Canadian Journal of Emergency Medicine (2022) 24:465–466
https://doi.org/10.1007/s43678-022-00340-x

EDITORIAL

# Are outcomes worse in patients who develop post-intubation hypotension?

**Robert S. Green**[1,2] · **Mete Erdogan**[1]

Received: 29 May 2022 / Accepted: 7 June 2022


For ED patients who require airway management, endotracheal intubation (ETI) remains the standard of care. Although ETI is potentially lifesaving, adverse events are to be expected and prepared for. Post-intubation hypotension is one of the most common hemodynamic alterations after ETI [1]. Incidence rates of post-intubation hypotension in the ED setting range between 0.5 and 44% (pooled estimate of 11%) [2]. Recently, the International Observational Study to Understand the Impact and Best Practices of Airway Management in Critically Ill Patients (INTUBE) evaluated all in-hospital emergency intubations in the ED, intensive care unit (ICU) and wards at 197 centers across 29 countries ($n=2964$) and identified cardiovascular instability/collapse as the predominant adverse event, occurring in 43% of patients [3]. Although post-intubation hypotension is a frequent occurrence following ETI, whether it is associated with worse outcomes continues to be an important question that warrants further investigation.

In this edition of *CJEM*, Émond et al. [4] add to the literature on post-intubation hypotension by evaluating its impact on 48 h in-hospital mortality and hospital length of stay in a cohort of 586 adult and geriatric ED patients at a level 1 trauma center. The authors use 4 definitions to assess for development of post-intubation hypotension within 60 min of intubation: ≥ 1 systolic blood pressure (SBP) measure < 90 mmHg, ≥ 2 SBP measures < 90 mmHg, ≥ 1 SBP measure < 110 mmHg, or ≥ 2 SBP measures < 110 mmHg. They observed ≥ 1 SBP measure < 90 mmHg in 38% (224/586) of the cohort and 28 (13%, 28/224) of these patients died within 48 h of intubation. After modeling the mortality risk using each definition and controlling for sex and comorbidities, Émond and colleagues found no difference in 48 h in-hospital mortality or length of hospital stay between patients who developed post-intubation hypotension and those who did not, even after stratifying by age group.

The concept of post-intubation hypotension requires greater attention, and we commend the authors on furthering our common understanding of the impact that intubation has on cardiovascular stability and patient outcomes. While the findings of Émond and colleagues are similar to those of Colleran et al. who found post-intubation hypotension was not associated with poor outcomes (i.e., death or discharge to a nursing home) in a cohort of 122 ED patients [5], there is also evidence that ED patients who develop post-intubation hypotension have higher in-hospital mortality and longer hospital length of stay [2]. In patients with major trauma, 36% develop post-intubation hypotension and these patients are almost twice as likely to die in-hospital and more than 3 times more likely to die in the ED [6]. Ferrada and colleagues performed a meta-analysis to assess the effect of post-intubation hypotension on mortality (4 studies, $n=2044$) and found significantly higher mortality in patients who developed post-intubation hypotension (33.2%) versus those who did not (19.6%) [7]. In addition, results from the INTUBE study show that patients who experience peri-intubation cardiovascular instability/collapse are at higher risk of ICU mortality (adjusted odds ratio of 2.47) [3].

Variation in the reported effects of post-intubation hypotension on patient outcomes is likely attributable in part to differences in study populations and outcomes assessed. Perhaps more importantly, this variation also stems from how post-intubation hypotension is defined in each study, as highlighted by Émond and colleagues [4]. All published definitions agree on the concept of reduced blood pressure following intubation; however, they often differ in the period over which post-intubation hypotension is assessed,

✉ Robert S. Green
greenrs@dal.ca

Mete Erdogan
mete.erdogan@nshealth.ca

[1] Nova Scotia Health Trauma Program, Nova Scotia Health, Halifax, NS, Canada

[2] Departments of Emergency Medicine, Critical Care, and Surgery, Dalhousie University, Halifax, NS, Canada

blood pressure cutoffs, degree of blood pressure decrease, and whether they incorporate any other considerations such as use of vasopressor medications or the existence of pre-intubation hypotension.

Unfortunately, a universally accepted definition of post-intubation hypotension does not exist at this time. Indeed, in our investigations of post-intubation hypotension across various patient populations, we have continuously evolved the definition that we used [6, 8, 9]. As more evidence becomes available, it is worth considering whether a broader term such as cardiovascular instability/collapse would better describe this concept and tease out the true results of intubation and consequences of decreased blood pressure. Authors of the INTUBE study defined cardiovascular instability/collapse as the occurrence of at least one of the following within 30 min from the start of the intubation procedure: systolic arterial pressure < 65 mmHg recorded at least once or systolic arterial pressure < 90 mmHg for > 30 min, new requirement for or increased use of vasopressors, or administration of a fluid bolus > 15 mL/kg to maintain target blood pressure [3]. Regardless of how post-intubation hypotension is defined, it is paramount that emergency physicians are aware of the risks with ETI and prepared to respond accordingly.

Intubation should be viewed as a complex procedure which is part of an even larger and more complex resuscitation. If the objective is to determine the impact of tracheal intubation on blood pressure and ultimately patient outcomes, the immediate effects of intubation on blood pressure are likely most reflective of the procedure and should be the focus. In our opinion, experiencing a blood pressure reduction immediately following ETI is most predictive of a negative outcome. As there may be challenges with capturing accurate and timely blood pressure recordings following intubation, we recommend setting a post-intubation window of 15 min to assess for development of post-intubation hypotension.

Although most literature points toward an association between post-intubation hypotension and poor outcomes, the study by Émond et al. [4] is an important contribution to the body of evidence on this topic. More effort is needed to work toward a standardized, consensus definition that will facilitate further investigations. We urge vigilance in avoiding and minimizing post-intubation hypotension by pre-intubation resuscitation, selective medication use for intubation, and by developing an individualized intubation plan for each patient.

## Declarations

**Conflict of interest** The authors declare no conflicts of interest.

## References

1. Mort TC. Complications of emergency tracheal intubation: hemodynamic alterations—part I. J Intensive Care Med. 2007;22(3):157–65. https://doi.org/10.1177/0885066607299525.
2. Green R, Hutton B, Lorette J, Bleskie D, McIntyre L, Fergusson D. Incidence of postintubation hemodynamic instability associated with emergent intubations performed outside the operating room: a systematic review. CJEM. 2014;16(1):69–79. https://doi.org/10.2310/8000.2013.131004.
3. Russotto V, Tassistro E, Myatra SN, et al. INTUBE Study Investigators Peri-intubation cardiovascular collapse in critically ill patients: insights from the INTUBE study. Am J Respir Crit Care Med. 2022. https://doi.org/10.1164/rccm.202111-2575OC.
4. Émond M, Lachance-Perreault D, Boucher V, et al. The impact of post-intubation hypotension on length of stay and mortality in adult and geriatric patients: a cohort study. CJEM. 2022. https://doi.org/10.1007/s43678-022-00305-0.
5. Colleran CA, Brewster CT, Kroemer AJ, Miccio B, Brown CA, Carlson JN. Factors associated with poor long-term outcomes after emergency department intubation. Cureus. 2021;13(5):e15178. https://doi.org/10.7759/cureus.15178.
6. Green RS, Butler MB, Erdogan M. Increased mortality in trauma patients who develop postintubation hypotension. J Trauma Acute Care Surg. 2017;83(4):569–74. https://doi.org/10.1097/TA.0000000000001561.
7. Ferrada P, Manzano-Nunez R, Lopez-Castilla V, et al. Meta-analysis of post-intubation hypotension: a plea to consider circulation first in hypovolemic patients. Am Surg. 2019;85(2):167–72.
8. Green RS, Edwards J, Sabri E, Fergusson D. Evaluation of the incidence, risk factors, and impact on patient outcomes of postintubation hemodynamic instability. CJEM. 2012;14(2):74–82. https://doi.org/10.2310/8000.2012.110548.
9. Green RS, Butler MB. Postintubation hypotension in general anesthesia: a retrospective analysis. J Intensive Care Med. 2016;31(10):667–75. https://doi.org/10.1177/0885066615597198.