Unlearning the ABCs: a call to reprioritize prehospital intubation for trauma patients

Brodie Nolan^{1,2,3} · Morgan Hillier^{3,4,5}

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Airway is not always the answer

Airway management has been a longstanding first priority for trauma resuscitation. Following the sequence of the “ABCs”—Airway, Breathing, and Circulation—has been taught for decades in Advanced Trauma Life Support courses and continues to be the primary systematic approach to trauma management despite being based on expert opinion with limited supporting evidence [1, 2]. Very few trauma patients present with true airway emergencies that require immediate intubation where a delay of a few minutes will result in adverse patient outcomes. One study from a Canadian trauma centre found the incidence of traumatic airway injuries to be 0.4% for blunt trauma and 4.5% for penetrating trauma, accounting for only 104 patients over 16 years [3]. The American Association for the Surgery of Trauma sponsored a study that found over 55% of trauma patients who presented in shock and required intubation had a “resequencing” of their ABCs to CAB and received blood products prior to intubation, reflecting a change to in-hospital practices [1]. Further, there is a mounting paradigm shift

that resuscitation and hemodynamic optimization prior to intubation is the preferred approach to airway management in trauma [4]. Although paramedics recognize the need to “load and go” for severely injured patients, it is time to update our prehospital trauma care by rethinking the necessity of intubation in the prehospital environment if hemodynamic resuscitation is not feasible.

Prehospital intubation in trauma is associated with harm

Much of Canada has a two-tiered emergency medical service (EMS) system which is staffed by paramedics that can provide basic life support (BLS) and advanced life support (ALS). Although there are regional differences, most paramedics trained to provide BLS are able to provide basic airway management and some can obtain intravenous (IV) access and provide crystalloid therapy. Advanced-care paramedics can perform intubation, needle thoracostomy, and administer parenteral fluid boluses. Furthermore, most land-based paramedics are unable to administer blood products or push-dose vasopressors as it is beyond the scope of ALS paramedic training. The nature of these limitations makes it challenging to resuscitate and optimize hemodynamics prior to intubation in the Canadian prehospital environment. Therefore, it's not surprising that the Ontario Prehospital Advanced Life Support (OPALS) major trauma study found no difference in mortality with the addition of a systemwide ALS program across 17 cities in Ontario [5]. In fact, a subgroup analysis of patients with a Glasgow coma scale (GCS) of less than 9 had a lower survival rate in the group that received ALS care (50.9% v. 60.0%; $p=0.02$) [5]. These findings were further supported by a systematic review and meta-analysis of 15 studies, which also found an increase in mortality in ALS-treated trauma

✉ Brodie Nolan
brodie.nolan@mail.utoronto.ca

Morgan Hillier
morgan.hillier@sunnybrook.ca

¹ Department of Emergency Medicine, St. Michael's Hospital, 30 Bond Street, Toronto, ON M5B 1W8, USA

² Li Ka Shing Knowledge Institute, Toronto, ON, USA

³ Division of Emergency Medicine, Department of Medicine, University of Toronto, Toronto, ON, USA

⁴ Department of Emergency Medicine, Sunnybrook Health Sciences Centre, Toronto, ON, USA

⁵ Sunnybrook Centre for Prehospital Medicine, Toronto, ON, USA

patients (weighted odds ratio (OR) 2.59) [6]. A more recent study on penetrating trauma patients also found treatment by ALS paramedics being associated with a higher odds of death compared to patients treated by BLS paramedics (OR 1.86, 95% confidence interval (CI) 1.21–3.01) [7]. Specific to prehospital intubation, a systematic review of 21 studies with over 35,838 trauma patients found higher mortality rates in injured patients that were intubated in the prehospital environment compared to in the emergency department (OR 2.56, 95%CI 2.06–3.18) [8]. This trend held true for subgroup analysis of all studies that included adjustment for injury severity score [8].

Intubation worsens trauma physiology: always

Positive pressure ventilation causes increased intrathoracic pressure and therefore decreases venous return and reduces cardiac output, resulting in further hypoperfusion and shock [9]. In critically ill trauma patients that are severely hypovolemic and dependent on venous return and their adrenergic response to maintain perfusion, intubation may precipitate death. Additionally, there is a vasodilatory response after intubation, especially with the use of induction medications, that may put trauma patients who are already hypovolemic at high risk for further deterioration [10]. A study of the national trauma data bank found that prehospital intubation of trauma patients was an independent predictor of hypotension on arrival to the emergency department [11]. A recent study found that risk factors for post-intubation hypotension or arrest included a systolic blood pressure of less than 130 mmHg, oxygen saturations less than 90% and age greater than 65 years [12]. In the setting of a tension pneumothorax or pericardial tamponade, intubation could also lead to sudden hemodynamic collapse by worsening the underlying obstructive shock [13, 14]. It is common practice for trauma patients with known tamponade physiology to defer intubation even in-hospital until the patient is in the operating room with surgeons ready to open the chest due to the high-risk nature of intubating these patients.

Minutes count in penetrating trauma

The Western Trauma Association suggests indications for resuscitative thoracotomy to include blunt trauma patients with less than 10 min of prehospital cardiopulmonary resuscitation (CPR), penetrating torso trauma patients with less than 15 min of CPR, and patients in profound refractory shock [15]. It is therefore critical to minimize the on-scene time for penetrating trauma patients to expedite transport to a trauma centre if they are to be considered for a resuscitative

thoracotomy. Unfortunately, prehospital intubation and transport with ALS paramedics have been classically associated with increased on-scene times for trauma patients [6]. Therefore, the decision to intubate a trauma patient on-scene may be enough of a delay that they are no longer considered a candidate for resuscitative thoracotomy. In an urban EMS environment, the prehospital trauma guidelines and training objectives should focus on immediate transport without unnecessary delay. A cohort study of 103,029 trauma patients with penetrating injuries showed improved survival for patients transported to hospital by personal vehicle compared to transport by paramedics [16]. This survival benefit is likely due to getting to a centre capable of providing definitive management as quickly as possible.

Less is more

Spontaneous breathing is physiologically advantageous compared to positive pressure ventilation in the unstable trauma patient. However, in patients who are not breathing spontaneously or adequately, airway management with oral, nasal or supraglottic airways may be required. If needed, manual ventilations should be performed skillfully and slowly to administer the minimal amount of volume required for adequate oxygenation and ventilation while being mindful of the intrathoracic pressure being generated. This is similar to the suggested management during a medical cardiac arrest, whereby aggressive ventilations are discouraged as they increase intrathoracic pressure and reduce venous return. Intubation for trauma patients should not routinely be part of a trauma arrest algorithm in an urban environment unless paramedics are unable to adequately ventilate and oxygenate patients with BLS airway adjuncts. Furthermore, prehospital intubation should generally be avoided altogether for patients that are peri-arrest. There are obvious challenges in the care of injured patients in a rural setting with prolonged transport times and intubation may be considered in these cases. We recognize that long out of hospital times with an unsecured airway carry significant risks, however the decision to intubate these patients should be done with an understanding of the negative physiologic consequences to the patient as outlined above.

Paramedics work in austere environments with limited resources to manage the dynamic and challenging trauma patient. Given the mounting evidence, we recommend that paramedics should utilize their prehospital expertise to provide BLS airway maneuvers while emphasizing on rapid transport of the hemodynamically unstable trauma patient. Continuing to follow the ABCs for prehospital trauma care is now outdated and the evidence points towards harm—it is time for a serious rethink to our approach of managing the airway in prehospital trauma care.

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