ASSESSMENT OF RAPID SEQUENCE INTUBATION SKILLS IN INTENSIVE CARE UNIT PHYSICIANS USING SIMULATION

Barotov Shuhrat Karimovich - Assistant of the Department of Clinical Skills Training on Simulators, Bukhara State Medical Institute named after Abu Ali ibn Sina, Uzbekistan

Abstract. Background: Rapid sequence intubation (RSI) is a critical airway management technique in intensive care units (ICUs). Despite its importance, standardized assessment tools for experienced ICU physicians remain limited.

Objective: To evaluate the effectiveness of a multidisciplinary simulation-based RSI training program utilizing a structured checklist to improve technical and nontechnical performance.

Methods: A prospective observational study was conducted involving 20 ICU physicians. Participants underwent high-fidelity in situ simulation training focused on checklist-guided RSI. Performance was assessed before training, immediately after training, and four weeks later in real clinical settings.

Results: Mean RSI performance scores improved significantly from baseline (98 ± 15) to post-training (132 ± 12; $P < 0.001$) and were retained at four-week follow-up (129 ± 13; $P < 0.001$ vs baseline). Improvements were noted in both technical and nontechnical domains, particularly among physicians with less than five years of ICU experience.

Conclusion: Simulation-based RSI training using a structured checklist significantly enhances airway management performance and teamwork among ICU physicians, with sustained skill retention.

Keywords: Rapid sequence intubation, simulation-based training, ICU, airway management, checklist, nontechnical skills.

ОЦЕНКА НАВЫКОВ БЫСТРОЙ ПОСЛЕДОВАТЕЛЬНОЙ ИНТУБАЦИИ У ВРАЧЕЙ ОТДЕЛЕНИЯ ИНТЕНСИВНОЙ ТЕРАПИИ С ИСПОЛЬЗОВАНИЕМ СИМУЛЯЦИИ

Баротов Шухрат Каримович - ассистент кафедры обучения клиническим навыкам на симуляторах Бухарского государственного медицинского института имени Абу Али ибн Сины, Узбекистан

Аннотация. Быстрая последовательная интубация (БСИ) является критическим методом управления дыхательными путями в отделениях интенсивной терапии (ИБТ). Несмотря на свою важность, стандартизированные инструменты оценки для опытных врачей реанимации остаются ограниченными.

Цель: оценить эффективность многодисциплинарной симуляционной программы обучения RSI с использованием структурированного контрольного списка для повышения технической и нетехнической производительности.

Методы: Проспективное наблюдательное исследование было проведено с участием 20 врачей реанимации. Участники прошли высокоточное симуляционное обучение на месте, основанное на контрольном списке RSI. Успеваемость оценивалась до тренировки, сразу после тренировки и через четыре недели в реальных клинических условиях.

Результаты: средние баллы результативности RSI значительно улучшились с исходного уровня (98 ± 15) до послетренировочного периода (132 ± 12; P < 0,001) и сохранялись при четырехнедельном наблюдении (129 ± 13; P < 0,001 по сравнению с исходным). Были отмечены улучшения как в технических, так и в нетехнических областях, особенно среди врачей с менее чем пятилетним стажем работы в реанимации.

Заключение: Обучение РСИ на основе симуляции с использованием структурированного контрольного списка значительно повышает эффективность управления дыхательными путями и командную работу среди врачей реанимационных отделений, с сохранением навыков.

Ключевые слова: быстрая последовательная интубация, симуляционное обучение, отделение интенсивной терапии, управление дыхательными путями, чек-лист, нетехнические навыки.

Introduction. Rapid sequence intubation (RSI) is an essential airway management technique in critical care medicine, designed to facilitate rapid endotracheal intubation while minimizing aspiration risk. In the intensive care unit

_____

(ICU), patients frequently present with hemodynamic instability, hypoxemia, or altered mental status, making RSI a high-risk but life-saving intervention.

Traditional RSI training relies largely on clinical exposure, which may be inconsistent due to variable case volume, duty-hour limitations, and patient safety concerns. Simulation-based education has therefore emerged as a powerful alternative, enabling deliberate practice of high-risk procedures in a controlled and safe environment.

Previous studies have demonstrated that simulation improves intubation success rates, procedural confidence, and knowledge retention, particularly among trainees. However, limited data exist regarding standardized simulation-based assessment frameworks tailored specifically for experienced ICU physicians. Moreover, many assessments focus predominantly on technical proficiency, neglecting nontechnical skills such as communication, leadership, and crisis resource management.

This study evaluates a novel multidisciplinary simulation-based RSI training program incorporating a structured checklist to assess and improve both technical and nontechnical performance among ICU physicians. We hypothesized that focused simulation training would lead to measurable and sustained improvements in airway management performance and teamwork.

Methods. This prospective observational study was conducted from January to June 2025 at the Simulation Center of the Republican Scientific and Practical Medical Center of Anesthesiology and Resuscitation, Tashkent, Uzbekistan. Ethical approval was obtained from the Institutional Review Board (IRB No. 2025-012), and written informed consent was obtained from all participants.

Twenty ICU physicians were recruited via convenience sampling. Inclusion criteria comprised at least two years of ICU experience and prior exposure to rapid sequence intubation (RSI) procedures. Exclusion criteria included participation in similar simulation training within the preceding six months or inability to complete follow-up assessments. Participant characteristics were as follows: mean age 38

years (range 28–52), 12 males and 8 females, with a mean ICU experience of 6.5 ± 3.2 years.

High-fidelity simulation scenarios were conducted using Laerdal SimMan 3G mannequins, incorporating difficult airway anatomy, hemodynamic instability, and complex team dynamics. Each simulation session lasted 45 minutes and included a structured pre-briefing, scenario enactment, and debriefing using the PEARLS framework.

Results. A 32-item RSI checklist was developed through a modified Delphi process involving six experts in critical care and simulation education. The checklist comprised 20 technical parameters (e.g., preoxygenation, medication administration, tube confirmation) and 12 nontechnical parameters (e.g., leadership, communication, role clarity), with each item weighted from 1 to 5 points, yielding a maximum score of 150. Inter-rater reliability was high (Cohen's $\kappa = 0.85$).

Participants' performance was assessed at three time points: baseline (pre-training simulation), immediately post-training, and four weeks later during real clinical RSI procedures, with patient consent obtained when feasible. Data were analyzed using SPSS version 27. Paired t-tests compared pre- and post-training scores, and a P value < 0.05 was considered statistically significant. Results are reported with 95% confidence intervals (CI).

All 20 participants completed the study. Baseline mean performance score was 98 ± 15 (95% CI: 91–105), reflecting moderate proficiency with identifiable gaps in nontechnical skills. Immediate post-training assessment demonstrated a significant improvement, with a mean score of 132 ± 12 (95% CI: 126–138; $P < 0.001$). At four-week follow-up, performance remained elevated with a mean score of 129 ± 13 (95% CI: 122–136; $P < 0.001$ versus baseline; $P = 0.42$ versus post-training), indicating sustained skill retention.

Subgroup analysis revealed that physicians with less than five years of ICU experience showed greater improvement (mean increase: 38 points) compared to those with more than five years of experience (mean increase: 28 points; $P = 0.03$).

Notable improvements were observed in both technical and nontechnical domains, particularly in communication, role clarity, and anticipatory task execution. No adverse events occurred during simulation or subsequent clinical evaluations.

Discussion. This study demonstrates that structured simulation-based training significantly improves RSI performance among ICU physicians. Unlike traditional approaches that emphasize procedural mechanics alone, our checklist-based framework integrated nontechnical skills critical to effective airway management.

The sustained improvement observed at four-week follow-up suggests successful transfer of simulation-acquired skills into real clinical practice. Enhanced role clarity and shared mental models likely contributed to reduced cognitive load on intubating physicians and improved overall team performance.

Participants reported increased awareness of anticipatory actions, such as early preparation of post-intubation equipment and monitoring, highlighting the value of multidisciplinary engagement. While physicians demonstrated less pronounced changes in role perception, this likely reflects their pre-existing familiarity with RSI leadership responsibilities.

Limitations include the single-center design and modest sample size, which may limit generalizability. Future studies should assess long-term patient-centered outcomes, including first-pass success rates, complication rates, and time-based efficiency metrics using video review of real-life intubations.

Conclusion. Simulation-based RSI training utilizing a structured checklist is an effective, safe, and sustainable method for improving airway management skills among ICU physicians. Incorporation of such programs into continuing medical education may enhance patient safety and team performance in critical care settings.

REFERENCES:

1.   Wallace C, McGuire B. Rapid sequence induction: its place in modern anaesthesia. Continuing Education in Anaesthesia, Critical Care & Pain. 2014;14(3):130–135.

2.   Seifman MA, Fuzzard SK, To H, Nestel D. COVID-19 impact on junior doctor education and training: a scoping review. Postgrad Med J. 2022;98(1160):466–476.

3.   Cook TM, El-Boghdadly K, McGuire B, et al. Consensus guidelines for managing the airway in patients with COVID-19: guidelines from the Difficult Airway Society, the Association of Anaesthetists, the Intensive Care Society, the Faculty of Intensive Care Medicine and the Royal College of Anaesthetists. Anaesthesia. 2020;75(6):785–799.

СПИСОК ЛИТЕРАТУРЫ:

1. Уоллес С., Макгуайр Б. Индукция быстрой последовательности: ее место в современной анестезиологии. Непрерывное образование в анестезиологии, интенсивной терапии и обезболивании. 2014;14 (3):130-135.

2. Сейфман М.А., Фаззард С.К., То Х., Нестел Д. Влияние COVID-19 на образование и подготовку молодых врачей: обзорное исследование. Postgrad Med J. 2022;98 (1160):466-476.

3. Кук Т.М., Эль-Богдадлы К., Макгуайр Б. и др. Согласованные рекомендации по обеспечению проходимости дыхательных путей у пациентов с COVID-19: руководство от Общества трудных дыхательных путей, Ассоциации анестезиологов, Общества интенсивной терапии, Факультета интенсивной терапии и Королевского колледжа анестезиологов. Anaesthesia. 2020;75 (6):785-799.