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LETTER

Cost-effectiveness of non-invasive airway management of comatose patients with acute poisoning

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The NICO (non-invasive airway management in comatose patients) randomized controlled trial found that, in acute poisoned comatose patients with a Glasgow Coma Scale < 9, withholding intubation was associated with a significant clinical improvement in the hierarchical composite primary end point of in-hospital death, length of stay in intensive care unit (ICU), and length of hospital stay compared to routine practice [1]. The trial-based economic evaluation estimated the incremental cost-effectiveness ratio (ICER) at 28 days, using the outcome of in-hospital death and adverse events related to intubation (mechanical ventilation, admission to the ICU, and rapid-onset pneumonia).

The economic evaluation was performed using patient-level data collected alongside the trial [1, 2]. Data for the economic analysis, covering medical resource use and major events, were collected prospectively (electronic supplementary material [ESM]). The perspective was the healthcare provider, restricted to hospitals. The end point of the economic evaluation was the ICER expressed as the difference in costs divided by the difference in composite outcome. Total costs in 2023 euros (€) were estimated from the time of recruitment until the earliest of death, withdrawal and 28 days, not discounted [3]. Differences in mean costs and frequency of adverse events were estimated using separate generalized linear-regression mixed models, with a gamma distribution and logarithmic link for costs, and a Bernoulli distribution (logit link) for frequency. All models were adjusted for the strategy (fixed effect) and the hospital (random effect). The ICER indicates the additional investments needed for the intervention to gain one extra unit of effect compared with usual care. The uncertainty surrounding these point estimates was examined using a stratified for hospital non-parametric bootstrapping technique with 1000 replications [3]. The net monetary benefit for different levels of willingness to pay was calculated. Detailed methods are included in the electronic supplementary material.

The hierarchical composite primary end point was improved in the restricted intubation compared with the control group, with a win ratio of 1.85 (95% confidence interval [CI] 1.33–2.58; $P < 0.001$) and 1.83 (95% CI 1.29–2.60; $P = 0.001$) after stratification by center. The total mean cost in the restricted intubation group was €3803 (7399) vs €5407 (9316) in the control group, a not statistically significant difference of €1613 (95% CI −€3797 to €572). The main driver of the cost difference was higher ICU costs, with a statistically significant difference (€ − 1463; 95% CI € − 2658 to € − 267) (ESM).

The point estimate of the ICER was − €5578 per event averted indicating that the withholding of intubation was both cost saving and event reducing. The uncertainty in the incremental costs and effect represented on the cost-effectiveness plane in Fig. 1 shows that in 88.6% of bootstrap replications, restrictive intubation was both more effective and less costly. The net monetary benefit ranged from €1670 to €16,021 (ESM).

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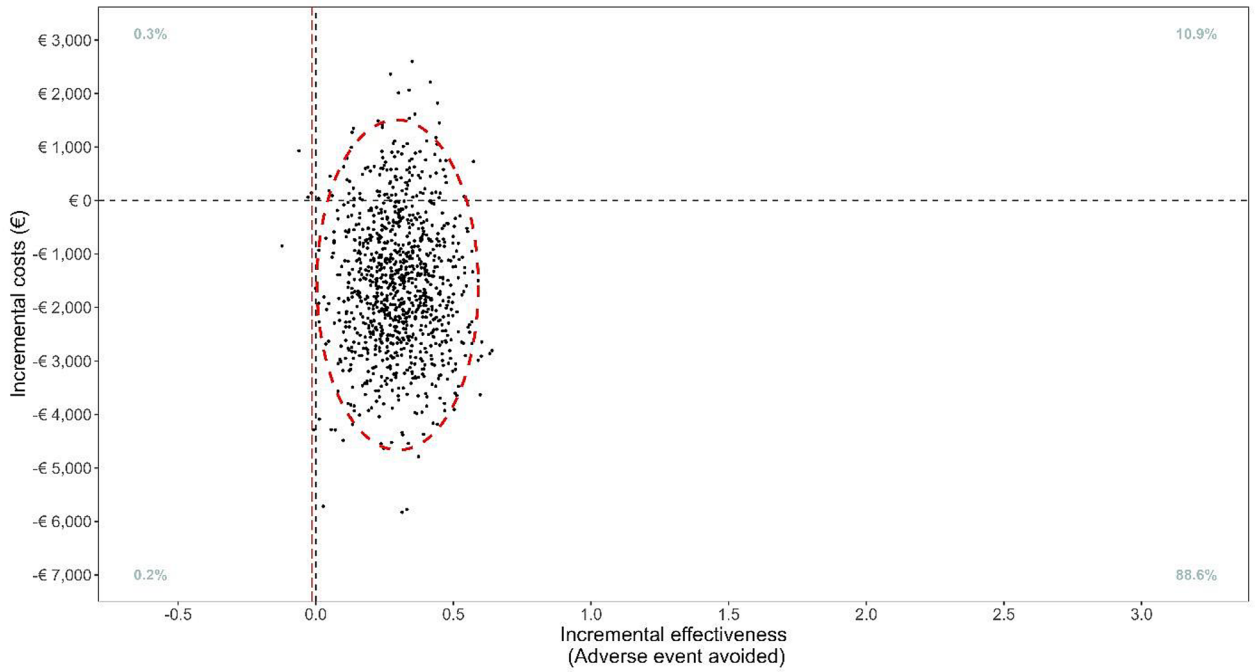

Fig. 1 Bootstrap distribution of 1000 incremental cost–effectiveness ratio comparing restrictive intubation to control in the intention-to-treat population

Withholding intubation had an 88.6% probability of dominance vs routine practice with lower hospitalization and ICU costs. Limitation: we used a fixed emergency department cost per patient. Policymakers should explore how these monetary benefits can be appropriately utilized in critical care.

Supplementary Information
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Author contributions

ID-Z and YF had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Concept and design: ID-Z and YF Acquisition, analysis, or interpretation of data: all authors. Drafting of the manuscript: BFNS, MM, ANO and ID-Z Critical revision of the manuscript for important intellectual content: YF Statistical analysis: BFNS and ANO Obtained funding: YF Administrative, technical, or material support: MM Supervision: ID-Z and YF.

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Data sharing statement

Data available: Yes. Data types: deidentified participant data. How to access data: data request shall be sent to Isabelle.durand-zaleski@aphp.fr. When available: with publication supporting documents. Document types: statistical/analytic code. How to access documents: request shall be sent to Isabelle.durand-zaleski@aphp.fr. When available: with publication. Who can access the data: researchers whose proposed use of the data has been approved by the steering committee. Types of analyses: any purpose. Mechanisms of data availability: after approval by the steering committee and signed data sharing agreement.

Declarations

Conflicts of interest

ID-Z reported personal fees from Air Liquide, BMS, Pfizer, and Roche, outside the submitted work.

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