Hannah *et al.*
Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine
(2025) 33:120
https://doi.org/10.1186/s13049-025-01433-z

Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine

RESEARCH Open Access

Video laryngoscopy versus direct laryngoscopy in a UK pre-hospital physician/critical care paramedic helicopter emergency medical service

Julian Hannah[1,2,4*], Oluwasemire Adetoro[1], Adam J. R. Watson[1,3], Peter Owen[1,2,4], John Gamblin[1,2], Megan Lloyd[1] and James O. M. Plumb[1,2,3,4]

Abstract

Background It is recognised that multiple attempts at intubation are associated with harm. However, it remains unclear whether video laryngoscopy (VL) significantly improves pre-hospital tracheal intubation success compared to direct laryngoscopy (DL) in critically ill patients. While operating theatre studies strongly favour VL, some pre-hospital studies suggest it may worsen outcomes.

Methods This single-centre retrospective service evaluation included critically ill patients requiring pre-hospital tracheal intubation by a UK-based Helicopter Emergency Medical Service (HEMS) Hampshire & Isle of Wight Air Ambulance between 1st November 2018 and 22nd April 2024. This time period saw the introduction of VL with the option to use it versus DL. Patient demographics, intubation indication, anaesthetic drugs, and intubation technique (type of laryngoscopy, grade of view, number of attempts, and complications) were collated. The primary outcome was first-pass success, comparing VL and DL groups, with significance set at $p = < 0.05$.

Results We included 1,279 patients (median age 56, 69% male), of whom 478 (37%) received VL and 803 (63%) received DL. The most common indication for intubation was low GCS ($n = 477$ (39%). Overall, First-pass success was 92% ($n = 443$) in the VL group and 84% ($n = 799$) in the DL group. Since the introduction of VL in June 2022, both the proportion of VL intubations and first-pass success rates have increased annually.

Conclusion Our findings support the routine use of VL for pre-hospital tracheal intubation.

Trial registration This project used routinely collected data and was registered with University Hospital Southampton as a service evaluation SEV/0735, date of registration 16/07/2024.

Keywords Video laryngoscopy, Direct laryngoscopy, Intubation, First-pass success, Prehospital, Airway management, HEMS

*Correspondence:
Julian Hannah
julian.hannah@uhs.nhs.uk
[1]University Hospital Southampton NHS Foundation Trust, Southampton, UK
[2]Hampshire & Isle of Wight Air Ambulance, Southampton, UK
[3]Clinical & Experimental Sciences, Faculty of Medicine, University of Southampton, Southampton, UK
[4]Perioperative & Critical Care Theme, NIHR Southampton Biomedical Research Centre, Southampton, UK

Background

Tracheal intubation remains the gold standard for airway management in critically ill patients. However, there remains uncertainty as to which laryngoscopy technique is superior to achieve successful tracheal intubation, particularly in the pre-hospital setting. The majority of recent in-hospital evidence suggests video laryngoscopy (VL) is superior to more traditional direct laryngoscopy (DL) across all major performance metrics, including first-pass success rates, overall success rates, and a decrease in harmful events such as oesophageal intubation, hypoxia and hypotension [1–3]. The shift to VL use has been widely reported across hospital settings, including emergency departments, intensive care units, and operating theatres [3–5]. Driving this change was a Cochrane review by Hansel et al., which analysed 222 RCTs with over 26,000 intubations and clearly favoured VL for performance and safety [1].

First-pass success rate is a metric widely used for assessing intubation performance. Multiple intubation attempts are associated with adverse events such as prolonged periods of hypoventilation, reduced oxygenation, increased airway trauma, and oesophageal intubation [6, 7]. This is particularly significant in critically ill patients who are already vulnerable to secondary brain injury, where hypoxia, hypotension, and hypo/hypercapnia are detrimental [8]. Showing direct correlation with first-pass success and patient outcome is problematic as other performance related care, such as poor haemodynamic support, may confound findings. While first-pass success rate does not directly measure patient outcomes, it is used extensively throughout academic literature as a measure of good quality care due to the strong links with increased harm when this is not achieved.

Despite evidence favouring VL in the hospital setting, there is still a lack of high-quality data for the global adoption of first intention use of VL in delivery of prehospital care [1, 9]. The most recent Cochrane review concluded that the available prehospital evidence is too heterogeneous to draw clear conclusions [1]. Some studies suggest VL inferiority, citing lighting issues, camera fogging, and worse intubating conditions as potential confounders [9, 10]. Additionally, much of the prehospital literature is inconsistent, with studies varying in the types of VL devices used (such as hyper-angulated blades), clinician experience (paramedic and nurses with limited training), and differences in organisational governance structures [9]. A lack of equipoise in the literature, alongside clinician preference, have restricted uptake of VL as the first-intention device and thus may only be used as a rescue device.

Within the UK, prehospital critical care is delivered through a variety of models. Large portions of the country are served by charity-funded, physician-led Helicopter Emergency Medical Service (HEMS) teams, while others rely on ambulance service-led care, provided by paramedics with some offering additional enhanced care services [11, 12]. Furthermore, some areas of the UK have both responses, and dependant on local dispatch models either one or both may attend patients requiring prehospital intubation.

Where there are differing current practice methods, these should be examined to determine which methods provide safe and consistent patient care. This service evaluation aims to share intubation performance metrics comparing the use of VL and DL, primarily focusing on first-pass success rates following the adoption of VL as the first-choice intubation device.

Methods

Study design

This single-centre retrospective cohort of critically ill patients who required prehospital tracheal intubation by the Hampshire & Isle of Wight Air Ambulance (HIOWAA). Data were collected from 1 November 2018 to 22 April 2024.

This project used routinely collected data and was registered with University Hospital Southampton as a service evaluation SEV/0735.

Study setting

The study was conducted at Hampshire & Isle of Wight Air Ambulance (HIOWAA), a UK-based air ambulance service that provides critical care to patients experiencing medical and traumatic emergencies. The team comprises HEMS Paramedics and Prehospital Emergency Medicine (PHEM) Physicians, whose base specialities include Anaesthesia and Emergency Medicine.

Hampshire and the Isle of Wight Air Ambulance (HIOWAA) is a charity-funded HEMS team that operates as a care group within the University Hospital Southampton governance system. This HEMS team responds to critically ill and injured patients covering an area with a large population of 1.5 million people in 2022. A large portion of these patients require airway management during cardiac arrest or through delivery of prehospital emergency anaesthesia (PHEA). It is therefore important to evaluate clinical practice interventions, such as intubation performance, to ensure patients receive best-practice care.

All physicians receive comprehensive training in airway management, including time in surgical theatre settings as part of their base specialities. Paramedics undergo initial training in theatre, achieving more than 25 successful intubations during their training period, and continue to participate in yearly placements. Ongoing competency for all clinicians is ensured through mandatory airway log maintenance by peer supervision, senior case review,

annual appraisals, and adverse events reporting electronic systems.

Due to the Covid-19 pandemic, UK national guidance issued in 2020 recommended VL as the primary device for intubation to reduce viral load in aerosol-generating procedures [13, 14]. Hampshire and the Isle of Wight Air Ambulance (HIOWAA) thus adopted VL as the first intention device for intubation. The final decision on whether to use VL or DL was left to the discretion of the individual clinician performing laryngoscopy. This practice was widely adopted where transition to this practice may not have occurred in the absence of this national recommendation.

The VL equipment available during the study included the McGrath™ Mac video laryngoscope (Aircraft Medical Ltd., Edinburgh, UK) with size 1–4 reusable plastic blades. Hyper-angulated X-blades were also available, along with DL Macintosh blades in all standard sizes 1–4.

Study population

Patients (aged > 18 years) who underwent prehospital intubation by the HIOWAA team. This included patients who were critically ill due to traumatic injuries or medical conditions. Patients were intubated either with the use of anaesthetic drugs as part of a prehospital emergency anaesthetic (PHEA) or without anaesthetic medication, such as during cardiac arrest.

Data collection

Data were collected retrospectively from clinical electronic medical records (HEMSbase, Medic One Systems Ltd, UK) HEMSbase database. Collected variables included, patient demographics, indication for intubation, anaesthetic drugs used, intubation techniques, including type of laryngoscopy, grade of airway view (using the Cormack Lehane grading system), number of attempts, and associated complications. We categorised intubation indication as airway compromise, cardiac arrest, clinical course, humanitarian, low GCS, respiratory failure, or unmanageable. Patients with incomplete medical records were excluded from the analysis.

Outcome measures

The primary outcome was first-pass tracheal intubation success rate with secondary outcomes, overall tracheal intubation success, total number of intubation attempts, airway view (Cormack-Lehane grading system), overall intubation success rate.

Data analysis

Analysis was undertaken in R Studio [15]. The primary cohort analysis was a direct comparison between the VL and DL groups. The secondary cohort analysis compared between professional groups as airway operator (anaesthetics vs. emergency medicine vs. paramedic), with further sub-group analyses to compare VL vs. DL for each group. Fisher's exact test was used to generate p-values to assess for statistical significance across the direct and video laryngoscopy groups. These were presented as both the entire HEMS group and as the professional backgrounds of the intubating clinician. The Kruskal-Wallis rank sum test and Pearson's Chi-squared test were used to test for significant differences in demographic features such as age, weight and gender. ANOVA was used to compare mean attempts across professional groups. A p-value of less than 0.05 was deemed statistically significant for each analysis. Clinician background information was unavailable for three attempts, so it was excluded from the professional group comparison but included in the entire HEMS group analysis. Of the 1279 cases included in the DL vs. VL comparison, 1237 records had information available on age, weight, gender, Cormack-Lehane grade and indication for the intubation. In some instances, entries were not completed and reported as unknown. This may be due to the information not being available or poor record keeping.

Results VL vs. DL

Characteristics data is presented in Table 1. Information was available for first-pass success, overall success and mean number of attempts for 1279 individual entries from HEMSBase over the defined study period. There were 799 intubations in the DL group and 480 in the VL group, with an overall first-pass success of 87% ($n = 1112$). The median age for the entire group was 56 years which did not differ significantly across the VL or DL groups ($p = 0.5$). Weight was also similar across groups, with a median of 80 kg. More males were intubated overall (69% vs. 31%), with a similar distribution across the type of laryngoscopic device used ($p = 0.2$).

First-pass success for the entire HEMS group with DL was 84%($n = 669$) vs. 92%($n = 475$) for the VL cohort, which reached a significance level of $p < 0.001$. Overall success improved significantly from 96 to 99% when using VL, and the mean number of attempts reduced from 1.20 to 1.09 across the entire HEMS group, with a p-value of < 0.001. The number of grade 1 views increased using the VL from 70 to 92%, and grade IV views reduced from 1.5 to 0.4% when using the VL. Patients who were intubated with the indication of 'cardiac arrest' were DL 6.1% and VL 19% p < 0.001, and those with 'low GCS' DL 33% and VL 48% p < 0.001.

Professional group comparison

Data presented in Table 2. First-pass success increased significantly across all groups: Anaesthetists (83% vs. 93%), Emergency Medicine (77% vs. 93%) and paramedicine (83% vs. 91%). Overall success was also improved

Table 1 VL vs DL characteristics data

Characteristic	Overall *N* = 1,279[1]	Direct *N* = 799[1]	Video *N* = 480[1]	*p*-value[2]
Age	56 (40, 68)	57 (40, 68)	55 (41, 67)	0.5
Unknown	114	96	18	
Weight	80 (70, 90)	80 (70, 90)	80 (70, 90)	0.6
Unknown	27	1	26	
Gender				0.2
Female	399 (31%)	260 (33%)	139 (29%)	
Male	880 (69%)	539 (67%)	341 (71%)	
Indication				
Airway compromise	141 (11%)	96 (12%)	45 (9.4%)	<0.001
Cardiac arrest	142 (11%)	49 (6.1%)	93 (19%)	<0.001
Clinical course	34 (2.7%)	15 (1.9%)	19 (4.0%)	0.2
Humanitarian	2 (0.2%)	0 (0%)	2 (0.4%)	-
Low GCS	493 (39%)	261 (33%)	232 (48%)	<0.001
Other	393 (31%)	333 (42%)	60 (13%)	0.72
Respiratory failure	51 (4.0%)	39 (4.9%)	12 (2.5%)	0.068
Unmanageable	22 (1.7%)	6 (0.8%)	16 (3.3%)	0.42
Unknown	1	0	1	
View				< 0.001
Grade I	955 (76%)	549 (70%)	406 (86%)	
Grade II	234 (19%)	177 (22%)	57 (12%)	
Grade III	56 (4.4%)	51 (6.5%)	5 (1.1%)	
Grade IV	14 (1.1%)	12 (1.5%)	2 (0.4%)	
Unknown	20	10	10	
Base Specialty				< 0.001
Anaesthetics	435 (35%)	305 (40%)	130 (28%)	
Emergency Medicine	531 (43%)	344 (45%)	187 (40%)	
Paramedicine	268 (22%)	120 (16%)	148 (32%)	
Unknown	45	30	15	
First Pass	1,112 (87%)	669 (84%)	443 (92%)	< 0.001
Success	1,232 (96%)	757 (95%)	475 (99%)	< 0.001
Mean Attempts	1.16	1.20	1.09	< 0.001

[1]Median (Q1, Q3); n (%)

[2]Wilcoxon rank sum test; Pearson's Chi-squared test; Fisher's exact test

and found to be significant across all groups: Anaesthetists (96% vs. 98%), Emergency Medicine (94% vs. 99%) and Paramedicine (94% vs. 99%). The paramedicine group was the only group to see a slight but not statistically significant increase in mean attempts when using VL (1.11 vs. 1.16, $p = 0.32$).

The anaesthetic group appeared to intubate younger patients with a median age of 54 (IQR, 35–66) compared with the Paramedicine cohort 59(IQR 47–70). The intra-group difference between all clinician groups was significant, with a p-value of 0.003. Weight and gender distribution across groups were found to be non-significant. The anaesthetic group appeared to intubate more grade IV views than the Emergency Medicine and Paramedicine groups (1.9% vs. 1.1% vs. 0.0%). Low GCS was the most common reason for intubation in 39% ($n = 477$) of cases. Humanitarian reasons were the least used indication, appearing in only two cases (0.2%) across the dataset. Paramedics intubated more patients in cardiac arrest than any other group (7.5% vs. 7.7% vs. 25%). There appeared to be a similar distribution across indications for the Anaesthetic and Emergency Medicine groups.

Discussion

The data presented demonstrates that within this UK-based, physician-led HEMS service, VL outperforms DL in the delivery of tracheal intubation in all assessed primary and secondary outcomes. Overall, first-pass success rates improvement from 84% in the DL group to 92% in the VL group ($p < 0.001$). Overall intubation success rates improved significantly from 95 to 99% ($p < 0.001$). We observed improved glottic views across all clinicians, regardless of their background specialty. Additionally, VL appeared to be used preferentially for those indicated in intubation due to 'cardiac arrest' DL 6.1% and VL 19%, and those with 'low GCS' DL 33% and VL 48%. If clinicians preferentially use VL in situations with anticipated

Table 2 Professional group comparison

Characteristic	Overall $N=1,237$[1]	Anaesthetics $N=438$[1]	Emergency Medicine $N=531$[1]	Paramedicine $N=268$[1]	*p*-value[2]
Age	56 (40, 68)	54 (35, 66)	56 (41, 68)	59 (47, 70)	0.003
Unknown	108	43	53	12	
Weight	80 (70, 90)	80 (70, 90)	80 (70, 90)	80 (70, 90)	0.6
Unknown	26	9	7	10	
Gender					0.4
Female	386 (31%)	141 (32%)	170 (32%)	75 (28%)	
Male	851 (69%)	297 (68%)	361 (68%)	193 (72%)	
Indication					
Airway compromise	138 (11%)	50 (11%)	62 (12%)	26 (9.7%)	
Cardiac arrest	140 (11%)	33 (7.5%)	41 (7.7%)	66 (25%)	
Clinical course	33 (2.7%)	13 (3.0%)	17 (3.2%)	3 (1.1%)	
Humanitarian	2 (0.2%)	0 (0%)	2 (0.4%)	0 (0%)	
Low GCS	477 (39%)	175 (40%)	218 (41%)	84 (31%)	
Other	373 (30%)	139 (32%)	156 (29%)	78 (29%)	
Respiratory failure	51 (4.1%)	19 (4.3%)	26 (4.9%)	6 (2.2%)	
Unmanageable	22 (1.8%)	9 (2.1%)	9 (1.7%)	4 (1.5%)	
Unknown	1	0	0	1	
View					0.2
Grade I	926 (76%)	331 (77%)	394 (75%)	201 (77%)	
Grade II	227 (19%)	72 (17%)	106 (20%)	49 (19%)	
Grade III	51 (4.2%)	19 (4.4%)	21 (4.0%)	11 (4.2%)	
Grade IV	14 (1.1%)	8 (1.9%)	6 (1.1%)	0 (0%)	
Unknown	19	8	4	7	
First Pass	1,079 (87%)	385 (88%)	456 (86%)	238 (89%)	0.2
Success	1,191 (96%)	425 (97%)	506 (95%)	260 (97%)	0.3
Mean Attempts	1.16	1.16	1.16	1.14	0.735

[1]Median (Q1, Q3); n (%)

[2]Kruskal-Wallis rank sum test; Pearson's Chi-squared test; Fisher's exact test; ANOVA

difficult airways, then the overall increase in first pass success with VL becomes more remarkable.

To the best of our knowledge this service evaluation provides the largest data set of real-world application of VL from a UK prehospital critical care team. This is the first data set published of its kind and strengthens the case for wider adoption of VL as the first intention device for intubation in this setting. This service evaluation also demonstrates that there was little to no variation amongst baseline specialities at overall first-pass intubation attempts. However, it is conceivable that anaesthetists tended to be first operator when faced with predicted difficult airways and therefore this may account for similarities seen across operating groups. These findings align with the inter-changeable operator model shown by Price who found similar first pass success rates across these disciplines in the same context [16]. Additionally, it should be noted that paramedics were far more likely to intubate during cardiac arrest (25%) compared to anaesthetic and emergency medicine backgrounds (7.5% and 7.7% respectively), however this appears not to influence first pass and overall intubation success rates.

Our findings correspond with increasing evidence from in-hospital studies, including a 2022 Cochrane review, that illustrates the advantages of VL over DL [1]. The hospital-based studies within this review consistently showed improved glottic views, higher first-pass success rates, and fewer complications with VL. De Jong who published a large real-world observational study of over 26,000 patients showed significant improvements when using VL with an absolute improvement of 'easy' intubations increasing from 94.7 to 98.7%. This data shows a 2-times improvement aligning with the improvement our data shows [5].

One systematic review and meta-analysis of randomised controlled trials comparing VL and DL in critical care settings (both pre and in hospital) found that VL was superior in the in-hospital setting but not in the prehospital context [2]. It is interesting to note that among the prehospital studies, the devices that performed worse with VL were either using hyper-angulated blades, which differ from the McIntosh style we used, or were in teams with limited intubation experience and thus it is hard to compare results.

However, two of these studies used McIntosh-style blades and were physician-led, making them more comparable to our findings. Macke et al. reported an improvement in first-pass success rates from 79% with

DL to 95% with VL ($p = 0.007$) [17], similar findings to those observed in our dataset. Conversely, Kreutziger et al. (2019) [18] found no significant difference between DL and VL, with first-pass success rates of 83% and 79%, respectively. However, this lack of improvement may be attributed to other factors such as camera fogging, poor ambient lighting affecting screen visualisation, and difficulties advancing the tracheal tube through the pharynx and larynx. Despite these obstacles, they found VL still provided better glottic visualisation. Moreover, the initial training clinicians received with the VL devices in that study remains unclear. As VL becomes more widely adopted in hospital practice, it is likely that these challenges will be mitigated through improved training and education, leading to better overall performance.

Previous studies have reported mixed results regarding the efficacy of VL, with some suggesting no advantage or even worse outcomes compared to DL. A 2017 systematic review and meta-analysis by Jiang et al. found that VL did not improve first-attempt success rates in emergency and critical care patients and was associated with worse outcomes in the prehospital setting, particularly when used by experienced operators [19]. The study attributes these findings to factors such as device variability, challenges with airway secretions, and differences in operator familiarity with VL. They did however find better glottic visualisation. The discrepancies between our findings could be due to the clinician's familiarity with the device. As clinicians become more experienced with VL, techniques may be utilised to improve the advancement of bougie and tracheal tube past the vocal cords.

These data support use of VL as first intention device for intubation in high-performing, well-governed UK-based prehospital critical care teams. All UK-based critical care teams should consider adaptation of local guidelines and standard operating procedures to include VL with McIntosh style blades for first intention device, and at a minimum have this device available as a rescue device.

We did not assess laryngeal manipulation of either device which may account for physiological changes such as bradycardia following vagal stimulation or pain response such as tachycardia and hypertension following laryngeal manipulation during intubation. We also did not assess for other safety measures such airway trauma, c-spine manipulation, hypoxic events, hypotensive events or spikes in ICP. Further research could also include outcome data whereas we used surrogates. Additionally, patient injury type was not assessed for variance across patients presenting illness.

Being a retrospective service evaluation, this study has inherent limitations. As it relied on accurate documentation in medical records, it is susceptible to reporting bias, as data quality depends on how consistently and accurately cases were recorded. Clinicians were free to choose their preferred intubation device, which may have introduced selection bias. It is possible that those less familiar or confident with VL were more likely to continue using DL, potentially skewing the results. Additionally, the study period overlapped with the COVID-19 pandemic, during which VL adoption was accelerated due to recommendations to reduce aerosol-generating procedures. This shift may have coincided with enhanced training and governance measures, contributing to overall improved intubation performance and potentially confounding the findings.

The study used surrogate metrics such as first-pass success rates and glottic visualisation as indicators of intubation effectiveness. While these are widely accepted benchmarks, they do not capture broader clinical outcomes such as patient survival, complications, or long-term morbidity. Additionally, outcome metrics such as hypotension and hypoxia during intubation attempt were not routinely collected and thus these measures were not analysed. It should also be noted the Cormack-Lehane glottic grade is not a validated method of use in glottic visualisation using VL, however reporting systems still use this grading system and thus it has been used within this service evaluation. Importantly, one can sometimes 'see but can't intubate' when using a VL with a 'grade 1 view'.

Furthermore, individual clinician performance was not assessed, meaning that a small number of poor performers could have influenced the results. However, given the large sample size and consistent proficiency across clinician backgrounds, this is unlikely to have significantly impacted the overall findings.

Conclusion

This service evaluation supports the routine use of VL over DL for prehospital tracheal intubation in a UK HEMS setting. VL demonstrated higher first-pass success rates, improved glottic visualisation, and fewer intubation attempts, with benefits seen across all clinician groups. These data support adoption of VL by appropriately trained and governed prehospital providers, echoing movements seen across hospital departments. Further research is needed to adjust for potential confounders. However, this change appears to be safe and thus could be adopted through quality improvement methodology as seen in this instance. In the absence of widespread evidence, this practice should only be adopted by organisations with robust education, training, and governance standards to ensure safe and effective implementation.

Abbreviations

VL	Video laryngoscopy
DL	Direct laryngoscopy
HEMS	Helicopter emergency medical services

PHEA	Prehospital emergency anaesthesia
GCS	Glasgow coma scale
RCT	Randomised controlled trial
UK	United Kingdom
HIOWAA	Hampshire & isle of wight air ambulance
NHS	National health service
NIHR	National institute for health and care research
PHEM	Prehospital emergency medicine
ICP	Intracranial pressure
ANOVA	Analysis of variance

Acknowledgements
The authors would like to thank the clinical and operational teams at Hampshire & Isle of Wight Air Ambulance for their continued commitment to high-quality prehospital care and their support in data collection and clinical governance. We are also grateful to University Hospital Southampton NHS Foundation Trust for providing institutional oversight and support for this service evaluation.

Author contributions
JH was responsible for the conception and design of the study, methodology development, data acquisition, data analysis and interpretation, drafting of the original manuscript, and overall project administration. He also acts as the corresponding author. OA contributed to data collection. AW provided supervision, supported methodological design, and contributed to the critical revision of the manuscript for important intellectual content. PO assisted with data curation, production of tables, and manuscript review and editing. JG and ML provided input into reviewing and editing. JP provided senior oversight and supervision, contributed to study design and interpretation, reviewed and edited the manuscript.

Funding
No external funding was received for this evaluation. The study was supported internally by University Hospital Southampton NHS Foundation Trust and Hampshire & Isle of Wight Air Ambulance.

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
This service evaluation was conducted using routinely collected data and was registered with University Hospital Southampton as a service evaluation (SEV/0735). Ethical approval was not required in accordance with the Health Research Authority guidelines for service evaluations in the UK. Consent to participate was not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 12 May 2025 / Accepted: 24 June 2025
Published online: 08 July 2025

References

1. Hansel J, Rogers AM, Lewis SR, Cook TM, Smith AF. Videolaryngoscopy versus direct laryngoscopy for adults undergoing tracheal intubation. Cochrane Database of Systematic Reviews. John Wiley and Sons Ltd;; 2022.
2. Zhang K, Zhong C, Lou Y, Fan Y, Zhen N, Huang T et al. Video laryngoscopy May improve the intubation outcomes in critically ill patients: A systematic review and meta-analysis of randomised controlled trials. Emerg Med J. 2024.
3. De Jong A, Pouzeratte Y, Laplace A, Normanno M, Rollé A, Verzilli D, et al. Macintosh videolaryngoscope for intubation in the operating room: A comparative quality improvement project. Anesth Analg. 2021;132:524–35.
4. Cook TM, Aziz MF. Has the time really come for universal videolaryngoscopy? Br J Anaesth. Elsevier Ltd; 2022. pp. 474–7.
5. De Jong A, Sfara T, Pouzeratte Y, Pensier J, Rolle A, Chanques G et al. Videolaryngoscopy as a first-intention technique for tracheal intubation in unselected surgical patients: a before and after observational study. Br J Anaesth. 2022 [cited 2025 Jan 8];129:624–34. Available from: http://www.bjanaesthesia.org/article/S0007091222002872/fulltext
6. Natt BS, Malo J, Hypes CD, Sakles JC, Mosier JM. Strategies to improve first attempt success at intubation in critically ill patients. 2016.
7. Cook TM, Woodall N, Harper J, Benger J. Major complications of airway management in the UK: results of the fourth National audit project of the Royal college of anaesthetists and the difficult airway society. Part 2: intensive care and emergency departments. Br J Anaesth. 2011;106:632–42.
8. Hoyne J, Edlow J. Here's My Take: Airway Management in Patients With Acute Brain Injury or Ischemia. J Emerg Med. 2025 [cited 2025 Mar 14]; Available from: https://linkinghub.elsevier.com/retrieve/pii/S0736467924004074
9. Pourmand A, Terrebonne E, Gerber S, Shipley J, Tran QK. Efficacy of video laryngoscopy versus direct laryngoscopy in the prehospital setting: A systematic review and Meta-Analysis. Prehosp Disaster Med. Cambridge University Press;; 2023. pp. 111–21.
10. Trimmel H, Kreutziger J, Fitzka R, Szüts S, Derdak C, Koch E, et al. Use of the glidescope ranger video laryngoscope for emergency intubation in the prehospital setting: a randomized control trial. Crit Care Med. 2016;44:e470–6.
11. Watson AJR, Henderson D, Beecham R, Ward J, Owen P, Hannah J et al. Pre-Hospital Critical Care for Out-of-Hospital Cardiac Arrests with Return of Spontaneous Circulation: A Retrospective Observational Study. J Clin Med. 2025 [cited 2025 Feb 19];14:966. Available from: https://www.mdpi.com/2077-0383/14/3/966/htm
12. Houghton Budd S, Alexander-Elborough E, Brandon R, Fudge C, Hardy S, Hopkins L et al. Drug-free tracheal intubation by specialist paramedics (critical care) in a united Kingdom ambulance service: a service evaluation. BMC Emerg Med. 2021;21.
13. Cook TM, El-Boghdadly K, McGuire B, McNarry AF, Patel A, Higgs A. Consensus guidelines for managing the airway in patients with COVID-19: guidelines from the difficult airway society, the association of anaesthetists the intensive care society, the faculty of intensive care medicine and the Royal college of anaesthetists. Anaesthesia. 2020;75:785–99.
14. El-Boghdadly K, Wong DJN, Owen R, Neuman MD, Pocock S, Carlisle JB, et al. Risks to healthcare workers following tracheal intubation of patients with COVID-19: a prospective international multicentre cohort study. Anaesthesia. 2020;75:1437–47.
15. RStudio Team. RStudio: Integrated Development Environment for R. Boston, MA: RStudio, PBC; 2022 [cited 2025 Jun 2]. Available from: https://www.rstudio.com/
16. Price J, Lachowycz K, Steel A, Moncur L, Major R, Barnard EBG. Intubation success in prehospital emergency anaesthesia: a retrospective observational analysis of the Inter-Changeable operator model (ICOM). Scand J Trauma Resusc Emerg Med. 2022;30.
17. Macke C, Gralla F, Winkelmann M, Clausen JD, Haertle M, Krettek C, et al. Increased first pass success with c-mac videolaryngoscopy in prehospital endotracheal intubation—a randomized controlled trial. J Clin Med. 2020;9:1–9.
18. Kreutziger J, Hornung S, Harrer C, Urschl W, Doppler R, Voelckel WG, et al. Comparing the McGrath Mac video laryngoscope and direct laryngoscopy for prehospital emergency intubation in air rescue patients: A multicenter, randomized, controlled trial. Crit Care Med. 2019;47:1362–70.
19. Jiang J, Ma D, Li B, Yue Y, Xue F. Video laryngoscopy does not improve the intubation outcomes in emergency and critical patients - a systematic review and meta-analysis of randomized controlled trials. Crit Care. 2017;21.

Publisher's note