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The effectiveness of prehospital rapid sequence intubation in critically ill patients

Sultan Mohammed Alanazi
KSA, National Guard Health Affairs

Hatim Faihan Alotaibi
KSA, National Guard Health Affairs

Ibrahim Mohammed Alanazi
KSA, National Guard Health Affairs

Rakan Faisal Al Basri
KSA, National Guard Health Affairs

Salman Abdullah Alharbi
KSA, National Guard Health Affairs

Hatim Abdullah Alshehri
KSA, National Guard Health Affairs

Abdulrhman Abdullah Alenazi
KSA, National Guard Health Affairs

Mohannad Ali Almusallam
KSA, National Guard Health Affairs

Shafi Marzoug Alyamy
KSA, National Guard Health Affairs

***Abstract*---Background** Tracheal intubation in critically sick patients presents a significant risk of complications attributable to variables such as respiratory failure, hemodynamic instability, and drug sensitivity. Present recommendations mostly depend on expert opinion and data from elective intubations, lacking substantial evidence from randomized controlled trials (RCTs) in critical care environments (ICU, ED, general wards). This systematic review sought to assess high-quality evidence-based methods for intubation in critically sick patients, concentrating on pharmacological agents, techniques, and

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Corresponding email: *akk29337@gmail.com*
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equipment. **Methods** A thorough search of PubMed, BioMed Central, Embase, and the Cochrane Central Register of Clinical Trials found pertinent randomized controlled trials examining treatments aimed at enhancing the success rate and safety of tracheal intubation in critically sick patients. A meta-analysis was conducted when applicable. **Results** Intubation problems in critically sick patients vary from 4.2% to 39%. Pre-oxygenation by non-invasive ventilation (NIV) has shown enhanced effectiveness over conventional techniques in extending safe apnea duration and minimizing desaturation. Although high-flow nasal cannula (HFNC) enhanced comfort, its advantages for apneic oxygenation were restricted in this demographic. Etomidate and ketamine had equivalent safety and effectiveness as sedatives, whilst succinylcholine and rocuronium showed similar success rates as neuromuscular blocking drugs. The sniffing position outperformed the ramping position for laryngoscopy. Post-intubation recruitment maneuvers enhanced short-term oxygenation; however, the benefits were ephemeral. **Conclusion** This study underscores the effectiveness of non-invasive ventilation for pre-oxygenation, the sniffing posture for laryngoscopy, and the use of etomidate and ketamine as sedatives. Nonetheless, considerable research deficiencies persist concerning sedative drugs, sophisticated airway management, and individualized intubation algorithms. Additional high-quality randomized controlled trials are essential to fill these gaps and enhance patient outcomes.

***Keywords*---**Rapid Sequence Intubation, Critically Ill Patients, Pre-oxygenation, Airway Management, Sedation.

1. Introduction

Tracheal intubation is a prevalent and essential procedure frequently required for critically ill patients in environments such as the intensive care unit (ICU), emergency department (ED), and during in-hospital emergencies in general wards. (1). Intubations in critically ill patients differ significantly from elective intubations conducted in the controlled setting of an operating room, as they involve heightened risk and intricate challenges. Patients often exhibit significant respiratory failure, hemodynamic instability, recent food consumption, and comorbid conditions including cardiac or cerebrovascular disease. Furthermore, they frequently exhibit heightened sensitivity to the negative effects of sedatives and other medications, which complicates the intubation process. (2). Consequently, tracheal intubation in this population correlates with elevated rates of significant complications, such as severe hypoxia, hemodynamic collapse, cardiac arrest, and, in certain instances, mortality. The occurrence of difficult intubation is markedly greater than that of elective intubation procedures in the operating room. (3).

Airway management outside the operating room is significantly influenced by several modifiable factors, including inadequate provider training, lack of supervision, failure to identify high-risk patients, and insufficient backup plans or equipment. The restricted space surrounding ICU beds, especially in the

emergency department and general wards, may intensify these challenges. (4). Standardized protocols, typically manifested as checklists or procedural bundles, have been proposed to enhance patient outcomes by emphasizing critical steps including pre-oxygenation, identification of patient risks, and confirmation of the availability of essential medications and equipment. (5).

Current intubation guidelines predominantly depend on expert opinions or retrospective data, primarily originating from procedures intended for elective intubations in operating room environments (6). We conducted a systematic review of randomized controlled trials (RCTs) to identify high-quality evidence-based practices for intubation in critically ill patients and to address this gap. The objective was to evaluate the efficacy of different drugs, techniques, and devices employed in intubation, particularly in critically ill patients in ICU, ED, or general ward environments. A meta-analytic assessment was conducted when feasible to enhance the reliability of the findings.

2. Methods

We searched PubMed, BioMed Central, Embase, and the Cochrane Central Register of Clinical Trials. The search criteria targeted studies investigating drugs, techniques, or devices designed to enhance the success rate or safety of tracheal intubation in critically ill patients within ICU, ED, and general ward settings. Research must directly examine patient safety or success outcomes associated with tracheal intubation interventions. Meta-analytic evaluations were conducted to integrate findings where applicable.

3. Techniques for Pre-Oxygenation in Critically Ill Patients

Pre-oxygenation is an essential procedure in the preparation of critically ill patients for intubation, aimed at enhancing the oxygen reserves in the lungs and bloodstream. This optimizes the duration of "safe apnea," which refers to the interval during laryngoscopy and intubation when the patient is apneic yet maintains adequate oxygen levels to prevent hypoxia. In standard elective operating room intubations, pre-oxygenation is commonly accomplished by administering high-concentration oxygen via a face mask or utilizing a bag-valve-mask device for manual ventilation of the patient. Standard pre-oxygenation techniques may be insufficient for critically ill patients due to their unique physiological challenges (7). Critically ill patients often present with conditions such as acute respiratory distress syndrome (ARDS), lung injury, or impaired cardiac function, which collectively diminish lung compliance and lower baseline oxygen reserves. Critically ill patients necessitate more comprehensive pre-oxygenation strategies compared to the standard approaches used for healthy patients undergoing elective intubation, owing to their physiological differences. (8).

Various advanced pre-oxygenation techniques were evaluated in studies to ascertain their efficacy in prolonging the safe apnea duration in critically ill patients. Two methods demonstrating potential efficacy are Non-Invasive Ventilation (NIV) and High-Flow Nasal Cannula (HFNC) (9). Research indicates that both NIV and HFNC may outperform standard oxygen therapy in this

demographic, especially in patients experiencing severe hypoxemia. (10). In critically ill patients, these methods have demonstrated superior maintenance of oxygen saturation levels during intubation, thereby decreasing the risk of severe desaturation. NIV demonstrated significant efficacy in enhancing oxygenation when administered for a minimum of three minutes before intubation (11).

High-Flow Nasal Cannula (HFNC) has emerged as a notable technique in recent years, recognized for its potential advantages in pre-oxygenation. HFNC administers a high flow of heated, humidified oxygen via a nasal cannula, offering patients a more comfortable and effective means of oxygenation (12). HFNC aids in decreasing the work of breathing and sustaining elevated oxygen saturation levels in the lungs (13). Nonetheless, its function in apneic oxygenation, wherein oxygen delivery persists despite the absence of breathing, seems to be restricted in critically ill patients. HFNC has demonstrated efficacy in preventing desaturation during elective surgeries and enhancing oxygen levels in the operating room; however, research suggests it does not provide similar benefits during the apneic oxygenation phase in critically ill patients. This may result from the decreased lung compliance and elevated oxygen demands observed in critical care patients, which diminish the effectiveness of HFNC during apnea. (1). Hypoxemic patients in the ICU or emergency department often exhibit depleted oxygen reserves, indicating that HFNC may not sustain adequate oxygenation as effectively as observed in healthier surgical patients. This distinction is significant as it highlights that a technique proven effective in elective settings may not yield the same advantages for critically ill populations. (14).

The use of non-invasive ventilation (NIV) has demonstrated potential benefits for pre-oxygenation and for prolonging safe apnea duration during intubation. This technique is especially beneficial for patients experiencing severe respiratory failure, as it facilitates both pre-oxygenation and ventilation. NIV utilizes a tight-fitting mask or helmet interface to provide a controlled flow of oxygenated air, thereby effectively supporting oxygenation levels in patients with significantly impaired lung function (15). Evidence indicates that, when time permits, pre-oxygenation using NIV is superior to standard oxygen delivery methods, especially for patients at elevated risk of desaturation. Research demonstrates that critically ill patients receiving pre-oxygenation with NIV before intubation have reduced instances of critical desaturation, potentially leading to a decreased risk of complications such as hypotension or cardiac arrest during and following the intubation process. (16).

4. Sedative Options and Neuromuscular Blocking Agents (NMBA)

The selection of suitable sedatives and neuromuscular blocking agents (NMBAs) is essential for ensuring the safe intubation of critically ill patients. Patients frequently exhibit altered physiology, characterized by hemodynamic instability and diminished oxygen reserves, which increases their vulnerability to the effects of sedatives and neuromuscular blocking agents. An unsuitable selection may result in significant complications, including hypotension, respiratory depression, and other negative outcomes. Recent studies have investigated various sedatives and neuromuscular blocking agents to determine options that enhance safety and efficacy for these patients (17).

Etomidate and ketamine were the main sedatives assessed in randomized controlled trials (RCTs). Etomidate is frequently selected in the ICU due to its hemodynamic stability; however, it is associated with adrenal suppression, which raises concerns regarding its impact on outcomes in critical illness. (18). In the largest trial analyzed, etomidate and ketamine demonstrated comparable intubation-related outcomes, showing no significant differences in intubation success rates or procedure-related adverse events. Etomidate adversely impacted adrenal function; however, this did not correlate with an elevated risk of mortality or organ dysfunction in critically ill patients. (19). Ketamine, recognized for its dissociative anesthetic properties, demonstrated comparable efficacy while also preserving blood pressure and heart rate, which is beneficial for patients with hemodynamic instability. (20). Despite the frequent study and use of etomidate and ketamine, propofol, a commonly employed sedative in clinical settings, has not been extensively evaluated in this patient population. The hemodynamic effects of propofol in critically ill patients can be detrimental, primarily due to the risk of significant hypotension. (21).

Succinylcholine and rocuronium are the primary neuromuscular blocking agents compared, especially in the context of rapid sequence intubation (RSI) for critically ill patients. Both drugs are effective for achieving rapid paralysis, which is crucial for successful intubation; however, they exhibit differences in pharmacokinetic and pharmacodynamic properties. (22). Succinylcholine, classified as a depolarizing neuromuscular blocking agent, exhibits a rapid onset and brief duration, rendering it a preferred option for intubation. Rocuronium, a non-depolarizing neuromuscular blocking agent, exhibits a rapid onset of action while possessing an extended duration, potentially leading to prolonged paralysis in specific instances. (23). The reviewed trials indicate that succinylcholine and rocuronium exhibit equivalent success rates for rapid sequence intubation; however, rocuronium necessitates a marginally longer duration for intubation than succinylcholine. (24).

5. Positioning and Equipment for Laryngoscopy

Correct patient positioning during laryngoscopy is essential for the success of intubation, alongside the selection of the appropriate sedative and NMBA. The positioning of the patient significantly affects the visualization of airway structures, thereby serving as a crucial element in the efficiency and safety of the procedure. The reviewed studies compared two primary positions: the sniffing position and the ramped position, to assess their effectiveness for critically ill patients (25).

The sniffing position is a conventional method that involves tilting the patient's head slightly upward, thereby aligning the oral, pharyngeal, and laryngeal axes to facilitate a more direct view of the glottis. This position is commonly employed in elective and emergency contexts, frequently resulting in improved airway visualization during laryngoscopy. Studies indicate that the sniffing position enhances first-attempt success rates relative to the ramped position in critically ill patients. (26). This finding differs from previous studies conducted in elective operating room settings, which indicated that the ramped position offers a better glottic view, particularly in patients with obesity or other anatomical difficulties.

The ramped position entails elevating the head and torso, typically using multiple pillows or supports, to align the external auditory meatus with the sternal notch, thereby optimizing the alignment of airway structures. (27). The position may be advantageous for patients with particular airway anatomy; however, studies indicate that physiological differences in critically ill patients could render the sniffing position more favorable. Critically ill patients frequently exhibit diminished baseline oxygenation and increased hemodynamic instability. The sniffing position may facilitate more rapid intubation and reduce stress on these compromised systems.

The reviewed studies focused on video laryngoscopy (VL) in comparison to direct laryngoscopy (DL) for laryngoscopic equipment. Video laryngoscopy provides a magnified, indirect visualization of the glottis and adjacent structures, proving beneficial in cases involving known or anticipated difficult airways. In elective surgical contexts, VL has demonstrated a reduction in failed intubations and is frequently favored for intricate airway situations (27, 28). The evidence regarding the efficacy of VL in critically ill patients is multifaceted. While video laryngoscopy enhances glottic visualization, it does not seem to decrease the frequency of intubation attempts or negative outcomes in critically ill patients. Some trials have indicated a higher incidence of complications associated with VL in these patients, possibly attributable to the extended duration needed for device setup and operation, which may lead to prolonged apnea times (29). This result differs from findings in elective intubation studies, which indicate that VL is linked to an increased first-pass success rate and a reduction in adverse events. The differences in outcomes between elective and emergency intubation may arise from the urgent requirements of intubation in critically ill patients, where rapid and uncomplicated direct laryngoscopy may be more effective in reducing apnea duration and hemodynamic instability (30).

6. Post-intubation recruitment maneuvers (RM)

Recruitment maneuvers (RMs) are techniques employed to reopen or reinflate collapsed alveoli, the small air sacs in the lungs that facilitate gas exchange. Alveolar collapse frequently occurs in critically ill patients, particularly following intubation and the application of positive pressure ventilation. (31). Atelectasis frequently arises from alterations in lung compliance and pressure, leading to diminished oxygenation efficiency. The function of RMs is to mitigate this by temporarily applying elevated airway pressures, thereby "recruiting" the alveoli into the ventilation process. Increasing the number of open alveoli enhances the surface area for oxygen exchange, potentially improving blood oxygenation levels. (32).

It is essential to recognize that the beneficial effects of RMs were temporary. Oxygenation improved at both the 5-minute and 30-minute intervals; however, this effect was not maintained over an extended duration. (33). The transient response underscores a limitation of RMs, indicating that the maneuver fails to offer a durable solution to alveolar collapse. This transient benefit indicates that while RMs can provide temporary support for oxygenation, they should be integrated with additional ventilatory strategies, such as optimizing positive end-

expiratory pressure (PEEP), to sustain alveolar patency and avert subsequent collapse. (34).

Extensive studies have been conducted on recruitment maneuvers for acute lung injury and acute respiratory distress syndrome (ARDS)(35-37). Under these conditions, alveolar collapse presents a significant challenge, and recruitment maneuvers have been employed to enhance oxygenation and patient outcomes. Controlled studies indicate that, for patients with ARDS, the careful application of recruitment maneuvers (RMs) can yield significant benefits, despite associated risks. The maneuvers may lead to hemodynamic instability as a result of the transient elevation in intrathoracic pressure, subsequently diminishing venous return to the heart. Therefore, although RMs are beneficial for lung injury, the risk of negative cardiovascular effects requires meticulous patient selection and monitoring. (38, 39).

The role of recruitment maneuvers in post-intubation care for critically ill patients remains underexplored. In contrast to patients with ARDS, intubated patients exhibit varying degrees of alveolar collapse and lung compliance problems (40). The response to RMs in this population can vary, and it remains unclear whether the benefits seen in ARDS patients apply to individuals without pre-existing lung injury. The reviewed randomized controlled trial presents initial evidence suggesting that respiratory maneuvers may confer short-term oxygenation advantages, especially in hypoxemic patients' post-intubation. In patients experiencing low oxygen levels post-intubation, recruitment maneuvers may provide an effective intervention to enhance oxygenation and maintain physiological stability (41).

7. Conclusion

This review highlights several effective practices for improving tracheal intubation outcomes in critically ill patients, particularly the value of non-invasive ventilation (NIV) and high-flow nasal cannula (HFNC) for pre-oxygenation, the benefits of the sniffing position, and the relative safety of etomidate and ketamine as sedatives. Nonetheless, substantial gaps persist in the evidence, particularly regarding the necessity for high-quality research on sedation agents, advanced airway management tools, and patient-specific algorithms for intubation.

References

1. De Jong A, Myatra SN, Roca O, Jaber S. How to improve intubation in the intensive care unit. Update on knowledge and devices. Intensive care medicine. 2022;48(10):1287-98.
2. Mosier JM, Sakles JC, Law JA, Brown III CA, Brindley PG. Tracheal intubation in the critically ill. Where we came from and where we should go. American journal of respiratory and critical care medicine. 2020;201(7):775-88.
3. DeMatteo M, Aldo FL, Mort TC. Emergency Tracheal Intubation In a Non-OR Setting. Emergency. 2022.
4. Castellanos Esparraguera A. A preprocedural checklist to improve patient safety during prehospital rapid sequence intubation. 2019.

5. Joshi R, Hypes CD, Greenberg J, Snyder L, Malo J, Bloom JW, et al. Difficult airway characteristics associated with first-attempt failure at intubation using video laryngoscopy in the intensive care unit. Annals of the American Thoracic Society. 2017;14(3):368-75.
6. Garcia SI, Sandefur BJ, Campbell RL, Driver BE, April MD, Carlson JN, et al. First-attempt intubation success among emergency medicine trainees by laryngoscopic device and training year: a national emergency airway registry study. Annals of Emergency Medicine. 2023;81(6):649-57.
7. Higgs A, Cook T, McGrath B. Airway management in the critically ill: the same, but different. Oxford University Press; 2016. p. i5-i9.
8. Davis DP, Bosson N, Guyette FX, Wolfe A, Bobrow BJ, Olvera D, et al. Optimizing physiology during prehospital airway management: an NAEMSP position statement and resource document. Prehospital Emergency Care. 2022;26(sup1):72-9.
9. Danish MA. Preoxygenation and anesthesia: a detailed review. Cureus. 2021;13.(2)
10. Wang Q, Peng Y, Xu S, Lin L, Chen L, Lin Y. The efficacy of high-flow nasal cannula (HFNC) versus non-invasive ventilation (NIV) in patients at high risk of extubation failure: a systematic review and meta-analysis. European Journal of Medical Research. 2023;28(1):120.
11. Holyoak RS, Melhuish TM, Vlok R, Binks M, White LD. Intubation using apnoeic oxygenation to prevent desaturation: a systematic review and meta-analysis. Journal of critical care. 2017;41:42-8.
12. 12Thota B, Jan KM, Oh MW, Moon TS. Airway management in patients with obesity. Saudi Journal of Anaesthesia. 2022;16(1):76-81.
13. 13Dhakal Y, Bhattarai B, Khatiwada S, Subedi A. Effectiveness of preoxygenation with positive airway pressure in non-obese healthy patient: a comparison of the supine and 25° head up position. 2019.
14. Kornas RL, Owyang CG, Sakles JC, Foley LJ, Mosier JM. Evaluation and management of the physiologically difficult airway: consensus recommendations from Society for Airway Management. Anesthesia & Analgesia. 2021;132(2):395-405.
15. e Silva LOJ, Cabrera D, Barrionuevo P, Johnson RL, Erwin PJ, Murad MH, et al. Effectiveness of apneic oxygenation during intubation: a systematic review and meta-analysis. Annals of emergency medicine. 2017;70(4):483-94. e11.
16. Sjöblom A. Clinical and Physiological Consequences of Preoxygenation Using High-Flow Nasal Oxygen in Emergency Anaesthesia: Karolinska Institutet (Sweden); 2023.
17. Sulser S, Ubmann D, Schlaepfer M, Brueesch M, Goliasch G, Seifert B, et al. C-MAC videolaryngoscope compared with direct laryngoscopy for rapid sequence intubation in an emergency department: a randomised clinical trial. European Journal of Anaesthesiology| EJA. 2016;33(12):943-8.
18. Koenig SJ, Lakticova V, Narasimhan M, Doelken P, Mayo PH. Safety of propofol as an induction agent for urgent endotracheal intubation in the medical intensive care unit. Journal of intensive care medicine. 201.504-499:(8)30;5
19. Semler MW, Janz DR, Russell DW, Casey JD, Lentz RJ, Zouk AN, et al. A multicenter, randomized trial of ramped position vs sniffing position during endotracheal intubation of critically ill adults. Chest. 2017;152(4):712-22.

20. Matchett G, Gasanova I, Riccio CA, Nasir D, Sunna MC, Bravenec BJ, et al. Etomidate versus ketamine for emergency endotracheal intubation: a randomized clinical trial. Intensive care medicine. 2022:1-14.
21. Buckley MS, Agarwal SK, MacLaren R, Kane-Gill SL. Adverse hemodynamic events associated with concomitant dexmedetomidine and propofol for sedation in mechanically ventilated ICU patients. Journal of Intensive Care Medicine. 2020;35(12):1536-45.
22. Tran D, Newton E, Mount V, Lee J, Mansour C, Wells G, et al .Rocuronium vs. succinylcholine for rapid sequence intubation: a Cochrane systematic review. Anaesthesia. 2017;72(6):765-77.
23. Tang L, Zhao X, Li S, Huang L, Li J, Chen L, et al. Impact of succinylcholine vs. Rocuronium on apnea duration for rapid sequence induction: a prospective cohort study. Frontiers in Medicine. 2022;9:717477.
24. Guihard B, Chollet-Xémard C, Lakhnati P, Vivien B, Broche C, Savary D, et al. Effect of rocuronium vs succinylcholine on endotracheal intubation success rate among patients undergoing out-of-hospital rapid sequence intubation: a randomized clinical trial. Jama. 2019;322(23):2303-12.
25. Huang H-B, Peng J-M, Xu B, Liu G-Y, Du B. Video laryngoscopy for endotracheal intubation of critically ill adults: a systemic review and meta-analysis. Chest. 2017;152(3):510-7.
26. Jaber S, De Jong A, Pelosi P, Cabrini L, Reignier J, Lascarrou JB. Videolaryngoscopy in critically ill patients. Critical Care. 2019;23:1-7.
27. Lascarrou JB, Boisrame-Helms J, Bailly A, Le Thuaut A, Kamel T ,Mercier E, et al. Video laryngoscopy vs direct laryngoscopy on successful first-pass orotracheal intubation among ICU patients: a randomized clinical trial. Jama. 2017;317(5):483-93.
28. Hurtado EM, Merchante MS, Ventura SM, Flores MLM, Melchor JR. Videolaryngoscopy in the Intensive Care Unit: We could Improve ICU Patients Safety. Bedside Procedures. 2018:5.
29. Nandhakumar J, Reddy HKV, Maurya I, Nag K. Comparison of the glottic views in a head elevated laryngoscopy position with the patient in supine or °25backup: An observer-blinded randomised clinical trial. Turkish Journal of Anaesthesiology and Reanimation. 2021;49(6):453.
30. Santos RS, Moraes L, Samary CS, Santos CL, Ramos MB, Vasconcellos AP, et al. Fast versus slow recruitment maneuver at different degrees of acute lung inflammation induced by experimental sepsis. Anesthesia & Analgesia. 2016;122(4):1089-100.
31. Nguyen A. Use of recruitment maneuvers in patients with acute respiratory distress syndrome. Dimensions of Critical Care Nursing. 201.43-135:(3)37;8
32. Arslan K, Özşahin Y, Ak HY, Salihoğlu Z. Effect of pressure-controlled recruitment maneuver on hemodynamics and respiratory mechanics during pneumoperitoneum. Laparoscopic Endoscopic Surgical Science. 2021;28(3):141.
33. Hernandez E, Dulla J, Dawes JJ, Orr RM, Lockie RG, editors. Academy graduation and the physical fitness of police recruits. 39th Annual Meeting of the Southwest Regional Chapter of the American College of Sports Medicine; 2019.
34. Vigevani S. Oscillation mechanics during general anaesthesia: effect of lung recruitment manoeuvres and laparoscopic surgery. 2019.

35. Goligher EC, Hodgson CL, Adhikari NK, Meade MO, Wunsch H, Uleryk E, et al. Lung recruitment maneuvers for adult patients with acute respiratory distress syndrome. A systematic review and meta-analysis. Annals of the American Thoracic Society. 2017;14(Supplement 4):S304-S11.
36. Constantin J-M, Godet T, Jabaudon M, Bazin J-E, Futier E. Recruitment maneuvers in acute respiratory distress syndrome. Annals of translational medicine. 2017;5.(14)
37. Bhattacharjee S, Soni KD, Maitra S. Recruitment maneuver does not provide any mortality benefit over lung protective strategy ventilation in adult patients with acute respiratory distress syndrome: a meta-analysis and systematic review of the randomized controlled trials. Journal of Intensive Care. 2018;6(1):1-8.
38. 38Egan S, Curley GP. What is the role of PEEP and recruitment maneuvers in ARDS? Evidence-Based Practice of Critical Care. 2019:50.
39. Pei S, Wei W, Yang K, Yang Y, Pan Y, Wei J, et al. Recruitment Maneuver to reduce postoperative pulmonary complications after laparoscopic abdominal surgery: A systematic review and meta-analysis. Journal of Clinical Medicine. 2022;11(19):5841.
40. Cherian SV, Kumar A, Akasapu K, Ashton RW, Aparnath M, Malhotra A. Salvage therapies for refractory hypoxemia in ARDS. Respiratory medicine. 2018;141:150-8.
41. Battaglini D, Iavarone IG, Robba C, Ball L, Silva PL, Rocco PR. Mechanical ventilation in patients with acute respiratory distress syndrome: current status and future perspectives. Expert Review of Medical Devices. 2023;20(11):905-17.

فعالية التخدير السريع المتسلسل قبل المستشفى في المرضى الحرَج

المُلخص:

الخلفية: يُمثل التَنبيبُ القصبي في المرضى الحرَج خطرًا كبيرًا لحدوث مضاعفات ناتجة عن عوامل مثل الفشل التنفسي وعدم استقرار الدورة الدموية وحساسية الدواء. تعتمد التوصيات الحالية في الغالب على رأي الخبراء وبيانات من التَنبيب الانتقائي، مع نقص في الأدلة القوية المستندة إلى التجارب العشوائية المراقبة (RCTs) في بيئات الرعاية الحرجة (وحدة العناية المركزة، غرفة الطوارئ، الأجنحة العامة). يهدف هذا الاستعراض المنهجي إلى تقييم الأساليب القائمة على الأدلة عالية الجودة للتَنبيب في المرضى الحرَج، مع التركيز على العوامل الدوائية والتقنيات والمعدات.

الطريقة: تم إجراء بحث شامل في قواعد البيانات PubMed و BioMed Central و Embase و Cochrane Central Register of Clinical Trialsللعثور على التجارب العشوائية المراقبة ذات الصلة التي تدرس العلاجات الهادفة إلى تحسين معدل نجاح التَنبيب القصبي وسلامته في المرضى الحرَج. تم إجراء تحليل تلوي عندما كان ذلك مناسبًا.

النتائج: تتراوح مشاكل التَنبيب في المرضى الحرَج من 4.2٪ إلى 39٪. أظهرت التهوئة غير الغازية قبل الأكسجة فعالية محسنة مقارنة بالتقنيات التقليدية في إطالة مدة انقطاع النفس الآمن وتقليل الانخفاض في تشبع الأكسجين. على الرغم من أن قناع الأنف عالي التدفق (HFNC) عزز الراحة، إلا أن مزاياه فيما يتعلق بالأكسجة أثناء انقطاع النفس كانت محدودة في هذه الفئة السكانية. أظهر الإيتوميدات والكيتامين سلامة وفعالية متساويتين كمهدئات، بينما أظهر السكسينيل كولين والروكورونيوم معدلات نجاح مماثلة كعوامل مُرخية للعضلات. تفوقت وضعية الشم على وضعية الرفع في التنظير الحنجري. عززت مناورات تجنيد الرئة بعد التَنبيب الأكسجة قصيرة المدى، لكن الفوائد كانت عابرة.

الاستنتاج: تؤكد هذه الدراسة على فعالية التهوية غير الغازية للأكسجة المسبقة، ووضعية الشم للتنظير الحنجري، واستخدام الإيتوميدات والكيتامين كمهدئات. ومع ذلك، لا تزال هناك أوجه قصور كبيرة في البحث فيما يتعلق بالأدوية المُهدئة، وإدارة المجاري الهوائية المتقدمة، وخوارزميات التَنبيب الفردية. هناك حاجة إلى المزيد من التجارب العشوائية المراقبة عالية الجودة لسد هذه الثغرات وتحسين نتائج المرضى.

الكلمات المفتاحية: التَنبيب السريع المتسلسل، المرضى الحرَج، الأكسجة المسبقة، إدارة المجاري الهوائية، التخدير.