

# Transfer of Surgical Skills: the Importance of Arthrosimulation Training for Orthopaedic Surgery Residents

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## Context

- **The learning curve** in arthroscopy is steep and tedious, and **surgical errors** are frequent in early training.
- Current residency programs are facing work hour restrictions, higher number of residents and an increase in the amount of knowledge and in the complexity of tasks.
- The **virtual arthroscopy simulator** offers a safe and realistic **training environment** that allows residents to achieve an adequate level of competency in arthroscopy before setting foot in the operating room.

## Objectives

- Evaluate the **transfer** of arthroscopic **skills** acquired on a virtual simulator to the operating room.
- Demonstrate the **relevance** of adding arthroscopic simulation **training** to an arthroscopy curriculum.
- **Hypothesis:** Arthroscopic training has a mesurable effect on residents skills in the operating room.

## Methods

- **Orthopaedic surgery residents** are being recruited from 3 universities in Quebec during the next 2 years.
- Residents are divided in **4 distinct groups** [table 1] based on their level of **training** and participation in a sports medicine rotation including an **arthroscopy simulation curriculum**. Information on prior experience is recorded through an online survey.
- Residents are filmed in the **operating room** and on a **virtual simulator** during a **knee diagnostic arthroscopy**. They will be asked to do the procedure following a standardized sequence of steps.
- 2 different views are used to analyze each session:
  - Arthroscopy screen [Figure 1].
  - Hands of the resident [Figure 2].
- Videos are combined picture-in-picture and analyzed by 2 independent observers using:
  - Simple visual parameters by Alvand et al. (2012) [Table 2].
  - ASSET evaluation tool by Koehler et al. (2013) [Table 3].

Table 1: Distribution of residents in 4 groups

Group	Level of training	Simulation curriculum
A	Senior (R4-R5)	No
B	Senior (R4-R5)	Yes
C	Junior (R2-R3)	No
D	Junior (R2-R3)	Yes

Table 2: Simple visual parameters of Alvand et al. (2012)

1. Prevalence of lookdowns.
2. Prevalence of instrument loss.
3. Triangulation time (total time of instrument loss / prevalence of instrument loss)

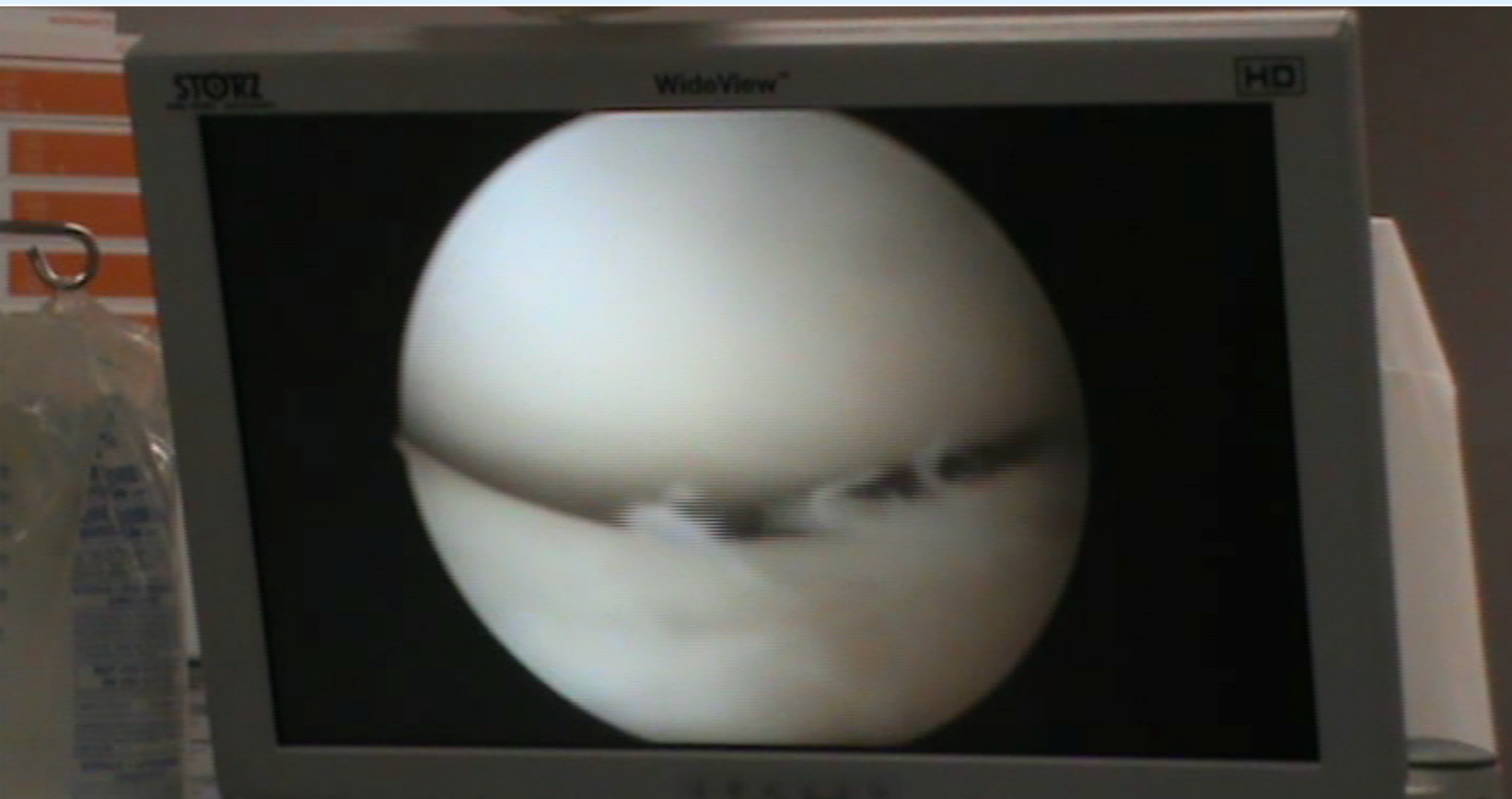


Figure 1: View from camera #1 showing the arthroscopy screen.



Figure 2: View from camera #2 showing the hands of the resident.

Table 3: Criteria evaluated on the global rating scale of the ASSET tool by Koehler et al. (2013)

1. Safety	4. Instrument dexterity	7. Quality of procedure
2. Field of view	5. Bimanual dexterity	8. Autonomy
3. Camera dexterity	6. Flow of procedure	Added complexity of procedure

## Results

- To evaluate the feasibility of our project, we first implemented a pilot with staff surgeons.
- **6 staff surgeons** (n=12 videos) from 4 teaching hospitals and **1 resident** excluded from the study were recruited and filmed for at least 1 knee diagnostic arthroscopy each.
- The chosen evaluation grids are adequate for our study. The 2 independent observers have followed a training protocol made available to us by the authors of the ASSET grid.
- A large gap in the scoring has been found between the various levels of training.
- An ANOVA will be used to test our hypothesis.
- Ethics has been approved at most sites and the **evaluation** of residents has started.

## Discussion

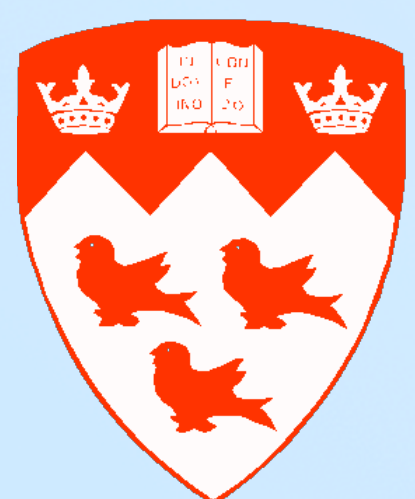
- We are studying a homogenous population of orthopaedic residents from 3 universities in the Province of Québec.
- The project is feasible and gaining momentum, yet we underestimated the amount of time needed for preparation, ethics approval, and recruitment.
- Preliminary ASSETS scores show a large gap between junior residents and staff in the operating room which leaves ample room for the results of the senior resident group and residents trained on the arthroscopy simulator.

## Conclusion

- We validated the application of the **ASSET grid** and **simple visual parameters** for the purposes of our study.
- **Recruitment** of residents is currently ongoing. Enthusiasm is present.
- Results of this study could help to justify dedicated simulation training time in residency programs.

## References

1. A. Alvand, T. Khan, S. Al-Ali, W. F. Jackson, A. J. Price, and J. L. Rees, 'Simple Visual Parameters for Objective Assessment of Arthroscopic Skill', *J Bone Joint Surg Am*, 94 (2012), e97.  
2. R. J. Koehler, S. Amsdell, E. A. Arendt, L. J. Bisson, J. P. Bramen, A. Butler, A. J. Cosgarea, C. D. Harner, W. E. Garrett, T. Olson, W. J. Warne, and G. T. Nicandri, 'The Arthroscopic Surgical Skill Evaluation Tool (Asset)', *Am J Sports Med*, 41 (2013), 1229-37.



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