

## Commentary

# Prehospital advanced trauma life support: how should we manage the airway, and who should do it?

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### Abstract

Adequate oxygenation at all times is of paramount importance to the critically injured patient to avoid secondary damage. The role of endotracheal intubation in out-of-hospital advanced trauma life support, however, remains controversial. Initiated by a recent observational study, this commentary discusses risks and benefits associated with prehospital intubation, the required personnel and training, and ethical implications. Recent evidence suggests that comprehensive ventilatory care already initiated in the field and maintained during transport may require the presence of a physician or another adequately skilled person at the scene. Benefits of such as service need to be balanced against increased costs.

**Keywords** airway management, costs, emergency care systems, emergency physicians, ethical implications, out-of-hospital endotracheal intubation, paramedics, prehospital advanced trauma life support

### Introduction

The *British Medical Journal* recently published a report by Christensen and Hoyer [1] on prehospital tracheal intubation in severely injured patients. This retrospective observational study identified 220 severely injured patients (injury severity score > 15), who were treated by the anaesthesiologist staffed mobile emergency care unit in Aarhus (Denmark) over a period of 3 years (1998–2000). A total of 172 patients were taken to the hospital, and 41% (74/172) of these were intubated before arrival. The majority (84% [62/74]) of intubations were facilitated by anaesthesia (hypnotics, analgesics and muscle relaxants), and 58% (36/62) of patients intubated in this manner survived for at least 6 months. This contrasted with only 8% (1/12) survivors among those patients who were intubated without administration of anaesthetics. The authors concluded the following from their data: endotracheal intubation in traumatized patients who do not require the use of anaesthetics should not be considered hopeless; and ambulance personnel may be unable to master administration of anaesthesia and intubation in the prehospital setting (a corresponding paper was published previously elsewhere by the same group [2]).

The work reported by Christensen and Hoyer [1] lacks substantial supplemental information, making it difficult to appreciate how the authors drew their conclusions from the actual data presented in the article. The group of patients who received anaesthetics for intubation appears very heterogeneous, exhibiting large variations in Glasgow Coma Scale and Injury Severity Scores. No details are provided on the respective injury patterns and the organ systems involved. Therefore, differences in injury characteristics between the groups might have contributed, at least in part, to the differences in survival rates (see the report by Eckstein and coworkers [3] for comments on the limitations of the Injury Severity Score for characterizing a group of severely injured patients).

Additionally, it is difficult to appreciate why Christensen and Hoyer concluded that ambulance personnel may not be able to master anaesthesia and intubation in trauma patients, because their data were collected in a physician-based emergency care system. They relate their data to a previous study from the UK conducted by Lockey and coworkers [4], which analyzed the survival of severely traumatized patients after out-of-hospital endotracheal intubation without the use

of anaesthetics. This group, however, analyzed data from patients who were intubated by paramedics or by physicians at the scene. All but one of their patients eventually died before hospital discharge ( $n=486$ ) but, in contrast to the suggestion by Christensen and Hoyer, Lockey and coworkers attribute this adverse outcome to the severity of the sustained injuries rather than to the quality of care provided (e.g. by the participating paramedics). Giving credit to the limited empirical evidence, Lockey and coworkers even question the current practice in the UK that allows paramedics to perform non-drug-assisted intubations only.

However, the work by Christensen and Hoyer raises an interesting set of questions on the overall role of endotracheal intubation in out-of-hospital advanced trauma life support. Is intubation actually beneficial, and what are the risks and benefits associated with this intervention? Should a physician perform the intubation? Finally, should severely injured patients, given their bad prognosis, be intubated at all?

### **Should endotracheal intubation be part of out-of-hospital advanced trauma life support?**

There is broad consent that providing adequate oxygenation at all times is of paramount importance to the critically injured patient because hypoxaemia or, worse, asphyxia may result in secondary damage (e.g. to the cardiovascular system or the brain). Accordingly, control of the airway is given the highest priority in the current algorithms for trauma management. Moreover, trauma victims are at risk for pulmonary aspiration of, for example, stomach contents or blood. As a consequence, early control of the airway by endotracheal intubation appears to be the best therapeutic approach, and indeed has been shown to improve outcome in critically injured patients [5–7]. Invasive airway management at the scene is successfully performed in systems that supply physician staffed ambulances, and is considered a vital part of their advanced trauma life support [7–12].

Some experts, however, argue that out-of-hospital intubation may be deleterious to traumatized patients who are not in respiratory distress, because of the risks involved (e.g. airway trauma, oesophageal intubation, hazard to the cervical spine). Moreover, they believe that intubation unnecessarily prolongs the time spent on-scene and that it does not improve long-term outcome [3,13–17].

However, there is little scientific evidence to support either opinion. Most of the studies favouring prehospital endotracheal intubation of severely traumatized patients were conducted in out-of-hospital systems that rely on highly skilled personnel such as anaesthesiologists, emergency physicians, or specially trained nurses, mostly in continental Europe or Australia. In contrast, studies that do not support this approach rely on data from paramedic or emergency technician staffed services, mostly in the USA or the UK.

### **Must out-of-hospital intubation be performed by a physician to be beneficial?**

There is no doubt that endotracheal intubation in the prehospital setting is more difficult and involves a higher risk for failure compared with in-hospital intubation [10,17]. Intubation may be particularly difficult in the severely but not fatally injured patient, who will fight laryngoscopy and gag or cough on passage of the endotracheal tube. These situations not only require additional skills and experience but also the use of anaesthetics and/or muscle relaxants. Because both drugs may only be applied by physicians, it appears obvious that outcome may be influenced by the skills and training of the emergency personnel.

Specially trained physicians or appropriately skilled nonphysician care providers may actually be required at the trauma scene for patients to benefit from prehospital intubation [18]. Recent studies indeed support the idea that, for example, rapid sequence induction before endotracheal intubation can safely be administered by paramedics in the field [19–22]. Invasive airway management requires sufficient training of personnel and immediate availability of appropriate salvage airway devices [23] and monitoring [24]. However, if adequate skills are not available, then critically traumatized patients may rather benefit from adequate ventilation using less invasive means (e.g. bag–valve–mask ventilation if transport times are short) [25,26].

Unfortunately, no study has yet related outcome to the availability of qualified personnel in the different prehospital emergency care systems. This might actually be very difficult because multiple issues must be considered, including manual skills, case load and continuing training opportunities for the providers, applicable guidelines for airway management, drug treatment options available and subsequent ventilation patterns, as well as access to prehospital emergency medical services and many other social and economic issues that could all affect outcomes after severe trauma.

Christensen and Hoyer [1] do not contribute to this discussion because their study was performed in a purely physician staffed medical system.

### **Should severely injured patients be intubated at all, given their poor prognosis?**

A survival rate of only 0.2% in severely injured patients who could be intubated without anaesthetics [4] is indeed very discouraging and appears to suggest that endotracheal intubation should be abandoned in this setting. Christensen and Hoyer reported a slightly better survival (8% [1/12] of patients) and concluded that invasive airway management is not a hopeless intervention. However, given the small size of the nondrug intubation group ( $n=12$ ), it is difficult to conclude that the outcome is actually better than that reported by Lockey and coworkers [4].

Regardless of this, the above-mentioned question relates to an extremely complex ethical problem, which must be addressed on broader grounds. From our perspective, the decision to provide or withhold a potentially life-saving treatment must be based on a thorough consideration of individual circumstances in every single case, although empirical data may help to reach this decision. Even if survival seems unlikely, all appropriate means should be applied in the out-of-hospital setting to allow further diagnosis and treatment in a qualified trauma centre.

## Conclusions

At present we can only conclude that appropriate oxygenation is essential in any critically traumatized patient. The applied means of airway management should be based on the skills of the respective provider. It seems unlikely that prehospital endotracheal intubation by itself may influence outcome after severe trauma, because it mainly reflects the overall standard of prehospital medical care. A more important question might be whether intensive care (e.g. optimal airway management and appropriate ventilation) should already be started in the field and maintained during transport, which may indeed require the presence of a physician or another adequately skilled person at the scene. If such a system is considered desirable, then the benefits of early intensive care must be balanced against the increased costs of this service.

## Competing interests

None declared.

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