

A Multimodal Simulation Training Programme for Direct Anterior Approach Hemiarthroplasty

Development, Feasibility, and Preliminary Performance Analysis



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Introduction / Purpose

- The direct anterior approach (DAA) to hip hemiarthroplasty offers potential advantages in a frail fracture population, yet UK adoption remains below 5%.
- **The barrier is training, not evidence.** Registry data show a 64% increased revision risk in a surgeon's first 50 anterior hip cases. In a cohort with limited physiological reserve, these early-curve complications carry significant consequences.
- No structured multimodal simulation programme currently exists for this procedure.
- **This study develops and evaluates the first structured training pathway for DAA hemiarthroplasty.**

Method

Design

Prospective feasibility study at Imperial College London under ethics approval.

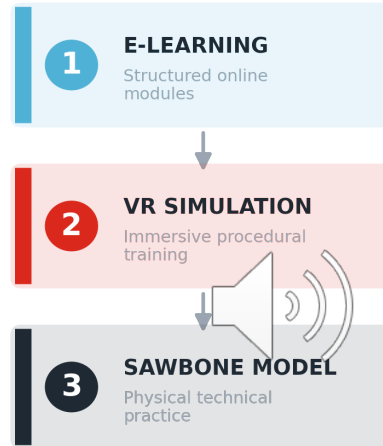
Participants

Orthopaedic trainees with no prior anterior hip experience, randomised to VR-first or sawbone-first training sequences.

The Training Environment



Three-Stage Programme



Assessment

- MCQ knowledge testing at multiple timepoints
- Hybrid OSATS-PBA framework
- Critical step checklist
- Objective VR-derived metrics, benchmarked against an expert reference for each procedural phase

Results

100%

of participants improved
after training

74%

mean reduction in excess
time above expert

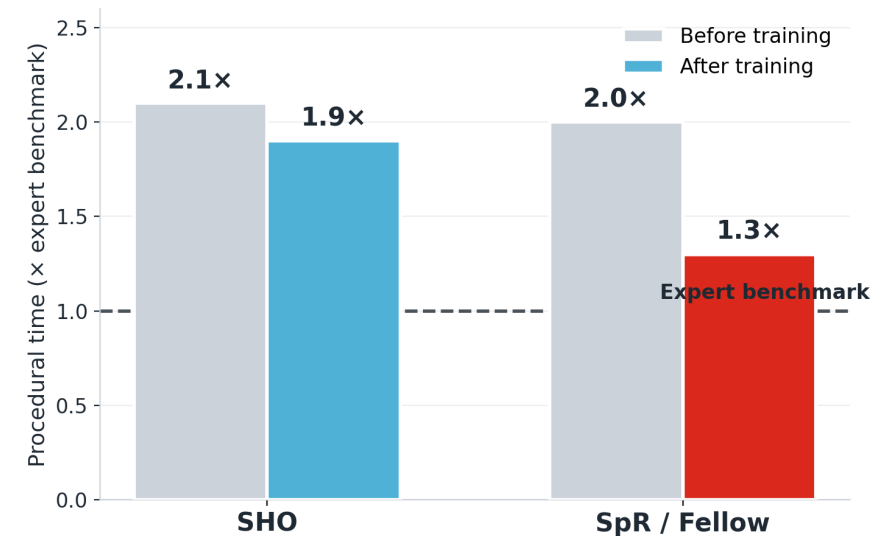
1.02x

best performer — within 2%
of expert benchmark

- A clear grade-dependent pattern emerged. SpR and fellow-level trainees approached the expert benchmark; SHOs improved but remained further from it.
- This suggests the programme amplifies existing surgical dexterity, supporting construct validity of the platform.
- Instrument drop rate was lower in sawbone-first trainees (0.8 vs 5.2), suggesting physical and virtual training contribute complementary skills.



Both grades improved — seniors reached near-expert level



Conclusion

Conclusions

- A structured multimodal training programme for DAA hemiarthroplasty is feasible and supports measurable improvements in simulated technical performance.
- More senior trainees approached expert benchmark performance following training.
- All participants demonstrated consistent within-subject progression, regardless of grade.



Implications

- Simulation-based training offers a scalable strategy to mitigate early learning curve risk in DAA hemiarthroplasty.
- Completion of the full cohort, including knowledge and OSATS-PBA outcomes, will inform progression to prospective clinical evaluation.

Simulation can take trainees through the most dangerous part of the learning curve — before any patient contact.

Summary & Acknowledgements

The first structured multimodal simulation pathway for direct anterior hemiarthroplasty is feasible, discriminates by training grade, and brings senior trainees close to expert benchmark performance before any patient contact.



Full cohort recruitment is ongoing, with knowledge and OSATS-PBA outcomes to follow. These data will form the basis of a prospective clinical evaluation.

Authors

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