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Research Article

Comparing Intubation Techniques in Mannequin during Ongoing CPR: Conventional Non-Styleted, Conventional Styleted, Conventional Kiwi Grip, and Video Laryngoscopy –A Simulation Based Observational Study.

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ABSTRACT

Background: Airway management during cardiopulmonary resuscitation (CPR) is technically challenging, and interruptions in chest compressions may adversely affect resuscitation quality. While video laryngoscopy has been increasingly adopted in emergency settings, evidence comparing different intubation techniques during ongoing CPR—particularly with respect to procedural efficiency—remains limited.

Methods: This simulation-based observational study was conducted in a tertiary care clinical skills and simulation centre in India. A total of 230 endotracheal intubations were performed on a standardized mannequin during continuous chest compressions by 115 expert and 115 intermediate-level operators. Five intubation techniques were evaluated in equal proportions: conventional laryngoscopy, conventional styleted laryngoscopy, kiwi grip technique, video laryngoscopy with channeled blade (VL-Ch), and video laryngoscopy with non-channeled blade (VL-NCh). The primary outcome was first-pass intubation success. Secondary outcomes included time to first-pass intubation, total intubation time, requirement, number, and duration of pauses in chest compressions, Cormack–Lehane grade, and subjective difficulty.

Results: Overall, first-pass success was 73.9%, with no statistically significant difference across intubation techniques (p=0.341). However, procedural efficiency varied significantly. VL-Ch demonstrated a shorter mean time to first-pass intubation (14.22±6.02 s) and shorter total intubation time (14.80±6.28 s) compared with conventional laryngoscopy (p=0.011 and p=0.003, respectively). The number of pauses during chest compressions differed significantly by technique (p=0.036), and pause duration during successful first-pass intubation was shortest with VL-Ch (p=0.019). Expert operators achieved significantly shorter total intubation times and pause durations than intermediate operators.

Conclusions: In this standardized simulation model, intubation technique did not significantly influence first-pass success during CPR, but meaningful differences were observed in procedural efficiency. Channeled video laryngoscopy was associated with faster intubation and shorter interruptions of chest compressions, suggesting potential advantages in time-critical resuscitation scenarios.

Keywords: cardiopulmonary resuscitation; airway management; video laryngoscopy; endotracheal intubation; simulation study

INTRODUCTION

Introduction of endotracheal intubation when the cardiopulmonary resuscitation (CPR) is still in progress is a highly operator-reliant and technically challenging process.1,2 The irregularity of chest compressions, the limitation of head position, the inadequacy of visualization, and the urgency of airway control are all the factors that promote the occurrence of long intubation attempts and esophageal misplacement.3 It is essential to have fast and consistent first-pass success, whereby repeated or slow attempts can disrupt chest compressions, ventilatory and have a negative impact on quality of resuscitation.4

Direct laryngoscopy (DL) has long been the default method of managing the airways during CPR but its efficacy is affected by factors of operator experience, glottic exposure and optimal alignment of airway axes-which is not usually optimal in the conditions of active resuscitation.5,6 As an indirect magnified view of the glottis with no requirement of full axial alignment, video laryngoscopy (VL) has become a potentially effective alternative in emergency and resuscitation.7 Studies of emergency department and out-of-hospital cardiac arrest indicate that VL has an increased first-pass success rate and enhanced glottic visualization than does DL, especially in the hands of novice or non-expert operators. A number of clinical trials have also shown lower esophageal intubation with VL during CPR.8 However, there are prehospital studies showing enhanced laryngeal visualization, but no significant rise in first-pass success, probably because the operators were not familiar with VL-specific tube delivery methods.

Big-registry studies in pediatric and mixed emergency samples also show that VL could be more effective than even the so-called augmented DL methods using bougies, external laryngeal manipulation, or optimal positioning.9 Nevertheless, procedural success has not always been transferred to better patient-centred outcomes including return of spontaneous circulation or survival, highlighting airway management is only one aspect of the overall quality of resuscitation.10

Mannequin and simulation-based studies offer a controlled setting to test airway devices in the standardized CPR conditions at reduced levels of patient-confounded factors.11,12 The results of previous mannequins studies have consistently indicated benefits of VL and video-assisted stylets compared to traditional DL in challenging airway situations, such as cervical spine immobilization, restraints due to infection control, and among the less experienced operator. Another feature of these studies is that the recent training and the knowledge of devices are the important factors that affect the intubation performance, but at times in favor of trainees, and not the experienced clinician that mostly utilizes DL.13

Since the variety of intubation aids has recently grown, namely, stylelets and grip-assisted methods, the comparative analysis of the different forms of DL as well as VL during continuous chest compressions should be justified.14 Observational studies may be simulated and reveal relative performance features of first-pass success, intubation time, ease of use in the conditions of CPR, and thus inform training approaches and airway management guidelines.

As such, the current mannequin-based simulation study will focus on comparing traditional non-styleted DL, traditional styleted DL, Kiwi-grip-assisted DL, and video laryngoscopy in endotrascheal intubation during resuscitation with ongoing CPR, especially regarding the success of the procedure and operator performance. This study aimed to compare the success rate, intubation time, and ease of endotracheal intubation using different intubation techniques during ongoing cardiopulmonary resuscitation (CPR) in a standardised mannequin-based simulation model.

Methodology

The study was conducted at the Clinical Simulation Centre and Skills Laboratory of Aarupadai Veedu Medical College (AVMC), Puducherry, a dedicated facility for advanced procedural training and research. A simulation-based observational study design was employed. Participants included faculty members, senior residents, and postgraduate trainees drawn from multiple clinical specialties, namely Emergency Medicine, Anaesthesiology, Critical Care Medicine, and General Medicine, representing a spectrum of airway management experience. The study was carried out over a duration of 18 months. The sample size was calculated based on the study by Yazdani R et al., which reported a total successful bougie-assisted intubation rate of 97.8%. Assuming an absolute precision of 5% and a 5% level of significance, the sample size was estimated using the formula $n = (Z^{1-\alpha/2}{}^{2} \times p \times (1 - p)) / d^2$. Based on this calculation, a total of 45 participants were planned to be recruited, comprising 23 experts and 23 participants with an intermediate level of training. Convenience sampling was adopted for participant recruitment. Participants were eligible for inclusion if they had performed a minimum of 25 mannequin-based intubations without ongoing cardiopulmonary resuscitation prior to study participation, were willing to adhere to the study protocol and provide informed consent, belonged to relevant clinical specialties, and had experience levels categorized as either expert or intermediate.

Data Collection Procedure

Data were collected using a structured data collection proforma. Participant details recorded included name, specialty, years of intubation experience, and experience level (expert or intermediate).

Each participant performed endotracheal intubation on a standardized adult airway mannequin during continuous chest compressions using the following techniques:

1. Conventional direct laryngoscopy
2. Conventional direct laryngoscopy with stylet
3. Conventional Kiwi grip technique
4. Video laryngoscopy (channeled blade)
5. Video laryngoscopy (non-channeled blade)

Chest compressions were standardized across all attempts. For each technique, the following parameters were recorded:

- First-pass intubation success or failure
- Time required for first and subsequent intubation attempts
- Number and duration of pauses in chest compressions (maximum 10 seconds per pause)
- Total time to successful intubation
- Number of intubation failures
- Cormack–Lehane (CL) grade obtained
- Subjective level of difficulty rated on a 3-point scale

Data were documented by an independent observer using the standardized proforma.

Statistical Analysis

- Continuous variables were expressed as mean ± standard deviation or median with interquartile range, as appropriate.
- Categorical variables were expressed as proportions and percentages.
- Intubation success rates and procedural times across different intubation techniques were compared using appropriate statistical tests, including the chi-square test for categorical variables.

Results

Table 1. Baseline characteristics of intubation attempts and operators

Characteristic	n (%)
Intubation technique	
Conventional laryngoscopy	46 (20.0)
Conventional styleted	46 (20.0)
Kiwi grip	46 (20.0)
Video laryngoscopy, channeled (VL-Ch)	46 (20.0)
Video laryngoscopy, non-channeled (VL-NCh)	46 (20.0)
Operator experience	
Expert	115 (50.0)
Intermediate	115 (50.0)
Total	230

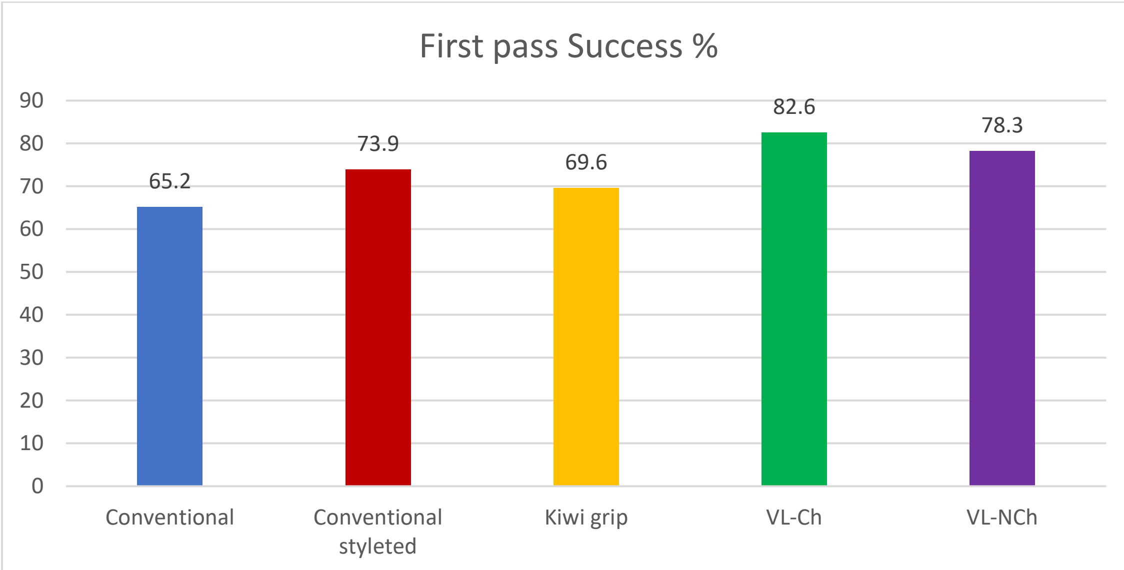

Figure 1. First-pass intubation success across different intubation techniques

Table 2. Chest compression interruptions during intubation

Variable	Conventional	Conv. styleted	Kiwi grip	VL-Ch	VL-NCh	*p* value
Pause required, n (%)	43 (93.5)	39 (84.8)	41 (89.1)	34 (73.9)	37 (80.4)	0.090
Number of pauses, n (%):						
– 0 pauses	3 (6.5)	7 (15.2)	5 (10.9)	12 (26.1)	9 (19.6)	**0.036**
– 1 pause	29 (63.0)	30 (65.2)	30 (65.2)	31 (67.4)	34 (73.9)	
– ≥2 pauses	14 (30.4)	9 (19.6)	11 (23.9)	3 (6.5)	3 (6.5)	

Table 3. Intubation time outcomes by technique

Intubation technique	Time to first-pass (s) Mean ± SD
Conventional	19.78 ± 10.03
Conventional styleted	17.13 ± 7.89
Kiwi grip	18.50 ± 8.02
Video laryngoscopy, channeled (VL-Ch)	14.22 ± 6.02
Video laryngoscopy, non-channeled (VL-NCh)	16.11 ± 7.38
ANOVA (df = 4, 225)	

F value	**3.335**
p value	**0.011**

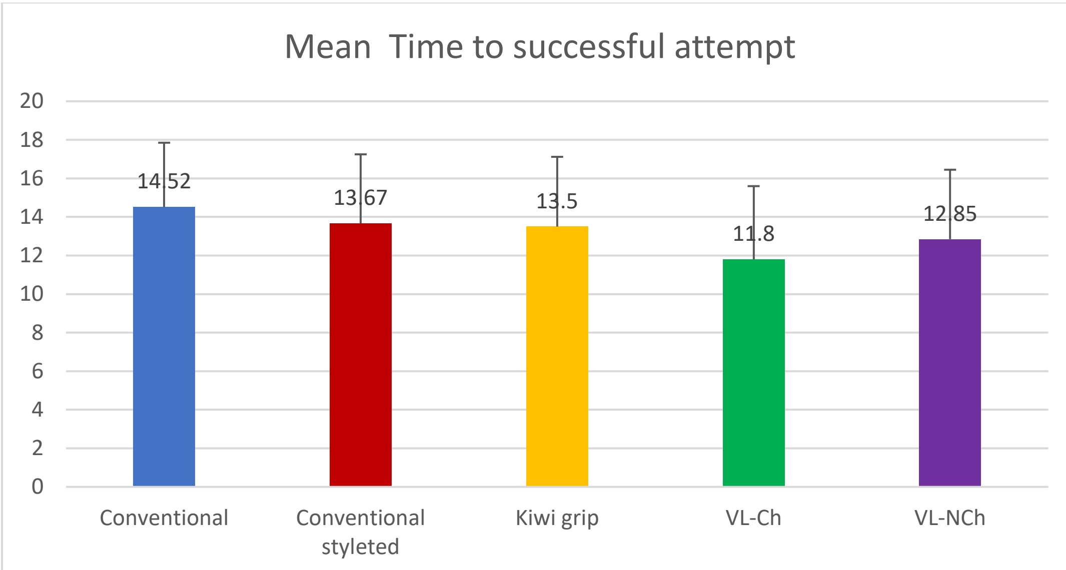

Figure 2. Comparison of total intubation time across intubation techniques

Table 4. Outcomes by operator experience

Outcome	Expert (n=115)	Intermediate (n=115)	*p* value
First-pass success, n (%)	90 (78.3)	80 (69.6)	0.133
Total intubation time (s), Mean ± SD	17.06 ± 8.04	19.55 ± 9.17	0.030
Pause duration (s), Mean ± SD	5.23 ± 4.37	6.69 ± 4.89	0.018

A total of 230 intubation attempts performed during cardiopulmonary resuscitation were analysed. All five intubation techniques—conventional laryngoscopy, conventional styleted laryngoscopy, Kiwi grip, video laryngoscopy with a channeled blade (VL-Ch), and video laryngoscopy with a non-channeled blade (VL-NCh)—were equally represented, with 46 attempts (20.0%) in each group. Procedures were performed by expert and intermediate operators in equal proportions (115 each, 50.0%) (Table 1). Overall, first-pass intubation success was achieved in 170 of 230 attempts (73.9%). First-pass success rates varied across techniques, ranging from 65.2% with conventional laryngoscopy to 82.6% with VL-Ch, as illustrated in Figure 1; however, the association between intubation technique and first-pass success was not statistically significant (χ^2=4.51, df=4, p=0.341).

Pauses during chest compressions were required in the majority of intubation attempts, ranging from 73.9% with VL-Ch to 93.5% with conventional laryngoscopy, with no significant difference in the overall requirement for pauses between techniques (p=0.090) (Table 2). A single pause was the most frequently observed pattern across all techniques. The distribution of the number of pauses differed significantly by intubation technique (p=0.036), with VL-Ch demonstrating a higher proportion of intubations completed with no pauses or fewer pauses compared with conventional techniques (Table 2). Mean time to first-pass intubation across techniques ranged from 14.22 ± 6.02 seconds with VL-Ch to 19.78 ± 10.03 seconds with conventional laryngoscopy, and one-way ANOVA showed a statistically significant difference between techniques (F=3.335, p=0.011) (Table 3). Total intubation time also differed across techniques, with VL-Ch showing the shortest duration and conventional laryngoscopy the longest (Figure 2). In analysis by operator experience, experts achieved a higher proportion of first-pass success than intermediate operators, although this difference was not statistically significant (78.3% vs 69.6%; p=0.133). Expert operators demonstrated a significantly shorter total intubation time (17.06 ± 8.04 s vs 19.55 ± 9.17 s; p=0.030) and shorter pause duration during chest compressions (5.23 ± 4.37 s vs 6.69 ± 4.89 s; p=0.018) compared with intermediate operators (Table 4).

Discussion

In this simulation-based observational study of endotracheal intubation during ongoing chest compressions, three main findings emerged. First, overall first-pass success was moderate (73·9%) and did not differ significantly across the five techniques tested (p=0·341) (Figure 1), suggesting that—under standardized mannequin conditions—device choice alone may not determine whether the trachea is intubated on the first attempt. Second, clinically relevant differences were observed in procedural efficiency: channeled video laryngoscopy (VL-Ch) achieved shorter time to first-pass intubation (14·22±6·02 s) and shorter total intubation time (14·80±6·28 s) than conventional direct laryngoscopy (DL) (p=0·011 and p=0·003, respectively) (Table 3, Figure 2), with Bonferroni-adjusted comparisons confirming VL-Ch was faster than conventional laryngoscopy. Third, CPR interruptions were common (pauses required in 84·3%), and while the requirement for a pause did not differ significantly by technique (p=0·090), the number of pauses did (p=0·036), with VL groups showing fewer two-pause patterns than conventional techniques; among successful first-pass intubations, pause duration also differed (p=0·019), with VL-Ch shorter than conventional (p=0·030) (Table 2). Taken together, these findings indicate that the principal advantage of VL-Ch in this model is not a higher first-pass success rate, but faster tube delivery with fewer or shorter interruptions to chest compressions—an outcome dimension increasingly recognised as central to resuscitation quality.

The absence of a significant difference in first-pass success between VL and DL in our mannequin CPR setting aligns with several out-of-hospital datasets where VL improves visualization but does not consistently translate into higher first-pass success when operator training and device familiarity vary. Brenne et al. reported an overall first-pass success of 62·8% in out-of-hospital cardiac arrest with no significant difference between DL and VL, noting better performance when clinicians used their regular device. Similarly, Risse et al. demonstrated improved glottic visualization with GlideScope VL during CPR but no significant difference in successful intubation. These findings are concordant with our observation that most laryngeal views were favourable, yet first-pass success did not differ by technique (Figure 1), implying that beyond visualization, tube delivery mechanics during ongoing compressions—such as hand–eye coordination, stylet shaping, and channel guidance—may be critical determinants of performance. In contrast, large emergency department registries consistently report higher first-pass success with VL, particularly in predicted difficult airways. Sakles et al. demonstrated a graded advantage of VL over DL as airway difficulty increased, while data from the NEAR registry showed higher first-pass success with VL in difficult airways, along with fewer oesophageal intubations and less vomiting. Brown et al. further showed that unaided VL outperformed augmented DL approaches. The discrepancy with our findings is plausibly explained by the standardized mannequin airway, absence of secretions and physiologic deterioration, and the CPR-specific constraint in which tube passage rather than glottic identification often dominates time and success. Our results therefore complement registry data by demonstrating that even when first-pass success is similar (Figure 1), procedural efficiency and compression interruption patterns can still differ meaningfully by device (Table 2, Figure 2).

Our time findings are consistent with prior studies reporting variable effects of VL on intubation speed depending on device design and user experience. Wayne and McDonnell et al reported fewer attempts and shorter intubation times with VL in out-of-hospital settings, whereas Platts-Mills et al. observed longer intubation times with GlideScope despite similar success rates, illustrating that improved visualization does not guarantee faster tube delivery without optimal technique. The faster performance observed with VL-Ch in our study (Table 3, Figure 2) supports the concept that channeled devices may reduce the technical and cognitive burden of tube delivery during continuous compressions by guiding trajectory, thereby improving speed even when success rates are unchanged.

The high frequency of pauses in our study warrants emphasis. Interruptions during airway management are common during resuscitation, and multiple attempts are strongly associated with complications in critically ill patients. Hypes et al. showed that more than one attempt, even in VL-dominant practice, was associated with markedly higher complication rates, underscoring why first-pass success without interruption or delay may be a more meaningful target than first-pass success alone. Although our mannequin model cannot assess hypoxemia, hypotension, or aspiration, the observed reductions in intubation time and pause duration with VL-Ch (Table 2, Table 3) are clinically relevant, as they may reduce exposure to prolonged interruptions and procedural delays during CPR.

Operator experience demonstrated expected directional effects, with experts achieving shorter total intubation times and shorter pause durations, alongside non-significant trends toward higher first-pass success (Table 4). This pattern is consistent with field and registry observations that training and device familiarity are key determinants of airway performance, and suggests that the benefits of VL—particularly for tube delivery—may be attenuated without device-specific training.

Strengths of this study include the balanced design (Table 1), standardized chest compressions, and inclusion of CPR-specific performance metrics beyond success alone. Limitations include the inherent constraints of mannequin simulation, potential learning or fatigue effects, and the observational design, which cannot fully exclude residual operator-related confounding. Generalisability to clinical cardiac arrest—particularly to difficult airways with blood, vomitus, or restricted access—should therefore be interpreted with caution.

References

1. Berg KM, Bray JE, Ng KC, Lockey AS, Greif R, Morley PT, et al. 2023 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations: Summary From the Basic Life Support; Advanced Life Support; Pediatric Life Support; Neonatal Life Support; Education, Implementation, and Teams; and First Aid Task Forces. Resuscitation [Internet]. 2023 Dec [cited 2026 Jan 27];193:109992. Available from: https://www.resuscitationjournal.com/article/S0300-9572(23)00306-4/fulltext
2. Wang HE, Yealy DM. Current concepts in airway management for cardiopulmonary resuscitation. Mayo Clin Proc [Internet]. 2013 Feb [cited 2026 Jan 27];88(2):191–9. Available from: https://www.mayoclinicproceedings.org/article/S0025-6196(11)63444-7/fulltext
3. IrishHealthPro. Is endotracheal intubation necessary during CPR? [Internet]. Dublin: IrishHealthPro; 2024 [cited 2026 Jan 27]. Available from: https://www.irishhealthpro.com/content/articles/show/name/is-endotracheal-intubation-necessary-during-cpr
4. Panchal AR, Bartos JA, Cabañas JG, Donnino MW, Drennan IR, Hirsch KG, et al. Cardiopulmonary Resuscitation. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 [cited 2026 Jan 27]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470402/
5. Singh J, Bhardwaj M. Videolaryngoscopy versus direct laryngoscopy in predicted difficult airways: a comparative study. Int J Med Pharm Res [Internet]. 2018 [cited 2026 Jan 27];4(4):1547. Available from: https://ijmpr.in/article/videolaryngoscopy-versus-direct-laryngoscopy-in-predicted-difficult-airways-a-comparative-study-1547/
6. De Jong A, Sfara T, Pouzeratte Y, Pensier J, Rollé 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 [Internet]. 2022 Jul 1 [cited 2026 Jan 27];129(4):615-623. Available from: https://pubmed.ncbi.nlm.nih.gov/35934547/
7. Burkle CM, Zepeda FA, Bacon DR, Rose SH. A historical perspective on the development of direct laryngoscopy. Respir Care [Internet]. 2014 [cited 2026 Jan 27];59(1):122-34. Available from: https://www.sciencedirect.com/science/article/abs/pii/S2210844013001044
8. Schacherer NM, Joseph J, Al-Jabah A, Miller M, Atanasov SM, Thoma B, et al. First-pass success of video laryngoscope compared with direct laryngoscope in intubations performed by residents in the emergency department. Cureus [Internet]. 2023 Nov 17 [cited 2026 Jan 27];15(11):e48968. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC10665768/
9. Kaji AH, Shover C, Lee J, Yee L, Pallin DJ, April MD, et al. Video versus direct and augmented direct laryngoscopy in pediatric tracheal intubations. Acad Emerg Med [Internet]. 2020 May [cited 2026 Jan 27];27(5):394–402. Available from: https://pubmed.ncbi.nlm.nih.gov/32107810/
10. Brenne N, Brünjes N, Rupp D, Sassen MC, Jerrentrup A, Wulf H, et al. Success of airway management in out-of-hospital cardiac arrest using different devices - a prospective, single-center, observational study comparing professions. Scand J Trauma Resusc Emerg Med [Internet]. 2025 Jun 23 [cited 2026 Jan 27];33:109. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC12183896/
11. Uslu Y, Van Giersbergen MY. The effects of manikin-based and standardized-patient simulation

on clinical outcomes: a randomized prospective study. Cyprus J Med Sci [Internet]. 2023 Aug 9 [cited 2026 Jan 27];8(4):263-269. Available from: https://cyprusjmedsci.com/articles/the-effects-of-manikin-based-and-standardized-patient-simulation-on-clinical-outcomes-a-randomized-prospective-study/cjms.2022.2022-12

12. Abbasi M, Asadoola Y, Ebrahimi H, Bahonar E, Dabirian Z, Esmaeili SM, et al. Comparison of mannequin-based simulation training method with virtual training method on nursing students' learning cardiopulmonary resuscitation: A controlled randomized parallel trial. Iran J Nurs Midwifery Res [Internet]. 2024 Jul 24 [cited 2026 Jan 27];29(4):438–45. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC11349165/

13. Difficult Airway Society. Difficult Airway Society 2025 guidelines for management of unanticipated difficult tracheal intubation in adults. Br J Anaesth [Internet]. 2025 [cited 2026 Jan 27]. Available from: https://www.sciencedirect.com/science/article/pii/S0007091225006932

14. Park SO, Ko J, Kim JW, Na SY, Lee JH, Choi PC. Comparison of different intubation methods in difficult airways during simulated cardiopulmonary resuscitation with continuous chest compression: a randomized cross-over manikin trial. J Clin Med [Internet]. 2019 Aug 21 [cited 2026 Jan 27];8(9):1273. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC6719269/

15. Risse J, Fischer M, Meggiolaro K, Fariq-Spiegel K, Pabst D, Manegold R, et al. Effect of video laryngoscopy for non-trauma out-of-hospital cardiac arrest on clinical outcome: A registry-based analysis. Resuscitation [Internet]. 2023 Jan 1 [cited 2026 Jan 27];182:109688. Available from: https://pubmed.ncbi.nlm.nih.gov/36528148/

16. Sakles JC, Patanwala AE, Mosier JM, Dicken JJ. Comparison of video laryngoscopy to direct laryngoscopy for intubation of patients with difficult airway characteristics in the emergency department. Intern Emerg Med [Internet]. 2014 Feb [cited 2026 Jan 27];9(1):93–8. Available from: https://pubmed.ncbi.nlm.nih.gov/23572213/

17. Ruderman B, Mali M, Kaji AH, Kilgo R, Watts S, Wells R, et al. Direct vs video laryngoscopy for difficult airway patients in the emergency department: a National Emergency Airway Registry study. West J Emerg Med [Internet]. 2022 Aug 19 [cited 2026 Jan 27];23(5):706–15. Available from: https://pubmed.ncbi.nlm.nih.gov/36205627/

18. Brown CA 3rd, Kaji AH, Fantegrossi A, Carlson JN, April MD, Kilgo RW, et al. Video laryngoscopy compared to augmented direct laryngoscopy in adult emergency department tracheal intubations: a National Emergency Airway Registry (NEAR) study. Acad Emerg Med [Internet]. 2020 Jan 20 [cited 2026 Jan 27];27(2):100-108. Available from: https://pubmed.ncbi.nlm.nih.gov/31957245/

19. Wayne MA, McDonnell M. Comparison of traditional versus video laryngoscopy in out-of-hospital tracheal intubation. Prehosp Emerg Care [Internet]. 2010 Jun [cited 2026 Jan 27];14(2):278–82. Available from: https://pubmed.ncbi.nlm.nih.gov/20199241/

20. Hypes C, Sakles J, Joshi R, Greenberg J, Natt B, Malo J, et al. Failure to achieve first attempt success at intubation using video laryngoscopy is associated with increased complications. Intern Emerg Med [Internet]. 2017 Dec [cited 2026 Jan 27];12(8):1235–43. Available from: https://pubmed.ncbi.nlm.nih.gov/28364235/