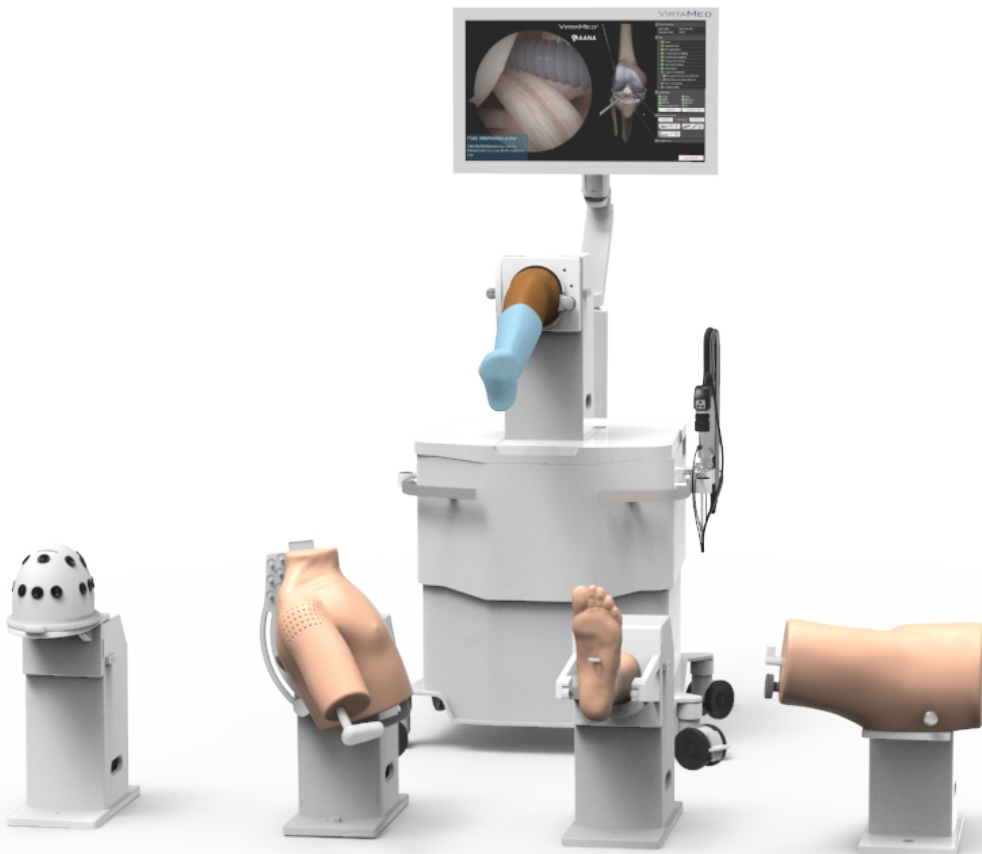




**VirtaMed ArthroS™**  
The most realistic arthroscopy simulator



Preferred simulation training partner of



**AGA**  
Gesellschaft für Arthroskopie  
und Gelenkchirurgie



# Why is medical training better with simulation?



## Prepare Trainees for Success

---

- Realistic instruments and highly-realistic graphics mean that skills transfer easily from the simulator to the OR.
- Anatomically correct models support life-like joint movement and realistic haptic feedback.
- Simulators offer risk-free and hands-on experience for trainees to make mistakes and test boundaries.
- Society-endorsed and proficiency-based courses motivate students to reach benchmarks.



## Save Money

---

- Simulation reduces long-term costs for personnel, materials, equipment, and operating-room time.
- Trainees enter the OR having already mastered the basics and can focus on learning more complex skills.
- Simulator-trained surgeons take less time to complete procedures in the OR and make fewer mistakes.
- All-in-one platform is compatible with other VirtaMed specialties such as gynecology, urology, and laparoscopy.



## Accelerate Training

---

- Quickly meet the ABOS-mandated requirement for skills training with our structured curriculum and FAST module.
- Trainees with regular access to a simulator progress faster, meaning they get into the OR sooner.
- Simulators can be used 24/7 so trainees can practice when and as often as they want.
- Objectively assess trainees' skills with impartial feedback reports; quickly identify areas for improvement.



## Support Better Patient Care

---

- Trainees will have mastered the basics prior to working with patients.
- Instructors can ensure trainees reach pre-defined standards before treating patients.
- Improve the overall patient experience with surgeons who are confident and comfortable with the procedure.

” Simulation shortened the learning curve because they could learn all the basic skills here in the lab. I didn't have to teach them in the theater, and it's also safer for patients [if surgeons are] able to come and practice on the simulator before trying a new technique.

— Professor Rob Middleton, Head of the Orthopaedic Research Institute, Bournemouth University.



# VirtaMed ArthroS™ FAST

In 2013 the Fundamentals of Arthroscopic Surgery Training (FAST) program was developed with the goal of improving and standardizing surgical education in the field of arthroscopy. VirtaMed has an exclusive partnership with Sawbones, and their FAST dome has been adapted for virtual reality simulation offering exciting new training opportunities.



## Learning objectives

- Control camera movements and center an image
- Control image orientation (i.e. camera horizon)
- Perform basic triangulation
- Minimize unnecessary movement of the scope
- Practice deliberate linear scope movements
- Track a moving target with the scope
- Correctly use the angled optics (i.e. periscoping)
- Find, grasp and manipulate objects

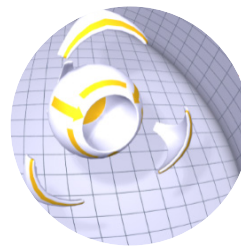
## Cases

- 8 cases with 136 exercises for camera navigation: image centering, horizon control and periscoping
- 8 cases with 164 exercises for basic bi-manual skills: triangulation, probing, and grasping



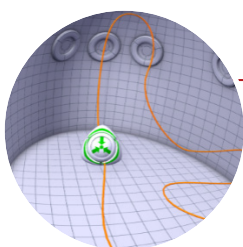
### Image Centering

Get familiar with horizon alignment and image steadiness



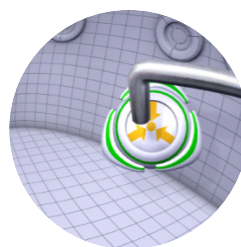
### Camera Alignment

Correctly perform camera alignment using both portals



### Object Tracking

Visualize, track and center a moving object



### Triangulation

Practice triangulation skills by combining the camera and a probe.

## Hardware

- FAST workstation gives your trainees diverse training scenarios
- Instruments adapted for virtual reality provide metrics to measure performance
- Supports ambidextrous training



# VirtaMed ArthroS™ Knee

Trainees have the chance to perform complete diagnostic arthroscopic interventions on numerous and diverse patient cases. Mastering these basic tasks enables trainees to perform a complete knee arthroscopy more easily, efficiently and safely.

## Courses

- Knee Basic Skills Course
- Knee Course in Diagnostics
- Knee Advanced Course in Diagnostics
- Knee Advanced Course
- AANA Knee Course
- Balgrist Knee Arthroscopy Course

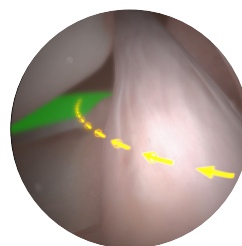
## Cases

- 12 cases for basic skills training: guided diagnostics, triangulation, and therapeutic arthroscopies
- 19 cases for diagnostic arthroscopy: different meniscus lesions, unhappy triad, arthrosis grade I-IV, synovitis
- 11 cases for therapeutic arthroscopy: different meniscus lesions, combined arthrosis and tears, synovitis, and loose body removals



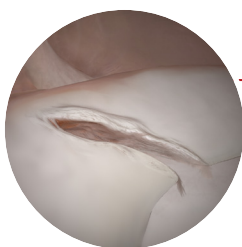
### Arthroscopy Basic Skills

Learn instrument handling and triangulation skills while avoiding cartilage damage



### Guided Diagnostic Tours

Get familiar with the arthroscopic anatomy and learn to visualize relevant structures



### Diagnostic Cases

Visualize and palpate various pathologies in the knee joint including arthrosis, meniscus lesions, etc.

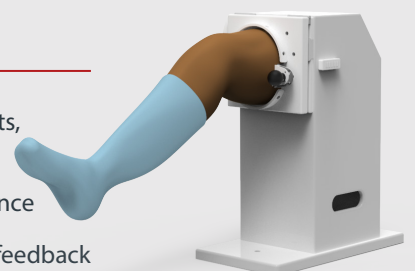


### Therapeutic Cases

Master different complete therapeutic procedures such as meniscectomy or loose body removal

## Hardware

- Anatomic right knee model allows for physical manipulation of the knee and hip joints, including varus and valgus, flexion, extension, hip flexion, hyperflexion, and figure 4
- Realistic instruments adapted for virtual reality provide metrics to measure performance
- Internal structures such as bones, tendons, and menisci offer learning-essential haptic feedback



# VirtaMed ArthroS™ ACL Reconstruction

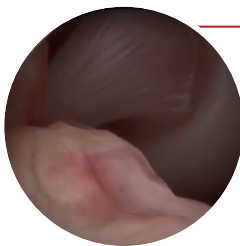
The ACL Reconstruction module is an advanced add-on to the ArthroS™ Knee module. It contains learning content to practice and perform an anatomical ACL reconstruction via the anteromedial portal with a bone-patellar tendon-bone BTB graft and interference screw graft fixation. Cases were designed in collaboration with the Arthroscopy Association of North America (AANA) and use a proficiency-based progression training model.

## Trainees will learn:

- Manipulate an anatomical knee model, including varus/valgus stress, and 120° hyperflexion
- Navigate the 3D anatomy of the knee joint in relation to the relevant landmarks for ACL reconstruction
- Mastery of correct graft positioning and learning the consequences of an incorrect placement
- Correctly use the following instruments: grasper, probe, scalpel, guide pin, reamer, tibial drill guide

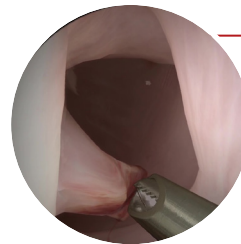
## Cases

- 1 case to evaluate the effects of incorrect femoral and tibial tunnel placements on the resulting graft position
- 2 practice cases for femoral and tibial tunnel placement: suitable tunnel placements are highlighted
- 3 master cases composed of full-length procedures for an acute ACL tear, a partial ACL tear and a chronic ACL tear



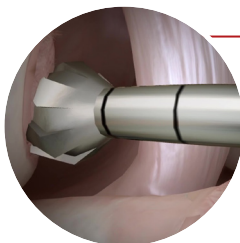
### Diagnostics

Perform an AANA diagnostic exam to assess concomitant injuries.



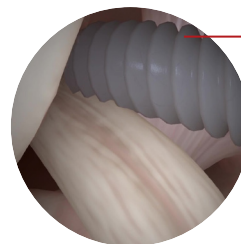
### Tear Preparation

Remove soft tissue to prepare the femoral and tibial footprints, and expose bony landmarks.



### Tunnel Placement

Use guidepins, tibial drill guide, and reamers to correctly place femoral and tibial tunnels.



### Graft Insertion and Fixation

Orient and pass the BTB graft intra-articularly and fix it appropriately.

## Hardware

- The ACL Reconstruction module is an add-on to the ArthroS™ Knee Module
- Includes a new Multihandle instrument adapted for the in-simulation virtual representation of the scalpel, guide pin, reamer, tibial drill guide, screwdriver.



# VirtaMed ArthroS™ Meniscal Repair

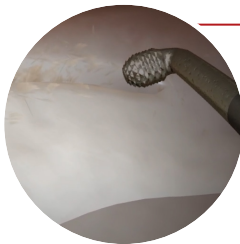
The Meniscal Repair module is an advanced add-on to the ArthroS™ Knee module. It contains learning content to practice and perform a range of techniques to repair the damaged meniscus. The module was designed in collaboration with Prof. Dr. med. Romain Seil, one of the leading surgeons in the field.

## Trainees will learn:

- Evaluation of different meniscal tears and understanding of procedure steps for their repair
- Placing implants and passing sutures at the correct location on the meniscus
- Mastery of advanced meniscal repair techniques and consequences of an incorrect procedure
- Correctly use the following instruments: grasper, probe, scalpel, guide pin, reamer, tibial drill guide

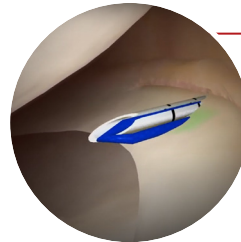
## Cases

- 4 cases all-inside technique: medial peripheral tear and lateral radial tear
- 2 cases outside-in technique: medial peripheral tear
- 2 cases for medial meniscus root tear repair using a transtibial two-tunnel pull-out technique
- 2 cases for medial meniscus ramp lesion repair using a two-portal posteromedial approach



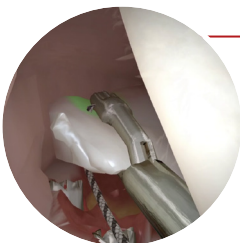
### All-inside technique

Preserve the meniscus by repairing radial and peripheral tears using one or two sets of implants.



### Outside-in technique

Place the sutures with meniscal needles in a horizontal mattress configuration to accurately repair a peripheral tear.



### Medial Root Tear

Use the tibial drill guide and the reamer to correctly place tibial tunnels and pass the sutures at the right location.



### Medial Ramp Lesion

Learn how to repair a medial meniscus ramp lesion using the posteromedial approach.

## Hardware

- The Meniscal Repair module is an add-on to the ArthroS™ Knee Module
- Includes a new Multihandle instrument adapted for the in-simulation virtual representation of the scalpel, tibial drill guide, reamer, needle inserter, suture passer.



# VirtaMed ArthroS™ Meniscectomy

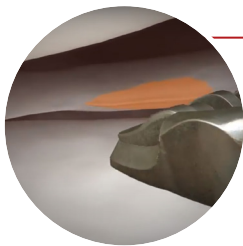
The Meniscectomy module is an add-on to the ArthroS™ Knee module. It contains training cases for partial meniscectomy of suitable tears that have been developed in collaboration with the Arthroscopy Association of North America (AANA), and incorporates the association's proficiency-based training evaluation model.

## Trainees will learn:

- Perform an AANA diagnostic exam
- Visualize and probe the meniscus tear
- Resect the meniscus to stable edges
- Smooth the edges
- Avoid errors like over resection of healthy tissue, and damage to non-target tissue

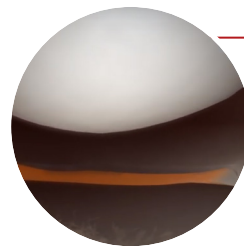
## Cases

- 5 variations of meniscus tears: Lateral and medial flap tear, bucket handle tear, medial hidden flap tear, medial horizontal cleavage tear
- 10 cases divided into practice and test modes. The test mode guides step-by-step through the procedure while the test mode assesses whether a diagnostic exam and a partial meniscectomy can be carried out independently.



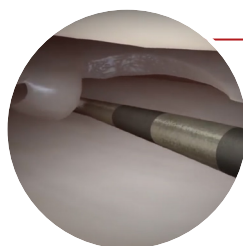
### Flap Tear

Learn how to fix a flap tear without removing much tissue.



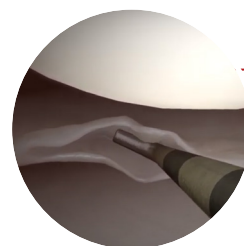
### Bucket Handle Tear

Treat a bucket handle tear to allow the knee to start bending again.



### Hidden Flap Tear

Diagnose and resect a medial hidden flap tear.



### Horizontal Cleavage Tear

Remove the damaged portion of the meniscus when located more centrally.

## Hardware

- The Meniscectomy module is an add-on to the ArthroS™ Knee Module and requires no extra hardware.

# VirtaMed ArthroS™ Shoulder

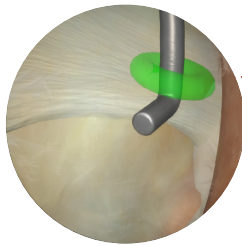
Includes guided basic skill training cases integrated into a realistic simulation. Mastering these basic tasks enables trainees to perform a complete shoulder arthroscopy.

## Courses

- Shoulder Basic Skills Course
- Shoulder Course in Diagnostics
- Shoulder Advanced Course in Diagnostics
- Shoulder Advanced Course
- AANA Shoulder Diagnostic Training Course
- Balgrist Shoulder Arthroscopy Course

## Cases

- 12 cases for basic skills training: guided diagnostic tour of the glenohumeral and subacromial spaces, instrument triangulation, and joint palpation
- 14 cases for diagnostic arthroscopy: healthy 15-point anatomy exam, lesions of the rotator cuff (L-shaped and crescent-shaped supraspinatus tears, subscapularis tear, PASTA tear), SLAP lesions, Bankart lesions (anterior and posterior), and subacromial impingement syndrome
- 3 cases for therapeutic arthroscopy: subacromial decompression, subacromial debridement, and loose body removal



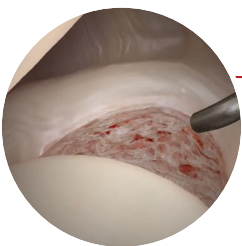
### Arthroscopy Basic Skills

Learn instrument handling and triangulation skills while avoiding cartilage damage



### Guided Diagnostic Tours

Get familiar with the arthroscopic anatomy and learn to visualize the relevant structures



### Diagnostic Cases

Visualize various pathologies in the shoulder joint including impingements and calcification.

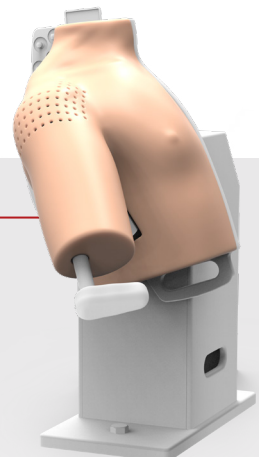


### Therapeutic Cases

Master complete procedures such as loose body removals or subacromial decompressions

## Hardware

- Anatomic right shoulder model provides learning-essential haptic feedback, including a realistic palpation of landmarks, and movements such as abduction, adduction, flexion, traction and rotation
- Free choice of portals for portal placement training
- Rapid switch between lateral decubitus and beach chair position



# VirtaMed ArthroS™ Rotator Cuff Repair

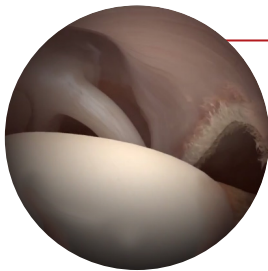
The Rotator Cuff Repair module is an add-on to the ArthroS™ Shoulder module and contains the additional instruments necessary to perform a double-row rotator cuff repair. Cases were designed in collaboration with the Arthroscopy Association of North America (AANA) and use a proficiency-based progression training model.

## Trainees will learn:

- Manipulation of the shoulder joint and selection of appropriate portals to gain access to the subacromial space
- Procedure steps to perform a double-row rotator cuff repair, including portal establishment, correct anchor locations, placement, knotless suture management, tendon piercing, and fixation procedure steps

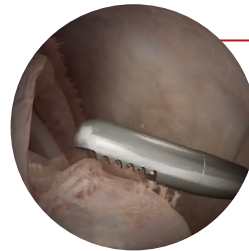
## Cases

- 3 diagnostic patient cases with different rotator cuff tears (Crescent and L-Shaped supraspinatus tears)
- 4 practice cases for diagnostics and preparation of tear, medial and lateral row anchor placement
- 2 master cases composed of full-length procedure



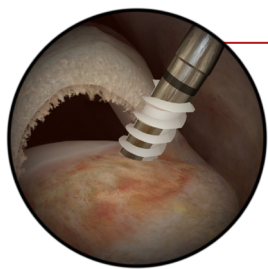
### Diagnostics

Diagnostic tours in glenohumeral and subacromial spaces to assess tear pattern and location of crescent and L-shaped tears



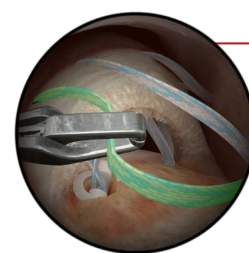
### Preparation

Use an arthroscopic shaver to debride the damaged tissue



### Anchor Placement

Training of correct anchor location, trajectory and placement

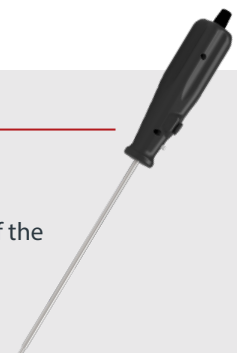


### Suture Management

Manage multiple sutures, pierce the tendon and complete double-row fixation

## Hardware

- The Rotator Cuff Repair module is an add-on to the ArthroS™ Shoulder Module
- Includes a new Multihandle instrument adapted for in-simulation virtual representation of the threaded dilator, awl and anchor implant system.

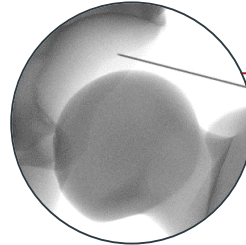


# VirtaMed ArthroS™ Hip

To prepare surgeons for a successful hip arthroscopy, the ArthroS™ Hip offers realistic soft tissue layers that allow trainees to palpate bony landmarks to find the correct portals.

## Trainees will learn:

- Efficiently use 70 degree angled optics
- Triangulate in either supine or lateral decubitus position
- Navigate the camera and instruments in the central and peripheral aspects of the hip

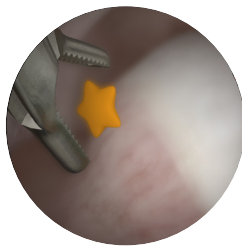


## Zero Radiation Fluoroscopy

Real-time simulated fluoroscopic imaging lets trainees adjust instruments during the procedure without the need for a C-arm

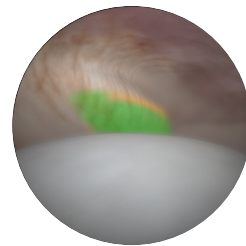
## Cases

- 16 cases for basic skills training: guided diagnostic cases and triangulation cases in peripheral and central compartments
- 4 cases for diagnostic arthroscopy: healthy anatomy, labral tear, wave sign cartilage, cartilage flaps
- 2 cases for therapeutic arthroscopy: loose body removal, cam decompression



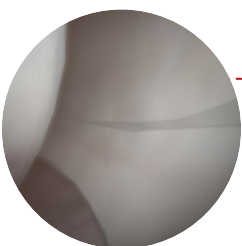
## Arthroscopy Basic Skills

Learn instrument handling and triangulation skills while avoiding cartilage damage



## Guided Diagnostic Tours

Get familiar with the arthroscopic anatomy and learn to visualize the relevant structures



## Diagnostic Cases

Visualize various pathologies in the hip joint including labral tear, and cartilage flaps

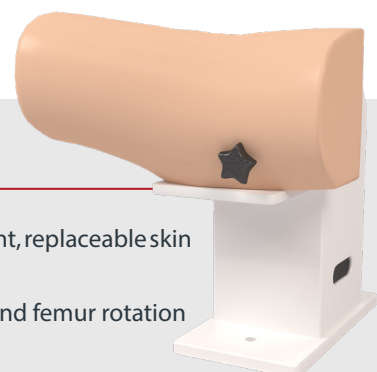


## Therapeutic Cases

Master complete procedures such as loose body removals and cam decompressions

## Hardware

- Anatomic left hip model with adapted guidewire, halfpipe for portal placement, replaceable skin insert with portals, and two replaceable skin inserts without portals
- Allows for realistic palpation of bony landmarks, joint traction, hip flexion, and femur rotation
- Switch quickly between lateral decubitus and supine positions



# VirtaMed ArthroS™ Ankle

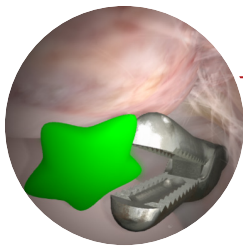
Navigating the ankle joint is difficult; the joint is narrow and the risk of damaging cartilage or nerves is higher than most other arthroscopic surgeries, the curved bone horizon is disorienting, and surgeons often lose track of the exact location of the arthroscopic camera in the absence of visual landmarks. The ArthroS™ Ankle allows trainees to tackle and overcome these challenges prior to their first live patient case.

## Trainees will learn:

- Navigate the camera and instruments in the anterior and posterior aspects of the ankle joint
- Visualize the most important anatomical structures and identify pathological conditions
- Triangulate in either prone or supine position
- Control two instruments at the same time and triangulate while avoiding unnecessary tool movement and unintended contact with the cartilage surfaces in the ankle joint.

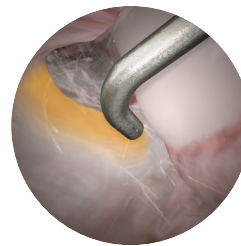
## Cases

- 6 cases for basic skills training: guided diagnostic cases, triangulation cases
- 5 cases for diagnostic arthroscopy: healthy anatomy, cartilage defects, loose bodies and impingement conditions
- 2 cases for therapeutic arthroscopy: loose body removal, impingement decompression



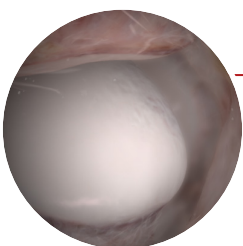
### Arthroscopy Basic Skills

Learn instrument handling and triangulation skills while avoiding cartilage damage



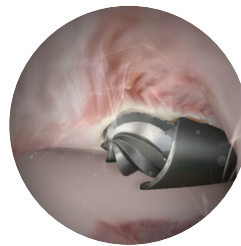
### Guided Diagnostic Tours

Get familiar with the arthroscopic anatomy and learn to visualize the relevant structures



### Diagnostic Cases

Visualize various pathologies in the ankle joint including impingements and osteochondritis.

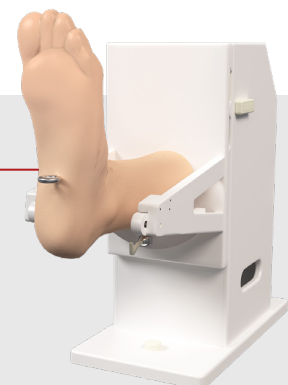


### Therapeutic Cases

Master complete procedures such as loose body removals or impingement decompressions

## Hardware

- Anatomic left ankle model with bones and tendons provides learning-essential haptic feedback
- Allows for realistic physical manipulation of the joint such as traction and flexion
- Switch quickly between supine and prone positions



# Realistic surgical instruments

Trainees learn using realistic instruments specially adapted for simulation. This means that what they practice with is what they use in the operating room.



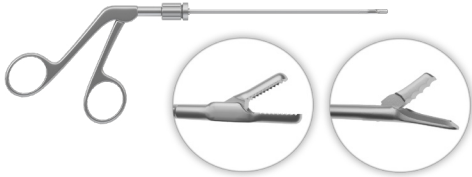
## Arthroscope

- Simulated fluid handling
- Focus wheel and functional buttons allow trainees to take images of the procedure which can be reviewed and used for debriefing
- Camera management, with 0, 30 and 70-degree optics available



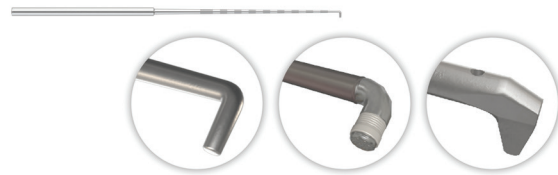
## Shaver / Hooded Burr

- Operated with a foot pedal or buttons on the instrument
- Simulated suction
- Switches virtually between a shaver and hooded burr, giving trainees access to more instruments



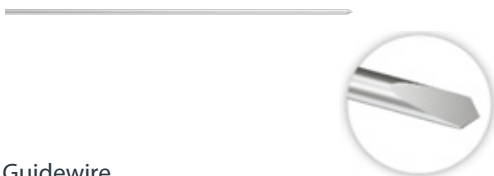
## Grasper / Punch

- Instrument can switch virtually between a grasper and a punch
- Ambidextrous; accommodates both dominant and non-dominant hands



## Probe / Electrocautery Device

- Multi-use device switches between a probe and electrocautery device
- Electrocautery device is pedal-operated and provides auditory feedback



## Guidewire

- Used with our zero-radiation fluoroscopy to train correct portal placement in the hip



## Multi-handle instrument

- Adapted for use with advanced procedures like the Rotator Cuff Repair module, and the ACL Reconstruction module

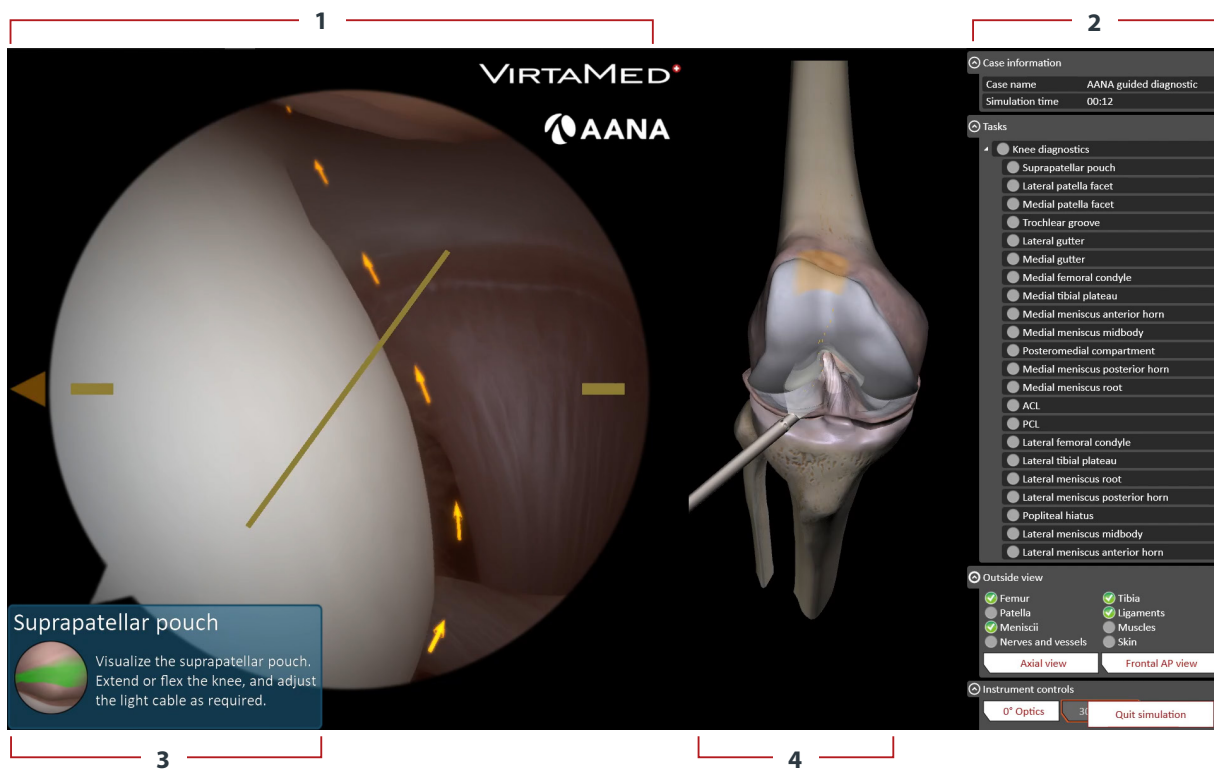
# Software designed to make training faster and more effective

## 1. Arthroscopic view and learning guidance

- Photo-realistic camera view is similar to what trainees would see in the operating room
- Virtual structures can be palpated, shaved, and cut. Joints are movable and external movement is reflected in the arthroscopic view
- Guide arrows and horizon control to help trainees learn diagnostic tours and camera usage

## 2. Task list, instrument access, and complications

- Tasks automatically check off, letting trainees know what is still left to complete
- Tasks can be selected for additional hints
- Switch between instruments with touch-screen controls
- Complications can be added



## 3. Guidance and Severe Error Messages

- Step-by-step messages lead trainees through cases and provide instruction
- Severe error messages emphasize: potential patient safety issues and costly damage to instruments

## 4. Inside and outside views

- Trainees can orient themselves and their instruments to quickly learn triangulation and joint navigation
- Can be used to illustrate portal placement, and demonstrate the muscle and nerve structures of the joint

# Students progress faster with impartial feedback reports

Objective and detailed feedback reports provide information on all aspects of the completed case. Pre-defined benchmarks help students self-assess their progress and empower them to take control of their learning. Data is then stored on the simulator or in the cloud with VirtaMed Connect and can be reviewed at any time.

## 1. Individualized metrics

- Easily identify areas for improvement
- Ensure trainees are up-to-standard with pre-defined proficiency scores

## 2. Progress tracking

- Feedback reports are saved and can be reviewed by case and time
- Trainers can easily access reports and view progress over time

## 3. Videos and images

- The procedure is recorded and can be used along with photos for case review
- Joint overviews highlights iatrogenic damage

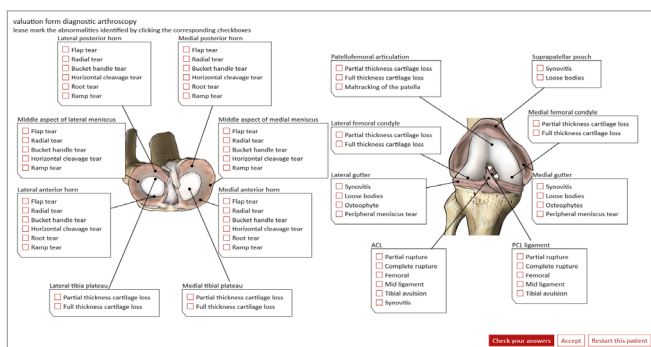


## 4. Procedure task breakdown

- Easily identify areas for improvement
- Ensure trainees are up-to-standard with pre-defined proficiency scores

## 5. Interactive graphs

- Identify trends over time and track trainee progress at a glance with interactive graphs

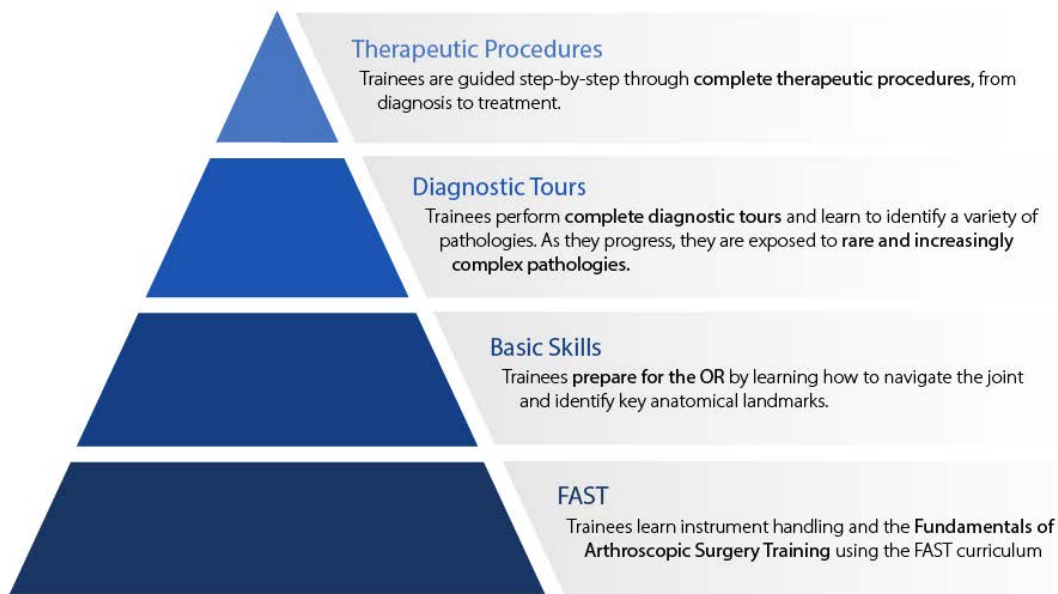


## Demonstrable knowledge

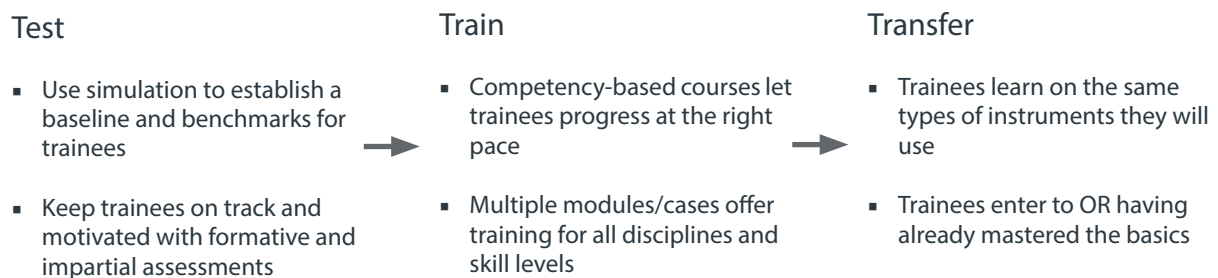
Diagnostic cases contain an anatomical diagram and questionnaire which tests trainee knowledge of joint anatomy, pathology identification, and terminology.

# Training & Education

We support the entire learning journey. VirtaMed's Training & Education team are experts in the pedagogy of using simulation for medical education. They have in-depth simulator knowledge, medical expertise, years of collaboration experience with world-class physicians. Anything but ordinary, no one is more qualified to help you integrate simulation into your existing training curriculum.



## Curriculum Integration Process



”

VR is more likely to be successful if it is systematically integrated into a well-thought-out education and training program which objectively assesses technical skills and improvement proximate to the learning experience.<sup>1</sup>

<sup>1</sup> Gallagher, A. G., et al. "Virtual Reality Simulation for the Operating Room: Proficiency-based Training as a Paradigm Shift in Surgical Skills Training." *Annals of Surgery*, 241, no. 2 (2005): 364.

# Curriculum Integration

VirtaMed's high-fidelity virtual-reality simulators support all styles of learning and all levels of curriculum integration. For a one-off course, a week-long seminar, or for the entire residency, the ArthroS offers you and your trainees unparalleled realism, convenience, and risk-free learning opportunities. The platform is compatible with VirtaMed modules for gynecology, urology, and laparoscopy, making it ideal an all-in-one training tool.

## One-day courses

- Simulator is ideal for single-day introductory or refresher courses, or skills assessments
- Simulator is portable and can conveniently be used for off-site trainings

## Multi-day seminars

- Hold multi-day seminars and utilize competency-based courses to motivate and guide trainees
- Use specific modules for in-depth training on certain joints

## Longer courses

- Diverse course offerings support training across the entire learning journey
- Simulator is ready for use 24/7. Supports independent and convenient learning.

6:30 - 7:00 AM	Meet & greet with coffee	
7:00 - 7:45 AM	<b>Introduction to the Simulation Lab</b> <ul style="list-style-type: none"> <li>Introduction to the simulator, how it works, and how to independently operate it</li> <li>Introduce concepts of performance-based proficiency and how to interpret feedback metrics</li> </ul>	
8:00 - 9:30 AM	<b>Group 1</b> <b>Simulation exercises I (FAST Module)</b> Basic Skills Warm-up with VirtaMed FAST Module <ul style="list-style-type: none"> <li>6x Image centering (3x camera in dominant hand and 3x camera in non-dominant hand)</li> <li>6x Telescoping (3x camera in dominant hand and 3x camera in non-dominant hand)</li> <li>6x Periscoping (3x camera in dominant hand and 3x camera in non-dominant hand)</li> </ul>	<b>Group 2</b> <b>Round tables/didactic challenges I</b> <ul style="list-style-type: none"> <li>Overview of relevant joint anatomy</li> <li>Portal placement and function</li> <li>Video demonstration of an arthroscopic tour</li> </ul>
	3x is the minimum number of repetitions suggested. However, trainees should practice until they reach the predefined proficiency benchmarks provided by AANA before progressing to the next section.	
9:30 - 11:00 AM	Round tables/didactic challenges I	Simulation exercises I (FAST Module)
11:00 - 12:30 PM	<b>Simulation exercises II (FAST and anatomic model)</b> <ul style="list-style-type: none"> <li><b>Skills evaluation:</b> Diagnostic tour with photos                             <ul style="list-style-type: none"> <li>1x instructor-led demonstration</li> <li>6x Probe triangulation</li> <li>3x camera in dominant hand</li> <li>3x camera in non-dominant hand</li> </ul> </li> <li>Practice: 1x Catch the Stars, 1x Triangulation, 1x Diagnostic Tour</li> </ul>	<b>Round tables/didactic challenges II</b> <ul style="list-style-type: none"> <li>Determined by course organizer</li> </ul>
12:30 - 1:30 PM	Lunch	
1:30 - 3:00 PM	Round tables/didactic challenges II	Simulation exercises II (FAST and anatomic model)
3:00 - 4:30 PM	<b>Simulation exercises III (anatomic model)</b> <ul style="list-style-type: none"> <li>3x Diagnostic Tour</li> <li>3x Unknown pathology with palpation hook</li> <li>3x Catch the Stars</li> <li><b>Skills evaluation:</b> Diagnostic tour with photos</li> </ul>	<b>Round tables/didactic challenges III</b> <ul style="list-style-type: none"> <li>Practical exercises</li> <li>Question and answer session</li> </ul>
4:30 - 6:00 PM	Round tables/didactic challenges III	Simulation exercises III (anatomic model)
6:00 - 6:30 PM	Final debrief and closing comments. Presentation of Certificates of Achievement	



” Our goal is to improve patient care by advancing education in arthroscopy. We want to ensure all arthroscopic surgeons have access to high-quality skills training and continuous education. Working with VirtaMed's first-rate simulators, experienced developers and dedicated education specialists helps AANA reach that goal.

— Joseph C. Tauro, MD AANA Learning Center Committee Chair

<sup>1</sup> Course outline is based upon a several courses that were conducted by or for AANA members at the OLC Education & Conference Center in Rosemont, IL as well as input from VirtaMed's Training & Education team. Specific courses and their agendas can be found at [www.aana.org](http://www.aana.org).



# VirtaMed Connect

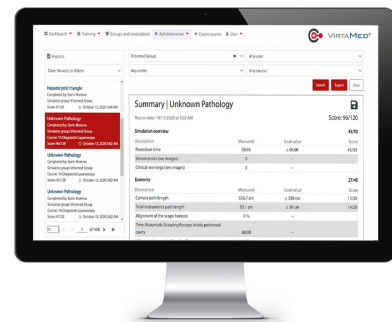
Connect is VirtaMed's cloud-based solution that lets you access your simulator data any time from anywhere. Use Connect to remotely create courses, track student progress, and manage your simulator usage, all from the convenience of your desk or tablet.



## Keep your focus on education

### Simulator management that lets you focus on what is important

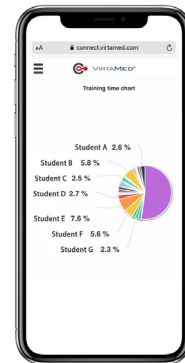
- Access simulators remotely; no need to leave your office
- Conveniently create courses and manage curricula
- Motivate your students with online leader boards



## Proficiency-based progression

### Use objective performance measurements to guide learning

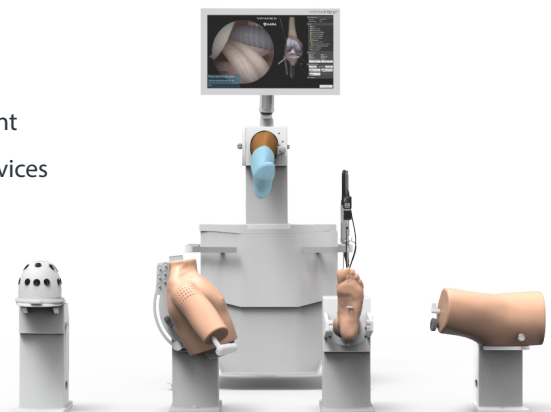
- Coach students on key areas for improvement
- Monitor cohort progress; know who is training and when
- Capture and compare student results over time



## Scale to your needs

### Log in anywhere: across your simulators and devices

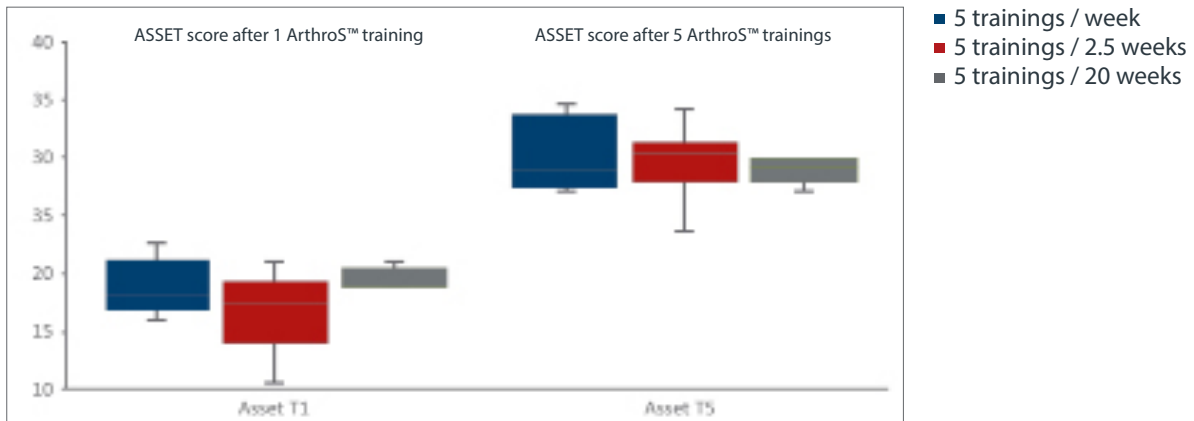
- Facilitate research collaboration with cloud-based data
- Manage multi-simulator and multi-site training programs
- Know your simulator status and location with fleet management
- Requires a stable Internet connection and access to certain services



# Validation

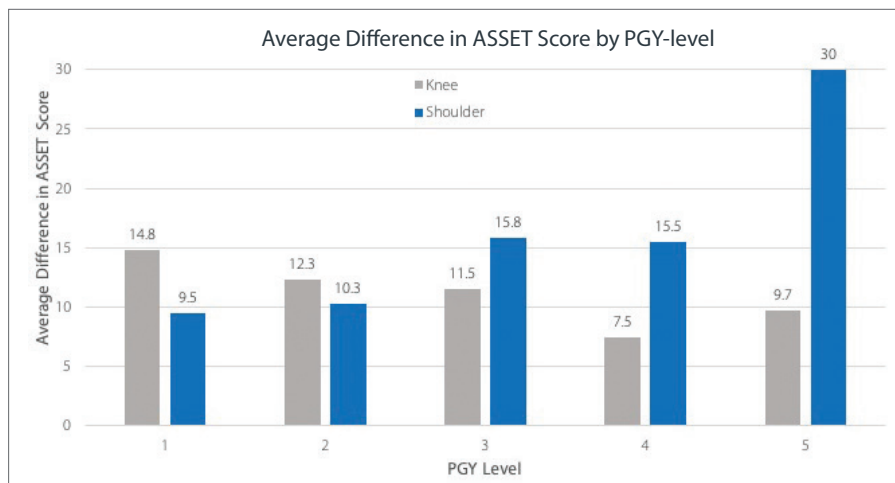
VirtaMed ArthroS™ is the most realistic, accurate, and helpful tool on the market for arthroscopy training.<sup>1</sup>

## Effectivity of Arthroscopic Skill Acquisition in Virtual Reality Knee Arthroscopy Training<sup>2</sup>



Simulator training makes a difference, as shown by the ASSET scores of different groups after one training session and again after five training sessions on the VirtaMed ArthroS™ Knee. Any level of training was deemed beneficial, with training twice a week yielding the highest improvement.<sup>2</sup>

## Efficacy of an Arthroscopic Virtual Based Simulator for Orthopaedic Surgery Residents by Year in Training<sup>3</sup>



Residents training on the VirtaMed ArthroS™ made significant improvements in both their knee and shoulder arthroscopic skills.<sup>3</sup>

All residents improved with simulation training, with junior residents improving more on the ArthroS™ Knee, and senior residents improving more on the ArthroS™ Shoulder.

” We have assessed all virtual reality arthroscopy simulators on the market, and VirtaMed was clearly the best fit to partner with AANA. The combination of lifelike anatomic models, high-fidelity graphics and original tools adapted for simulation make the VirtaMed ArthroS™ the closest thing to real surgery.

— Laura Downes, CEO of the Arthroscopy Association of North America (AANA)



<sup>1</sup> Pedowitz, R., et al. “Asymmetry in Dominant/Non-Dominant Hand Performance Differentiates Novices from Experts on an Arthroscopy Virtual Reality Serious Game.” *Studies in Health Technology and Informatics*. (2016) 220: 289–294.

<sup>2</sup> Reppenhausen, S., et al. “Effectivity of Arthroscopic Skill Acquisition in Virtual Reality Knee Arthroscopy Training.” Poster presented at: ESSKA (May 2016) Barcelona.

<sup>3</sup> Yari, S., et al. “Efficacy of an Arthroscopic Virtual Based Simulator for Orthopaedic Surgery Residents by Year in Training.” *Orthopaedic Journal of Sports Medicine* (2018).

# Scientific validation studies

## I: Face Validity Studies on ArthroS™

### Validation of the Updated ArthroS Simulator: Face and Construct Validity of A Passive Haptic Virtual Reality Simulator With Novel Performance Metrics

Roberts P. G, Guyver P, Baldwin M, Akhtar K, Alvand A, Price A. J, Rees J. L. *Knee Surg. Sports Traumatology Arthroscopy.* (2017) 25: 616.  
DOI:10.1007/s00167-016-4114-1

### Comparison of Three Virtual Reality Arthroscopic Simulators As Part of An Orthopedic Residency Educational Curriculum

Martin K. D, Akoh C. C, Amendola A, Phisitkul P  
*Iowa Orthop Journal.* (2016) 36: 20–25. PMID: PMC4910782

### Validation of A Virtual-reality-based Simulator for Shoulder Arthroscopy

Rahm S, Germann M, Hingsammer A, Wieser K, Gerber C  
*Knee Surgery, Sports Traumatology, Arthroscopy.* (2016) 24(5): 1730-1737.  
DOI: 10.1007/s00167-016-4022-4

## II: Construct Validity Studies on ArthroS™

### Lessons Taught by a Knee Arthroscopy Simulator About Participants in a European Arthroscopy Training Programme

Baumann Q, Hardy A, Courage O, Lacombe P, Accadbled F  
*Orthopaedics & Traumatology: Surgery & Research.* (2019).  
DOI:10.1016/j.otsr.2019.09.008

### Validation of the Hip Arthroscopy Module of the VirtaMed Virtual Reality Arthroscopy Trainer

Gallagher K, Bahadori S, Antonis J, Immins T, Wainwright T, Middleton R  
*Surgical Technology International.* 2019 (34).  
URL: <http://eprints.bournemouth.ac.uk/31821/3/Manuscript.pdf>

### Knee, Shoulder, and Fundamentals of Arthroscopic Surgery Training: Validation of a Virtual Arthroscopy Simulator

Tofte J. N, Westerlind B. O, Martin K. D, Guetschow B. L, Uribe-Echevarria B, Rungprai C, Phisitkul P.  
*Arthroscopy – The Journal of Arthroscopic and Related Surgery.* (2016) 33(3): 641-646.e3.  
DOI: 10.1016/j.arthro.2016.09.014

### Validation of a Virtual Reality-Based Hip Arthroscopy Simulator

Bauer D. E, Wieser K, Achimair A, Zingg P. O, Dora C, Rahm S  
*Arthroscopy.* (2016), 35(3): 789-795.  
DOI: 10.1016/j.arthro.2018.10.131

## III. Studies on Simulation-based Training Effects with ArthroS™

### Ten hours of simulator training in arthroscopy are insufficient to reach the target level based on the Diagnostic Arthroscopic Skill Score

Anetzberger, Hermann; Reppenhausen, Stephan; Eickhoff, Hansjörg; Seibert, Franz Josef; Döring, Bernd; Haasters, Florian; Mohr, Michael; Becker, Roland  
*Knee Surgery, Sports Traumatology, Arthroscopy.* (2022) 30(4): 1471-1479.  
DOI: 10.1007/s00167-021-06648-y

### Efficacy of Standardized Training on a Virtual Reality Simulator to Advance Knee and Shoulder Arthroscopic Motor Skills

Rahm S, Weiser K, Bauer D, Waibel F, Meyer D, Gerber C, Fuentses S  
*BMC Musculoskeletal Disorders.* (2018) 19(150): 910.  
DOI: 10.1186/s12891-018-2072-0

### Simulation-Based Training Platforms for Arthroscopy: A Randomized Comparison of Virtual Reality Learning to Benchtop Learning

Middleton R, Alvand A, Roberts P. G, Hargrove C, Kirby G, Rees J. L,  
*Arthroscopy: The Journal of Arthroscopic and Related Surgery.* (2017) 33(5): 996-1003.  
DOI:10.1016/j.arthro.2016.10.021

### Fundamentals of Arthroscopic Surgery Training Program Improves Knee Arthroscopy Simulator Performance in Arthroscopic Trainees

Cychosz C, Tofte J, Johnson A, Gao Y, Phisitkul P  
*Arthroscopy: the Journal of Arthroscopic and Related Surgery.* (2018) 34(5): 1543-1549.  
DOI: 10.1016/j.arthro.2017.11.028