

Combining virtual patients with simulation-based education: does order matter? A quantitative multi-method study

Submission date 24/07/2026	Recruitment status No longer recruiting	☐ Prospectively registered ☐ Protocol
Registration date 30/07/2026	Overall study status Completed	☐ Statistical analysis plan ☐ Results
Last Edited 07/09/2026	Condition category Other	☐ Individual participant data ☒ Record updated in last year

Plain English summary of protocol
Not provided at time of registration

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Study information

Scientific Title

Virtual patients combined with EPA 6 simulation training for medical students

Study objectives

Ethics approval required

Ethics approval required

Ethics approval(s)

Approved 31/01/2023, Cantonal Ethics Committee Bern (KEK) (Murtenstrasse 31, Bern, 3010, Switzerland; +41 31 633 70 70; info.kek@be.ch), ref: BASEC-No: Req-2023-00138

Primary study design

Interventional

Allocation

Randomized controlled trial

Masking

Blinded (masking used)

Control

Active

Assignment

Crossover

Purpose

To generate evidence on the optimal sequencing and implementation of a blended learning approach combining virtual patients and simulation-based education within a self-directed learning framework in undergraduate medical education.

Study type(s)

Health condition(s) or problem(s) studied

Blended learning with virtual patients and simulation-based education in undergraduate medical education.

Interventions

Intervention:

Pre-existing student groups were randomized to one of two educational sequences: (1) completion of a virtual patient (VP) module before participation in simulation-based education (SBE) or (2) completion of the same VP module after SBE.

The VP module consisted of three standardized virtual patient cases delivered through a digital learning platform. Upon completion of the module, the platform automatically recorded participants' learning analytics individually, including completion of all three cases, case success rates, and processing time.

All participants completed the same face-to-face SBE course, consisting of three standardised team-based simulation scenarios, each assessed by one facilitator. The intervention differed only in the timing of the VP module relative to the SBE session.

Primary outcomes included objective assessment of team performance during the simulation. Secondary outcomes included participants' self-assessed confidence and perceived competence regarding the learning objectives. Self-assessments were conducted before and after the educational intervention. The total duration of participation comprised completion of the VP module, participation in the SBE course, and pre- and post-intervention self-assessments, all completed within a single study period during the students' last study term.

Originally, the study comprised the subsequent objective structured clinical examination (OSCE), as part of the planned follow-up outcome. This analysis could not be conducted because the OSCE dataset was no longer available due to institutional reorganisation. Consequently, the present study is limited to the evaluation of immediate educational outcomes and cannot determine whether the observed effects translated into subsequent objective clinical performance.

Intervention Type

Behavioural

Primary outcome(s)

1. Facilitator assessments measured using a study-specific questionnaire comprising items aligned with the nine predefined learning objectives of the virtual patient (VP) cases, with responses recorded on a 5-point Likert scale, at immediately after each of three simulation-based education session
2. VP processing measured using automated recording of VP log data, including processing time, completion status and success rates. Log data were linked with simulation-based education participation dates to determine whether the VP cases were completed before or after the simulation session, and collected at the end of the study
3. Self-assessments confidence measured using a study-specific standardized questionnaire: Students rated their expectations regarding the impact of the VP cases on their confidence and the extent to which these expectations were fulfilled using a 5-point Likert scale, at baseline (immediately before the intervention) and immediately after completion of both the three VP cases and the three simulation-based education sessions
4. Self-assessment competencies measured using a study-specific standardized questionnaire. Students rated their expectations regarding the impact of the VP cases on achieving each of the nine predefined learning objectives and the extent to which these expectations were fulfilled using a 3-point Likert scale, at baseline, immediately before the blended learning intervention

and the extent to which these expectations were fulfilled immediately after completion of both the three VP cases and the three simulation sessions

5. Blended learning perception measured using a study-specific standardized questionnaire. Participants rated the overall blended learning format and the perceived impact of the VP cases within, on a 3-point Likert scale, at immediately after completion of both the VP cases and the simulation-based education session

Key secondary outcome(s)

1. Self-reported confidence related to the predefined learning objectives measured using a study-specific questionnaire assessing confidence regarding each of the nine learning objectives on a 5-point Likert scale, at baseline, immediately before the blended learning intervention and immediately after completion of both the VP cases and the simulation-based education session

2. Perceived contribution of the VP cases to achieving the predefined learning objectives measured using a study-specific questionnaire assessing the perceived contribution of the VP cases to each learning objective on a 3-point ordinal scale, at completion of both the VP cases and the simulation-based education session

3. VP engagement measured using automatically recorded VP processing data, including completion status, processing time, success rates, and completion before or after the simulation-based education session, determined by linking platform log data with simulation participation dates, at the end of the simulation-based education session

Completion date

30/06/2023

Eligibility

Key inclusion criteria

1. Enrolled as an undergraduate medical student at the University of Bern
2. Enrolled in the sixth year of the undergraduate medical curriculum
3. Assigned to a pre-existing simulation group consisting of eight students for the scheduled simulation-based education session
4. Provision of written informed consent to participate in the study

Healthy volunteers allowed

Yes

Age group

Adult

Lower age limit

18 Years

Upper age limit

40 Years

Sex

All

Total final enrolment

240

Key exclusion criteria

1. Not enrolled as a sixth-year undergraduate medical student at the University of Bern
2. Not assigned to a scheduled simulation group

Date of first enrolment

19/03/2023

Date of final enrolment

24/04/2023

Locations**Countries of recruitment**

Switzerland

Sponsor information**Organisation**

University of Bern

ROR

<https://ror.org/02k7v4d05>

Funder(s)**Funder type****Funder Name**

University of Bern

Alternative Name(s)

UniBE, Universität Bern, Université de Berne, Universitas Bernensis, , UB

Funding Body Type

Government organisation

Funding Body Subtype

Universities (academic only)

Location

Switzerland

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary

Not expected to be made available

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Other files			29/07/2026	No	No