Clinical Trial Protocol
Iranian Registry of Clinical Trials

08 Nov 2026

The Effect of Virtual Reality-Based (VR) Training on Knowledge and Clinical Performance of Cardiopulmonary Resuscitation among Nursing Students: A Randomized Controlled Trial

Protocol summary

Study aim
To determine the effect of virtual reality based training on knowledge and clinical performance of cardiopulmonary resuscitation (CPR) among nursing students

Design
Two arm parallel-group randomized controlled trial on 38 sixth-semester nursing students (census sampling), 1:1 allocation, block randomization (block sizes 4 and 6) using Sealed Envelope Ltd.

Settings and conduct
This study will be conducted at the Clinical Skills Center of Shahid Beheshti Nursing and Midwifery School, Rasht. Participants will be randomly allocated to traditional and virtual reality training groups. Pre-test assesses knowledge (questionnaire) and performance (checklist on manikin). Four weeks post-intervention, post-test will be administered by the researcher using the same instruments.

Participants/Inclusion and exclusion criteria
Sixth-semester students who provide informed consent to participate in the study, No previous participation in virtual reality-based CPR training before the study; Students who have previously taken this course with an incomplete grade

Intervention groups
In the control group, traditional CPR training based on 2025 American Heart Association guidelines, including PowerPoint lectures and hands-on manikin practice over two 2-hour sessions and 90-minute supervised practice session. In the intervention group, VR-based training using headset, motion sensors, manikin, and four simulated environments (street, classroom, mall, mosque) with cardiac arrest scenarios (smoking, electrocution, unknown cause) and environmental stressors. Each student will use the system for 12 minutes per session and will participate twice in the intervention, resulting in a total intervention time of 8 hours across four 2-hour sessions.

Main outcome variables
Knowledge of CPR Clinical performance of CPR

General information

Reason for update

Acronym

IRCT registration information
IRCT registration number: **IRCT20260602069618N1**
Registration date: **2026-06-14, 1405/03/24**
Registration timing: **prospective**

Last update: **2026-06-14, 1405/03/24**
Update count: **0**

Registration date
2026-06-14, 1405/03/24

Registrant information

Name
Saba Jahani

Name of organization / entity

Country
Iran (Islamic Republic of)

Phone
+98 11 3525 1319

Email address
sabajahani70@gmail.com

Recruitment status
Recruitment complete

Funding source

Expected recruitment start date
2026-06-23, 1405/04/02

Expected recruitment end date
2026-06-29, 1405/04/08

Actual recruitment start date

empty

Actual recruitment end date

empty

Trial completion date

empty

Scientific title

The Effect of Virtual Reality-Based (VR) Training on Knowledge and Clinical Performance of Cardiopulmonary Resuscitation among Nursing Students: A Randomized Controlled Trial

Public title

Effect of Virtual Reality-Based (VR) Training on Knowledge and Clinical Performance of Cardiopulmonary Resuscitation

Purpose

Education/Guidance

Inclusion/Exclusion criteria

Inclusion criteria:

Sixth-semester students who provide informed consent to participate in the study. No previous participation in virtual reality-based cardiopulmonary resuscitation (CPR) training before the study.

Exclusion criteria:

Students who have previously taken this course with an incomplete grade.

Age

No age limit

Gender

Both

Phase

N/A

Groups that have been masked

No information

Sample size

Target sample size: **38**

Randomization (investigator's opinion)

Randomized

Randomization description

All eligible nursing students will be allocated equally (1:1 ratio) to the traditional and virtual reality-based training groups using block randomization with block sizes of 4 and 6. The randomization sequence will be generated using the online randomization service Sealed Envelope Ltd. The students will be unaware of their group allocation.

Blinding (investigator's opinion)

Not blinded

Blinding description

Placebo

Not used

Assignment

Parallel

Other design features

A Randomized Controlled Trial

Secondary Ids

empty

Ethics committees

1

Ethics committee

Name of ethics committee

Ethics committee of Gilan University of Medical Sciences

Street address

Shahid Beheshti School of Nursing and Midwifery, Daneshjoo St., Shahid Beheshti Blvd.

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Province

Guilan

Postal code

41469-39814

Approval date

2026-05-13, 1405/02/23

Ethics committee reference number

IR.GUMS.REC.1405.071

Health conditions studied

1

Description of health condition studied

Knowledge and clinical performance of cardiopulmonary resuscitation among nursing students

ICD-10 code

ICD-10 code description

Primary outcomes

1

Description

knowledge score of cardiopulmonary resuscitation

Timepoint

before the intervention and 4 weeks after the intervention

Method of measurement

G. Spinelli's cardiopulmonary resuscitation knowledge questionnaire.

2

Description

Clinical performance score of cardiopulmonary resuscitation

Timepoint

before the intervention and 4 weeks after the intervention

Method of measurement

Observational checklist for cardiopulmonary resuscitation performance

Secondary outcomes

empty

Intervention groups

1

Description

Control group: Cardiopulmonary resuscitation (CPR) training based on the 2025 American Heart Association guidelines will be delivered using the traditional method, including lectures with PowerPoint presentations and hands-on demonstrations on a manikin. The training will be conducted over two 2-hour sessions, followed by one 90-minute supervised practical practice session in which students perform CPR procedures on a manikin under instructor supervision.

Category

Other

2

Description

Intervention group: Cardiopulmonary resuscitation (CPR) training will be delivered using virtual reality (VR) technology. The educational program provides an interactive and intelligent simulation of the key steps of CPR, including scene safety assessment, evaluation of the patient's level of consciousness, activation of emergency medical services, assessment of pulse and breathing, identification of the correct chest compression site, evaluation of compression rate, depth (shallow, adequate, or excessive), rhythm, and chest recoil, airway opening using the Head Tilt–Chin Lift maneuver, performance of five cycles of 30:2 compressions-to-ventilations, and training in the use of an automated external defibrillator (AED).Participants will use equipment developed by Aras Mixed Reality, a knowledge-based company, including a virtual reality headset, VR-compatible computers, motion-tracking sensors, a CPR training manikin, and microcontroller-based processing units. The system consists of two components: training and assessment. For the assessment phase, four different simulated environments (street, classroom, shopping mall, and mosque) have been designed to enable participants to practice and evaluate their skills under a variety of environmental and psychological conditions, including situational stress. In each environment, a distinct cardiac arrest scenario is presented. For example, one scenario involves cardiac arrest following cigarette smoking, another following electrocution, and a third with no apparent cause. Participants are required to perform CPR according to the 2025 American Heart Association (AHA) Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. This VR simulator incorporates several advanced technologies, including alignment of the physical manikin with its virtual counterpart through augmented reality technology, detection of hand, finger, and pulse assessment movements using image-processing techniques, and the ability to palpate the chest, assess pulse, and perceive breathing through mixed reality technology. During chest compressions, the extent of chest depression is visually displayed, allowing participants to practice achieving the recommended compression depth of 5–6 cm accurately. In addition, environmental stressors are simulated through virtual characters exhibiting behaviors such as shouting, crying, and creating panic, thereby enabling participants to develop the skills necessary to perform CPR effectively in realistic and stressful situations. Each participant will use the VR system for a total of 12 minutes per session, including both training and assessment. Based on the sample size, completion of one full training round requires approximately 4 hours. Each participant will undergo the training process twice; therefore, the total intervention time for the intervention group will be approximately 8 hours. The intervention will be implemented in four sessions, each lasting 2 hours.

Category

Other

Recruitment centers

1

Recruitment center

Name of recruitment center

Shahid Beheshti School of Nursing and Midwifery, Rasht

Full name of responsible person

Marzieh Jahani

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Shahid Beheshti School of Nursing and Midwifery, Daneshjoo St., Shahid Beheshti Highway.

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Sponsors / Funding sources

1

Sponsor

Name of organization / entity

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Full name of responsible person

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Grant name

Grant code / Reference number

Is the source of funding the same sponsor organization/entity?

Yes

Title of funding source

Rasht University of Medical Sciences

Proportion provided by this source

100

Public or private sector

Public

Domestic or foreign origin

Domestic

Category of foreign source of funding

empty

Country of origin

Type of organization providing the funding

Academic

Person responsible for general inquiries

Contact

Name of organization / entity

Rasht University of Medical Sciences

Full name of responsible person

Saba Jahani

Position

Master's Student of Medical-Surgical Nursing

Latest degree

Bachelor

Other areas of specialty/work

Nursery

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Person responsible for scientific inquiries

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Full name of responsible person

Marzieh Jahani

Position

Associate professor

Latest degree

Ph.D.

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Person responsible for updating data

Contact

Name of organization / entity

Rasht University of Medical Sciences

Full name of responsible person

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Position

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Latest degree

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Sharing plan

Deidentified Individual Participant Data Set (IPD)

Undecided - It is not yet known if there will be a plan to make this available

Study Protocol

Undecided - It is not yet known if there will be a plan to make this available

Statistical Analysis Plan

Undecided - It is not yet known if there will be a plan to make this available

Informed Consent Form

Undecided - It is not yet known if there will be a plan to make this available

Clinical Study Report

Undecided - It is not yet known if there will be a plan to make this available

Analytic Code

Not applicable

Data Dictionary

Undecided - It is not yet known if there will be a plan to make this available