

**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. Waiver 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<sub>2</sub> 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<sub>2</sub> ≥93% was achieved with passive oxygenation were analysed separately from those in whom SpO<sub>2</sub> 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<sub>2</sub> ≥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<sub>2</sub> <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<sub>2</sub> <93%) despite passive oxygenation. However, PPV appears to increase aspiration risk without improving intubation success for patients in whom normoxaemia (SpO<sub>2</sub> ≥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 O <sub>2</sub> result	Parameter	PPV	No PPV	P-value
Normoxaemia (n=8435)	n	4118	4317	–
	Pre-PPV SpO <sub>2</sub> (%)	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 SpO <sub>2</sub> (%)	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

prevalence of 'second victim' experiences and its impact on professional careers in anaesthesiology.

An online survey with 41 questions was sent to members with valid e-mail addresses (3293 members) of the Difficult Airway Society (DAS), the Society for Airway Management (SAM), and the European Airway Management Society (EAMS). The survey was conducted between February 1 and April 1, 2019, with two reminders sent later. We received 721 complete responses (22%). The respondents provided written informed consent to coded data analysis. Questions asked for demographic information, professional experience, experience with airway crises and the impact on personal well-being, job performance, legal sequels, and patient outcome.

Survey participants, whose mean (standard deviation) age was 47 (12) yr, were 62% male, 93% anaesthesiologists with 20 (10) yr of experience (13 [9] yr focusing on airway management), and 7% were in training. Airway experts were identified in 47%, and routine airway providers in 47% of the respondents. Interest in airway management was triggered in 49% by a difficult case, in 29% by research, in 45% by an educational event, and in 62% by a colleague (multiple answers were allowed). Although 89% were involved in an airway crisis, only 23% considered themselves to be a 'second victim'. Only 38% participated in a debriefing, and in 19% changes at the departmental level were instituted. Symptoms reported by second victims are displayed in Table 4. Symptoms persisted in 26% up to weeks, in 8% for half a year, in 5% for >1 yr, and in 5% they still persist. Acquiring advanced airway expertise served as a coping mechanism in 72% of those considered to be a second victim, 33% became airway educators, and 65% went into advanced airway management training. After the adverse experience, 29% changed nothing, 48% changed airway management strategies, 9% airway teaching, and 8% equipment. Patient outcomes were 51% without sequela, 20% with minor and 2% with major morbidity, 17% with death; and 4% resulted in litigation. Location was operating room (OR; 65%), emergency room (ER; 10%), and ICU (11%); 56% during the week-day, 5% on weekends.

This survey has shown that more than a fifth of airway events result in anaesthesiologists as second victims with substantial impact on their own well-being. Relieving factors included proper debriefing, support by colleagues and staff,

advanced airway teaching, and skill acquisition to become an airway expert.

## Elective tracheostomy versus delayed extubation for postoperative airway management after major head and neck oncologic surgery

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Tracheostomy has been used traditionally to provide secure airway in patients after radical head and neck cancer (HNC) surgery. However, recent studies have questioned these practices, and delayed tracheal extubation may be equally safe.<sup>1,2</sup> We planned a study to determine the safety and efficacy of overnight intubation followed by extubation the next morning (delayed extubation strategy [DES]) compared with elective tracheostomy (ETR) for postoperative airway management and to identify factors that were associated with performance of an ETR.<sup>3</sup>

A prospective observational study approved by the Institutional Ethics Committee was conducted between August 2015 and July 2016. Adult patients undergoing elective major oropharyngeal resection for HNC under general anaesthesia with tracheal intubation were included. The decision regarding postoperative airway management using either ETR or DES was made by the operating surgeon and anaesthetist according to usual practice. Extent of the disease, type of surgery, demographic details, and anaesthesia and airway management details were recorded. Time to extubation (in the DES group), time to oral intake and speech, complications until discharge, and length of hospital stay were recorded.

A total of 4477 patients were screened, and 714 were included. DES was performed in 417 patients (58.4%) and ETR in 303 patients (42.4%). DES was associated with a significantly shorter stay in hospital (7.2 [3.7] vs 11.5 [7.2] days,  $P=0.00$ ), less time to oral intake (5.1 [1.6] vs 7.2 [2.8] days,  $P=0.00$ ), and less time to speech (3.6 [1.6] vs 6.1 [2.7] days,  $P=0.00$ ). Overall complications (4.3% vs 22.5%,  $P=0.00$ ) and airway related complications (1.7% vs 8.7%,  $P=0.00$ ) were significantly lower in the DES group compared with ETR. On multivariate analysis, T3–T4 tumour stage (odds ratio [OR]=10.2; 95% confidence interval [CI], 5.2–20.3), preoperative radiotherapy (OR=3.9; 95% CI, 1.4–10.5), bilateral neck dissection (OR=2.6; 95% CI, 1.0–6.6), reconstruction with a composite flap with or without bone (OR=2.5; 95% CI, 1.5–4.2) and duration of anaesthesia (OR=1.006; 95% CI, 1.004–1.008) were independent predictors of ETR.

After major intraoral HNC surgery, a DES is safe with fewer complications and faster return to oral feeding and speech. Tracheostomy may be performed in selected patients with T3–T4 tumours, composite flaps, bilateral neck dissection, or those receiving prior radiotherapy.

**Table 4** Experience of second victim symptoms

Experienced symptoms	Self-reported second victim n=113; n (%)
Anxiety, fear	80 (71)
Sadness, guilty	45 (40)
Lack of confidence	43 (38)
Stress	39 (35)
Sleep disorders	30 (27)
Flashbacks	22 (19)
Learning opportunity	17 (15)
Relief	10 (9)