Original Papers

Prospective observational study of emergency airway management in the critical care environment of a tertiary hospital in Melbourne

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Summary

The objective of this study is to describe the population of patients receiving emergency airway management outside operating theatres at our institution, a tertiary referral centre in Melbourne. A registry of all patients receiving emergency airway management in the emergency department, ICU and on the wards as part of Medical Emergency Response teams' care, was prospectively collected. There were 128 adults and one paediatric patient requiring emergency airway management recruited to the study. Data for analysis included patient demographics, pre-oxygenation and apnoeic oxygenation, staff, drugs, details of laryngoscopic attempts, adjuncts, airway manoeuvres, complications sustained and method of confirmation of endotracheal tube placement. Over a 12-month period, there were 139 intubations of 129 patients, requiring a total of 169 attempts. Respiratory failure was the most common indication for intubation. Intubation was successful on the first episode of laryngoscopy in 116 (83.5%) patients. Complications occurred in 48 patients. In the cohort of patients without respiratory failure, nasal cannulae apnoeic oxygenation significantly reduced the incidence of hypoxaemia (0 out of 31 [0.0%] versus 10 out of 60 [16.7%], *P*=0.016; absolute risk reduction 16.7%; number needed to treat: 6). Waveform capnography was used to confirm endotracheal tube placement in 133 patients and there were four episodes of oesophageal intubation, all of which were recognised immediately. In the critical care environment of our institution, emergency airway management is achieved with a first-attempt success rate that is comparable to overseas data. Nasal cannulae apnoeic oxygenation appears to significantly reduce the risk of hypoxaemia in patients without respiratory failure and the use of waveform capnography eliminates episodes of unrecognised oesophageal intubation.

Key Words: intubation, airway management, nasal cannulae, apnoeic oxygenation

Airway management and endotracheal intubation are core skills required for practitioners in the critical care environment. The Australasian College of Emergency Medicine and the College of Intensive Care Medicine of Australia and New Zealand require development of these skills to a high standard during advanced training[1].

Emergency airway management (EAM) is a high-risk procedure in critical care environments. In 2011, the Royal College of Anaesthetists published their Fourth National Audit Project[2], which examined major complications of airway management in all National Health Service Hospitals in the United Kingdom. At least one in four major airway events reported to the project occurred in the ICU or emergency department (ED), suggesting a high rate of complications when EAM is performed in these environments. When major complications of airway management occurred in the ICU, 61% (22 out of 36) led to death or brain damage compared to 14% (19 out of 133) of events during anaesthesia. The absence of capnography (end-tidal CO_2 detection) was thought to contribute to 74% of these airway-related deaths and the authors suggested that greater use of capnography would save lives. In other work, capnography has been shown to be superior to other forms of assessment in determining endotracheal tube position[3], and patients exposed to oesophageal intubation are known to have increased rates of hypoxaemia, regurgitation and aspiration[4]. Early detection of oesophageal intubation using capnography would appear warranted.

The reasons why EAM may be more difficult in the critical care environment outside of an operating theatre are multifactorial. Patients frequently have substantial physiologic derangement, are often non-fasted, regularly present outside daylight hours, present outside of critical care locations which do not have a full complement of airway equipment or ready access to other skilled staff and require an emergency procedure rather than a planned elective procedure. Adjuncts that may improve the safety of EAM are therefore important to identify. Hypoxaemia occurs in up to 70% of patients undergoing EAM, depending on the definition used and

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number of laryngoscopic attempts[5]. Reducing the frequency of its occurrence is an important goal.

Apnoeic oxygenation is used commonly in Australian and New Zealand ICUs to prevent hypoxaemia during brain death testing[6,7]. In 2010, Levitan published an online opinion piece[8], followed by a review paper[9], suggesting that the use of nasal cannulae (nasal prongs) to provide a continuous flow of O_2 while efforts to secure a tube were underway, may result in prolonged safe apnoea time. In our ICU and ED, the provision of apnoeic oxygenation via nasal cannulae during EAM entered common use, however its use has never been prospectively assessed in EAM in the critical care environment. Prior studies have demonstrated its utility in delaying haemoglobin desaturation in the simulated difficult airway[10] and in the obese patient[11] in the elective anaesthetic environment.

As a result of the Fourth National Audit Project[12], it became clear that EAM in the critical care environment as a whole required further study, as this patient population appears to have the potential for a much higher rate of complications than the elective anaesthesia cohort. Several studies have been published describing EAM in ICUs in Scotland[13], Canada[14,15], the USA[16] and Australia[17]. In 2009, Fogg et al published a prospective observational study of EAM in the ED[18]. However, there has been no prospective collection of data in the Australian critical care environment in its entirety, including the ED, ICU and on the wards as part of Medical Emergency Response teams.

The aims of this study were to describe the patients receiving EAM in our critical care environment (outside operating theatres), to describe our practice of end-tidal CO_2 confirmation of tube placement and our elective use of nasal cannulae for apnoeic oxygenation during EAM.

Methods

This prospective observational study was carried out from March 2013 to February 2014 in the ED, ICU and wards of St Vincent's Hospital, a tertiary referral centre in Melbourne, Victoria. The ICU admits approximately 1350 patients per annum, while the ED has an annual census of approximately 41,500 patients. There is a well-developed Medical Emergency Response system on the wards[19,20].

Ethical approval for the study was granted by the St Vincent's Hospital (Melbourne) Research Governance Unit as a Quality Assurance project (Reference No.: QA017/13).

All patients who required EAM for critical illness in the ED, ICU and on the wards as part of a Medical Emergency Response over a period of 12 months were included. A data sheet (see Appendix 1, online) was completed as close to the time of intubation as possible. Missing data were established through interview or correspondence with the staff involved, or from the (electronic) medical record. The ICU admissions register was regularly reviewed to ensure all episodes of airway intervention were recorded.

The team leader and primary airway operator were recorded, as were patient demographics including age, weight and reason for intubation. If performed, formal airway assessment including an evaluation utilising the 'LEON' mnemonic (Look externally; Evaluate 3-3-2; Obstruction present?; Neck mobility assessment) was recorded[21]. The presence or absence of pre-oxygenation and apnoeic oxygenation was recorded. Laryngoscopes available for use throughout the study period included conventional laryngoscopes with Macintosh blades of appropriate sizes and the Glidescope videolaryngoscope (Verathon, Burnaby, BC, Canada). Waveform capnography or colour-change capnometry devices were available for confirmation of endotracheal tube placement. Patient observations were recorded before induction and following intubation and all peri-procedure medications were recorded.

An episode of EAM was defined as the process of translaryngeal tracheal intubation for each patient. An intubation attempt was defined as a single passage of the laryngoscope blade past the lips. Difficult laryngoscopy was defined as Cormack and Lehane grade III or IV, while difficult intubation was defined as an episode of EAM that required more than two attempts[16]. There is variation in the literature for these definitions. We defined a novice intubator as having performed fewer than ten intubations and an experienced intubator more than 100[18], however these criteria have not been consistently applied in the literature.

Adjuncts to intubation were defined as the use of a Frova Intubation Introducer (Cook Medical, Bloomington, IN, USA) or stylet, external laryngeal manipulation, cricoid pressure and manual inline stabilisation. Other intubation manoeuvres were defined as oropharyngeal or nasopharyngeal airway insertion, bag-valve-mask ventilation after failed attempt, supraglottic airway (SGA) insertion after failed attempt, cricoid pressure removal and emergency surgical airway.

Intubation complications were defined as equipment failure,

Table 1
Diagnostic categories of patients requiring intubation (n=139)

Diagnostic category	n	%
Respiratory failure	48	34.5
Airway obstruction	2	1.4
Sepsis	9	6.5
Gastrointestinal bleed	1	0.7
Seizure	6	4.3
Intracranial haemorrhage/stroke	5	3.6
Overdose/ingestion	27	19.4
Altered mental status, not overdose	27	19.4
Cardiac arrest	13	9.4
Other	1	0.7
Total	139	100

hypoxaemia (peripheral oxygen saturation <93%[18]), bradycardia (heart rate <60/minute), hypotension (systolic blood pressure <90 mmHg), dental trauma, airway trauma, need for second dose of muscle relaxant, oesophageal intubation, laryngospasm, mainstem bronchial intubation, medication error, vomit without aspiration, vomit with aspiration and cardiac arrest. Failure to establish an airway was defined as inability to insert an endotracheal tube or SGA.

Indications for EAM were classified as either trauma or medical indications and included respiratory failure, airway obstruction, anaphylaxis, congestive heart failure, sepsis, gastrointestinal bleed, seizure, intracranial haemorrhage or stroke, overdose or ingestion, altered mental status—not overdose—and cardiac arrest.

All data were entered into Microsoft Excel 2011 (Microsoft, Redmond, WA, USA) and statistical analysis was performed using Stata Version 13 (Stata Corp, College Station, TX, USA). For continuous data, results are expressed as median (IQR) or mean (SD) depending on normality, and for categorical variables as number (percentage). Univariate analysis of associations between categorical variables was performed using chi-square test or Fisher's exact test and P <0.05 was assumed to represent statistical significance.

Results

During the 12-month period, 139 intubations were performed in 128 adults and one paediatric patient. Nine patients were intubated twice in the same admission and one patient was intubated twice during separate admissions. Repeat intubations within the same admission were for respiratory failure (eight in nine) and altered mental status—not overdose (one in nine). There were a total of 169 attempts at intubation.

Patients

The male-to-female ratio was 1.48 with a median age (IQR) of 54 years (35 to 69 years) and a median weight (IQR) of 70 kg (63 to 88 kg). The median Charlson comorbidity index (IQR) was 1.00 (0.00 to 2.00). Table 1 shows the breakdown of patients into diagnostic categories. Respiratory failure was the predominant indication for intubation, followed by overdose or ingestion and altered mental status—not overdose.

Vital signs prior to EAM were deranged in the majority of patients, as presented in Table 2. Episodes of EAM were distributed evenly between daytime and night-time, however more intubations occurred on the weekend than were expected (38.1%).

Table 2

Results: patient and clinician factors (n=139)

	Criterion assessed	n	%	*P*-value
Vital signs pre-induction	Pulse >100/min	71	51.1	
	Systolic blood pressure <90 mmHg	9	6.5	
	SpO_2 <93%	25	18.0	
	Respiratory rate >25/min	43	30.9	
	GCS score <9	65	46.8	
Airway assessment	Performed	120	86.3	
	Predicted difficult laryngoscopy	29	20.9	
	Success on first attempt if predicted to be difficult (n=29)	18	62.1	
	Success on first attempt if predicted to not be difficult	86	87.8	0.002
	Inter-incisor distance 3 fingers	66	91.7	
	Inter-incisor distance 2 fingers	5	62.5	0.013
Seniority of team leader	ICU physician	21	15.1	
	Emergency physician	23	16.5	
	ICU registrar	60	43.2	
	Emergency registrar	35	25.2	
Seniority on first attempt at laryngoscopy	ICU physician	4	2.9	
	Emergency physician	7	5.0	
	ICU registrar	70	50.4	
	Emergency registrar	49	35.3	
	Anaesthetic registrar	4	2.9	
	ICU RMO	5	3.6	

GCS=Glasgow Coma Scale, RMO=Resident Medical Officer.

Table 3
Pre-oxygenation and apnoeic oxygenation

	Method	n	%
Pre-oxygenation	NIV	27	19.4
	BVM device	97	69.8
	Non-rebreathing mask*	14	10.1
	Other	1	0.7
Apnoeic oxygenation	None	63	45.3
	NC 15 l/min O_2 flow	44	31.7
	BVM	21	15.1
	BVM + NC 15 l/min O_2 flow	3	2.2
	NIV mask left in situ	8	5.8
	Other	0	0.0

*Non-rebreathing mask refers to a plastic face mask with an attached reservoir bag and incorporates a one-way valve system to prevent rebreathing. NIV=non-invasive ventilation, BVM=bag-valve-mask, NC=nasal cannulae.

A formal airway assessment was performed in the majority of patients. An inter-incisor distance of three fingers was predictive of first-attempt success, compared to patients who had two-finger inter-incisor distance (*P*=0.013). The thyromental (*P*=0.52) and thyrohyoid distance (*P*=0.72) was not predictive of first-attempt success.

When assessment of the airway was performed, the predicted difficult airway was associated with decreased first-attempt success (*P*=0.002).

Pre-oxygenation and apnoeic oxygenation

All patients were pre-oxygenated prior to laryngoscopy. This was most commonly achieved using a bag-valve-mask device, with the next most common being non-invasive ventilation, as seen in Table 3. Apnoeic oxygenation during EAM was used in 76 of 139 (54.6%) patients and, when provided, the most common method of administration was nasal cannulae at 15 l/min O_2 flow.

Overall, nasal cannulae did not prevent hypoxaemia (*P*=0.316), as seen in Table 4. For the subgroup of patients intubated for respiratory failure, hypoxaemia was not prevented (*P*=0.369). However, in the subgroup of patients being intubated for reasons other than respiratory failure, there were no episodes of hypoxaemia in those receiving nasal cannulae apnoeic oxygenation compared with 16.7% of those without apnoeic oxygenation (0 in 31 [0%] versus 10 in 60 [16.7%], *P*=0.016).

Staff

Table 2 details the seniority of both team leader and airway operator. The team leader was a consultant (ED or ICU physician) at 44 of 139 (31.7%) intubations and a registrar (ED or ICU) at 95 of 139 (68.3%) intubations. Figure 1 shows the seniority of the intubator at each attempt at intubation. There were a total of 169 attempts at intubation. The majority of attempts were by ED registrars with 53 of 169 attempts (31.4%) and ICU registrars with 82 of 169 attempts (48.5%). Of the 29 in 139 (20.9%) airways predicted to be difficult, 26 were performed by ED or ICU registrars, two by resident medical officers and one by an anaesthetic registrar. Only 7 of 29 (24.1%) were supervised by consultants, as seen in Table 5.

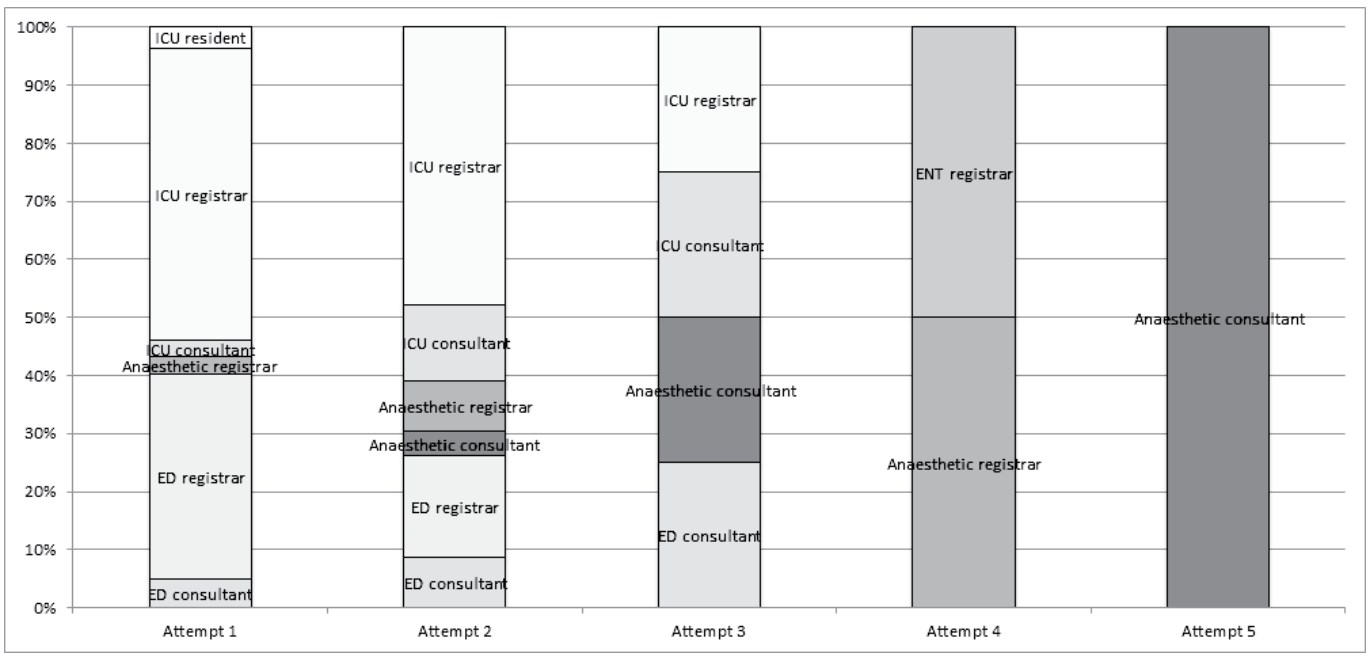

Figure 1: Bar chart showing the seniority of intubator at each attempt. ED=emergency department, ENT=ear, nose and throat.

Table 4

Hypoxaemia (SpO_2 <93%) and nasal oxygen during efforts to secure a tube

Patients	Nasal cannulae during apnoea	Hypoxaemia	%	*P*-value
All patients	No	18	19.6	
	Yes	6	12.8	0.316
Patients with respiratory failure	No	8	25.0	
	Yes	6	37.5	0.369
Patients without respiratory failure	No	10	16.7	
	Yes	0	0.0	0.016

Table 5

The predicted difficult airway

	Clinician	n	%
Seniority of team leader	ICU physician	1	3.4
	ED physician	6	20.7
	ICU registrar	16	55.2
	ED registrar	6	20.7
Seniority on first attempt at laryngoscopy	ICU physician	0	0.0
	ED physician	0	0.0
	ICU registrar	15	51.7
	ED registrar	11	37.9
	Anaesthetic registrar	1	3.4
	ICU RMO	2	6.9

ED=emergency department, RMO=resident medical officer.

No intubations of patients with predicted difficult airways were performed by a consultant on the first attempt.

Drugs

Neuromuscular blocking agents were used to facilitate intubation in 126 of 139 (90.6%) patients. Post-procedural neuromuscular blocking agents were used in 54 of 139 (38.8%) patients, while post-procedural analgesia was provided in only 43 of 139 (30.9%) patients. When suxamethonium was used on induction, the mean dose was 1.51 (0.36) mg/kg. When rocuronium was used on induction, the mean dose was 0.88 (0.39) mg/kg.

Laryngoscopy

The majority of patients had laryngoscopy performed with either a conventional laryngoscope with a Macintosh blade or the Glidescope videolaryngoscope. Table 6 demonstrates that laryngoscopy was found to be difficult in 19 of 139 (13.7%) patients, yet difficult intubation occurred in only 4 of 139 (2.9%). There were no failed airways.

When the Macintosh blade was used on the first attempt, the Cormack-Lehane grade of laryngoscopy was 1 to 2 in most patients. When the Glidescope was used on the first attempt, the grade of laryngoscopy (indirectly viewed on the video screen) was 1 to 2 in the majority of patients. Use of direct laryngoscopy resulted in first-attempt success in 100 out of 120 (83.3%) patients and videolaryngoscopy in 14 out of 16 (87.5%) patients (*P*=0.13). No attempt was made to discern the reason for using a videolaryngoscope rather than a direct laryngoscope. There were two blind nasotracheal intubations during the study period, both successful on the first attempt.

Overall, intubation was successful on the first attempt in 116 of 139 (83.5%) patients. ED registrars and ICU registrars had comparable first-attempt success rates. When stratified by experience, novice operators (fewer than ten intubations) were significantly less likely to be successful on the first attempt than all others (*P*=0.02). As expected, higher Cormack-Lehane grade of laryngoscopy was associated with decreased first-attempt success (*P*=0.0001).

Adjuncts

The use of adjuncts to facilitate intubation is described in Table 6. On the first attempt at laryngoscopy, a Frova intubation introducer was used infrequently, while a stylet was used in the majority and no adjunct was used in 53 of 139 intubations (38.1%).

When a Frova introducer was used, first-attempt success occurred in 7 of 13 (53.9%) patients, compared to the stylet, where first-attempt success occurred in 64 of 73 (87.7%) patients (*P*=0.01). When adjunct use in the predicted difficult airway was analysed, it appeared that the first-attempt success rate was again lower when a Frova introducer was used, with only 1 in 4 (25%) patients having first-attempt success compared to 10 in 13 (76.9%) when using the stylet (*P*=0.16).

Airway manoeuvres and complications

No airway manoeuvre was required in the majority of patients. External laryngeal manipulation was performed in 26 of 139 (18.7%) patients, while an oropharyngeal or nasopharyngeal airway was used in 20 of 139 (14.4%) patients. Bag-valve-mask ventilation following a failed attempt was required in 18 out of 139 (12.9%) patients. A SGA was used as an airway rescue device in one patient, following initial difficult laryngoscopy. In none of the four difficult intubations was an SGA used. There were no emergency surgical airways.

Complications occurred in 48 out of 139 (34.5%) patients on the first intubation attempt, as seen in Table 7. The most common complication was hypoxaemia, occurring in 24 of 139 (17.3%) patients. No patients had cardiac arrest following induction. When the predicted difficult airway was analysed, there was no difference in the number of complications on the first or second attempt (*P*=0.67).

Confirmation of endotracheal placement

End-tidal CO_2 devices were used for all episodes of EAM.

There was one failure of both waveform capnography and the colour-change capnometry device and clinical confirmation alone was used to confirm endotracheal tube placement. Waveform capnography was used in 133 of 139 (95.7%) patients. There were four episodes of oesophageal intubation, all of which were recognised immediately using waveform capnography.

Discussion

This is the first descriptive study of EAM in the critical care environment of an Australian hospital and demonstrates several important findings: registrars training in emergency and intensive care medicine commonly perform EAM safely at a first-attempt success rate that is comparable to overseas data; nasal oxygen during efforts to secure a tube appears to significantly reduce the risk of hypoxaemia in patients without respiratory failure; and the almost universal use of waveform capnography eliminates episodes of unrecognised oesophageal intubation.

Of the 169 attempts at intubation, few were performed by an anaesthetic registrar or consultant. This is comparable to the US but contrasts to the UK, where 74% of critical care airways are managed by doctors with >24 months of formal anaesthesia training[13]. ED and ICU physicians performed few

Table 6
Results: laryngoscopy

	Criterion assessed	n	%	*P*-value
Grade of view at first attempt	Grade 1 (direct)	83	68.0	
	Grade 2 (direct)	21	17.2	
	Grade 3 (direct)	12	9.8	
	Grade 4 (direct)	6	4.9	
	Grade 1 (video)	14	87.5	
	Grade 2 (video)	1	6.3	
	Grade 3 (video)	0	0.0	
	Grade 4 (video)	1	6.3	
First-attempt success	Direct laryngoscopy	100	83.3	
	Videolaryngoscopy	14	87.5	0.13
	ICU physician	2	50.0	
	Emergency physician	7	100.0	
	ICU registrar	58	82.9	
	Emergency registrar	43	87.8	
	Anaesthetic registrar	3	75.0	
	ICU RMO	3	60.0	
First-attempt success (direct laryngoscopy) by grade	Grade 1	81	97.6	
	Grade 2	17	81.0	
	Grade 3	3	25.0	
	Grade 4	1	16.7	0.0001
First-attempt success by experience of clinician	<10 prior intubations	5	55.6	
	10–100 prior intubations	63	84.0	
	>100 prior intubations	48	87.3	0.02
Adjuncts used at first attempt	Frova introducer	13	9.4	
	Stylet	73	52.5	
	Neither	53	38.1	
Adjunct success at first attempt	Frova introducer	7	53.8	
	Stylet	64	87.7	0.01
	Frova introducer in predicted difficult airway	1	25.0	
	Stylet in predicted difficult airway	10	76.9	0.16

RMO=resident medical officer.

Table 7
Airway complications on the first attempt

Type of complication	n	%
None	91	65.5
Equipment failure	2	1.4
Hypoxaemia	24	17.3
Bradycardia	2	1.4
Hypotension	7	5.0
Dental trauma due to intubation	1	0.7
Airway trauma due to intubation	0	0.0
Oesophageal intubation	3	2.2
Laryngospasm	0	0.0
Mainstem bronchial intubation	4	2.9
Medication error	0	0.0
Vomit—no aspiration	0	0.0
Vomit—with aspiration	1	0.7
Cardiac arrest	0	0.0
Second dose of relaxant	3	2.2
Other	1	0.7

intubations in our study, raising the concern of 'skill fade'. Of further concern, registrars, often being supervised by other registrars (and not consultants), most commonly performed airways that were anticipated to be difficult. Despite this, the incidence of complications was not different between those airways predicted to be difficult and those that were not.

The majority of patients were intubated on the first attempt at laryngoscopy, comparable to prior studies[13,18]. Laryngoscopy was difficult in 13.7% of patients, which is lower than that found by Fogg et al. Difficult intubation occurred in only 2.9% of patients, which is much lower than prior studies[16,22,23]. An inter-incisor distance of three fingers was predictive of first-attempt success, however both thyro-mental and thyrohyoid distance were not predictive of first-attempt success, in contrast to prior studies[24,25].

When comparing the use of a Frova introducer to facilitate first-attempt success versus a stylet, the Frova introducer had a lower success rate. This could be confounded by the fact that Frova introducers are more commonly used in the anticipated difficult airway; however, even in this group, there was a lower success rate compared to a stylet. There may be a disconnect between theory and practice in that operators know they should be using a Frova introducer for difficult airways but it is a practical skill that requires significant, and hard-to-obtain, experience. This has implications for training in our institution.

The use of a supraglottic airway device during emergency airway management in our study was very low and may reflect a failure to follow airway algorithms.

The overall complication rate in our study was 32%, comparable to prior studies[18,26]. Of note, hypoxaemia occurred in 18.7% of patients, which is also similar to prior studies[13,18,27].

When patients without respiratory failure were intubated, with nasal cannulae providing apnoeic oxygenation, the complication of hypoxaemia was eliminated, which has significant implications for future research into emergency airway management. This finding is likely to be repeatable given the significance and size of the absolute risk reduction and future studies should target this therapy in order to inform management.

Use of capnography in Australian ICUs for airway management has been reported at 72%[17]. Our study demonstrated its use in 95.7% of patients and there were no unrecognised oesophageal intubations. Capnography is recommended for use in all episodes of airway management, in all locations[2,12,28].

Drug use to facilitate intubation was consistent with prior studies, however rocuronium dosing may be lower than recommended for rapid sequence intubation[29]. Of concern, post-procedural analgesia was provided to only 30.9% of patients, which is a deviation from current guidelines recommending analgesia-first sedation in mechanically ventilated ICU patients[30].

Limitations

This single-institution observational study is unlikely to be representative of all critical care environments in Australia. The patient population studied did not include any trauma or burns patients due to the nature of the institution, thus limiting comparison with other studies. Although prospectively collected, we required the team leader to complete the data collection form, and resultant reporter bias would likely under-report complications. A specialist anaesthetist did not perform glottic visualisation on each occasion, thus the reporting of airway grade may be inaccurate.

It is possible that not all intubations in the study period were captured and, despite the efforts of investigators, it was not possible to capture all the data required for every intubation.

Recommendations

Regular audit of emergency airway management in Australian EDs and ICUs is essential. In accordance with guidelines, capnography should be used to confirm endotracheal placement in all emergency airway management, as this virtually eliminates the possibility of unrecognised oesophageal intubation. The utility of nasal cannulae apnoeic oxygenation is an area for further study, as it appears that, for patients without respiratory failure, it may prevent episodes of hypoxaemia.

Conclusion

In the critical care environment of our institution, airway management is achieved with registrars performing the majority of emergency airway management at a first-attempt success rate that is comparable to overseas data, while the use of waveform capnography eliminates episodes of unrecognised oesophageal intubation. The data collected and analysed

suggests that nasal cannulae apnoeic oxygenation appears to significantly reduce the risk of hypoxaemia in patients without respiratory failure and requires further study.

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Place Patient Sticker Here	**DATE:**	
	EST WEIGHT:	
	TEAM LEADER:	Specialty + Seniority (eg. ED Reg)

DIFFICULT AIRWAY INDICATORS – "LEON"		Tick if NO FORMAL ASSESSMENT made	❑
Looks difficult?	Y / N	**Obstruction** present?	Y / N
Evaluate **3-3-2** rule (see over)	_ - _ - _	Neck **mobility** limited?	Y / N
Other			

Preoxygenation	NRBM	❑	BVM	❑	NIV	❑	TIME OF **INDUCTION**	:	TIME OF **INTUBATION**	:
Apnoeic O_2	Nil	❑	NP ❑	BVM	❑	NIV	❑			

Attempt	Intubator	Specialty + Seniority	No. of previous intubations (please circle)	Blade type M=Mac V=Video O=Other	Cormack & Lehane Grade		B=Bougie S=Stylet N=Neither	External laryngeal manipulation (Y/N)	Cricoid (Y/N)	Manual inline stabilisation (Y/N)	Tube size
					Direct	Video					
1			<10 10-100 >100								
2			<10 10-100 >100								
3			<10 10-100 >100								
4			<10 10-100 >100								
5			<10 10-100 >100								

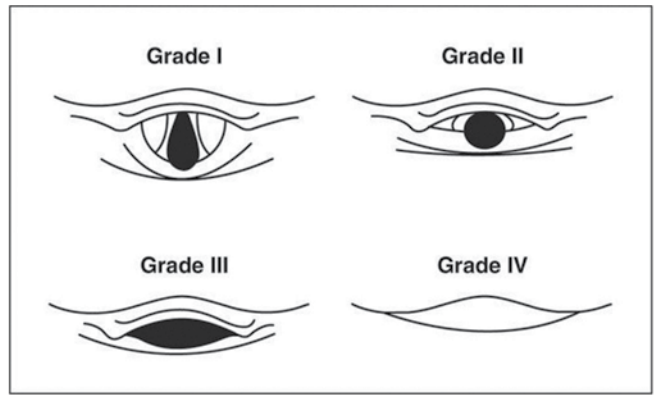
OTHER INTUBATION MANOEUVRES — INDICATE ON WHICH ATTEMPT/S AFTER TICK BOX						
NIL	❑			LMA inserted after failed attempt	❑	
Guedel / NPA inserted	❑			Cricoid pressure removed	❑	
BVM ventilation after failed attempt	❑			Surgical airway	❑	

INTUBATION COMPLICATIONS — INDICATE ON WHICH ATTEMPT/S AFTER TICK BOX						
NIL	❑		Record Lowest Stats/BP and Duration	Oesophageal intubation	❑	
Equipment failure – describe in comments	❑			Laryngospasm	❑	
Desaturation – SpO2 < 93%	❑			Mainstem bronchial intubation	❑	
Bradycardia – HR < 60bpm	❑			Medication error	❑	
Hypotension – BP < 90 requiring treatment	❑			Vomit – no aspiration	❑	
Dental trauma	❑			Vomit – with aspiration	❑	
Airway trauma	❑			Cardiac arrest	❑	
Second dose of paralytic agent	❑			Other – describe in comments	❑	

ENDOTRACHEAL PLACEMENT CONFIRMATION					
Colour-change Capnometry	❑	**Waveform** Capnography	❑	Clinical confirmation alone	❑

DISPOSITION	ICU	❑	Theatre	❑	Transferred to another hospital	❑	Required subsequent re-intubation	❑	Extubated	❑	Died	❑

COMMENTS

"LEON" Evaluation	Cormack & Lehane Grading
Look Externally • Facial trauma • Large incisors • Beard or moustache • Large Tongue Evaluate 3-3-2 rule: • Inter-incisor distance ≥ 3 fingers • Hyoid-mental distance ≥ 3 fingers • Thyroid-hyoid distance ≥ 2 fingers Obstruction (eg haematoma, epiglottitis, large tonsils) Neck mobility limited?	

INDICATION FOR INTUBATION – tick best one only					
TRAUMA:		MEDICAL:			
Traumatic Cardiac Arrest	❑	Respiratory failure	❑	Altered mental status – not overdose	❑
Head injury – threatened airway	❑	Airway obstruction	❑	Cardiac Arrest	❑
Head injury – airway not patent	❑	Anaphylaxis	❑	**OTHER** (Please State):	
Combative / Agitated	❑	CHF	❑		
Face / Neck trauma	❑	Sepsis	❑		
Shock	❑	GI bleed	❑		
Drowning	❑	Seizure	❑		
Burn / Inhalation	❑	ICH / Stroke	❑		
Penetrating trauma	❑	Overdose / Ingestion	❑		

Observations	Last Set **BEFORE** INDUCTION	GCS		RR		SBP		HR		SaO_2	
	First Set **AFTER** INTUBATION					SBP		HR		SaO_2	

Medication **BEFORE** induction			Medication **FOR** induction			Medication **POST** induction	
Morphine		dose (mg)	Ketamine		dose (mg)	Vecuronium	❑
Fentanyl IV		dose (mcg)	Thiopentone		dose (mg)	Ketamine	❑
Fentanyl intranasal		dose (mcg)	Propofol		dose (mg)	Morphine	❑
Midazolam		dose (mg)	Fentanyl		dose (mcg)	Midazolam	❑
Ketamine		dose (mg)	Suxamethonium		dose (mg)	Propofol	❑
Topical LA		dose (mg)	Rocuronium		dose (mg)	Fentanyl	❑
Other		dose (mg)	Other		dose (mg)	Other	❑
Nil	❑		**Nil**	❑		**Nil**	❑

COMMENTS