Clinical Trial Protocol
Iranian Registry of Clinical Trials

08 Nov 2026

Comparison of the Effects of Three Educational Methods—Virtual Reality, Augmented Reality, and Video-Based Training—on Learning, Educational Satisfaction, Self-Efficacy, and Critical Thinking Disposition among Undergraduate Nursing Students in Hemodialysis Machine Set-Up and Priming

Protocol summary

Study aim

Comparing the Effects of Virtual Reality, Augmented Reality, and Video-Based Education on Learning, Educational Satisfaction, Self-Efficacy, and Critical Thinking Disposition in Nursing Students Regarding Hemodialysis Machine Preparation, Set-Up, and Priming

Design

A randomized, single-blind, parallel-group, non-controlled clinical trial on 60 students. The rand function of Excel was used for randomization.

Settings and conduct

This randomized, quasi-experimental study with three parallel groups will be conducted on 60 seventh-semester nursing students at Shiraz University of Medical Sciences. Following informed consent, eligible students will be randomly assigned to three groups—virtual reality, augmented reality, and video (20 students per group)—and will receive training on operating the hemodialysis machine, covering setup, circuit assembly, and priming.

Participants/Inclusion and exclusion criteria

Inclusion criteria: 1) Written informed consent; 2) Seventh-semester undergraduate nursing students; 3) Completion of the Hemodialysis Intensive Care course; 4) No previous formal training in operating a hemodialysis machine; 5) No previous work experience in this field. Exclusion criteria: 1) Unwillingness to participate; 2) Severe anxiety disorder, based on self-report; 3) Failure to attend the workshops; 4) Being a guest student; 5) Incomplete questionnaire (≥20% unanswered).

Intervention groups

Group 1 (VR): Received training on hemodialysis machine operation, preparation, setup, and priming using virtual reality–based educational content. Group 2 (AR): Received training on hemodialysis machine operation, preparation, setup, and priming using augmented reality–based educational content. Group 3 (Video): Received training on hemodialysis machine operation, preparation, setup, and priming through an educational video.

Main outcome variables

Student learning regarding hemodialysis machine setup and priming, educational satisfaction, self-efficacy, and disposition toward critical thinking.

General information

Reason for update

Acronym

IRCT registration information

IRCT registration number: **IRCT20100919004775N17**
Registration date: **2026-09-14, 1405/06/23**
Registration timing: **prospective**

Last update: **2026-09-14, 1405/06/23**
Update count: **0**

Registration date

2026-09-14, 1405/06/23

Registrant information

Name

Zinat Mohebbi

Name of organization / entity

Shiraz University of Medical Sciences

Country

Iran (Islamic Republic of)

Phone

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Recruitment status
recruiting
Funding source

Expected recruitment start date
2026-09-23, 1405/07/01
Expected recruitment end date
2027-01-21, 1405/11/01
Actual recruitment start date
empty
Actual recruitment end date
empty
Trial completion date
empty

Scientific title
Comparison of the Effects of Three Educational Methods—Virtual Reality, Augmented Reality, and Video-Based Training—on Learning, Educational Satisfaction, Self-Efficacy, and Critical Thinking Disposition among Undergraduate Nursing Students in Hemodialysis Machine Set-Up and Priming

Public title
Comparing the Effects of Virtual Reality, Augmented Reality, and Video-Based Education on Learning, Educational Satisfaction, Self-Efficacy, and Critical Thinking Disposition in Nursing Students Regarding Hemodialysis Machine Preparation, Set-Up, and Priming
Purpose
Education/Guidance
Inclusion/Exclusion criteria
Inclusion criteria:
Providing written informed consent to participate in the study Being a seventh-semester undergraduate nursing student Having completed the Hemodialysis Intensive Care course in the previous semester Having no previous formal training in operating a hemodialysis machine Having no previous work experience involving the operation of a hemodialysis machine
Exclusion criteria:
Unwillingness to participate in the study Having severe anxiety disorders, as reported by the participant Failure to attend the educational workshops Being a guest student Incomplete completion of the questionnaire (leaving 20% of the questions unanswered)
Age
No age limit
Gender
Both

Phase
N/A
Groups that have been masked
No information
Sample size
Target sample size: **60**
Randomization (investigator's opinion)
Not randomized
Randomization description
Blinding (investigator's opinion)
Not blinded
Blinding description
Placebo
Not used
Assignment
Parallel
Other design features

Secondary Ids

empty

Ethics committees

1

Ethics committee
Name of ethics committee
Ethics committee of Shiraz University of Medical Sciences
Street address
Namazi Square
City
Shiraz
Province
Fars
Postal code
7193613119
Approval date
2026-06-14, 1405/03/24
Ethics committee reference number
IR.NASRME.REC.1405.016

Health conditions studied

1

Description of health condition studied
Training undergraduate nursing students on how to use a hemodialysis machine
ICD-10 code
ICD-10 code description

Primary outcomes

1

Description
The main outcome of student learning in the field of preparing, setting, and priming a hemodialysis machine will be measured using a test designed by the researcher before and immediately after the educational intervention. The learning score and the rate of change in score from pre-test to post-test will be compared in the three groups of virtual reality, augmented reality, and film. In the proposal, learning is also defined operationally based on the scores and difference in scores of the initial and final tests.
Timepoint
Before the intervention and immediately after the educational intervention
Method of measurement
Students’ learning regarding the setup and priming of the hemodialysis machine will be measured using a

researcher-designed knowledge test. The test will be administered before the intervention as a pre-test and immediately after the intervention as a post-test. The change in learning scores will be compared among the three groups.

Secondary outcomes

1

Description
Educational satisfaction: The level of students' satisfaction with the educational method received, which will be measured immediately after the intervention using the "Educational Satisfaction Scale" and the scores of the three groups will be compared with each other.
Timepoint
Before the intervention and immediately after the educational intervention
Method of measurement
Educational satisfaction: The level of students' satisfaction with the educational method received, which will be measured immediately after the intervention using the "Educational Satisfaction Scale" and the scores of the three groups will be compared with each other.

2

Description
Self-efficacy: The level of students' self-efficacy after receiving the education, which will be measured using the Schwartz and Jerusalem General Self-Efficacy Scale (1981)
Timepoint
Before the intervention and immediately after the educational intervention
Method of measurement
The level of students' self-efficacy after receiving the education, which will be measured using the Schwartz and Jerusalem General Self-Efficacy Scale (1981)

3

Description
Critical Thinking Propensity:The level of students' tendency to think critically after the educational intervention, which will be measured using the Ritex Critical Thinking Propensity Questionnaire (2003).
Timepoint
Before the intervention and immediately after the educational intervention
Method of measurement
The level of students' tendency to think critically after the educational intervention, which will be measured using the Ritex Critical Thinking Propensity Questionnaire (2003).

Intervention groups

1

Description
Intervention group 1: education is provided using Virtual Reality (VR). The educational content is presented as a 360-degree video. Each student individually views the educational content in a quiet environment with safety principles observed, using a dedicated virtual reality headset.
Category
Other

2

Description
Intervention group 2: Education is provided using Augmented Reality (AR). The educational content is presented as an interactive video incorporating digital information layers into the real environment. Each student individually views the educational content using a dedicated headset
Category
Other

3

Description
Intervention group 3: Education is provided using an educational video. The video contains the same educational content as that provided to the first group and is recorded using a camera in the School of Nursing and Midwifery at Shiraz University of Medical Sciences, with the presence of an instructor.
Category
Other

Recruitment centers

1

Recruitment center
Name of recruitment center
School of Nursing and Midwifery, Shiraz University of Medical Sciences
Full name of responsible person
Zeinat Mohebbi
Street address
School of Nursing and Midwifery, Nemazee Hospital, Nemazee Sq., Shiraz, Iran
City
Shiraz
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Postal code
7193613119
Phone
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Email
zmohebi@sums.ac.ir

Sponsors / Funding sources

1

Sponsor

Name of organization / entity
Shiraz University of Medical Sciences
Full name of responsible person
Hamid Mohammadi
Street address
School of Nursing and Midwifery, Nemazee Hospital, Nemazee Sq., Shiraz, Iran
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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
Shiraz 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
Shiraz University of Medical Sciences
Full name of responsible person
Zinat Mohebbi
Position
Associate Professor
Latest degree
Ph.D.
Other areas of specialty/work
Nursery
Street address
School of Nursing and Midwifery, Nemazee Hospital, Nemazee Sq., Shiraz, Iran
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Person responsible for scientific inquiries

Contact

Name of organization / entity
Shiraz University of Medical Sciences
Full name of responsible person
Zinat Mohebbi
Position
Associate professor
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Ph.D.
Other areas of specialty/work
Nursery
Street address
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Shiraz
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Person responsible for updating data

Contact

Name of organization / entity
Shiraz University of Medical Sciences
Full name of responsible person
Zinat Mohebbi
Position
Associate Professor
Latest degree
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Other areas of specialty/work
Nursery
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Sharing plan

Deidentified Individual Participant Data Set (IPD)
Yes - There is a plan to make this available

Study Protocol
Yes - There is a plan to make this available

Statistical Analysis Plan

Yes - There is a plan to make this available

Informed Consent Form

Yes - There is a plan to make this available

Clinical Study Report

Yes - There is a plan to make this available

Analytic Code

Not applicable

Data Dictionary

Not applicable

Title and more details about the data/document

The study protocol includes information on the clinical trial design and methodology, study population and sample, inclusion and exclusion criteria, participant allocation to the intervention groups, educational methods based on virtual reality, augmented reality, and video-based training, data collection instruments, assessed outcomes, and the timing of outcome assessments. The statistical analysis plan includes the predefined methods for analyzing the study data, including descriptive analysis of demographic and study variables, assessment of data distribution, selection of appropriate statistical tests for comparing the three educational groups, and analysis of the study outcomes.

When the data will become available and for how long

Access period starts 12 months after results are published.

To whom data/document is available

Eligible researchers and members of research teams who submit a valid research request specifying the purpose and intended use of the data may access the de-identified individual participant data and study documents, subject to approval by the principal investigator and compliance with confidentiality and participant privacy requirements.

Under which criteria data/document could be used

Individual participant data will be available in a de-identified form and solely for research purposes and statistical analyses related to the study topic. Access to the data will require a valid research request specifying the purpose and proposed analysis, compliance with confidentiality and participant privacy requirements, obtaining necessary approvals from relevant authorities, and approval by the principal investigator. Use of the data for non-research or commercial purposes, or for any activity that could directly or indirectly identify participants, will not be permitted.

From where data/document is obtainable

Requests for access to de-identified individual participant data and other study documents should be submitted to the principal investigator of the study. Requests will be reviewed based on the research purpose, proposed use of the data, and compliance with confidentiality and participant privacy requirements. Upon approval by the principal investigator and obtaining the necessary permissions, the requested data will be provided to the applicant.

What processes are involved for a request to access data/document

The requester should submit a request to the principal investigator, specifying the research purpose, intended use of the data, and proposed analyses. The request will be reviewed for scientific relevance, compliance with confidentiality and participant privacy requirements, and consistency with the study objectives. Upon approval by the principal investigator and obtaining the necessary permissions, the de-identified data will be provided to the requester.

Comments