25 (0.33–15.3)	0.41
Queensland	3.53 (0.71–17.4)	0.12
South Australia	5.49 (1.00–30.0)	0.05
Victoria	2.95 (0.60–14.5)	0.18
Western Australia	1.21 (0.20–7.28)	0.84
<b>Hospital type</b>		
Rural/regional	1	
Metropolitan	1.00 (0.54–1.86)	1.00
Tertiary	0.61 (0.32–1.16)	0.13
Private	0.47 (0.27–0.83)	0.01
Frailty	1.61 (1.34–1.95)	< 0.001

ANZROD = Australian and New Zealand Risk Of Death.

Total number of patients entered, 13 697; area under receiver operating characteristic, 0.82 (95% CI, 0.80–0.83).

**Table 5. Sensitivity analysis of mortality among patients aged 80 years or more in the 131 intensive care units contributing frailty data, by site completeness of frailty coding**

<b>Completeness of frailty coding</b>	<b>Frailty status unknown</b>	<b>Frail</b>	<b>Not frail</b>	<b>Unadjusted odds ratio</b>	<b>Adjusted odds ratio*</b>
<b>Low levels (&lt; 10%) (N = 17)</b>					
Number of patients	14 913	122	151		
Mortality	13.0%	13.9%	4.6%	3.33 (1.33–8.32)	2.61 (0.92–7.42)
<b>Medium levels (10–50%) (N = 55)</b>					
Number of patients	10 473	2381	3317		
Mortality	13.5%	18.6%	9.2%	2.27 (1.94–2.66)	1.94 (1.59–2.36)
<b>High levels (&gt; 50%) (N = 59)</b>					
Number of patients	4774	3700	5942		
Mortality	11.3%	17.0%	7.7%	2.45 (2.16–2.79)	1.75 (1.50–2.05)

\* Mixed effects logistic regression adjusted for sex, region, hospital type, and severity of illness (ANZROD) on admission to the intensive care unit, with site as random effect.