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ORIGINAL RESEARCH

Variations in rapid sequence intubation practices: a survey study from Saudi Arabia

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Abstract

Background: Rapid Sequence Intubation (RSI) is a crucial technique for securing the airway in emergencies. A comprehensive understanding of healthcare professionals' practices and preferences is essential for enhancing patient outcomes. **Methods**: We conducted a crosssectional, internet-based survey targeting physicians in acute care settings in the Kingdom of Saudi Arabia. This study included emergency and critical care medicine staff members who examined their practices, preferences and perceptions related to RSI. Participants provided information on their preferred induction agents, methods for confirming intubation, post-intubation care, and other aspects pertinent to RSI. **Results**: The survey received responses from 491 physicians across various institutional settings in Saudi Arabia. Eighty-one percent of participants reported adherence to the conventional RSI approach, while 73.8% correctly identified its purpose in emergency scenarios. Sixty-one percent of respondents defined an "attempt" at RSI as the insertion of the laryngoscope blade into the oropharynx, regardless of endotracheal tube (ET) placement. Propofol was the preferred induction agent for hemodynamically stable patients (38.9%), followed by etomidate (32.2%). Only 19.5% utilized the head-up position during RSI. Apneic oxygenation was practiced by 66.4% of the physicians, with the remainder either unaware of or skeptical about this technique. The most commonly used method for confirming ET tube placement was direct visualization of the tube passing through the vocal cords; however, only 36.2% of physicians employed waveform capnography. **Conclusions**: This study offers important insights into the current RSI practices and preferences among healthcare professionals. While some practices are consistent with evidence-based guidelines, others do not, emphasizing the need for continued education and updated guidelines. Further research is needed to bridge knowledge gaps and refine RSI practices, thereby improving outcomes in emergency airway management.

Keywords

Rapid sequence intubation; Practice variation; Emergency medicine; Saudi Arabia

1. Introduction

Rapid Sequence Intubation (RSI) is a fundamental procedure in emergency medicine, anesthesia, and critical care, essential for safely securing the airway. This approach reduces the risk of gastric content aspiration while ensuring adequate oxygenation and ventilation in patients requiring urgent intervention [1]. RSI was first introduced in 1970 by Stept and Safar, primarily to mitigate aspiration risks [2].

Proper execution of RSI, ensuring first-pass success, is crucial in minimizing potentially fatal complications [3].

The classical RSI method introduced by Stept and Safar includes: pre-oxygenating the lungs with 100% oxygen, inducing unconsciousness, applying cricoid pressure, administering a paralytic agent, observing a period of apnea without positive pressure ventilation, and performing tracheal intubation with confirmation of placement [1]. Parts of this traditional sequence have remained the same while others have evolved as a result of the ongoing emergence of new literature [1, 4] as well as varying approaches influenced by different clinical environments, institutional protocols, clinician experience, patient demographics, and resource availability [1, 4, 5]. The innovations in medications, equipment and techniques may have also contributed to deviations from the traditional RSI protocol. The goal, however, remains to minimize the duration between the loss of airway reflexes and tracheal intubation, aiming to reduce pulmonary aspiration in patients needing emergent airway management [6].

Airway management outside of the operating room is associated with a higher incidence of complications, including severe hypoxia, aspiration, hemodynamic instability, esophageal intubation, and cardiac arrest [7]. Every aspect of the traditional RSI is currently under scrutiny, with ongoing debates regarding medication choices, patient positioning, pre-oxygenation techniques, the use of positive pressure ventilation during the apneic phase, and the efficacy of cricoid pressure [4].

This survey aimed to determine the current practices and adherence of acute care physicians and trainees to established RSI protocols. The primary objective was to assess compliance with the conventional RSI methodology.

2. Materials and methods

Data were collected via a cross-sectional, internet-based questionnaire (multiple-choice options) distributed to physicians in acute care settings. The questionnaire was developed by study investigators and reviewed for content accuracy by two faculty members specializing in emergency medicine and airway management. It underwent face validity testing with experienced staff in emergency and critical care medicine, their feedback was incorporated into the final version by the principal author. Additionally, the finalized questionnaire was reviewed by two senior physicians—one in emergency medicine and one in critical care medicine, each with over 20 years of clinical experience. These senior physicians did not participate in the study. The questions focused on the sequential practice of traditional RSI and were divided into two sections: (1) Personal clinical practice of participants, and (2) Departmental recommendations concerning RSI. The final questionnaire included 32 questions (see **Supplementary material**). Consent was obtained from all participants at the start of the survey, and no personally identifiable information was collected, ensuring anonymity. The survey was sent to all trainees and physician members of the Saudi Society of Emergency Medicine and the Saudi Society of Critical Care Medicine. We included trainees and physicians practicing in emergency medicine and critical care medicine departments who primarily manage adult patients. We excluded participants performing elective intubations in the operating room and participants whose primary population are pediatric patients.

While the literature does not provide a cut-off for number of intubations to determine experience, we used less than 50, between 50 and 100, and more than 100 intubations for low, medium and highly experienced intubators. We used Lee *et al.*'s [8] publication as a guide which concluded that a minimum number of 119 intubations are required for a first-pass success rate of 85% or higher. Microsoft Excel was used for data collection, entry, cleaning and coding. Data analysis was conducted using SPSS version 28 (IBM Corporation, Armonk, NY, USA). Frequencies and percentages were calculated to describe all categorical variables, which are presented in tables.

3. Results

We received 491 completed surveys out of 780 distributed, yielding a response rate of 62.9%. Most participants specialized in Emergency Medicine (75.2%). Among the professional roles, residents comprised the largest group (52.3%). A small percentage of participants (7.4%) worked in private hospitals with the rest working in academic institutions or government hospitals (the remaining 92.6%). An analysis of procedural experience, based on the number of intubations performed, showed varied expertise levels (Table 1).

TABLE 1. Participant characteristics.

Characteristic	Number of participants
Total	(n = 491)
Male	274 (55.8%)
Female	217 (44.2%)
Age in years (median (IQR))	34 (27–54)
Specialty	
Critical care medicine	122 (24.8%)
Emergency medicine	369 (75.2%)
Position	
Resident	256 (52.3%)
Midlevel (registrar)	96 (19.5%)
Attending (consultant)	139 (28.2%)
Hospital type	
Academic	228 (46.3%)
Government	227 (46.3%)
Private	36 (7.4%)
Number of procedures	
Less than 50	223 (45.6%)
50 to 100	106 (21.5%)
More than 100	162 (32.9%)

IQR: interquartile range.

Self-reported adherence to conventional RSI (primary outcome) was 81.9%. Sixty-one percent of respondents define an "attempt" as inserting the endotracheal tube (ETT) past the vocal cords. Almost half of the participants (46.3%) reported routinely using pre-treatment agents for RSI, while 53.7% did not. Regarding patient positioning, 73.2% preferred the supine position, with the head in the sniffing position for RSI. The most critical objective of RSI, according to 69.2% of participants, was successful endotracheal intubation on the first attempt. Apneic oxygenation was routinely used by 66.4% of participants, with 12.8% doubting its effectiveness and 20.8% unfamiliar with the concept (Table 2).

In hemodynamically stable patients, propofol was the most favored induction agent (38.9%), followed closely by Etomidate (32.2%). In contrast, for hemodynamically unstable patients, Etomidate emerged as the top choice at 42.3%, closely followed by Ketamine at 41.6%. Regarding neuromuscular blocking agents, Succinylcholine was favored by 51.7% of participants, while Rocuronium was preferred by 41.6%.

Regarding device selection, video laryngoscopy (Glidescope®) was the most favored device (42.3%), followed by direct laryngoscopy (Macintosh) at 29.5%.

TABLE 2. Participant's personal opinion in rapid sequence intubation (RSI).

Item	(n = 491)
Adherence to conventional RSI	
The administration of an induction agent only before tracheal intubation	64 (13.0%)
The administration of both induction agent and neuromuscular blocking agent before tracheal intubation	398 (81.9%)
I don't know	29 (6.0%)
What is the purpose of rapid sequence intubation (in emergency settings) as opposed to traditional sequence intubation (in the operating room)?	
Minimize the risk of pulmonary aspiration	363 (73.8%)
They both have the same purpose	96 (19.5%)
I don't know	32 (6.7%)
How do you define an "attempt" at intubation?	
Insertion of the laryngoscope blade into the oropharynx regardless of whether an endotracheal tube was inserted	303 (61.7%)
Insertion of an endotracheal tube passed the vocal cords	149 (30.2%)
I don't know	39 (8.1%)
Do you routinely use pre-treatment agents for rapid sequence intubation?	
Yes	228 (46.3%)
No	263 (53.7%)
Which of the following patient positions is ideal for rapid sequence intubation?	
Trendelenberg position (head down at 15–30 degrees)	36 (7.4%)
Reverse-Trendelenberg position (head up at 15–30 degrees)	95 (19.5%)
Supine while head at sniffing position	360 (73.2%)
What is the most important objective of rapid sequence intubation?	
Successful endotracheal intubation on the first attempt	340 (69.2%)
Successful endotracheal intubation on the second attempt	11 (2.1%)
Good Cormack-Lehane grade view	50 (10.3%)
Minimizing hypotension	36 (7.5%)
I don't know	54 (11.0%)
Do you incorporate apneic oxygenation in rapid sequence intubation?	
I do not believe in apneic oxygenation	63 (12.8%)
I do not know what apneic oxygenation is	102 (20.8%)
I use nasal prongs at 15 L/min during the apneic phase	326 (66.4%)

Pre-oxygenation methods varied, with 59.0% preferring non-rebreather masks combined with positive pressure ventilation via a bagvalve mask during the apneic period, and 40.9% opting for non-rebreather masks alone. Most participants (81.9%) reported using a stylet for endotracheal intubation during RSI. Confirmation of endotracheal tube placement primarily relied on visualizing the tube passing through the vocal cords (43.0%), followed by capnography (36.2%). After intubation, head of bed elevation was the preferred patient position (59.7%). For post-intubation analgesia and sedation, Fentanyl was preferred by 64.1% of respondents, followed by Propofol at 15.4%, Midazolam at 14.8%, and a group where sedation was not routinely used at 6.0% (Table 3).

When asked about first-pass success rates for RSI, 42.3% of respondents confirmed that their departments track these rates. While 57.7% indicated that their departments do not monitor firstpass success. Regarding institutional practices in RSI, 30.9% reported that their department has a protocol or guideline for RSI. In contrast, the majority (69.1%) stated that their department lacks such protocols or guidelines. This highlights the variation and evolving practices of RSI (Table 4).

4. Discussion

Our survey aimed to assess practices and institutional preferences among emergency and critical care physicians in Saudi Arabia. While indications for RSI have remained consistent, the practice has evolved over the years due to limited evidence

TABLE 3. Participant's practice in rapid sequence intubation (RSI).

Item	(n = 491)
Which of the following induction agents do you prefer in hemodynamically stable patients?	
Propofol	190 (38.9%)
Etomidate	159 (32.2%)
Ketamine	80 (16.1%)
Midazolam	62 (12.8%)
Which of the following induction agents do you prefer in hemodynamically unstable patients?	
Propofol	39 (8.1%)
Etomidate	208 (42.3%)
Ketamine	205 (41.6%)
Midazolam	39 (8.1%)
Which neuromuscular blocking agent do you prefer?	
Succinylcholine	254 (51.7%)
Rocuronium	205 (41.6%)
Other	32 (6.7%)
Which of the following is your preferred device for endotracheal intubation?	
Direct laryngoscopy (Macintosh)	145 (29.5%)
Direct laryngoscopy (Miller)	80 (16.1%)
Video laryngoscopy (Glidescope®)	207 (42.3%)
Video laryngoscopy (C-MAC®)	59 (12.1%)
What is the most important objective of rapid sequence intubation?	
Successful endotracheal intubation on the first attempt	340 (69.2%)
Successful endotracheal intubation on the second attempt	11 (2.1%)
Good Cormack-Lehane grade view	50 (10.3%)
Minimizing hypotension	36 (7.5%)
I don't know	54 (11.0%)
Do you incorporate apneic oxygenation in rapid sequence intubation?	
I do not believe in apneic oxygenation	63 (12.8%)
I do not know what apneic oxygenation is	102 (20.8%)
I use nasal prongs at 15 L/min during the apneic phase	326 (66.4%)
Which of the following methods do you prefer routinely for pre-oxygenation in patients without hypoxia?	
Non-rebreather oxygen mask alone	201 (40.9%)
Non-rebreather mask oxygen and positive pressure ventilation via bag-valve-mask ventilation during the apneic period	290 (59.0%)
Do you use a stylet for endotracheal intubation during rapid sequence intubation?	
Yes	403 (81.9%)
No	88 (18.1%)
How do you confirm endotracheal tube placement?	
Visualizing the endotracheal tube passing through vocal cords	212 (43.0%)
Using capnometry	66 (13.4%)
Using capnography	177 (36.2%)
I don't know	36 (7.4%)

TABLE 3. Continued.

Item	(n = 491)
What is the ideal position for your patient after endotracheal intubation?	
Supine	195 (39.6%)
Head of the bed elevation	293 (59.7%)
Head of bed depression	3 (0.7%)
Which of the following agents do you prefer for post-intubation analgesia/sedation?	
Fentanyl	315 (64.1%)
Propofol	75 (15.4%)
Midazolam	72 (14.8%)
Not routinely indicated	29 (6.0%)

TABLE 4. Participant's institutional practice.

Item	(n = 491)
Does your department carry a protocol or guideline for rapid sequence intubation?	
Yes	151 (30.9%)
No	340 (69.1%)
Does your department monitor rates of first-pass success for rapid sequence intubation?	
Yes	207 (42.3%)
No	284 (57.7%)

supporting traditional methods and new literature challenging the conventional approach. The absence of updated, unified guidelines has led to variations in RSI practices among physicians, likely influenced by differences in settings and their training backgrounds.

Our results indicate that self-reported adherence to conventional RSI practices was 81.9%. This aligns with established medical protocols and guidelines emphasizing the rapid administration of medications to facilitate secure airway management in emergency settings [9, 10]. However, the remaining 13.0%, do not follow conventional RSI practice. This variation could be due to differences in training backgrounds, institutional protocols, or individual interpretations of RSI components. Previous studies have indicated that conventional rapid sequence intubation techniques are associated with higher success rates and fewer complications [11–14]. For example, a prospective observational study by Walls *et al.* [13] demonstrated that the success rate of RSI on the first attempt, utilizing both an induction and paralytic agent, was significantly higher compared to induction-only intubations (82% *vs.* 76%). These findings align with recognized medical standards. Numerous studies and guidelines support the combined use of induction and neuromuscular blocking agents as fundamental to RSI, enabling rapid and effective airway control while minimizing risks such as aspiration or laryngospasm [1, 15]. The addition of a paralytic agent promotes muscle relaxation, facilitating smoother endotracheal tube insertion and preventing gastric muscle contractions, thereby reducing the likelihood of aspiration [16].

Moreover, patients who are not paralyzed may retain muscle tone and protective airway reflexes, which increases the risk of unsuccessful laryngoscopy, as well as the potential for vomiting and aspiration [17, 18]. Achieving the full effect of the paralytic agent typically requires approximately 35–100 seconds [19]. A 1997 study comparing complication rates in RSI with and without paralytics found a 50% higher complication rate in the non-paralyzed group [14].

While most participants endorsing this definition demonstrate widespread adherence to best practices in emergency airway management. It is important to note that 6.0% of participants expressed uncertainty about the definition of RSI, suggesting a potential gap in knowledge or understanding among some healthcare providers. This highlights the need for ongoing education and training to ensure consistent and proficient implementation of RSI protocols.

The study's findings on the purpose of RSI show a predominant understanding among participants that RSI is essential for quickly securing the airway in emergencies and minimizing the risk of pulmonary aspiration, especially in cases involving a full stomach. This aligns with established medical practice, which emphasizes the importance of rapid airway control to prevent aspiration related complications. Unlike routine intubation, RSI is reserved for emergencies to rapidly control the airway and reduce the risk of pulmonary aspiration when the stomach is full [20]. However, it is noteworthy that about 20% of survey participants believe that RSI and normal intubation serve the same purpose, a perspective that diverges from conventional understanding. This discrepancy highlights a potential gap in knowledge or interpretation among healthcare providers.

The study's results regarding medication choices in RSI reflect the evolving landscape of drug selection in airway management, reflecting a shift from traditional practices to more nuanced decision-making guided by contemporary literature. Historically, the limited availability of induction agents confined RSI to a narrow selection, often comprising thiopentone and succinylcholine, because of the limited selection of induction agents [21, 22]. However, the emergence of diverse induction agents has introduced variability in RSI practices, with drug choices largely based on physician discretion. This underscores the importance of evidence-based decision-making, highlighting the need for clinicians to stay current with the literature to inform their choices. Recent literature has advocated for the use of pre-induction agents, such as low-dose induction agents or opioids, to mitigate agitation and, importantly, ensure optimal pre-induction preparation, such as adequately oxygenating and positioning the patient. Although their inclusion in anesthesia guidelines [1, 23], the survey findings indicate that a significant proportion of physicians do not adopt this practice, indicating a potential gap between evidence and clinical implementation.

The categorization of patients into hemodynamically stable and unstable groups has traditionally influenced medication selection in RSI. While etomidate has historically been preferred for unstable patients due to its hemodynamic stability, recent studies suggest comparable efficacy between etomidate and propofol, with etomidate providing slightly superior hemodynamic control [22]. Moreover, the growing preference for ketamine in critically ill or unstable patients, due to its favorable cardiovascular profile and lack of adrenal suppression, indicates a shift in practice toward safer and more versatile induction agents [10, 24]. A 2019 study demonstrated that etomidate effectively demonstrated greater hemodynamic stability during induction and endotracheal intubation [25]. These findings align with our survey results, which show that most physicians choose etomidate and propofol for stable patients, while generally avoiding propofol for hemodynamically unstable patients.

Regarding neuromuscular blockade, succinylcholine is well-known for its rapid onset and short duration, despite concerns regarding prolonged paralysis and potential complications, especially in high-risk patients [26]. A recent meta-analysis and systemic review comparing the superiority of one neuromuscular blocking agent over the other reported a slightly higher first-pass success rate with succinylcholine [27]. Our study's findings indicate a preference for succinylcholine among physicians, consistent with its longstanding inclusion in RSI protocols. However, the increasing recognition of rocuronium as an alternative, supported by the availability of reversal agents and its perceived safety profile, suggests a potential shift in practice preferences.

The ideal patient positioning and pre-oxygenation methods for RSI are subjects of ongoing debate, with traditional practices evolving based on contemporary evidence. Historically, concerns about positive pressure ventilation during RSI have led to avoiding oxygenation during the apneic period, based on the belief that it could cause gastric insufflation and increase the risk of regurgitation [1]. However, this approach has been associated with hypoxia and apneic desaturation, especially in critically ill patients with reduced respiratory reserves, such as obese and pregnant individuals [1]. Traditional pre-oxygenation techniques involve administering 100% oxygen via a tight-fitting mask for 3–5 minutes to maximize respiratory reserve [28]. Recent studies, however, indicate that applying Positive End-Expiratory Pressure or Continuous Positive Airway Pressure may offer superior benefits in terms of delaying desaturation and reducing atelectasis risk, particularly in obese surgical patients [29, 30]. While implementing non-invasive ventilation strategies can be challenging in emergency settings, they merit consideration for patients already using such devices who need RSI [31].

Recent evidence supports the use of apneic oxygenation to prevent hypoxia, improve first-pass success rates, and reduce hypoxemia. A recent article on RSI guidelines for the critically ill advocated for the use of non-invasive positive pressure ventilation in patients with low oxygen saturation and high flow nasal cannula in patients anticipated to have difficult laryngoscopy [32].

Alternatively, bag mask ventilation (BMV) with controlled pressures below 25 mmHg during the apneic period is safe and effective, addressing prior concerns about the risk of regurgitation [33]. However, the superiority of apneic oxygenation methods remain inconclusive.

This underscores the evolving nature of RSI protocols and the importance of incorporating emerging evidence into clinical practice to optimize patient outcomes. The findings emphasize the need for ongoing education and review of RSI protocols to ensure they align with the latest evidence-based guidelines and protocols.

Regarding the ideal patient position post-intubation, our study's findings are consistent with the literature, with a majority of physicians (73%) preferring the supine sniffing position to others. This preference highlights the practical challenges and the lack of definitive evidence supporting alternative positions, such as the ramped-up or reverse Trendelenburg positions. While these positions have been theorized to offer benefits in terms of improved oxygenation and reduced aspiration risk, further research is needed to establish their efficacy in clinical practice.

Cricoid pressure, historically advocated by Sellick to prevent passive regurgitation during RSI, is perhaps the most controversial element of RSI. A 2022 systematic review evaluating efficacy and potential adverse effects shows insufficient evidence to support the benefits of cricoid pressure on first-pass success or reduction in regurgitation and aspiration [34].

There are several challenges associated with performing cricoid pressure, such as difficult laryngoscopy and prolonged intubation, as well as the need to train staff on proper techniques and force application. Nevertheless, in the absence of definitive evidence against its use and considering its potential to prevent regurgitation, some experts still recommend it [32].

The survey did not include physician's preferences regarding cricoid pressure, due to the controversial evidence, however, findings regarding participants' preferences for induction agents, neuromuscular blocking agents, and pre-oxygenation methods provide insight into how clinicians navigate the use of cricoid pressure in this context.

Confirming the placement of the endotracheal tube (ETT) is crucial in RSI to prevent catastrophic complications such as esophageal intubation. Direct visualization of the tube passing through the vocal cords, whether by direct or video laryngoscopy, is considered the primary method of confirmation, as highlighted in the literature [35]. However, in emergencies where direct visualization may be challenging, relying solely on this method can be risky. This highlights the importance of incorporating additional confirmatory tools such as quantitative waveform capnography.

While capnography continues to be the gold standard for confirming ETT placement to date [36]. Recent studies have introduced ultrasound as a promising option, especially in scenarios where end-tidal CO_2 monitoring may be unreliable, such as in patients with cardiac arrest [37]. A 2022 meta-analysis demonstrated high sensitivity and specificity for confirming ETT placement in situations where capnography is unavailable or unreliable [38]. Despite these developments, our study shows a divide in preferences between capnography and direct visualization, highlighting the need for further research into the optimal combination of confirmatory methods to ensure patient safety.

Regarding the use of stylets in RSI, the main goal is to achieve first-pass success to minimize the risk of adverse events associated with multiple intubation attempts [39]. Research has demonstrated a substantial rise in adverse events between unsuccessful first attempts and subsequent intubation attempts [3]. Recent evidence from a randomized clinical trial in 2022 indicates that stylets may be preferred over bougies for ease of intubation in RSI, although care must be taken during their insertion and removal to prevent postoperative sore throat [40]. However, conflicting evidence exists, with some studies favoring the use of bougies, highlighting the continuing debate in this area. Additionally, emerging research has reported favorable outcomes with lighted stylets, further adding to the complexity of the decision-making process.

Despite providing valuable insights into the practices and preferences surrounding RSI, this study has several limitations. Firstly, the data was collected from physicians and not distributed to nurses or emergency medical services personnel. The collected data is based on self-reported responses from participants, which may introduce recall bias or inaccuracies. Additionally, the survey format may limit the depth of understanding regarding the rationale behind certain choices, such as medication preferences or procedural techniques. Moreover, the study's sample size and participant demographics might not fully reflect the diversity of clinical settings or geographic regions, which may limit the generalizability of the findings. Furthermore, the survey's design may not capture evolving practices or recent advancements in RSI techniques and guidelines, as the field continues to evolve. Lastly, as with any survey-based study, respondent bias may be present, where participants may provide responses they perceive as socially desirable rather than reflecting their actual practices or beliefs. These limitations should be considered when interpreting the results and highlight the need for further research to address these gaps in understanding.

5. Conclusions

In conclusion, this study offers valuable insights into the practices, preferences and perceptions surrounding RSI among healthcare professionals. Our findings reveal a variety of approaches in RSI, which reflect the complexity and variety of clinical scenarios faced in emergency airway management. Participants' preferences for induction agents, neuromuscular blocking agents, confirmation techniques, and post-intubation care highlight the detailed decision-making process involved in RSI. While some practices align with established guidelines and literature, such as the use of capnography for endotracheal tube confirmation, others differ, highlighting the need for further research and standardization in specific areas. Additionally, our study identifies areas where current practices may differ from evolving evidence, emphasizing the importance of continuous education and regular guideline updates.

ABBREVIATIONS

RSI, Rapid Sequence Intubation; ET, endotracheal; BMV, bag-mask ventilation; ETT, endotracheal tube; IQR, interquartile range.

AVAILABILITY OF DATA AND MATERIALS

Data are available upon reasonable request from the corresponding author.

AUTHOR CONTRIBUTIONS

AB—conceived, designed the study and drafted the manuscript. AH, WA, AlH, NA, SA and RA—collected data and performed statistical analyses. SH, AA, RAO and EB—analyzed the results. All authors reviewed and edited the manuscript. All authors revised and approved the final version.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the unit of biomedical ethics at the King Abdulaziz University, Jeddah, Saudi Arabia (ref. 92-1). All participants have consented to take part in the survey.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found, in the online version, at https://oss.signavitae.com/mre-signavitae/article/1897895707376795648/attachment/Supplementary%20material.pdf.

REFERENCES

[1] Avery P, Morton S, Raitt J, Lossius HM, Lockey D. Rapid sequence induction: where did the consensus go? Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine. 2021; 29: 64.

[2] Stept WJ, Safar P. Rapid induction-intubation for prevention of gastric-content aspiration. Anesthesia & Analgesia. 1970; 49: 633–666.

[3] Nauka PC, Moskowitz A, Fein DG. Appraising first-pass success: during emergency airway management, what does it mean to be successful? Annals of the American Thoracic Society. 2023; 20: 21–23.

[4] Kriswidyatomo P, Paramitha MP. Rapid sequence induction/intubation controversies. Hong Kong Journal of Emergency Medicine. 2021; 28: 314–319.

[5] Hampton JP, Hommer K, Musselman M, Bilhimer M. Rapid sequence intubation and the role of the emergency medicine pharmacist: 2022 update. American Journal of Health-System Pharmacy. 2023; 80: 182–195.

[6] Allene MD, Melekie TB, Ashagrie HE. Evidence based use of modified rapid sequence induction at a low income country: a systematic review. International Journal of Surgery Open. 2020; 25: 17–23.

[7] Karamchandani K, Wheelwright J, Yang AL, Westphal ND, Khanna AK, Myatra SN. Emergency airway management outside the operating room: current evidence and management strategies. Anesthesia & Analgesia. 2021; 133: 648–662.

[8] Lee GT, Park JE, Woo SY, Shin TG, Jeong D, Kim T, *et al*. Defining the learning curve for endotracheal intubation in the emergency department. Scientific Reports. 2022; 12: 14903.

[9] Engstrom K, Brown CS, Mattson AE, Lyons N, Rech MA. Pharmacotherapy optimization for rapid sequence intubation in the emergency department. American Journal of Emergency Medicine. 2023; 70: 19–29.

[10] Higgs A, McGrath BA, Goddard C, Rangasami J, Suntharalingam G, Gale R, *et al*. Guidelines for the management of tracheal intubation in critically ill adults. British Journal of Anaesthesia. 2018; 120: 323–352.

[11] Sagarin MJ, Chiang V, Sakles JC, Barton ED, Wolfe RE, Vissers RJ, *et al*. Rapid sequence intubation for pediatric emergency airway management. Pediatric Emergency Care. 2002; 18: 417–423.

[12] Tayal VS, Riggs RW, Marx JA, Tomaszewski CA, Schneider RE. Rapid-sequence intubation at an emergency medicine residency: success rate and adverse events during a two-year period. Academic Emergency Medicine. 1999; 6: 31–37.

[13] Walls RM, Brown CA, Bair AE, Pallin DJ. Emergency airway management: a multi-center report of 8937 emergency department intubations. The Journal of Emergency Medicine. 2011; 41: 347–354.

[14] Li J, Murphy-Lavoie H, Bugas C, Martinez J, Preston C. Complications of emergency intubation with and without paralysis. American Journal of Emergency Medicine. 1999; 17: 141–143.

[15] Eichelsbacher C, Ilper H, Noppens R, Hinkelbein J, Loop T. Rapid sequence induction and intubation in patients with risk of aspiration: recommendations for action for practical management of anesthesia. Anaesthesist. 2018; 67: 568–583.

[16] Lundstrøm LH, Duez CH, Nørskov AK, Rosenstock CV, Thomsen JL, Møller AM, *et al*. Avoidance versus use of neuromuscular blocking agents for improving conditions during tracheal intubation or direct laryngoscopy in adults and adolescents. Cochrane Database of Systematic Reviews. 2017; 5: CD009237.

[17] Cooper RM, Khan S. Extubation and reintubation of the difficult airway. In Hagberg CA (ed.) Benumof and Hagberg's airway management (pp. 1018–1046.e7). 3rd edn. Elsevier: Amsterdam. 2013.

[18] Cooper RM. Extubation and changing endotracheal tubes. In Hagberg CA (ed.) Benumof's Airway management (pp. 1146–1180). 2nd edn. Elsevier: Amsterdam. 2007.

[19] Catoire P, Roussel M, Teissandier D. Sequence of administration of anesthetic agents during rapid sequence induction for emergency intubation: a French survey on current practices. European Journal of Emergency Medicine. 2024; 31: 71–73.

[20] Collins J, O'Sullivan EP. Rapid sequence induction and intubation. BJA Education. 2022; 22: 484–490.

[21] Pillay L, Hardcastle T. Collective review of the status of rapid sequence intubation drugs of choice in trauma in low- and middle-income settings (prehospital, emergency department and operating room setting). World Journal of Surgery. 2017; 41: 1184–1192.

[22] Groth CM, Acquisto NM, Khadem T. Current practices and safety of medication use during rapid sequence intubation. Journal of Critical Care. 2018; 45: 65–70.

[23] Lockey DJ, Crewdson K, Davies G, Jenkins B, Klein J, Laird C, *et al*. AAGBI: Safer pre-hospital anaesthesia 2017: Association of Anaesthetists of Great Britain and Ireland. Anesthesia. 2017; 72: 379–390.

[24] Zeiler FA, Teitelbaum J, West M, Gillman LM. The ketamine effect on ICP in traumatic brain injury. Neurocritical Care. 2014; 21: 163–173.

[25] Rayamajhi M, Thapa P, Khadka A, Amatya BR, Bajracharya U. Comparative study of propofol and etomidate on the haemodynamic effects during induction and endotracheal intubation. Medical Journal of Shree Birendra Hospital. 2019; 18: 7–15.

[26] Cook D, Simons DJ. Neuromuscular Blockade. StatPearls: Treasure Island (FL). 2023.

[27] Malhotra C, Sahu A, Kumar A, Bhoi S, Aggarwal P. 73 succinylcholine versus rocuronium in emergency airway management: a systematic review and meta-analysis. Annals of Emergency Medicine. 2023; 82: S30.

[28] Mathew G, Manjuladevi M, Joachim N, Kothari AN. Effect of high fresh gas flow and pattern of breathing on rapid preoxygenation. Indian Journal of Anaesthesia. 2022; 66: 213–219.

[29] Dos Santos Neto JM, de Carvalho CC, de Andrade LB, Dos Santos TGB, Andrade RGADC, Fernandes RAML, *et al*. Continuous positive airway pressure to reduce the risk of early peripheral oxygen desaturation after onset of apnoea in children: a double-blind randomised controlled trial. PLOS ONE. 2021; 16: e0256950.

[30] Chiang TL, Tam KW, Chen JT, Wong CS, Yeh CT, Huang TY, *et al*. Non-invasive ventilation for preoxygenation before general anesthesia: a systematic review and meta-analysis of randomized controlled trials. BMC Anesthesiology. 2022; 22: 306.

[31] Wallace C, McGuire B. Rapid sequence induction: its place in modern anaesthesia. Continuing Education in Anaesthesia Critical Care & Pain. 2014; 14: 130–135.

[32] Acquisto NM, Mosier JM, Bittner EA, Patanwala AE, Hirsch KG, Hargwood P, *et al*. Society of critical care medicine clinical practice guidelines for rapid sequence intubation in the critically ill adult patient. Critical Care Medicine. 2023; 51: 1411–1430.

[33] Casey JD, Janz DR, Russell DW, Vonderhaar DJ, Joffe AM, Dischert KM, *et al*; PreVent Investigators and the Pragmatic Critical Care Research Group. Bag-mask ventilation during tracheal intubation of critically ill adults. The New England Journal of Medicine. 2019; 380: 811–821.

[34] Tessarolo E, Alkhouri H, Lelos N, Sarrami P, McCarthy S. Review article: effectiveness and risks of cricoid pressure during rapid sequence induction for endotracheal intubation in the emergency department: a systematic review. Emergency Medicine Australasia. 2022; 34: 484–491.

[35] American College of Emergency Physicians. Verification of endotracheal tube placement. 2022. Available at: https://www.acep.org/patient-care/policy-statements/verification-of-endotracheal-tube-placement (Accessed: 23 November 2024).

[36] Hansel J, Law JA, Chrimes N, Higgs A, Cook TM. Clinical tests for confirming tracheal intubation or excluding oesophageal intubation: a diagnostic test accuracy systematic review and meta-analysis. Anaesthesia. 2023; 78: 1020–1030.

[37] Gonzalez JM, Ortega J, Gonzalez JE, Crenshaw N, McGhee S, Groom J. Point-of-care ultrasonography to confirm endotracheal tube placement: a review for the emergency nurse practitioner. Advanced Emergency Nursing Journal. 2024; 46: 126–140.

[38] Chen WT, Wang MY, Jiang TT, Tang M, Ye QH, Wang HY, *et al*. Transtracheal ultrasound for confirmation of endotracheal tube placement

in the intensive care unit: a systematic review and meta-analysis. European Review for Medical and Pharmacological Sciences. 2022; 26: 8224–8233.

[39] Hasegawa K, Shigemitsu K, Hagiwara Y, Chiba T, Watase H, Brown CA III, *et al*.; Japanese Emergency Medicine Research Alliance Investigators. Association between repeated intubation attempts and adverse events in emergency departments: an analysis of a multicenter prospective observational study. Annals of Emergency Medicine. 2012; 60: 749–754.e2.

[40] Bawa C, Raina J, Dureja M, Singh A, Yadav N, Kumar A. Intubation performance with stylet and preloaded bougie for rapid sequence intubation in patients undergoing general anaesthesia: a randomised clinical trial. Journal of Clinical and Diagnostic Research. 2022; 16: 15.

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