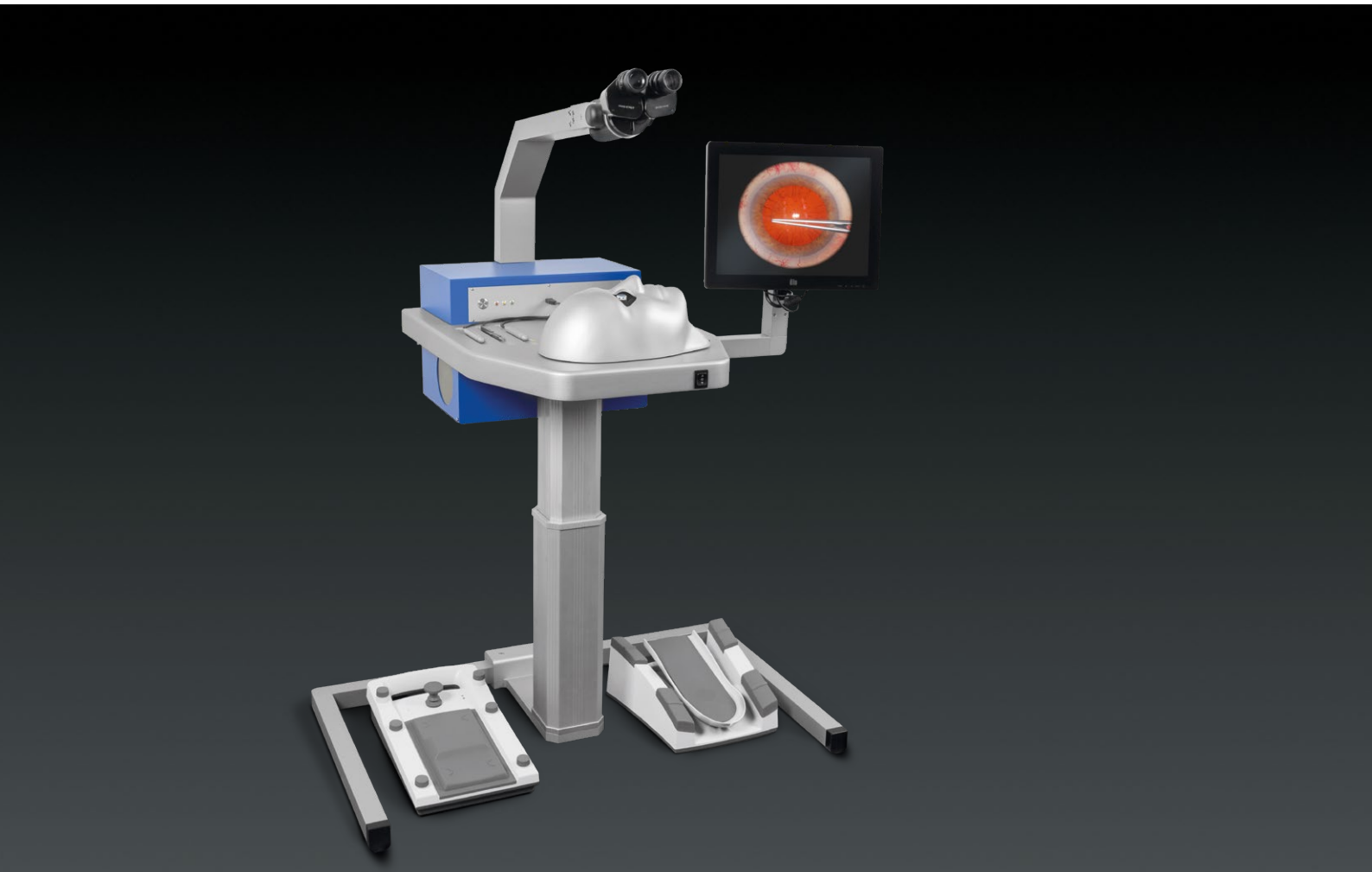


EYESI SURGICAL

Training simulator for intraocular surgery

Look closer. See further.

HAAG-STREIT SIMULATION

High-end virtual reality simulator **Training of cataract and vitreoretinal surgery**

Eyesi Surgical is a virtual reality simulator for intraocular surgery training. The simulator platform can be equipped with interfaces for cataract and vitreoretinal surgery. Software modules provide the actual training content. The training tasks range from basic skills training through to training of surgical procedures and complications management. The practical training on the simulator is complemented by introductory online courses on the VRmNet web portal.

RISK-FREE TRAINING

Learning from mistakes without making them

Eyesi Surgical offers a lifelike training environment and a highly realistic simulation of intraocular structures and the behavior of fluids and tissue in real-time. The simulator can introduce novices to the first steps of surgical procedures. More advanced eye specialists can use Eyesi Surgical to deliberately hone specific skills – without the risk of complications for real patients.

BROAD RANGE OF TRAINING SCENARIOS

Expertise comes from experience

The broad range of cataract and vitreoretinal training modules available on Eyesi Surgical increases residents' surgical experience independent from patient flow and hospital routine. Residents can practice on their own or under guidance from a mentor. The standardized curriculum and the simulator's objective assessment gives both residents and educators confidence in surgical abilities – before entering the OR.

Lifelike training environment

Through the simulator's OR microscope, trainees see the virtual surgical field in stereo and high resolution, while operating with lifelike surgical instruments. The highly realistic simulation of interaction with tissue in real-time provides for a highly immersive training environment.

Standardized curriculum

Eyesi Surgical comes with an embedded courseware, offering training at different levels of difficulty. The curriculum combines training of basic skills with surgical procedures in a consecutively structured course design, leading students step-by-step to expert performance.

Evidence-based assessment

The Eyesi Surgical simulator provides trainees and educators with objective assessment and detailed skill evaluation. Various parameters relating to instrument and microscope handling, surgical efficiency, and tissue treatment are recorded by the system and are stored in a database for further analysis.

Lifelike environment
Realistic surgery training

The Eyesi Surgical platform can be equipped with a patient model head for either cataract or vitreoretinal surgery training and an according set of handpieces.

HIGH-END VIRTUAL REALITY

Immersive training experience

Eyesi Surgical offers an immersive simulated environment for training of surgical steps. Just as in real surgery, discreet instrument movements are required to avoid undue wound stress, loss of viscoelastic, or diminished red reflex. The simulation of the posterior segment environment includes a handheld light source or a chandelier illumination and scleral indentation.

STEREO VISUALIZATION

Operating microscope

While training on Eyesi Surgical, users see the surgical field through a binocular microscope featuring mechanical and optical systems from Haag-Streit. The microscope offers a precise stereo visualization of the surgery simulation. Focus and zoom are operated using the microscope foot pedal.

OPERATING MICROSCOPE

AUXILIARY OPTICS

Wide-angle viewing system

In order to enhance the lifelike training environment of Eyesi Surgical for posterior segment surgery, it is possible to integrate a binocular indirect ophthalmomicroscope and a stereoscopic diagonal inverter hardware mimic, which is operated just like a real BIOM/SDI in the operating room. The complex interactions of auxiliary optics are reproduced accurately.

TRUE-TO-LIFE HANDPIECES

Surgery instruments

The simulator's handpieces are inserted through incisions in the model eye. The cataract patient head can be operated on from a temporal or superior position. Virtual cataract instruments, such as forceps, visco cannula, cystotome, and phaco probe can be assigned to the handpieces using the touch screen. For posterior segment surgery training, instruments such as a light probe, forceps, endolaser, or vitrector are available. In the retinal detachment training module, trainees can select an air, oil, or gas infusion.

HANDPIECE AND MODEL EYE

INTERFACE AND FOOT PEDAL

OR machine

The simulator features an OR machine interface and a two-axis foot pedal to control fluidics. Trainees can change the phaco or vitrectomy machine settings to explore the effects of parameter changes. The complex interaction between instruments and intraocular tissue can be experienced in real time.

OR MACHINE INTERFACE

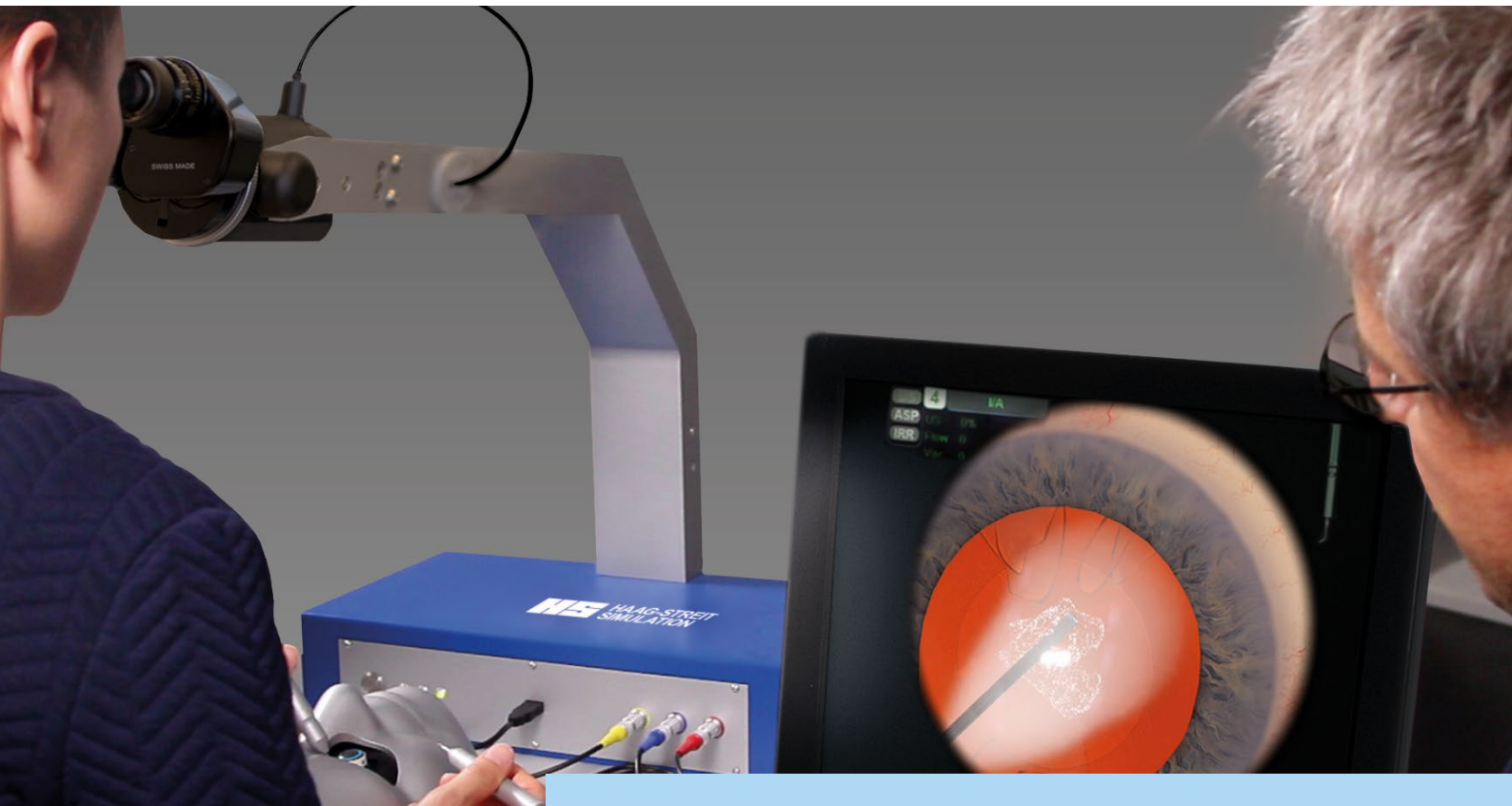
Standardized curriculum
Eyesi Surgical courseware

Eyesi Surgical comes with a preinstalled courseware. Starting with basic skills, the didactically structured courses lead trainees step-by-step to proficiency. The modular courseware concept makes it easy to integrate simulator training into residency programs.

LEARNING STEP-BY-STEP

Training at the appropriate level of difficulty

Eyesi Surgical allows residents to practice at a level of difficulty appropriate for their current skill level. The training tasks break down complex surgical techniques into smaller pieces. Introductory online medical courses on the VRmNet web portal complement the practical training on the simulator. The number of Eyesi training modules is continuously being extended.



BASIC SKILLS TRAINING

Abstract tasks

Introductory basic skills tasks are designed to advance the coordination of hand, eye, and foot and spatial orientation inside the eye. The exercises aim at minimizing reaction time, excess movements, and tremor. The abstract simulation tasks repeat and reinforce microsurgical motor skills, microscope handling, and proper pivoting at the incision.

EDUCATIONAL SUPPORT

Guidance elements

Eyesi Surgical features visual and auditive guidance to support beginners in their learning process. During the training, graphical elements support trainees by indicating the optimal rhexis diameter, injection speed, or the distance of the instrument to lens and cornea, for example. Additional text messages point out surgical mistakes.

BLENDED LEARNING

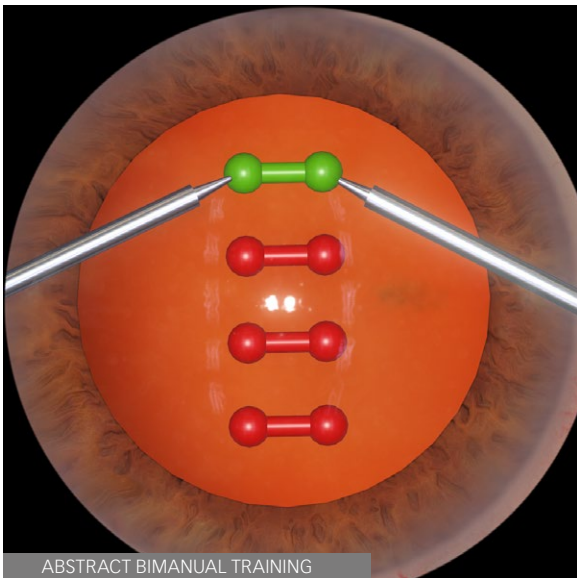
Online medical courses

Optional online courses on the VRmNet web portal are intertwined with the simulator curriculum and complement the practical simulator training. The courses illustrate anterior segment anatomy, explain the preparatory steps for cataract surgery, and provide detailed information on surgical techniques. Expert videos offer insights from experienced cataract surgeons.

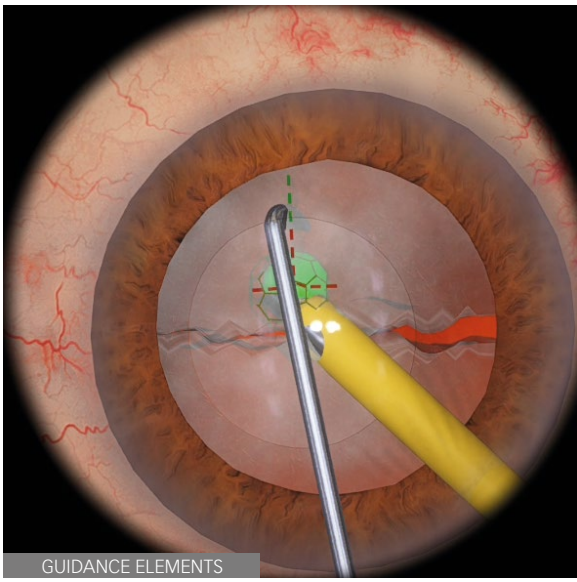
LEARNING FROM MISTAKES

Complications management

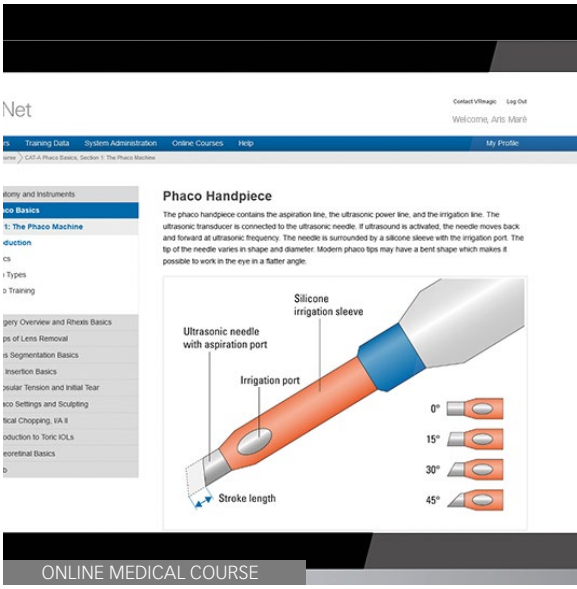
In the more advanced Eyesi Surgical courses, trainees have the opportunity to practice complications management in a controlled and safe environment. Available training modules feature rescuing an errant rhexis tear, inserting an iris expansion ring in patients with floppy iris syndrome, implanting a capsular tension ring, or performing an anterior vitrectomy.



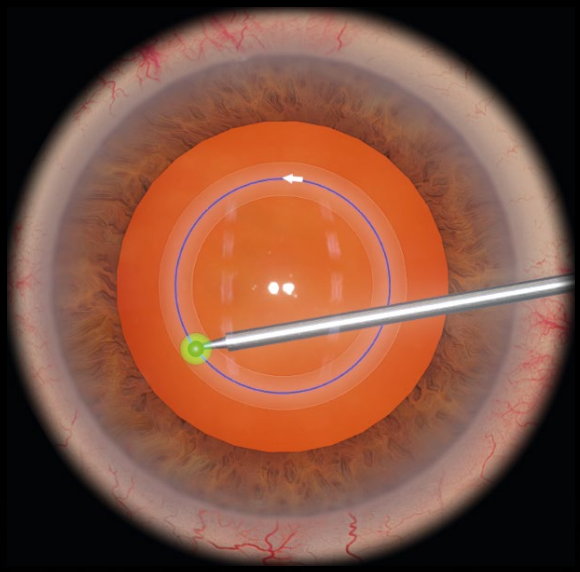
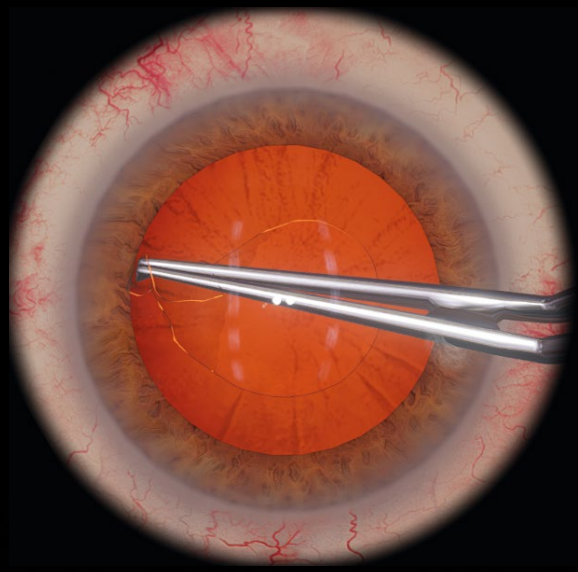
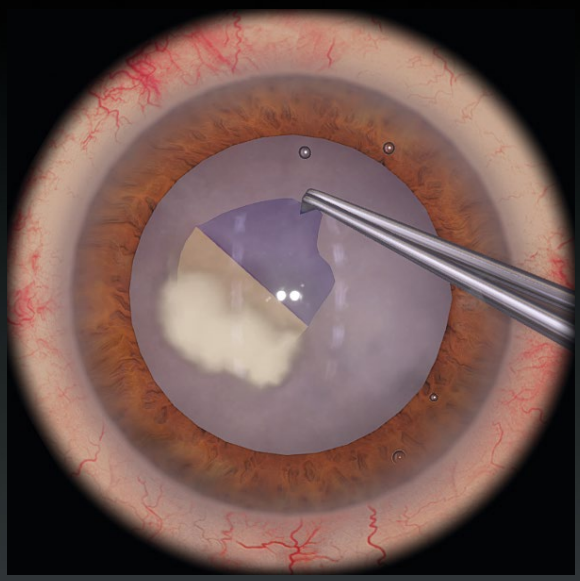
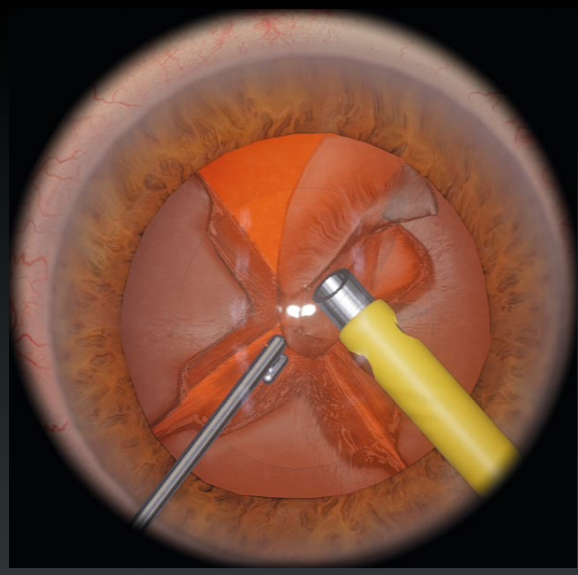
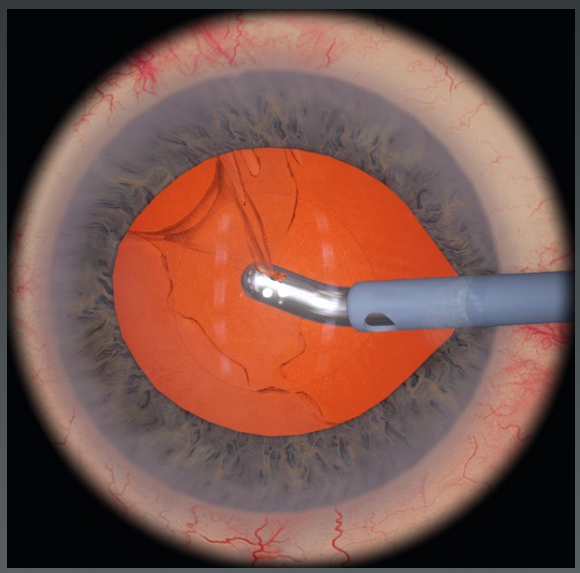
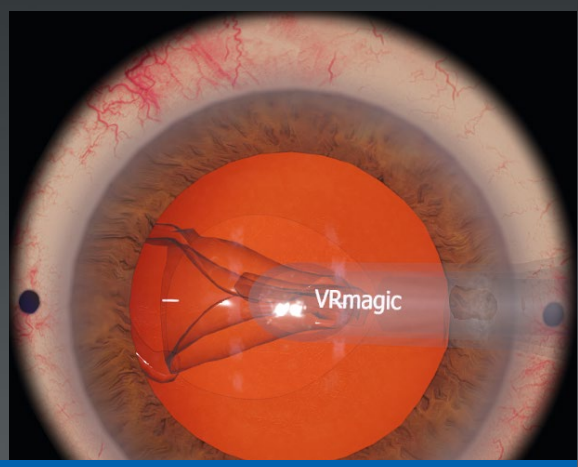
ABSTRACT BIMANUAL TRAINING



GUIDANCE ELEMENTS



ONLINE MEDICAL COURSE

Cataract training modules

Eyesi Surgical
Cataract courseware

The Eyesi Surgical cataract courseware is organized into four tiers of ascending difficulty. The training modules offer an immersive environment for training of surgical steps, including capsulorhexis, hydro-dissection, phaco divide & conquer and phaco chop, irrigation & aspiration, and IOL insertion. Advanced training modules also present complicated situations such as floppy iris syndrome, weakened zonules, or posterior capsule rupture requiring anterior vitrectomy.

OVERVIEW

Cataract courseware

Tier CAT-A

The CAT-A tier uses abstract scenarios to train basic microsurgical skills, such as instrument navigation in the anterior chamber, tremor control, fine motor dexterity, and proper microscope use.

Tier CAT-B

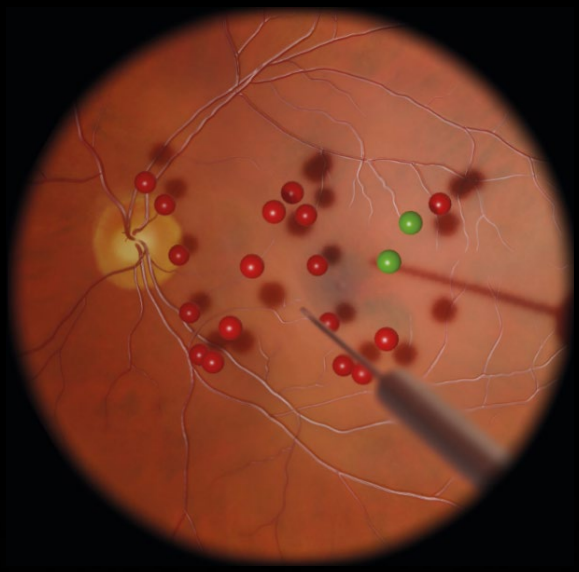
In the CAT-B tier, isolated steps of cataract surgery are trained following abstract instrument handling tasks. Trainees will practice first steps in capsulorhexis, lens segmentation, lens removal, and intraocular lens insertion in a simulated surgical environment.

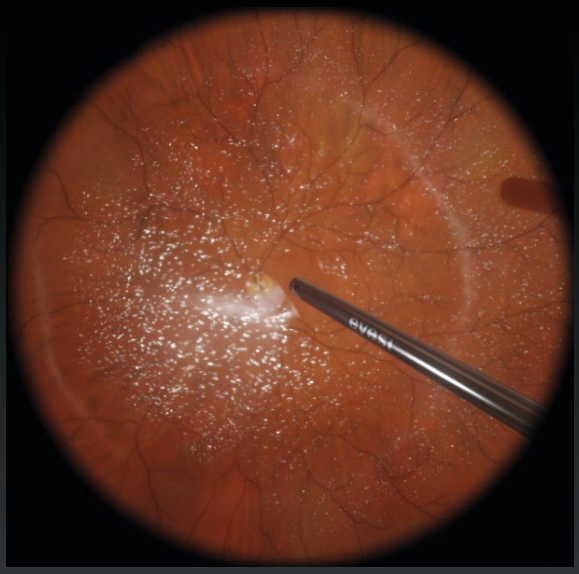
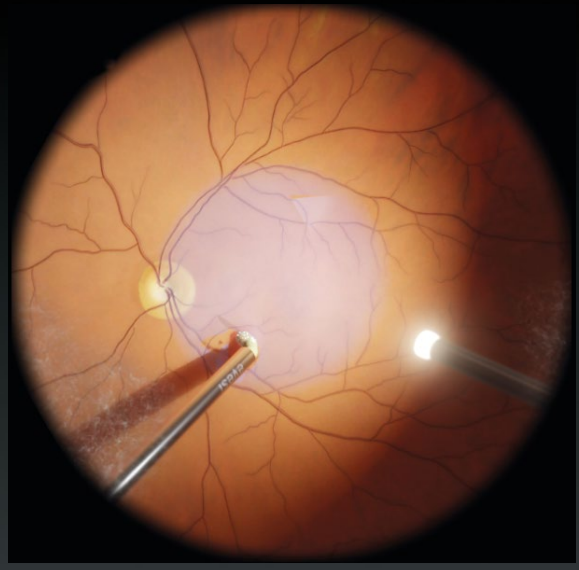
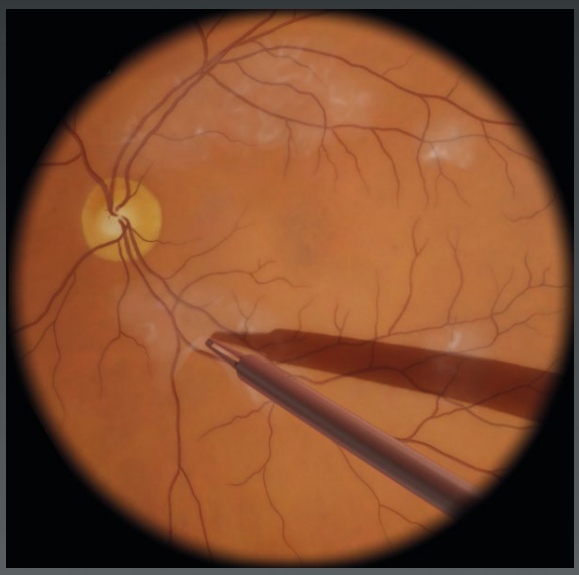
Tier CAT-C

The CAT-C tier refines the acquired cataract skills through more challenging scenarios: trainees practice advanced surgery techniques, such as vertical chopping or insertion of a toric IOL, and perform multi-step cataract procedures, for example, the complete phaco divide and conquer technique.

Tier CAT-D

The CAT-D tier offers difficult cataract surgery cases under demanding conditions, such as high capsular tensions or weak zonules. Trainees will be challenged by randomized tasks and complications, such as posterior capsule rupture, requiring them to adapt to the surgical scenario quickly.




Vitreoretinal training modules

Eyesi Surgical
Vitreoretinal courseware

The Eyesi Surgical vitreoretinal courseware is designed to help trainees develop essential surgical skills for posterior segment surgery. The curriculum includes posterior hyaloid detachment, internal limiting membrane (ILM) peeling, the removal of epiretinal membranes, or the treatment of retinal detachments with oil or gas endotamponades. A realistic training environment is provided through the possibility of scleral indentation, a vitrectomy machine, an endolaser, or air, oil, and gas infusion.

OVERVIEW

Vitreoretinal courseware

Tier VRT-A

The VRT-A tier uses abstract scenarios to train basic surgical skills, such as instrument navigation in the vitreous and using the non-dominant hand. Trainees will also learn to visualize the vitreous through efficient use of the microscope, auxiliary optics, and light source.

Tier VRT-B

In the VRT-B tier, different vitreoretinal surgery steps will be trained separately; following abstract instrument handling tasks, trainees will practice first steps in peeling and removing membranes, using the endolaser, and setting the vitrectomy machine for different purposes.

Tier VRT-C

The advanced VRT-C tier refines already acquired surgery skills by training multi-step vitreoretinal procedures under increasingly demanding conditions, such as retinal detachment treatment. Enhanced proficiency with the non-dominant hand is required to peel highly adherent membranes.

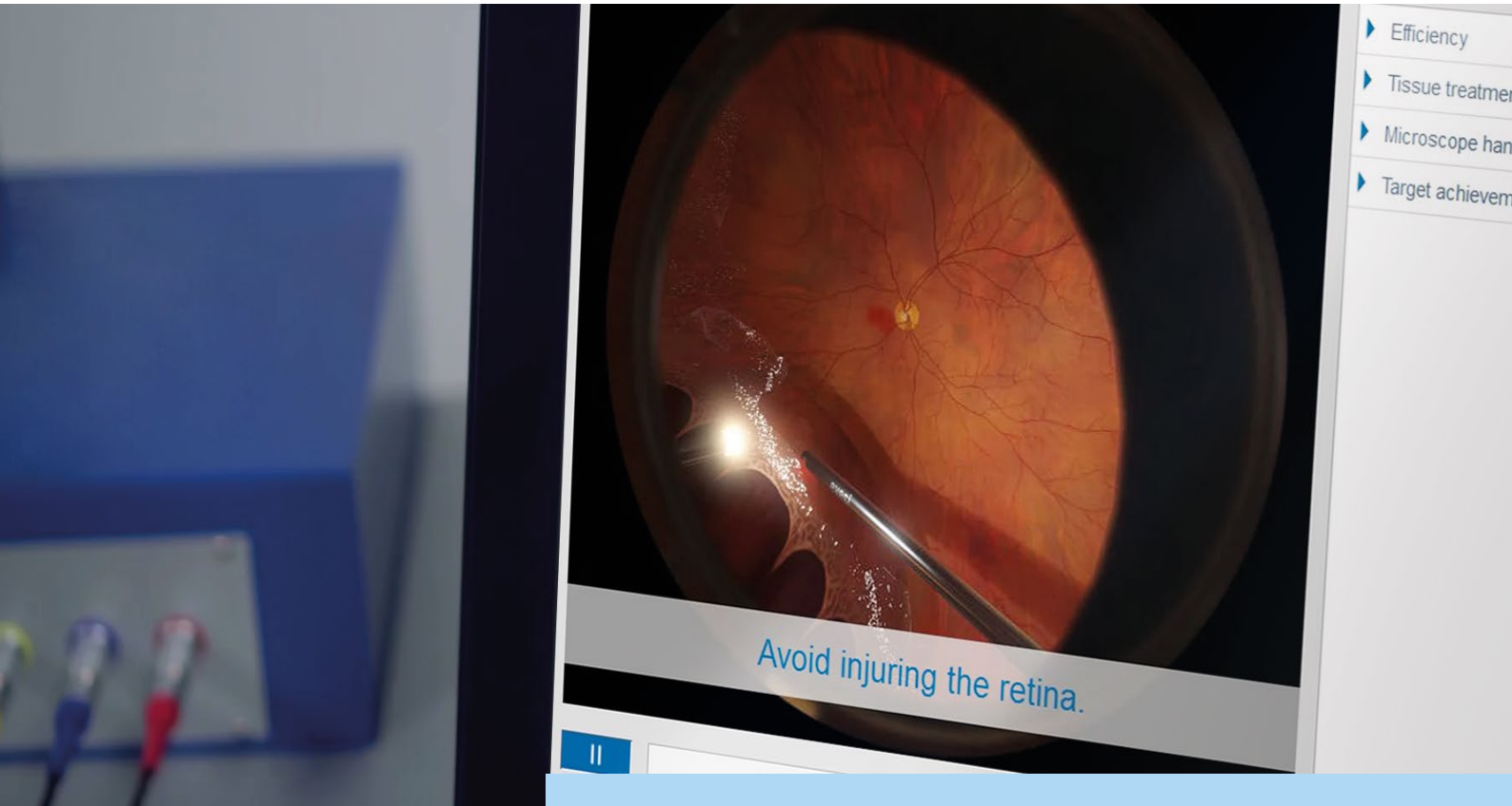
Evidence-based assessment
Evaluation & feedback

At the end of each task, Eyesi Surgical presents trainees with a detailed performance summary. Various parameters relating to instrument and microscope handling, surgical efficiency, and tissue treatment are recorded by the training system. The detailed feedback allows trainees to improve their skills systematically.

PERFORMANCE MONITORING

Training reports

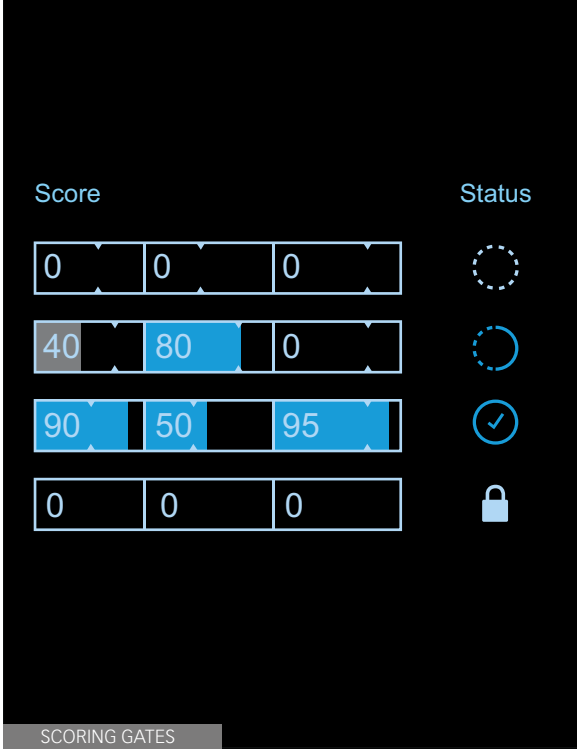
The evidence-based assessment provided by Eyesi Surgical allows educators to monitor their residents' training progress over time. Based on the training reports, training contents can be tailored individually. The VRmNet web portal enables educators to check on their classes' current training status at a glance and manage courses accordingly.



PERFORMANCE RELIABILITY

Scoring gates

The Eyesi Surgical courseware uses scoring gates to ensure reliability of the performance level; trainees can only advance through assigned courses after having met a required minimum score three times in a row.

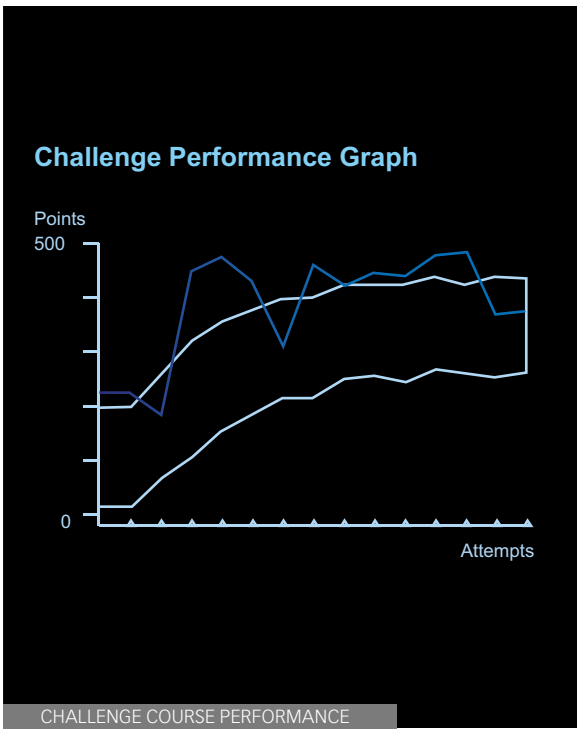


SCORING GATES

PEFORMANCE OVER TIME

Challenge course

The Cataract Challenge course has been designed to benchmark residents' training performance over time. The course mimics the conditions of real surgery. Every 60 minutes of training time, trainees have to perform a complete cataract procedure in sequential order. They only have one attempt at each cataract step and a limited time window of 15 minutes.

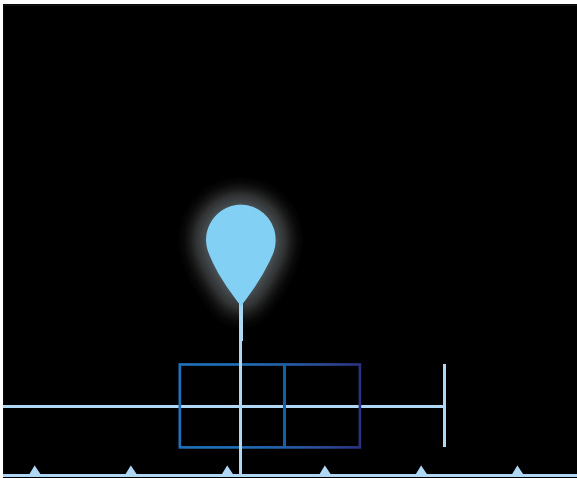


CHALLENGE COURSE PERFORMANCE

PEER-GROUP PERFORMANCE

Performance comparison

On networked simulators, trainees can view an evaluation that ranks their individual performance against other Eyesi Surgical users after each surgical task. A presentation with box-and-whisker plots allows for judging their own performance at a glance. Both residents and educators can also access the peer-group comparison on the VRmNet web portal.



PERFORMANCE COMPARISON

VRmNet
Web portal for networked simulators

VRmNet is a web-based service for networked training simulators from Haag-Streit Simulation. The web portal offers features for trainees and educators. The personalized VRmNet dashboard can be accessed online from any computer or mobile device 24/7.

ONLINE LEARNING

Courses for trainees

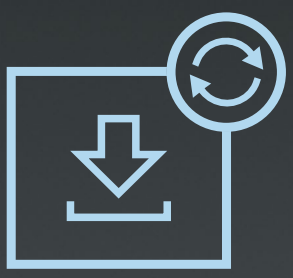
Residents log in to VRmNet to access online medical courses and their training history. To prepare trainees for their first training session, VRmNet provides an online orientation with short videos on simulator usage.

EASY ADMINISTRATION

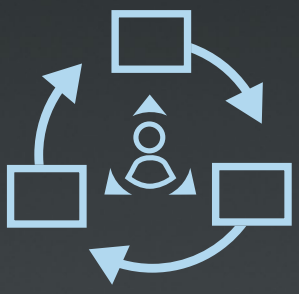
Performance monitoring

Educators can view their residents' training status online and compare their results to peer group training data. Configurable notifications and reports keep teachers informed on important milestones.

Benefits for operation and service



Automatic updates



Optimized allocation

Online service

Online medical courses

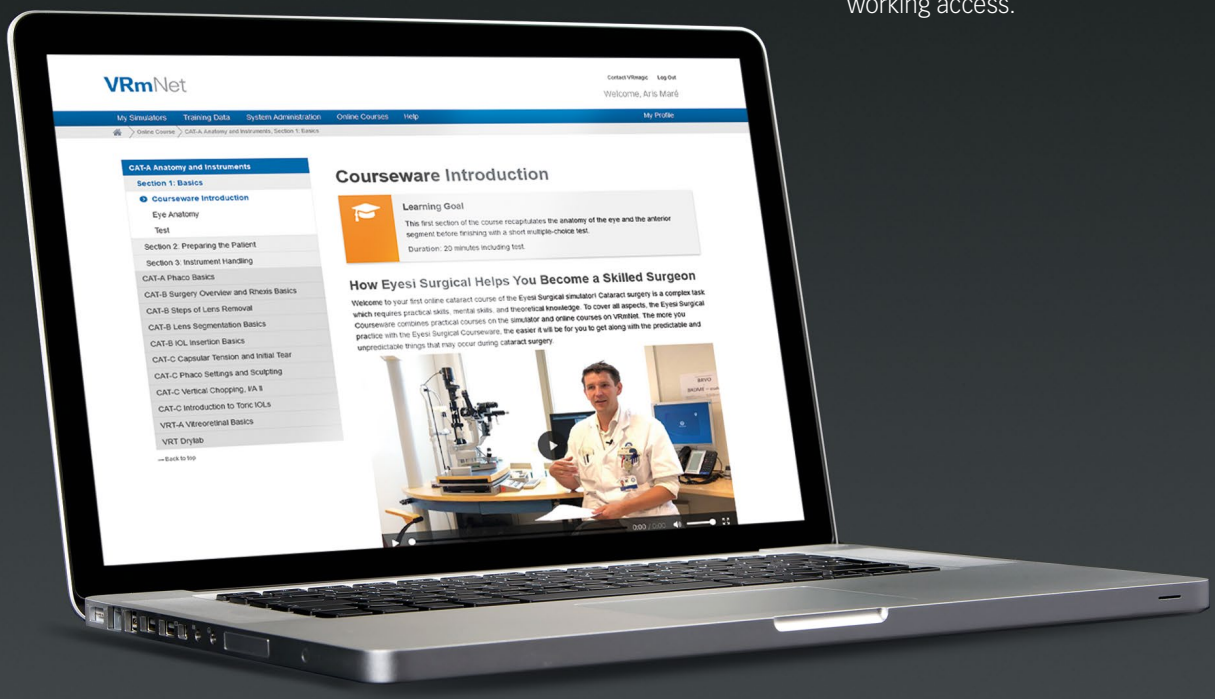
VRmNet features online medical courses that are intertwined with the training curriculum on the simulator. The introductory courses are enriched with videos, images, and multiple-choice tests.

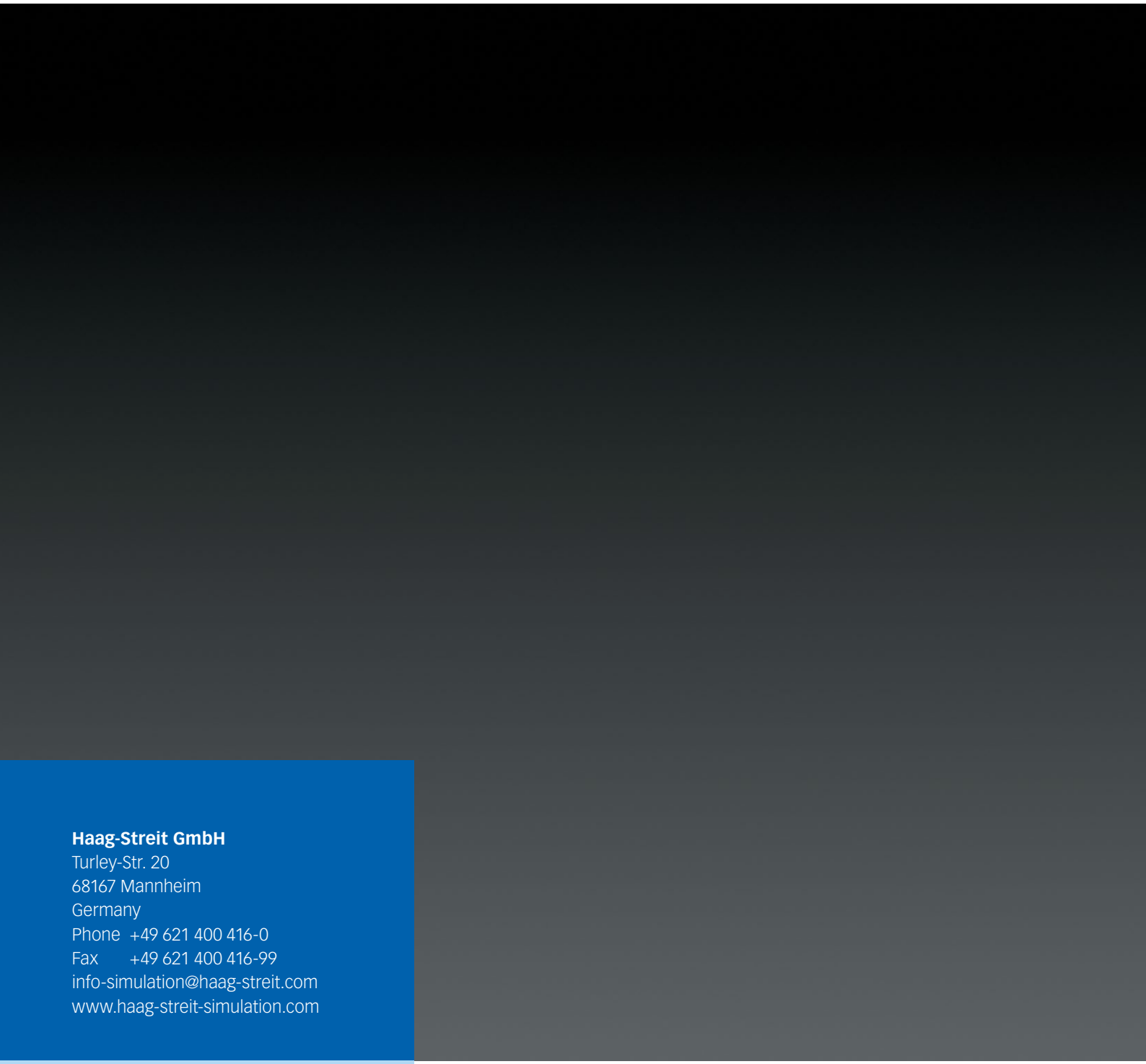
Administration tools

Educators can use VRmNet to comfortably set up users, manage courses, and analyze their residents' training data down to the last detail.

Automatic software updates

All simulators connected to VRmNet receive the latest software updates automatically. Customers profit from data back-ups and synchronization as well as easily operated service through the VRmNet networking access.





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