UT nieuws

SPECIAL

This special is an extra edition of
UT Nieuws Magazine | April 2016

ECTM

SHAPING THE FUTURE OF MEDICINE

Foreword

Dear colleagues and other readers,

The University of Twente's Experimental Centre for Technical Medicine (ECTM) is celebrating its tenth anniversary. The ECTM is one of the most innovative medical simulation centres in the world, in that it (uniquely) marries technology and medicine to a strong educational concept. By now, a great number of UT students have used the ECTM's simulators as part of their course work, and quite a few medical specialists are receiving training at the centre. The UT's facilities are regularly used to train people in things such as surgical skills and medical emergency procedures. Thanks to the progress being made in the worlds of simulation, virtual reality and serious gaming, this form of technical medicine education will be even more widely applicable in future, and will ensure that patients receive better and safer health care.

Due to the combination of simulators and high-tech medical equipment, the ECTM is not just an educational institution, but a place which is increasingly hosting research involving human subjects. Therefore, the ECTM also offers expertise on how to conduct clinical trials, in association with various health care institutions and professional doctors' associations.

Thanks to its attractive setting and the large number of visitors from many fields of study, the ECTM has become a perfect meeting place, where education, research and entrepreneurship go hand in hand to develop the health care of the future.

Over the last ten years, we have built a solid foundation. In the next few years we will further develop this foundation into a well-reputed technical medical centre which will attract many parties from abroad.

We decided to publish this UT News special to show you what we do and why we have reason to be proud of what we have achieved over the last few years.

Kind regards,

Maarten IJzerman
Dean of HBT, Faculty of
Science and Technology

Colophon

This independently realized special edition of UT News was published in association with the Experimental Centre for Technical Medicine (ECTM).

The following persons contributed to this special: Ditta op den Dries, Sandra Pool, Maaike Platvoet, Paul de Kuyper, Rense Kuipers, Kitty van Gerven (UT News editors), Remke Burie (ECTM), Rikkert Harink, Christiaan Krouwels and Erik van 't Hullenaar (photography).

Cover image: Rikkert Harink

Graphic design and realization: Jeremiah Wetzel (SMG-Groep, www.smg-groep.nl)

PO Box 217, 7500 AE Enschede
+31 (0)53 489 2029, info-utnieuws@utwente.nl
www.utnieuws.nl

Contact ECTM: ECTMsecretariatTNW@utwente.nl
https://www.utwente.nl/tg/ectm/

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Remke Burie, head of the ECTM

‘The ECTM is unique and a leader in its field’

Remke Burie is the head of the ECTM. Together with his colleagues, he has turned the ECTM into a unique training and research facility for students over the last ten years. Now Burie wishes to pitch his lab to external parties. ‘There is so much scope for development.’

They started purchasing simulation equipment almost as soon as their plans for the design of an Experimental Centre for Technical Medicine had been given the green light in 2006. ‘We had a very good look at what was needed from an educational point of view,’ says Burie. ‘This was not about students learning tricks on simulation equipment. We wanted them to be able to learn how to experiment with technology. This resulted in our purchasing the Human Patient Simulator, which we still have today. It was a major outlay for the ECTM – probably the most expensive thing we bought. However, we definitely got our money’s worth out of it, because the doll is used very often indeed.’

HUMAN PATIENT SIMULATOR

Of course, the ECTM is much more than its Human Patient Simulator. For instance, the lab now boasts ultrasound equipment students are allowed to use to practise on each other. There are video rooms where students can practise and analyze professional conversations with patients, as well as simulators on which several types of endoscopy (e.g. minimally invasive diagnostic procedures and surgery) can be practised.
It was not long before the ECTM, which was located at Noordhorst at the time, outgrew its premises. In 2009, portacabins were installed while the Carré Building was being constructed. In 2010, the ECTM moved to the third floor of the Carré Building, where it was granted 1,200 m2. ‘After losing some space for a little while, we have now seen our floor area expanded to 1,400 square metres,’ Burie tells us. ‘And even that’s not enough, because we have no room for the MRI equipment we have recently acquired. So we’re renting additional space in the Meander Building for that. In other words, we’ve outgrown our premises again.’

NEW PREMISES

Therefore, the ECTM is looking into finding new premises, on which the university’s Executive Board will soon issue a decision. ‘We do like our current premises, but we’ve also noticed that it is important for our external presentation and the coherence between the various Health components that all our components be located in the same building.’
In addition to serving more Technical Medicine students, Burie hopes the ECTM’s facilities will be used more often by students of other disciplines in the future. ‘For instance, Psychology students are already using our video rooms, and Biomedical Technology students use our facilities in their practical ultrasonography and physiology seminars. However, I think Industrial Design and Creative Technology students could use our facilities, too, to test and design new health care concepts.’

GROWTH OPPORTUNITIES

‘The ECTM is not just a facility serving Bachelor’s and Master’s students, it also increasingly serves researchers, who will either use our medical equipment or ask us to help them design and conduct clinical trials involving human subjects. In addition, we could do a better job of using our expertise and facilities to offer training and refresher courses to health care professionals. We are already offering such courses to vascular surgeons and emergency medicine physicians. Teaching refresher courses to health care providers, especially on developments in technology, is a worldwide trend. This has been picked up by the medical industry, which is always evolving. It’s a great opportunity to attract new users.’
According to Burie, the centre should be attractive to companies and entrepreneurs, as well. ‘I think there is great scope for testing products or conducting experiments in a simulated environment. Add to this the unique expertise we have at the UT and our very strong medical network, and you’ll agree that there is ample scope for ensuring that new products are developed more quickly.’
The ECTM is unique and a leader in its field, says Burie. ‘But if we wish to hold on to that position, we’ll have to remain one step ahead of our competition. This being the case, I hope that the ECTM will become the number one centre to which you can turn for any technical medicine knowledge you may require.’

TEXT: MAAIKE PLATVOET | PHOTO: RIKKERT HARINK >

Experiments and innovations

'Hospitals are increasingly required to work more efficiently, people are increasingly in need of home care, and new technologies are being developed all the time. Health care professionals are facing many challenges,' says Heleen Miedema.

'For our current group, the current Experimental Centre for Technical Medicine (ECTM) is proving to be a real boon, but the future European Technical Medicine Centre (ETMC) will be an even greater godsend,' says Heleen Miedema, the Programme Director for Technical Medicine, Biomedical Technology and Health Sciences.

The time when health care students learned everything they needed to know in a hospital or other type of health care institution is over, says Miedema. Hospitals are not quite the centres of learning they used to be. 'This being the case, there is a need for simulated environments which can assume the role which used to be played by hospitals,' states Miedema. 'When we were developing our simulated environment, the ECTM, we asked ourselves the following questions: "What kind of things must a health care professional learn?", "How does one learn things in a simulated environment?" and "How to ensure that students can apply the things they learn in the simulated environment to the situations they will encounter in medical practice?" Educational research provided us with the answers to our questions – answers we were able to apply directly.'

Miedema says it is for good reason that the French training centre IRCAD – an expert in the field of minimally invasive surgery – is entering into a partnership with the UT. 'They are impressed with our educational method and with the rate at which our students develop their skills. The ECTM currently serves as an experimental centre which trains students to become technical and medical professionals and which tests new technological concepts. In addition, since the centre inspires researchers, it serves as a source of innovative health care.'

Now that the current ECTM is outgrowing its premises, Miedema hopes that the centre will soon receive the green light for a newly to be constructed building in which plans for the ETMC can be realized. 'The ECTM is an environment with a high level of expertise, in which health care professionals are challenged. It is now up to us to convert this concept into a fully fledged European Technical Medical Centre.'

Mathilde Hermans

ECTM **EXPERT**

'There is much room for improvement in the field of remote monitoring'

'I only just started as a lecturer and researcher at the ECTM. In my research, I will be focusing on remote patient monitoring for the next few years. There is a trend towards an increasing number of patients – after all, our population is ageing – but at the same time there is a great emphasis on cutting expenses. As a result, some patient care will increasingly be delivered outside the hospital setting.

Mobile medical equipment and wearables help us monitor patients remotely. Take, for instance, a plaster or monitor which measures signals and forwards its measurements to a centralized server by phone.

My graduation project at Amsterdam Academic Medical Centre saw me investigate how to remote-monitor patients who had undergone heart valve surgery, thus allowing them to go home sooner. Remote monitoring is a completely new method designed to make health care more efficient and detect abnormalities more quickly. There is still much room for improvement. It is important that the people checking the monitoring results focus on the right information out of large amount of transmitted data. Which data matter depends on the patient and their situation. In other words, the challenge is to turn a general application into something which will benefit individual patients.

In addition to this study, I'm engaged in several courses taught as part of the Technical Medicine curriculum. I'm also going to be supervising students, which is a great aspect of my new job – transferring my knowledge and enthusiasm for my field of study to others.'

TEXT: SANDRA POOL | PHOTO: RIKKERT HARINK >

TEXT: RENSE KUIPERS | PHOTO: RIKKERT HARINK >

MST neurologist and UT professor Michel van Putten discusses collaboration

‘Technological solutions to clinical problems’

Michel van Putten moves in two worlds. In one world, he is a neurologist at MST; in the other world, he holds UT’s Clinical Neurophysiology chair. These twin roles allow him to see from up close how both worlds can strengthen each other. In his words, it is all about ‘showing compassion for the patient, while at the same time being fascinated by their affliction’.

According to Van Putten, who has been affiliated with the UT for approximately ten years now, his research is strongly motivated by patient care. ‘I have always had the feeling and the vision that the interface of medicine and technology offers plenty of scope for research and innovation. You can see the results of that in the work we do in my department.’

The issues which drive Van Putten and his colleagues are clinically motivated. His department converts fundamental research into clinical research and vice versa, thus causing the traditional boundaries between the UT and the hospital to blur. For instance, Jeannette Hofmeijer and Joost le Feber are using cultivated neurons in the animal testing lab to determine which basic processes play a part in changing brain function due to lack of oxygen. Recently, these swabs have shown that the level of brain damage due to lack of oxygen can be reduced.

EPILEPSY AND COMA RESEARCH

Van Putten himself mainly uses EEG (electro-encephalogram) and TMS (transcranial magnetic stimulation) equipment at the ECTM, so as to investigate the irritability of the cerebral cortex, which has probably changed in patients with epilepsy. ‘We would like to improve the methods we use to diagnose such patients, and develop a biomarker to predict the effect of medication,’ says Van Putten. ‘At the ECTM we can also develop basic measurement protocols, which we can then apply to patients at MST, which houses a replica of this measurement set-up,’ he says, explaining the translational nature of his research.

A second line of research in which EEG plays an essential part is diagnosing the level of brain damage due to lack of oxygen. ‘Along with my colleagues Marleen Tjepkema and Jeannette Hofmeijer, and in close association with the intensivists at MST and the Rijnstate Hospital, I have by now shown that EEG is highly suitable to predicting whether or not patients will wake from their coma following resuscitation, and if so, what their quality of life will be like.’

WHITE COAT AND T-SHIRT

Technical Medicine PhD and Master’s students similarly have one foot in medical practice (the hospital) and the other at the ECTM or in the lab. ‘I think this combination of clinical work and basic neurophysiology is quite unique,’ states Van Putten. ‘One moment you’re at the Clinical Neurophysiology department or the intensive care unit, wearing a white coat; the next moment you’re sitting in front of a computer at the UT in a T-shirt. Clinical technologists can handle this kind of switch.’ In closing, he says, ‘It’s good to see that such translational research is increasingly being encouraged, as with the Pioneers in Healthcare vouchers which have been granted to several UT researchers, Menzis health insurers and the MST en ZGT hospitals.’

How London became a hit

They absolutely loved the UT's Technical Medicine students, right from the get-go. Ten years down the line, they still do. Each year, several UT Master's students travel to London for a work placement or to graduate from Guy's Hospital, which is affiliated with King's College London. UT researcher Bennie ten Haken was the first person at the UT to talk to the Brits.

He vividly remembers how it all came about. Ten Haken, a superconductivity researcher, was enjoying a sabbatical and was conducting research at Berkeley. While there, he received a phone call asking him to come and help establish a Technical Medicine degree programme. 'It was the first time I was granted the opportunity to contribute to something entirely new. No decisions had been made on anything. It struck me as an incredible challenge, which I was happy to contribute to.'

In those early years, the technical medicine programme only served the 'domestic market',' says Ten Haken. There were no such things as overseas work placements. 'Students are being trained to obtain their Dutch doctor's credentials, but obviously, the international field is an interesting place to obtain some experience.' Technical Medicine students do a total of four brief clinical internships. According to Ten Haken, two types of students can be distinguished among those doing the internships. 'Some students receive very high marks right from their first internship. These students perform very well in a clinical setting and could do with a few more challenges. Other students take a bit longer to successfully complete their internships. We love sending the first group of students on foreign internships, because no matter where they go, we receive positive feedback. Why? Because these students can solve technological issues as well as have a meaningful conversation with the local doctors.'

LONDON

Back in 2003, Ten Haken attended a conference on labs on a chip in Barcelona, where he met a scientist named Quentin Pankhurst, who worked at Guy's Hospital and indicated that he wanted to 'be more patient-oriented'. Ten Haken and Pankhurst collaborated on a new form of magnetic detection to be used in sentinel lymph node biopsy. 'Is there any way we could collaborate more often?' Pankhurst inquired. In answer, one Biomedical Technology student was sent to London. 'And they just loved it.' Technical Medicine students followed soon afterwards.

So London is happy with its UT students, but the reverse is also true. The Technical Medicine department is happy with the opportunities afforded by London work placements. Due to strict protocols, Technical Medicine students are often barred from working with patients in foreign hospitals. 'However, in England they are allowed to work with patients, since they are being supervised by doctors. The fact that they are allowed to work with real patients, just like in Dutch hospitals, makes these internships incredibly useful.'

Over the years, Pankhurst grew so enthusiastic about his Dutch students that Ten Haken and programme director Heleen Miedema flew to London to explain exactly what the Technical Medicine programme entails. 'The Brits nearly fainted when they heard that clinical technologists are registered doctors in the Netherlands,' Ten Haken tells us. 'They were flabbergasted. You see, things are far more complicated in the English setting, what with there being so many hospitals and so many managers. Even so, University College London has by now taken the first steps towards establishing a Technical Medicine programme of its own. We will definitely try to contribute to that, since the international aspect is so very important.'

The UT's first Technical Medicine student in London

Maarten Grootendorst was the first Technical Medicine student to do a work placement in London. He is currently carrying out his doctoral research at Guy's Hospital.

'Back in 2011, I did an internship at Guy's Hospital's Research Oncology department, where I started a multi-centre study to evaluate a new technology to detect the sentinel node in women with breast cancer. In addition, I was allowed to obtain patients' medical history at the hospital's outpatient clinics and perform physical examinations. I learned a lot more about, and gained a lot of additional experience with, sentinel lymph node biopsies in the operating theatre, where I was allowed to assist during operations.

My internship was a success in several ways. For instance, medical ethics review committees authorized us to conduct the

TEXT: MAAIKE PLATVOET | PHOTO: RIKKERT HARINK >

Building a bridge between research and the business community

Bauke Anninga did a work placement at King's College London in 2012 and is now conducting sentinel node research as part of his PhD research.

'Initially, I was there for a three-month work placement, but both myself and my supervisor were so happy with the way things were going that I ended up staying to do my final work placement there, as well. During this work placement I designed a multi-centre clinical trial to administer a new type of sentinel node surgery to melanoma patients. Afterwards, I was offered a position in the college's PhD programme, so as to be able to continue my sentinel node trial. For this purpose I closely collaborated with other hospitals, including Medisch Spectrum Twente in Enschede. This trial resulted in several publications in well-reputed journals.
At the moment I'm completing my doctoral research. My interests and ambitions are in the field of research and the business community. To this end, I established the Innovation Forum (www.innoforum.org) in my leisure time, along with colleagues from Cambridge University. Innovation Forum's objective is to build a bridge between universities and companies, and to grant researchers the opportunity to view their studies not just as a means to a next publication, but perhaps as a spin-out from the university where they work. People turned out to be interested in the concept, and we now have branches in fifteen locations all over the globe. My plan for the future is to expand this number even further.'

study not just in the UK, but in the Netherlands (at Medisch Spectrum Twente) as well. Since I'd gained some experience in London, I was allowed to start the project in the Netherlands, as well, which became my graduation project.
In addition, I met the head of King's College London's Surgical Oncology department, Professor Arnie Purushotham. While I was preparing for my graduation, we started collaborating, which eventually resulted in my being offered a spot in the hospital's PhD programme. I now investigate new imaging techniques used to provide an intra-operative image of tumour cells in women who are undergoing breast-conserving surgery. I hope to receive my doctorate this summer.
By now the Research Oncology department has created several permanent work placement positions for Technical Medicine Master's students.'

ECTM
EXPERT

Anique Bellos-Grob

‘Ultrasound: dynamic research and dynamic teaching’

‘Variation and dynamics are key words to me, which is why I feel quite at home at the ECTM. Ever since I was offered a lecturing and research position here in August 2013, after obtaining my Master’s degree in Health Sciences and Technical Medicine, I have been engaged in the centre’s ultrasound and endoscopy courses in myriad ways. Among other things, I coordinate the endoscopy and laparoscopy lectures and simulation training sessions taught here by doctors, while teaching hands-on and ultrasound simulation training courses to both Bachelor’s and Master’s students myself.
I love teaching, partly because students really like working with ultrasound technology. They’re really happy to do some practical stuff after sitting through so many theoretical lectures. I have to admit I find ultrasonography an attractive method myself. You see, ultrasonography provides an instant result; you can tell whether you’re doing it right at once. Moreover, it’s a non-invasive diagnostic method. I like that, too.
That said, I’m glad my job doesn’t entirely revolve around teaching. You see, in addition to my work at the ECTM, I work at Utrecht University Medical Centre’s Gynaecology department, where I’m conducting doctoral research into ultrasonography of the pelvic floor. Thanks to this research, I often get to talk to patients, doctors and fellow PhD students. In short, I have a highly varied job, which suits my jack-of-all-trades attitude just fine, as I really like doing dozens of things at a time.’

TEXT: KITTY VAN GERVEN | PHOTO: RIKKERT HARINK >

Lex van Loon

‘I get to present my students with practical examples’

ECTM
EXPERT

‘I was a Technical Medicine student myself, and have been a lecturer and researcher for the last two years. I work at Radboud University Medical Centre’s Intensive Care unit and examine which patients benefit from being administered additional fluids and which patients don’t. The problem is that we are unable to predict beforehand who is and isn’t going to make a recovery thanks to additional fluids. The idea is for the fluids – generally a saline solution – to be absorbed into the patient’s cardiovascular system. It is important for the heart to be able to properly pump it around, so as to provide the tissues with more oxygen. What you don’t want is for the liquid to start pooling in the lungs. Hopefully, we will one day have a diagnostic tool which indicates who could and couldn’t do with additional fluids. Unfortunately, we’re not quite there yet.’
‘I bring the experience I gain in clinical practice to the ECTM. I teach courses on the physiology of blood vessels to both Bachelor’s and Master’s students of Technical Medicine. The great thing about the UT/Radboud UMC partnership is that I get to present my students with practical examples and discuss the latest developments in my field.’
‘Finally, I’ve got some great news. Together with a few colleagues, I’m establishing an area at the ECTM where various types of medical wearables will be able to be tested. Students and researchers alike will be able to get to know new wearable medical equipment there, and to assess its usability at the same time.’

TEXT: SANDRA POOL | PHOTO: RIKKERT HARINK >

TEXT: PAUL DE KUYPER | PHOTO: RIKKERT HARINK >

Simulated patients contribute to Technical Medicine students' training

Many afflictions, which are all over by the end of the day

Sometimes they have lung problems, at other times they're epileptics, and the next time they may suffer from dementia. Approximately 45 simulated patients play a vital part in the training Technical Medicine Bachelor's students receive at the ECTM.

Third-year Technical Medicine student Tom Boonen conducts a consultation with simulated patients Anita and Leo Lettink, while lecturer Annelies Lovink observes the action.

'You get to play a variety of roles,' says Leo Lettink. 'Sometimes you'll suffer heart problems, or lung problems, and at other times you'll have problems with your hip,' his wife Anita adds. 'In addition, we'll sometimes play a couple where one partner is rather dominant.'

Anita and Leo are two of approximately 45 simulated patients who help out Technical Medicine students through role-playing games held as part of the Competent Communication & Professional Conduct course. Generally, simulated patients spend two half days per month playing patients. They receive scenarios beforehand, to help them study their parts.

'Students attend these seminars for the entire duration of their Bachelor's degree,' says lecturer and course coordinator Annelies Lovink. 'They learn how to conduct a consultation in their capacity as clinical technologists. In Year 1, the role-playing games are all about making contact with patients. In Year 2, students will conduct an entire consultation, including a physical examination. In Year 3, they will be confronted with tough cases such as bad news conversations or patients who are afraid or angry.'

'Since we've been doing this for seven years now, we've seen students develop. They're getting increasingly mature,' says Anita. 'You can tell mainly when they're conducting a physical examination,' Leo adds. 'The first time they measure your blood pressure, their hands will shake. Of course, they will have practised on each other, but touching a complete stranger is a different matter altogether.' 'Yeah, that can be funny,' says Anita. 'But no matter how clumsy they may be, we have to stay in character.'

SEVERELY DEMENTED

The greatest role Leo ever played was one in which he was asked to speak in dialect. 'I noticed that the students had no trouble understanding me, even though I used words which aren't commonly used.' For her part, Anita once played a demented old lady who used an iPad as a coaster for pans. 'It's quite difficult, actually, playing a severely demented person.'

'It really is fun work,' Anita tells us. 'We feel like we're contributing to the students' development. We even get to provide feedback on our consultation experience.' This feedback – which simulated patients are trained to deliver – is important, Lovink confirms. 'This is how a student learns what kind of impression he has made on his patient.'

In closing, Leo tells us that the simulated patients have a great time with each other. 'Whenever we enter the building, we'll greet each other by asking, "So, what's the issue today? Your lungs or your liver?" We have a lot of fun together.' And why not? Unlike real patients attending real consultations, simulated patients always leave the practice in the pink of health at the end of the day.

TEXT: MAAIKE PLATVOET I PHOTO: CHRISTIAAN KROUWELS >

Linda van der Veen introduces clinical applications

‘There is a great deal of close collaboration between the technologists and the doctors’

Linda van der Veen, 31, is a postdoctoral researcher at Amsterdam’s Antoni van Leeuwenhoek Hospital’s Nuclear Medicine department. ‘I’m always working on innovations, technology and medicine.’

Linda van der Veen was one of the UT’s first Technical Medicine students to graduate. She belonged to a cohort of students whose training was all about pioneering, inventions and innovations. ‘It drove me bonkers at times,’ she says with a smile while we walk to the staff cafeteria through the warren of corridors that is the Nuclear Medicine department. Once she’s sipping her cappuccino, Linda (who originally hails from Groningen) admits that she had no real concept back in 2003 of what her Technical Medicine degree would bring her. ‘Looking back on it now, I think I was expecting to become a doctor.’ However, she has never regretted her decision to study Technical Medicine.

During her Master’s degree, she did a work placement and a final internship at Leiden UMC’s Nuclear Medicine department. ‘I’ve always been interested in medical imaging. In Leiden I researched the technological aspects of cardiac examinations, to determine what was considered normal and what was considered abnormal. My research resulted in the publication of two articles. Since my graduation project contained a lot of preparatory research for my doctoral thesis, I was able to complete my doctoral research in two years.’

Linda was offered a post-doctoral position in Leiden, but opted instead to transfer to the Antoni van Leeuwenhoek Hospital, which specializes in oncology. ‘I was given a chance here to continue exploring nuclear medicine. It’s a pleasant place for Technical Medicine graduates since there is a great deal of close collaboration between the technologists and the doctors. In addition, many of my colleagues have a background in physics, so we understand each other quite well.’

MOBILE GAMMA CAMERA

Having first served a three-year contract, she is now on a permanent contract. ‘My work deals with introducing and establishing clinical applications and clinical physics. In addition, lab technicians report to me when problems arise, for example with scans.’ Among other things, she was responsible for making the hospital’s mobile gamma camera operational. ‘This camera can join the patient in the operating theatre so as to take 3D images. My department has used the camera to detect, very precisely, the location of tumours in women with breast cancer, after we had inserted iodine seed implants on the location of the tumours while performing biopsies.’

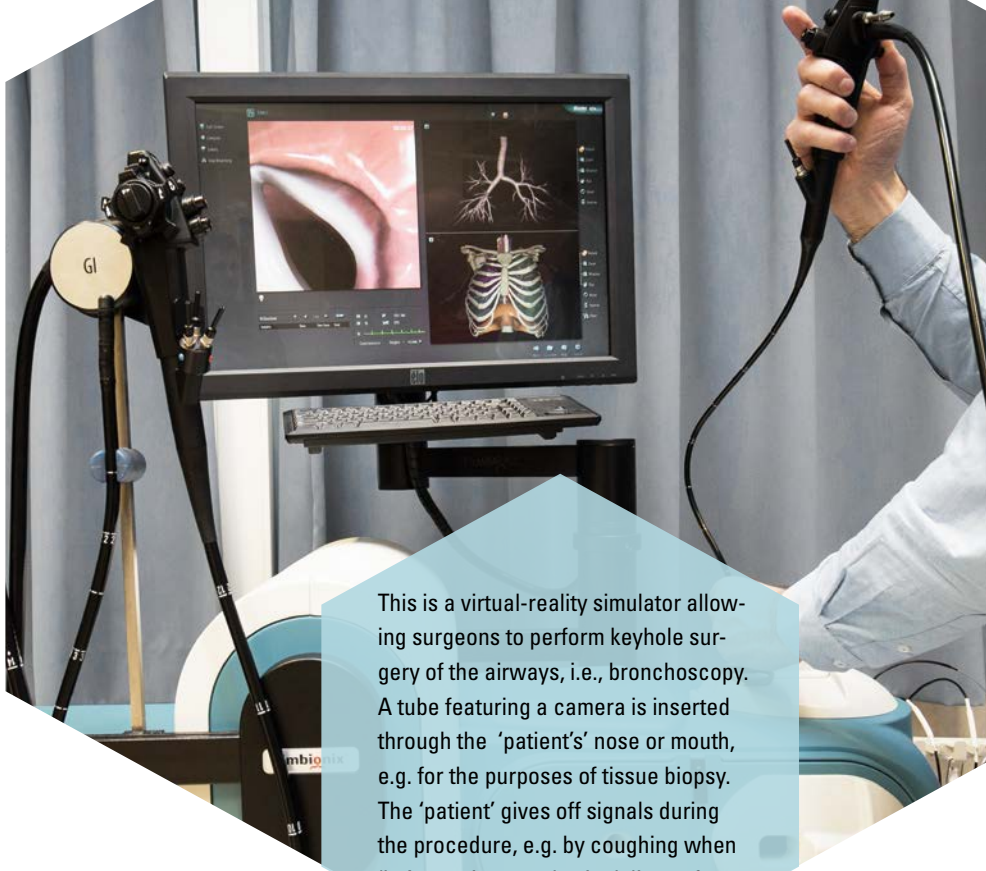
‘What makes my job so interesting is the ongoing process of innovation and inventing new technological applications. I’m glad I didn’t become a regular doctor. The work would have gotten boring too quickly. Doctors are too stuck in certain routines for my taste.’

She is now ‘fighting a serious fight’ to have her position as a clinical technologist formally recognized. She has already obtained the board’s promise to do just that. ‘If I’m recognized as a clinical technologist, I’ll be more independent and I’ll be able to assume greater responsibility within the medical team. I’m sure I can make that happen.’

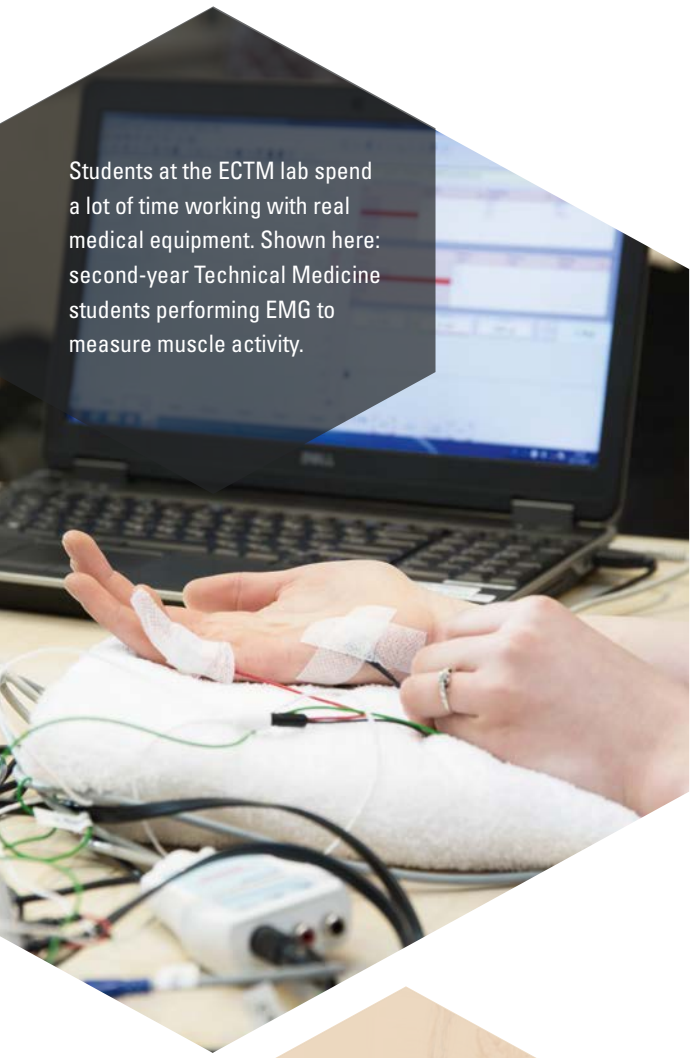
UT nieuws PHOTO COVERAGE

PHOTOS: RIKKERT HARINK >

The ECTM in images

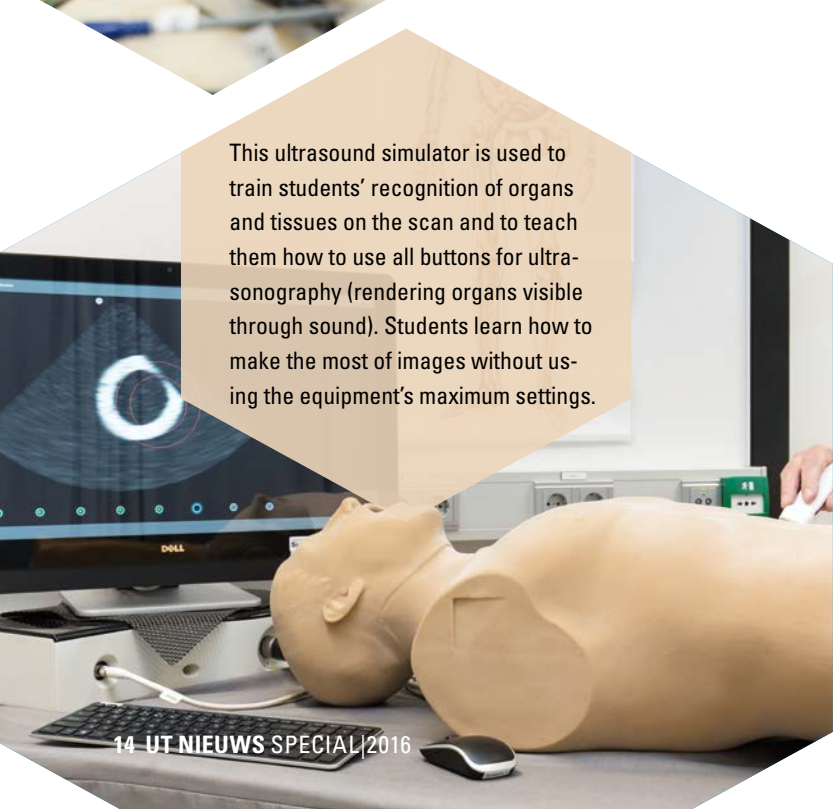


This is a virtual-reality simulator allowing surgeons to perform keyhole surgery of the airways, i.e., bronchoscopy. A tube featuring a camera is inserted through the 'patient's' nose or mouth, e.g. for the purposes of tissue biopsy. The 'patient' gives off signals during the procedure, e.g. by coughing when 'he' experiences physical discomfort.



Students at the ECTM lab spend a lot of time working with real medical equipment. Shown here: second-year Technical Medicine students performing EMG to measure muscle activity.

This laparoscopic surgery simulator allows the student to perform minimally invasive keyhole surgery in the abdominal cavity in virtual reality.

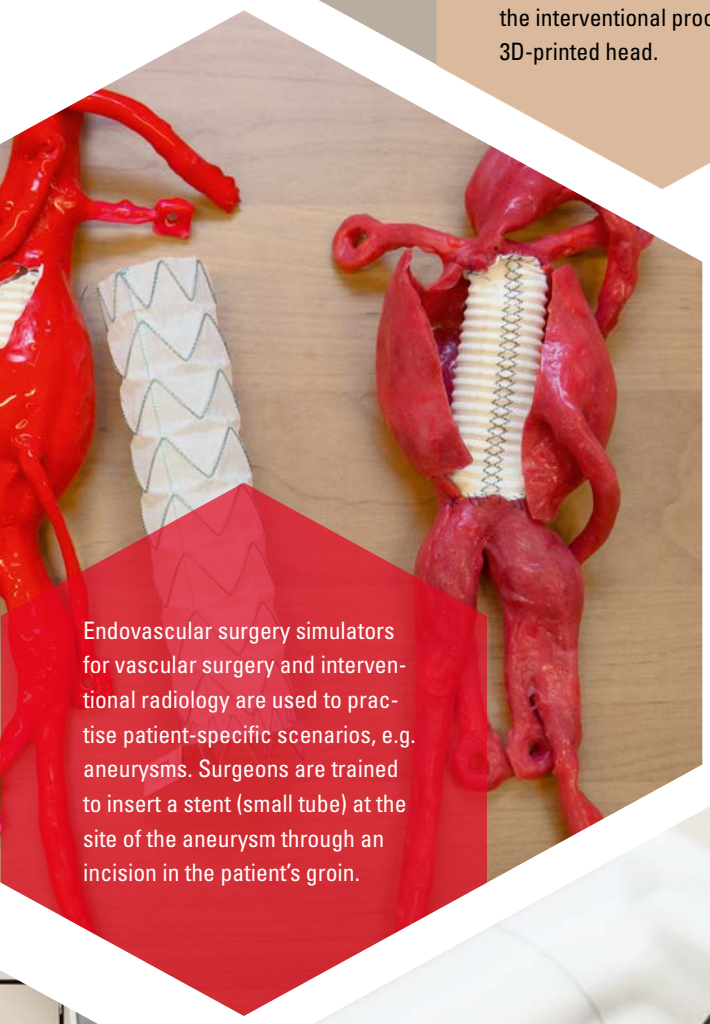


This ultrasound simulator is used to train students' recognition of organs and tissues on the scan and to teach them how to use all buttons for ultrasonography (rendering organs visible through sound). Students learn how to make the most of images without using the equipment's maximum settings.

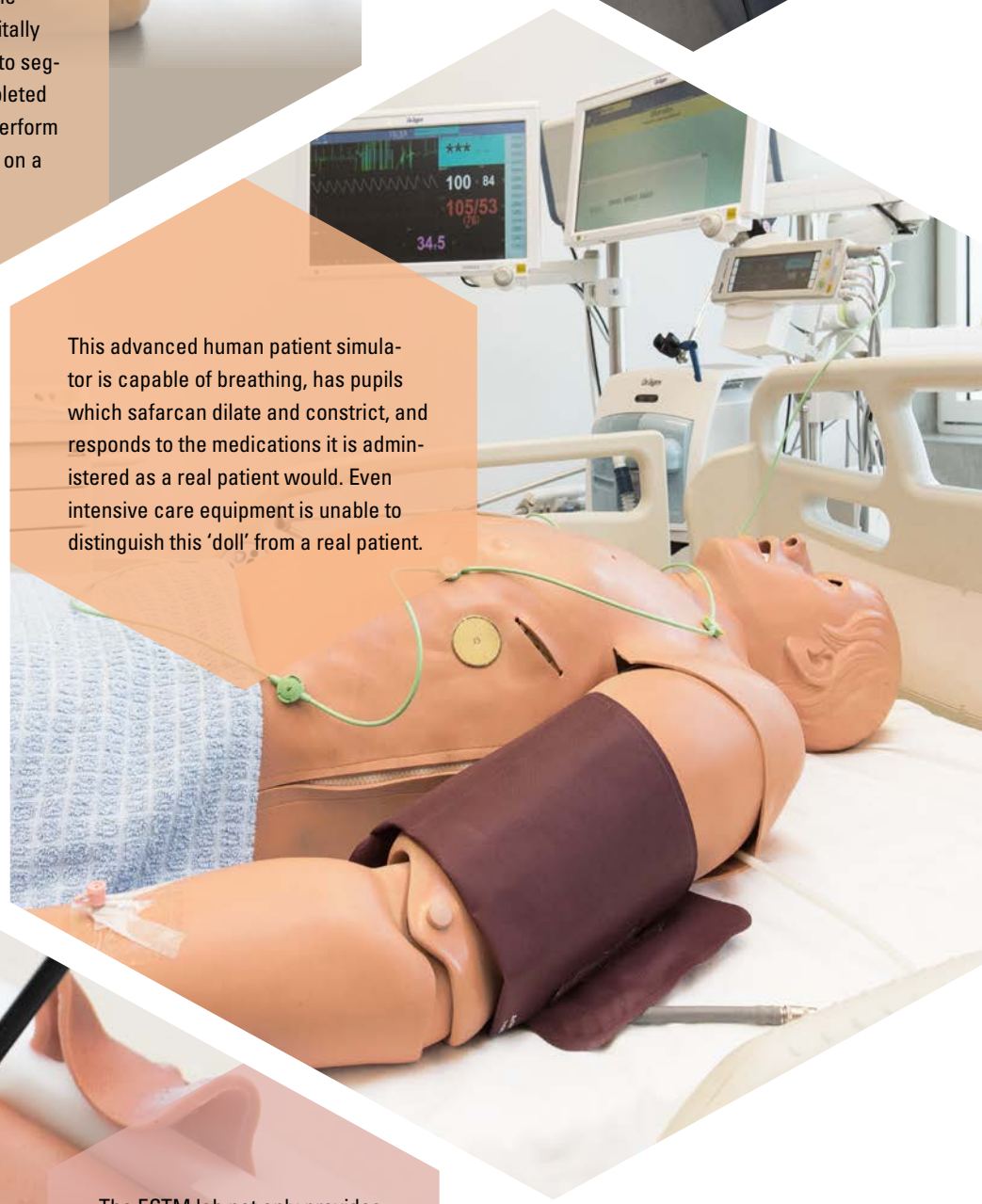
This simulated operating theatre allows the ECTM to train and assess students in performing complex medical interventional procedures (minimally invasive surgery, electrosurgery and vascular surgery).

Students are asked to plan the ideal path to a tumour by digitally dividing the patient's head into segments. Once they have completed this task, they are asked to perform the interventional procedure on a 3D-printed head.

This Cone Beam CT scanner teaches students to work with X-ray equipment by reconstructing scans. The CT scanner revolves around the patient's head and is mainly used in dental, oral and maxillofacial surgery.



Endovascular surgery simulators for vascular surgery and interventional radiology are used to practise patient-specific scenarios, e.g. aneurysms. Surgeons are trained to insert a stent (small tube) at the site of the aneurysm through an incision in the patient's groin.



This advanced human patient simulator is capable of breathing, has pupils which safarcan dilate and constrict, and responds to the medications it is administered as a real patient would. Even intensive care equipment is unable to distinguish this 'doll' from a real patient.

The ECTM lab not only provides virtual training. Small clips can be used to suture artificial skin. In addition, students receive practical suturing training on pigs' legs.

Vascular surgeon Bob Geelkerken

‘Thanks to the ECTM, our vascular surgery course is the best in the country’

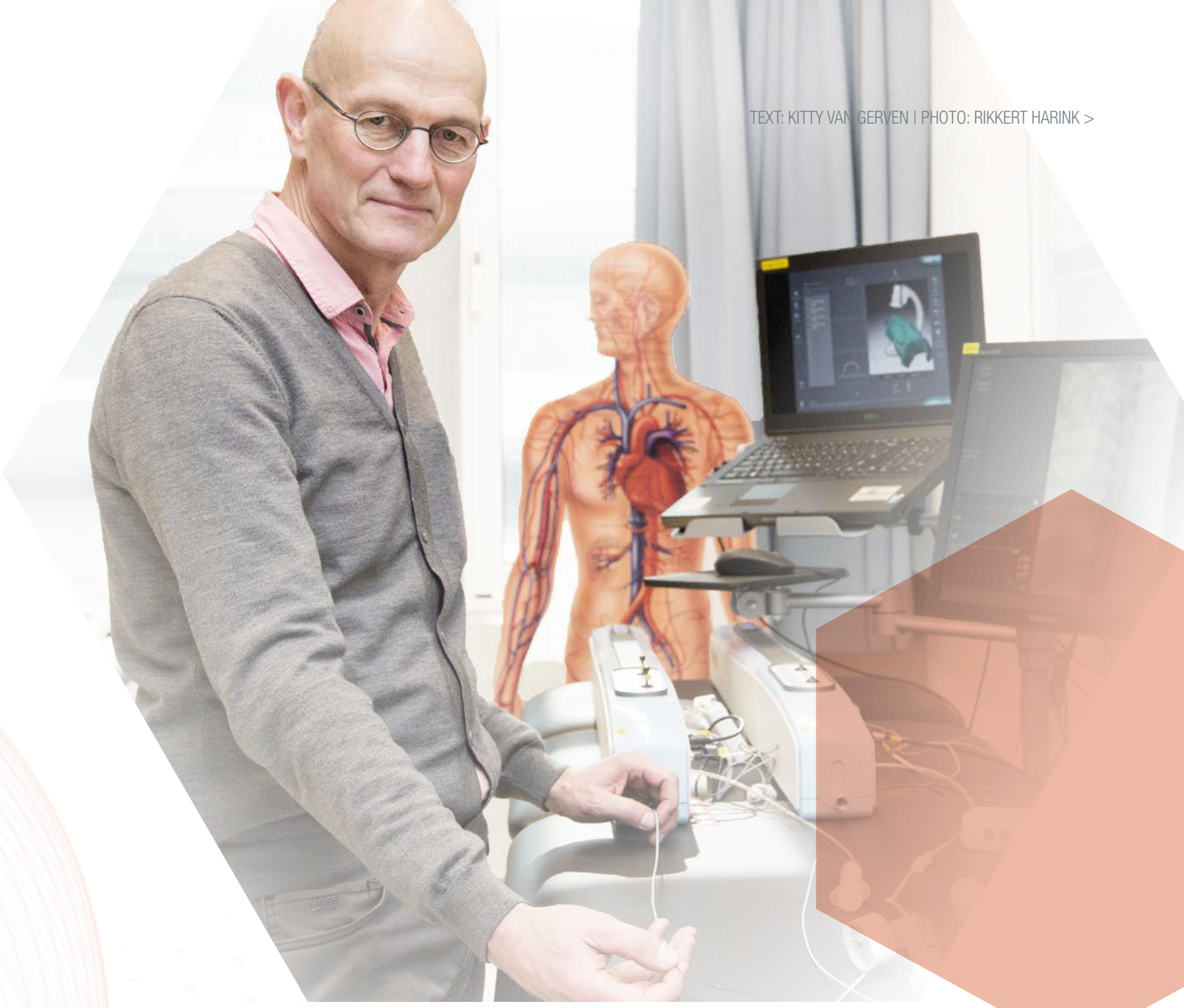
Serendipity, that’s all it was. If Bob Geelkerken, a vascular surgeon at Medisch Spectrum Twente, hadn’t happened to attend the ECTM’s Open Day five years ago, the vascular surgeons of the future might not have had one of the best-equipped training and testing spaces in Europe at their disposal. ‘Also, our vascular surgery educational programme would not have been voted the best in the Netherlands.’

Every time residents in vascular surgery from all over the Netherlands arrive in Enschede, Bob Geelkerken feels a pang of pride. He is proud to be able to welcome the students to one of the best-equipped practical training rooms in Europe, a training and testing centre chockfull of state-of-the-art technology and the very best medical simulation equipment money can buy. However, most of all, he’s proud because he knows that the workshops in which students are taught the skills they require to become fully fledged vascular surgeons are top of the bill. ‘And yes, as a Twentenaar, albeit originally from elsewhere, I’m fairly proud of that,’ Geelkerken admits.
He’s not the only one to be proud, because both the budding vascular surgeons (24 of whom annually take their practical examinations in Enschede) and the observers supervising them couldn’t agree more: this space has it all. Of course, Geelkerken knew that as soon as he entered the brand new Experimental Centre for Technical Medicine five years ago. ‘I was a chance visitor, but when I saw that space, the operating theatre, the way the rooms had been designed, the possibilities afforded by video recording, and the various simulation technologies, I knew straight away that this was exactly what we needed for our practical examinations.’
As it happened, Geelkerken, who had contributed to the drawing-up of a new vascular surgery curriculum just a few years earlier, was serving as the secretary to the programme committee of NVvV, the Dutch Association of Vascular Surgeons, at the time. In other words, he was extremely familiar with the requirements for practical training areas. As a result, his proposal to enter into a partnership with the ECTM was quickly accepted by his peers. ‘And thanks to the UT’s great educational expertise, it only took us half a year to draw up a complete training programme,’ says Geelkerken.

SEVEN VASCULAR DISCIPLINES

The ECTM training programme has two objectives: first, to improve budding vascular surgeons’ skills, and secondly, to assess these skills. ‘Out of all 44 disciplines which make up surgery training, vascular surgeons are expected to have mastered all seven of the vascular disciplines to the very highest standard,’ Geelkerken explains. ‘They must have the knowledge, be able to apply it and be able to teach it to others.’
In order to assess whether students are competent in all seven disciplines, they must attend a number of workshops in the fifth and sixth year of their degree, in which the seven disciplines are taught. ‘The workshops follow a fixed format,’ Geelkerken explains. ‘Candidates are presented with a case, only to be asked to demonstrate their understanding of this case. They are then asked to perform an interventional procedure, after which they are assessed. Students’ marks are added to their portfolios, which are forwarded to their supervisors at the hospitals where they are receiving their training.’
The interventional procedures are performed using the ECTM’s simulation equipment, which allows users to effortlessly imitate real-life situations encountered in hospitals. ‘We have open training devices, such as carotid artery and abdominal aorta devices, as well as a virtual training device, a Simbionix.

TEXT: KITTY VAN GERVEN | PHOTO: RIKKERT HARINK >



This endovascular training device allows us to practise repairing vessels in accordance with the so-called inner tube method, which allows the student to follow their actions on a monitor,' Geelkerken explains.

EDUCATIONAL EXPERTISE

However, the state-of-the-art technology the UT centre has at its disposal is not the only reason why the Dutch Association of Vascular Surgeons is so satisfied with its partnership with the ECTM. 'Another contributing factor is the educational expertise contributed by the university.'

According to Geelkerken, the latter is the main reason why the vascular surgery course has been raised to a higher standard over the last five years. 'Now that courses and examinations have been standardized at the ECTM, the course is seeing uniform standards, for the first time in its history. Until recently, trainee surgeons were only assessed at their own hospitals, and it was the student's own supervisor at the hospital where they were being trained who decided whether or not they should be allowed to practise as a qualified vascular surgeon. Now we have nation-wide standardized minimum requirements and budding vascular surgeons' performance is assessed more objectively.'

GRADUATES' LEVEL OF PROFICIENCY

According to Geelkerken, the aforementioned changes have not only made it easier to assess students, but have also raised the level of proficiency displayed by graduates of the course. European vascular surgery examinations regularly demonstrate just how competent the ECTM graduates are. 'It turns out that surgeons who have taken their examinations at the ECTM have no difficulty whatsoever passing those exams,' states Geelkerken.

As a matter of fact, the surgeons' performance is such that the Council for Surgical Training and Education (Consilium Chirurgicum) has voted the ECTM's vascular surgery course 'the most successful course and assessment of knowledge, skills and behaviour' for the last five years. For this reason, Geelkerken would not be surprised if more medical disciplines were to come knocking on the ECTM's door at some point in the near future. 'I can't tell you right now whether this is going to happen and if so, in what way,' the Enschede-based specialist says on that score. 'However, I'm convinced that, what with technology playing an increasingly large part in surgeries, the ECTM will increasingly play a central role in the process.'

ECTM
EXPERT

Eline Mos-Oppersma

‘I never even wanted to become a teacher!’

‘My research is in the field of respiratory physiology – in other words, everything related to breathing. My research at Nijmegen’s Radboud University Medical Centre focuses on the regulation of breathing. For instance, I look at how regulatory system works in healthy people, and then apply my findings to the patients I’m studying. This two-step approach is the best thing about being a clinical technologist: you have to return to basic physiology in order to ensure that a patient and a mechanical ventilator are a good match. That’s the ultimate goal.

Respiratory physiology is a relatively new field of study within the field of medicine. Half a century ago, patients were still being ventilated by iron lungs. What I like about my job as a lecturer and researcher with the ECTM is that I can apply my research in Nijmegen to my students. I get to apply the knowledge I gain in Nijmegen to my lectures here. And I never even wanted to become a teacher!

Because this is what it’s all about – educating clinical technologists, so as to enable them to come up with innovative ideas. The ECTM, in its capacity as a connecting element, encourages and inspires students to do so. External parties come here to learn, while we send students into the world. Whatever we can do to improve the level of care patients receive!’

TEXT: RENSE KUIPERS | PHOTO: RIKKERT HARINK >

ECTM
EXPERT

Erik Groot Jebbink

‘Just because you’re qualified doesn’t make you competent’

‘I got my degree in Technical Medicine in 2013 from Arnhem Rijnstate Hospital’s Vascular Surgery department, where I still work one day a week. At the ECTM I work as a lecturer and researcher. My research focuses on how the placement of a stent in the bifurcation of the aorta and the femoral arteries affects circulation.

In addition, I coordinate the Master’s course in surgical skills, which is taught as part of our Technical Medicine programme. Technical Medicine graduates are registered doctors and are therefore qualified to perform surgical procedures. However, just because you’re qualified doesn’t make you competent. So as to increase students’ competence, we teach them basic skills such as making an incision and suturing. Furthermore, we teach them how to behave in an operating theatre. You see, operating theatres are a special type of work environment, and it’s important that students are aware of its rules. The main focus of this course is the safe and rational performance of practical skills. It takes a lot of practice to master these skills.

What I like most about my work is how varied it is. On top of coordinating Technical Medicine courses, I coordinate the courses vascular surgeons take at the ECTM, while also conducting my own doctoral research. I made a conscious decision not to go about getting my PhD the regular way, because I like the variety of what I’m currently doing. For instance, last quarter I was mainly focusing on the surgical skills course, but in the current quarter I have more time to carry out my research.’

TEXT: PAUL DE KUYPER | PHOTO: RIKKERT HARINK >

TEXT: SANDRA POOL >

Holland Innovative is a partner in the TechMed trial centre

‘We look into the marketing of products’

At the TechMed trial centre, companies use the services and facilities provided by the ECTM. Their objective is to test and quickly market clinical technology products which are still being developed.

The UT collaborated with three companies (Holland Innovative Twente, DKMS and Panton) to establish the trial centre, which opened in January of this year. Regional hospitals and academic medical centres are also involved in the trial centre. In this manner, the ECTM’s facilities and expertise become accessible and available to several parties.
‘Which is interesting,’ says Ivo Aarninkhof, a graduate of the UT’s Mechanical Engineering department and managing director of Holland Innovative Twente. ‘Our company looks into the marketing of the medical products being developed. Moreover, we pay a great deal of attention to the needs of our clients, who range from start-ups to multinationals, and we make sure that the products are aligned with those needs. We’re good at that.’

MORE GROWTH

Holland Innovative Twente specializes in reliability engineering, which is designed to optimize a product’s development process, and in Design for Six Sigma, a method designed to develop new products in which clients’ wishes are taken into account right from the earliest stages of the design. ‘These proven methodologies are highly analytical, which results in robust products with a predictable lifespan which can be marketed more quickly,’ says Aarninkhof.
The company is headquartered in The Gallery, close to the action. ‘We have observed that the world of clinical technology is constantly evolving. Hospitals are increasingly using technology as part of their medical processes. It’s an extremely dynamic field of activity. We expect much more growth in the field of clinical technology products.’
The establishment of the UT’s new TechMed trial centre is in line with this development and enables companies like Holland Innovative to test technological products in a simulated and realistic medical environment. ‘The ECTM is the physical location,’ Lisette Steinvoren, a project manager with Holland Innovative, adds. ‘Entrepreneurs can test their prototypes here in association with the end users, and then further develop them. We ensure that the trial centre receives projects which meet a clear customer need and combine robust technology with a clear business case.’

SPINAL DRILLING JIG

Take, for example, the Spineguide, a 3D-printed spinal drilling jig. This was ‘designed to be used in patients with scoliosis, a curvature of the spine,’ Steinvoren explains. ‘Sometimes surgery is required to remedy scoliosis. It involves a surgeon fixing the vertebrae in place with screws. Such surgeries require a great deal of precision and are performed manually. It is vital that the places where screws are inserted be selected very carefully, as the screws must not touch the nervous system. This drilling jig helps surgeons drill in the right place, thus reducing the risk of complications.’
‘The trial centre allows us to test this drilling jig in a very realistic medical setting,’ Steinvoren goes on to say. ‘In addition, this method allows us to keep communicating with Technical Medicine students and to develop new ideas for other projects.’

EMBARK ON A TECHNICAL MEDICINE INTERNSHIP

Number of students per hospital in the 2014-2015 academic year

47

UMC Utrecht

UTRECHT UMC	
Popular courses:	
Clinical neurophysiology	**6**
Traumatology	**6**
Other	35

Into the hospital

Technical Medicine students are doing internships in hospitals in the Netherlands as well as abroad. Below you will find a list of the most popular hospitals in the Netherlands.

42

Radboudumc

NIJMEGEN RADBOUD
Popular courses:
Intensive care 6
Neonatology 5
Other 31

39

MST

ENSCHEDE MST
Popular courses:
Pulmonary medicine 9
Other 30

39

amc

AMSTERDAM AMC
Popular courses:
BME Radiology 6
Internal medicine 6
Other 27

25

umcg

GRONINGEN UMC
Popular courses:
Radiology 5
Other 20

25

ANTONI VAN LEEUWENHOEK
NEDERLANDS KANKER INSTITUUT

AMSTERDAM AVL
Popular courses:
Surgery 15
Other 10

14

Rijnstate

ARNHEM RIJNSTATE
Popular courses:
Internal medicine 6
Vascular surgery 6
Other 2

11

isala

ZWOLLE ISALA
Popular courses:
Nuclear medicine 5
Other 6

9

zgt

ALMELO-HENGELO ZGT
Popular courses:
Orthopaedics 5
Other 4

infographic by Petra Meulman
Source: UT Technical Medicine Dept Image credit: Shutterstock


Radboudumc

TEXT: SANDRA POOL I PHOTO: ERIK VAN 'T HULLENAAR >

Jonne Doorduin performs measurements, analyses and interpretations

'Doctors can't do this'

He knows exactly in which situations to use his skills as a clinical technologist to the greatest effect. Jonne Doorduin, 31, employs his expertise in the field of clinical technology in brain surgeries and with patients who must be weaned off mechanical ventilation.

Jonne was one of the first graduates of the UT's Technical Medicine degree course. Since he graduated in 2010, he has worked at the intensive care unit (ICU) of Nijmegen's Radboud University Medical Centre, where he specializes in mechanical ventilation. In his office, he tells us that some patients experience great problems upon being weaned off ventilation. 'This may have several causes. Take, for instance, heart failure or weakness of the diaphragm, the main muscle involved in breathing. I have implemented a technological tool that measures the activity of the diaphragm and interprets the data. Doctors can't do that.'

The measurements are conducted in a so-called expertise centre, i.e., a unit containing four beds. Jonne dons his white lab coat and invites us to join him on a guided tour. 'In a way, this is the success story of our team,' he says while entering one of the rooms. 'Together with my colleague Lisanne Roesthuis, who also completed her degree in Technical Medicine at the UT, I first began to examine our own patients, but now we are receiving patients from other hospitals, as well. We examine, analyze and diagnose them, in consultation with an ICU doctor. We provide treatment, as well.'

Jonne tells us about a patient who spent four weeks on a ventilator in another hospital. 'Doctors there believed the patient's problems were due to a weak diaphragm, but it turned out it wasn't like that at all. The patient was experiencing heart failure. But with the right medications, the patient was able to be weaned off the ventilator within a week.'

IN THE OPERATING THEATRE

In addition to working in the ICU, the UT graduate also works at the Department of Clinical Neurophysiology, at an experimental research lab. 'And once week I'm in an operating theatre guarding the patient's nervous system, for instance with brain surgeries. On those occasions I'm positioned behind a measurement unit and stimulate the patient's brain with small electrical pulses. We then check whether the patient responds to these stimuli. In this way, we guide the neurosurgeon who is working on removing a tumour, for example. Together, we determine which tissue can be removed and which cannot. The measurements help us determine precisely where the boundaries are and how deep the surgeon can cut.'

On our way back to Jonne's office we pass an 'iron lung', a human-sized piece of equipment which supported ventilation back in the old days. 'This huge monster is how it all began,' Jonne enthusiastically tells us. 'And now we have a small tube with a ventilator attached to it. Isn't it wonderful how things develop?'

Jonne is more than happy to contribute to this development. In addition to his clinical duties, he is doing a PhD in mechanical ventilation. 'I hope to get my doctorate within a year.'

ECTM
EXPERT

Jordy van Zandwijk

‘MRI is full of challenges’

‘Medical imaging technology really is my cup of tea, that’s something I already realized while taking my Technical Medicine degree. MRI, to me, is the most challenging technology. That’s why it’s great that I was hired as a lecturer and researcher at the ECTM straight after completing my Master’s degree at the UT in 2015. Now that we have a low-field MRI scanner of our own, I’m able to focus completely on MRI, both in my teaching duties and in my research.

The scanner we have here is special in that it allows you to scan people in an upright position, and therefore allows you to scan joints which are bearing weight, which provides all manner of new insights. In addition, this MRI scanner is highly suited to researching implants, prostheses and devices which must be integrated in an MRI scan. Personally, I’m curious when it comes to the options of scanning a person in real time in combination with medical interventions. I may do some doctoral research on this subject in the next few years.

What I like best about the ECTM is the combination of education and research, which keeps things nice and varied. Before I could start teaching MRI technology, I spent last year developing the ultrasonography MOOC. It was a lot of work, but I gained a wealth of experience from it, especially with regard to online education.’

TEXT: KITTY VAN GERVEN | PHOTO: RIKKERT HARINK >

ECTM
EXPERT

Marije Kamphuis

‘I’ll be able to manage my own research’

‘I just got my degree in Technical Medicine, and this month I’ve begun working at the ECTM as a lecturer and researcher. In the meantime, I’ll still have to complete my Health Sciences degree. I find that having a job inspires me to get that degree. I made a conscious decision to combine two programmes. I love gaining more in-depth knowledge of technology, but how do you get people to buy that technology? That’s what I’m learning in my Health Sciences programme.

The ECTM has given me a six-year contract. The focus of my research has not yet been completely determined, but it’s clear that it will have something to do with imaging and radiation. This is a many-sided field, comprising aspects such as safety, dose reduction and digital image processing. Fifty percent of my duties will be education-related. What I most wish to do this at this early stage is to explore and find out what makes my heart start beating a little faster. Once I’ve decided that, I’ll choose a subject for my doctoral research.

At any rate, I’m really looking forward to this job. I’m ready to assume greater responsibility. You can’t really do that as a student. Now I can present myself as a clinical technologist and manage my own research. I think that will be a fun challenge.’

TEXT: MAAIKE PLATVOET | PHOTO: RIKKERT HARINK >

TEXT: SANDRA POOL >

SMEs meet UT through innovation vouchers

‘Easy access to the UT through vouchers’

Small and medium-sized enterprises (SMEs) will get the opportunity to get to know the UT’s centres of expertise through so-called ‘innovation vouchers’. The companies joining in the scheme come from as far as Canada. One of the participating centres is the Experimental Centre for Technical Medicine.

The opportunity to get to know each other is designed to help companies explore the possibility of collaborating with a knowledge institute, say Marieke Hofste and Janinka Feenstra, both strategic business development project managers. ‘For companies it’s an easy way to gain access to the UT,’ says Hofste. ‘A voucher is worth ten thousand euros. It not just grants a company access to our facilities and expertise, but also to supervision and training, if necessary.’

‘On top of the ten thousand euro vouchers, we ask companies to invest 2,500 euros themselves,’ says Feenstra. ‘This allows us to make a first selection and ensures that we will only receive serious applications. Moreover, we only accept companies who have not worked with any centres of expertise before.’

QUICK FINAL RESULT

Companies wishing to collaborate with the UT are often struggling with the issue of how to develop their innovative products. ‘And with the road leading to it,’ says Hofste. ‘The sooner the knowledge institutes and companies get in touch with us, the greater their chance of success. The UT likes to contribute. Often companies will get in touch with us before officially submitting an application. If you do things together from scratch, you can manage expectations and come to a final result more quickly.’

The UT is only making its vouchers available to high-tech enterprises with fewer than 250 employees. ‘Much can be gained from cooperation between small and medium-sized enterprises and the UT,’ according to Hofste. ‘We believe that SMEs are very valuable; they have a lot of knowledge and expertise. They are able to change gears quickly and are more flexible than large companies. And we, in turn, seek to give SMEs easy access to the UT’s expertise.’

At the ECTM, companies are able to use facilities such as MRI, ultrasonography and EEG systems, or operating theatres, for example. Feenstra, ‘In addition, the ECTM can help companies conduct a range of experiments and studies, such as analysing liquid flows in stents or the reliability of sensors for particular medical applications.’

NOT JUST FOR REGIONAL USE

In each round, the expertise centre will award ten innovation vouchers. ‘We awarded eight vouchers the first time round. A great score,’ says Hofste. ‘We are currently working on the second edition. We are now in the coordination phase and are assessing whether the research questions match our centre’s profile. It looks like the ECTM will be serving two applicants. The great thing is that companies from all over the world are allowed to use these vouchers. They are not just for regional use. The companies are coming from as far as Canada.’

Research involving human subjects: what does it entail?

Researchers seeking to conduct clinical trials involving human subjects encounter very specific legislation. Many researchers are not aware of all the rules, says Clinical Trials Coordinator Cindy Lammertink.

Scientists seeking to conduct experiments involving human subjects need to know whether their trials are subject to the Medical Research Involving Human Subjects Act (WMO). Before being able to start such a trial, scientists must have the trial authorized by a Medical Ethics Review Committee (METC) and the UT's Executive Board. In addition, researchers seeking to trial medical resources (such as prostheses) - developed at the UT - off UT premises are required to register their experiments with the Healthcare Inspectorate (IGZ).
'Sometimes it's hard to determine whether a study is subject to the Medical Research Involving Human Subjects Act,' says Cindy Lammertink, who coordinates clinical trials involving human subjects on behalf of the ECTM's MIRA Institute. 'There are two criteria, but they are described in the Act in very general terms. Criterion No. 1: It is medical and scientific research. Criterion No. 2: Human beings are subjected to certain procedures or rules of conduct. Even the explanation provided on this subject lends itself to different interpretations.'
In addition, having a trial assessed by a review committee takes time. As Lammertink says, it is not a wise idea to embark on an experiment involving human subjects in the final three months of your PhD contract. 'Generally, Medical Ethics Review Committees take at least two months to assess a study. It is important for departments to be aware of this.'

SCREENING TOOL

Even if a study is not subject to the Medical Research Involving Human Subjects Act, there are guidelines researchers must take into account. Since many researchers are unfamiliar with these procedures, Lammertink has developed a screening tool, allowing scientists to complete a form on the MIRA website's intranet. Lammertink will then advise the scientists on the design of their study and help them collect all the required documents and fill out the requisite forms.
'Of course there are standard procedures,' Lammertink explains. 'It is vital that you inform your subjects on the purpose and nature of the experiment, as well as the burden it will place on them and the risks associated with it. And you must always ask for permission, even if you're not conducting the kind of study that must be pre-authorized by a review committee.'
It gets more complicated if the study comes with significant risks and thorny ethical issues. 'In such cases, review committees often won't authorize your study unless you have taken out special insurance covering the subjects. I help scientists apply for such insurance. Furthermore, review committees may stipulate other conditions. A while ago, we applied for permission to conduct an experiment involving transcranial magnetic stimulation in epilepsy patients. The review committee insisted that we include a neurologist on the team, so as to administer anti-convulsants if necessary.'
Lammertink would like all scientists affiliated with MIRA to apply for permission to conduct a study involving human subjects through the screening tool, which benefits them, too, she says. 'If you are having difficulties completing the screening form, it means you haven't properly designed your study. The screening tool makes researchers more aware of all the steps they have to consider. Moreover, they will receive support, which will improve the quality of their study.'

EXAMPLES OF STUDIES INVOLVING HUMAN SUBJECTS CARRIED OUT AT THE ECTM

- Rehabilitation robot LOPES, which supports the gait of patients who are partly paralysed following cerebral infarction or paraplegia.
- The development of smart glasses which provide patients suffering from Parkinson's disease with stimuli, so as to stop their movements from 'freezing'.
- A study investigating transcranial magnetic stimulation (TMS) in both healthy subjects and epilepsy patients, using a brief magnetic pulse to stimulate parts of the brain.
- The ECTM's donor service collects small amounts of employees' and students' blood for various types of scientific research.
- Using an MRI scanner to gain a good understanding of weight-bearing joints (also refer to the 'Into the upright scanner' section).

TEXT: PAUL DE KUYPER | PHOTO: RIKKERT HARINK >

Into the upright scanner

Although the magnetic field of the MRI scanner which was installed in Meander last November is considerably lower than that of the scanners being used in Dutch hospitals, doctors from all over the country are curious to see the UT's MRI scanner in action, as the machine is able to rotate, meaning patients can be scanned in an upright position.

'Our MRI scanner is unique. There is no other scanner in the Netherlands which can rotate,' researcher Bennie ten Haken enthusiastically tells us. Last November, the ECTM received its own MRI (magnetic resonance imaging) scanner, meaning that Technical Medicine and Biomedical Technology students no longer have to go to the hospital in Hengelo for their MRI seminars. The magnetic field of the ECTM's MRI scanner is significantly lower than that of the scanners encountered in many hospitals – 0.25 tesla rather than 3 to 7 tesla – but according to Ten Haken, this does not matter. 'Sure, you may obtain lower-resolution images, or you may have to go on measuring for a little longer, but that makes no difference when you're using the machine for educational purposes. This scanner allows us to teach all the clinical aspects of MRI.'

Orthopaedic and vascular research

The fact that the scanner can be rotated presents scientists with several interesting advantages, says Frank Simonis, an assistant professor who is designing a study involving human subjects and the MRI scanner. The manufacturer designed the rotating scanner to enable doctors to scan for orthopaedic complaints, such as backache or joint disorders. 'It allows you to scan the entire body in a weight-bearing position. Generally speaking, you don't experience orthopaedic problems while lying on your back, but you do when you're standing upright.'

In addition, Simonis is exploring other ways to use the rotating scanner for research purposes. He has already come up with a few ideas. 'It's interesting that we are now able to scan women who are suffering from post-partum pelvic floor prolapse in an upright position. In addition, we could use it for vascular research, to determine how blood vessels respond to certain types of strain, for instance in people with intermittent claudication due to stenosis of the artery.'

When it comes to using the new MRI scanner, education and research are clear priorities. 'We don't intend to make money off it by treating patients with it, although we may do that every once in a while down the line,' Ten Haken says. He also says some doctors, orthopaedic surgeons and gynaecologists have already shown an interest in the scanner. 'They, too, wish to learn what opportunities a rotating scanner affords.'