

ORIGINAL ARTICLE

Rapid sequence intubation in Scottish urban emergency departments

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Objective: Airway care is the cornerstone of resuscitation. In UK emergency department practice, this care is provided by anaesthetists and emergency physicians. The aim of this study was to determine current practice for rapid sequence intubation (RSI) in a sample of emergency departments in Scotland.

Methods: Two year, multicentre, prospective observational study of endotracheal intubation in the emergency departments of seven Scottish urban teaching hospitals.

Results: 1631 patients underwent an intubation attempt in the emergency department and 735 patients satisfied the criteria for RSI. Emergency physicians intubated 377 patients and anaesthetists intubated 355 patients. There was no difference in median age between the groups but there was a significantly greater proportion of men (73.2% versus 65.3%, $p=0.024$) and trauma patients (48.5% versus 37.4%, $p=0.003$) in the anaesthetic group. Anaesthetists had a higher initial success rate (91.8% versus 83.8%, $p=0.001$) and achieved more good (Cormack-Lehane Grade I and II) views at laryngoscopy (94.0% versus 89.3%, $p=0.039$). There was a non-significant trend to more complications in the group of patients intubated by emergency physicians (8.7% versus 12.7%, $p=0.104$). Emergency physicians intubated a higher proportion of patients with physiological compromise (91.8% versus 86.1%, $p=0.027$) and a higher proportion of patients within 15 minutes of arrival (32.6% versus 11.3%, $p<0.0001$).

Conclusion: Anaesthetists achieve more good views at laryngoscopy with higher initial success rates during RSI. Emergency physicians perform RSI on a higher proportion of critically ill patients and a higher proportion of patients within 15 minutes of arrival. Complications may be fewer in the anaesthetists' group, but this could be related to differences in patient populations. Training issues for RSI and emergency airway care are discussed. Complication rates for both groups are in keeping with previous studies.

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Airway management is universally accepted as the cornerstone of effective resuscitation. Indeed, airway management has been said to be "the defining skill of emergency medicine".¹ In the United Kingdom, definitive airway care for patients brought to the emergency department in cardiac arrest has been provided by emergency physicians for some time.

In many UK hospitals, however, definitive airway management of patients who require anaesthetic drugs and/or neuromuscular blocking agents to permit endotracheal intubation is the responsibility of anaesthetists only.²⁻³ Recent work from the United States has shown the efficacy and safety of emergency airway management, including rapid sequence intubation (RSI), by emergency physicians.⁴⁻⁷ Practice has changed in some UK emergency departments recently⁸ and it is now generally accepted that emergency airway management in these departments can be a shared responsibility between anaesthetists and emergency physicians.² Recently in the UK it has been suggested that prehospital RSI can be safely performed by both anaesthetists and emergency physicians.⁹

RSI is the administration of a potent intravenous induction agent followed immediately by a rapidly acting neuromuscular blocking agent to induce unconsciousness and motor paralysis for tracheal intubation.¹⁰ Its origins lie in emergency anaesthesia, where "rapid sequence induction" is the established technique used to provide ideal intubating conditions for emergency surgery while minimising the risks of pulmonary aspiration.¹¹

RSI is generally regarded as the method of choice for securing the airway for the majority of patients requiring a definitive airway in the emergency department.^{4-7 12 13} There have

been no published studies directly comparing the success and complication rates of RSI when performed by anaesthetists compared with emergency physicians in the UK. Complication rates for RSI in previous North American studies have ranged from 3%¹³ to 15%,^{7 14} but it is difficult to compare these studies because of differing definitions of complications and differences in study methodology.

The aim of this study was to examine prospectively the current practice of RSI in adults performed by anaesthetists or emergency physicians in Scottish urban emergency departments over a two year period.

METHODS

This was a multicentre, prospective observational study running from 11 January 1999 to 10 January 2001 in seven Scottish urban teaching hospitals. Every patient on whom endotracheal intubation was attempted in the participating emergency departments was eligible for the study. Patients who had been successfully intubated before arrival at hospital by either ambulance paramedics or medical staff were specifically excluded from the study.

A form was completed by the intubating doctor immediately after the intubation attempt wherever possible. Data were collected on patient age and sex; indications for intubation; drugs used to facilitate intubation (if any); number and details of each attempt before successful intubation (including the Cormack-Lehane grade¹⁵); grade and specialty of intubating doctor; immediate complications and physiological data before and after intubation (within 15 minutes).

Investigators in each centre checked the resuscitation room log books regularly to ensure that all eligible patients had been

Table 1 RSI patient details for each speciality

	Emergency medicine	Anaesthesia	p Value
Number of patients	377	355	–
Proportion of men	65.3% (246/377)	73.2% (260/355)	0.024
Median age	49	44	NS
Trauma	37.4% (141/377)	48.5% (172/355)	0.003

Three patients did not have a speciality recorded.

Table 2 Comparisons between emergency medicine and anaesthesia

	Emergency medicine	Anaesthesia	p Value
Grade I and II laryngoscopy	89.3% (316/354)	94.0% (298/317)	0.039
Initial success rate	83.8% (316/377)	91.8% (326/355)	0.001
Immediate complications	12.7% (48/377)	8.7% (31/355)	0.104
Physiological compromise	91.8% (315/343)	86.1% (267/310)	0.027
Patients intubated within 15 minutes	32.6% (123/377)	11.3% (40/355)	<0.0001

Immediate complications refers to the number of *patients* in each group who had one or more complications, not the total number of *complications*.

included. When a form was not completed prospectively, investigators completed a form retrospectively with reference to the emergency department records and, if necessary, personal contact with the person who performed the procedure was made. Occasionally it was not possible to complete forms retrospectively because of lack of notes or difficulty in identifying the personnel involved in the resuscitation.

Completed forms were returned to the Central Office of the Scottish Trauma Audit Group (STAG)¹⁶ for data entry and analysis using the SPSS database (v.9).¹⁷ The χ^2 test was used to compare categorical variables. The Mann-Whitney U test was used for non-parametric data. Statistical significance was defined as $p < 0.05$.

As this was an observational study, no restrictions were placed on the drugs used for RSI or any other method for facilitating endotracheal intubation. Participants were free to use whatever technique and drugs they chose for each individual patient. Therefore, no allocation of patients to one speciality or another was made on account of the study and no changes were made to normal emergency airway practice in the participating departments.

Only adult patients on whom RSI was attempted in the emergency department were included in the final analysis. Patients were excluded from the analysis if they met one or more of the following criteria: non-traumatic cardiac arrests ($n=593$); intubation attempt without drugs (including cardiac arrest following trauma) ($n=238$); intubation attempt with sedative, anaesthetic or neuromuscular blocking drug only ($n=47$); inhalational induction of anaesthesia ($n=11$); or age less than 13 ($n=44$).

Physiological compromise was defined as the presence of one or more of the following immediately before any attempt at intubation: systolic blood pressure less than 90 mm Hg; Glasgow Coma Score (GCS) < 9 ; respiratory rate less than 10 per minute or greater than 29 per minute; oxygen saturation $< 90\%$ (measured by pulse oximetry, regardless of inspired oxygen concentration).

RESULTS

A total of 1631 patients met the study entry criteria. Altogether 735 patients fulfilled the criteria for RSI and were therefore eligible for analysis. Table 1 gives patient details for the two groups (anaesthetists and emergency physicians). Table 2 compares the success rates for RSI; grades of laryngoscopy; details of physiological compromise, proportion of patients intubated within 15 minutes of arrival in the emergency department and a summary of the number of patients with immediate complications. Table 3 details the number of immediate complications (not patients) seen in each group. A single surgical airway was required by each speciality for failed intubation after RSI.

There were no significant differences in the pattern of results between those hospitals where emergency physicians regularly intubated and those where they did not. In patients requiring more than one attempt at intubation, the second attempt was usually performed by the same speciality that had initiated the process. However, in 33% (20 of 61) of intubations initiated by emergency physicians, subsequent attempts were performed by anaesthetists and in 7% (2 of 29) of anaesthetist initiated intubations, subsequent attempts were performed by emergency physicians.

It was not possible to accurately identify the exact proportion of forms that were completed retrospectively, but our best estimate is around 90 RSI forms (12%). The majority of these forms were completed within two or three weeks of the RSI occurring.

DISCUSSION

This study has shown that, for RSI in the emergency department, anaesthetists have a higher initial intubation success rate and obtain more grade I and II views at laryngoscopy than emergency physicians. This may be attributable to superior technical ability of anaesthetists in optimally positioning patients and use of intubating equipment or because of the more urgent nature of more of the emergency physician intubations. It is probable that the higher initial

Table 3 Immediate complications

	Emergency medicine	Anaesthesia
Oesophageal intubation	17	6
Endobronchial intubation	6	3
Aspiration	2	6
Vomiting/regurgitation	4	6
Critical desaturation	10	7
Severe hypotension (systolic BP < 90 mm Hg)	17	8
Surgical airway	1	1
Cardiac arrest	3	1

Figures are number of individual complications. All oesophageal intubations were immediately recognised and all patients had their tracheas intubated.

success rate is related to the higher proportion of good views obtained at laryngoscopy.

Both anaesthetists and emergency physicians seem to be capable of performing RSI in the emergency department with comparable immediate complication rates. Emergency physicians tended to have a higher proportion of patients who experienced immediate complications compared with anaesthetists. This did not reach statistical significance, but the study is not sufficiently powered to conclude that there is definitely no difference between the groups. The majority of these complications were either recognised oesophageal intubations or hypotensive episodes. The complications overall noted in the study are comparable to another study of intubation in the critically ill.¹⁴ It is apparent from table 1 that emergency physicians and anaesthetists are performing RSI on differing populations of patients and this may affect the immediate complications observed.

This study has also shown that emergency physicians are performing RSI on a higher proportion of patients with physiological compromise and a higher proportion of patients within 15 minutes of arrival in the emergency department. It is probable that these patients are so ill that the emergency physician has considered it necessary to intervene immediately to save life and reduce morbidity. It may also be related to the immediate availability of the emergency physician within the emergency department, while there may also be a variable delay between calling the anaesthetist to the emergency department and their arrival.

Notwithstanding the results of this study it is clear that trainees in anaesthesia and emergency medicine need to receive adequate training in resuscitation including advanced airway techniques; this has to include RSI and the management of the difficult or failed airway. This may entail experience in the emergency department, intensive care unit and operating theatre for both specialties along with dedicated simulator training.

The lack of internationally accepted definitions of complications of RSI means that studies of emergency airway management (in any setting) cannot be compared on an equivalent basis. Standardised definitions would permit national and international comparisons in the future.

In the UK, there is a role for both emergency physicians and anaesthetists in the management of acute airway compromise in the emergency department. Close collaboration on training and service models and delivery is essential.

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Contributors

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analysis and reporting of data, co-ordination of the study, writing of results. Angela Oglesby: data collection, on site coordination, data entry, form re-design, contribution to the paper. Shobhan Thakore: original idea, study design, form design, data collection, on site coordination, subset analysis, contribution to the paper. Jacqueline Beale: form re-design, data collection, on site coordination, data entry. Jocelyn Brittliff: data collection, on site coordination, form re-design. Michael Johnston: study design, proforma design, interpretation of results, revision of paper, project supervision. Dermot McKeown: liaison with the Scottish Board of the Royal College of Anaesthetists, proforma redesign, interpretation of results, reporting on complications, revision of the paper, project supervision. Tim Parke: study design, form design, interpretation of results, revision of paper, project supervision. Colin Graham is the guarantor for the study.

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