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# EVALUATING THE EFFECTIVENESS OF RAPID SEQUENCE INTUBATION VS. DELAYED SEQUENCE INTUBATION IN EMERGENCY DEPARTMENT SETTINGS

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## ABSTRACT

**Background:** Rapid Sequence Intubation (RSI) and Delayed Sequence Intubation (DSI) are critical techniques used in emergency departments for airway management. The choice of technique can significantly impact patient outcomes, particularly in critical care scenarios. **Objective:** This study aims to compare the effectiveness and safety of RSI and DSI in emergency department settings, focusing on intubation success rates, incidence of complications, and overall patient outcomes. **Methods:** A randomized controlled trial was conducted involving 200 patients requiring emergency airway management at a tertiary care center. Patients were randomly assigned to receive either RSI or DSI. Data on intubation success, complication rates, and patient outcomes were collected and analyzed statistically. **Results:** Both RSI and DSI demonstrated high intubation success rates, with 87% success in the RSI group and 82% in the DSI group (P=0.249). Complication rates were similar between the groups, with 26% in the RSI group and 20% in the DSI group experiencing complications (P=0.286). There were no significant differences in the duration of hospital stay and mortality rates between the two techniques. **Conclusion:** RSI and DSI are both effective and safe techniques for emergency airway management. The choice between RSI and DSI should be tailored based on patient-specific factors and clinical judgment. Future studies with larger sample sizes and multiple centers are recommended to validate these findings and support decision-making in emergency care.

**Keywords:** Rapid Sequence Intubation, Delayed Sequence Intubation, Emergency Department.

## INTRODUCTION

Intubation in emergency settings is a critical and time-sensitive procedure aimed at securing a patient's airway. Rapid Sequence Intubation (RSI) is traditionally the preferred method in emergency departments due to its quickness and effectiveness in protecting the airway from

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aspiration and minimizing trauma. However, Delayed Sequence Intubation (DSI) has gained attention for its potential benefits, including better oxygenation and reduced hemodynamic disturbances by allowing pre-oxygenation and sedation before administering paralytics. Guihard B *et al.*(2019)[1], Birenbaum A *et al.*(2019)[2]

RSI involves administering a potent sedative followed immediately by a neuromuscular blocking agent to achieve intubation conditions swiftly, minimizing the risk of aspiration and patient discomfort. On the other hand, DSI involves administering oxygen and sedation first to optimize the patient's physiological status before the administration of neuromuscular blocking agents, theoretically reducing the risk of hypoxemia-related complications. Gleason JM *et al.*(2018)[3]

The literature reveals mixed outcomes associated with both techniques. Studies such as those by Gellerfors M *et al.*(2018)[4] and Kovacs G *et al.*(2018)[5] provide foundational insights into the mechanics and outcomes of RSI and DSI, respectively. Furthermore, a research done by Alzahrani AM *et al.*(2018)[6] compares the two techniques, suggesting that while RSI is quicker, DSI may offer reduced complication rates in specific patient populations. Yao W *et al.*(2020)[7]

**Aim**

To compare the effectiveness and safety of Rapid Sequence Intubation versus Delayed Sequence Intubation in emergency department settings.

**Objectives**

1. To assess the intubation success rate of RSI compared to DSI in the emergency department.
2. To evaluate the incidence of complications associated with RSI and DSI.
3. To compare patient outcomes following RSI and DSI in terms of duration of hospital stay and mortality rates.

## MATERIAL AND METHODOLOGY

**Source of Data:** Data were collected from patients requiring intubation in the emergency department of a tertiary care hospital.

**Study Design:** This was a prospective, randomized controlled trial.

**Study Location:** The study was conducted at the emergency department of a tertiary care hospital.

**Study Duration:** Data collection spanned from January 2023 to December 2023.

**Sample Size:** A total of 200 patients were included in the study, with 100 randomly assigned to each intubation technique.

**Inclusion Criteria:** Adults aged 18 years and older requiring emergency intubation due to respiratory distress, altered mental status, or severe metabolic acidosis were included.

**Exclusion Criteria:** Patients under 18 years, those with known difficult airways, and those with contraindications to neuromuscular blockers were excluded.

**Procedure and Methodology:** Patients were randomly assigned to undergo either RSI or DSI. For RSI, a sedative followed immediately by a neuromuscular blocker was administered. For DSI, patients were pre-oxygenated and sedated before receiving the neuromuscular blocker.

**Sample Processing:** Not applicable.

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**Statistical Methods:** Data were analyzed using Chi-squared tests for categorical variables and t-tests for continuous variables. A p-value of less than 0.05 was considered statistically significant.

**Data Collection:** Data on intubation success, complications, and patient outcomes were systematically recorded in patient medical records and later extracted for analysis.

## OBSERVATION AND RESULTS

**Table 1: Effectiveness and Safety of RSI vs. DSI**

| Parameter | RSI n (%) | DSI n (%) | 95% CI for RSI | 95% CI for DSI | P value |
|---|---|---|---|---|---|
| Intubation Success | 87 (87%) | 82 (82%) | 80.2-93.8% | 75.1-88.9% | 0.249 |
| Any Complication | 26 (26%) | 20 (20%) | 18.6-33.4% | 13.7-26.3% | 0.286 |

This table evaluates the effectiveness and safety of Rapid Sequence Intubation (RSI) compared to Delayed Sequence Intubation (DSI) in an emergency department setting. The intubation success rate for RSI is recorded at 87% with a confidence interval (CI) of 80.2-93.8%, while DSI shows a success rate of 82% with a CI of 75.1-88.9%. The statistical analysis shows no significant difference (P value = 0.249). Additionally, the table details complication rates, with 26% for RSI (CI: 18.6-33.4%) and 20% for DSI (CI: 13.7-26.3%), also indicating no significant difference in safety between the two methods (P value = 0.286).

**Table 2: Intubation Success Rate of RSI vs. DSI**

| Parameter | Intubation Success n (%) | 95% CI | P value |
|---|---|---|---|
| RSI | 87 (87%) | 80.2-93.8% | 0.249 |
| DSI | 82 (82%) | 75.1-88.9% | 0.249 |

This table focuses solely on the intubation success rates of RSI and DSI, reiterating the results presented in Table 1. RSI has an 87% success rate (CI: 80.2-93.8%), while DSI has a slightly lower success rate of 82% (CI: 75.1-88.9%). Both groups show a P value of 0.249, suggesting no statistically significant difference between the techniques in achieving successful intubation.

**Table 3: Incidence of Complications Associated with RSI and DSI**

| Complication | RSI n (%) | DSI n (%) | 95% CI for RSI | 95% CI for DSI | P value |
|---|---|---|---|---|---|
| Aspiration | 4 (4%) | 2 (2%) | 0.1-7.9% | -0.5-4.5% | 0.686 |
| Dental Injury | 3 (3%) | 2 (2%) | 0-6.1% | -0.5-4.5% | 1.000 |
| Hypotension | 11 (11%) | 9 (9%) | 6.5-15.5% | 4.6-13.4% | 0.653 |
| Bradycardia | 8 (8%) | 7 (7%) | 3.5-12.5% | 2.7-11.3% | 0.780 |

Table 3 provides a breakdown of specific complications associated with each intubation technique. The incidence rates and CIs for complications such as aspiration, dental injury, hypotension, and bradycardia are listed for both RSI and DSI. Notably, all comparisons show no significant difference in the incidence of complications between the techniques, with P values ranging from 0.653 to 1.000, indicating that neither method significantly increases the risk of specific adverse events.

**Table 4: Patient Outcomes Following RSI and DSI**

| Outcome | RSI | DSI | 95% CI for RSI | 95% CI for DSI | P value |
|---|---|---|---|---|---|

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| | | | | | |
|---|---|---|---|---|---|
| Hospital Stay (days) | 5.5 ± 3.2 | 5.8 ± 3.5 | 4.7-6.3 | 4.9-6.7 | 0.522 |
| Mortality | 6 (6%) | 5 (5%) | 2.2-9.8% | 1.6-8.4% | 0.759 |

This table compares the outcomes of patients following the use of RSI and DSI, focusing on the duration of hospital stay and mortality rates. The average hospital stay is 5.5 days for RSI and 5.8 days for DSI, with overlapping confidence intervals (4.7-6.3 for RSI and 4.9-6.7 for DSI) and a P value of 0.522, indicating no significant difference. Mortality rates are similarly close, with 6% for RSI and 5% for DSI, and CIs of 2.2-9.8% and 1.6-8.4%, respectively, also showing no significant difference (P value = 0.759).

## DISCUSSION

In table 1, the study found no significant difference in intubation success rates between RSI (87%) and DSI (82%) with P=0.249, which aligns with the findings meta analysis of Mankowitz SL *et al.*(2018)[8], who also reported that while RSI is traditionally preferred for its speed, DSI can provide comparable success rates with improved patient oxygenation levels. Complication rates between RSI (26%) and DSI (20%) also showed no significant difference (P=0.286), which is supported by Higgs A *et al.*(2018)[9], suggesting that DSI might reduce complications related to hypoxemia.

Table 2 specifically examines the intubation success rates, confirming the closeness in effectiveness between RSI and DSI as noted in Table 1. The lack of significant difference (P=0.249) supports broader clinical practice trends where choices between RSI and DSI may be dictated more by patient condition and clinician preference than substantial differences in success rates, as discussed by Kornas RL *et al.*(2021)[10].

Detailed analysis in table 3 of specific complications shows no significant differences between the two techniques. The rates of aspiration, dental injury, hypotension, and bradycardia were low and statistically similar. This finding is crucial as it indicates that DSI, despite the delayed administration of neuromuscular blockers, does not increase the risk of these complications, which complements the research by Joffe AM *et al.*(2019)[11], who highlighted the safety profile of DSI when correctly implemented.

For table 4, Patient outcomes measured by duration of hospital stay and mortality rates showed no significant differences, with both groups having similar lengths of stay and mortality rates (P=0.522 and P=0.759, respectively). This suggests that the intubation technique may not influence these long-term outcomes significantly, echoing the findings of Casey JD *et al.*(2019)[12], who found that initial airway management strategy might not be as critical to long-term outcomes as the subsequent care.

## CONCLUSION

This study aimed to evaluate the comparative effectiveness and safety of Rapid Sequence Intubation (RSI) versus Delayed Sequence Intubation (DSI) in emergency department settings. The findings suggest that both RSI and DSI are equally effective in achieving successful intubation, with success rates closely aligned and no statistically significant differences observed. Additionally, the study demonstrated that both techniques have comparable safety profiles, as indicated by the similarity in the rates of various complications such as aspiration, dental injury, hypotension, and bradycardia.

In terms of patient outcomes, including hospital stay duration and mortality rates, our research found no significant differences between the two techniques, reinforcing the notion that the choice of intubation method might not influence these long-term outcomes. These results are consistent with existing literature that supports the use of both RSI and DSI under specific

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clinical circumstances, allowing clinicians to tailor their approach based on individual patient needs and conditions.

In conclusion, both RSI and DSI provide viable options for airway management in emergency settings, with no clear superiority of one method over the other in terms of intubation success, complication rates, and overall patient outcomes. The choice between RSI and DSI should be guided by clinical judgment and patient-specific factors rather than a one-size-fits-all approach. This study contributes to the ongoing discourse in emergency medicine, providing evidence that supports the flexibility and adaptability of airway management strategies to enhance patient care and safety.

## LIMITATIONS OF STUDY

1. **Sample Size and Power**: Although the sample size of 200 patients is adequate for initial observations, it may not provide sufficient power to detect smaller differences in outcomes between RSI and DSI that could be clinically significant. Larger studies are needed to confirm these findings and ensure generalizability across different patient populations and settings.
2. **Single-Center Design**: As this study was conducted in a single emergency department, the findings may not be generalizable to other settings with different patient demographics, staffing levels, or clinical protocols. Multi-center studies could provide a more robust comparison and enhance the external validity of the results.
3. **Operator Experience**: The experience and skill level of the clinicians performing the intubations could influence both the success rates and the complication rates associated with each technique. This study did not control for variations in operator experience, which could introduce bias into the results.
4. **Selection Bias**: The allocation to RSI or DSI was randomized; however, certain clinical conditions might influence the choice of intubation technique in practice. This could lead to selection bias if not adequately randomized or if exclusion and inclusion criteria are not strictly adhered to.
5. **Reporting and Observation Bias**: Given the nature of observational data collection in emergency settings, there may be inconsistencies in how complications or adverse events were observed and reported. Standardized reporting mechanisms and prospective data collection could mitigate this limitation.
6. **Control of Confounding Variables**: Various confounding factors such as underlying patient health conditions, the severity of clinical presentations, and the use of different sedative or paralytic agents were not fully controlled. These factors could significantly impact both the efficacy and safety outcomes of the intubation techniques.
7. **Follow-up Duration**: The study primarily focused on immediate outcomes and complications associated with intubation in an emergency setting. Longer follow-up periods would be required to fully assess the impact of intubation technique on longer-term outcomes such as hospital length of stay and mortality.

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