PRAGMATIC META-ANALYSIS OF PROPORTIONAL ASSIST VENTILATION+ VERSUS PRESSURE SUPPORT VENTILATION AND ITS IMPACT ON COST EFFECTIVENESS

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Background

- Clinical studies of mechanical ventilation (MV) are often small with large uncertainty in outcomes [1,2]
- Meta-analysis provides a method to combine data into a single estimate of efficacy
- A meta-analysis of proportional assist ventilation+ (PAV+) versus pressure support ventilation (PSV) was recently undertaken but did not report on outcomes relevant to our cost-effectiveness model [3]
- A pragmatic meta-analysis was undertaken to provide estimates of efficacy and explore how data sources used impact on outcomes.

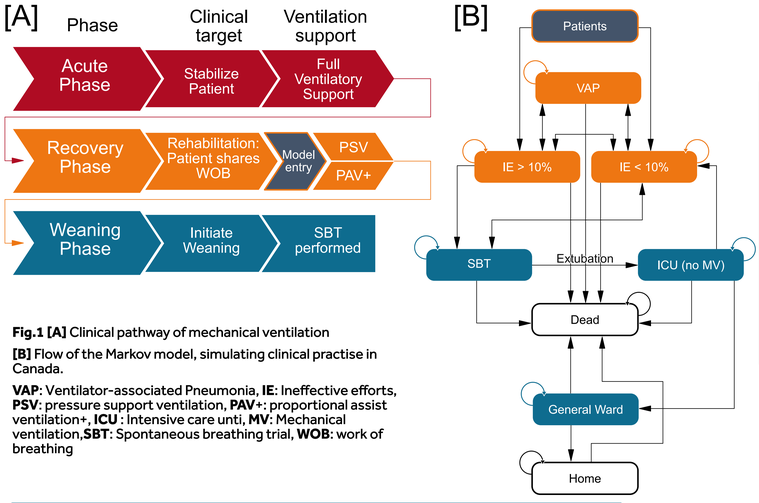


Fig.1 [A] Clinical pathway of mechanical ventilation

[B] Flow of the Markov model, simulating clinical practise in Canada.

VAP: Ventilator-associated Pneumonia, **IE**: Ineffective efforts, **PSV**: pressure support ventilation, **PAV+**: proportional assist ventilation+, **ICU** : Intensive care unti, **MV**: Mechanical ventilation,**SBT**: Spontaneous breathing trial, **WOB**: work of breathing

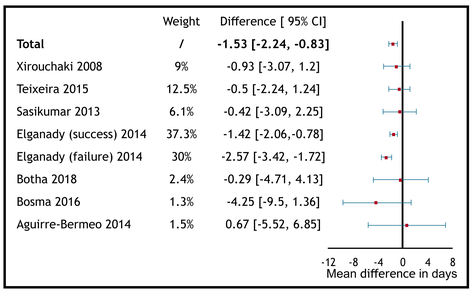


Fig.2 Forest plot of time from randomization to extubation or death.

Methods

- A Markov-model of patient care from MV in the intensive care unit (ICU) through to discharge home or death was developed for the Canadian setting (**Fig.1**)
- Structured searches identified studies of PAV+ versus PSV that were then subject to meta-analysis
- Outcomes of interest were:
  - MV/ICU/hospital time
  - ICU/hospital mortality
- The model was populated with efficacy inputs from either Canadian trials or meta-analysis estimates
- Outcome parameters:
  - 20 years time horizon
  - Costs in 2017 CAD
  - Quality-adjusted life years (QALYs) using EQ-5D
- A sensitivity analyses (n=2,000) was performed, using a willingness-to-pay (WTP) threshold of CAD 50,000 per QALY gained

Conclusion

- Efficacy data from individual trials as compared to meta-analysis substantially changed the numerical outcomes of the model
- However the interpretation remained the same: PAV+ is expected to be cost effective for mechanical ventilation in Canada

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Results

- Seven studies comparing PAV+ with PSV were identified (**Fig.2**)
- A total of 271 PAV+ patients and 253 PSV patients
- Meta-analysis included at least 4 studies for each outcome
- Heterogeneity was low (I2 ≤ 24%) and PAV+ was associated with a significant reduction in time on MV (**Fig. 2**), in the ICU, and in hospital
- Using **Canadian data** the Cost of care and quality of life results were:
  - PSV: CAD 141,003 and 6.07 QALYs gained
  - PAV+: CAD 129,333 and 6.29 QALYs gained
  - This makes PAV+ dominant.
- With **meta-analysis data**, PAV+ cost CAD 147,276 and accrued 6.98 QALYs over 20 years
- Therefore PAV+ was cost effective at CAD 6,900 per QALY gained versus PSV
- The sensitivity analysis revealed that in the Canadian scenario 80% of simulations were under the WTP threshold, compared with 100% when using meta-analysis (**Fig.3**)

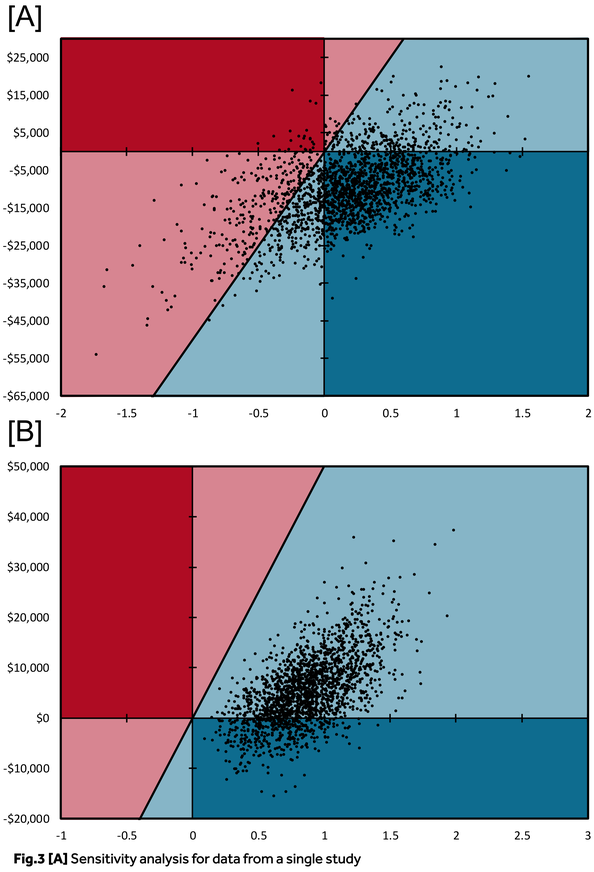


Fig.3 [A] Sensitivity analysis for data from a single study

[B] Sensitivity analysis for data from a meta analysis

The diagonal line represents the willingness to pay threshold of 50,000 per QALY gained in both graphs. **Dark red**: domniated; **light red**: not cost-effective; **light blue** cost-effective; **dark blue**: dominant

References

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