



## Article Appraisal

**Article:** Increased mortality in trauma patients who develop post-intubation hypotension

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### Background and Study Objective(s):

The negative association of post-intubation hypotension on patient outcomes is well established in the critical care patient population, however its effect has not been demonstrated exclusively in the adult major trauma population. The authors' objective was to determine prevalence of post-intubation hypotension in an adult major trauma population and assess for associations between postintubation hypotension and patient outcomes.

### Study Design:

This was a retrospective case series that included 444 trauma patients between 2000 and 2015 intubated by the Trauma Nova Scotia Trauma Service at the QEII HSC in Halifax, the province's only trauma referral centre. Cases were drawn from the Nova Scotia Trauma Registry. Eligible patients were adult trauma patients  $\geq 16$  years who underwent intubation by the TNS Trauma Service. They excluded those complicated by burns, who underwent intubation pre-hospital or in another centre, and those with incomplete records.

Data was collected through a formal chart review by trained abstractors who were blinded to the study hypothesis. The primary outcome was prevalence of post-intubation hypotension, defined as any of: a decrease in SBP to  $\leq 80$ mmHg or less, any decrease of SBP  $\geq 20\%$  from baseline, any decrease in MAP to  $\leq 60$ mmHg, or an additional decrease in SBP by 5mmHg in those with pre-intubation hypotension. Secondary outcomes were in-hospital and ED mortality, admission and length of stay in hospital and ICU, need for inpatient renal replacement therapy, and inpatient ventilation and vasopressor therapy. Patients were separated into a post-intubation hypotension group ("PIH") and non-postintubation hypotension group ("non-PIH") in a dichotomous manner. Characteristics of those in the PIH and non-PIH groups were reported using descriptive statistics. They controlled for patient and provider characteristics and tested for association between PIH development and patient outcomes using multivariate logistic regressions.

### Results:

Of the 3152 patients identified in the trauma registry, 444 were included in the study. Post-intubation hypotension occurred in 36.3% of patients. The PIH group was characterized by being older (PIH  $44.8 \pm 2.8$  years vs. non-PIH  $39.0 \pm 18.2$  years) and more likely to have a higher injury severity score. The groups were similar in terms of sex,

provider level for intubation, injury type, and prevalence of TBI. Patients in the PIH group had significantly higher ED and in-hospital mortality, and were more likely to require vasopressor therapy (AOR 1.05; 95% CI 1.03-1.06). Groups were similar with regards to type of injury (blunt versus penetrating trauma) and received similar volumes of fluid post-intubation. With peri-intubation medication administration, ketamine use was significantly greater in the PIH group (PIH 36.0% vs. non-PIH 22.6%) while propofol use was significantly greater in the non-PIH group (PIH 44.0% vs. non-PIH 67.8%). Fentanyl was also used more in the non-PIH group (PIH 30.4% vs. non-PIH 41.7%). Paralytic use (rocuronium, etomidate, succinylcholine) was similar between groups. With multivariate regression models, there was an association between PIH and ED mortality (AOR 3.45; 95% CI 1.01-3.31) and in-hospital mortality (AOR 1.83; 95% CI 1.25-3.20). In-hospital mortality as associated with older age (AOR 1.05; 95% CI 1.03-1.06), staff performing intubation (AOR 2.94; 95% CI 1.13-7.66), injury severity score  $\geq 12$  (AOR 4.73; 95% CI 1.18-19.0) and presence of TBI (AOR 5.72; 95% CI 2.93-11.2). Likelihood of in-hospital mortality decreased with administration of fentanyl (AOR 0.99; 95% CI 0.98-0.99) and any paralytic (AOR 0.36; 95% CI 0.15-0.85).

### **Validity of Results:**

The recruitment methods used were appropriate for the study, and the definition of post-intubation hypotension was comprehensive. However, the study analysis was based on converting blood pressure, a continuous variable, into a dichotomous variable, leading to significant limitations in the interpretation of data. The major concern was the lack of control for blood pressure, specifically pre-intubation hypotension, in the study and its impact on interpretation of the results. Without controlling for pre-intubation blood pressure, we are unable to determine if the patients presenting with pre-intubation hypotension and poor prognosis from those who were not hypotensive pre-intubation who had a change in course and negative outcome associated with the development of post-intubation hypotension. Lack of control for this variable hindered the interpretation of results and ability to draw conclusions. Further consideration includes the prolonged period over which patients were recruited, which encompasses many changes in resuscitation culture, not limited to peri-intubation medication choice and resuscitative fluid and drug selection. Overall, the study design was not appropriate to answer the study question. A more appropriate method would be propensity score matching, which would allow the authors to adjust and account for differences between groups, potentially yielding more robust comparisons.

### **Generalizability of Results:**

The patient population studied is similar to that seen at Vancouver General Hospital, also a Canadian major trauma centre with a trauma team seeing predominantly blunt trauma victims, as well as Victoria General Hospital. However, generalizability is hindered by concerns regarding internal validity as previously described.

### **The Bottom Line:**

Post-intubation hypotension was common (36.3%) amongst the population of intubated major trauma patients, and was associated with increased mortality. The findings are consistent with current knowledge surrounding the association between postintubation hypotension and poor outcomes in critically ill patients. The most likely explanation for the results of the study is that the patients in the postintubation hypotension group were sicker at baseline, and therefore had poor outcomes. This suggests postintubation hypotension was likely a marker of disease severity, and it is unclear whether it has a role in mediating the patients' outcomes.