Physical Education, Health and Social Sciences

https://journal-of-social-education.org E-ISSN: 2958-5996

P-ISSN: 2958-5988

Comparative Study of Airway Management Techniques in Pre-Hospital Emergency Care

Irfan Hameed[1]

[1] Abeer Medical Center ,Taif, KSA. Email: irfanhameed1997@gmail.com

DOI: https://doi.org/10.63163/jpehss.v4i1.1029

Abstracts

Pre-hospital airway management in emergency care has evolved significantly, shifting from a rigid emphasis on endotracheal intubation (ETI) as the definitive standard to a nuanced, context-dependent approach prioritizing effective oxygenation, ventilation, minimal interruption of chest compressions, and overall perfusion. This comparative review examines the technical foundations, mechanical characteristics, and clinical outcomes of basic airway maneuvers (bag-valve-mask [BVM] ventilation), supraglottic airway (SGA) devices (including i-gel and King LT), and advanced techniques such as ETI with direct or video laryngoscopy. In out-of-hospital cardiac arrest (OHCA), landmark trials like AIRWAYS-2 and PART, alongside meta-analyses, demonstrate comparable or contextually superior outcomes with SGAs in terms of first-pass success, reduced hands-off time, and survival metrics (higher 72-hour survival with laryngeal tube in PART, no difference in favorable neurological outcomes in AIRWAYS-2). However, ETI may offer advantages in specific subgroups, such as witnessed non-shockable rhythms. In trauma and traumatic brain injury, ETI remains frequently utilized for precise control, though overall mortality shows no significant difference compared to extraglottic alternatives when performed by experienced providers. Pediatric scenarios highlight higher risks with advanced airways, favoring BVM as the initial strategy pending ongoing trials like Pedi-PART. Current 2025 AHA and ERC guidelines advocate a stepwise, provider-skill-based selection without universal superiority of any single method, mandating waveform capnography and emphasizing perfusion-centric resuscitation. Emerging technologies, including AI-assisted video laryngoscopy, signal future refinements. Overall, evidence supports SGAs as a robust primary option in most adult OHCA cases, with ETI reserved for scenarios requiring definitive airway protection.

Keywords: Pre-Hospital Airway Management, Out-of-Hospital Cardiac Arrest, Endotracheal Intubation, Supraglottic Airway Devices, Bag-Valve-Mask Ventilation, Video Laryngoscopy, Aha 2025 Guidelines, Erc 2025 Guidelines, Ohca Survival Outcomes, Trauma Airway Management, Pediatric Airway

1. Introduction

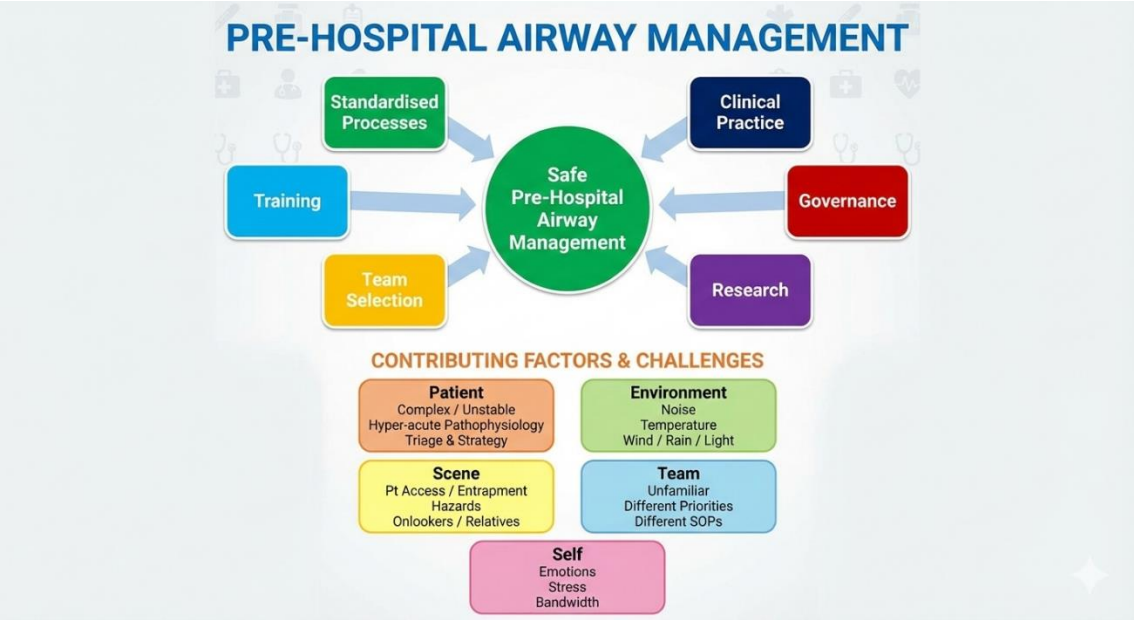
The clinical focus of pre-hospital emergency care has fundamentally shifted over the last four decades, moving from a hierarchical model that prioritized definitive airway establishment to a more integrated, perfusion-centric approach (Beyer, 2025). Historically, the management of the airway in out-of-hospital cardiac arrest (OHCA) and trauma was rooted in the assumption that endotracheal intubation (ETI) represented the gold standard of care, offering the only true means of securing the trachea and protecting the lungs from the catastrophic risk of gastric aspiration (EAJEM, 2024). However, as the sophistication of emergency medical services (EMS) has increased, so too has the scrutiny of advanced interventions (Hampiholi, 2024). The current

landscape is characterized by a transition toward evidence-based practice where the theoretical advantages of a technique are weighed against the operational challenges and the potential for procedural harm, particularly the interruption of high-quality chest compressions (Benger et al., 2018).

The trajectory of this evolution began with the introduction of ETI into the pre-hospital environment in the late 1970s and early 1980s. Before this, basic maneuvers such as mouth-to-mouth resuscitation and manual airway clearance were the primary tools available to rescuers (Wang et al., 2018). The subsequent rise of supraglottic airway (SGA) devices including the laryngeal mask airway (LMA), the laryngeal tube (LT), and second-generation devices like the i-gel provided a radical alternative (Okyay et al., 2023). These devices, designed for blind insertion without the need for a laryngoscope, addressed the inherent difficulty of performing ETI in the chaotic and physically restricted environments typical of pre-hospital care (Debaty et al., 2025)

By 2025, the international consensus reflected in the guidelines of the American Heart Association (AHA) and the European Resuscitation Council (ERC) has consolidated these experiences into a nuanced framework. This framework emphasizes that no single airway approach is universally superior; instead, the choice between bag-valve-mask (BVM) ventilation, SGA, and ETI must be dictated by the etiology of the emergency, provider skill, and specific patient characteristics (Baba, 2024). This shift is best exemplified by the consolidation of the Chain of Survival into a single six-link chain for the 2025 guidelines, which integrates recovery and survivor support alongside early recognition and high-quality cardiopulmonary resuscitation (Puticiu et al., 2025).

Figure 1. Multifactorial Model of Safe Pre-Hospital Airway Management: Enabling Factors and Key Challenges



2. Technical Foundations and Mechanical Considerations of Airway Modalities

A deep understanding of the technical mechanisms of airway devices is essential for interpreting clinical outcomes. Recent guidelines emphasize a stepwise approach that prioritizes oxygenation and ventilation over procedural complexity (Schoettker et al., 2025).

2.1 Basic Airway Management and Manual Interventions

Bag-valve-mask (BVM) ventilation remains the cornerstone of pre-hospital resuscitation. While often viewed as a basic skill, its effective performance is technically demanding and highly dependent on the rescuer's ability to maintain a superior mask seal while simultaneously performing manual airway maneuvers (Alghamdi et al., 2024). In patients without suspected cervical spine injury, the head tilt–chin lift maneuver is the standard for opening the airway (Manual maneuvers/adjuncts, 2021). In the presence of trauma, the jaw thrust maneuver without head extension is mandated to preserve spinal integrity, though rescuers are permitted to use the head tilt–chin lift if the jaw thrust fails to provide adequate ventilation (Lax et al., 2022).

The efficacy of BVM is significantly enhanced by the use of adjuncts such as oropharyngeal airways (OPA) and nasopharyngeal airways (NPA), which prevent the tongue and soft tissues from occluding the posterior pharynx (Davis, 2022). The 2025 AHA guidelines specify that in patients with suspected basal skull fractures or severe coagulopathy, the OPA is the preferred adjunct to mitigate the risk of accidental intracranial entry or epistaxis (Dhandapani et al., 2026). Furthermore, the guidelines now recommend a two-person BVM technique whenever feasible to minimize gastric insufflation and maximize oxygen delivery (Lyng et al., 2022).

2.2 Supraglottic Airway (SGA) Mechanics

Supraglottic airways are designed to sit above or around the glottis, allowing for the delivery of positive pressure ventilation without passing through the vocal cords (Van Zundert et al., 2024).

Table 1: Mechanical Mechanisms and Characteristics of Common Supraglottic Devices

Device Category	Mechanical Mechanism and Characteristics	Representative Examples
First-Generation SGA	Simple inflatable cuffs providing a seal over the laryngeal inlet. No gastric access.	LMA Classic (LMA Classic, 2021)
Second-Generation SGA	Non-inflatable or improved inflatable cuffs with dedicated ports for gastric tube insertion.	i-gel, ProSeal (i-gel vs. King LT, 2021)
Laryngeal Tubes	Dual-balloon system; one balloon seals the esophagus, the other the oropharynx. Ventilation occurs between the two.	King LT, King LTS-D (Laryngeal Tubes, 2024)

The i-gel represents a significant departure from traditional inflatable designs. It utilizes a soft, gel-like thermoplastic elastomer that is anatomically shaped to mirror the peri-laryngeal structures. Technical comparisons between these devices indicate that the i-gel can be placed significantly faster (14.4 seconds) than the King LT (39.7 seconds), which may contribute to its superior first-pass success rates (Price et al., 2022).

2.3 Endotracheal Intubation (ETI) and Laryngoscopy

Endotracheal intubation remains the most definitive method for protecting the airway and controlling ventilation. By placing a cuffed tube directly into the trachea, it creates a physical barrier against the aspiration of gastric contents (Ramirez et al., 2024). However, the mechanical requirement for direct visualization of the vocal cords using a laryngoscope is the primary source of procedural failure. Video laryngoscopy (VL) has sought to address these challenges by providing an indirect view of the glottis even when the anatomical axes are not aligned (Fonya et al., 2023).

3. Comparative Analysis of Outcomes in Out-of-Hospital Cardiac Arrest

The choice of airway management strategy in OHCA is central to the debate over pre-hospital priorities. Patients treated with ETI often show significantly higher rates of survival to hospital admission and 24-hour survival, yet these advantages frequently vanish by the time of hospital discharge (Alghamdi et al., 2024).

3.1 Survival Metrics and ROSC

Meta-analyses comparing ETI and SGA for OHCA have revealed a phenomenon often described as "front-loaded survival" (Amagasa et al., 2023).

Table 2: Comparative Survival Metrics: Endotracheal Intubation (ETI) vs. Supraglottic Airway (SGA)

Outcome Metric	Endotracheal Intubation (ETI)	Supraglottic Airway (SGA)	Statistical Significance
Survival to Hospital Admission	26.8%	14.5%	$p < 0.001$ (EAJEM, 2024)
24-Hour Survival Rate	25.5%	17.6%	$p < 0.001$ (EAJEM, 2024)
Survival to Hospital Discharge	8.6%	6.0%	$p = 0.09$ (EAJEM, 2024)
Neurologically Favorable Survival	5.3%	3.8%	$p = 0.35$ (EAJEM, 2024)

Registry-based studies indicate that return of spontaneous circulation (ROSC) may be more frequent with SGA use than with ETI, likely reflecting higher first-pass success and reduced hands-off time during CPR (Katzenschlager et al., 2023).

3.2 The Landmark Randomized Controlled Trials

The AIRWAYS-2 trial found no significant difference in favorable functional results (Modified Rankin Scale 0-3) at 30 days between i-gel and ETI groups. Conversely, the PART trial found that the SGA group (King LT) showed a significant advantage in 72-hour survival and survival to hospital discharge compared to ETI (Wang et al., 2018).

3.3 Subgroup Nuance: Non-Shockable Rhythms

In witnessed OHCA with non-shockable rhythms, ETI was associated with a significantly higher rate of ROSC, one-month survival, and favorable neurological outcome compared to SGA (Tham et al., 2023).

4. Advanced Airway Management in Trauma and Traumatic Brain Injury

In the trauma setting, airway management is a high-stakes intervention focused on preventing secondary brain injury through the maintenance of normoxia and normocapnia (Dhandapani et al., 2026).

4.1 ETI vs. SGA for Survival in Trauma

Data from the German TraumaRegister DGU indicates that ETI remains the primary choice for severe trauma, used in 92.5% of cases where an airway was secured (Weigeldt et al., 2024).

Table 3: Comparison of Clinical Features and Metrics in Trauma Airway Management

Feature	ETI Group	EGA Group	Implications
In-Hospital Mortality	33.0%	30.7%	No significant difference (p = 0.32) (TraumaRegister DGU, 2024)
Traumatic Brain Injury (TBI)	66.4%	56.1%	High prevalence in both groups (Trauma rescue time/GCS, 2024)
Rescue Time (Median)	73 min	63 min	ETI associated with longer on-scene times (Trauma rescue time/GCS, 2024)

Sensitivity analyses suggest that pre-hospital intubation may reduce morbidity by approximately 12% when performed by expert providers following standardized protocols (Sindhushree et al., 2025).

5. Pediatric Pre-Hospital Airway Management: A Distinct Clinical Challenge

The pediatric airway presents unique anatomical and physiological hurdles. Children have higher metabolic oxygen demands and lower functional residual capacity, meaning hypoxia develops much more rapidly than in adults (Trachsel et al., 2022).

5.1 Performance and Success Rates in Children

Meta-analyses show a markedly lower performance level in pediatric intubation compared to adults (Ng et al., 2023).

Table 4: Pediatric Performance Metrics and Outcomes

Parameter	Rate / Ratio	Clinical Context
Overall Success (with RSI)	92.5%	Muscle relaxants improve results (Pediatric RSI/success, 2024)
Overall Success (without RSI)	78.9%	Significant risk of failure without drugs (Pediatric RSI/success, 2024)
Survival Odds Ratio (ETI vs BVM)	0.39	BVM often associated with better survival (Pediatric BVM survival, 2025)

5.2 The Pedi-PART Trial and Future Directions

The Pediatric Prehospital Airway Resuscitation Trial (Pedi-PART) is currently being conducted to determine if BVM-only, BVM followed by SGA, or BVM followed by ETI results in better 30-day ICU-free survival (Amagasa et al., 2023).

6. Provider Expertise and Safety Metrics

Operator training and clinical experience significantly impact success rates. Physician-led systems consistently report ETI success rates exceeding 98%, compared to approximately 90% for non-physician providers. Continuous waveform capnography is now the mandatory standard for verifying tube placement (Bosson et al., 2022).

7. Technological Trends and the 2026 Market Outlook

The future of pre-hospital airway management is being redefined by digital integration. The global video laryngoscope market is projected to reach 1.34 billion USD by 2032 (VL market size 2025/2026, 2025). Key trends include the integration of Artificial Intelligence (AI) to detect anatomical landmarks and recommend optimal tube placement (Alotaibi et al., 2023).

8. Analysis of the 2025 AHA and ERC Guidelines

The 2025 guidelines emphasize quality and perfusion priority:

- **Strategy Selection:** Choosing either BVM or advanced airway is reasonable; SGA is preferred if ETI success probability is low (Alghamdi et al., 2024).
- **Standardized Quality:** Waveform capnography is mandatory, with an ERC target EtCO2 >= 25 mmHg during CPR (Capnography targets 2025, 2025) (Perman et al., 2025),
- **Ventilation:** For advanced airways, continuous compressions with 1 breath every 6 seconds are recommended (Hickey et al., 2024).

9. Synthesis and Professional Implications

The comparative study of pre-hospital airway management reveals a discipline in a state of high-resolution refinement. Evidence suggests the supraglottic airway is a robust and effective primary tool for the majority of adult cardiac arrest scenarios (Forestell et al., 2024). In trauma, ETI continues to be supported for precise control of blood gases, provided it is achieved rapidly through RSI and VL. For children, BVM ventilation remains the recommended baseline strategy due to the risk of procedural harm (Nah et al., 2024).

10. Conclusion

Pre-hospital airway management has matured into a highly evidence-based discipline that balances theoretical airway security with practical considerations of procedural speed, provider expertise, and minimal disruption to high-quality CPR. While ETI provides the most definitive protection against aspiration and enables precise ventilation control particularly valuable in trauma, traumatic brain injury, or select OHCA subgroups large-scale randomized trials and meta-analyses indicate that supraglottic airways often deliver comparable or superior early survival metrics due to higher insertion success rates and reduced interruption of compressions. In most adult OHCA scenarios, second-generation SGAs represent a reliable and efficient primary strategy. Pediatric care warrants caution with advanced interventions given anatomical and physiological vulnerabilities, with BVM ventilation serving as the foundational approach. The 2025 AHA and ERC guidelines appropriately reject a one-size-fits-all paradigm, instead endorsing individualized, stepwise decision-making guided by patient characteristics, etiology, and rescuer proficiency, with mandatory continuous capnography for confirmation and monitoring. As digital tools and AI integration advance, future refinements promise even greater precision and safety. Ultimately, optimal pre-hospital airway care prioritizes effective oxygenation and systemic perfusion over procedural complexity, ensuring the best possible outcomes for critically ill patients in challenging out-of-hospital environments.

References

Alghamdi, Y. A., ObidAlsobh, H. S., Alsubhi, A. A., Alshammari, N. F. S., Alzhrani, M. K. M., Al Mansournur, S. S. H., ... & Alotaibi, S. A. L. (2024). Advancements in Airway Management and Ventilation in a Prehospital Cardiac Arrest: A Narrative Review. Journal of International Crisis and Risk Communication Research, 7(S8), 2638.

Alghamdi, Y. A., ObidAlsobh, H. S., Alsubhi, A. A., Alshammari, N. F. S., Alzhrani, M. K. M., Al Mansournur, S. S. H., ... & Alotaibi, S. A. L. (2024). Advancements in Airway Management and Ventilation in a Prehospital Cardiac Arrest: A Narrative Review. Journal of International Crisis and Risk Communication Research, 7(S8), 2638.

Alotaibi, H. F., Alanazi, S. M., Albasri, R. F., & Alanazi, I. M. (2023). Advances in pre-hospital emergency care: Enhancing outcomes through innovative practices and technology. International journal of health sciences, 7(S1), 3422-3434.

Amagasa, S., Utsumi, S., Moriwaki, T., Yasuda, H., Kashiura, M., Uematsu, S., & Kubota, M. (2023). Advanced airway management for pediatric out-of-hospital cardiac arrest: A systematic review and network meta-analysis. The American Journal of Emergency Medicine, 68, 161-169.

American Heart Association. (2025). Part 1: Executive summary: 2025 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation, 152(16_supplement_2). https://doi.org/10.1161/CIR.0000000000001372

Baba, L. N. (2024). Ventilatory Assistance. Sole's Introduction to Critical Care Nursing-E-Book: Sole's Introduction to Critical Care Nursing-E-Book, 183.

Benger, J. R., Kirby, K., Black, S., Brett, S. J., Clout, M., Lazaroo, M. J.,... & Nolan, J. P. (2018). Effect of a strategy of a supraglottic airway device vs tracheal intubation during out-of-hospital cardiac arrest on functional outcome: The AIRWAYS-2 randomized clinical trial. JAMA, 320(8), 779–791. https://doi.org/10.1001/jama.2018.11597

Bosson, N., Hansen, M., Gausche-Hill, M., Lewis, R. J., Wendelberger, B., Shah, M. I., ... & Wang, H. E. (2022). Design of a novel clinical trial of prehospital pediatric airway management. Clinical Trials, 19(1), 62-70.

Cambridge University Press. (2024). Paramedics' success and complications in prehospital pediatric intubation: A meta-analysis. Prehospital and Disaster Medicine. https://doi.org/10.1017/S1049023X

Cardiac Arrest Registry to Enhance Survival. (2021). Comparison of neurologic outcomes in out-of-hospital cardiac arrest patients managed with King Laryngeal Tube vs i-gel. PubMed. https://pubmed.ncbi.nlm.nih.gov/37120129/

Davis, T. C. (2022). Assessment and Management of the Airway. Drain's PeriAnesthesia Nursing–E-Book: A Critical Care Approach, 339.

Debaty, G., Johnson, N. J., Dewan, M., Morrison, L. J., Bray, J. E., Smyth, M., ... & Morley, P. (2025). Real-time ventilation quality feedback devices efficacy in out-of-hospital cardiac arrest: a scoping review. Resuscitation Plus, 101069.

Dhandapani, M., Vasantha Kalyani, C., S, M. K., Kishore, A., & Bhat, R. (2026). Pediatric Head and Maxillofacial Trauma. In Pediatric Trauma Resuscitation Manual (PTRM) for Primary Care Providers (pp. 105-126). Singapore: Springer Nature Singapore.

Duke University. (2025). Survival after out-of-hospital cardiac arrest in children: A propensity score analysis. Duke Scholars. https://scholars.duke.edu/publication/1533110

EAJEM. (2024). Endotracheal intubation versus supraglottic airway for airway management in adults with out-of-hospital cardiac arrest: A systematic review and meta-analysis. Eurasian Journal of Emergency Medicine.

European Resuscitation Council. (2025). European Resuscitation Council guidelines 2025. https://www.erc.edu/science-research/guidelines/guidelines-2025/guidelines-2025-english/

Fonya, M., Kamgang, F., & Webedjo, K. (2023). Suctioning of the upper and lower respiratory tract: Clinical guidebook for nursing students.

Forestell, B., Ramsden, S., Sharif, S., Centofanti, J., Al Lawati, K., Fernando, S. M., ... & Rochwerg, B. (2024). Supraglottic airway versus tracheal intubation for airway management in out-of-hospital cardiac arrest: a systematic review, meta-analysis, and trial sequential analysis of randomized controlled trials. Critical Care Medicine, 52(2), e89-e99.

Hampiholi, N. (2024). Elevating emergency healthcare-technological advancements and challenges in smart ambulance systems and advanced monitoring and diagnostic tools. *International Journal of Computer Trends and Technology*, *72*(1), 1-7.

Hickey, S., Sankari, A., & Giwa, A. (2024). Mechanical ventilation. StatPearls.

Katzenschlager, S., Kelpanides, I. K., Ristau, P., Huck, M., Seewald, S., Brenner, S., ... & Popp, E. (2023). Out-of-hospital cardiac arrest in children: an epidemiological study based on the German Resuscitation Registry identifying modifiable factors for return of spontaneous circulation. Critical Care, 27(1), 349.

Lax, P., & Veitch, J. (2022). Fundamentals of Airway Management in Trauma. In Textbook of Acute Trauma Care (pp. 97-112). Cham: Springer International Publishing.

Long, B., & Gottlieb, M. (2025). Emergency medicine updates: Cardiac arrest airway management. The American Journal of Emergency Medicine.

Lyng, J. W., Guyette, F. X., Levy, M., & Bosson, N. (2022). Prehospital manual ventilation: an NAEMSP position statement and resource document. Prehospital Emergency Care, 26(sup1), 23-31.

March, J. A., Tassey, T. E., Resurreccion, N. B., Portela, R. C., & Taylor, S. E. (2018). Comparison of the i-gel supraglottic and King laryngotracheal airways in a simulated tactical environment. Prehospital Emergency Care. https://doi.org/10.1080/10903127.2017.1399183

Merchant, R. M.,... & American Heart Association. (2025). Part 9: Adult advanced life support: 2025 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation. https://doi.org/10.1161/CIR.0000000000001376

Nah, S., Lee, Y., Choi, S. J., Lee, J., Hwang, S., Lim, S., ... & Chung, H. S. (2024). Current trends in emergency airway management: a clinical review. Clinical and Experimental Emergency Medicine, 11(3), 243.

Ng, P., Tan, H. L., Ma, Y. J., Sultana, R., Long, V., Wong, J. J. M., & Lee, J. H. (2023). Tests and indices predicting extubation failure in children: a systematic review and meta-analysis. Pulmonary Therapy, 9(1), 25-47.

Okyay, R. D., Küçükosman, G., Köksal, B. G., Pişkin, Ö., & Ayoğlu, H. (2023). Effects of supraglottic airway devices on hemodynamic response and optic nerve sheath diameter: proseal LMA, LMA supreme, and I-gel LMA. Medicina, 59(4), 753.

Perman, S. M., Berg, R. A., & Nadkarni, V. M. (Eds.). (2025). Cardiac Arrest and Cardiopulmonary Resuscitation, An Issue of Critical Care Clinics: Cardiac Arrest and Cardiopulmonary Resuscitation, An Issue of Critical Care Clinics, E-Book (Vol. 42, No. 1). Elsevier Health Sciences.

Price, P., Laurie, A., Plant, E., Chandra, K., Pishe, T., Brunt, K., ... & Brunt, K. R. (2022). Comparing the first-pass success rate of the King LTS-D and the i-gel airway devices in out-of-hospital cardiac arrest. Cureus, 14(11).

Puticiu, M., Pop, F., Butoi, M. A., Banicioiu-Covei, M., Rotaru, L. T., Blaga, T., & Cimpoesu, D. (2025). Artificial Intelligence in Cardiopulmonary Resuscitation. Medicina, 61(12), 2099.

Ramirez, G., Campanero, M. A., Zaldua, A. M., & Jauregizar, N. (2024). Problems Related to Endotracheal Intubation as an Input for the Design of a New Endotracheal Tube. Medical Devices: Evidence and Research, 349-367.

Schoettker, P., & McNarry, A. (2025). Advancing Airway Management—Guidelines Must Evolve With Clinical Practice. A&A Practice, 19(4), e01962.

Tham, L. P., Fook-Chong, S., Ahmad, N. S. B., Ho, A. F. W., Tanaka, H., Do Shin, S., ... & Ong, M. E. H. (2022). Pre-hospital airway management and survival outcomes after paediatric out-of-hospital cardiac arrests. Resuscitation, 176, 9-18.

Trachsel, D., Erb, T. O., Hammer, J., & von Ungern-Sternberg, B. S. (2022). Developmental respiratory physiology. Pediatric Anesthesia, 32(2), 108-117.

Van Zundert, A. A., Gatt, S. P., Van Zundert, T. C., Hagberg, C. A., & Pandit, J. J. (2024). Supraglottic airway devices: present state and outlook for 2050. Anesthesia & Analgesia, 138(2), 337-349.

Wang, H. E., Schmicker, R. H., Daya, M. R., Stephens, S. W., Idris, A. H., Carlson, J. N.,... & Nichol, G. (2018). Effect of a strategy of initial laryngeal tube insertion vs endotracheal intubation on 72-hour survival in adults with out-of-hospital cardiac arrest: A randomized clinical trial. JAMA, 320(8), 769–778. https://doi.org/10.1001/jama.2018.10962

Weigeldt, M., Schulz-Drost, S., Stengel, D., Lefering, R., Treskatsch, S., Berger, C., & TraumaRegister DGU. (2024). In-hospital mortality after prehospital endotracheal intubation versus alternative methods of airway management in trauma patients. A cohort study from the TraumaRegister DGU®. European Journal of Trauma and Emergency Surgery, 50(4), 1637-1647.