effective for teaching both techniques. Only 57% of staff felt quite/very confident in CMAC® D blade use before training *despite* multiple previous teaching programmes, showing the high frequency of skill decay and the need for regular training; continued training is planned to address this.

References

1. Hagberg CA, Artime CA, Daily WH. *The Difficult Airway: A Practical Guide*. Oxford University Press USA, 2013.
2. Cook TM, Boniface NJ, Seller C, *et al. Br J Anaesth* 2018; **120**: 173—80
3. O'Farrell G, McDonald M, Kelly FE. *Anaesthesia* 2015; **70**: 104

Evaluation of a tissue superobese emergency front-of-neck access model using the scalpel-bougie-tube technique

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Commercially available part task trainers for emergency front-of-neck access (eFONA) teaching do not replicate the anatomy encountered by clinicians in extreme obesity where the tissue depth between the skin and the cricothyroid membrane can exceed 3 cm.[1 2] We created and evaluated an eFONA bench top trainer using commercially sourced porcine larynx with super obese model of porcine larynges, skin and varied depth fat layer between 0 and 30 mm (non-obese *vs* super obese).

After obtaining ethical approval, consent from participants, and standardised training with the Difficult Airway Society (DAS) advocated scalpel—bougie—tube technique, participants were randomised to perform eFONA in the non-obese and super obese models. Our primary outcome was passage of tracheal tube in trachea, and secondary outcomes were time, success in less than 40 s, anatomical accuracy, injury score, and tracheal ring injury.

Seven anaesthesia trainees performed four repetitions in each model. Failure was significantly more common in obese models (eight/28 [obese] *vs* 25/28 [non-obese], $P < 0.001$, Fig. 4). There was a significant difference in the proportion of successful eFONA in less than 40 s (seven/28 *vs* 19/28, $P < 0.003$). The time taken in the non-obese model was significantly shorter than that in super obese models (35 [27—42] *vs* 50 [43—59] s, $P < 0.001$). Accidental direct tracheal entry was found in one super obese model but none in the non-obese model. Five false passages were observed in the super obese model and none were observed in the non-obese model. There was no significant difference in injury scale between the obese and non-obese groups (1.0 [0.0—1.5] *vs* 0.0[0.0—1.0], $P = 0.07$). Tracheal injury was more common in the obese group than in the non-obese group (12/28 *vs* one/28, $P < 0.002$). There was a negative correlation between number of attempts and time in the non-obese ($R = -0.55$, $P = 0.03$) but not in the super obese models.

In summary, the relatively inexpensive super obese model was consistently more difficult than the non-obese model during eFONA with the DAS advocated scalpel—bougie—tube technique. More than four repetitions may be required to improve performance.
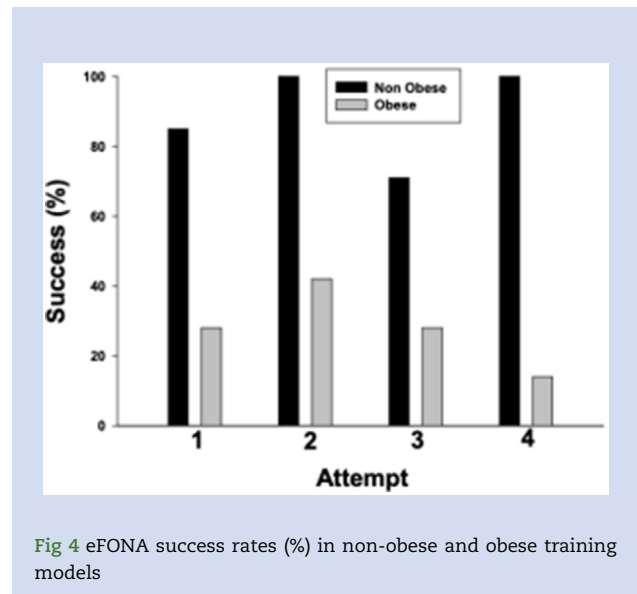

Fig 4 eFONA success rates (%) in non-obese and obese training models

References

1. Le Fevre PJ, Gough C, Hearne BJ, *et al. Anaesthesia* 2019; **74**: 480—7
2. Long N, Ng S, Donnelly G, Owens M, *et al. Int J Obstet Anesth* 2014; **23**: 29—34

First pass success is important in prehospital tracheal intubation to minimise the risk of physiologic deterioration

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Pre-hospital tracheal intubation of the critically ill and injured can be challenging and patients are at risk of serious complications. The purpose of this study was to determine the association between the number of intubation attempts and the occurrence of physiologic deterioration.

This institutional review board (IRB)-approved project was an observational study conducted in a large USA helicopter emergency medical service (HEMS) of patients undergoing rapid sequence intubation in the field by the flight crew (flight nurse/flight paramedic) over a 4 yr period from January 1, 2015 to December 31, 2018. Data were collected on patient, operator, and procedural characteristics, and included method of intubation, drugs and devices used, difficult airway characteristics, number of intubation attempts, outcome of each attempt, and complications associated with intubation. The predictor variable was first pass failure, which was defined as failure to achieve tracheal intubation on a single laryngoscope insertion. The outcome variable was physiologic deterioration, which was defined as the occurrence of any one of the following three physiologic complications: hypoxemia (SpO_2 <90%), hypotension (systolic blood pressure <90 mm Hg) or cardiac arrest (loss of pulses requiring cardiopulmonary resuscitation). Patients

Table 2 Physiologic deterioration with first pass success *vs* first pass failure.

Physiologic deterioration	First pass success % (*n*)	First pass failure % (*n*)	%Difference (95% CI)
Hypoxaemia	4.5 (262)	27.1 (118)	−22.6 (−26.8 to −18.4)
Arterial hypotension	0.7 (39)	1.8 (8)	−1.1 (−2.4 to 0.1)
Cardiac arrest	0.2 (9)	1.4 (6)	−1.2 (−2.3 to −0.1)
Total patients*	5.2 (300)	28.0 (122)	−22.8 (−27.1 to −18.6)

*Patients may have more than one complication.

were excluded if they were <18 or >89 yr of age, or if they were hypoxaemic, hypotensive, or in cardiac arrest before intubation was attempted. Multivariable logistic regression was performed to evaluate the relationship between first pass failure and the occurrence of physiologic deterioration.

A total of 6247 patients were included in the analysis. Of these, 93.0% (*n*=5811) required one attempt, 5.7% (*n*=353) required two attempts, and 1.3% (*n*=83) required three or more attempts. Physiologic deterioration occurred in 5.2% of patients (*n*=300) who required one attempt, 26.9% of patients (*n*=95) who required two attempts, and 32.5% of patients (*n*=27) who required three or more attempts (Table 2). In the multivariable logistic regression analysis, first pass failure was associated with an increased risk of physiologic deterioration (adjusted odds ratio [aOR], 5.7; 95% confidence interval [CI], 4.4–7.4).

In this study of prehospital intubations by an aeromedical service, first pass failure was associated with a marked increase in the risk of physiologic deterioration. To maximise patient safety during prehospital intubation, every effort should be made to optimise conditions for first pass success.

Benefits of positive pressure ventilation for preoxygenation before rapid sequence intubation are dependent upon oxygenation status

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Positive pressure ventilation (PPV) has been advocated before rapid-sequence intubation (RSI). However, the risk of aspiration owing to gastric insufflation may outweigh the preoxygenation benefits in normoxaemic patients.

An observational study of air medical RSI patients was conducted over a 2-yr period. Wavier of informed consent was granted by the Institutional Review Board. Flight crews were instructed to perform preoxygenation, potentially including the use of PPV, to target SpO_2 values ≥93%). A computerised quality review form was completed immediately after all patients encountered involving advanced airway management. For this analysis, patients receiving PPV were compared with those not receiving PPV with regard to rates of first attempt intubation success without desaturation (FASWD) and reported aspiration events. Patients in whom SpO_2 ≥93% was achieved with passive oxygenation were analysed separately from those in whom SpO_2 values remained <93% despite passive oxygenation.

A total of 9778 RSI patients were included in this analysis. A total of 8966 (92%) were successfully intubated on the first attempt, and a total of 8775 (90%) were intubated successfully on the FASWD. A total of 8435 patients (86%) achieved normoxaemia (SpO_2 ≥93%) with passive oxygenation alone; the use of PPV was associated with decreased intubation success and an increase in aspiration events. A total of 1343 patients (14%) remained hypoxaemic (SpO_2 <93%) with passive oxygenation alone; the use of PPV was associated with increased intubation success without a statistically significant increase in aspiration Table 3.

Use of PPV for preoxygenation before RSI appears to be beneficial for patients with persistent hypoxemia (SpO_2 <93%;) despite passive oxygenation. However, PPV appears to increase aspiration risk without improving intubation success for patients in whom normoxaemia (SpO_2 ≥93%) can be achieved with passive oxygenation alone. These data suggest that PPV use should be limited to patients with persistent hypoxaemia despite passive oxygenation.

Table 3 Effects of positive pressure ventilation in the presence of persistent hypoxaemia; comparison with normoxaemia

Passive O₂ result	Parameter	PPV	No PPV	P-value
Normoxaemia (*n*=8435)	*n*	4118	4317	—
	Pre-PPV SpO₂ (%)	97.6	97.0	NS
	FASWD (%)	89.0	93.0	<0.001
	Aspiration (%)	0.9	0.5	0.022
Hypoxaemia (*n*=1343)	*n*	1227	116	—
	Pre-PPV SpO₂ (%)	81.2	83.8	NS
	FASWD (%)	84.0	75.9	0.036
	Aspiration (%)	2.8	1.7	NS

Second victim response in anaesthesiologists after difficult airway management: an international survey

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Airway management has a direct impact on patient experience and outcome but when difficulties occur, the practitioner may experience mental and physical health problems, known as a 'second victim' response. Little is known about the