**Clinical Trial Protocol**

**Study Title**

Advancing Anesthesiology Trainee Proficiency in Airway Management via Simulation-Based Training: A Non-hypoxic Apnea Duration Approach

**Registration Details**

* Registry: Chinese Clinical Trial Registration Center
* Registration Number: ChiCTR2200065877
* Registration Date: 17/11/2022

**Study Objectives**

**Primary Objective**

To evaluate the impact of incorporating non-hypoxic apnea duration awareness in simulation-based airway management education for anesthesiology trainees.

**Secondary Objectives**

1. Assess changes in clinical competence through modified DOPS scores
2. Measure trainee satisfaction with the simulation training approach
3. Evaluate performance improvements in specific airway management domains

**Study Design**

* Type: Quasi-experimental study
* Allocation: Randomized 1:1 allocation
* Blinding: Independent evaluator blinded to group assignment

**Participant Selection**

**Inclusion Criteria**

* Anesthesiology undergraduate students
* Age: 18-25 years
* Completed two-month theoretical and bedside internship course

**Exclusion Criteria**

* Less than three months of internship experience
* Previous tracheal intubation experience
* Withdrawal during study period
* Failure to complete simulation within specified timeframe

**Intervention**

**Intervention Group**

* Receive simulation with non-hypoxic apnea duration information
* Real-time countdown of 247 seconds until SpO2 reaches 90%
* Standardized difficult airway scenario

**Control Group**

* Conventional simulation training
* No specific non-hypoxic apnea duration information provided

**Outcome Measures**

**Primary Outcome**

* Modified Direct Observation of Procedural Skills (DOPS) assessment
* Evaluated across 10 distinct performance domains

**Secondary Outcome**

* Satisfaction questionnaire
* 10 domains assessed using 5-point Likert scale

**Statistical Analysis Plan**

* Sample size calculation:
  + Effect size: 0.8
  + α error: 0.05
  + Power: 0.8
* Comparative statistical tests:
  + Independent sample t-test for normally distributed data
  + Non-parametric tests for non-normal distributions
  + Chi-square test for categorical variables
* Software: SPSS 22.0
* Significance level: P < 0.05

**Ethical Considerations**

* Approved by Ethics Committee of Shanghai General Hospital (No. 2022KY093)
* Written informed consent from all participants
* Confidentiality of participant data
* No physical risk to participants

**Timeline**

* Study Period: December 2022 to March 2023
* Participant Recruitment: Consecutive sampling
* Simulation Sessions: Standardized protocol
* Data Collection and Analysis: Immediate post-simulation assessment

**Limitations and Considerations**

* Single-center design
* Small sample size
* Short observation period
* Limited generalizability

**Dissemination Plan**

* Manuscript preparation
* Presentation at relevant medical education conferences
* Publication in peer-reviewed journal

**Funding and Conflicts of Interest**

* No external funding reported
* Authors declare no competing interests