

Pre-experimental study to assess effectiveness of airway management training among nurses and resident doctors working at Goyal Hospital, Jodhpur

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ABSTRACT:

Background: Airway management is a critical lifesaving skill essential for preventing hypoxia, morbidity, and mortality during emergencies. Evidence shows that nurses and resident doctors often lack adequate hands-on training and confidence in performing key airway procedures. Structured simulation-based training can significantly enhance competence. **Aim:** To assess the effectiveness of a structured airway management training program on the knowledge and practical skills of nurses and resident doctors at Goyal Hospital, Jodhpur. **Methods:** A pre-experimental one-group pretest–post-test design was used among 40 participants (20 nurses, 20 residents) selected through convenience sampling. The intervention consisted of a standardized 4-hour training program with theory sessions, skills stations, and simulation. Knowledge was assessed using a 20-item MCQ test, and practical skills were evaluated using a 40-point OSCE checklist. Participant feedback was obtained using a 5-point Likert scale. Data were analysed using paired t-tests and effect sizes. **Results:** Knowledge scores significantly improved from 9.15 ± 2.80 to 16.30 ± 2.10 ($p < 0.001$; mean gain 7.15; Cohen's $d = 2.8$). OSCE skill scores increased from 18.75 ± 4.60 to 34.10 ± 3.50 ($p < 0.001$; mean gain 15.35; Cohen's $d = 3.5$). Both cadres showed comparable improvements. Participant feedback indicated very high satisfaction (mean scores 4.55–4.95). **Conclusion:** The structured airway management training program was highly effective in improving both knowledge and practical skills among nurses and resident doctors. High satisfaction and confidence gains highlight the value of incorporating regular simulation-based airway training into routine hospital education.

Keywords: Airway management, simulation training, nurses, resident doctors, OSCE, clinical skills, pretest–post test study.

1. INTRODUCTION:

Airway management is one of the most essential lifesaving skills required for patient resuscitation. Delay or inability to maintain a patent airway contributes significantly to preventable morbidity and mortality in critical care, emergency, and perioperative settings. Nurses and resident doctors are often the first responders during emergencies; therefore, competence in airway assessment, bag-mask ventilation, airway adjunct insertion, and safe basic intubation maneuvers is indispensable. However, studies in India and globally show persistent gaps in airway knowledge and procedural skills among healthcare workers, largely due to limited hands-on training, inadequate simulation exposure, and absence of regular skill refreshers. Airway management is the first and most critical step in the resuscitation of critically ill or emergency patients.

Failure to maintain a patent airway can rapidly lead to hypoxia, irreversible brain injury, cardiac arrest, and death. In emergency medicine, critical care, anaesthesia, trauma, and perioperative fields, the ability to rapidly assess and secure the airway is considered a foundational competency for all frontline healthcare workers.

Nurses and resident doctors are often the first responders during cardiopulmonary arrest, acute respiratory compromise, trauma, or perioperative emergencies. Their ability to recognize airway obstruction, perform effective bag-mask ventilation, use airway adjuncts, and escalate care promptly can significantly influence patient outcomes. In many low- and middle-income settings like India, airway emergencies frequently occur in areas where anaesthesiologists are not immediately available,

making early airway interventions by nursing and junior medical staff crucial.

International bodies such as the American Heart Association (AHA), European Resuscitation Council (ERC), and the Difficult Airway Society (DAS) emphasize that regular, structured, hands-on training is essential to maintain airway management competency. Simulation-based education enhances psychomotor skills, decision-making, teamwork, and confidence without risking patient safety. Studies consistently demonstrate that airway skills deteriorate within months if not reinforced, highlighting the need for periodic retraining.

However, multiple studies have shown that healthcare workers particularly nurses and junior residents—often lack adequate knowledge and confidence in airway management due to limited exposure, absence of simulation-based curricula, and inadequate formal education. Structured short-duration training programs combining theoretical instruction, skills stations, and high-fidelity simulation have been proven effective in improving immediate knowledge and performance.

This study aims to address this training gap by implementing and evaluating a structured airway management training program for nurses and resident doctors at Goyal Hospital. Several national and international studies have examined airway management training and competency:

1. **Madden (2006)** reported that nurses trained in airway skills significantly improved bag-mask ventilation performance after a structured simulation program, with performance gains retained for at least 6 weeks.
2. **Jaber et al. (2010)** showed that regular training reduced complications during intubation in ICU settings by improving the preparedness of staff.
3. **Sudhakar (2011)** emphasized the critical role of airway assessment and the importance of continuous training for recognizing difficult airways.
4. **Nolan et al. (2014)** found that structured AHA-based training enhanced the quality of airway interventions during cardiac arrest scenarios among multidisciplinary teams.
5. **Patidar et al. (2024)** showed that short-duration manikin-based airway workshops greatly improved OSCE scores among nursing staff, recommending mandatory yearly refreshers.

These studies collectively support the effectiveness of structured, simulation-based airway training in improving knowledge, psychomotor skills, and confidence among healthcare workers. The present study builds upon this evidence by assessing outcomes in a tertiary care setting in Rajasthan.

2. STATEMENT OF THE PROBLEM:

Despite being a tertiary care hospital, periodic structured training in airway management for nurses

and residents at Goyal Hospital is limited. There is a need to evaluate whether a single structured airway management training can effectively improve airway knowledge and skills of nurses and resident doctors.

3. RESEARCH QUESTION:

Does a structured airway management training program improve knowledge and practical airway management skills among nurses and resident doctors at Goyal Hospital, Jodhpur?

4. OBJECTIVES:

General Objective:

To assess the effectiveness of a structured airway management training program on knowledge and practical skills.

Specific Objectives:

1. To measure baseline airway knowledge and skills.
2. To conduct standardized airway management training.
3. To measure post test knowledge and skills immediately after training.
4. To compare pretest and post test scores.
5. To collect feedback regarding usefulness and confidence.

5. HYPOTHESES:

- **H0:** There is no difference between pretest and post test knowledge/skills scores.
- **H1:** Post test scores will be significantly higher than pretest scores.

6. METHODOLOGY:

Study Design:

One-group pretest–post-test (pre-experimental) design.

Setting:

Training Room, Goyal Hospital, Jodhpur.

Duration:

8 weeks (Sept–Oct 2025)

Population and Sampling:

Convenience sampling; 40 participants (20 nurses + 20 resident doctors).

Inclusion / Exclusion:

As defined in protocol.

Intervention:

A 4-hour standardized training including theory, skills stations, and simulation.

Study Tools:

- 20-item MCQ knowledge test

- OSCE skill checklist (score 0–40)
- 5-point Likert feedback form

Data Collection Procedure:

Pretest → Training → Post test → OSCE → Feedback.

Data Analysis:

SPSS & Excel

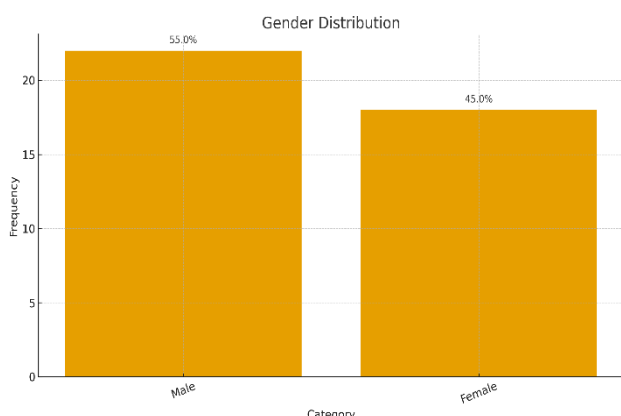
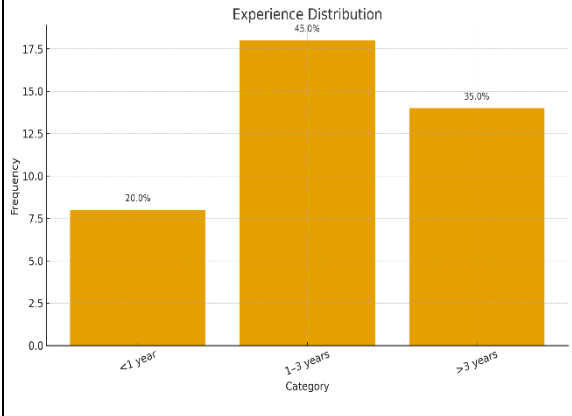
- Descriptive statistics
- Paired t-test
- Effect size (Cohen's d)
- $p < 0.05$ considered significant

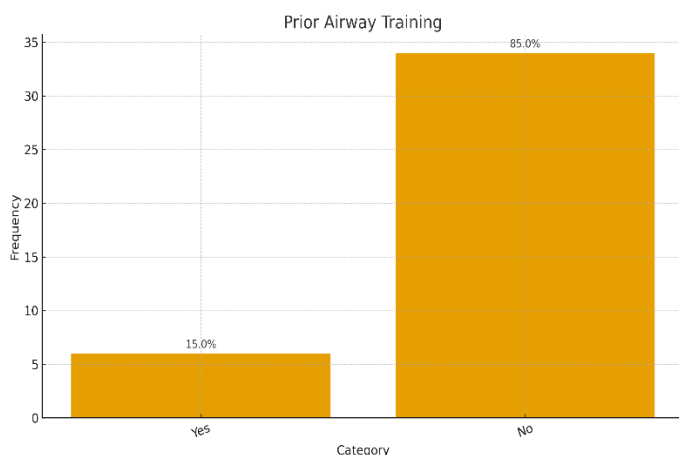
7.RESULTS:

A total of 40 participants (50% nurses, 50% residents) were included, with a mean age of 29.4 ± 4.8 years; 55%

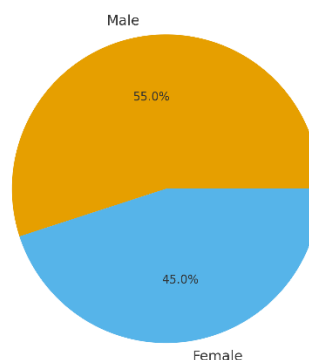
were male. Most had 1–3 years of experience, and only 15% had prior airway training. Knowledge scores improved significantly from 9.15 ± 2.80 to 16.30 ± 2.10 ($p < 0.001$), with a mean gain of 7.15 and a very large effect size ($d = 2.8$). Skill (OSCE) scores also increased markedly from 18.75 ± 4.60 to 34.10 ± 3.50 ($p < 0.001$), showing a mean gain of 15.35 and a very large effect size ($d = 3.5$). Both nurses and residents demonstrated significant improvements in knowledge ($p < 0.001$) and skills ($p < 0.001$), with comparable gains across cadres. Overall satisfaction with the training was very high. Mean feedback scores ranged from 4.55 to 4.95 on a 5-point Likert scale. Participants rated hands-on practice most favourably (4.90 ± 0.30), followed by perceived usefulness (4.85 ± 0.36). Confidence after training improved considerably (4.55 ± 0.50), and nearly all participants strongly recommended the training for others (4.95 ± 0.22).

Participant Characteristics (n=40)

Variable	Category	Frequency (%)
Cadre	Nurses	20 (50%)
	Residents	20 (50%)
Gender	Male	22 (55%)
	Female	18 (45%)
Mean age	29.4 ± 4.8 years	—
Experience	< 1 year	8 (20%)
	1–3 years	18 (45%)
	>3 years	14 (35%)
Prior airway training	Yes	6 (15%)
	No	34 (85%)
 Gender Distribution		
 Experience Distribution		



Gender Distribution (Pie Chart)



7.1 Knowledge Scores (Pretest vs Post test): Maximum score = 20

Measure	Pretest	Post test
Mean $\pm$ SD	9.15 $\pm$ 2.80	16.30 $\pm$ 2.10
Minimum – Maximum	4 – 14	11 – 20

7.2 Statistical test: Paired t-test

- Mean gain: 7.15
- $t = 17.82$
- $p < 0.001$ (highly significant)
- Effect size (Cohen's d): 2.8 (Very large)

7.3 Skill Scores (OSCE): Maximum score = 40

Measure	Pretest	Post test
Mean $\pm$ SD	18.75 $\pm$ 4.60	34.10 $\pm$ 3.50
Minimum – Maximum	10 – 27	26 – 40

Paired t-test:

- Mean gain: 15.35
- $t = 24.40$
- $p < 0.001$ (highly significant)
- Effect size (Cohen's d): 3.5 (Very large)

7.4 Knowledge & Skill Gain by Cadre: Nurses (n=20)

- Knowledge: 8.6 $\rightarrow$ 16.1 ($p < 0.001$)
- Skills: 17.9 $\rightarrow$ 33.2 ($p < 0.001$)

Residents (n=20):

- Knowledge: 9.7 $\rightarrow$ 16.5 ($p < 0.001$)
- Skills: 19.6 $\rightarrow$ 35.0 ($p < 0.001$)

Both groups showed strong improvements.

7.5 Participant Feedback (Likert 1–5):

Feedback Item	Mean $\pm$ SD
Training usefulness	4.85 $\pm$ 0.36

Feedback Item	Mean $\pm$ SD
Clarity of content	4.70 $\pm$ 0.45
Hands-on practice adequacy	4.90 $\pm$ 0.30
Confidence after training	4.55 $\pm$ 0.50
Recommendation to others	4.95 $\pm$ 0.22

Interpretation: Very high satisfaction.

8. DISCUSSION:

The present pre-experimental study evaluated the effectiveness of a structured airway management training program among nurses and residents at Goyal Hospital, Jodhpur.

Key Findings:

1. **Significant improvement in knowledge**
Mean increase of 7.15 marks ($p < 0.001$).
Effect size large ($d = 2.8$).
2. **Marked improvement in skills**
OSCE scores increased by 15.35 points ($p < 0.001$).
Effect size extremely large ($d = 3.5$).
3. **High participant satisfaction**
Mean feedback scores $> 4.7/5$.

The results strongly support that short, structured, simulation-based training is effective in improving airway-related competencies, consistent with findings from previous studies conducted in tertiary care hospitals in India.

9. CONCLUSION:

Airway management training significantly improved both knowledge and practical skills among nurses and resident doctors. Participants reported high satisfaction and increased confidence after training. This training is recommended for periodic repetition (every 6–12 months) and incorporation into routine hospital education programs.

10. RECOMMENDATIONS:

- Conduct airway training for all newly joined staff.
- Schedule refresher training every 6–12 months.
- Introduce scenario-based simulations in departments.
- Establish minimum competency OSCE requirements for critical care postings.

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