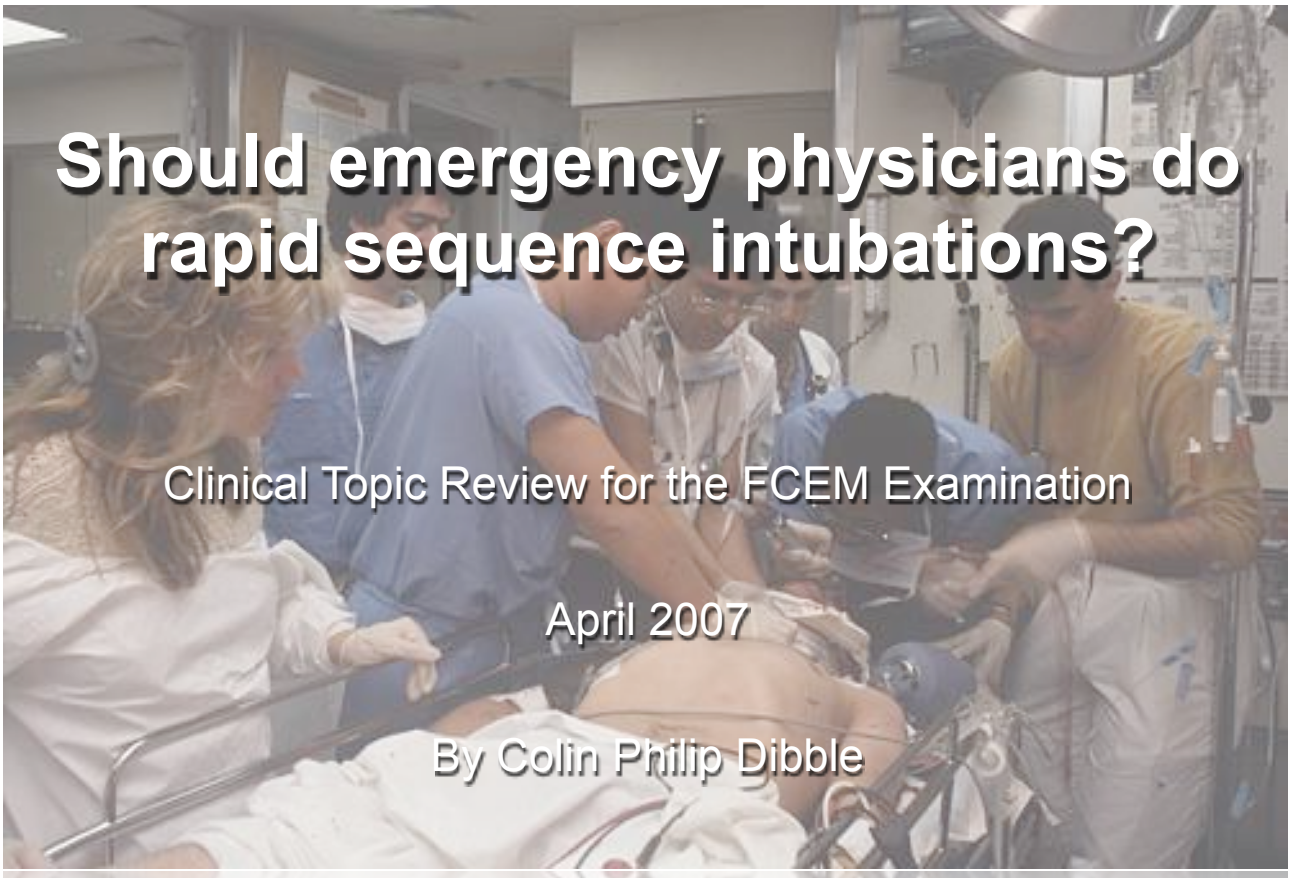

# Should emergency physicians do rapid sequence intubations?

Clinical Topic Review for the FCEM Examination

April 2007

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**Abstract**

**Study Objectives**: There is an increasing trend for emergency physicians to control patients' airway using the rapid sequence intubation (RSI) technique. The purpose of the review was to search for the evidence related to emergency physician RSI, in the emergency department and their success rates and complications, with a particular emphasis on comparison with the current main providers, anaesthetists.

**Methods:** A systematic search strategy was used to search the Medline database. In addition, the Cochrane database, EMBASE, grey literature and hand searching references was done.

**Results:** 14 papers were found for analysis, including 1 randomised controlled trial. In addition to previous reviews were found. The balance of evidence reveals that emergency physicians have a high success rate and a low complication rate comparable to anaesthetists. Anaesthetists have a higher first attempt success rate. The intubating emergency physicians is more often a more senior clinician than the anaesthetist and intubation is achieved faster.

**Personal research:** A prospective observational study of all adult RSI's at Wythenshawe hospital was done. 25 patients included. More of the RSI's are done by anaesthetists, and there is no significant difference in complication rates. In addition, a telephone survey was conducted of all 210 emergency departments in England and Wales. RSI are more often done by anaesthetists, but emergency physicians are now involved in 35% of departments.

**Conclusions:** Emergency physicians are capable of performing RSI safely and timeously with minimal complications. However there needs to be a standardised training program, and ongoing audit and skill maintenance. Impact of other pressures, such as the four target also need to be considered when discussing providing this service.

**Word count:** 3318 words

## Introduction

Rapid sequence induction of anaesthesia is a specific technique originally used by anaesthetists, described formally in 1970 by Stept and Safar who used it in a series of 80 patients between 1967 and 1969[1], showing it to reduce the risk of gastric aspiration. By definition it involves a short period of pre-oxygenation followed by the rapid delivery of a short acting induction agent and a neuromuscular blocking agent accompanied by cricoid pressure (as described by Sellick in 1961)[2] and the passage of a cuffed endotracheal tube. It differs from standard anaesthetic techniques mainly in its speed of delivery of predetermined doses of anaesthetic and depolarising muscle relaxing drugs. However its was developed to induce a state of anaesthesia for surgery and, not primarily for airway control. With the advent of critical care this procedure was increasingly used for the rapid control and protection of the airway and for ventilation. This technique is often referred to as 'rapid sequence intubation' (hereafter referred to as RSI).

There has been a move over the last 30 years for RSI to be preformed by emergency physicians and this is now widespread in, for example, North America[3] and Singapore[11] and is starting to became the case in some hospitals within the United Kingdom. In the United States, according to the National Emergency Airway Registry, anaesthetists are reported to do only 3% of RSIs[5] and 5.5% in trauma patients.[20] This raises many important questions within anaesthetics and emergency medicine with regard to practitioners abilities, training, maintenance of skills and whether this technique should remain solely within the remit of anaesthetists.

Many of the possible complications of RSI, such as hypotension, or airway loss, are routinely managed in the emergency department. The purpose of this review is to present the evidence related to adult RSI in the emergency department by emergency physicians, and compare this, wherever possible, to the current anaesthetic providers.

## Three Part Question

The search strategy was based on the following three part question:

[In an emergency department RSI] are [emergency medicine clinicians] effective with regard to [complications and success rates]

## Evidence

Search Strategy

Medline 1966 to September 2006 via Ovid interface:
{exp Intubation, Intratracheal/ OR (rapid sequence induction).mp OR rsi.mp OR intubation.mp OR (crash induction).mp OR airway management.mp} AND {exp Medical Staff, Hospital/ or exp Emergency Medical Services/ or exp Emergency Service, Hospital/ or (emergency department).mp OR A&E.mp OR (accident and emergency).mp OR casualty.mp} AND {safety.mp. or exp SAFETY/ OR efficacy.mp OR complications.mp OR success.mp}
In addition The Cochrane Database, Embase, and grey literature (the Clinical Trials Registry (USA), International Standard Randomised Controlled Trial Number Register, and New York Academy of Medicine) were searched. Hand searching revealed editorials and research forum data.

Results

462 papers were found of which 446 were not directly relevant and 2 of which were review articles. This left 14 papers for analysis as detailed below:

Key: ED=Emergency department, EP=emergency physician, A=anaesthetist

| Author, date & country | Patient group | Study type | Outcomes | Key results | Study Weaknesses |
|---|---|---|---|---|---|
| Simpson et al, Jan 2006, UK[6] | 255 ED RSI's, 180 EP vs 75 A | Prospective observational study | Complications in EP groups over time (vs baseline anaesthetist complication rates);<br>1999 Trauma<br>2003 Trauma<br>Anaesthetist<br><br>1999 Non-Trauma<br>2003 Non-trauma<br>Anaesthetist | (mainly desaturation for EP group)<br><br>43% (3/7)<br>14% (3/21)<br>18% (6/34)<br>(p=NS)<br><br>28% (5/18)<br>4% (1/23)<br>22% (9/41)<br>(p=NS) | Observational study, details of complications not defined, self reporting, compared with A over whole time period, not year by year. |
| Sagarin et al, October 2005, USA[7] | 7498 intubations, 6661 EP, 5768 by EP residents (4513 or 78% were RSI), 837 by non-EP (292 or 3% were A) | Prospective observational multicentre study | Success by first intubator (EP res)<br><br>First attempt success by post grad. year (PGY)<br>PGY 1<br>PGY 2<br>PGY 3<br>PGY 4+<br>Attending<br><br>Cricothyrotomy | 5193/5757 (90%)<br><br><br><br>72% (n=498)<br>82% (n=2081)<br>88% (n=1963)<br>82% (n=233)<br>98% (n=772)<br><br>50/5757 (0.9%) | Observational study, no adverse event reporting apart from cricothyrotomy, no comparison with other non-EP intubators, self reporting. Included cardiac arrests. |
| Graham et al, 2004, Scotland, UK[8] | 396 ED trauma RSI's, 152 by EP, 242 by A | Prospective, Observational multicentre study | Complications by specialty (in 233 patients)<br><br><br>Median ISS<br><br><br><br>Median Time to intubation<br><br><br>Laryngoscopy grades I & II<br><br>(no failed intubations in any groups) | EP 11/110 (10.0%)<br>A 13/123 (10.6%)<br>p=1.0<br><br>EP=27/152 (17.7%)<br>A=24/242 (9.9%)<br>p<0.001<br><br>EP=12mins<br>A=33mins<br>p<0.001<br><br>EP=89/103 (86.4%)<br>A=99/104 (95.2%)<br>p=0.051 | Observational study, no power study, self reporting, some data were only from matched intubation and STAG forms (n=233) and some data was missing (26 from laryngoscopy grade) |

| Author, date & country | Patient group | Study type | Outcomes | Key results | Study Weaknesses |
|---|---|---|---|---|---|
| Bushra et al, Philadelphia, USA, 2004[9] | 673 ED trauma patients ,467 A supervised , 206 EP supervised, | Prospective, Observational study | Successful intubations within 2 attempts<br><br>Cricothyrotomy | A=442/467 (94.6%) EP=196/206 (95.1%) (OR 1.109)<br><br>A=13/467 (2.8%) EP=2/206 (1%) (OR 0.342) | Observational study, no power study, no mention of complications. Self reporting.<br><br>EP performed 81% of A group and in 98% of EP groups. |
| Levitan et al, Philadelphia, 2004[10] | 658 ED trauma intubations | Prospective, randomised trial | Number of laryngoscopy attempts;<br>1<br><br>2<br><br>3<br><br>Success<br><br>Cricothyrotomy<br><br>Major complications(aspiration, critical hypoxia, cardiac arrest) | <br>EP=394/456 (86.4%), A=174/194 (89.7%)<br><br>EP=50 (11%) A=13 (6.7)<br><br>EP=12 (2.6%) A=7 (3.6%)<br><br>EP=454/456 (99.6%) vs A=194/194 (100%)<br><br>EP=2/456 (0.4%) vs A=0<br><br>0 in either group | Quasi randomised by odd (A)/ even (EP) days, no power study, only major complications. More numbers in EP groups (immediate need). |
| Wong et al, 2004, South East Asia[11] | 1068 ED intubations, (550 cardiac arrests), A=16, EP Resident=658, MO (EP SHO's) =392. | Prospective, Observational study | Speciality vs success rate;<br>First attempt<br><br>Final success rate<br><br>Commonest Complications;<br>Hypotension<br>Multiple attempts<br>Oesophageal intubation<br>Aspiration<br>dental trauma | <br>A=87.5%<br>EP=93.1%<br>MO=85.2%<br><br>A=100%<br>EP= 97.3%<br>MO=90.5%<br><br><br>4.2%<br>1.9%<br><br>1.5%<br>0.4%<br>0.4% | Observational study, no power study, no complications by specialty, large difference in numbers between groups, included cardiac arrest patients. Self reporting. Included children. |

| Author, date & country | Patient group | Study type | Outcomes | Key results | Study Weaknesses |
|---|---|---|---|---|---|
| Graham et al, 2003, Scotland[12] | 735 ED RSI's;377 by EP, 355 by A | Prospective observational multicentre study | Grade 1&II laryngoscopy; EP vs A<br><br>Initial success rate; EP vs A<br><br>Complications; EP vs A<br><br>Physiological compromise; EP vs A<br><br>Intubation <15 minutes; EP vs A | 89.3% vs 94% (p=0.039)<br><br>83.8% vs 91.8% (p=0.001)<br><br>12.7% vs 8.7% (p=0.104)<br><br>91.8% vs 86.1% (p=0.027)<br><br>32.6% vs11.3% (p<0.0001) | Observational study, self reporting, |
| Wong et al, 2003, Singapore[13] | 142 ED trauma intubations, 49 (34.5% RSI's) | Retrospective observational study | Number of attempts, (10 not attempted)<br><br>anaesthetist called (potentially difficult airway),<br><br>complications;<br>nil<br>hypotension<br>other | 113/132 (85.6%) first attempt, 129 (90.8%) successful<br><br>13 (9.2%)<br><br><br>109 (76.8%)<br>27 (19%)<br>6 (4.2%) | Retrospective, observational study, No comparison by specialties, small numbers. Self reporting. Non-attempt of 10 (7%) categorised as 'failure'- actual failure (2.1%) corrected by EP. |
| Tam et al, 2001, Hong Kong [14] | 214 ED intubations, 87 cardiac arrests & 5 children | Prospective observational study | Success rate; EP<br><br>A(after failed by EP)<br><br>Complications, (none fatal):<br>detected oesophageal intubation,<br>dental trauma,<br>soft tissue injury,<br>bronchial intubation,<br>desaturation <90%,<br>hypotension <90mmHg,<br>arrhythmia | 207/214(97%) 90% on 1st attempt<br><br>7/214 (3%)<br><br><br><br>13 (6%)<br>1 (0.5%)<br>7 (3.3%)<br><br>3 (1.4%)<br><br>4 (1.9%)<br><br>3 (1.4%)<br>1 (0.5%) | Observational study, no power study, no direct comparison between specialties, included paediatric patients & cardiac arrests. Self reporting |

| Author, date & country | Patient group | Study type | Outcomes | Key results | Study Weaknesses |
|---|---|---|---|---|---|
| Omert et al, 2001, Pittsburgh, Pennsylvania, USA[15] | 200 ED trauma intubations, A=101, EP=99 | Prospective observational study | Demographics<br><br>Intubation success within 3 attempts<br><br>First attempt,<br><br>Complication rates (%)<br>Hypoxia<br>Aspiration<br>Main stem<br>Bradycardia<br>Oesophageal<br>Dental trauma<br>Surgical airway<br>TOTAL (none fatal) | A= higher GCS and lower RTS P<0.001)<br><br>A=75%/ EP=87.9%<br><br>A=77.2%/EP= 73.7%<br><br>A vs EP<br><br>14.9 vs 18.2<br>5 vs 0.1<br>5.9 vs 2<br>2 vs 3<br>7.9 vs 6.7<br>0 vs 2<br>2 vs 0<br>37.6 vs 33.3 (p=NS) | Retrospective for anaesthetic led part of study period, observational study, no power study. 61 (60.1%) of A group intubations were carried out by EP residents. Small numbers. Self reporting. Included nurse anaesthetists. |
| Butler et al, 2001, UK[16] | 60 RSI's in A&E, 4 aged under 10 | Prospective observational multicentre study | Speciality of decision maker<br><br>RSI practitioner<br><br>Complications;<br>Desaturation<br>Hypotension<br>Cardiac arrest<br><br>Mean Speed to RSI<br><br>RSI practitioner arrival within 5 mins | A=16 (26%)/ EP=44 (73%)<br><br>A=35 (58%)/ EP=16 (26%)<br><br>2<br>3<br>1<br>3 cases =A<br>3 unrecorded<br><br>A=5:42min EP=3:52min (p=0.17) Subgroup analysis showed that in 25% A, delay >10 mins<br><br>A=51%/ EM=62% | Observational study, no power study, small numbers, no comparison of complications by group. Self reporting. |
| Dufour et al, 1994, Quebec, Canada[17] | 219 ED RSI's by EP, including children | Retrospective observational study | Complications;<br>Hypotension<br>Aspiration<br>Bradycardia<br>Bigeminy<br><br>No failed intubations | <br>24 (10.96%)<br>3 (1.37%)<br>3 (1.37%)<br>2 (0.91%) | Retrospective, observational study, no comparison by speciality. self reporting. |

| Author, date & country | Patient group | Study type | Outcomes | Key results | Study Weaknesses |
|---|---|---|---|---|---|
| Sakles et al, 1997 California[18] | 610 intubations, including children, 515 (89.9%) had RSI's | Prospective observational study | Intubations by speciality<br><br>Intubation by grade;<br>EMR-1 (yr1)<br>EMR-2 (yr2)<br>EMR-3 (yr3)<br>Specialists<br><br>Complications;<br>Cardiac arrest<br>Dental trauma<br>Desaturation<br>Hypotension<br>Mainstem intub'n<br>Pneumothorax<br>Vomiting<br>TOTAL<br><br>Success by EP<br>Success in RSI | EP=569 (93.3%)/A=18 (3%)/ Other=23 (3.8%)<br><br>15 (2.6%)<br>101 (17.8%)<br>418 (73.5%)<br>35 (6.2%)<br><br>3 (0.5%)<br>3 (0.5%)<br>20 (3.3%)<br>3 (0.5%)<br>18 (3%)<br>0<br>10 (1.6%)<br>57 (9.3%)<br><br>563 (98.9%)<br>99.2% | Observational study, no mention of attempts made, no comparison by speciality of success or complications. Self reporting. |
| Taryle et al, 1979, Colorado, USA[19] | 43 intubations in ED | Prospective observational study | Grade intubating<br><br>Complications | EM=23<br>A=20<br><br>EM=20/23<br>A=14/23<br>(p=NS) | Observational study, small numbers, no comparison of specific complications or attempts by speciality, numbers don't add up. Self reporting. None had RSI. Included for historical reasons |

## Prospective Observational Study of RSI's

Wythenshawe hospital (University Hospital of South Manchester NHS Foundation Trust) Emergency department (68129 patients in 2005 of which 53370 were 16 years or over) is one in which some of the emergency physicians' perform RSI's. The decision to do so is dependent on the clinician's training and experience, the state of the department, the urgency of the patient's clinical need and the presence of a trauma team. A prospective observational study of RSI's was started as an audit from February 2006 in which a data collection sheet was completed after every adult RSI. To ensure capture of all cases the emergency department or hospital notes of all patients transferred, admitted to ITU and

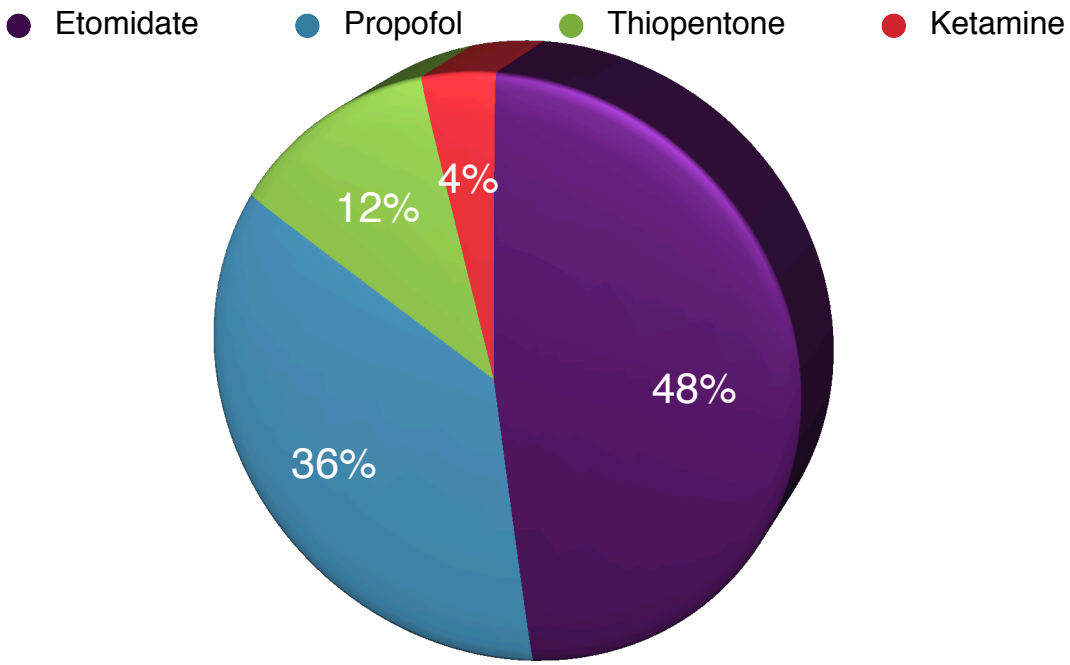
who had died were manually searched and missing data collected retrospectively. Information collected included ED number, age, sex, date, time, indication for RSI, grade and speciality of operator, drugs and dose used, number of laryngoscopy attempts and any complications.

There was incomplete data available on 4 leaving 25 for analysis. 20 (80%) RSIs were performed by anaesthetics/ICU and 5 (20%) were performed by emergency physicians. The mean age of patients was 51 years (range 18-89 years), 48% (12/25) were males. There were 3 complications, a recognised bronchial intubation by an anaesthetist (1/20 or 5%) and two episodes of hypotension by an emergency physician (2/5 or 40%), $X^2$=4.64 (degree of freedom 1), Fisher's exact test p=0.09 but the small numbers make interpretation difficult. The majority of RSI's were performed by specialist registrars (22/25 or 88%), the rest by a senior house officer (4%) and 2 (8%) by consultants.

The indications were as follows:

| Indication | Numbers (Percent) |
|---|---|
| Isolated head injury | 4/25 (16%) |
| Polytrauma | 2/25 (8%) |
| Airway protection | 7/25 (28%) |
| Respiratory failure | 4/25 (16%) |
| LVF | 0/25 |
| Generally Ill for ICU | 4/25 (16%) |
| Status epilepticus | 2/25 (8%) |
| Other | 2/25 (8%) |

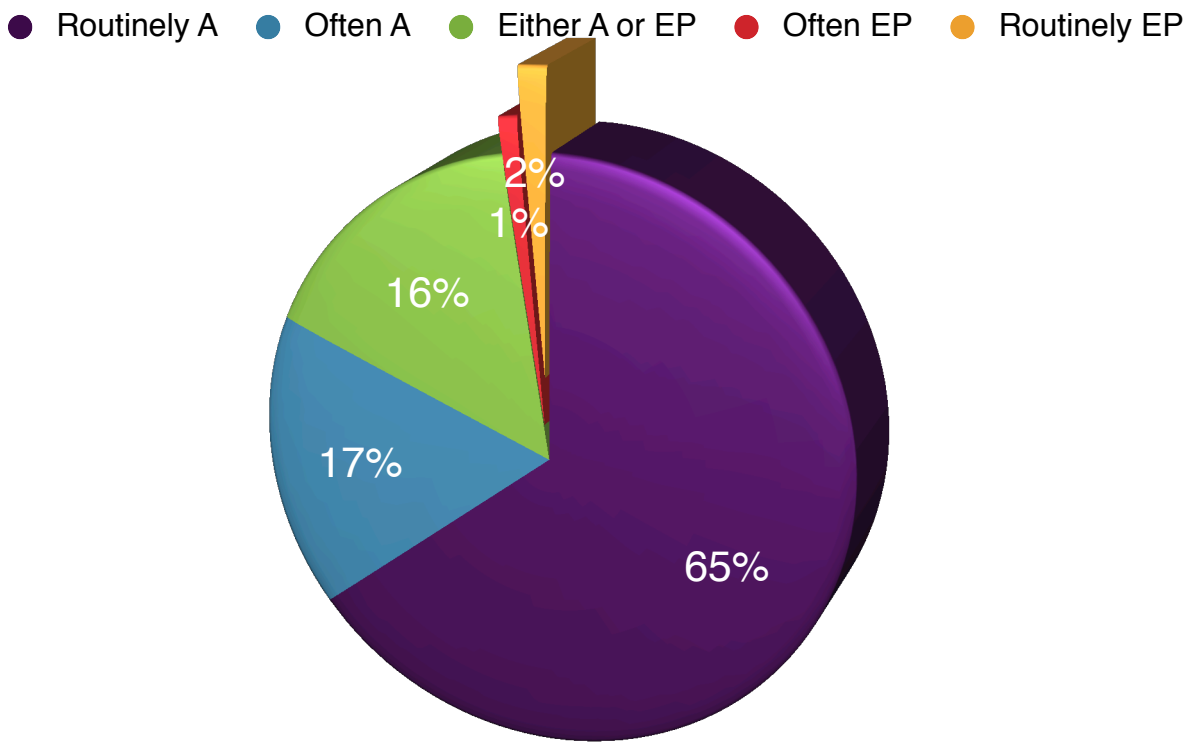
The induction agents used were as follows:




All clinicians used suxamethonium.

**Telephone survey**

All 210 NHS emergency departments in England and Wales were telephoned and the middle grade, specialist registrar or consultant asked who performs the RSI's. (The "Routinely an anaesthetist" response included infrequent emergency physician RSI's, in cases, for example, where a single consultant did his own RSI's or there was a delay getting an anaesthetist).




The results show that in the majority of cases RSI's are routinely done by anaesthetists.

The fact that many departments do not have emergency physicians that are trained and practiced in RSI, means that it will take time to improve the specialties level of this skill. The new run through training will include 6 months anaesthesia and 6 months intensive care thus emergency physician trainees will be able to influence this practice in the future.

## Discussion

The evidence found favours the null hypothesis that there is no difference in performance or complication rates when compared to anaesthetists. In countries, and United Kingdom hospitals, where emergency physicians have taken over this role, they provide an effective and safe service, with assistance, from the anaesthetic service. These findings are consistent with reviews by Kovacs et al in 2004 and Graham in 2005.[3,23] Furthermore, there are some instances in which RSI's by emergency physicians may be advantageous.

The time taken for an anaesthetist to intubate is often delayed, in what is a time critical situation [8,12,16] . The anaesthetist who does attend may be less experienced [8,16] and this makes an experienced emergency physician the safer clinician to perform the RSI. With the NCEPOD guidelines for out of hours operations, there is a reduction in out of hours anaesthetic services, making covering the emergency department more difficult. In a growing specialty such as emergency medicine, we need to explore where we can expand our roles to improve both patient care and the specialty as a whole.

Training is vital in order to ensure that RSI's are done appropriately and safely as well as the ensuing ongoing care with, for example, ventilation and paralysis. The Royal College of Anaesthetists have laid down guidelines as to the required skills (RITA 1).[4] This involves an assessment in performing pre-operative patient assessment, machine checks and the actual process of giving a general anaesthetic, including rapid sequence induction. This occurs three months into a senior house officers training. After this time the clinician is then permitted to perform rapid sequence inductions on-call, with varying degrees of supervision. This RITA 1 assessment is done on relatively well patients (ASA I and II)[4]. Many emergency medicine specialist registrars in this country have undergone a year of training as anaesthetic senior house officers prior to commencing emergency medicine specialist training. The United States residency training program includes specific training in this area and involves a minimum of 35 intubations, followed by yearly training periods of 2 weeks, as laid down by the Accreditation Council for Graduate Medical Education (ACGME), the equivalent of the United Kingdom Post Graduate Medical Education and Training Board (PMETB). There is variation in opinion as to the minimum required length of anaesthetic training required before RSI's may be undertaken in the emergency department but it ranges from 3 months to 1 year.[21] This is still more experience than is required in the United states system. The longer and more thorough the initial training pe-

riod, the slower the skill decline over time.[22] Even in the absence of any previous exposure, training in the technique of intubation is followed by only a small skill reduction. In one randomised controlled trial, a group of 84 health sciences students scored an average of 45/52 at baseline after 5 hours training in intubation. This decreased to 33/52 at 40 weeks with no further training or practice in one group, but 40/52 with feedback and practice in another group.[22] Improvement in practice is evident as emergency physicians increase their numbers of RSI's.[6,7] Anaesthetists are the most experienced in airway management but the environment and patient mix in the emergency department makes this a unique setting. The emergency physician is used to dealing with sick patients and working in a noisy and distracting resuscitation room. In most of the papers, anaesthetists were called to assist in cases where airway difficulties were anticipated, and this should remain the case.

In addition, with the current government 4 hour target, the time taken to do an RSI and the ensuing ongoing care and senior commitment may be difficult if a department is particularly busy.

There is currently a working party from the Royal College of Anaesthetists and the College of Emergency Medicine to address issues of RSI training and skill maintenance.[23] There also needs to be a national database for all RSI's to enable audit and accountability.[23] For the foreseeable future, in the United Kingdom, it appears that emergency airway management will continue to be provided by a combination of anaesthetists and suitably trained and experienced emergency physicians.

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