

# Low tidal volume ventilation and mortality in patients with acute brain injury: a secondary analysis of an international observational study\*



## AUTHORS

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## INTRODUCTION

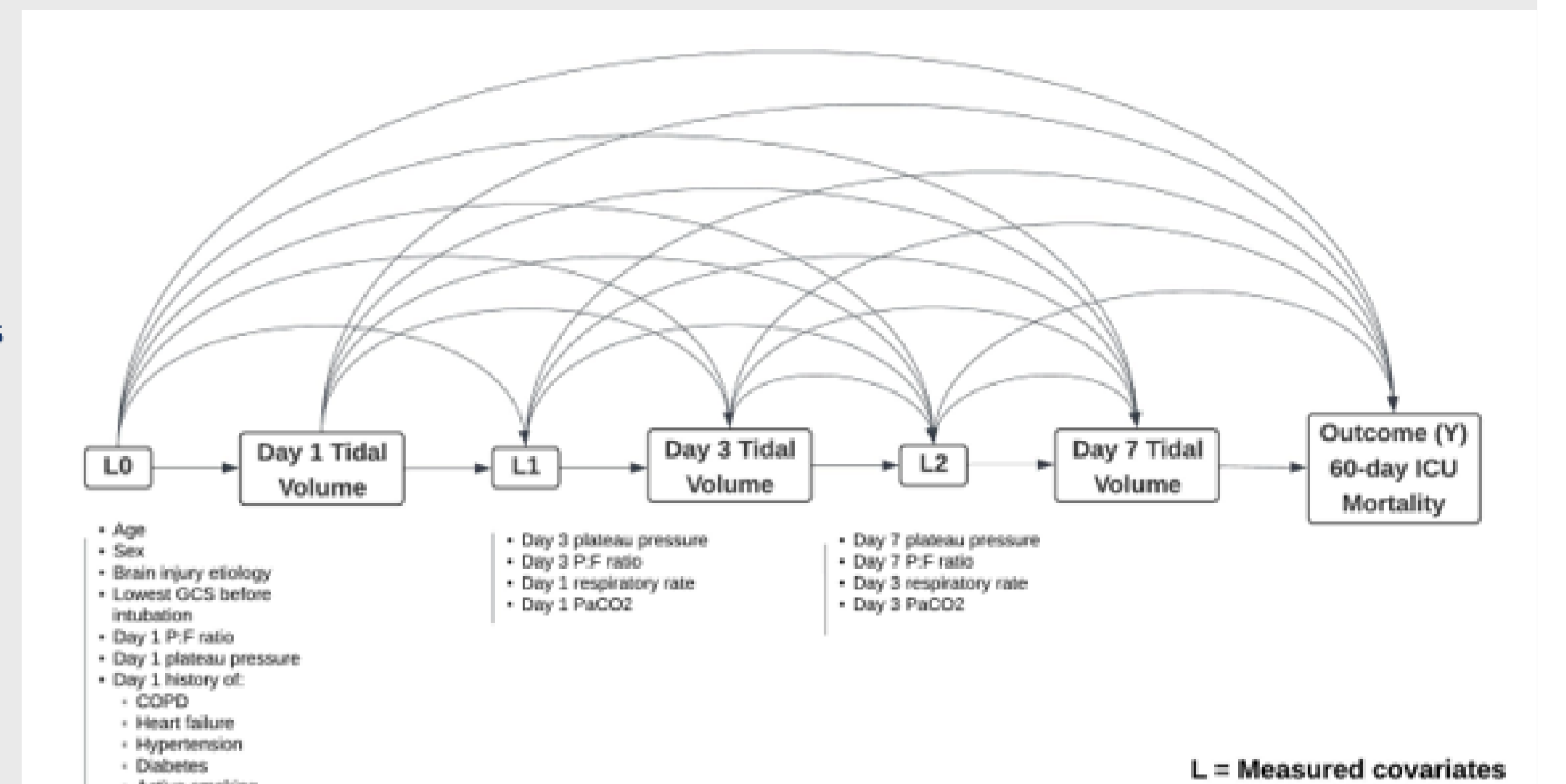
- Low tidal volume ventilation (LTVV) reduces ventilator-induced lung injury and decreases mortality in patients with acute respiratory distress syndrome (ARDS).
- Patients with acute brain injury (ABI) were under-represented in ARDS trials. Thus, potential benefits and/or harms of LTVV in ABI are less well defined.
- Tidal volume ( $V_T$ ) is a dynamic, time-varying treatment which is adjusted based on other dynamic confounders.
- Standard regression methods do not sufficiently account for the feedback between dynamic treatments and confounders.
- In contrast, “G methods” provide an established approach to derive robust causal estimates for a time-varying exposure in the presence of time-varying confounding.

## OBJECTIVES

To evaluate the causal association between low tidal volume ventilation ( $LTVV, V_T \leq 8 \text{ mL/kg PBW}$ ), delivered over the first 7 days of invasive mechanical ventilation, and all-cause death in the ICU at 60 days.

## METHOD

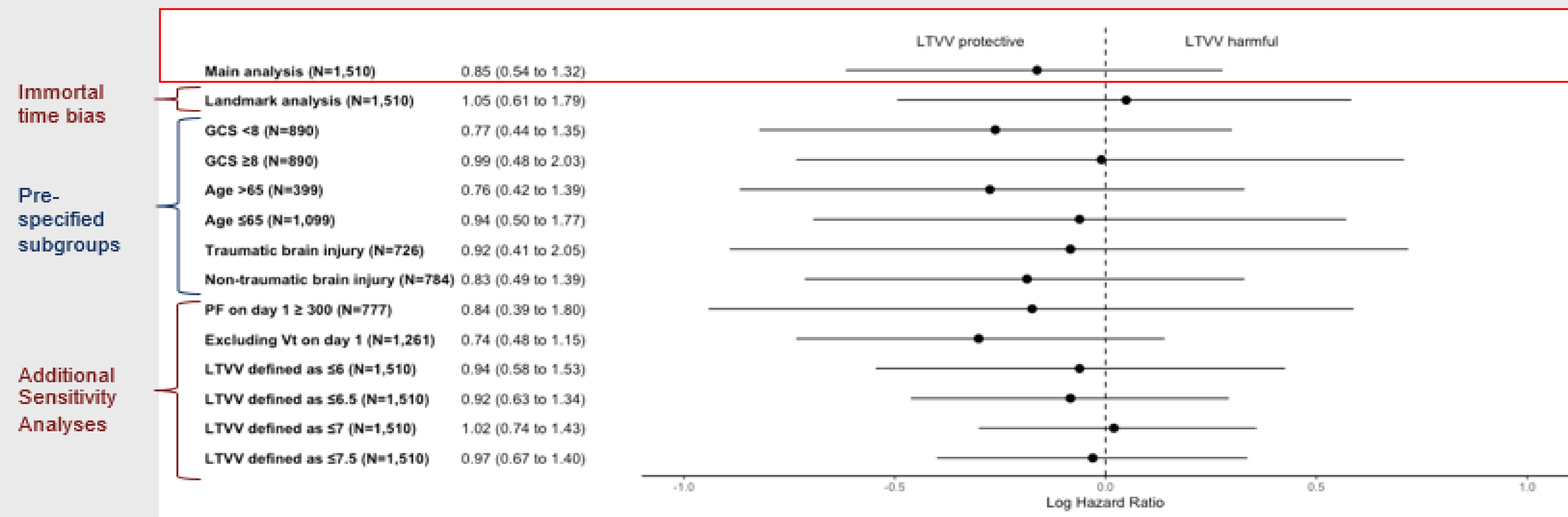
- **Data source:** post-hoc analysis of the Extubation in Neurocritically Ill patients and association with Outcomes (ENIO) study. (Consecutive patients, 73 ICUs, 18 countries, June 2018 – Nov 2020).
- **Exposure:** LTVV ( $V_T \leq 8 \text{ mL/kg PBW}$ )
- **Comparator:** conventional ventilation ( $V_T > 8 \text{ mL/kg PBW}$ ).
- **Endpoint:** all-cause death in the ICU at 60 days (includes WLST).
- **Model:** marginal structural Cox model; stabilized IPTW for days 1, 3, and 7 (Super Learner); stabilized IPCW account for informative censoring. Marginal Hazard Ratios (HRs) and robust standard errors generated.



## RESULTS

- 1,510 patients included, 73 ICUs, 18 countries
- Mean age: 51.7 years (SD 18.2)
- 513 patients (34%) were female
- Most common ABI etiology: traumatic brain injury (N=726; 48%) and intra-cranial hemorrhage (N=521; 35%).

There was no association between cumulative exposure to LTVV and all-cause 60-day ICU mortality



## CONCLUSION

- We found no association between LTVV, delivered dynamically over the first 7 days of invasive mechanical ventilation, and all-cause death at 60 days in patients with ABI.
- Limitations:
  - Incorporate time-varying ICP and other cerebrovascular confounders (e.g., cerebral perfusion and intracranial compliance).
  - Incorporate more granular markers of lung injury and gas exchange.
  - Evaluate patient-centered outcomes.

## ACKNOWLEDGEMENTS

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Thank you to Dr. Julian Daza for his leadership on this work.

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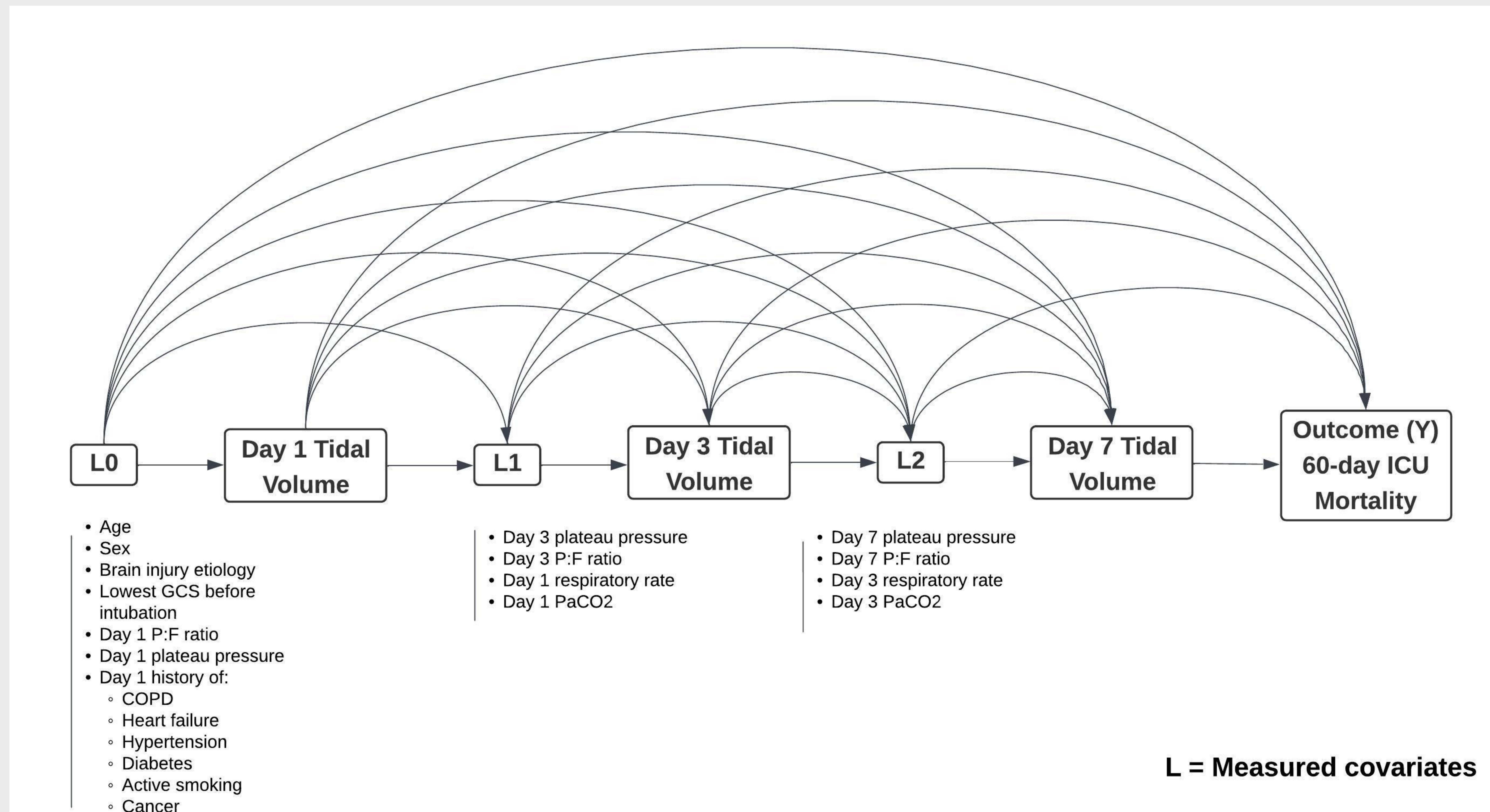
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**To evaluate the causal association between low tidal volume ventilation (LTVV,  $V_T \leq 8$  mL/kg PBW), delivered over the first 7 days of invasive mechanical ventilation, and all-cause death in the ICU at 60 days.**

# METHOD

IPTW: inverse probability of treatment weighting  
IPCW: inverse probability of censoring weights  
WLST: withdrawal of life-sustaining therapy

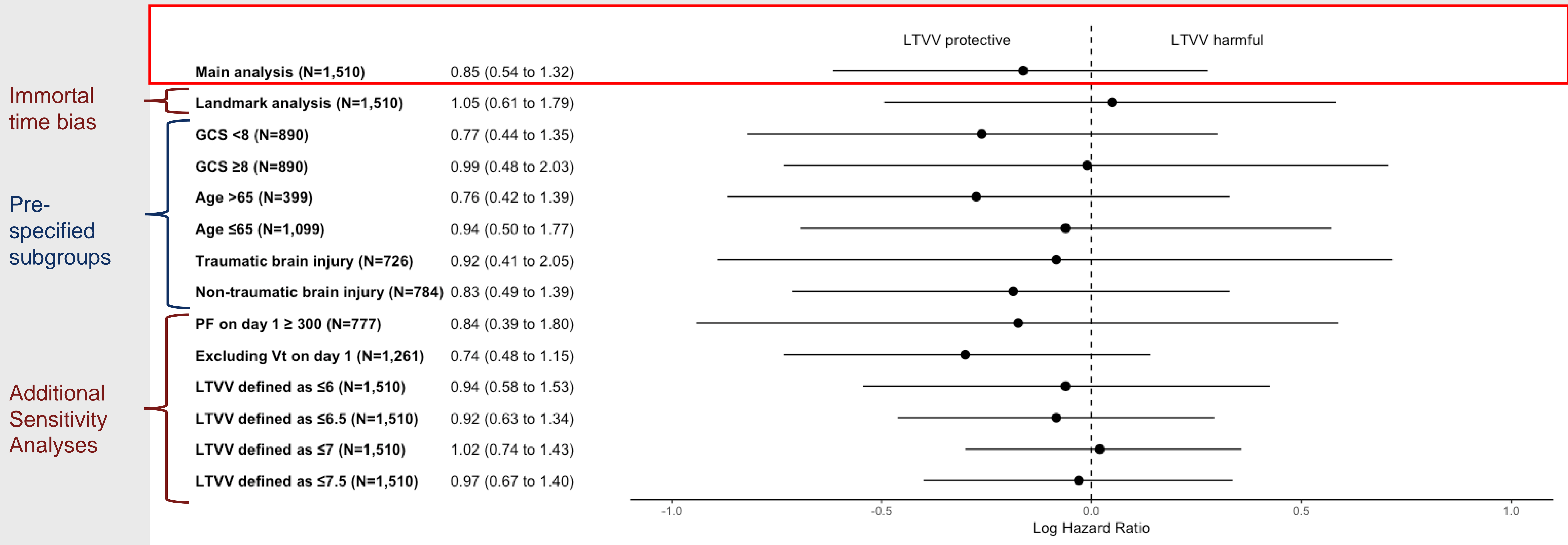
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