



Outcomes of Intensive care patients following prolonged mechanical ventilation

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Background

Prolonged mechanical ventilation (PMV), defined as 21 days or more of invasive or non-invasive mechanical ventilation, has an international average hospital mortality rate of 29% and 58% within 12 months of discharge⁽¹⁾. International data cannot be appropriately interpreted to predict outcomes locally. This is the first Australian Capital Territory (ACT) report on patient outcomes following PMV.

Methods

Adult (16 years or older) ICU patients admitted to the Canberra Hospital and Calvary Public Hospital Bruce between 2008-2019 who met the criteria for PMV were included in this retrospective cohort study. Baseline characteristics, severity of illness scores and discharge disposition were compared to mortality at 12 months (including in-hospital mortality) to identify predictors of outcome in this cohort.

Outcomes

Primary outcome: Mortality (hospital and at 12 months following discharge).

Secondary outcomes: Hospital discharge disposition and readmissions to hospital within 12 months.

Results

Main findings

- > 117 patients met criteria for PMV in the ACT public hospital ICUs between 2008-2019.
- > 98 patients were analysed as 19 (16%) patients were lost to 12 month follow-up.
- > In-hospital mortality was 37% (36/98) with a further 8% (5/62) survivors dying within 12 months following discharge.
- > Of those who survived until hospital discharge, 63% (39) were discharged home and 37% (23) required some form of ongoing care.
- > Of the 62 survivors, 27% (17) required hospital readmissions within 12 months.
- > Predictors of mortality following PMV included: age >50 years (OR 2.571, 95% CI 0.851-7.769, $P = 0.09$), primary cardiovascular or respiratory diagnosis (OR 2.142, 95% CI 0.943-4.865, $P = 0.07$), and admission following a MET call (OR 2.166, 95% CI 0.897-5.229, $P = 0.09$) (Table 2).
- > On multivariate analysis, males were significantly more likely to die following PMV (OR 4.398, 95% CI 1.733-11.163, $P = 0.002$) (Table 2).

References

Damuth E, Mitchell JA, Bartock JL, Roberts BW, Trzeciak S. Long-term survival of critically ill patients treated with prolonged mechanical ventilation: a systematic review and meta-analysis. *Lancet Respiratory Medicine*. 2015;3(7):544-53.

Table 1. Baseline characteristics, severity of illness scores and proxies, and discharge disposition of PMV patients in the ACT compared to outcome at 12 months.

Characteristic*	Patients (n=117)	Alive (n=57)	Dead (n=41)	P =
Sex				0.001
Male	65 (55.6)	24	31	
Female	52 (44.4)	33	10	
Age, median (IQR)	63 (52-70)	64 (47-71)	63 (56-69)	0.09*
Socioeconomic status (n=113)				0.41
Disadvantaged	25 (22.1)	12	8	
Neither disadvantaged nor advantaged	31 (27.4)	12	13	
Advantaged	57 (48.7)	32	18	
Principal diagnosis				0.07[†]
Respiratory	33 (28.2)	15	16	
Neurological	29 (24.8)	15	8	
Trauma	18 (15.4)	6	4	
Cardiovascular	13 (11.1)	5	6	
Other	24 (20.5)	16	7	
Severity of illness[†]				P =
Ventilation time (days)	49.7 (44.3)	47.5 (41.5)	53.8 (54.5)	0.49
ICU length of stay (days)	51.8 (34.1)	52.8 (36.2)	50.7 (33.6)	0.90
Hospital length of stay (days)	131.7 (190.1)	174.5 (259.2)	91.0 (78.9)	0.001
MET admission n (%)	31 (26.5)	13	16	0.08
APACHE II score	20.1 (6.7)	19.7 (7.3)	20.7 (6.8)	0.52
APACHE III score	72.6 (27.2)	72.0 (26.5)	76.0 (30.7)	0.79
APACHE III-risk of death	0.3 (0.3)	0.3 (0.2)	0.4 (0.3)	0.28
ANZROD (n=113)	0.2 (0.2)	0.2 (0.2)	0.3 (0.2)	0.19

APACHE=Acute Physiology and Chronic Health Evaluation
ANZROD=Australian and New Zealand risk of death score
*values are n (%) unless otherwise indicated
†values are mean (STD) unless otherwise indicated
‡comparing under and over 50 years
§comparing combined respiratory and cardiovascular to rest

Table 2. Univariate and multivariate logistic regression analysis comparing clinical variables and mortality at 12 months in patients undergoing PMV.

Variable	Univariate analysis OR (95% CI), P =	Multivariate analysis OR (95% CI), P =
Sex (male)	4.262 (1.758-10.336), 0.001	4.398 (1.733-11.163), 0.002
Age (over 50)	2.571 (0.851-7.769), 0.09	2.492 (0.770-5.757), 0.13
Socioeconomic status (ref: advantaged)		
Disadvantaged	1.185 (0.409-3.437), 0.75	
Neither disadvantaged nor advantaged	1.926 (0.727-5.102), 0.19	
Cardiovascular or respiratory diagnosis	2.142 (0.943-4.865), 0.07	1.743 (0.711-4.275), 0.23
MET admission	2.166 (0.897-5.229), 0.09	2.138 (0.794-5.757), 0.13
Ventilation time	1.004 (0.995-1.012), 0.42	
Hospital length of stay	0.994 (0.989-0.999), 0.03	
ICU length of stay	0.999 (0.988-1.011), 0.92	
APACHE-II score	1.021 (0.964-1.083), 0.48	
APACHE-III score	1.005 (0.991-1.020), 0.44	
APACHE-III-risk of death	2.717 (0.545-13.541), 0.22	
ANZROD	3.915 (0.530-28.920), 0.18	

APACHE=Acute Physiology and Chronic Health Evaluation
ANZROD=Australian and New Zealand risk of death score

Conclusions

This cohort had a high in-hospital mortality compared to international reports. In keeping with the literature, we demonstrated that severity of illness scores are inaccurate predictors of mortality in persistently critically ill patients. Baseline characteristics and discharge disposition may be more accurate in predicting outcomes in this cohort. Our findings support recommendations that local outcome data be used to inform evidence-based guideline development in Australia.