



**Ambulance Service
of New South Wales**



Factors Associated with Difficult Intubation in
Aeromedical Prehospital Rapid Sequence Intubation
– A Prospective Observational Study.

Greater Sydney Area HEMS

Authors: K. Habig, B. Burns, S. Ware.

Background



**Ambulance Service
of New South Wales**

Aeromedical retrieval teams in Australia routinely undertake rapid sequence intubation for prehospital trauma. The majority of services within Australia utilise a critical care physician/ retrieval paramedic team for aeromedical pre-hospital scene responses and this is the model under which GSA-HEMS operates.

Pre-hospital RSI of critically ill trauma patients is a high-risk procedure that has been shown to have an increased rate of severe complications – such as failed intubation, failure of oxygenation, transient hypoxia, hypotension or need for surgical airway, compared with other settings such as the operating theatre environment.¹



OBJECTIVE

To describe the factors associated with difficult intubation in pre-hospital RSI, as defined by more than a single attempt at laryngoscopy, by a dedicated aeromedical retrieval service operating with a critical care physician/ retrieval paramedic operational crew in NSW, Australia.

METHODS

This observational study was conducted using prospectively collected data in the GSA-HEMS Airway Registry for the period Sep 2009 to Sep 2013. Multi-variate logistic regression was performed for factors associated with more than a single look at laryngoscopy needed to achieve tracheal intubation.

Results



**Ambulance Service
of New South Wales**

443 pre-hospital RSIs occurred in 50 months.

Aeromedical retrieval paramedics were the initial laryngoscopist in 290 (65.5%).

First look success tracheal intubation was achieved in 372 (84.0%) (95%CI 80.3-87.1%). Intubation was achieved on second look in 58 (13.1% Cumulative total 97.1%). Overall successful tracheal intubation was achieved in 438 (98.9%) (95% CI 97.4-99.5%), with 3 SGA and 2 surgical airways performed.

“Intubation events” occurred in 116 (26.2%) with desaturation (defined in the registry as SaO₂ <93% at any time during intubation) the commonest in 77 (17.4%).

Factors associated with a requirement for than more than a single attempt at laryngoscopy included: paramedic laryngoscopist and the presence of at least 1 difficult airway indicator.

Table 1. Patient Characteristics



**Ambulance Service
of New South Wales**

Variable	All intubations (n=443)		Non-difficult intubation (n=372)		Difficult intubation (n=71)	
Male*	330	(74.5)	272	(73)	58	(82)
Age, years (median <i>IQR</i>)**	34	32	33	32	41	32
Weight, kg (median <i>IQR</i> ***)	75	25	75	20	80	25
Transported by rotary wing	336	(75.8)	280	(75)	56	(79)
Traumatic injury	399	(90.1)	336	(90)	63	(89)
Reason for intubation						
Traumatic cardiac arrest	37	(8.4)	33	(9)	4	(6)
Head injury threatened airway	218	(49.2)	181	(49)	37	(52)
Head injury airway not patent	53	(12.0)	47	(13)	6	(8)
Combative agitated	135	(30.5)	109	(29)	26	(37)
Shock	46	(10.4)	39	(10)	7	(10)
Burn/inhalation	28	(6.3)	24	(6)	4	(6)

n (%) unless otherwise indicated; * 2 missing (sex); **22 missing (age); ***15 missing (weight)

Table 2. Univariate Analysis



**Ambulance Service
of New South Wales**

Variable	All intubations (n=443)		Non-difficult intubation (n=372)		Difficult intubation (n=71)		p-value
	n	(%)	n	(%)	n	(%)	
Nil difficult airway indicators	80	(18.1)	76	(20)	4	(6)	0.0060
Blood/vomitus in airway	158	(35.7)	123	(33)	35	(49)	0.0097
Limited mouth opening	34	(7.7)	22	(6)	12	(17)	0.0023
Trauma to face/neck	95	(21.4)	81	(22)	14	(20)	0.6991
C-spine precautions	277	(62.5)	229	(62)	48	(68)	0.3357
Obese body habitus	44	(9.9)	33	(9)	11	(15)	0.0916
Limited neck movement	14	(3.2)	7	(2)	7	(10)	0.0016
Paramedic as 1 st operator	290	(65.5)	233	(63)	57	(80)	0.0051
Cricoid pressure	165	(37.2)	134	(36)	31	(44)	0.2235
Midline inline stabilisation	268	(60.5)	223	(60)	45	(63)	0.5878
Night mission	137	(30.9)	108	(29)	29	(41)	0.0500
Intubated on ground	73	(16.5)	60	(16)	13	(18)	0.6501

Table 3. Multivariate Analysis



Ambulance Service
of New South Wales

Variable	OR	95%CI	<i>p</i> -value
Night mission	1.780	1.015-3.122	0.0443
Blood/vomitus in airway	1.864	1.054-3.297	0.0324
Limited mouth opening	3.057	1.341-6.968	0.0078
Limited neck movement	4.610	1.476-14.402	0.0086
Paramedic as 1st operator	3.295	1.666-6.517	0.0006

Discussion/Conclusions



**Ambulance Service
of New South Wales**

This study used a very strict definition of difficult airway (more than one look laryngoscopy tracheal intubation) and of desaturation ($\text{SaO}_2 < 93\%$ at anytime during intubation regardless of pre-existing hypoxaemia).

RSI success was comparable or better than the majority of published data for pre-hospital services² as well as ED³, ICU⁴, and PICU⁵ intubations and indicate the procedure can be performed safely and effectively in the pre-hospital setting by experienced teams operating under strict operating procedures, utilising pre-RSI checklists and routine audit of practice with a detailed airway registry of all intubations.

Factors associated with more than a single attempt included a paramedic laryngoscopist, the presence of blood/vomit in airway, limited mouth opening, facial/neck trauma, C-spine precautions, or neck extension limited by anatomy.

REFERENCES

1. Spaite, D et al Out-of-hospital rapid sequence intubation: Are we helping or hurting our patients? *Annals Emerg Med* Dec 2003 Vol. 42 (6) pp 729-730
2. Fakhry, S. et al Prehospital Rapid Sequence Intubation for Head Trauma: Conditions for a Successful Program *Journal of Trauma* May 2006 Volume 60 (5) pp 997-1001
3. Fogg et al Prospective observational study of the practice of endotracheal intubation in the emergency department of a tertiary hospital in Sydney, Australia *Emerg Med Australas.* 2012 Dec;24(6):617-24
4. De Jong, A Early Identification of Patients at Risk for Difficult Intubation in the Intensive Care Unit. *Am J Respir Crit Care Med.* 2013 Apr 15;187(8):832-9
5. Nishisaki, A. et al Effect of Just-in-time Simulation Training on Tracheal Intubation Procedure Safety in the Pediatric Intensive Care Unit *Anesthesiology* July 2010 Vol 113 (1) pp 214-223