

Can AI-assisted virtual and augmented reality training improve severe pelvic trauma training for international medical students?

Submission date 14/10/2026	Recruitment status No longer recruiting	☐ Prospectively registered
		☐ Protocol
Registration date 14/10/2026	Overall study status Completed	☐ Statistical analysis plan
		☐ Results
Last Edited 14/10/2026	Condition category Injury, Occupational Diseases, Poisoning	☐ Individual participant data
		☒ Record updated in last year

Plain English summary of protocol

Background and study aims

Severe pelvic trauma is a serious injury that requires healthcare professionals to assess patients quickly, make important treatment decisions, and carry out practical procedures. Traditional teaching methods can make it difficult for medical students to practise these skills in realistic situations. New technologies such as virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) may offer a more interactive way to learn and provide immediate feedback during training.

This study investigated whether AI-assisted VR and AR training could improve the ability of international medical students to manage severe pelvic trauma compared with conventional teaching methods.

Who can participate?

Adults aged 18 to 30 years who were enrolled in the English-language Clinical Medicine programme at Nanjing Medical University could take part. Participants had to have completed relevant courses in anatomy, physiology, pathophysiology, and basic clinical skills, and be willing to provide informed consent.

People were not eligible if they had already received VR- or AR-based training in severe pelvic trauma or if they experienced motion sickness that prevented them from using a head-mounted display.

What does the study involve?

Participants first completed a structured assessment of their severe pelvic trauma management skills.

They were then randomly assigned to one of two training groups. Both groups received around 80 minutes of teaching and covered the same learning objectives.

Participants in the AI-assisted VR-AR group received a 20-minute theory session followed by 60 minutes of VR and AR simulation training. During the training, they managed simulated severe pelvic trauma cases and received real-time feedback from an AI system.

Participants in the conventional training group received a 20-minute theory session followed by 60 minutes of faculty-led case-based practical training without the VR-AR system.

Immediately after training, all participants completed a three-station assessment that tested their ability to gather clinical information, make diagnostic and treatment decisions, and perform practical procedures. Assessors who did not know which training group participants had been assigned to scored their performance.

What are the possible benefits and risks of participating?

Participants may have benefited from additional training in the management of severe pelvic trauma and gained experience through either simulation-based or conventional teaching methods. Those in the AI-assisted VR-AR group may also have benefited from receiving immediate feedback during training.

The risks were expected to be low. However, some participants could experience discomfort or motion sickness when using VR or AR equipment. Individuals with motion sickness severe enough to prevent use of a head-mounted display were excluded from participation.

Where is the study run from?

The study was run at the First Affiliated Hospital of Nanjing Medical University in Nanjing, China.

When is the study starting and how long is it expected to run for?

February 2026 to May 2026.

Who is funding the study?

The study is funded by the National Natural Science Foundation of China and the Natural Science Foundation of Jiangsu Province.

Who is the main contact?

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Study information

Scientific Title

Effect of artificial intelligence-assisted virtual and augmented reality training versus conventional training on post-training severe pelvic trauma management performance in international medical students: a parallel-group randomized controlled trial

Study objectives

The primary objective was to compare the effect of integrated artificial intelligence (AI)-assisted virtual reality and augmented reality (VR-AR) training with conventional instruction on immediate simulated clinical performance in the management of severe pelvic trauma among international medical students. Secondary objectives included evaluating learners' perceptions of the VR-AR training experience, including realism, usability, engagement, confidence, perceived usefulness of AI-assisted feedback, and training-related physical symptoms.

Ethics approval required

Ethics approval required

Ethics approval(s)

Approved 03/03/2023, Ethics Committee of Nanjing Medical University (No. 101 Longmian Avenue, Jiangning District, Nanjing, 211166, China; +86 25 86869732; njmucrec@njmu.edu.cn), ref: 2023-418

Primary study design

Interventional

Allocation

Randomized controlled trial

Masking

Blinded (masking used)

Control

Active

Assignment

Parallel

Purpose

Supportive care, Treatment

Study type(s)

Health condition(s) or problem(s) studied

Medical education and clinical skills training in severe pelvic trauma management

Interventions

Following completion of the baseline assessment, participants were randomly assigned in a 1:1 ratio to either the AI-assisted VR–AR training group or the conventional instruction group using a computer-generated randomization sequence prepared by a research team member independent of recruitment and outcome assessment. Allocation was concealed using sequentially numbered, opaque, sealed envelopes, which were opened after the baseline assessment.

Intervention group: Participants received approximately 80 minutes of instruction, comprising a 20-minute standardized theory reinforcement session followed by 60 minutes of AI-assisted VR–AR practical training for the management of severe pelvic trauma. The intervention combined desktop VR and head-mounted AR simulation and was designed around simulated severe pelvic trauma scenarios. Participants practised clinical assessment, information acquisition, diagnostic and treatment decision-making, and procedural management. Real-time AI-assisted feedback was incorporated into the training to help learners identify errors during practice and make timely corrections and improvements.

Control group: Participants received approximately 80 minutes of instruction, comprising a 20-minute standardized theory reinforcement session followed by 60 minutes of structured, faculty-guided case-based practical training for the management of severe pelvic trauma. The control group covered the same core learning objectives as the intervention group but did not use the AI-assisted VR–AR training system.

Both groups received instruction of approximately equal duration and addressing the same core learning objectives. Participants underwent a study-specific three-station structured performance assessment before randomization and immediately after completion of the assigned training. Post-training clinical performance was independently scored by two assessors who were blinded to group allocation, using coded participant identifiers without group information.

Intervention Type

Other

Primary outcome(s)

1. Total score for simulated severe pelvic trauma management measured using a study-specific three-station structured assessment of severe pelvic trauma management (score range, 0–100). Performance was independently rated by two blinded assessors, and the mean of the two assessors' ratings was used as the participant-level score at immediately after completion of the assigned training intervention; baseline performance was assessed before randomization for adjustment in the primary analysis

Key secondary outcome(s)

1. Clinical information acquisition domain score measured using the study-specific three-station structured assessment (score range, 0–30). The participant-level score was the mean of the two blinded assessors' ratings at immediately after completion of the assigned training intervention; baseline performance was assessed before randomization
2. Diagnostic and treatment decision-making domain score measured using the study-specific three-station structured assessment (score range, 0–40). The participant-level score was the mean of the two blinded assessors' ratings at immediately after completion of the assigned training intervention; baseline performance was assessed before randomization
3. Hands-on procedural performance domain score measured using the study-specific three-station structured assessment (score range, 0–30). The participant-level score was the mean of the two blinded assessors' ratings at immediately after completion of the assigned training intervention; baseline performance was assessed before randomization

Completion date

21/05/2026

Eligibility**Key inclusion criteria**

1. International medical students enrolled in the English-taught Clinical Medicine program at the International Education College, Nanjing Medical University
2. Completion of prerequisite courses in anatomy, physiology, pathophysiology, and basic clinical skills before entering clinical training
3. Willingness to participate voluntarily and provision of written informed consent before enrollment

Healthy volunteers allowed

Yes

Age group

Adult

Lower age limit

18 Years

Upper age limit

30 Years

Sex

All

Total final enrolment

49

Key exclusion criteria

1. Previous VR- or AR-based training specifically addressing severe pelvic trauma
2. Self-reported motion sickness that precluded the use of a head-mounted display

Date of first enrolment

26/02/2026

Date of final enrolment

24/04/2026

Locations

Countries of recruitment

China

Study participating centre

the First Affiliated Hospital with Nanjing Medical University

300 Guangzhou Road, Nanjing, Jiangsu Province

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China

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Sponsor information

Organisation

Nanjing Medical University

ROR

<https://ror.org/059gcgy73>

Funder(s)

Funder type**Funder Name**

National Natural Science Foundation of China

Alternative Name(s)

Chinese National Science Foundation, Natural Science Foundation of China, National Science Foundation of China, NNSF of China, NSF of China, National Nature Science Foundation of China, Guójiā Zìrán Kēxué Jījīn Wěiyuánhùi, , NSFC, NNSF, NNSFC

Funding Body Type

Government organisation

Funding Body Subtype

National government

Location

China

Funder Name

Natural Science Foundation of Jiangsu Province

Alternative Name(s)

Jiangsu Provincial Natural Science Foundation, Jiangsu Province Natural Science Foundation, Jiangsu Natural Science Foundation

Funding Body Type

Government organisation

Funding Body Subtype

Local government

Location

China

Results and Publications

Individual participant data (IPD) sharing plan**IPD sharing plan summary**

Not expected to be made available