ORIGINAL ARTICLE

Tracheal intubation in the emergency department: the Scottish district hospital perspective

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Background: Tracheal intubation is the accepted gold standard for emergency department (ED) airway management. It may be performed by both anaesthetists and emergency physicians (EPs), with or without drugs.

Objective: To characterise intubation practice in a busy district general hospital ED in Scotland over 40 months between 2003 and 2006.

Setting: Crosshouse Hospital, a 450-bed district general hospital serving a mixed urban and rural population; annual ED census 58 000 patients.

Methods: Prospective observational study using data collection sheets prepared by the Scottish Trauma Audit Group. Proformas were completed at the time of intubation and checked by investigators. Rapid-sequence induction (RSI) was defined as the co-administration of an induction agent and suxamethonium.

Results: 234 intubations over 40 months, with a mean of 6 per month. EPs attempted 108 intubations (46%). Six patients in cardiac arrest on arrival were intubated without drugs. 29 patients were intubated after a gas induction or non-RSI drug administration. RSI was performed on 199 patients. Patients with trauma constituted 75 (38%) of the RSI group. 29 RSIs (15%) were immediate (required on arrival at the ED) and 154 (77%) were urgent (required within 30 min of arrival at the ED). EPs attempted RSI in 88 (44%) patients and successfully intubated 85 (97%). Anaesthetists attempted RSI in 111 (56%) patients and successfully intubated 108 (97%). Anaesthetists had a higher proportion of good views at first laryngoscopy and there was a trend to a higher rate of successful intubation at the first attempt for anaesthetists. Complication rates were comparable for the two specialties.

Conclusions: Tracheal intubations using RSI in the ED are performed by EPs almost as often as by anaesthetists in this district hospital. Overall success and complication rates are comparable for the two specialties. Laryngoscopy training and the need to achieve intubation at the first (optimum) attempt needs to be emphasised in EP airway training.

Tracheal intubation is the accepted gold standard for emergency department (ED) airway management for patients requiring a definitive airway. It may be performed by both anaesthetists and emergency physicians (EPs), with or without drugs.

Rapid-sequence induction (RSI) and intubation is recognised as a core skill for EPs resuscitating patients who are critically ill. The College of Emergency Medicine in the UK recognises that future EPs should have all the necessary skills to manage the airway for the first 30 min after admission to an ED.¹ It is generally accepted that emergency airway management in EDs should be a shared responsibility between anaesthetists and EPs.^{1–2}

Studies from the US have documented the success and complication rates of RSI in the ED performed by EPs.^{3–6} UK studies have shown that ED RSI can be performed by EPs with acceptable success and complication rates,^{7–8} and in the prehospital environment.^{9–10} Specialty responsibility for RSI in UK EDs varies widely between departments, with RSI remaining exclusively in the domain of anaesthetists in many UK EDs.^{1–11}

Intubation practices in Scottish urban EDs have been reported previously.⁸ This study aims to specifically examine and characterise ED RSI in a UK district general hospital. It will determine the success rates and complication rates of RSI through comparison of emergency medicine and anaesthetic practice.

METHODS

This single-centre prospective observational study was conducted from 1 February 2003 to 1 July 2006 (40 months). It

was performed in the ED of Crosshouse Hospital, Kilmarnock, UK, a 450-bed district general hospital serving a mixed urban and rural population in southwest Scotland. The ED has an average annual census of 58 000 patients.

RSI data collection forms (identical with those used in previous studies^{8–12} prepared by the Scottish Trauma Audit Group) were completed by the intubating doctor immediately after the intubation attempt for all RSIs carried out in the ED during the study period. The resuscitation register was reviewed at 09:00 h daily by one of the authors, and outstanding forms were completed retrospectively after direct consultation with the clinician responsible for the intubation. Prospective form completion occurred in 95% of the cases.

Data collected included patient age and sex, indication for intubation, urgency rating, patient physiology, intubation drugs used, specialty and seniority of operator and supervisor, number and details of each attempt at intubation including the Cormack–Lehane¹³ grade, success rate and associated complications.

Attempted laryngeal visualisation to facilitate tracheal intubation was used as the definition of an attempted intubation. Complications were defined as desaturation (<90%), cardiac arrest, hypotension requiring treatment, trauma, aspiration or oesophageal intubation. Aspiration was defined as a clinical diagnosis within the ED, and any necessary re-intubation or re-attempt at visualisation of the larynx was taken as an additional attempt.

Abbreviations: ED, emergency department; EP, emergency physician; RSI, rapid-sequence induction

Table 1 Comparison between rapid-sequence induction data for the two specialities

	Emergency physician, (n = 88)	Anaesthetist, (n = 111)	p Value
Median (range) age (years)	51.5 (6–88)	42 (0–82)	0.004*
Men	60	71	0.53
Trauma	36	39	0.40
Children	3	15	0.014
Immediate RSI	15	14	0.38
Urgent RSI	67	87	0.71
Semi-elective RSI	6	10	0.57
Success at first attempt	72	101	0.056
Grades I and II views on first laryngoscopy	68/79	98/103	0.032
Etomidate	68	21	<0.001
Thiopentone	21	63	<0.001
Propofol	5	26	<0.001
Ketamine	0	2	—

RSI, rapid-sequence induction.

p Value refers to χ^2 test, except *, which is a Mann–Whitney U test.

As in previous work, RSI was defined as the simultaneous administration of an induction agent with a rapidly acting neuromuscular blocking agent.¹⁴ For the purposes of the study, a senior doctor (of either speciality) was defined as a consultant, staff grade doctor or specialist registrar.

Data from completed forms were entered and analysed using a computer-based database (SPSS V.13.0). Categorical data were compared using the χ^2 test or Fisher's exact test as appropriate and continuous data were compared using the Mann–Whitney U test.

RESULTS

A total of 234 intubations were identified over 40 months, with a mean of 6 intubations per month. Overall, 108 (46%) patients were intubated by EPs.

Patients who did not undergo RSI

Thirty-five patients were excluded from further analysis. Six patients were in cardiac arrest on arrival at the ED and were intubated without drugs by EPs. It was not the intention of the study to include the non-drug-assisted intubations, and the data for these six patients were collected in error. This represents a tiny proportion of the total number of patients in cardiac arrest who presented over the study period.

The remainder had either inhalational induction or drugs to facilitate tracheal intubation, although not meeting the previous definition of RSI. Four patients were intubated following overdoses. Seven patients were intubated for neurological diagnoses, five of whom were in a coma at presentation. Eleven patients were intubated for cardiorespiratory compromise. Seven patients with trauma were also intubated.

Five of the above patients were intubated after inhalational induction in the ED, all performed by anaesthetists. Inhalational inductions were undertaken on two patients with trauma, one patient with anaphylaxis and two children with inhaled foreign bodies.

Patients who underwent RSI

RSI was performed on 199 patients. Table 1 summarises the results. EPs carried out 88 (44%), and anaesthetists 111 (56%) of the RSIs. Patients with trauma constituted 75 (38%) of the RSI group. RSIs were classified as immediate (required on arrival at the ED, n = 29, 15%) or urgent (required within

30 min of arrival at the ED, n = 154, 77%). 16 (8%) RSIs were classified as semi-elective, for example, for transfer.

Of the 88 EP RSIs, 15 (17%) were classified as immediate and 67 (76%) as urgent. Of the 111 anaesthetist RSIs, 14 (13%) were classified as immediate and 87 (78%) as urgent.

EPs successfully intubated 72/88 (82%) patients on the first laryngoscopy, another 12/16 (75%) on the second attempt and a further 1/4 (25%) on the third attempt. One EP patient was eventually intubated on the fifth attempt following four grade IV views; cricoid pressure was relaxed and the larynx was externally manipulated to allow successful intubation. The remaining two EP patients were intubated by an anaesthetist, one on the second laryngoscopy and one on the third laryngoscopy. The overall EP intubation success rate (intubation in ≤ 3 attempts at laryngoscopy) was therefore 85/88 (97%).

Anaesthetists successfully intubated 101/111 (91%) patients on the first laryngoscopy, another 5/10 (50%) on the second attempt and a further 2/5 (40%) on the third attempt. ED consultants successfully intubated two of the anaesthesia patients on the second attempt at laryngoscopy. The remaining child was successfully intubated on the third attempt by a consultant paediatrician; this child had a congenitally abnormal airway. The overall anaesthesia intubation success rate (intubation in ≤ 3 attempts at laryngoscopy) was identical with that of the EP at 108/111 (97%).

EPs intubated a similar proportion of patients with trauma, and there were similar proportions of immediate, urgent and semi-elective RSIs in both groups (table 1). Anaesthetists intubated the majority of children (aged <16 years old). The median age of 51.5 years in the EP group was significantly higher than the median age of 42 years in the anaesthesia group. Figure 1 shows the seniority of intubating doctors according to specialty.

A senior (as previously defined) EP was present at 176/199 (88%) ED RSIs and a senior anaesthetist was present at 77/199 (39%). For RSIs where EPs had the first attempt at laryngoscopy, a senior EP was present in 86/88 (98%) of cases and a senior anaesthetist was present in 7/88 (8%). For RSIs where anaesthetists had the first attempt at laryngoscopy, a senior EP was present in 90/111 (81%) cases and a senior anaesthetist was present in 70/111 (63%).

In all, 26 complications were recorded in 20 EP RSIs and 30 complications were recorded in 22 anaesthetic patients (fig 2). No surgical airways were required, and only one patient (previously described) required more than three intubation attempts.

Table 1 outlines the differences in the choice of induction agent.

DISCUSSION

Tracheal intubation and RSI in the ED are performed by EPs almost as often as by anaesthetists in this Scottish district hospital at a combined rate of approximately six intubations, including five RSIs, per month. This pattern of practice is broadly similar to that seen in a previous study in Scottish urban EDs.⁸ EPs intubated a similar number of patients with trauma¹² and performed a similar number of immediate and urgent RSIs.

Intubation of children in UK EDs remains, fortunately, a rare event.^{15–16} The majority of children in this study were intubated by anaesthetists; this may reflect the ability of the EP to identify patients who need specific anaesthesia input. It may also reflect the fact that the EP is usually the team leader for such emergencies and requires skilled help with the airway as he or she is involved in coordination and overall team organisation for these rare and difficult cases.

Figure 1 Seniority by specialty for rapid-sequence induction patients. SHO, senior house officer; SG, staff grade doctor; SpR, specialist registrar; Cons, consultant.

Anaesthetists achieved a higher proportion of good laryngoscopic views ($p = 0.032$), and there was a trend to better first-attempt success rates compared with EPs ($p = 0.056$). This is consistent with the study performed in Scottish urban EDs several years ago; similarly, the better success rates are probably closely related to the superior views obtained by anaesthetists.

More emphasis needs to be placed on laryngoscopy skill acquisition for EPs, with a clear emphasis on achieving first-attempt success in every case.^{17–19} It is clear from our results that the intubation is most likely to be successful on the first attempt regardless of specialty, and successful intubation on the first attempt should be the aim of every ED intubation attempt.

However, the overall successful intubation rate was identical at 97% for the two specialties, and the number of complications was similar for the two groups. This suggests that both specialties have important roles to play in the management of the critically ill ED patient requiring emergency airway care. Collaboration and ongoing joint care are recommended.¹

Etomidate remained the EP's favoured induction agent, whereas anaesthetists used thiopentone more commonly. This perhaps represents individual training and drug preferences, as the number of haemodynamically unstable patients seems to be broadly similar in the two groups.²⁰ We did not assess complication rates by induction agent as this was not one of the aims of the study.

The instance of a senior doctor being present was high for both specialties. EPs seem to almost mandate the presence of a senior EP (98%) before attempting RSI, suggesting that the patient who is critically ill routinely activates a senior emergency medicine response. Similarly, when anaesthetists are performing RSI, both senior EPs and anaesthetists are present in a large proportion of cases. This early collaborative approach can only serve to increase training opportunities for all staff and to increase patient safety and quality of care.

This study is limited by the fact that it only includes one centre, and the results therefore may not be equally applicable to all UK EDs. It is possible that these results could be

Figure 2 Complications by specialty.

replicated in EDs with a similar high level of commitment to ED airway care from EPs and anaesthetists.

CONCLUSIONS

This is the first study to specifically examine tracheal intubation and RSI practice in a UK district hospital ED setting. It suggests that RSI can be performed safely in the district hospital ED by both EPs and anaesthetists, with comparable intubation success rates and complication rates. This practice is based on the presence of senior EPs and anaesthetists, close clinical supervision and the development of collaborative working practices between anaesthetic and emergency departments.

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