SST in Emergency Education

Study Protocol

NCT Number:	
Document Date:	2025-08-25
Version:	1.0

1. STUDY BACKGROUND

Emergency medicine clinical clerkship represents a critical transition for medical and nursing students from theoretical knowledge to practical application. Traditional lecture-based teaching (LBT) has documented limitations in fostering active learning, clinical reasoning, and interprofessional collaboration.

Case-Based Scenario Simulation Teaching (CBSST) immerses learners in highly realistic clinical contexts, enabling interns to experience the urgency of emergency care and to master team-based resuscitation before actual clinical practice. Interprofessional education (IPE) has gained increasing recognition in healthcare training; however, existing studies have largely focused on general clinical skills rather than specifically targeting cardiopulmonary resuscitation (CPR) scenarios involving collaborative medical-nursing intern teams.

This retrospective cohort study aims to evaluate the effectiveness of CBSST compared with conventional LBT in improving CPR educational outcomes among medical and nursing interns.

2. STUDY OBJECTIVES

2.1 Primary Objective
To compare the differences between traditional lecture-based teaching (LBT) and case-based scenario simulation teaching (CBSST) in improving medical and nursing interns' CPR-related clinical competence, as measured by theoretical examination scores and Mini-Clinical Evaluation Exercise (Mini-CEX) total scores.

2.2 Secondary Objectives
• To evaluate the impact of teaching modality on Mini-CEX dimension scores (knowledge mastery, operational skills, clinical judgment, and team collaboration).
• To assess teaching satisfaction and self-perceived learning burden between the two groups.
• To provide evidence for optimizing intern CPR training curricula in teaching hospitals.

3. STUDY DESIGN

This is a single-center, two-arm retrospective cohort study. Participants are medical and nursing interns who completed centralized CPR training at the study institution between September 2024 and November 2025.

Cohort Definition:
• Control Cohort (LBT Group): Interns who received conventional four-stage lecture-

based CPR training.
• Exposure Cohort (CBSST Group): Interns who received five-stage case-based scenario simulation combined with interprofessional team training.

Both groups utilized identical CPR manikins (Resusci Anne QCPR, Laerdal Medical), shared the same teaching venue, and received instruction from American Heart Association (AHA)-certified BLS instructors. Total course duration was 4 hours per group.

4. STUDY POPULATION

4.1 Inclusion Criteria
1. First-time clinical internship in medical or nursing programs;
2. No prior Basic Life Support (BLS) certification before enrollment;
3. Training attendance rate ≥ 90%;
4. Complete training assessment records and questionnaire data available.

4.2 Exclusion Criteria
1. Absence rate ≥ 10% during the training period;
2. Withdrawal from training for any reason or missing data ≥ 20%;
3. Previous participation in off-campus similar simulation training courses.

4.3 Sample Size
A total of 69 interns met inclusion criteria: 34 in the LBT group and 35 in the CBSST group. Post-hoc power analysis (G*Power 3.1) assuming effect size $d = 1.0$, $\alpha = 0.05$ (two-sided), and power = 80% indicated a minimum requirement of 34 participants per group. The available sample satisfies this requirement after accounting for an anticipated 5% missing data rate.

5. DATA SOURCES AND COLLECTION

Data will be retrospectively extracted from:
• Hospital teaching administration archive system;
• Standardized assessment databases;
• Anonymized electronic questionnaire platforms.

Variables extracted include:
• General Information: Gender, age, professional category (medical student / nursing student), rotation department, training date;
• Training Records: Teaching modality, attendance status, instructor qualifications;
• Assessment Scores: Theoretical examination scores (0–100), Mini-CEX scores (four

dimensions, 9-point scale each, total 0–36);
• Questionnaire Data: Teaching satisfaction (5-point Likert scale across four dimensions) and self-perceived learning burden (5-point Likert scale).

6. INTERVENTIONS / EXPOSURES

6.1 Traditional Lecture-Based Teaching (LBT)
Four-stage instruction: (1) theoretical lecture via PowerPoint emphasizing the "4-minute golden rescue time" and compression parameters; (2) instructor demonstration of CPR procedures; (3) group practice with corrective feedback; (4) summary using mnemonics and common error correction; followed by assessment.

6.2 Case-Based Scenario Simulation Teaching (CBSST)
Five-stage instruction: (1) pre-course case preparation with guided reflective questions; (2) interprofessional role-play and team-based BLS simulation with instructor observation and real-time feedback; (3) structured debriefing and discussion highlighting strengths, weaknesses, and teamwork bottlenecks; (4) summary of key rescue points and expansion recommendations; followed by assessment.

7. OUTCOME MEASURES

7.1 Primary Outcomes
• Theoretical Examination Score: Closed-book examination using a unified question bank (maximum 100 points).
• Mini-CEX Total Score: 3-level, 9-point scale per dimension (1–3 Needs Improvement; 4–6 Pass; 7–9 Excellent). Four dimensions: knowledge mastery, operational skills, clinical judgment, and team collaboration (maximum 36 points).

7.2 Secondary Outcomes
• Mini-CEX dimension sub-scores;
• Teaching Satisfaction: Course content, course resources, classroom interaction, and teaching methods (1 = Poor, 5 = Excellent);
• Learning Burden: Self-perceived learning load (1 = Poor, 5 = Excellent).

7.3 Evaluation Tool Properties
Mini-CEX assessors: Two AHA-certified BLS instructors with ≥5 years of clinical teaching experience. Prior to the study, assessors completed a 2-hour calibration session. Inter-rater reliability: Cohen's kappa = 0.85 (95% CI: 0.72–0.98) based on 10 pilot cases.

Satisfaction questionnaire: Developed from health professions education literature, adapted for CPR simulation. Content validity confirmed by a panel of three clinical

education experts. Pilot testing (n = 10) confirmed clarity and flow. Internal consistency: Cronbach's α = 0.82 overall; dimension-specific α = 0.71–0.86.

8. QUALITY CONTROL

8.1 Data Quality
• Dual independent extraction with cross-checking; cases with ≥20% missing data excluded;
• Standardized variable coding; logical outlier verification (e.g., scores outside valid ranges flagged against source records).

8.2 Exposure Assignment
• Training modality confirmed via teaching archives and instructor documentation to prevent misclassification;
• Homogeneity control: identical equipment, venue, and instructor pool across both groups.

8.3 Outcome Assessment
• Assessor blinding: Mini-CEX scoring and theoretical exam grading performed by assessors blinded to group allocation;
• Questionnaire anonymity: Anonymous electronic submission to minimize social desirability bias;
• Temporal consistency: All outcomes assessed immediately post-training.

8.4 Confounding Control
• Gender, age, and professional category collected for adjustment in multivariable or stratified analyses;
• Exclusion of participants with prior BLS or off-campus simulation training.

9. STATISTICAL ANALYSIS

Detailed methodology is provided in the separate Statistical Analysis Plan (SAP). Key points include:
• Normality: Shapiro-Wilk test; continuous data presented as mean ± SD or median (IQR); categorical data as frequencies (%).
• Comparisons: Independent t-test (normal), Mann-Whitney U (non-normal), Chi-square or Fisher's exact test (categorical).
• Multiple comparison correction: Bonferroni correction—Mini-CEX dimensions α = 0.0125 (0.05/4); satisfaction dimensions α = 0.01 (0.05/5).
• Effect sizes: Cohen's d (pooled SD) and Hedges' g correction for small samples.

• Software: SPSS version 23.0; two-sided tests; $P < 0.05$ significant (except Bonferroni-adjusted dimensions).

10. ETHICAL CONSIDERATIONS

This study was conducted in accordance with the Declaration of Helsinki. Ethics approval was obtained from the Institutional Review Board of the Second Affiliated Hospital of Zhejiang University School of Medicine (Approval No. 20260693).

Given the retrospective nature and use of anonymized teaching records, the requirement for informed consent was waived. All participant records are securely stored at the hospital. Any public reporting will not disclose individual identities.

11. DATA MANAGEMENT AND CONFIDENTIALITY

All data are stored in the hospital's secure teaching administration system. Access is restricted to authorized research personnel. Anonymized identifiers are used for analysis. Individual participant data will not be shared outside the research team due to institutional data privacy policies and the scope of the original ethics approval.

12. INFORMED CONSENT

This is a retrospective study. Application for waiver of informed consent will be submitted to the institutional review board.

13 ADVERSE EVENT REPORTING

This study involves resident physicians and interns as research subjects. All data collected are derived from routine clinical teaching processes and simulation-based training; no real patients are involved. The study does not entail additional risks beyond standard educational activities and is considered safe for all participants.