

RESPIRATION AND THE AIRWAY

Advanced airway management is necessary in prehospital trauma patients

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Editor's key points

- A prospective observational study of prehospital airway management was conducted in 472 trauma patients.
- More than half of patients initially treated by a paramedic team had significant airway compromise on arrival of an advanced care team.
- Major complications included failed tracheal intubation, unrecognized oesophageal intubation, and failure to administer oxygen.

Background. Treatment of airway compromise in trauma patients is a priority. Basic airway management is provided by all emergency personnel, but the requirement for on-scene advanced airway management is controversial. We attempted to establish the demand for on-scene advanced airway interventions. Trauma patients managed with standard UK paramedic airway interventions were assessed to determine whether airway compromise had been effectively treated or whether more advanced airway management was required.

Methods. A prospective observational study was conducted to identify trauma patients requiring prehospital advanced airway management attended by a doctor–paramedic team. The team assessed and documented airway compromise on arrival, interventions performed before and after their arrival, and their impact on airway compromise.

Results. Four hundred and seventy-two patients required advanced airway intervention and received 925 airway interventions by ground-based paramedics. Two hundred and sixty-nine patients (57%) still had airway compromise on arrival of the enhanced care team; no oxygen had been administered to 52 patients (11%). There were 45 attempted intubations by ground paramedics with a 64% success rate and 11% unrecognized oesophageal intubation rate. Doctor–paramedic teams delivering prehospital anaesthesia achieved definitive airway management for all patients.

Conclusions. A significant proportion of severely injured trauma patients required advanced airway interventions to effectively treat airway compromise. Standard ambulance service interventions were only effective for a proportion of patients, but might not have always been applied appropriately. Complications of advanced airway management occurred in both provider groups, but failed intubation and unrecognized oesophageal intubation were a particular problem in the paramedic intubation group.

Keywords: airway management; intubation; prehospital emergency care

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Timely and appropriate airway management is essential for severely injured trauma patients since airway compromise is considered to be a significant cause of poor outcome and preventable death in this patient population.^{1,2}

This study was performed to establish the frequency of airway compromise in trauma patients in the period shortly after injury. Early advanced airway interventions can be provided by enhanced care personnel. For example, prehospital doctor–paramedic teams are capable of all advanced airway interventions (including prehospital anaesthesia and surgical airway), but these are costly and relatively scarce resources. It is important to understand whether there is demand for these skills in addition to those routinely provided by

ambulance service personnel. Although there is a perception that advanced airway management is required for severely injured trauma patients on scene, there are no recently published quantitative data on the demand. To address this question, we attempted to establish whether available standard UK paramedic airway interventions dealt adequately with identified airway compromise in trauma patients, or if further advanced airway management was required.

Methods

A prospective observational study was conducted over a 1 yr period (April 2012–March 2013) to identify all prehospital trauma patients attended by an enhanced care doctor–

paramedic team who required an airway intervention on scene in London, UK. An airway intervention was defined as oral or nasal airway insertion, supraglottic airway insertion, tracheal intubation, or assisted ventilation. In addition to standard clinical data collection, the doctor-paramedic team was asked to agree and record any airway compromise at the point of their arrival on scene and any interventions that had been carried out by ambulance service personnel to manage the airway before the enhanced care team arrival. This was an attempt to determine whether any remaining compromise was due to the interventions being ineffective or because (for whatever reason) appropriate interventions had not been attempted. The type, success, and resulting complications of interventions carried out subsequently were also recorded. The local ambulance service, which attended the majority of patients in the study, has stopped training paramedics in the skill of intubation without drugs. However, those paramedics who registered before June 1, 2010, retain this skill. During the study period, both standard laryngeal mask airways™ and the I-Gel™ airway were used as supraglottic airway devices by ambulance service paramedics.

The attending enhanced care team consisted of a doctor and a paramedic. The doctors have a minimum of 5 yr post-graduate experience and are usually from the specialities of anaesthesia or emergency medicine with competency in the full range of advanced airway management skills, including prehospital anaesthesia. The enhanced care team paramedic is an experienced paramedic seconded from the local ambulance service with specific selection and training for an extended role. The enhanced care team is delivered to the scene by helicopter or fast response cars.

Dispatch of the enhanced care team is via a flight paramedic who screens calls to the ambulance control room. Three categories of dispatch were used in the study period. 'Immediate' dispatch on the basis of the caller indicating one of the following trauma mechanisms: person under a train, road traffic collision with person trapped, associated fatality, or person ejected, fall of more than two storeys, and traumatic amputation above the wrist or ankle. The second category is 'interrogation'. An ambulance is dispatched and the flight paramedic speaks to the call maker to try and establish the facts of the incident and state of the patient. If serious injury is suspected, the enhanced care team is dispatched. The third category of dispatch is 'crew request' where an ambulance crew can request the attendance of the enhanced care team after assessment of the patient.

The project proposal was viewed by the local research and development department (London's Air Ambulance). The project met the criteria for, and was registered as, a service evaluation project. No additional interventions were carried out and the study recorded only the frequency of events in normal practice with a view to service improvement. Ethical approval was therefore not required.

Results

In total, the doctor-paramedic team attended 1963 patients during the 1 yr study period (April 1, 2012–March 31, 2013);

472 patients (24.0%) required advanced airway management and were intubated on scene. Of these patients, 368 were males (78%) and 104 were females (22%); the mean age was 40 yr (range 0–95). The most common mechanisms of injury were road traffic collision, 187 patients (39.6%); falls, 137 patients (29%); assaults, 50 patients (10.6%). Ninety-four patients died on scene (19.9%). On arrival of the doctor-paramedic team, 469 patients had ambulance service personnel in attendance. On three occasions, the doctor-paramedic team arrived on scene first.

Of the 469 patients where ambulance service personnel were first on scene, 269 (57%) had airway compromise on arrival of the enhanced care team. Complete airway obstruction was present in 16 patients and partial airway obstruction in 158 patients. Paramedics initially reported two recognized oesophageal intubations. Gross airway contamination was reported in 159 patients: 104 were contaminated with blood, 39 with vomit, and 16 with both. Some patients were reported to have more than one type of airway compromise (Fig. 1).

Ambulance service airway management

Overall, 925 airway interventions had been performed on 469 patients by the ambulance service before arrival of the doctor-paramedic team (Table 1). Of the 200 patients without airway compromise on arrival of the enhanced care team, 134 (67%) had received ambulance service airway interventions. Fifty-two patients (11%) did not have oxygen applied at the point of arrival of the enhanced care team. In 159 patients, the airway was grossly contaminated with blood or vomit. Suctioning of the airway to remove the contamination was reported to have been carried out in 56 patients (39%). The frequency of airway interventions was examined in these two groups in more detail (Table 2).

Ninety-four patients underwent advanced airway interventions by ambulance service paramedics before enhanced care team arrival (tracheal intubation without drugs or supraglottic airway insertion). There were 45 attempted intubations. Twenty-nine intubation attempts (64%) were successful; of which, 27 (93%) were in patients in established cardiac arrest. Sixteen attempted intubations (36%) were unsuccessful. There were five unrecognized oesophageal intubations identified after enhanced care team attendance, and two oesophageal intubations that had been recognized but not rectified until after enhanced care team attendance. Forty-eight out of 52 supraglottic airway insertions (92%) were successful.

Doctor-paramedic airway management

Thirty-nine doctors attended the patients in this study period. Non-anaesthetists managed 247 patients (52.3%), and anaesthetists managed 225 (47.7%) patients. Fifty-eight per cent of cases were attended by fast response car and 42% by helicopter. The median time to arrival on scene by helicopter after activation was 16 (range 4–32) min. The median time to arrival on scene by fast response car after activation was 19 (range 2–49) min.

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