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Preparing nursing students for catheter care using immersive 360-degree videos or conventional simulation

Submission date 27/11/2026	**Recruitment status** No longer recruiting	[_] Prospectively registered [_] Protocol
Registration date 27/11/2026	**Overall study status** Completed	[_] Statistical analysis plan [_] Results
Last Edited 27/11/2026	**Condition category** Other	[_] Individual participant data [X] Record updated in last year

Plain English summary of protocol

Background and study aims
This study investigates whether preparing nursing students using immersive 360-degree video-based training leads to better performance in simulated catheter-related care than conventional simulation-based training when students later complete an unfamiliar clinical scenario. The study also examines performance in an earlier scenario, changes in performance over time, and the frequency of procedural errors recorded by independent assessors.

Who will participate?
Second-year Bachelor of Nursing students aged 18 years or older enrolled in the Clinical Simulation I course at the Universidad Católica San Antonio de Murcia (UCAM), Spain, who attended the scheduled training sessions and provided written informed consent, including consent for video recording.

What does the study involve?
Teaching subgroups were randomly allocated to one of two preparation programmes. One programme used immersive 360-degree video demonstrations with questions, feedback and instructor-led discussion. The other programme used live demonstrations and hands-on practice with task trainers, followed by feedback and discussion. Both programmes lasted four hours and covered urinary, nasogastric and rectal catheterisation and related care. One week later, all students attended the same practical seminar.

Students then took part in two simulated clinical scenarios within a ten-week teaching module. The first scenario was completed during course sessions 7 or 8 and the second during sessions 9 or 10, approximately two weeks later. Students performed catheter-related tasks including insertion, ongoing care, removal and assisting another student. The simulations were video-recorded and assessed independently by two external assessors who were unaware of programme allocation. Performance scores and recorded errors were compared between the two preparation programmes.

What are the possible benefits and risks of participating?
Students may have benefited from additional learning opportunities and feedback provided through the training and simulation activities. The study did not involve real patients and assessments were conducted in a simulated educational environment. Risks were limited to those normally associated with participation in educational simulation activities and video recording.

Where is the study run from?
Faculty of Nursing, Universidad Católica San Antonio de Murcia</Sponsor Organisation> (UCAM), Murcia, Spain.

When is the study starting and how long is it expected to run for?
The study recruited participants between February 2026 and May 2026. Follow-up assessments were completed within the ten-week curricular module, and the study is complete.

Who is funding the study?
Universidad Católica San Antonio de Murcia</Sponsor Organisation>.

Who is the main contact?
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Additional identifiers

Local protocol identifier
CE012606-CAT360-MAB

Open Science Framework registration DOI
https://doi.org/10.17605/OSF.IO/892M3

Study information

Scientific Title
Immersive 360° video preparation and nursing students' simulated performance in catheterisation and related care: a follow-up analysis of a cluster randomised trial

Study objectives
To compare two complete preparation programmes in nursing students' performance in an unfamiliar second simulated clinical scenario, analysing catheter insertion, ongoing care, removal and assistance separately. Complementary outcomes comprise first-scenario performance, within-student changes across two scenarios, and assessor-specific recorded errors.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 30/01/2026, Comité de Ética de la Investigación de la UCAM (Research Ethics Committee of UCAM) (Universidad Católica San Antonio de Murcia, Campus de los Jerónimos, Guadalupe, Murcia, 30107, Spain; +34 968278828; comite_etica@ucam.edu), ref: CE012606

Primary study design
Interventional

Allocation
Randomized controlled trial

Masking
Blinded (masking used)

Control
Active

Assignment
Parallel

Purpose
Nursing education and simulated procedural performance

Study type(s)

Health condition(s) or problem(s) studied
Nursing students' simulated catheterisation and related care skills

Interventions
This is retrospective registration of the catheterisation-related simulation follow-up of a cluster randomised educational study. Data collection, video assessment and analysis preceded registration. No new recruitment or randomisation occurred for the follow-up.

In Clinical Simulation I, established teaching subgroups within four curricular groups were randomly allocated to two preparation programs, with 16 subgroups per program. An investigator uninvolved in teaching, assessment or analysis generated the allocation list. A research-team investigator not involved in teaching or assessment held the list and informed instructors before the first session. Students and instructors knew the program allocation. Students had not practiced the studied catheterization procedures or used virtual reality before the study training.

Both preparation programs lasted four scheduled hours and covered urinary, nasogastric and rectal catheterization and related care. Immersive preparation combined 360-degree demonstrations, procedural questions, explanatory feedback and instructor-led debriefing without handling equipment. Conventional preparation used live demonstrations and task-trainer practice with supplies, peer observation, feedback and debriefing. One week later, both programs attended the same four-hour practical seminar, including approximately 60 minutes of theory and 50 minutes of paired physical practice followed by course skills and knowledge assessments. Those course assessments are not outcomes of the present scenario follow-up. Individual practice time was not measured.

The clinical simulation block began three weeks after the common seminar. Each student participated in two scenarios separated by two weeks within the ten-week curricular module. First-scenario assessments occurred in course sessions 7 or 8; the corresponding second-scenario assessments occurred in sessions 9 or 10. For the first scenario, students received the clinical case one week in advance and performed four nursing interventions in approximately 10 to 15 minutes. For the second, students received an unfamiliar case ten minutes beforehand and performed eight interventions in approximately 25 to 30 minutes. Both programs received debriefing after each scenario. Scenario assessments used a Nursing Anne manikin in a simulated hospital-room setting. The first scenario was not a pre-intervention baseline. The comparison concerns complete preparation programs within continued teaching; it does not isolate a video effect, retention without reinforcement or transfer to patient care.

The teaching group was involved in two catheterization-related assessments: as performers and assistants. Others undertook different curricular interventions. Part of the performer cohort were assigned to insertion, others to ongoing care and to removal. Role, partner and catheter type were retained across scenarios.

Two independent external assessors (E1 and E2), blinded to program allocation and each other's ratings, reviewed the recordings. Insertion, ongoing care, removal and assistance were analyzed separately. Performer scores were the unrounded mean of two assessor totals, each total being the mean of ten items scored from 0 to 10. Assistant scores were the mean of the two recorded overall ratings; assistant item-level ratings were unavailable and were not reconstructed. Higher

scores indicate better performance. No missing scores were imputed. The four second-scenario scores form the primary reporting family. First-scenario scores, within-student changes and assessor-specific recorded errors provide complementary outcomes.

E1 and E2 independently recorded whether each performance contained at least one error, separately from rubric scores. A zero means no error was recorded by that assessor, not proof of no underlying risk. Performer and assistant error records remain separate. A third calibrated assessor (E3) subsequently reviewed performer recordings only; E3 analyses are supplementary and do not replace E1/E2 outcomes. Original video assessment occurred during June to August 2026, and supplementary E3 review occurred in September 2026. The study completion date reflects the last student session and collection of participant recordings, not later scoring or analysis.

For each task and scenario, program comparisons used ordinary least-squares models adjusted for catheter type, with standard errors clustered by teaching subgroup, CR1 correction and t degrees of freedom equal to the number of represented subgroups minus one. Paired-change models used one within-student difference per participant. Holm correction covered the four tasks separately for each scenario and for changes. Error proportions were analyzed separately by assessor and scenario using cluster-level permutation comparisons. Assessor agreement, item profiles, outcome intracluster correlations and sensitivity analyses were supplementary; no real-patient outcomes were measured.

Intervention Type
Behavioural

Primary outcome(s)
1. Catheter insertion performance score in the second simulated scenario measured using scoring undertaken by the independent assessors E1 and E2, blinded to program allocation, at the second simulated clinical scenario (course session 9 or 10), two weeks after the first scenario, within the ten-week curricular module

2. Ongoing catheter care performance score in the second simulated scenario measured using scoring undertaken by the independent assessors E1 and E2, blinded to program allocation, at the second simulated clinical scenario (course session 9 or 10), two weeks after the first scenario, within the ten-week curricular module

3. Catheter removal performance score in the second simulated scenario measured using scoring undertaken by the independent assessors E1 and E2, blinded to program allocation, at the second simulated clinical scenario (course session 9 or 10), two weeks after the first scenario, within the ten-week curricular module

4. Assistance performance score in the second simulated scenario measured using scoring undertaken by the independent assessors E1 and E2, blinded to program allocation, at the second simulated clinical scenario (course session 9 or 10), two weeks after the first scenario, within the ten-week curricular module

Key secondary outcome(s)
1. Catheter insertion performance score in the first simulated scenario measured using scoring undertaken by the independent assessors E1 and E2, blinded to program allocation, at the first simulated clinical scenario (course session 7 or 8), within the ten-week curricular module

2. Ongoing catheter care performance score in the first simulated scenario measured using scoring undertaken by the independent assessors E1 and E2, blinded to program allocation, at the first simulated clinical scenario (course session 7 or 8), within the ten-week curricular module

3. Catheter removal performance score in the first simulated scenario measured using scoring undertaken by the independent assessors E1 and E2, blinded to program allocation, at the first simulated clinical scenario (course session 7 or 8), within the ten-week curricular module

4. Assistance performance score in the first simulated scenario measured using scoring undertaken by the independent assessors E1 and E2, blinded to program allocation, at the first simulated clinical scenario (course session 7 or 8), within the ten-week curricular module

5. Within-student change in catheter insertion performance score measured using scoring undertaken by the independent assessors E1 and E2, blinded to program allocation, each score ten task-specific rubric items from 0 to 10 in half-point increments at the first simulated clinical scenario (course session 7 or 8) to the second (session 9 or 10), a scheduled interval of two weeks

6. Within-student change in ongoing catheter care performance score measured using scoring undertaken by the independent assessors E1 and E2, blinded to program allocation, each score ten task-specific rubric items from 0 to 10 in half-point increments at the first simulated clinical scenario (course session 7 or 8) to the second (session 9 or 10), a scheduled interval of two weeks

7. Within-student change in catheter removal performance score measured using scoring undertaken by the independent assessors E1 and E2, blinded to program allocation, each score ten task-specific rubric items from 0 to 10 in half-point increments at the first simulated clinical scenario (course session 7 or 8) to the second (session 9 or 10), a scheduled interval of two weeks

8. Within-student change in assistance performance score measured using scoring undertaken by independent assessors E1 and E2, blinded to program allocation, at the first simulated clinical scenario (course session 7 or 8) to the second (session 9 or 10), a scheduled interval of two weeks

9. Percentage of performer performances with at least one error recorded by blinded assessor E1, measured using independent assessor classification of whether one or more errors were observed during each performance (0-100%, with lower percentages indicating fewer performances with recorded errors), at the first scenario (course session 7 or 8) and second scenario (course session 9 or 10), approximately two weeks apart within the ten-week curricular module

10. Percentage of performer performances with at least one error recorded by blinded assessor E2, measured using independent assessor classification of whether one or more errors were observed during each performance (0-100%, with lower percentages indicating fewer performances with recorded errors), at the first scenario (course session 7 or 8) and second scenario (course session 9 or 10), approximately two weeks apart within the ten-week curricular module

11. Percentage of assistant performances with at least one error recorded by blinded assessor E1, measured using independent assessor classification of whether one or more errors were observed during each performance (0-100%, with lower percentages indicating fewer performances with recorded errors), at the first scenario (course session 7 or 8) and second scenario (course session 9 or 10), approximately two weeks apart within the ten-week curricular module

12. Percentage of assistant performances with at least one error recorded by blinded assessor E2, measured using independent assessor classification of whether one or more errors were observed during each performance (0-100%, with lower percentages indicating fewer performances with recorded errors), at the first scenario (course session 7 or 8) and second scenario (course session 9 or 10), approximately two weeks apart within the ten-week curricular module

Completion date
29/05/2026

Eligibility

Key inclusion criteria
1. Second-year Bachelor of Nursing students aged 18 years or older enrolled in Clinical Simulation I at UCAM.
2. Attendance at the scheduled training sessions.
3. Written informed consent, including video recording and assessment for research purposes.
No upper age limit was specified.

Healthy volunteers allowed
Yes

Age group
Mixed

Lower age limit
18 Years

Upper age limit
120 Years

Sex
All

Total final enrolment
443

Key exclusion criteria
Not meeting the key inclusion criteria

Date of first enrolment
02/02/2026

Date of final enrolment
29/05/2026

Locations

Countries of recruitment
Spain

Study participating centre
Faculty of Nursing, Universidad Católica San Antonio de Murcia (UCAM)
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Sponsor information

Organisation
Universidad Católica San Antonio de Murcia

Funder(s)

Funder type

Funder Name
Universidad Católica San Antonio de Murcia

Results and Publications

Individual participant data (IPD) sharing plan
De-identified analytical records are available from the corresponding author, Eloina Valero-Merlos (evalero@ucam.edu), on reasonable request, subject to institutional approval and applicable consent conditions. Individual educational records, source sheets and videos are restricted because of participant confidentiality and consent conditions. Assessment rubrics, statistical methods and aggregate results accompany the article. Analysis code and machine-readable aggregate outputs are available from the corresponding author on reasonable request.

Requests: Requests should be addressed to the corresponding author, Eloina Valero-Merlos (evalero@ucam.edu). Access is subject to institutional approval and applicable consent conditions. Individual educational records, source sheets and videos are restricted to protect confidentiality.

No fixed access period has been specified.

IPD sharing plan summary
Available on request