



CARIM + HVC ANNUAL REPORT 2025

CARDIOVASCULAR RESEARCH INSTITUTE MAASTRICHT
HEART+VASCULAR CENTER

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HEART+VASCULAR CENTER**

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PREFACE

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LINGER IN A LAVENDER HAZE?...

For months, we had prepared for their visit and discussed our strategies. We collected numbers, counted publications and grants, wrote reports, prepared presentations and tried to explain what makes CARIM CARIM. Then, in October 2025, an international committee arrived to closely inspect CARIM's scientific and societal performance. No stone was left unturned: our science, organisation, PhD programme, culture, leadership, societal impact and ambitions. They spoke with CARIM's employees at all levels of the organisation in the university and the hospital: PhD candidates, technical and administrative support staff, junior and senior researchers, Section and Division Leaders, and the Executive Board.

On the final day, we were confronted with very good news. The assessment was overwhelmingly positive. CARIM could still impress, with only two issues left to address to make it all perfect: our gender balance of 10% female Section Leaders needed to be improved, and we were too humble. Performing excellent cardiovascular research while focusing on young talent development just did not do it anymore, we had to become the best in Europe.

We fixed the 10% female representation among our Section Leaders over the weekend, and as a result, almost 40% of our current Section Leaders are women, which also reduced the average age of our Section Leaders by almost 10 years. One of our ERC members practically forced us to 'drag them in by the hair', and this is exactly what we did...

To become the best in Europe, we first had to benchmark our current position in the old world. Together with our chief operational officer we compared CARIM+HVC to the most prominent cardiovascular institutes in Europe. An objective algorithm that coupled innovative clinical procedures and guideline contributions to scientific output across 12 cardiovascular clinical care pathways, returned the top ten institutes for each pathway and yielded an eye-opening result.

CARIM+HVC was among the top 10 of all 12 pathways in Europe, if not among the best in half of those. Of course, there were care pathways in which we were outperformed by other institutes, but those institutes appeared much less frequently among the other pathways. Taken cumulatively, CARIM+HVC towered above other European institutes as a complete overarching institute covering all cardiovascular aspects, effectively becoming a category of one: nothing compares to us...

So perhaps this is the moment to sit down and relax, and to appreciate what we have achieved. Lean back and enjoy. Hug each other. Tell one another how good we are. Should we, like Taylor Swift, borrow the fifties expression of *Lavender Haze* to describe being so happy that the outside world fades away? Lie back in a calm and reassuring cloud in which any noise from the outside world becomes indistinct.

But there is one particular challenge with haze, it eventually clears.



PREFACE

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On the horizon, the view becomes less lavender-coloured. Serious direct funding cutbacks are looming and competition for research funding is intensifying. Maintaining an internationally leading research institute requires talented people, state-of-the-art infrastructure and, rather inconveniently, lots of funding. Excellence today is no guarantee of excellence tomorrow, but it surely provides a driving force. In that sense, the review committee did not merely congratulate us. It challenged us to become more ambitious: sharpen our scientific identity, develop flagship initiatives, strengthen interdisciplinary collaboration, continue to recognise and invest in talent and substantially improve our competitiveness for major personal international grants.

A recurring lesson is that we can afford to be more confident about what we have achieved. This is not bragging, it is recognising the quality of our science and of the people who make it possible. We have become a large and meaningful multidisciplinary community bridging university and clinic in which fundamental, translational and clinical cardiovascular research increasingly come together to create synergy.

As a result of our unification, we present to you our second integrated CARIM+HVC Annual Report, featuring interviews and highlights taken from our inpatient wards, our clinical care centers, scientific departments, and rising stars, brought together by our thriving cardiovascular community. The current report is packed with familiar faces from across our organisation and includes our new grants and contracts, as well as the awards and prizes proudly presented to our colleagues during yet another remarkable CARIM+HVC year.

We invite you to take a moment to browse through and inhale our collective achievements.

The external review tells us that we have earned the right to be proud. The future tells us that we have not earned the right to relax.

Let's enjoy lavender haze for a bit. Then get back to work.

This is CARIM+HVC 2025.

We hope you enjoy your reading.

Professor Tilman M. Hackeng, Scientific Director
Professor Kevin Vernooij, Medical Director
CARIM+HVC



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WHO ARE WE

01

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CARIM+HVC

Founded in 1988, the Cardiovascular Research Institute Maastricht (CARIM) has established itself over the past decades as a leading European research institute in the field of cardiovascular disease. At CARIM, more than 500 employees investigate basic mechanisms as well as early diagnosis and individual risk stratification of cardiovascular disease, enabling faster translation of new research concepts into clinical practice. New findings, products and techniques applied in healthcare are evaluated, often in collaboration with private partners, and the results of scientific research are published in high-ranking international journals. CARIM offers a dynamic training environment for master's students in basic and clinical sciences, guiding PhD candidates towards becoming independent researchers, and supporting postdoctoral fellows in developing into leading scientists in the field of cardiovascular disease, with a strong focus on translational excellence. CARIM is organised into three divisions, Blood, Vessels, and Heart, each comprising two interdisciplinary programmes: **1.** Blood coagulation, venous thrombosis & bleeding; **2.** Atherosclerosis, arterial thrombosis & stroke; **3.** Vascular complications of diabetes & hypertension; **4.** Regenerative & reconstructive cardiovascular medicine; **5.** Structural heart failure and **6.** Complex arrhythmias. These six programmes host 22 sections, which serve as independent scientific, infrastructural, and financial units within the institute.

CARIM embraces a collaborative team science approach that strategically combines the strengths of its divisions, programmes, sections, researchers, and infrastructure. All divisions integrate both basic and clinical research and

operate under a shared governance model. Each division is co-led by basic and clinical scientists, enabling collective responsibility for scientific progress, cross-programme collaboration, and talent development. Section Leaders manage their own teams and finances, fostering both autonomy and accountability. International researchers are attracted to CARIM by its open communication culture, interdisciplinary collaboration, high scientific standards, advanced technological platforms, and intellectually stimulating environment.

CARIM is one of eight thematic research institutes within the Faculty of Health, Medicine and Life Sciences (FHML) at Maastricht University and is embedded in the Maastricht University Medical Center+ (Maastricht UMC+).

KEY FIGURES CARIM 2025

ANNUAL BUDGET: M€ **26.8**

NEW CONTRACTS AND GRANTS: M€ **16.5**

RESEARCHERS: **172.6** FTE
(103 INTERNAL PHDS)

TECHNICAL AND SUPPORTING STAFF: **45.4** FTE

DEPARTMENTS/DISCIPLINES: **17**

INTERNATIONAL PEER-REVIEWED JOURNAL ARTICLES (SCI): **1,002**

PHD THESES: **49**

CARIM+HVC

The Heart+Vascular Centre (HVC) is part of Maastricht UMC+, with more than 600 staff members providing the highest quality cardiovascular care 24 hours a day. HVC stands for inventive and innovative top-referral cardiovascular care. Based on this legacy, HVC proactively and confidently positions and profiles itself as a progressive and internationally oriented academic cardiovascular clinic. Highly specialised expertise is employed across a broad spectrum of cardiovascular conditions. HVC primarily treats patients from the south-eastern Netherlands with complex conditions (tertiary care) and is an international reference centre for several treatments (quaternary care). HVC combines state-of-the-art care facilities, such as catheterisation labs, with optimal deployment of digital care and networked care.

HVC plays a prominent role in several nationally recognised centres of expertise, making a substantial contribution to tertiary and quaternary care for patients with rare and complex cardiovascular and thoracic conditions. Within the Maastricht UMC+ Centre for Cardiogenetics and Rare Heart Diseases, HVC provides specialised care for patients with inherited and rare cardiac disorders, including dilated and hypertrophic cardiomyopathy and cardiac amyloidosis. HVC is also actively involved in the Maastricht UMC+ Centre for Rare Respiratory Tumours, which holds national referral status for robotic thymectomy in the surgical management of mediastinal tumours. In collaboration with Radboud UMC, HVC furthermore co-leads the Centre for Marfan and Related Disorders, delivering expert care for patients with Marfan syndrome, Loeys-Dietz syndrome, vascular Ehlers-Danlos syndrome, idiopathic spontaneous coronary artery dissection,

and familial thoracic aortic aneurysms and dissections. In December 2025, Maastricht UMC+ received formal national recognition as a Centre of Expertise for pulmonary arterial hypertension, a designation that now forms a cornerstone of the newly established Centre of Expertise for Pulmonary Hypertension and Other Rare Lung Diseases.

HVC collaborates with private partners to develop and test innovative solutions for cardiovascular disease. Due to the intensive nature of some of these collaborations, strategic partnerships have been established. The Health Foundation Limburg (HFL) and Maastricht UMC+ are working together in the fight against cardiovascular diseases. Under the name *Hart en vaat onderzoekfonds Limburg*, the two organisations raise awareness of cardiovascular diseases and highlight the need for increased funding for research. It supports top-level clinical research at HVC, focussing on new treatments, faster diagnoses, improved care, and the prevention of cardiovascular diseases.

KEY FIGURES HVC 2025

REVENUE: M€ **110**

STAFF MEMBERS: **384 FTE**

NUMBER OF BEDS: **105**

OUTPATIENT VISITS: **42,000**

CLINICAL PROCEDURES: **5,000**

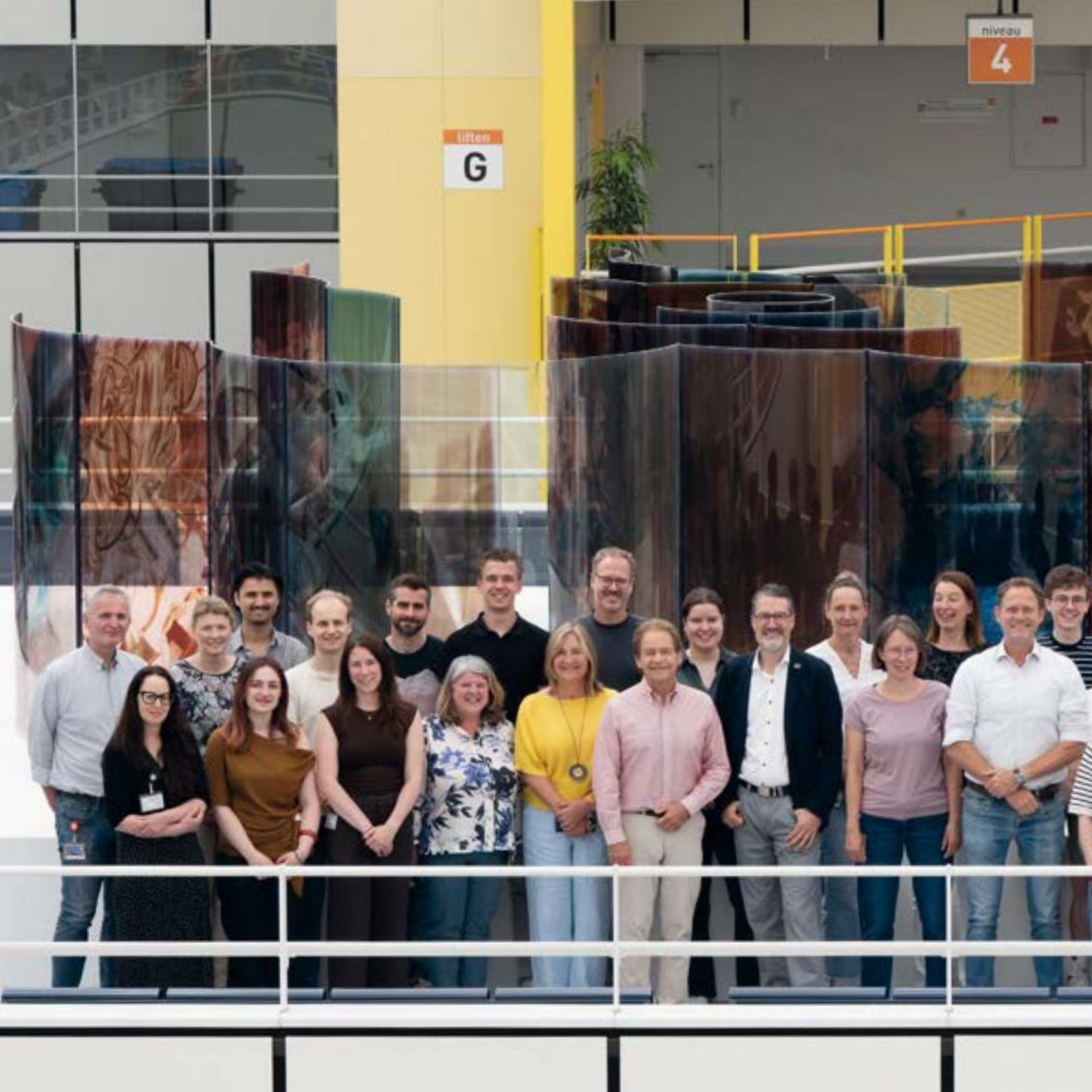
CARIM+HVC

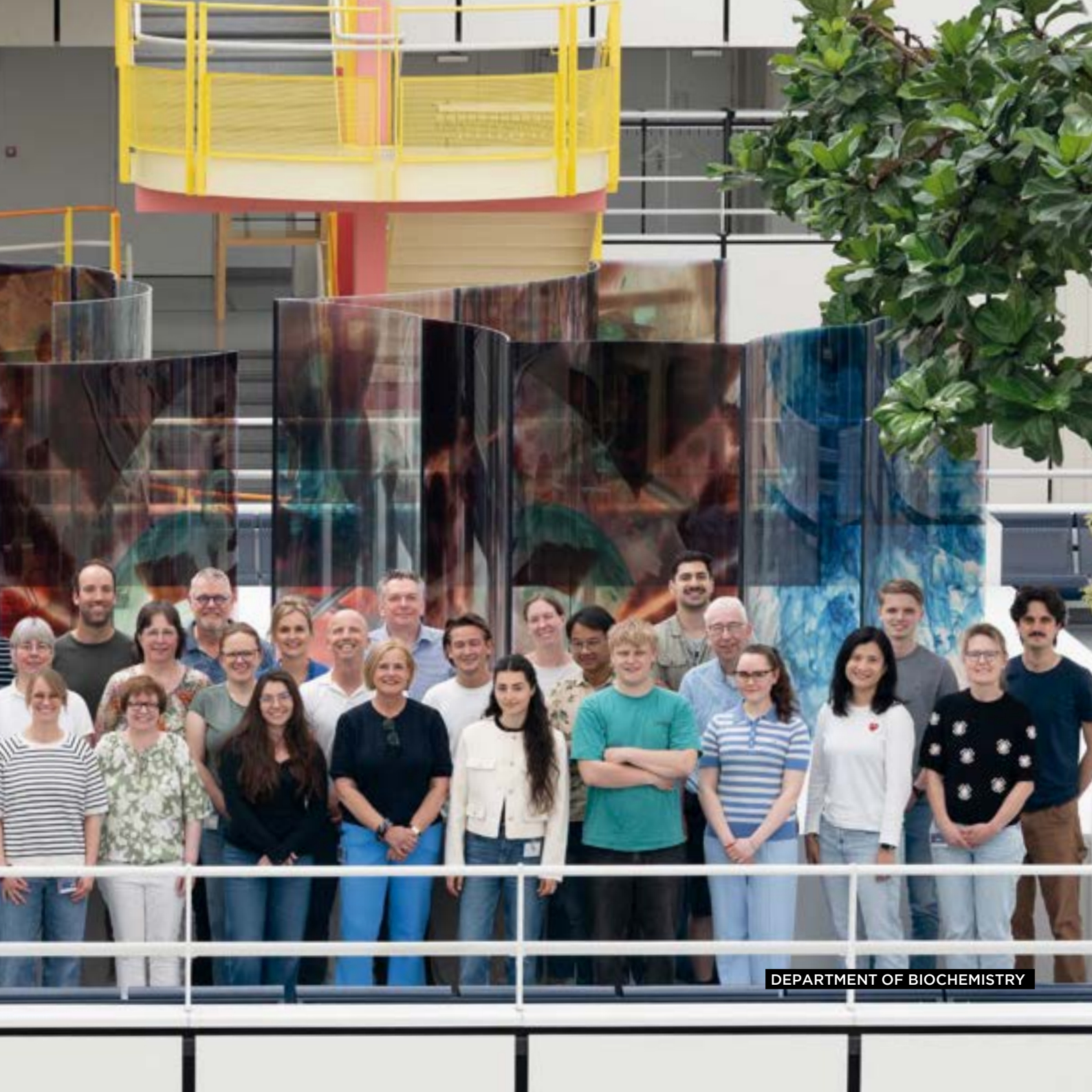
In 2024, CARIM and HVC formally joined forces as CARIM+HVC, building on decades of collaboration and a shared vision for excellence in cardiovascular medicine. This strategic integration represents a major step towards establishing a comprehensive CARIM Clinical Care Centre, where research and clinical practice are seamlessly aligned. The synergy between the two entities combines academic excellence and clinical expertise, creating a dynamic platform for innovation in diagnostics, treatment, and prevention. The unification was further formalised through the installation of a joint CARIM+HVC board, ensuring cohesive leadership across cardiovascular research, education, clinical residency training, and clinical care. This joint governance structure provides strategic direction and facilitates integrated decision-making, further accelerating the translation of innovation into daily cardiovascular care.

CARIM+HVC participates in more than 20 European projects, including five Doctoral Network programmes (formerly known as ITNs). CARIM+HVC has a long-standing tradition of collaborating with industry, sharing its expertise while maintaining its independence, as reflected by the right to independently publish. Past and ongoing collaborations with industry include, among others, Medtronic, Baxter, Bayer, Roche, Abbott, Siemens and Philips. Furthermore, CARIM+HVC researchers are involved in other public-private collaborations in (inter)national networks such as CVON, Horizon 2020, Horizon Europe, ERA-CVD, Interreg and Leducq Transatlantic Networks. International training is provided by all three divisions, leading to three excellent and much acclaimed courses (see pages 121-122): the Certificate of Advanced Studies in Antithrombotic Management (CAS-AM: Division Blood); the European Vascular Course (EVC: Division Vessels), and the Diploma of Advanced Studies in Cardiac Arrhythmia Management (DAS-CAM: Division Heart).

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DEPARTMENT OF BIOCHEMISTRY

A portrait of a woman with long, dark, wavy hair, wearing a white jacket over a white patterned top. She is standing with her arms crossed, looking directly at the camera. The background is a bright, out-of-focus indoor space with a white wall and a blue object visible in the distance.

INTERVIEW

JUDITH SLUIMER

The rocky road to success

In 2025, Judith Sluimer was awarded a prestigious Vici grant by the Dutch Research Council (NWO): a million and a half euros for five years of research, seven years after she had received a Vidi grant. This may sound like a smooth success story, but that is not the story she wants to tell now. “That’s a deliberate choice, as they were seven tough years, during which I almost lost my passion for science. I think it’s important for the younger generation to tell them an honest story.” In addition, this story is about leadership, as she has been leading CARIM’s Division Blood since 2025.

Since 2019, Judith Sluimer has used the money from her previous large grant, the Vidi, to collect ‘superdata’ for her research into the rupture of atherosclerotic plaques due to disrupted production and decay of connective tissue in the vessel wall. “After a while, the money ran out. I applied for so many grants, often reaching the final round and then just missing out. So you’re left empty-handed. After having received so many comments from reviewers on your proposals, you might even end up with your original project design again. Nothing is ever perfect; hardly any project can be implemented with 100% certainty.”

VENI-VIDI...

In 2024, she was also interviewed for a Vici grant but failed to get it. “I then seriously considered whether this was still what I wanted. Your resilience fades. I’ve always said that as a scientist, you also have to get your fulfilment from other things, but that became increasingly hard. Once the money runs out, there’s simply nothing you can do. My password at the time was VeniVidiFoetsie (*foetsie* being a Dutch word for lost), as a joke so as not to make it all sound too serious.” On the other hand, bad luck like this also makes you creative, Judith noticed. A visiting appointment at RWTH Aachen allowed her to search for funding in Germany, where the chances of success are much better than in the Netherlands. “It was an obvious next step, as I was already collaborating with Prof. Rafael Kramann. I was able to divide up the topics in a sensible way, and it was only a 35-minute trip from home to my office there.” She managed to obtain a German grant, which enabled her to appoint a postdoc who also worked at both sites.

Soon after the first rejection for a Vici grant, a stimulus grant from the Dutch national government was offered, for

which each institute could nominate one researcher. CARIM nominated Judith, and around the same time another grant made it possible to have a postdoc start working under her supervision. And then the second attempt at a Vici grant did pay off. “Then suddenly your cash box is full again. But it felt like a close call. Others kept telling me: ‘It’ll be alright. You have to keep knocking at the door. Your papers are super.’ But sometimes it’s difficult to keep your spirits up, which apparently is what you need to do.”

The differences between her first Vici application and the second one were minimal, she says. For her second attempt, she had more pilot data to show that she had already mastered a particular technique, reducing the risks somewhat. “That makes you feel confident: it doesn’t matter what they say, I know I can do it.”

STRATEGIC GAME

The ‘cross-species multi-omics atlas’ which is part of her Vici project is a challenge, for the reviewers as well. Sometimes, writing a grant application feels to her like a strategic game. “It has to be innovative, be based on sufficient pilot data, be correct in all details, involve little risk and be feasible. The only way to achieve that is with a team. They have generated the data, and I help to set out the overall lines.” Another body that provided a lot of assistance with formulating her proposal and graphic design was the Grants Office of FHML. Whereas she herself was quite pleased with her graphics, it turned out that a designer was able to further perfect them. “Each their own expertise”, she says with a sense of irony. “And finally, the University Library analysed my CV: what key words correspond to the expert you are claiming to be and how does this fit within CARIM? That was very helpful to put the finishing touch on it.”

SOMETIMES IT'S DIFFICULT TO KEEP YOUR SPIRITS UP, WHICH APPARENTLY IS WHAT YOU NEED TO DO

A month or so after the interview, at about six in the evening, she got an e-mail from NWO, saying that she had actually got the Vici grant. Delirious with joy, she ran out of her office, looking for people to share the news with. "I think there was only one colleague still at work in the lab, to be honest I can't even remember who, and in my euphoria I gave them a big hug. I was so immensely relieved. The next morning there was champagne for everyone and a hug and kisses from the dean at the UM carnival party later that week. It was crazy... Such a relief! A million and a half for five years, that really makes such a difference."

THE RESEARCH PROJECT

Judith's research had already shown that the first signs of vessel wall ageing can be seen in the outer layer of the blood vessels. In her opinion this represents the beginning of cardiovascular diseases, and is thus something you would like to stop, or preferably reverse. For years now, she has been focussing on the role in this process of fibroblasts, a type of cell that is present in the outermost layer of blood vessels. "My contacts with Edinburgh enabled me to use the single cell sequencing technology, very soon after the first

publication about it had appeared, to study gene expression in individual cells. This allowed us to distinguish the fibroblasts from the smooth muscle cells in the vessel wall. They look very similar, so that wasn't easy. We then identified a fibroblast-specific gene that we didn't know the function of. A colleague in Canada had mice which lacked this gene, so I would very much like to have their aortas to study. However, that's when Covid broke out, and researchers and mice weren't allowed to travel, so that the animals grew older and older in Canada. So then we suddenly had old mice without the gene, who developed higher blood pressures than old mice *with* the gene. The vessels could no longer fully relax and contract. The young mice were completely normal. Thus, by coincidence, we had found a causal association between this gene and the functioning of older blood vessels."

One of the first steps she took into the research field of ageing, which opened up a whole new world for her, involved an experimental animal model that seems to be resistant to ageing. "It is the same size as a mouse, but whereas mice live for at most three years, this animal can live for forty years. It's the naked mole-rat. It has evolved in this way and apparently

its blood vessels do not age, or age in a different way.” This led to the idea to compare this animal’s blood vessels with those of mice and humans, to search for properties that might be useful for rejuvenating human blood vessels. “I had not previously worked with comparative biology, where you try to use properties from nature to treat diseases.” She wants to compare blood vessels from both younger and older animals with those of naked mole-rats, in the hope of finding targets that can be used to stabilise blood vessels in terms of ageing, or even rejuvenate them. This will be studied at cellular level as well as in human blood vessels and in lab animals.

IF YOU WANT
TO STAY THE
COURSE, YOU
HAVE TO THINK
IT THROUGH
BEFORE YOU
ENTER INTO IT

The Vidi grant had already enabled her to discover how genes can be manipulated with medication, both *in vivo* and *ex vivo*, in order to reverse the consequences of ageing. “For the time being, we are unable to specifically treat the fibroblasts in a blood vessel, as there is as yet no delivery method. With the Vici grant I mainly hope to identify the targets for treatment.” Her research also showed that connective tissue formation takes place especially in the outermost vessel wall, whereas the fibroblasts also communicate with the smooth muscle cells in the middle layer, which are responsible for the contractions. “So it’s not a stand-alone effect: they influence other layers and thus cause stiffening or hypertension. That’s another new concept: the outside-in effects of fibroblasts.”

AUTHENTIC LEADERSHIP

A second big step in 2025 was her appointment as leader of CARIM’s Blood division. It was an obvious new step after she had attended the Dutch CardioVascular Alliance (DCVA) Leadership Program a few years ago. At the time, she mentioned in an interview that her aim was for authentic leadership, trying to get the best out of others while taking an interest in the people around her. Her idea to move up on the management ladder is now more nuanced. “I’ll be fifty next year, so I won’t be retiring anytime soon. If I were to take on a demanding management position too soon, I think I would have less time to be creative. There’s already quite a lot of pressure doing research and teaching, as well as trying to balance work and private life. That’s all going well now, so I’d like to enjoy that for a while yet.”

PLEASANT MEETINGS

After an intensive introductory period, during which the External Review Committee visited CARIM in 2025, which involved collecting and writing a lot of documents, it’s now

okay, she says. “We have a nice management team that I’m getting along fine with. That makes it a pleasure to attend the meetings, where there are not only very serious discussions but there’s always that spark of fun as well. That gives me energy, and at the same time I manage to give all topics in the division equal attention, which is one of my goals.” In addition, she still considers it important to take a personal interest in the people around her. “The most difficult aspect is that you sometimes have to take uncomfortable decisions that have consequences for people. That’s something I still have to learn to some extent before I take further steps.” This candour is also something she has carefully considered. “I want to tell it like it is. Not just the apparent successes but also the blood, sweat and tears that you don’t see in people’s LinkedIn posts and the like. I want to prepare the younger generation for reality. It’s a really super job, even a hobby. What other job allows you to do what comes into your mind, as long as you secure enough money to carry it out? But if you want to stay the course, you have to think it through before you enter into it.”

In her role as mentor for her team, she tries to keep an eye on these and other aspects. Balancing work and private life is part of that. This was something she found out herself by “overstepping my limits a few times”, and that is an ever-present danger. “But I do know how to relax, and I

deliberately make time for that: exercising, reading, doing stuff with the family or the kids. Consciously planning my free time.” And when acting as her own mentor, she pushes herself across the threshold to a new step in her career. Perhaps by applying for an ERC-advanced grant. “I don’t know if it’s typical of women, but I often think: that’s for later, not now. But you have to overcome that. It’s *now* I have the opportunity to make mistakes, as I’m now in a safe situation.”

Judith Sluimer is a Professor of Experimental Vascular Pathology. Her research focusses on the pathogenesis of atherosclerosis, specifically cellular oxygen metabolism and heterogeneity. She defended her PhD thesis at Maastricht University in 2008. In 2010 she obtained a Veni grant from NWO, followed by a Vidi in 2018 and a Vici in 2025. Since 2025, she has been the leader of CARIM’s Division Blood.

FOR DUTCH







DEPARTMENT OF PATHOLOGY

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HOW WE WORK

02

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CARIM+HVC

The Scientific Director has the overall responsibility for the research institute, including the organisation and management of its research programme, the scientific output, the training of bachelor and master students, PhD candidates and postdocs, the financial management and the public relations of the institute. The Scientific Director is assisted by the Managing Director, who handles the financial, legal and human resource issues, and by the Strategic Programme Coordinator, who together form the Management Team (MT).

The MT meets weekly to discuss day-to-day matters. Together with the three leaders of the Divisions Blood, Vessels, and Heart, a representative from the Strategic Board



EXECUTIVE BOARD AND EXTERNAL ADVISOR

(SB), the CARIM Priori board members, and the Medical Director of HVC, the MT constitutes the Executive Board (EB) of the institute. The EB meets monthly to discuss and decide on issues at the strategic and operational level. The EB is advised by the SB, the Education Programme Committee (EPC), the Research Council and the working group on Diversity, Inclusivity & Social Safety (DISS).

The Strategic Board (SB) advises and supports the EB in the development of CARIM's long-term strategy and policies. Comprising CARIM staff members representing all career stages, the SB serves as a forum for strategic discussion, and develops written vision statements on the future direction of CARIM and its sustainability in an increasingly competitive



STRATEGIC BOARD

HOW WE WORK

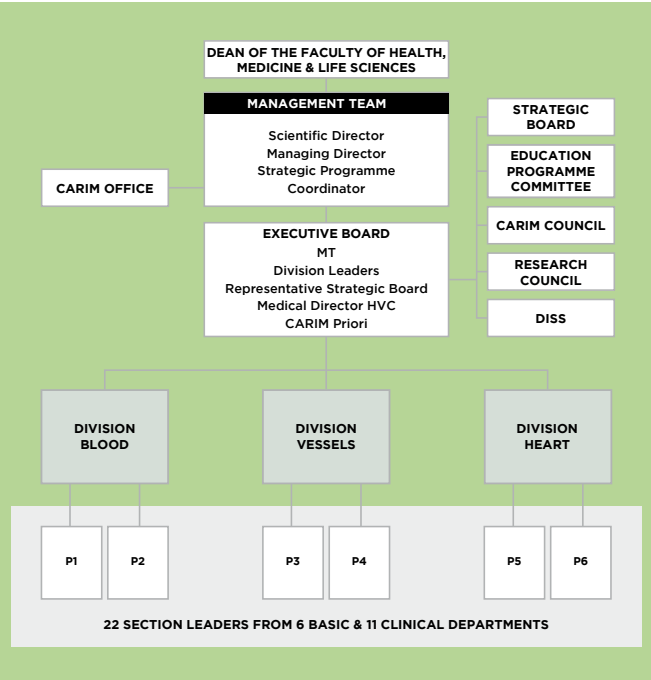
international scientific environment. The SB meets monthly to discuss issues such as grant programmes, national and international collaboration networks, trends, interdisciplinary communication and CARIM's visibility in the national and international cardiovascular fields.

The EPC coordinates both the PhD and master training programmes and advises the EB on all issues related to these educational programmes. The chair of the EPC is also CARIM's PhD Coordinator and advises the EB about all issues regarding the PhD programme. Within CARIM, the PhD Coordinator works closely with the CARIM Office and the Scientific Director.



The Research Council advises the Section Leaders, researchers and the EB on the quality of research proposals and meets regularly to discuss and guide grant applications. The Research Council trains applicants for their personal interviews with funding bodies and evaluates applications for CARIM's HS-BAFTA Talented future postdocs grant and CARIM's PhD call.

The CARIM Council consists of all Section Leaders and Department Heads and meets four times a year. The CARIM Council is informed by the EB about ongoing matters and advises the Scientific Director on research within the institute and the related education programmes.



EXECUTIVE BOARD

- Prof. Tilman Hackeng, Scientific Director
- Prof. Hugo ten Cate, Division Leader Blood (until March 2025)
- Prof. Judith Sluimer, Division Leader Blood (since March 2025)
- Prof. Casper Schalkwijk, Division Leader Vessels (until March 2025)
- Prof. Martijn Brouwers, Division Leader Vessels (since March 2025)
- Prof. Kevin Vernooy, Medical Director Heart+Vascular Center
- Prof. Joost Lumens, Division Leader Heart
- Prof. Uli Schotten, Representative Strategic Board
- Danny Luciana, Managing Director
- Tara de Koster, Strategic Programme Coordinator
- Lilian Skiba, CARIM Priori board member
- Dr Bart Spronck, CARIM Priori board member

BOARD DIVISION BLOOD

- Prof. Judith Sluimer
- Prof. Leon Schurgers
- Prof. Julie Staals

BOARD DIVISION VESSELS

- Prof. Martijn Brouwers
- Dr Nynke van den Akker
- Dr Marleen van Greevenbroek
- Prof. Barend Mees
- Dr Koen Reesink
- Prof. Casper Schalkwijk
- Prof. Leon Schurgers

BOARD DIVISION HEART

- Prof. Joost Lumens
- Dr Matthijs Cluitmans
- Dr Vanessa van Empel
- Dr Miranda Nabben
- Dr Sander Verheule
- Dr Job Verdonchot

STRATEGIC BOARD

- Prof. Uli Schotten, Chair
- Prof. Martijn Brouwers (until March 2025)
- Isabel Aguiar Encarnação (since March 2025)
- Prof. Judith Cosemans
- Dr Sébastien Foulquier (since September 2025)
- Dr Boy Houben
- Dr Aaron Isaacs
- Dr Fatma Karapinar
- Roel Spätjens (since March 2025)
- Prof. Paul Volders
- Danny Luciana
- Esther Wishaupt

SECTION LEADERS

- Prof. Elham Bidar, Dept of Cardiothoracic Surgery
- Dr Matthijs Blankesteijn, Dept of Pharmacology & Toxicology
- Prof. Martijn Brouwers, Dept of Internal Medicine
- Dr Bas van Bussel, Dept of Intensive Care
- Prof. Judith Cosemans, Dept of Biochemistry
- Prof. Tammo Delhaas, Dept of Biomedical Engineering
- Dr Vanessa van Empel, Dept of Cardiology
- Prof. Tilman Hackeng, Dept of Biochemistry
- Prof. Stephane Heymans, Dept of Cardiology
- Prof. Fatma Karapinar, Dept of Clinical Pharmacy
- Prof. Barend Mees, Dept of Vascular Surgery

- Dr Miranda Nabben, Dept of Cardiology
- Prof. Uli Schotten, Dept of Physiology
- Prof. Leon Schurgers, Dept of Biochemistry
- Prof. Judith Sluimer, Dept of Pathology
- Prof. Julie Staals, Dept of Neurology
- Prof. Monika Stoll, Dept of Biochemistry
- Prof. Kevin Vernooij, Dept of Cardiology
- Prof. Paul Volders, Dept of Cardiology
- Prof. Joachim Wildberger, Dept of Imaging
- Dr Kristien Winckers, Dept of Internal Medicine
- Prof. Leon de Windt, Dept of Cardiology

RESEARCH COUNCIL

- Dr Kristiaan Wouters, Chair
- Dr Constance Baaten, Secretary
- Dr Matthijs Blankesteyn
- Prof. Ingrid Dijkgraaf
- Dr Marjo Donners
- Dr Ed Eringa
- Dr Pieter Goossens

EDUCATION PROGRAMME COMMITTEE

- Prof. Eline Kooi, Chair, PhD Coordinator
- Dr Matthijs Blankesteyn, Coordinator Biomedical Sciences master
- Dr Boy Houben
- Dr Marleen van Greevenbroek
- Lisa den Brok (until July 2025)
- Stan Muijtens
- Margarita Pencheva (until January 2026)
- Rita Chamoun
- Sophie van de Walle
- Giuliana Lezzoche (since November 2025)
- Pepijn Sarabèr (since November 2025)

- Yesim Kaya (since November 2025)
- Esther Willigers

CARIM OFFICE

The CARIM Office consists of specialists who support the institute and its researchers with administrative, financial and legal issues, including people and development, and funding. Esther Willigers, Barbara Przybylski and Esther Wishaupt are responsible for administrative issues, including supporting the EB. Tara de Koster is the Strategic Programme Coordinator, contributing to the strategic and operational development of CARIM. The controller of CARIM is Lynn Lemeer, assisted by Hans Slenter. The Finance Department of Maastricht University provides support for accounting related to CARIM research projects with Henny Kerckhoffs, Johan Noordijk (until October 2025), Jacqueline Roufs-Scheepers, Cindy Coenen-Haan (since September 2025) and Lydia Xhonneux (since December 2025) involved. Julie Brouwer and Anke Neekmann of the Department of People and Development of Maastricht University are dedicated to CARIM. In legal affairs, Suzanne ten Hoeve and Michel van Veen provide legal support to CARIM. Dr Gwynned de Looijer offers faculty support for funding acquisition. Managing Director Danny Luciana is the head of the CARIM Office. Prof. Frits Rosendaal (LUMC, the Netherlands) is CARIM's external scientific advisor and provides guidance on an annual basis or as needed. The research within CARIM's divisions involves the research activities of employees working in 17 departments of Maastricht UMC+ (six basic and eleven clinical).

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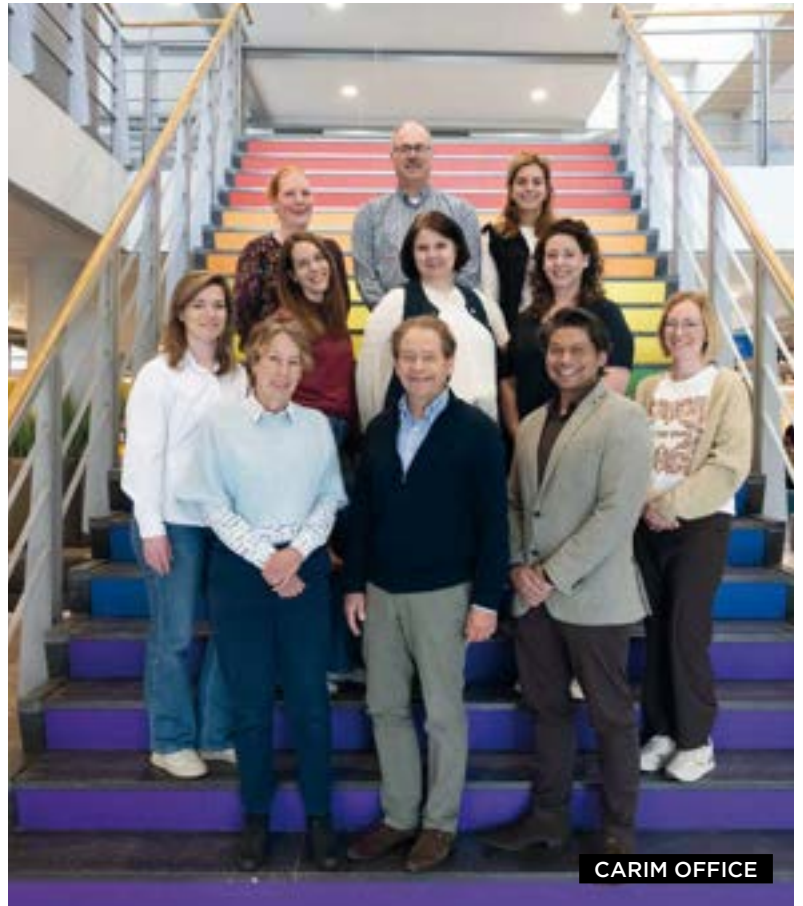
BASIC DEPARTMENTS

- Biochemistry
- Biomedical Engineering
- Epidemiology
- Genetics & Cell Biology
- Pharmacology & Toxicology
- Physiology

11

CLINICAL DEPARTMENTS

- Anesthesiology
- Cardiology
- Cardiothoracic Surgery
- Clinical Chemistry
- Clinical Pharmacy
- Internal Medicine
- Intensive Care
- Neurology
- Pathology
- Imaging
- Vascular Surgery



CARIM+HVC

Clinical care within HVC is organised into three departments, Cardiology, Cardiothoracic Surgery, and Vascular Surgery, and the Thrombosis Expertise Center (TEC). The Department of Cardiology comprises the Cardiac Intervention Center (CIC), the Cardiac Emergency Unit and Cardiac Care Unit, an Inpatient Ward, a Short Stay Ward, and Cardioresearch activities. The CIC is a unique, state-of-the-art clinical and research facility dedicated to catheter ablations, cardiac device implantations, transcatheter heart valve interventions, and percutaneous coronary intervention (PCI) procedures. It is equipped with advanced interventional technologies that support both high-quality patient care and innovative research. The Department of Cardiothoracic Surgery is responsible for inpatient surgical care and specialised services, including Extracorporeal Life Support (ECLS). The Department of Vascular Surgery provides comprehensive care for patients with vascular diseases and includes an inpatient ward as well as a specialised unit for organ preservation. The TEC focusses on the diagnosis, treatment, and management of thrombosis and anticoagulation therapy and incorporates the Anticoagulation Clinic.

The HVC Outpatient Clinic coordinates and schedules outpatient services for the Departments of Cardiology, Cardiothoracic Surgery, and Vascular Surgery. In addition, it facilitates outpatient care for the subspecialties of Vascular Dermatology, Vascular Medicine, and Vascular Neurology.

Cardioresearch is responsible for the coordination and execution of contract research within HVC. Its team of eight research coordinators supports approximately 40 to 50

clinical and scientific studies each year, primarily in the fields of cardiology and cardiac surgery. Cardioresearch provides comprehensive support throughout the research lifecycle, including study initiation, conduct, and close-out. Its activities encompass research administration, patient screening and recruitment, coordination of study visits, and data management. Cardioresearch is managed and supervised by cardiologist Dr Twan van Stipdonk.

HVC is led by the Medical Director, the Managing Director and the Vice Managing Director. Together, they constitute the Management Team (MT) and the core of the HVC Executive Board (EB). The EB is further composed of the chairs of the clinical departments, the clinical co-chair of the TEC, the Scientific Director of CARIM, and the Chief Strategy Officer of HVC.

The MT is supported by a dedicated staff unit that provides expertise in Finance & Control, Personnel & Organization, Quality, Safety & Operations, Marketing & Communications and Business Information. Integrated management of HVC's activities is ensured through the Operations Management Team, which comprises all operational managers, support staff, directors, and members of the EB. This structure facilitates coordinated decision-making and effective alignment of clinical, operational, and strategic objectives across the organisation.

Patient involvement in their treatment and the overall care process is of great importance within HVC. The perspectives, knowledge, and experiences of patients and their loved ones

HOW WE WORK

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are highly valued. Patients have already been involved in the development of new care pathways and the evaluation of existing care. To ensure this involvement is embedded in a structural way, a patient panel was established in September 2019. The panel actively contributes ideas on how care can better align with the needs and expectations of patients. Drawing from their own experiences, members provide valuable insight into what works well, and what could be improved. These perspectives are of great value to healthcare professionals, researchers, and leadership teams alike. The panel offers both solicited and unsolicited advice and meets six times per year. In scientific research, the patient voice is also becoming increasingly important. Many research funding applications now require patient participation, and the panel plays an active role in this area as well.

MANAGEMENT TEAM

- Prof. Kevin Vernooy, Medical Director
- Freek van Daal, Managing Director
- Daphne Sleijpen, Vice Managing Director (until September 2025)

EXECUTIVE BOARD

- Prof. Elham Bidar, Chair Department of Cardiothoracic Surgery
- Freek van Daal, Managing Director
- Dr Vanessa van Empel, Vice Chair Department of Cardiology
- Prof. Tilman Hackeng, Scientific Director CARIM
- Henk Hoogervorst, Chief Strategy Officer
- Prof. Geert Willem Schurink, Chair Department of Vascular Surgery



- Daphne Sleijpen, Vice Managing Director (until September 2025)
- Prof. Kevin Vernooy, Chair Department of Cardiology & Medical Director HVC
- Dr Kristien Winckers, Co-chair Thrombosis Expertise Center

DEPARTMENT OF CARDIOLOGY

- Prof. Kevin Vernooy, Chair
- Prof. Hans-Peter Brunner-La Rocca, Vice Chair
- Dr Vanessa van Empel, Vice Chair

DEPARTMENT OF CARDIOTHORACIC SURGERY

- Prof. Elham Bidar, Chair
- Prof. Roberto Lorusso, Vice Chair

DEPARTMENT OF VASCULAR SURGERY

- Prof. Geert Willem Schurink, Chair
- Prof. Barend Mees, Vice Chair

THROMBOSIS EXPERTISE CENTRE

- Prof. Henri Spronk, Co-chair
- Dr Kristien Winckers, Co-chair

OPERATIONS MANAGEMENT TEAM

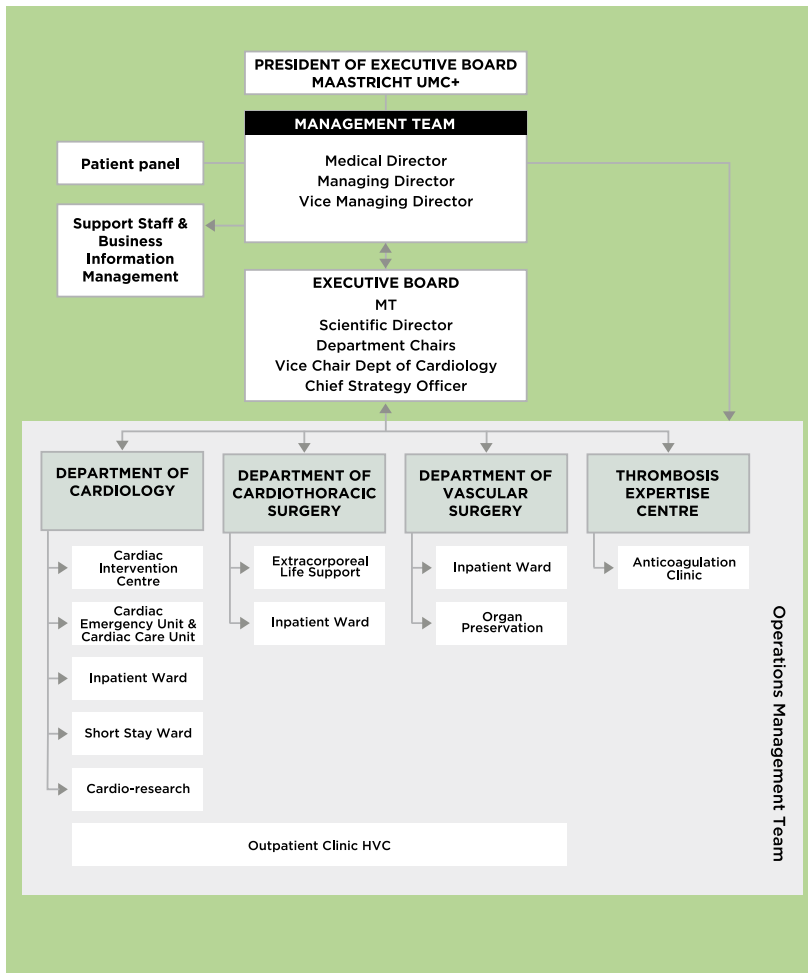
- Dr Arina ten Cate-Hoek, Anticoagulation Clinic
- Luuk Debie, Cardiac Intervention Center
- Petra Dodemond-Op het Veld, Business Finance
- Marie-José Dols, Cardiac Emergency Unit & Cardiac Care Unit
- Monique van Heusden, Business Finance
- Tom Joordens, Finance & Accounting
- Willemijn Jussen, Personnel & Organisation
- Wencke Korn, Outpatient Clinic

- Erik Körver, Extracorporeal Life Support
- Marion Lahaije-Mares, Marketing & Communications
- Kathleen Lousberg-Thenaerts, Inpatient Ward Cardiology
- John Nakken, Cardiac Intervention Center
- Angelique Plusquin, Inpatient Ward Vascular Surgery
- Mirte Soons, Quality, Safety & Operations
- Gwen Vliegen, Quality, Safety & Operations
- John Wijnenbergh, Business Development & Control
- Rens Wekenborg, Inpatient Ward Cardiothoracic Surgery/ Short Stay Ward Cardiology

PATIENT PANEL

- Francien Heijs, Chair
- Maud Clercx, Quality, Safety & Operations CAKZ (until September 2025)
- Martin Deguelle, panel member
- Annemarie Fuchs, panel member
- Valéry Hawinkels-Hellwig, Quality, Innovation & Research
- Henk Hoven, panel member
- Marion Lahaije-Mares, Marketing & Communications
- Tom Lemmens, panel member
- Claire Priem, panel member
- Ron Rosell, panel member (since November 2025)
- Dr Jan Willem Sels, cardiologist/intensivist
- Daphne Sleijpen, Vice Managing Director HVC (until September 2025)
- Mirte Soons, staff advisor Quality, Safety & Operations
- Anja Thehu-Mulder, panel member (until June 2025)
- René van der Reijden, panel member
- Gwen Vliegen, Safety & Operations CAKZ (from September 2025)
- Sjoerd Vogelzang, panel member (since September 2025)
- Dyon de Vreede, panel member

HOW WE WORK



SUPPORT STAFF & BUSINESS INFORMATION MANAGEMENT

The MT is supported by a dedicated staff, including Anja Lanckohr, who serves as Management Assistant to the MT. Financial management and business control are supported by Petra Dodemond-Op het Veld (Controller), Joël Straat (Assistant Controller), John Wijenberg (Business Development and Control), and Tom Joordens (Production Control). Quality, Safety & Operations are supported by Mirte Soons and Gwen Vliegen, while Marketing & Communications is supported by Marion Lahaije-Mares. Personnel & Organization support is provided by Willemijn Jussen and Nathalie Hofman. Monique Clairbois provides cross-functional support in Communications, Quality & Safety, and the Management Team Secretariat. Business Information is provided by Helma Poesen-Aerdt, Karianne Beekman-Teunissen, Rafke Niemands and Melanie Stones.

Integrated management of HVC's activities is ensured through the Operations Management Team, which comprises all operational managers, support staff, directors, and members of the EB. This structure facilitates coordinated decision-making and effective alignment of clinical, operational and tactical objectives across the organisation.





CARDIAC CATHETERISATION LABORATORY



INTERVIEW
**THEO LANKVELD
AND
ASTRID HERMANS**

The future is remote

When it turned out during the COVID-19 crisis that heart patients can easily and accurately monitor their heart rhythm at home using an app, this finding laid the foundation for an innovation of care in 2025.

That year, the Department of Cardiology of Maastricht UMC+ opened the Integrated Remote AF Clinic; a virtual centre in which nurses are leading. Cardiologist Theo Lankveld and assistant professor Astrid Hermans are hoping that this initiative will contribute to a future-proof outpatient clinic.

Monitoring patients' heart rhythm and heart rate, for instance in case of atrial fibrillation (AF), is an essential part of cardiovascular care. So far, this was done by making an ECG at the outpatient clinic, but the disadvantage of this approach is that this is only a momentary recording and that patients have to go to the hospital to have it done. During the Covid crisis it turned out that even elderly patients can easily work with an app that measures heart rhythm and heart rate at multiple moments. Patients lay their finger on the camera of a smartphone for one minute, which then records heart rhythm and heart rate. Asking a few supplementary questions about possible symptoms and activities also makes it possible to find a correlation between symptoms and heart rhythm. In addition, this system generates massive amounts of data for scientific research. "In short: everyone was happy, and together with the Belgian company that developed it, we introduced this FibriCheck app at 41 centres", says Astrid Hermans. "The data have already enabled us to do a lot of research."

In 2025, FibriCheck was being applied by Maastricht cardiologists after surgical operations, to monitor the rhythm, or in preparation for an outpatient appointment. Theo Lankveld: "As a cardiologist, I'm around at the outpatient clinic and I'm the contact person for the nurses who are the first to engage with each patient on the basis of the app data. This enables me to attend to multiple patients at the same time, while the patients get more time with a care professional than when they used to see only their own cardiologist." Apart from this quantitative difference, there is also a qualitative advantage, he explains. "AF also requires an assessment of risk factors like hypertension, the home situation and stress, and those are things that nurses are better at than doctors. I get to see the clinical data anyway, and the patient gets more attention and explanation."

REMOTE PATIENT CONTACTS ARE BECOMING EVER MORE COMMON

PLATFORM DEVELOPMENT IN PROGRESS

In addition, this development is of course also driven by necessity, Theo acknowledges. "The volume of patient contacts is still growing, and this rearrangement of tasks is necessary to ensure that it remains manageable." One aspect that Astrid is working on is adapting the way the outpatient clinic is organised, as remote patient contacts are becoming ever more common. "Originally, the data from the FibriCheck app used to be stored in a cloud, while now there is a link with the electronic patient file. But there are currently also other remote measurement instruments, whose data also end up in a cloud of their own. That's why we are currently developing a platform, called MetAFib, that will compile all data so that care providers will no longer have to consult multiple tabs and cloud devices to obtain a complete picture."

The team (which in addition to Astrid and Theo, consists of two nurses, two professors, two doctors who are also doing PhD research and a strategic manager) is also working on an app for patients that focusses on education. Astrid: “For instance, if a patient has to undergo an ablation, they will find patient-focused information in this app, in the shape of a ‘journey’ covering everything they have to know before and after the procedure. In addition, we want to provide the app with a kind of ‘front door’ for all heart-rhythm related apps that patients are nowadays working with. They will then have to use only one app, which we think will benefit especially older patients.” Theo emphasises that building such an app, just like the MetAFib app, remains an organisational challenge. “The patient data will have to be kept safely, and that obviously involves numerous rules and regulations.”

IN FIVE YEARS...

The two researchers hope to have the platform up and running at Maastricht within five years. Theo: “So that we’ll see it working well at the outpatient clinic, that patients will be better informed, that they’ll be able to record their own heart rhythm more easily and will be more aware of what they have to pay attention to. It would also be great if it could help to improve their lifestyle, which is one of the focal points in AF.” Astrid: “I hope that by then there will be less demand for in-person consultations and that we will be rolling out our approach and our platform to other Dutch AF clinics, so as to make our type of care more attractive to people outside the Maastricht region as well.”

Theo Lankveld has been working as a cardiologist since 2021, specialising in rhythm disorders. He particularly focusses on atrial fibrillation and pacemaker care. After studying medicine at Nijmegen University, he obtained his PhD at Maastricht University in 2015, and trained as a cardiologist at Maastricht UMC+ until 2021.

Astrid Hermans studied Health sciences at Maastricht University (Bachelor’s degree) and Biomedical sciences at Nijmegen (Master’s). She obtained her PhD at Maastricht in 2024, where she is now an assistant professor and postdoc researcher at the Department of Cardiology.

FOR DUTCH







INPATIENT WARD B3

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SCIENCE THAT MOVES HEARTS

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In 2025, the successful work of our researchers was reflected in 1,002 international peer-reviewed journal articles (SCI). 49 PhD candidates successfully defended their theses, and 16.5 million Euros were awarded through competitive funding from national science foundations, third-party funders, charities, EU framework programmes and industry.

SCHOLARLY IMPACT

22.6% of CARIM+HVC's publications belong to the top 10% and 4.1% to the top 1% of publications in their category, meaning that CARIM+HVC performs significantly above average when compared to others in the same scientific category. With an overall CNCI (Category Normalized Citation Impact) of 2.5, CARIM+HVC's publications are cited 2.5 times more often, on average, than the expected average for comparable publications in their specific fields. All research lines are above the global average in their contribution to the top 1% and top 10% of publications. 86% of CARIM+HVC's 2025 publications are available as open access.

	NUMBER OF DOCUMENTS*	AVERAGE CNCI	PAPERS IN TOP 1%		PAPERS IN TOP 10%	
			#	%	#	%
TOTAL	4,663	2.5	192	4.1%	1,052	22.6%
BLOOD	1,690	2.1	66	3.9%	419	24.3%
VESSELS	1,488	2.4	55	3.7%	267	17.9%
HEART	1,296	3.4	62	4.8%	315	25.0%

*The number of documents and citation impact for separate divisions and the research institute (2018-2023)

RESEARCH GRANTS AWARDED TO INDIVIDUALS

NHS DEKKER PROGRAMME

Within the framework of the Dekker programme of the Dutch Heart Foundation, Dr **Elisa D'Alessandro** (Dept of Physiology) and Dr **Job Stoks** (Dept of Cardiology) both received a Postdoc fellowship.

Elisa received the grant for the project 'Targeting heart fat and scar tissue to curb atrial fibrillation'. Atrial fibrillation is the most common heart rhythm disorder and increases the risk of heart failure, stroke, and dementia. The condition often worsens due to scarring in the atria, caused by inflamed fat tissue surrounding the heart. Elisa will investigate how this process works in detail, with the aim of intervening using medication. Her goal is to treat atrial fibrillation at an earlier stage, before serious complications develop. See pages 150-154 for an interview with Elisa.

After a heart attack, scar tissue in the heart can lead to life-threatening arrhythmias, but these often take years to develop. In his project 'From heart attack to cardiac arrest: searching for early warning signs', Job will be the first to map how the heart changes in the years following a heart attack and which patients go on to develop arrhythmias. The findings will help identify high-risk patients more effectively and enable more targeted and effective use of treatments such as implanting an ICD (implantable cardioverter-defibrillator).

In addition, Dr **Nick van Osta** (Dept of Biomedical Engineering) and Dr Karim Taha (UMC Utrecht) have been awarded a Dekker Team Science grant. Over the next three years, they will develop a digital copy of the heart to improve treatment for patients with heart failure caused by a stiff heart muscle (HFpEF), a rapidly growing condition affecting millions worldwide. Using ultrasound images taken at rest and during exercise, the researchers will build patient-specific computer models using the CircAdapt framework that reveal which disturbances in the heart cause symptoms. These digital hearts will allow clinicians to test treatments virtually before applying them to patients and to estimate heart filling pressures without invasive procedures. In the future, the digital model could also help monitor disease progression and refine personalised treatment plans. The Dekker grant supports promising researchers in establishing their own research lines and accelerating solutions for cardiovascular patients.

NWO TALENT PROGRAMME

Prof. **Judith Sluimer** (Dept of Pathology) has been awarded a Vici grant for the project 'Resetting fibroblast metabolism rejuvenates aged vasculature'. With this grant, she has now received all three grants within the NWO Talent Scheme. Judith has demonstrated that the first signs of vascular wall ageing are visible in the outer layer of the blood vessel, although research and treatments have so far focussed on the inner layer. Judith expects that her research will lead to new treatment possibilities for vascular ageing and resulting cardiovascular diseases. See pages 14-19 for an interview with Judith.

Dr **Bart Spronck** (Dept of Biomedical Engineering) has received a Vidi grant for the project 'The aorta as a key to personalised treatment of high blood pressure'. Patients with elevated blood pressure are often treated with medications



Dekker Laureate Meeting, The Hague. Source: Dutch Heart Foundation

that relax the muscle cells in their smallest arteries, causing these arteries to dilate and blood pressure to drop. In some patients, such medications are ineffective, possibly because they also dilate the aorta. This project investigates how aortic vasodilation affects the blood pressure dampening effect of the aorta, and whether this explains why these drugs are sometimes not effective. Using the resulting data, a computer model is developed to predict whether vasodilatory antihypertensive treatment will be beneficial or detrimental to the individual patient, allowing optimal treatment from the start.

Dr **Sabine Daemen** (Dept of Internal Medicine) and Dr **Uyên Châu Nguyễn** (Dept of Cardiology) both received a Veni grant. Sabine will spend the coming years diving deeper into a topic close to her heart: how restorative macrophages can be harnessed to combat MASH and liver fibrosis. Liver fibrosis is the formation of scar tissue in the liver, which can lead to serious health problems. Unfortunately, there are few treatment options available. Previous research showed that certain immune cells, called macrophages, can help repair fibrosis by breaking down scar tissue. This research focusses on understanding how these cells perform this repair function and identifying the signals they need to do so. With this knowledge, a new therapy can be developed that harnesses the power of macrophages to treat liver fibrosis.

Uyen will investigate how scar tissue in the heart affects the effectiveness of pacemaker therapy and how this therapy can be optimised to improve outcomes for heart failure patients with scar tissue. Heart failure is a serious condition characterised by shortness of breath, fatigue, hospitalisations, and high mortality. In the Netherlands, over 241,300 people live with heart failure, and the number of patients continues to rise due to an ageing population. One in four patients with heart failure is eligible for pacemaker therapy,

which can restore the heart's pumping function through electrical stimulation of the heart chambers, potentially curing heart failure. However, the majority of heart failure patients have scar tissue in the heart muscle as a result of coronary artery disease and/or a heart attack. These patients typically respond suboptimally to pacemaker therapy.

Dr **Dylan Mostert** (Dept of Cardiology) has been awarded a Rubicon grant from NWO. Her research focusses on improving heart attack recovery using injectable, instructive hydrogels combined with mechanobiological active human stem cell-derived cardiomyocytes (hiPSC-CMs). By optimising the interaction between hiPSC-CMs and magnetoresponsive hydrogels, she aims to enhance structural anisotropy, electromechanical coupling, and integration with myocardial tissue. To achieve this, she will develop a state-of-the-art *in vitro* model of the human myocardial wall capable of applying mechanical stimulation. As part of the Rubicon, Dylan will be seconded to DWI - Leibniz-Institut für Interaktive Materialien (Germany, Aachen) to conduct her research under the supervision of Prof. Laura de la Porte. In addition, Dylan received an Open Science XS grant. With the grant, she will explore how the maturity of hiPSC-CMs affects their ability to establish mechanical connections and respond to mechanical stimuli. By leveraging complementary 2D and 3D *in vitro* models of the human heart, she aims to advance our understanding of cardiomyocyte mechanobiology and its role in cardiac regenerative strategies.

NWO MOZAIK 2.0

Yesim Kaya (Dept of Cardiology) has received a Mozaik 2.0 grant from NWO for her PhD project IMPACT-VT, 'Improving the management of scar-related ventricular tachycardia: Introducing personalised 3D arrhythmia models and patient-centred care'. The current treatment of life-threatening

cardiac arrhythmias, particularly scar-related ventricular tachycardia, often falls short. This negatively affects patients' quality of life. Yesim's research focusses on an innovative approach to link mechanism-based diagnostics with personalised treatment. Yesim creates 3D heart models and investigates both invasive and non-invasive treatment options based on these models. In parallel, a streamlined clinical care pathway is being developed. The innovations resulting from her research will increase the effectiveness of treatment and ultimately improve patients' quality of life.

HARRY CRIJNS RESEARCH GRANT

Kas van der Heijden (master student FHML) received the 2025 Harry Crijns Research Grant for the project 'Keep on walking, a multicentre prospective randomized study'. Participating centres are Laurentius Hospital Roermond, VieCuri Venlo, Zuyderland MC and the Department of Vascular Surgery of Maastricht UMC+. The Harry Crijns Research Grant was awarded for the first time in 2021 by the *Hart en vaat onderzoeksfonds* of Health Foundation Limburg (this year sponsored by Amgen and Recordati) to a promising young researcher in the field of cardiovascular disease. The grant was instituted as a tribute to Prof. Harry

Crijns, who was Chair of the Department of Cardiology of Maastricht UMC+ until December 2020 and a board member of CARIM.



EUROPEAN RESEARCH GRANTS

The European Union has approved three new Marie Skłodowska-Curie Doctoral Networks involving CARIM researchers as coordinator or partners.



- **LipidBRIGHT**, coordinated by Dr **Heidi Noels** (Dept of Biochemistry), unites scientists across Europe to study lipid mediators in cardiovascular disease, chronic inflammation, kidney disease, and cancer. The consortium includes six research institutions, two SMEs from five countries (NL, BE, DE, FR, SE), and an associated institute from Switzerland, supported by 16 additional partners for training and dissemination. Over the period 2026-2030, 11 doctoral researchers will be trained to explore the role of lipids in disease mechanisms, detection, and therapy.
- **ThromboRisk**, involving Dr **Maarten Snoeijls** (Dept of Vascular Surgery), Dr **Arina ten Cate-Hoek** (Dept of Biochemistry), Dr **Magdi Nagy** (Dept of Biochemistry), Prof. **Robert van Oostenbrugge** (Dept of Neurology), and Prof. **Eline Kooi** (Dept of Imaging) and coordinated by Eindhoven University of Technology, will train 18 doctoral candidates in mechanobiology, biochemistry, pathophysiology, and computational modelling of thrombosis. By integrating *in silico*, *in vitro*, and *in vivo* approaches, the network aims to bridge cellular mechanisms and clinical outcomes in

thrombotic diseases, fostering personalised therapies. A distinctive feature is Challenge-Based Learning (CBL), where candidates collaboratively tackle real-world medical challenges with academia and industry.

- In **TrackAF**, CARIM+HVC through Dr **Stef Zeemering** (Dept of Physiology) will host three doctoral researchers and lead the network's training programme. TrackAF will train 15 researchers to improve understanding and management of atrial fibrillation (AF) and atrial cardiomyopathy through clinical research, computational modelling, AI, and experimental studies. The project focusses on disease progression, and the effects of age and sex on AF outcomes, addressing priorities from the 2024 European AF guidelines. The Maastricht team will integrate modelling, data science, and AI to enhance AF prediction, risk stratification, and treatment, preparing a new generation of translational cardiovascular scientists.

The project 'Quantifying atrial fibrillation burden to inform screening, treatment, and health policy (AF-B-STEP)', involving Prof. **Uli Schotten** (Dept of Physiology), has received funding from the Innovative Health Initiative Joint Undertaking (IHI JU). AF-B-STEP aims to identify how the burden of AF impacts health outcomes in patients using implanted devices and monitors. By analysing data from over 100,000 patients, the project will quantify the contributions of AF burden to health issues such as stroke and heart failure. It will establish universal reporting standards and actionable thresholds for AF burden, providing crucial data to improve clinical care and support treatment innovation. AF-B-STEP brings together university medical centres, industry representatives from the medical device, pharmaceutical, and digital health sectors, international cardiology

organisations, patient groups, management and dissemination professionals, and healthcare payers from Europe and Canada.

The European Commission also funded two projects involving Prof. **Hans-Peter Brunner-La Rocca** (Dept of Cardiology). The project 'EuroHeartPath: Leading Innovation in Cardiovascular Pathways for Improved Patient Outcomes' aims to address this by mapping care pathways across countries and promoting a more coordinated, data-driven approach. Through 18 studies, the project focusses on AI diagnostics, digital health, point-of-care testing, and robotics to improve early detection, monitoring, and treatment of heart conditions. By identifying best practices and enabling cross-country collaboration, EuroHeartPath seeks to deliver more personalised, efficient, and accessible cardiovascular care across Europe. The project 'IntegRating a Palliative Care Approach for PATients with HEart FaiLure (RAPHAEL)' is an international, multicentre research project with a patient advisory panel at its core, alongside experts in palliative care, cardiology, and primary care. RAPHAEL's ambition is to integrate a routine palliative care approach into heart failure care pathways across Europe through home-based multidimensional digital monitoring of symptoms, wishes, and needs.

Prof. **Miranda Schram** (Dept of Internal Medicine) is involved in the Horizon Europe Health-funded project 'Devising a personalized risk stratification and holistic management for prevention of cognitive impairment in patients with different cardiovascular phenotypes (DORIAN GRAY)'. The project investigates the relationship between mild cognitive impairment (MCI) and cardiovascular disease to develop AI-driven tools for risk stratification, early detection and personalised

prevention. By integrating clinical, imaging, biological, and real-world data, including data from wearable devices, the project aims to support personalised interventions for patients at risk of cognitive impairment.

Poly-DREAM (PI Dr **Daniël Molin**, Dept of Physiology), funded by Interreg Meuse-Rhine (ERDF) and the Ministry of Economic Affairs and Climate of the Netherlands, provides an Euregional public-private R&I platform advancing biopolymer-driven 3D printing spanning the biomedical, life sciences and manufacturing industries. Through cross-border collaboration (the Netherlands, Belgium, and Germany) the Poly-DREAM platform equips SMEs with the expertise and tools to accelerate advanced 3D printing innovation.

CONTRACT RESEARCH

Prof. **Judith Cosemans**, Prof. **Yvonne Henskens**, Dr **Floor Heubel-Moenen** and Dr **Paola van der Meijden** have secured k€ 1,240 in research funding from **Octapharma AG** to advance haemostatic therapies for bleeding disorders. The collaborative project will use the Maastricht flow chamber to perform *in vitro* studies examining how coagulation factor products used in the treatment of haemophilia A, haemophilia B, and von Willebrand disease influence thrombus formation. By combining the Department of Biochemistry's expertise in haemostasis and microfluidics (Judith, Paola) with the clinical expertise of the haemophilia treatment centre Maastricht (Floor) and the Central Diagnostic Laboratory's specialisation in clinical chemistry of haemostasis (Yvonne), this project highlights the unique translational research infrastructure of Maastricht UMC+.

Prof. **Joost Lumens** (Dept of Biomedical Engineering) has received k€ 698 in funding from **Medtronic** to support two PhD projects that investigate the mechanisms by which cardiac pacing strategies modulate cardiovascular function in heart failure. Both projects combine clinical observations with CircAdapt-based computational analyses developed within the Computational Cardiology group and address complementary questions along the heart failure spectrum. The first project, 'Optimization of Resynchronization Therapies Using Digital Twin Technology', led by PhD candidate **Laethitia Held**, investigates the mechanisms underlying acute haemodynamic responses to competing resynchronisation strategies (biventricular pacing, left bundle branch area pacing, and left bundle optimised CRT), drawing on data from the multicentre CSPOT study to explain interindividual variability in therapy response. The second project, 'Accelerated Pacing for Diastolic Heart

Failure Management', performed by PhD candidate **Sjoerd Vossen**, addresses heart failure with preserved ejection fraction (HFpEF) and employs the CircAdapt modelling and simulation framework to elucidate how accelerated pacing modulates ventricular remodelling, coronary supply-demand balance, and cellular contractile behaviour. At a later stage, both projects will apply patient-specific digital twin modelling to test whether the mechanistic insights obtained from the combined clinical-computational analyses are relevant at the individual patient level, thereby informing personalised optimisation of cardiac pacing therapy. Both PhD candidates closely collaborate with the pacing (Prof. Kevin Vernooy) and HFpEF (Dr Vanessa van Empel) teams of the Department of Cardiology.

In addition, Dr **Vanessa van Empel**, Dr **Justin Luermans**, Prof. **Joost Lumens** and Prof. **Kevin Vernooy** from the departments of Cardiology and Biomedical Engineering have received funding from **Medtronic** for the project 'RAPID-HFpEF: Effect of Accelerated Pacing on Hemodynamics in HFpEF Patients'. Heart failure with preserved ejection fraction (HFpEF) remains poorly understood and lacks targeted therapy, despite representing more than half of all heart failure diagnoses. Non-pharmacological approaches aimed at modulating resting heart rate through pacing have shown promising results, with recent studies demonstrating that moderately accelerated heart rate pacing can reduce left ventricular filling pressures and improve quality of life. Building on computational modelling and clinical pilot data from our centre, RAPID-HFpEF aims to quantify the acute haemodynamic effects of accelerated heart rate pacing in HFpEF patients. Thereby, potentially establishing the haemodynamic basis for pacing as a novel non-pharmacological treatment strategy in this underserved patient population.

OTHER GRANTS, AWARDS AND PRIZES

The research project 'Genetic Approach to Aortic Aneurysm', led by Prof. **Barend Mees**, has been awarded the Health Foundation Limburg (HFL) PhD Grant. In this study, experts in vascular surgery, cardiothoracic surgery, biochemistry, and clinical genetics collaborate on patient-centred solutions for hereditary connective tissue disorders such as Marfan syndrome, which carry a high risk of early, life-threatening aortic complications. As no preventive medication currently exists, patients often depend on high-risk surgeries. To address this, researchers are developing a 'mini-aorta' in the lab using stem cells from patients' blood. This model allows them to study disease progression at an individual level and test targeted treatments, including drugs to slow aneurysm growth and CRISPR-based gene therapies. If successful, these approaches could advance to clinical trials and enable safer, more personalised care.

A large-scale study has been launched in ten hospitals across the Netherlands to evaluate a new method for assessing stroke risk in patients with carotid artery narrowing. This randomised multicentre trial is funded by the ZonMw Efficiency Research Programme. The study focusses on patients who have experienced a TIA or minor stroke. For these individuals, it's crucial to determine who will benefit from surgery or stenting to remove plaque in the carotid artery, and who can be safely treated with medication alone. The current decision-making approach is primarily based on the degree of narrowing. The new method (**IMPROVE**) uses MRI to identify vulnerable plaque and more accurately assess stroke risk. Researchers expect this approach to be at least as effective as the standard method and potentially

more beneficial in preventing future strokes and reducing healthcare costs. Patients will be followed for several years to compare the health outcomes and cost-effectiveness of both strategies. The research team at Maastricht UMC+ consists of: Prof. Eline Kooi (project leader), Prof. Robert van Oostenbrugge, Prof. Luc Smits, Dr Martine Truijman, Prof. Manuela Joore, Dr Linda Jacobi-Postma, Dr Stephanie Ament, Dr Jan Willem Daemen, Juul Bierens, and Robin Pleumeekers. (see Highlight Division Blood on pages 74-79)

Six research projects received a Public-Private Partnership (PPP) Allowance in 2025: CARTA, coordinated by Dr **Koen Reesink** (Dept of Biomedical Engineering), PPP-HF study, led by Dr **Uyên Châu Nguyễn** (Dept of Cardiology), BELLINI, VELOCITY and AVIATOR, involving Prof. **Leon de Windt** (Dept of Cardiology) and MATRIX, involving Prof. **Wim van Zwam** (Dept of Imaging).

- The project 'Cardiovascular contractilopathy Assessment and treatment Response through patient-specific engineered Tissue Analysis (**CARTA**)' creates a 'virtual biopsy' using a patient's blood to create stem cell-derived heart and vascular muscle cells and convert them into miniature heart and vascular tissues (EHT and EVT). This allows highly detailed measurements of force, electrical signals, and mechanical stress within three months. The ultimate goal is early detection of diseases, more personalised risk profiling, and better treatment selection. The platform is intended to complement existing clinical data, such as imaging and genetics.
- Heart failure is a major cause of hospitalisation and mortality. Approximately 25% of patients develop dyssynchronous electrical activation due to ventricular conduction delays or a high burden of right

ventricular pacing, which can lead to pacing-induced cardiomyopathy. These patients are candidates for cardiac resynchronisation therapy (CRT) to restore electrical synchrony and improve cardiac function. Patient response to CRT response is, however, heterogeneous: ~30% show limited benefit, and ~10% develop ventricular arrhythmias, particularly patients who respond poorly. Accurate characterisation of a patient's 'electrical fingerprint' is essential for a personalised CRT approach. Currently, this relies mainly on conventional ECG, which provides only a global and partly subjective assessment of cardiac electrical activity. Ultra-high-frequency ECG is a novel, non-invasive technology that records high-frequency signals and enables real-time visualisation of local electrical activation, allowing identification of intra-cardiac conduction delays. It provides more detailed information than conventional ECG while maintaining a similar acquisition experience for the patient. Within the **PPP-HF** consortium programme, in collaboration with Dr Jurak (VDI Technologies), who invented this technology, and Dr Rademakers (Catharina Hospital), who first implemented it in the Netherlands, we aim to advance ultra-high-frequency ECG for clinical application to prevent dyssynchronous HF, personalise CRT, and predict ventricular arrhythmias.

- The **BELLINI** consortium, a public-private collaboration between the research group of Leon de Windt, the top research centre EPFL in Lausanne Switzerland, and Summa Biotech BV, is advancing next-generation gene therapy approaches for cardiovascular disease. While adeno-associated virus (AAV) vectors have shown promise in treating monogenic disorders, their application to complex acquired diseases such as ischemic heart disease requires more precise control of gene expression.

BELLINI addresses this challenge by developing drug-inducible AAV systems that enable tunable, on-demand therapeutic gene activity. The project focusses on engineering novel protein-based molecular switches that regulate RNA therapeutics designed to stimulate cardiomyocyte proliferation and cardiac repair. These constructs will be tested across advanced in vitro human models and in vivo large-animal systems. By integrating computational protein design with translational validation, BELLINI aims to establish safer and more controllable gene therapies, paving the way toward regenerative treatments for heart disease.

- The **AVIATOR** consortium brings together the research group of Leon de Windt, the German Primate Center, Jagiellonian University, and Summa Biotech BV to develop regenerative gene therapies for ischaemic heart disease (IHD). Current treatments do not restore lost heart muscle, making cardiomyocyte regeneration a key unmet need. AVIATOR explores delivery routes of advanced gene therapy AAV vectors for the heart. The project will evaluate inducible, heart muscle-targeted gene delivery systems in human induced pluripotent stem cell models, patient-derived cardiac tissue slices, and explore different routes of administration in large animal models of myocardial infarction. By leveraging next-generation AAV serotypes, AVIATOR aims to improve targeting specificity and safety. Beyond scientific innovation, the consortium integrates stakeholder engagement, public outreach, and early health technology assessment to address barriers to adoption. Its comprehensive approach enhances translational potential, with the long-term goal of enabling curative therapies that reduce the burden of cardiovascular disease.

- The **VELOCITY** consortium, uniting the Hubrecht Institute, Amsterdam UMC, the research group of Leon de Windt, and Phlox Therapeutics BV, focusses on developing gene therapy for laminopathies caused by mutations in the LMNA gene. These disorders include a severe form of dilated cardiomyopathy marked by poor prognosis and limited treatment options. VELOCITY is advancing a gene replacement strategy designed to restore LMNA function by delivering a therapeutic construct expressing LMNA and LMNC proteins. The approach will be validated in patient-derived stem cell models, engineered heart tissues, and a knock-in mouse model carrying a clinically relevant mutation. Complementary efforts include safety evaluation, patient stratification using clinical data repositories, and early health technology assessment. By combining cutting-edge biology with translational and societal considerations, VELOCITY aims to deliver a much-needed therapeutic avenue for patients with LMNA-related cardiomyopathy.
- Acute ischaemic stroke is caused by the occlusion of a cerebral artery by a thrombus. Thrombus composition varies in the relative proportions of red blood cells, fibrin, and platelets. Fibrin-rich thrombi are generally more compact and resistant to treatment, whereas red blood cell-rich thrombi are typically softer and easier to retrieve. Endovascular thrombectomy (EVT) is the standard treatment for large vessel occlusions, but its success depends in part on thrombus composition. In particular, achieving first-pass recanalisation is strongly associated with improved clinical outcomes, yet remains challenging for certain thrombus types. Currently, no reliable non-invasive method exists to determine thrombus composition prior to intervention, limiting the ability to tailor treatment strategies. The **MATRIX** project, involving Prof. Wim van Zwam, aims to develop a

machine learning approach to predict thrombus composition from CT and CT angiography (CTA) imaging. Preprocedural insight into thrombus characteristics enables more personalised device selection. This may improve recanalisation success and patient outcomes.

The **Netherlands Cohort Consortium (NCC)**, involving Prof. **Miranda Schram** (Dept of Internal Medicine; MHeNs) and Prof. **Annemarie Koster** (CAPHRI), has received a grant of M€ 17 from NWO. With this investment, virtually all university medical centres, the RIVM and VU Amsterdam are joining forces in a single national mega cohort: a unique research infrastructure with data from almost half a million Dutch citizens. The NCC combines the strengths of the eleven largest and most comprehensive cohorts in the Netherlands, including The Maastricht Study. This connection creates a coherent source of knowledge about health, lifestyle, environment and ageing. Thanks to the subsidy, the consortium will be able to conduct large-scale research into how and why people age healthily and what we can do to prevent diseases. The emphasis will be on multimorbidity (the co-occurrence of multiple chronic conditions) and new health risks, such as emerging infectious diseases.

Prof. **Barend Mees** (Dept of Vascular Surgery) is one of the coordinators, and now serves as consortium leader, who led the formation of the Aneurysm-NL consortium, together with Dr Mervyn Vergouwen (UMC Utrecht) and Prof Hanneke Takkenberg (ErasmusMC). This national initiative, funded by the Dutch Heart Foundation, aims to improve the detection, risk prediction, and treatment of aneurysms, potentially life-threatening vessel dilations that often remain asymptomatic until rupture. The project focusses on building a national research and data infrastructure that connects hospitals, researchers, and patients, enabling better under-

standing of disease progression and more personalised care. It combines clinical data, imaging, genetic information, and advanced models to identify new treatments and evaluate current therapies.

Two projects involving Prof. **Joost Lumens** (Dept of Biomedical Engineering), who serves as work package leader in both consortia, have received funding from the Dutch Heart Foundation. The 'Energetic Digital Heart Twin' consortium, funded through the Open Call for Consortia, aims to develop a computational model that integrates cardiac energy production and demand in patients with inherited cardiomyopathies. The consortium will validate this model using mini-hearts (engineered heart tissues) created from patients' stem cells, with the goal of predicting which medication works best for the individual patient. Joost's group contributes the CircAdapt electromechanical-haemodynamic modelling platform, which captures the mechanical energy demand of the heart and will be coupled to metabolic energy supply models developed by consortium partners. The FIT-HEART consortium investigates safe exercise limits for recreational and elite athletes and seeks to identify those at risk for adverse cardiovascular outcomes at an early stage. Within this consortium, Joost's group develops CircAdapt-based digital twins of athletes' hearts using baseline and follow-up MRI data from the ELITE+ cohort, quantifying atrial and ventricular tissue function of both the left and right heart in sex-specific models for male and female athletes. Together, these projects extend the group's computational modelling expertise into two new application domains: personalised pharmacotherapy for cardiomyopathy and cardiovascular risk stratification in sports cardiology.

The study 'Comparison of the Outcomes of Single vs Multiple Arterial Grafts in Women (ROMA:WOMEN)',

involving Prof. **Roberto Lorusso** (Dept of Cardiothoracic Surgery) has received a k€ 720 grant from the Dutch Heart Foundation through its Clinical Study Programme. ROMA:WOMEN is the first cardio-surgical trial specifically focussed on women. Because most bypass studies include only 15-20% women, it has been difficult to draw reliable conclusions for female patients. By expanding the original ROMA trial, researchers aim to close this knowledge gap and improve outcomes for women.

The project 'Calprotectin as a new companion biomarker and associated drug target for premature vascular aging in chronic kidney disease and type 2 diabetes (EU-Calprotect)', involving Dr **Marleen van Greevenbroek** and Dr **Carla van der Kallen** (Dept of Internal Medicine) has received funding from ZonMw through the EP PerMed programme. The EU-Calprotect project is designed to advance the use of plasma calprotectin concentration in clinical settings, positioning calprotectin as a biomarker that could be paired with targeted therapies to slow down premature vascular aging. The potential impact of the EU-Calprotect project is substantial, as it may pave the way for a more tailored approach to managing cardiovascular risk in patients with CKD and T2D. By focussing on individualised care, this project aims not only to improve patients' quality of life but also to reduce the long-term economic burden associated with these chronic conditions.

Dr **Fabienne Magdelijns** (Dept of Internal Medicine), together with **Melanie Acampo-de Jong** (TEC), has been awarded a k€ 295 grant from the Netherlands Thrombosis Foundation for the project 'Assessing the Efficacy of a Single Cycle Monitoring and Adjustment Strategy for DOACs in Frail Older Patients (The DOAC-FRAIL RCT)'. In close collaboration with Prof. Yvonne Henskens and Dr Kristien

Winckers, they coordinate this international randomised controlled study (the Netherlands and Belgium) from CARIM+HVC. In the DOAC-FRAIL RCT, frail older participants will be randomised into study groups. In the intervention group, patients will receive individualised adjustments to their direct oral anticoagulant (DOAC) therapy based on peak DOAC plasma level measurements, ensuring optimal dosing and/or drug selection. Over a two-year follow-up period, the study will evaluate the incidence of (major) bleeding events and thrombotic complications. This trial investigates a novel intervention strategy and is expected to provide important insights into the safer and more effective use of DOACs in frail older patients, with the ultimate aim of reducing complications and improving quality of life.

Prof. **Judith Sluimer** and Dr **Pieter Goossens** (Dept of Pathology) are involved in AtheroNeth, a national Dutch research consortium, sponsored by the Dutch Heart Foundation, that encompasses top research groups from all Dutch University Medical Centers. The aim of AtheroNeth is to improve the treatment of patients with ASCVD by deciphering distinct molecular phenotypes and developing innovative modalities based on multidimensional data sources that will improve patient stratification and lead to personalised therapy choices.

The project 'PRECISE - Improving detection, risk prediction and therapy for inherited heart diseases', involving Prof. **Stephane Heymans** (Dept of Cardiology) as coordinator, together with Dr **Job Verdonchot** and Dr **Martijn Hoes**, has received over M€ 7 in funding from NWO and the Dutch Heart Foundation through the KIC Partnership to conduct research on inherited heart diseases. The project brings together scientists from different disciplines, such as cardiology, the **HEALTH TECHNOLOGY ASSESSMENT**

unit, and genetics, into an interdisciplinary consortium. Together with (international) collaboration partners, co-funders, experts by experience, and patient organisations, the consortium aims to improve the detection, prediction, and treatment of inherited heart conditions. Stephane is also involved in the project CardioResource, which has received funding from NWO through the research programme 'Research Infrastructure (RI): national consortia'. CardioResource will be the first national registry for patients with heritable cardiac conditions. By bringing together the resources of all seven largest Dutch University Medical Centers, it will enable breakthrough research into these diseases by combining cutting-edge (AI-based) analysis in genetics, imaging and the integration of clinical data. This will lead to more accurate diagnosis and improved understanding of the risk of developing disease and severe cardiac complications for patients and their families. It will also facilitate the development of novel therapies for more effective and targeted treatment of these life-threatening conditions.

Dr **Rogier Veltrop** (Dept of Biochemistry) has secured multiple donations through the University Fund Limburg (SWOL) to advance his research on LMNA and related cardiac conditions. The 'BAG3 - cardiac' project (k€ 750) enables in-depth investigation of BAG3-related heart failure, a field still largely limited to preliminary studies. This project leverages the lab's advanced capabilities, including iPSC reprogramming, 3D cardiac tissue models, mechanobiology, apoptosis and calcification assays, (epi)genetics, and unique nano-indentation combined with confocal laser microscopy. Additional BAG3 mutation cell lines and their isogenic controls allow robust comparative analyses. The funding also supports a dedicated technical engineer for 4-5

years, ensuring continuous research output alongside Rogier, PhD candidates and MSc students. In addition, the 'ACM - cardiac' project (k€ 330) funds a PhD project focussed on the mechanobiochemistry of ACM-related heart failure, using iPSC-derived cardiac models and advanced techniques such as long-read sequencing, immunophenotyping, and stretched engineered heart tissues. Finally, the 'LMNA 331' project (k€ 280) supports a PhD project investigating LMNA-331-related cardiovascular failure, combining iPSC models with comprehensive analyses including mechanobiology, bioinformatics, (epi)genetics, kinome profiling, and engineered heart tissue studies. Complementing these larger research initiatives, additional public support was raised in 2025 through the Health Foundation Limburg crowdfunding platform 'Blood Cell to Heart Cell', generating a total of € 68,200. Through seminars, presentations, patient awareness days, and dedicated fundraising events organised by Health Foundation Limburg, these donations directly contribute to advancing LMNA mechanobiochemistry research.

Prof. **Leon Schurgers** (Dept of Biochemistry) is involved in the project 'WISER' (Development of a first-in-class therapeutic combatting vascular pathology in Williams-Beuren Syndrome via Elastic Fibre Restoration) funded through the EUREKA Eurostars programme from RVO (*Rijksdienst voor Ondernemend Nederland*). The WISER project aims to advance the development of ElastoCure as a first-in-class therapeutic combatting vascular pathology in Williams-Beuren Syndrome via Elastic Fibre Restoration. In Maastricht, we will develop complex 2D and 3D in vitro models of human vasculature using patient-derived stem cells, to be used for large-scale testing of ElastoCure drug candidates. Eventually, ElastoCure will be an innovative elastin-modulating therapy with significant pipeline potential

for a broad range of elastin deficiency-related diseases. The WISER consortium brings together expertise from Elastin Biosciences Ltd (UK), the University of Luxembourg, ReGEN Biomedical and Maastricht University.

The *Bloedserieus* team: ‘from menstruation to childbirth’, led by Prof. **Yvonne Henskens** (Dept of Internal Medicine) has won the 2025 Marja van Dieijen Award. The award includes a €25,000 grant and brings additional attention to an important health issue that affects many women but often goes unrecognised. With *Bloedserieus*, the team focusses on girls and women experiencing heavy bleeding during menstruation or after childbirth. In a significant proportion of cases, an underlying bleeding disorder is the cause, while diagnosis is often delayed for years. The project aims to shorten this diagnostic journey through a smart triage approach consisting of a self-administered questionnaire, targeted laboratory testing, and clear clinical guidance. (see pages 162-165 for an interview with Yvonne Henskens, Floor Heubel-Moenen and Nienke Meskes about their research).

The International Society on Thrombosis and Haemostasis (ISTH) has named Prof. **Tilman Hackeng** as a recipient of the 2025 Esteemed Career Award, recognising his outstanding contributions to the field of thrombosis and haemostasis. With a career rooted in biochemical curiosity, Tilman began his research journey in 1987, eventually earning a PhD focussed on the anticoagulant protein C pathway. Over the decades, his work has shaped the understanding of natural anticoagulant mechanisms that contributed to new therapeutic approaches for haemophilia. Beyond his scientific achievements, Tilman has been a dedicated member of the ISTH community for more than 30 years, mentoring young researchers and helping to organise major events, such as the 2013 ISTH Congress in Amsterdam. The



award was formally presented at the ISTH 2025 Congress in Washington, D.C., held from 21-25 June.

The project ‘**Stethoscan**’ received the 2025 Brightlands Impact Award. Stethoscan received € 20,000 and support to help bring its innovation closer to the market, within the



domains of health, sustainability, digitalisation, or nutrition. StethoScan is a smart stethoscope that quantitatively assesses heart valve disease and shunts, and predicts the severity of the condition. Based on research by **Tom Konings** and Prof. **Tammo Delhaas** (Dept of Biomedical Engineering), the project uses an algorithm that can determine the severity of heart valve disease based on heart murmur sounds. In this phase, the focus is on testing its clinical feasibility, including algorithm integration, hardware prototyping, and initial user validation.

Dr **Elisa D'Alessandro** (Dept of Physiology) has received a travel grant from the LNVH Distinguished Women Scientists Fund. Elisa's research focusses on atrial fibrillation (AF), a progressive cardiac arrhythmia driven by structural remodelling of the atria. During her PhD, she conducted extensive translational studies using the goat model of AF in collaboration with international experts from the RACE-V consortium. Most importantly, she demonstrated that coagulation proteins drive atrial remodelling and proved that anticoagulation therapy can prevent these detrimental changes. Elisa used the grant to take part in the prestigious Young Investigators Award session at the European Heart Rhythm Association (EHRA) Congress 2025 in Vienna.

The first Prof. Dr. R.S. Reneman Young Investigator Awards have been presented during our annual symposium. This new initiative aims to highlight the innovation, creativity, and scientific potential of our talented PhD candidates working in the field of cardiovascular disease. The process began with 19 submissions, from which the top five were selected for the pitch round. Ultimately, the three strongest candidates advanced to present their work at the CARIM+HVC



Symposium. We extend our appreciation to Anouk Achten, Ilse Huijberts, and Elien Bollen for their outstanding work and dedication throughout the competition. After a very close final round, **Anouk Achten** was awarded first place and received €2,500 to support her research. Ilse Huijberts and Elien Bollen were each awarded €500 in recognition of their excellent contributions.

Judith de Ruijter-van Dalem (Dept of Clinical Pharmacy) has won the first poster prize awarded by the European Association of Hospital Pharmacists (EAHP). Out of more than 1,000 abstract submissions, Judith was selected to present at the EAHP 2025 Congress. Her research highlights that when patients start new medications in the hospital, they often continue using them long after discharge, even when long-term use was not the original intent. For example, 1 in 5 patients prescribed a new benzodiazepine in the hospital still used it more than six months later and 1 in 10 patients prescribed a new opioid continued using it long-

term. These findings emphasise the need to be more critical about discharge medications and take steps to prevent unnecessary long-term use.



OTHER HIGHLIGHTS

Dr **Bart Spronck** (Dept of Biomedical Engineering) and Dr **Casper Muhl** (Dept of Imaging) have been selected to participate in the Dutch CardioVascular Alliance (DCVA) Leadership Program. The DCVA Leadership Program is designed to develop the next generation of cardiovascular research leaders in the Netherlands. Through this program, Bart and Casper will further strengthen their leadership skills and expand their professional networks, ultimately contributing to CARIM+HVC's mission to improve cardiovascular healthcare through innovative research and clinical applications.

With Prof. Hugo ten Cate reaching retirement, the leadership of the Thrombosis Expertise Centre (TEC) has been transferred, as of 1 April 2025, to Prof. **Henri Spronk** and Dr **Kristien Winckers** (Dept of Internal Medicine). Together, they will continue to develop thrombosis as a key area within CARIM+HVC, expanding it into a multidisciplinary centre for high-quality antithrombotic management and translational research. The aim of TEC is to bridge scientific research and clinical practice, thereby supporting the delivery of excellent patient care based on cutting-edge research.

At the 2025 European Society of Cardiology (ESC) Congress, Prof. **Frits Prinzen** (Dept of Physiology) was invited to deliver the distinguished Paul Hugenholtz Lecture on Innovation. This honorary lecture, named after the pioneering Dutch cardiologist and former ESC president Paul Hugenholtz, is awarded each year to a leading expert whose work embodies groundbreaking innovation in cardiovascular medicine. The lecture titled 'Innovation in pacing therapies: Where technology meets physiology' focussed on how technological advances in pacemaker



‘Blood Coagulation, Venous Thrombosis & Bleeding’ under the Division of Blood. He succeeds Prof. Iwan van der Horst. As of 1 June 2025, Prof. **Elham Bidar** (Department of Cardiothoracic Surgery) has been appointed as Section Leader within CARIM. Elham succeeded Prof. Jos Maessen, who has taken on the role of titular board member within the Executive Board of Maastricht UMC+, as head of the Department of Cardiothoracic Surgery as of 1 April 2026.

PROFESSORSHIPS

1 July 2025: Elham Bidar (Dept of Cardiothoracic Surgery) – Professor of Cardiothoracic Surgery

design, such as miniaturisation, longer battery life, and leadless pacing, combined with deeper insights into cardiac physiology are reshaping treatment options.

Dr **Kristiaan Wouters** and Dr **Marleen van Greevenbroek** (Dept of Internal Medicine) will represent the Netherlands on the Management Committee of the EU COST Action CA24138, EU-Resolution Biology Network (EU-RESOLVE), one of the largest COST networks in Europe. This prestigious European initiative brings together researchers and clinicians to advance our understanding of the biology of inflammation and its resolution.

As of 1 March 2025, Prof. **Judith Sluimer** (Dept of Pathology) and Prof. **Martijn Brouwers** (Dept of Internal Medicine) have been appointed as Division Leaders of the Blood and Vessels divisions, respectively. As of 1 March 2025, Dr **Bas van Bussel** (Department of Intensive Care) has been appointed interim Section Leader within the CARIM programme



INPATIENT WARD B4







INTERVIEW

NICK VAN OSTA

Team Van Osta-Taha scores

The phone call from the Dutch Heart Foundation came when Nick van Osta was in the pleasant company of three toddlers. It was Wednesday, his day off, and his two children had a friend over to play, when he heard that he and trainee cardiologist Karim Taha (UMC Utrecht) had won a Dekker Team Science grant: almost 700,000 euros for three years of research. “I was already mentally preparing myself for a rejection, so that was another striking contrast”, laughs the researcher. The two will use the money to construct digital twins of individual hearts.

After studying biomedical engineering at Eindhoven University of Technology, Nick van Osta did a PhD project at Maastricht University on the CircAdapt model. This computer model of the heart and blood circulation is being developed at Maastricht since 1991. The simple principle underlying this model is: the tension in the wall relates to the pressure in the wall, and the strain of the tissue relates to the cavity volume. "As it's so basic, it works very fast. Just what we need for this project: a fast model that enables us to construct a digital twin of an individual patient's heart at individual level, both at rest and during exertion." The two researchers are focussing on patients with HFpEF.

HFpEF stands for heart failure with preserved ejection fraction, particularly while at rest, in other words heart failure due to stiffness of the heart muscle. The clinical picture of this disease may vary somewhat between patients and is associated with different underlying causes. One of the first symptoms is shortness of breath during exertion. "It's difficult to measure the underlying causes in patients. You can do an ultrasound of the heart or insert a catheter to measure the pressure and so estimate the force the heart has to generate. But those are derivatives of the cause. We hope that our model will allow us to accurately simulate the actual causes."

A LOGICAL STEP

The foundation for this project was laid in Nick's own PhD research, which focussed on the patient-specific modelling by CircAdapt. In the last few years, Karim Taha has learned to perform ultrasound examinations of patients during exertion. "That's quite a challenge, for instance when patients are sitting on a exercise bike. A clinical PhD candidate in Utrecht will be doing these patient measurements as well as clinical research, and we will try to enrich this with our Maastricht model." They met while Nick was doing his PhD

project, through one of Karim's colleagues. It turned out their research interests matched, so when the new Dekker Team Science grant came up, applying for one was the obvious next step.

CircAdapt offers the possibility to adjust numerous parameters in order to simulate a beating heart as closely as possible. These include heart rate, wall stiffness, the amount of force generated by a volume in the heart's cavity, etc. "That also allows us to look at the abnormalities in each patient that relate to the parameters. And once we have the digital twin, we can administer a virtual treatment and simulate its effects. Our horizon after three years is then to identify groups. For instance, if certain abnormalities at the tissue level are present, the group will react particularly well to this therapy. Our first objective is to get a clear view of the various underlying causes of HFpEF in these patients. For example, can we predict which patients have passive stiffness (fibrosis) and which ones have too much calcium, which also results in increased stiffness of the heart. Will our model enable us to clearly distinguish between these groups, and can we offer an alternative to catheterisation? That would make it possible to predict the pressures in the heart in a less invasive manner. It's mostly a matter of optimising the parameters, which is what I also did during my PhD project."

ENGINEERING MEETS CARDIOLOGY

Nick derives great satisfaction from doing research that generates added value in practice. That is why he likes going to Utrecht to visit Karim in order to understand even better how the measurements are done and how reliable they are, and where necessary to attune the model to this. "As a cardiologist, Karim speaks a different language from us tech nerds, but he is highly interested in the technical aspects, so that makes it easier to communicate. That was also very



useful when we were preparing for the grant application.” At the Department of Biomedical Engineering, they have several projects running in collaboration with clinical partners. “We’re nowhere without the cardiologists. They can do lots of things without us, but not the other way round. They have the problems and we hopefully have part of the solution.” Collaborating with other departments is also important for the further development of CircAdapt. “For example, collaboration with the departments of Physiology and Cardiology has turned the model into a real success. Within CARIM, it’s easy to find people.”

SECOND ATTEMPT

To inspire colleagues, it may be encouraging to mention that the first application by the two researchers was rejected. Although they were invited for an interview, in the end the reviewers thought their plan was too ambitious and at the same time not sufficiently solution-targeted. “We thought that was contradictory, and we didn’t really share that view, but we did pick up on the feedback and incorporated it in order to strengthen our proposal. That mainly involved the way it was worded and a slightly different focus for the final goal. In the second year, we were again invited for an interview, and this went just as well as the first time. But you know, since we didn’t get the grant then, we came out with mixed feelings.”

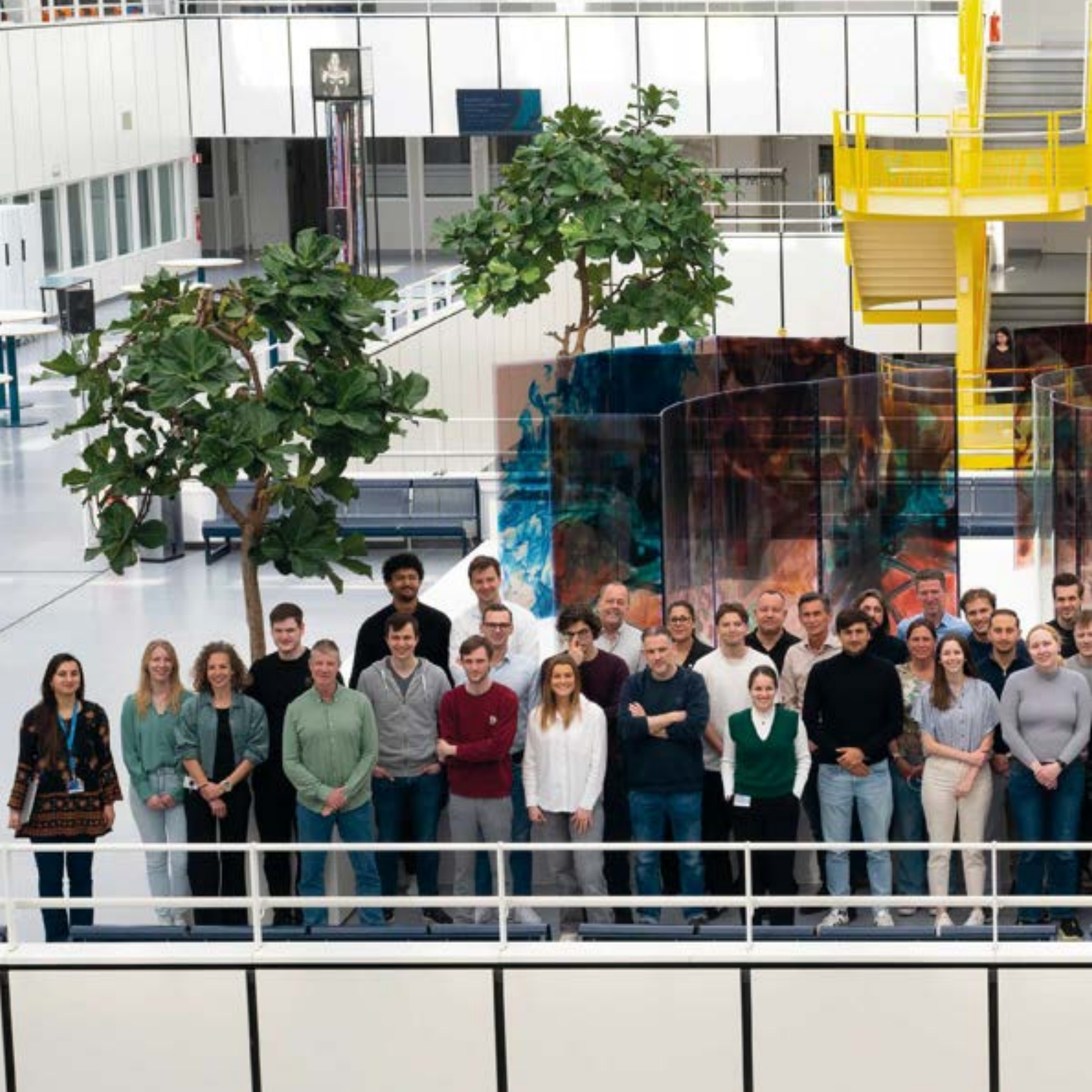
A month and a half later came the liberating phone call, on Wednesday, whereas the year before they would have had the call on a Tuesday if the news was favourable. “So we already feared that we once again hadn’t made it. But then the director of the Dutch Heart Foundation phoned. My wife was working in the attic, my daughter came running up to me during the call to ask me to help her with something, so I was in two different worlds at the same time”, he laughs. “I was so

happy that for a moment I didn’t know what to do. Well, phone Karim of course. It was marvellous to get that recognition. It’s something I do often get in my work, but that doesn’t help you fund your project.”

EFTELING

The Team Science grant came at the right time for Nick, enabling him to focus on what he is good at and what he enjoys doing. “I enjoy working on the model in order to get to know it better, just like the way the heart functions, and then work that into a tool that can in the future be used at the clinic. That’s what is important to me.” A pleasant working environment, with inspiring collaborations, also fits into that picture. “I get a lot of energy from the trust that senior colleagues put in me and the pleasant creative atmosphere in the group.” It is well worth the train journey from the village of Best near Eindhoven. “With the children, it’s quite a bit of a puzzle sometimes. Fortunately, I’m able to start early in the morning and leave early in the afternoon. On Wednesdays I have the day off, and in the weekend the children make sure you make time for them too. A day at work is often quieter than one spent at home. At the same time, I enjoy taking the kids to the Efteling amusement park for a day. I used to go there often myself as a child, with a season ticket, and our kids now have one too. That’s a great way to relax.”

Nick van Osta studied biomedical engineering at Eindhoven University of Technology. In 2021, he obtained his PhD at the Department of Biomedical Engineering (Maastricht University) on a thesis entitled ‘Making it Personal - Model-based Cardiac Tissue Characterization in Arrhythmogenic Cardiomyopathy’. His supervisors were Prof. Joost Lumens and Prof. Tammo Delhaas. Since then, he has worked as a postdoc researcher at this department. In 2025, he was awarded a Dekker Team Science grant.





DEPARTMENT OF CARDIOLOGY UM

A group of seven people, four women and three men, are standing outdoors in front of a building. The building has a mix of grey stone walls and sections covered in green ivy. The group is arranged in a single row, smiling at the camera. They are dressed in professional or business-casual attire. The text 'SHOWCASING CARIM: EXTERNAL REVIEW 2025' is overlaid in large, bold, white capital letters at the bottom of the image.

SHOWCASING CARIM: EXTERNAL REVIEW 2025

"Dear Dean, Chairman of the Committee, members of the External Review Committee and Executive Board, Scientific Advisor, welcome to the external review of CARIM. The mission of CARIM is to perform cutting-edge cardiovascular research in multidisciplinary teams, bringing together supportive and collaborative researchers from all backgrounds, and to secure the funding needed to drive this research..."

"Stop!"

The presentation had barely begun when one of the external committee members interrupted.

"That is not good enough. Your ambition should be to become the best cardiovascular research institute in Europe!"

And with that, the carefully prepared opening gave way to a lively debate about CARIM's ambitions, its identity, and its future. It was an unexpected intervention, but one that immediately set the tone for what would become an unusually candid, challenging, and energetic evaluation: the full-contact external review of CARIM in 2025.

THREE DAYS OF DIALOGUE AND EVALUATION

Following months of preparation, the external review of CARIM took place from 1-3 October 2025. The review committee (ERC) consisted of Prof. Harry Büller (chair), Dr Maarten Uyttenboogaart, Prof. Peter Rossing (participating online), Prof. Manuel Mayr, Prof. Karin Sipido, Prof. Jolien Roos-Hesselink, and Jamilla Goedegebuur, and was supported by Dr Roelinka Broekhuizen. The review visit started on the evening of Wednesday, 1 October, with a committee dinner at Harry's, including a brief welcome and introduction with the CARIM Management Team.

On Thursday, 2 October, the official programme opened with a welcome address by the Dean of FHML, Prof. Annemie Schols, followed by presentations from Prof. Tilman Hackeng on the strategic positioning of CARIM and from Danny Luciana on the institute's financial management. Subsequently, the division leaders of the Blood, Vessels and Heart research lines presented their activities and research priorities. Meetings were also held with the Chair of the Strategic Board and the Medical Director of HVC.

In the afternoon, the committee met with PhD candidates and representatives of the Education Programme Committee. Discussions focussed on supervision, educational quality, career development, and the research culture within CARIM. The day concluded with a poster session and buffet dinner for all CARIM staff members at Kasteel De Hoogenweerth, providing an opportunity for informal interaction with the committee members.

Friday, 3 October, focussed on in-depth discussions with various groups within CARIM, including technical support staff, junior and senior scientific staff, the Research Council, and representatives responsible for scientific integrity and social safety, including Prof. Frits Rosendaal, CARIM's Scientific Advisor. In addition, a meeting was held with the Dean and Vice Dean of FHML regarding CARIM's positioning and future vision within the faculty.

The external review concluded with a presentation of the preliminary findings by committee. Speaking on behalf of the committee, Chair Prof. Harry Büller addressed the CARIM Executive Board and faculty representatives. His message was strikingly positive. Overall, the evaluation provided a broad and integrated overview of the research environment



within CARIM, highlighting scientific excellence, interdisciplinary collaboration, talent development, governance, and societal responsibility. The committee greatly valued CARIM's thorough preparation, clear data, and open discussions with staff, administration, and PhD candidates. Their contributions made the evaluation both informative and engaging. The poster session was highly valued for the opportunity it provided to speak directly with researchers about their work. In addition, the chair expressed great admiration for CARIM as an institute, for the quality and commitment of its researchers, and for the leadership that had shaped its scientific culture and direction.

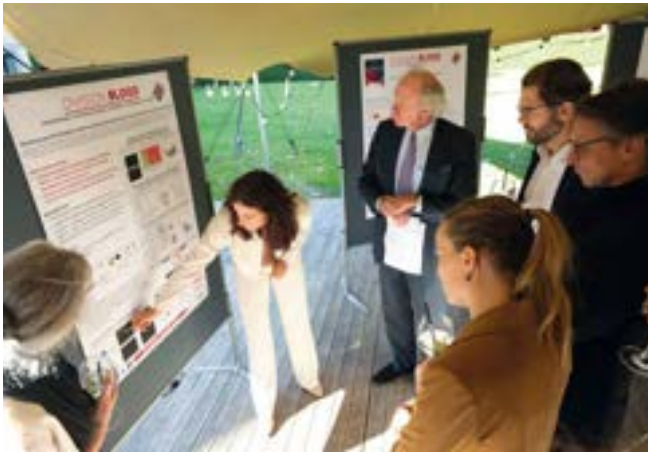
KEY RECOMMENDATIONS AND REFLECTIONS

The ERC feedback reflects an encouraging picture of CARIM's scientific environment and translational ambitions, while also pointing clearly to what is needed to sustain and strengthen its future excellence. Across the review, several priorities stand out: sharpening CARIM's long-term scientific vision, investing more strongly in talent development, increasing success in securing major international grants, and creating more consistent approaches to supervision, leadership, and career progression.

The ERC placed particular emphasis on sharpening CARIM's scientific identity and setting a more ambitious course for the future. Rather than primarily responding to opportunities as they arise, the committee encouraged CARIM to define where it wants to lead and to translate that ambition into visible flagship initiatives, such as the 'Lighthouse project'. Interdisciplinary collaboration, both across divisions and departments was seen as an important part of this effort, creating space for new ideas, stronger research output, and greater strategic visibility. The ERC also saw untapped potential in CARIM's international network, recommending that distinguished part-time researchers become more closely embedded in the institute to strengthen continuity, collaboration, and the exchange of expertise.

Grant competitiveness and talent development emerged as another major priority. The ERC saw clear scope for CARIM to strengthen its performance in ERC and other major international funding schemes by taking a more systematic approach to supporting applicants. This means learning more consistently from unsuccessful proposals, identifying promising researchers earlier, expanding mentoring, and giving talented researchers the protected time they need to develop competitive ideas and applications. The message extends beyond grant success alone: more structured mentoring for postdoctoral researchers and academic staff could help turn individual potential into sustained scientific and career development.

The committee also highlighted the importance of a transparent organisational structure and a healthy research culture. Particular attention was given to clearer role definitions, more consistent supervision practices, and the further professionalisation of career development tools such as Development Boards. Within the PhD programme, the



committee stressed the importance of equitable supervision and training opportunities across different categories of PhD candidates, timely implementation of Training and Supervision Plans, and robust systems for mentoring, guidance, and scientific integrity.

Diversity and sustainability formed another important pillar of the feedback. The ERC expressed concern about the apparent 'leaky pipeline' in the transition from postdoctoral researcher to permanent academic positions, particularly for women, and recommended a more proactive diversity strategy with measurable goals and monitoring. In parallel, the committee encouraged CARIM to strengthen strategic workforce planning and succession planning to ensure long-term sustainability of research capacity.

Finally, the ERC strongly encouraged CARIM to continue building on its translational and societal impact strengths. Recommendations included enhancing patient involvement in research processes, further exploring valorisation oppor-

tunities arising from major cohort studies such as the Maastricht Study, and continuing efforts to translate basic and observational findings into clinical applications and public health impact.

Overall, the ERC recommendations aim to help CARIM further develop into a strategically focussed, internationally competitive, and sustainable research environment with strong interdisciplinary collaboration and clear structures for leadership and talent development.

SHAPING THE FUTURE TOGETHER

CARIM broadly aligns with the ERC recommendations and recognises the importance of further strengthening strategic focus, organisational clarity, talent development, diversity, and grant competitiveness. In response to the recommendations, discussions have already taken place on how affiliations can be structured more purposefully. In doing so, a distinction is made between discontinuing less active affiliations and actively strengthening strategic collaborations, for example through targeted (partial) FTE allocations. This process is also linked to the renewed composition of Section Leaders (formerly referred to as PIs).

CARIM has also sharpened the way it defines leadership and governance. A clearer distinction is now made between leading within the organisation and leading a competitive grant. The term PI is reserved for researchers who serve as principal applicants on successfully awarded competitive grants, while those with operational leadership responsibilities within CARIM are consistently referred to as Section Leaders. This clearer terminology makes roles and responsibilities more transparent and avoids blurring the lines between grant ownership and organisational leadership.

In parallel, CARIM has implemented a substantial restructuring of section leadership to better align the organisation with six scientific programmes. This restructuring focussed on renewal, rejuvenation, diversity, and the clearer integration of incoming groups and specialisms. Measures included succession following retirement of senior staff, formal appointment of emerging scientific leaders, termination of selected leadership positions, and the creation of independent sections where scientific focus had evolved beyond existing group structures. Wherever feasible, these principles have already been implemented at the level of the former PIs (21), now Section Leaders (22) by which representation of female Section Leaders has risen from 10% to almost 40%, and the average age has fallen from 59 to 51 years.

CARIM also takes the ERC's concerns about diversity and career progression seriously, particularly the gap between the high proportion of female postdoctoral researchers and their lower representation at assistant professor level.



The figures suggest that many female researchers are not making the transition from postdoctoral positions to permanent academic careers. Several possible explanations are being explored, including stricter requirements for assistant professor appointments, particularly the 0.2 FTE teaching commitment for non-clinical researchers, as well as broader structural factors such as working patterns and part-time employment. Rather than speculate about the causes, CARIM will examine career trajectories over the past five years to identify where researchers are being lost from the academic pipeline and what factors may be driving this pattern.

To strengthen support at this critical stage of an academic career, CARIM is investing in targeted measures that help talented researchers take the next step. The Anna Maria van Schurman Stipendium plays an important role in this effort by supporting female researchers in their progression towards permanent academic positions. At the same time, insights from the ongoing analyses will help CARIM sharpen its broader gender and diversity strategy, identify where additional action is needed, and track whether these efforts translate into meaningful progress over time.

CARIM also sees clear opportunities to strengthen its performance in ERC and other major international funding schemes. Success depends on much more than the interview itself: the quality of the proposal, the support researchers receive, the institutional funding culture, and simply having enough strong applications in the pipeline all matter. CARIM therefore plans to look more closely at unsuccessful applications to understand where opportunities are being lost. A relatively low number of submissions, combined with a culture that places less pressure on researchers to apply, may partly explain current results. The next step is to build

SHOWCASING CARIM: EXTERNAL REVIEW 2025



a stronger grant culture through clearer expectations, more active mentoring and proposal support, and greater involvement of successful grant holders and external experts.

Building on the ERC feedback and the internal discussions that followed, CARIM has developed a strategic action plan. This action plan, incorporating the recommendations and proposed measures described above, will be submitted to the Executive Board of Maastricht University before the end of September 2026.

Finally, we would like to thank everyone who contributed to the ERC review process, from the committee members and internal contributors to the many colleagues working behind the scenes. Above all, we thank the entire CARIM community for its commitment, openness, and active engagement throughout the evaluation. The review marks not only the conclusion of an intensive process, but also the starting point for the next steps in further strengthening CARIM and shaping its future together.

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DEPARTMENT OF CARDIOTHORACIC SURGERY



HIGHLIGHT DIVISION BLOOD

ELINE KOOI, LINDA JACOBI-POSTMA AND MARTINE TRUIJMAN

From PARISK to IMPROVE: Improving stroke risk stratification and personalised patient selection through advanced carotid imaging

THE PARADIGM SHIFT IN CAROTID ARTERY DISEASE

Patients with carotid artery stenosis (narrowing of a main artery supplying the brain) are at increased risk of stroke. For decades, the clinical management of patients with stroke and transient ischemic attack (TIA) who have carotid artery stenosis has been mainly governed by a relatively simple metric: the degree of stenosis. Based on landmark trials from the 1990s, including NASCET and ECST, interventions like carotid endarterectomy (CEA) or carotid artery stenting (CAS) are primarily reserved for symptomatic patients with a significant stenosis of 50-99%, while those with non-significant stenosis are managed with medical therapy alone. Recent trials also still involved patients mainly selected based on stenosis [1]. However, this lumen-centric approach has increasingly been challenged by novel insights [2].

Emerging evidence suggests that many symptomatic patients with moderate or severe stenosis do not develop new clinical symptoms, while a substantial number of individuals with mild stenosis suffer devastating recurrent strokes. At the heart of this discrepancy is the concept of the vulnerable plaque: the composition of the atherosclerotic lesion, rather than just its luminal narrowing, is a key predictor of plaque rupture and stroke. Researchers at CARIM+HVC and international partners are at the forefront of this paradigm shift, moving the field toward a personalised model of risk assessment through advanced imaging. This highlight reviews advanced carotid imaging and its value for stroke risk stratification, and describes the IMPROVE trial which will investigate the clinical impact of carotid imaging on personalised patient selection for revascularisation.

HIGHLIGHT DIVISION BLOOD

PLAQUE VULNERABILITY

Numerous histopathological studies on surgical and post-mortem specimens have shown that rupture of a vulnerable atherosclerotic plaque is the main underlying cause of myocardial infarction and stroke. Histopathological studies can only investigate a single point in time, and can obviously only be performed post-mortem or after surgery, usually after the clinical event has already taken place. Researchers at CARIM+HVC have performed ground-breaking research into the development and evaluation of imaging techniques that allow non-invasive visualisation of the hallmarks of plaque vulnerability (inflammation, intraplaque haemorrhage (IPH), lipid core, thin/ruptured fibrous cap and plaque microvessels). With these techniques we were able, for the first time, to perform longitudinal studies in humans to unravel the aetiology of plaque destabilisation and to study the association between plaque vulnerability and stroke risk. The potential of these newly developed techniques was already illustrated in 2009 with a first report showing the *in vivo* development of carotid intraplaque haemorrhage on magnetic resonance imaging (MRI) and the coincidence of ipsilateral ischaemic stroke [3]. A prospective single centre cohort study at CARIM+HVC showed that intraplaque haemorrhage on carotid MRI predicts TIA and stroke risk. The study resulted in a PhD thesis by Robert Kwee, who received his doctorate with honours. Later, a large meta-analysis of individual patient data confirmed that intraplaque haemorrhage on MRI is a strong independent predictor of stroke risk in patients with carotid artery plaques, stronger than any of the known clinical risk factors, including degree of stenosis [4].

THE PLAQUE AT RISK (PARISK) STUDY

Based on these promising results of single centre studies, we initiated the PARISK (Plaque At RISK) study, a prospective multicentre cohort study of patients with symptomatic mild-to-moderate carotid stenosis. The goal was to determine if specific imaging biomarkers could predict recurrent strokes better than the standard one, the degree of stenosis. During a median follow-up of five years, the PARISK study found that two primary MR imaging parameters were independent predictors of recurrent TIA and stroke: intraplaque haemorrhage (IPH) and the total plaque volume [5]. By contrast, the primary computed tomography angiography (CTA) parameters were not significantly associated with stroke risk, indicating the superiority of MRI for risk stratification in these patients. Importantly, the PARISK study demonstrated that adding these markers to the established ECST risk score significantly improved the model's predictive performance, increasing the C-statistic from 0.67 to 0.78. These results indicated that intraplaque haemorrhage and total plaque volume are important predictors of clinical risk assessment.

HIGHLIGHT DIVISION BLOOD

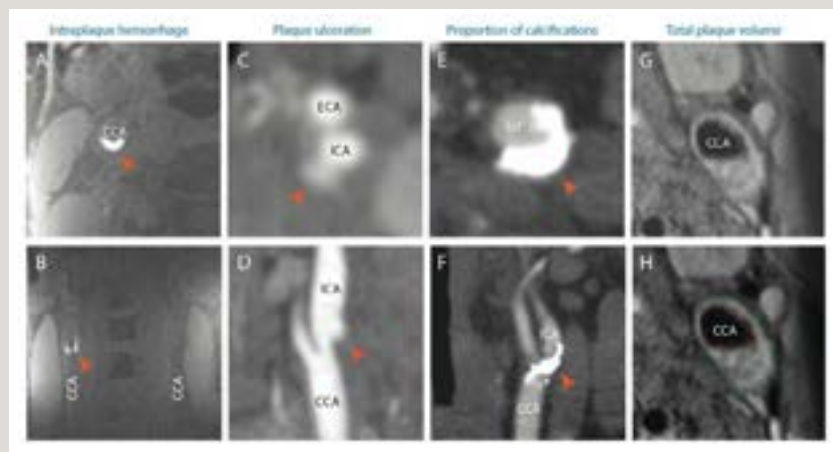


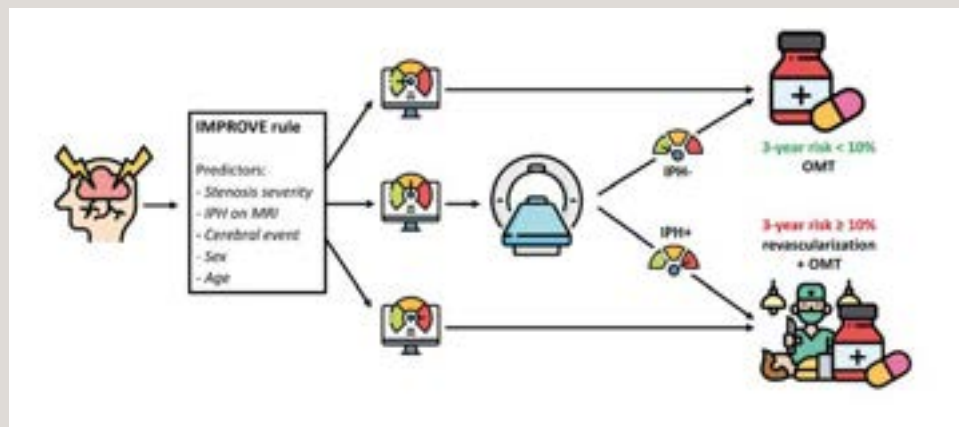
FIGURE 1 Images of the four predefined primary plaque characteristics of interest in the PARISK study. (A and B) 3-dimensional T1-weighted fast spoiled gradient echo MR images showing a hyperintense signal in the bulk of the plaque (orange arrowheads) indicative of intraplaque haemorrhage in axial view (A) and coronal view (B). (C and D) Computed tomography angiography (CTA) images showing contrast material reaching into a carotid plaque (orange arrowheads), which indicates plaque ulceration. (E and F) CTA images showing a relatively large bulk of calcification (orange arrowheads) at the level of the bifurcation. (G and H) Black blood T1-weighted MR images showing an axial view of a carotid plaque, which is delineated on each slice (H) to measure the total plaque volume. bif. bifurcation; CCA common carotid artery; ECA external carotid artery; ICA internal carotid artery [5].

IMPROVE

Building on data from PARISK and other cohorts, CARIM+HVC researchers developed the IMPROVE score, a clinical prediction model designed to individualise stroke risk [6]. Using the presence of intraplaque haemorrhage on MRI and four conventional clinical parameters, the IMPROVE model provides accurate individual stroke risk estimates for symptomatic patients with carotid artery disease. While the identification of high-risk imaging biomarkers is vital, the ultimate question is whether using these markers in clinical decision-making is effective and affordable.

Our recent decision-analysis study evaluated the cost-effectiveness of the IMPROVE model for patient selection for carotid revascularisation compared to 'care as usual' (CAU), which relies on the degree of stenosis [7]. The results of this decision-analysis study were striking: using the IMPROVE score to select patients for revascularisation could reduce ipsilateral ischaemic strokes and perioperative deaths by 35% over three years. Furthermore, the IMPROVE-based patient selection led to a 20% decrease in the total number of revascularisation procedures, effectively filtering out patients who would not have benefited from surgery. From an economic perspective, the IMPROVE strategy proved to be 'dominant', meaning it provided better health outcomes at lower cost. Societal costs were reduced by an average of €6,101 per patient, despite the additional MRI costs. Recently, CARIM+HVC obtained a large grant from ZonMw for a large randomised controlled trial in the Netherlands, the IMPROVE trial. This trial will investigate the clinical impact of IMPROVE-based selection for revascularisation.

HIGHLIGHT DIVISION BLOOD



reporting framework applicable across multiple imaging modalities, including ultrasound, CT and MRI. The system grades plaques from 1 (no plaque) to 4 (complicated plaque), the latter characterised by high-risk features (IPH, a ruptured fibrous cap or luminal thrombus). Recently, we demonstrated the clinical value of Carotid Plaque-RADS for stroke risk stratification in the PARISK population [10].

FIGURE 2 Application of the Individualised MRI based PRediction scOre using plaque Vulnerability for symptomatic carotid artEry (IMPROVE) decision rule. The IMPROVE risk is calculated for patients with a recent transient ischaemic attack (TIA) or stroke and 30-99% carotid stenosis based on the five listed predictors and taking into account the number of days since the index event. Approximately 53% of the patients need an extra MRI scan. An MRI is unnecessary in ~47% of the patients since, based on the other risk factors, the stroke risk is already high or low and the MRI result does not affect the risk category. If the IMPROVE 3-year risk of recurrent ipsilateral stroke on optimal medical therapy (OMT) is < 10%, IMPROVE will recommend OMT only. If the IMPROVE risk is $\geq 10\%$, IMPROVE will recommend carotid revascularisation in combination with OMT [8].

CAROTID PLAQUE-RADS

As advanced imaging becomes more prevalent, a new challenge arises: how can radiologists and clinicians communicate these complex findings? Until recently, carotid imaging lacked a standardised lexicon. An international panel of experts recently introduced Carotid Plaque-RADS [9]. This novel classification system provides a structured

PHOTON-COUNTING AND SPECTRAL CT

While MRI is currently the ‘gold standard’ for detecting IPH, it is not always available in the acute setting and is contraindicated for some patients. This is where the next leap in imaging technology, Photon-Counting Detector CT (PCCT), comes into play. Conventional CT scanners integrate the energy of all incoming X-ray photons, which leads to suboptimal soft tissue contrast. In contrast, PCCT counts individual photons and measures their exact energy levels. This ‘spectral’ information allows for unprecedented tissue characterisation. Our proof-of-concept studies recently demonstrated that spectral CT and PCCT can improve differentiation between the various plaque components [11, 12]. This means that in the future, a single, rapid CT scan at the emergency department might reveal both the degree of stenosis and a detailed composition of the plaque.

CLINICAL IMPLICATIONS AND FUTURE OUTLOOK

The research conducted at CARIM emphasises that we must move beyond the degree of stenosis alone and include advanced carotid imaging in clinical decisions for patients

HIGHLIGHT DIVISION BLOOD

with carotid artery disease. The PARISK study has shown that patients with non-significant stenosis can be at high risk of stroke if they have intraplaque haemorrhage. A model-based analysis showed that using the MRI-based IMPROVE score for patient selection for revascularisation reduces strokes and costs. In the coming years we will investigate the clinical impact of IMPROVE-based selection in a large randomised trial.

CONCLUSION

We aim to use advanced carotid imaging to ensure that the right patient receives the right treatment at the right time. By integrating advanced imaging, sophisticated prediction models and standardised reporting, our researchers are transforming the management of carotid artery disease. We are moving away from a 'one-size-fits-all' approach based on the lumen, toward a future of precision stroke prevention for patients with carotid atherosclerosis.

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DEPARTMENT OF CLINICAL PHARMACY

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NEXT LEVEL CARE

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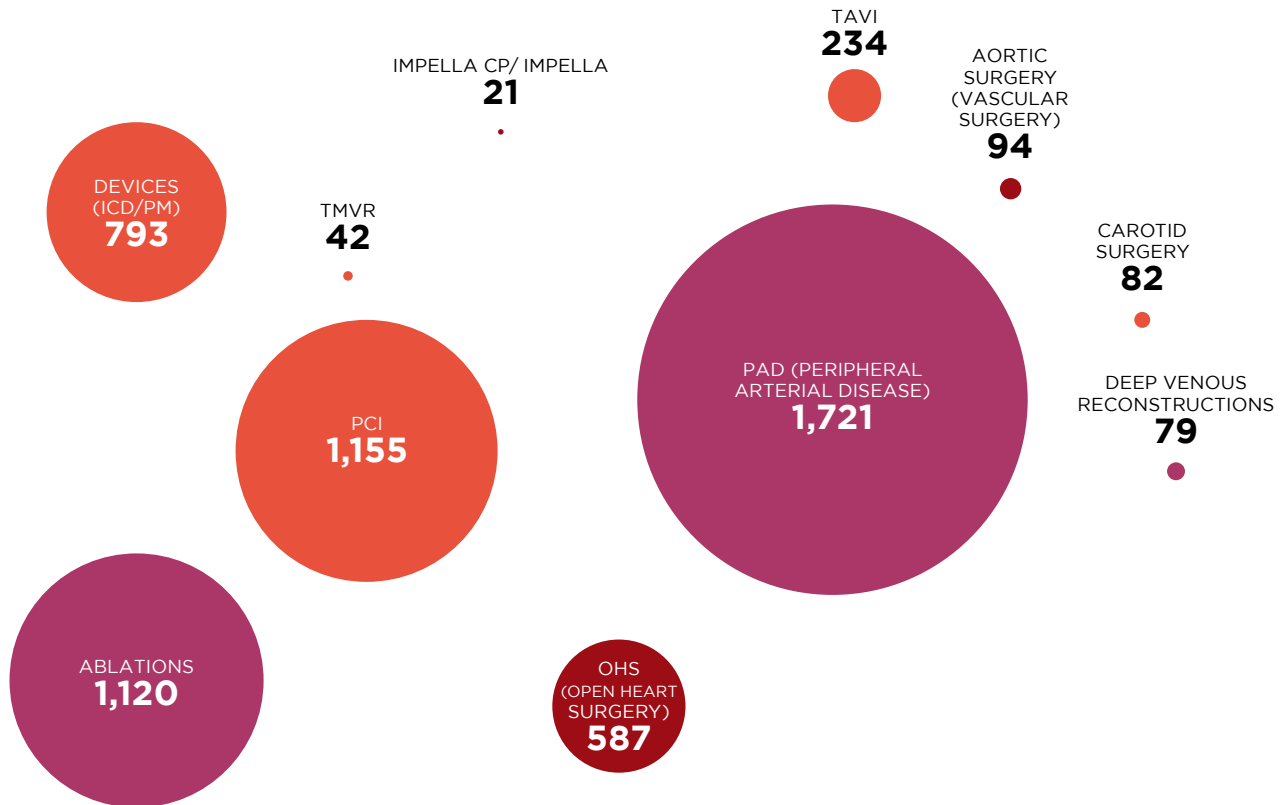
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NEXT LEVEL CARE

NEXT LEVEL CARE

In 2025, the Heart+Vascular Center (HVC) continued to provide high-quality, patient-centred cardiovascular care on a large scale. With over 42,000 outpatient visits and more than 5,000 procedures performed, the centre operated at

full capacity across its 105 beds. Supported by a dedicated team of nearly 390 FTE, HVC generated a total revenue of 110 million Euros, reflecting both its clinical scope and strategic significance within Maastricht UMC+. These figures highlight HVC's position as a national leader in complex cardiovascular care.



ADVANCES IN TREATMENT

Treatment options for patients with diastolic heart failure remain limited, but that could soon change. Research indicates that increasing the heart rate may improve outcomes for these patients. By using a virtual heart model, scientists at CARIM+HVC are helping to accelerate the development of these new treatment strategies. Developed by Prof. **Joost Lumens** (Dept of Biomedical Engineering), this computer-based model simulates the heart's function using physical laws and physiological principles, rather than large datasets. This approach enables researchers to better understand heart function and explore innovative therapies for diastolic heart failure.

In 2025, the first **TAVI (Transcatheter Aortic Valve Implantation)** via the axillary artery was performed at HVC

by cardiothoracic surgeon Dr **Bart Maesen**, clinical specialist at Medtronic **Dorien Peeters**, OR assistant **Ankie Bosch-Partoens**, vascular surgeon **Anna Prent** and cardiologist Dr **Pieter Vriesendorp**, marking an important milestone. This innovative approach was made possible through close collaboration between vascular surgery, cardiothoracic surgery and cardiology. It offers an alternative access route for patients in whom the standard transfemoral approach via the groin is not feasible. The successful procedure highlights the strength of multidisciplinary teamwork and expands treatment options for patients requiring TAVI.

A new **European guideline for dilated cardiomyopathy (DCM)** has been developed, translating the latest scientific insights into more personalised care. DCM is a condition in which the heart muscle becomes enlarged and weakened, often due to genetic causes, implicating that family members may also be at risk. Early detection can be life-saving. The guideline, co-developed by clinical geneticist

in training Dr **Job Verdonshot** (Dept of Cardiology) and European colleagues, improves risk stratification and follow-up: high-risk relatives are monitored more closely, low-risk relatives require fewer evaluations, and care is tailored based on specific genetic variants. This approach supports more precise, individualised care for families with inherited heart disease, reducing unnecessary testing while improving early detection and prevention. See pages 142-147 for an article highlighting Job's research.



INNOVATIVE TECHNOLOGIES

HVC is currently the only centre in the Netherlands that has structurally integrated the **Impella 5.5** into routine clinical practice, as of November 2025. The Impella 5.5 is improving survival chances for patients undergoing high-risk cardiac surgery. Patients with severe coronary artery disease and a weakened heart now benefit from temporary near-complete unloading of the heart during and after surgery. By using the device preventively in high-risk cases, surgeons can make complex open-heart procedures significantly safer. This is particularly important for patients who require surgery to prevent a heart attack but for whom the operation itself carries substantial risk due to reduced heart function. See pages 92-95 for an interview with Prof. Roberto Lorusso, Erik Körver and Ralph Dudink.

On 20 April 2025, for the first time at Maastricht UMC+, a patient with severe right-sided heart failure was successfully treated with the innovative **Evoque heart valve prosthesis**. This minimally invasive procedure, performed via the groin vein, provided a life-saving alternative for a patient who was no longer eligible for conventional treatment, resulting in an immediate improvement of symptoms. The case highlights how advanced imaging, specialist expertise, and cutting-edge technology come together within HVC to expand treatment options for high-risk patients. Dr **Bas Streukens**, imaging cardiologist and Medical Head of Echocardiography, played a central role in the assessment and execution of this treatment.

A team led by Dr **Arantxa Barandarian** and Dr **Ralph Theunissen** has successfully performed its first **CardioMEMS**



implantation. This milestone highlights the centre's commitment to innovative care and precise monitoring in heart failure. The CardioMEMS-HF sensor is a small, wireless device implanted in the pulmonary artery that continuously measures pressure in the lungs, an important indicator of heart failure. The sensor requires no batteries, remains in place for life, and automatically transmits data to the hospital. This enables clinicians to detect deterioration at an early stage and adjust treatment proactively, helping to reduce hospital admissions and improve patient stability and safety.

In 2025, for the first time at Maastricht UMC+, an organ donation procedure using abdominal normothermic regional perfusion (**a-NRP**) was successfully performed, resulting in a successful transplant. This technique, recently introduced nationwide, helps preserve abdominal donor organs in optimal condition during retrieval. The procedure was carried out by the Maastricht retrieval team in close collaboration with specialists from Erasmus MC Rotterdam. The milestone marks an important step in improving organ quality and transplantation outcomes, with expectations that a-NRP will be applied in a growing proportion of donation procedures in the coming years.

PATIENT SATISFACTION AND QUALITY INDICATORS

All university hospitals in the Netherlands use the Patient Experience Monitor (PEM) to assess patient satisfaction and gather feedback. These results are actively used by departments to improve the quality of care provided.

The results of 2025 for our centre are a source of pride. Outpatients rate their experience at an average of 8.6 (n=4,232), while patients admitted to the clinical ward give an average score of 8.5 (n=817). These scores reflect a consistently high standard of care across the centre. Patients are particularly satisfied with the sense of safety, trust in their treating physician, and the respectful communication and involvement of family members throughout their care.

At the same time, we have identified areas where further improvement is needed. These include the provision of information about medication side effects, physicians' familiarity with the patient's medical file, and long waiting times for admission to the clinical ward.

To drive these improvements and ensure that we continue to respond to patient needs, we actively gather input through a wide range of channels. These include, among others, our patient panel, the departmental nursing councils, and the centre nursing council. Together, these provide a broad foundation for translating patient and professional feedback into concrete quality improvements.

OTHER HIGHLIGHTS

During the Nursing Symposium ICT&Health 2025, the B4 and D4 departments received awards for their innovative care posters. Department B4 achieved second place (€1,250) with a new approach in which HPB patients walk to the operating room instead of being transported by bed, developed through close collaboration between nurses and physicians. Department D4 finished in third place (€1,000) with a revised protocol that significantly reduces bed rest after transfemoral TAVI from 1.5 days to 6 hours. Both departments will use the innovation budget to further develop their projects and continue improving the quality of patient care.



Prof. **Elham Bidar** has been appointed Head of Cardiothoracic Surgery as of 1 April, succeeding Prof. Jos Maessen. Over the past 20 years, Elham Bidar completed his medical training, PhD, and specialisation in cardiothoracic surgery at Maastricht UMC+, combining clinical work with research and education. Since 2019, he has served as a

NEXT LEVEL CARE

staff member, focussing on procedures such as arrhythmia surgery and aortic operations. In his new role, he aims to further strengthen the integration of CARIM and HVC, creating a multidisciplinary approach that combines innovation, research, and patient care.

Groups of enthusiastic third-year vocational nursing students from Vista College and Zuyd Hogeschool visited HVC in 2025 for an interactive introduction to its work. Already completing internships within Maastricht UMC+, the students explored the patient journey from initial symptoms to treatment and actively engaged throughout the session. The programme included tours of the wards and outpatient clinic, presentations on organ and tissue donation and the TEC, and a hands-on session in the cardiac catheterisation lab, where students experienced how a stent is placed. The

visit provided valuable insight into the diversity of roles within the centre and inspired many students to sign up for follow-up shadowing days.

The Department of Cardiothoracic Surgery has achieved very high scores in a national benchmark across all University Medical Centers. The patient experience survey assessed care quality based on trust in staff, communication, safety, and understanding of treatment options. The department performed particularly well in discharge care, receiving the highest rating in this category. This success is largely attributed to the strong role of nursing staff in preparing patients for discharge and providing follow-up care. While the results are a source of pride, the department also recognises that discharge care remains an area for continued improvement. The team remains committed to further enhancing



patient care before, during, and after hospital admission, continuously learning from patient feedback.

As of 1 November, Dr **Jan Willem Sels** has been appointed Head of Department and Chair of the Intensive Care Unit at CARIM+HVC, after serving in this role on an interim basis since January. He aims to further develop a future-proof Intensive Care Unit by closely integrating clinical care with research and education, ensuring continuous innovation and improvement in the treatment of critically ill patients.

On 13 November, healthcare professionals from across the region gathered for a **joint training day organised by Maastricht UMC+ and Radboud UMC, focussed on ventricular arrhythmias**. The programme covered a wide range of topics, from diagnosis to treatment and prevention of sudden cardiac death. Experts shared insights on when rhythm disorders such as VES and NSVT require further investigation, the importance of early recognition of ventricular tachycardia, and the latest treatment options. The day provided valuable knowledge exchange and highlighted the importance of collaboration in improving care for patients with complex heart rhythm disorders.

Maastricht UMC+ has expanded its number of nationally recognised Centers of Expertise for Rare Diseases (ECZAs), following approval from the Dutch Ministry of Health. Within this expansion, HVC has been officially recognised for its **expertise in cardiac amyloidosis** (with a focus on wild-type ATTR) and **pulmonary arterial hypertension**. These areas are embedded in dedicated expert centres, where multidisciplinary teams provide advanced diagnostics, treatment, and access to innovative therapies.

In September 2025, the Department of Cardiology opened the **Integrated Remote AF Clinic** with online hosts Astrid Hermans and Theo Lankveld. This 'remote clinic' combines the latest digital and nursing innovations for monitoring atrial fibrillation (AF) with patient education and self-management tools. This virtual outpatient clinic combines remote cardiac monitoring (telemonitoring) with regular care, allowing patients to visit the hospital less frequently for check-ups. See pages 34-37 for an interview with Astrid and Theo.



DEPARTMENT OF BIOMEDICAL ENGINEERING





INPATIENT WARD C3 AND CARDIAC EMERGENCY DEPARTMENT



INTERVIEW

**RALPH DUDINK
ROBERTO LORUSSO
AND ERIK KÖRVER**

Soft landing after heart surgery

The ‘heart-lung-machine’, which takes over the function of these organs during certain types of surgery, is used quite commonly in the operating room and Intensive Care Unit these days, but less invasive devices to support the heart are constantly being developed. In 2025, a multidisciplinary team from Maastricht UMC+ implanted the ‘Impella 5.5’ for the first time in a high-risk patient. This powerful pump is a bit smaller than a pen and can remain in the body for weeks. These types of mechanical circulatory support (MCS) allow patients a soft landing after heart surgery. Three members of the Maastricht MCS-board share their thoughts.

“We’re not performing miracles”, Roberto Lorusso says halfway through the interview. “But we provide additional help for patients who would have been refused for surgery in the past, because of their condition for example.” He describes the development of MCS as “a journey that started many years ago.” “The intra-aortal balloon pump, which helps the heart pump around blood, was developed in the sixties. In the future, we hope to receive approval from the government to start implanting left ventricular assist devices (LVADs) at Maastricht, which can take over the function of the heart for longer periods, also in the home situation. Until now, these patients need to go to Rotterdam or Utrecht, so there is a need for this approval for people in the south of the Netherlands.”

IDENTIFYING THE RIGHT PATIENT

Next to Roberto, we have Erik Körver and Ralph Dudink at the table. These three represent the MCS-board, which consists of surgeons, intensivists, perfusionists, anaesthesiologists, ICU nurses and more. The board meets regularly to discuss future developments and patients. “The biggest challenge is to identify the patient who will mainly benefit from MCS and the patient who will suffer more from its complications”, Ralph says. “Overdoing it is always a potential problem”, Roberto confirms. Ralph: “The major advantage from an anaesthesia point of view for using these devices in a prophylactic way is that we can reduce the inotropes, the medication to stimulate the heart. After a heart-lung-machine pump run, a patient with a severely depressed heart function would probably need them, but inotropes stress the heart as well.” Roberto: “Yes, these types of drugs demand even more from the heart, in a period where it should be at rest. With MCS we try to put the heart a bit at rest, while guaranteeing the blood circulation.”

A PHILOSOPHY

MCS is used for different types of patients, with different medical challenges. Examples are patients with severe heart failure, patients in cardiogenic shock, patients with an inflamed heart muscle (myocarditis) and after heart surgery or resuscitation. The MCS-board calls it ‘a philosophy’, to which it is dedicated. Next to the clinical work, they organise an annual course for like-minded teams from all over Europe, to practice, discuss and share ideas. Roberto: “We have more and more evidence that this is a way forward, but a next step would be to design a clinical study on how to use these devices.” In 2025, Roberto co-authored an ‘expert consensus document on protected cardiac surgery’ in the European Journal of Cardiothoracic Surgery. “Very important from the educational point of view”, he says, “to support this strategy.”

RISKS

A few days after the interview, the team is to implant the Impella 5.5 in a patient with a severely depressed heart function, without using the heart-lung-machine. Erik explains: “For healthy patients, the transit off the heart-lung-machine can be quite easy, but for these types of patients, it can be very difficult. It’s a very invasive technique, which stimulates inflammation and infection of the body. Several people have lost their legs afterwards.” During the first hours after cardiac surgery, patients are at very high risk of developing severe cardiac dysfunction, Roberto explains. “Dying is also a reality, that’s why we use devices such as Impella in a prophylactic way, to hopefully avoid a crash.” Not that the new devices come without any risks. Causing vascular damage is one of them. Also, the rotating pump in the arteries can cause rupture of the red blood cells, which can lead to kidney failure. “The risk is smaller with the 5.5 than its predecessors, but there will always be a risk”, Roberto says.

NO ONE MAN SHOW

As the biocompatibility of these devices increases, so do the possibilities for monitoring their position, function and more. What is also increasing is the target group for its application. Roberto: "Patients who would have died from myocardial infarction twenty years ago, survive these days because of advances in knowledge. There is practically no age limit for surgery anymore. But this implies that they sometimes go into surgery in poor condition or at high risk. In the past, they would have been rejected for surgery, but with MCS we can provide additional help to survive."

A final development they want to mention is the acknowledgement that this is a team effort. Not too long ago, this kind of care was a 'one-man show' by the surgeon. Ralph: "These days, everyone's role and opinion count equally, not only around the implantation, but also in taking care of the patient during and after surgery. We also conduct research together." Roberto confirms: "That's absolutely true. Also, preplanning is far more important now, knowing in advance which patients are at higher risk and trying to avoid a crash. That's also why we need to do more research: so we know

better which patient is the right candidate for a certain MCS technique. And of course, more and better devices will come in the future."

Prof. Roberto Lorusso studied medicine at the University of Milan, Italy, and obtained his PhD degree at Maastricht University in 1998. Since 2015, he has been a cardiothoracic surgeon at Maastricht UMC+. Mechanical circulatory support is one of his main research themes.

Erik Körver has been a senior clinical perfusionist at Maastricht UMC+ since 2011. He studied at Zuyd University of Applied Sciences and trained as a clinical perfusionist at Leiden (LUMC Zorgopleidingen).

Ralph Dudink has been working as a cardiothoracic anaesthesiologist at Maastricht UMC+ since 2019. He studied medicine at Maastricht University, after which he trained to be an anaesthesiologist at Maastricht UMC+, followed by an EACTAIC Fellowship in Cardiothoracic and Vascular Anaesthesia in 2018. He has a special interest in major aortic surgery and mechanical circulatory support.

WE PROVIDE ADDITIONAL HELP FOR PATIENTS WHO WOULD HAVE BEEN REFUSED FOR SURGERY IN THE PAST, BECAUSE OF THEIR CONDITION

A photograph of three medical professionals in a clinical setting. Two men in white scrubs stand on the left, and a woman in a white lab coat sits on the right. They are surrounded by medical equipment, including a Philips monitor and various cables. The text 'INTERVIEW' is overlaid in large, blue-outlined letters across the middle of the image.

INTERVIEW

**ROB DRIESSEN,
ROWAN ROBROEK
AND JIP VAESSEN**

Never a dull moment at the Coronary Care Unit

“Preventing that a patient has to be transferred from a medium care department like the CCU to the IC, that’s the big challenge of working in this department.” Rowan Robroek speaks from experience.

Together with head of Department Jip Vaessen and cardiologist-intensivist Rob Driessen, the clinical nurse specialist talks about the characteristics of Department C3 of Maastricht UMC+, that is, the Coronary Care Unit (CCU).

The most striking feature of Department C3 is that the patients occupying the eight beds are all continuously attached to monitoring equipment. They can only move in the vicinity of their beds and cannot really leave the room. Staff can monitor all patients from the central nursing station, and the monitors are interlinked. Rowan Robroek (specialised CCU nurse and trainee nurse-specialist) explains: “As a nurse, you are responsible for one or more patients, and when you’re in one room, you can also hear and see the alarms of the patients in the other rooms. So you can get there quickly if anything goes wrong.” This does, however, carry the risk of ‘alarm fatigue’, which is discussed further below.

THE GOAL: STABILISING

An important characteristic of this category of patients is that you almost ‘expect’ something to go wrong with them. “And that may mean a situation changing completely within just a few minutes”, says cardiologist-intensivist Rob Driessen. “That requires staff to show great flexibility and quick reactions. Here we have people who have had a cardiac infarction, have heart failure or cardiac arrhythmias, side by side with medium-care patients with disorders of other organs. Our goal is to stabilise them so they can be moved to a normal nursing ward like B3. That can sometimes be achieved within 24 or 48 hours, but patients with complex heart failure may have to stay here for a week or more.” Certain treatments can be administered at the CCU, such as placing an arterial line for continuous blood pressure monitoring and blood sampling. But also certain drugs for arrhythmias or low blood pressure which require accurate monitoring.

MIXED DEPARTMENT

What is perhaps less well known is that C3 also has intensive care patients. Whereas at the Intensive Care Unit (ICU), patients can be intubated for ventilation, CCU staff can only apply a non-invasive ventilation mask. If a patient has multiple organ failure, they need to be at the ICU, while single organ failure can be treated at the CCU. And that does not always need to be the heart. Head of department Jip Vaessen explains: “The population ranges from people with a cardiac infarction to those with a pulmonary embolism or a fractured rib. The largest patient group is that of the over-60s, but we also see younger people, for instance with a congenital heart disease. And sometimes we see old acquaintances; people with heart failure who return to the department from time to time.”

Rowan notes that you can also build up personal ties with ‘one time only’ patients. “Since as a nurse you care for three patients, you sometimes, when all is quiet and under control, have some time for a non-medical kind of conversation. About their home situation, about stuff that happens, so they can forget their illness for a moment.”

IN THE RIGHT PLACE

After completing his HBO-V (nursing degree) internship, Rowan knew immediately that he wanted to work at a CCU. He was invited to stay on and took the specialised CCU training course. He is currently training to become a cardiology nurse-specialist. “In terms of level, I will be in between the doctors and the nurses, and I can also improve the communication between these two groups. This is absolutely the right place for me.” Jip is currently doing a traineeship for this position, and was originally also a nurse

at the cardiology nursing ward. “I enjoy the clinical reasoning and switching between clinical care and emergency care. Nowadays I manage the preconditions, but when it’s particularly busy at the department, I’m also available to lend a helping hand in the care process. Together with Rowan I’m investing a lot of effort in improving the care process, including training and the like.”

ARTIFICIAL HEART

For the future, all three of them foresee numerous interesting developments emerging. Two focal points at HVC are complex arrhythmias and advanced heart failure. Rob: “The collaboration with the ICU is crucial for this. Common cardiac infarctions, percutaneous angioplasty and suchlike will become rarer here.” He also expects an increasing role for home monitoring, for instance using smart watches. In the future, the hospital also hopes to be implanting a so-called ‘left ventricular assist device’ (LVAD), an artificial heart, in patients. Rob: “It has been available for some time now and it works: it’s a pump you implant in the patient’s thoracic cavity and connect it to the arteries and the heart. The pump can support the heart for several years.”

ALARM FATIGUE

Rob is also doing research, for instance into ‘alarm fatigue’ among staff at departments where patients are being monitored by telemetry. What effect do the constant beeps and noises from the measuring devices have on the resilience and alertness of the staff? Five hundred care providers in eleven centres, including Maastricht UMC+, were sent a validated questionnaire. Rob: “It was particularly the nursing staff who had high scores for alarm fatigue. That is a risk for burn-out, and as such deserves greater attention.” Vaessen adds: “At nursing wards, where patients are walking around wearing a telemetry box, you more frequently get

false alarms, caused by their movements. A patient brushing their teeth may look like a life-threatening arrhythmia on the monitor. So then it’s a challenge to remain on the alert all the time to find out whether the alarm is real or false.”

Thanks to all this monitoring, it rarely happens at the CCU that a patient unexpectedly needs to be resuscitated, or dies. What can happen with this seriously ill patient group is that a situation suddenly takes a turn for the worse. Rowan: “That requires nursing staff to be at the patient’s bed within five to ten seconds. It also means that they have to be able to deal with the fact that turnover is fairly high at this department. It’s precisely this acute aspect of the care that appealed to Rob, inducing him in the final year of his cardiologist training to also complete the training course for ICU-physician (intensivist). “I’m also the deputy training director of the fellows, the intensivists in training, at the ICU, and I’m doing research as well. In my view that’s a perfect mixture.” Rowan and Jip definitely feel the same about their job at C3.

FOR DUTCH







DEPARTMENT OF INTERNAL MEDICINE UM



HIGHLIGHT DIVISION VESSELS

GEERT WILLEM SCHURINK

LumiGuide: fluoroscopy-free navigation in endovascular interventions

In recent decades, endovascular therapy techniques have made considerable progress, in terms of both complexity and applications. Interventions that were previously only possible with open surgery, such as repairing thoraco-abdominal and pararenal aortic aneurysms incorporating visceral target vessels, are nowadays routinely conducted endovascularly using fenestrated or branched endovascular aneurysm repair (F/BEVAR) (Figure 1). This minimally invasive approach offers considerable advantages in terms of perioperative morbidity and mortality, but at the same time introduces new challenges. One of the most relevant of these is its dependence on ionising radiation from fluoroscopy, which is indispensable for the visualisation of intravascular devices and vascular structures. Cumulative radiation doses in complex endovascular interventions are associated with DNA damage, increased carcinogenesis risk and stochastic health risks for both patients and surgical staff. In addition, fluoroscopy offers only a two-dimensional, greyscale projection of the anatomy and devices, which hampers the three-dimensional spatial orientation during navigation. Innovations like image fusion techniques have contributed to improved spatial orientation and a slight

reduction of the radiation load, but do not eliminate the fundamental dependence on X-rays. Current European guidelines, including the ESVS guidelines on radiation safety (2023) and the ESVS guidelines on abdominal aortic aneurysms (2024), therefore emphasise the importance of minimising radiation exposure in accordance with the ALARA (as low as reasonably achievable) principle.

TECHNOLOGY AND MECHANISM OF ACTION

LumiGuide, formerly known as Fiber Optic RealShape (FORS), is a technology developed by Philips Medical Systems (Best, the Netherlands) which uses a fundamentally different approach to the visualisation of endovascular devices. Instead of X-rays, the technique uses light pulse signals. Specially designed guidewires and catheters contain glass fibres connected to a laser unit. The laser unit generates pulses of light that are transported through the optical fibres; strain measurements derived from the reflected signals continually reconstruct the three-dimensional configuration of the device. This reconstruction is visualised as a colour-coded, three-dimensional representation on a separate screen, using shadow effects

HIGHLIGHT DIVISION VESSELS



FIGURE 1 LumiGuide procedure at the hybrid OR.

to optimise the spatial orientation. A biplane image offers simultaneous visualisation from two orthogonal planes, potentially simplifying the navigation. The image can be combined with an angiographic roadmap or with a three-dimensional fusion image generated based on the preoperative CT-angiography.

In the initial configuration, three LumiGuide-specific devices were available: a hydrophilic coated J-tip guidewire (0.035 inch, working length 120 cm) and two catheters in Berenstein and Cobra C2 configuration, respectively. Earlier studies identified the limited options regarding catheter types and the relatively short working length as major limitations, particularly in interventions involving both femoral and brachial access. In October 2022, Philips introduced the 3D-Hub, a compact attachment that can be mounted on nearly all commercially available catheters

via a standard luer-lock connector (Figure 2). A distinctive (signature) bend designed into the 3D-hub enables the LumiGuide guidewire to automatically detect when it enters the hub and the catheter connected to it, so that the catheter morphology is visualised on the basis of the position of the guidewire within the catheter. This development eliminated the dependence on the two available FORS-specific catheter types and made the options for catheter types more flexible. The current guidewire, which has a working length of 160 cm, also considerably expanded the options regarding catheter type.

RESULTS REPORTED IN THE LITERATURE

The first clinical data on FORS were published from Utrecht University Medical Centre (UMCU), initially as a preclinical feasibility study and subsequently as a 'first-in-human' clinical study. Since then, a growing series of publications have described the technical success rates and radiation reduction for various applications, including cannulation of the contralateral limb in standard EVAR (Figure 3), peripheral arterial disease and complex aortic repairs with fenestrations (Figure 4) and branches (Figure 5). Panuccio et al. and Sanders et al. reported technical success rates of 62% and 66%, respectively, with FORS-guided complex EVAR procedures, with a significant reduction of radiation parameters in successful FORS catheterisations, compared to catheterisations in which FORS resulted in technical failure. A limitation of these studies, however, was the lack of a primarily conventional control group and an intention-to-treat analysis.

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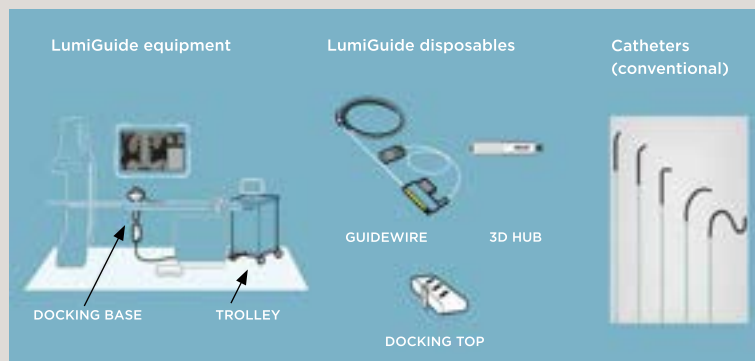


FIGURE 2 The fixed and disposable materials used in LumiGuide.

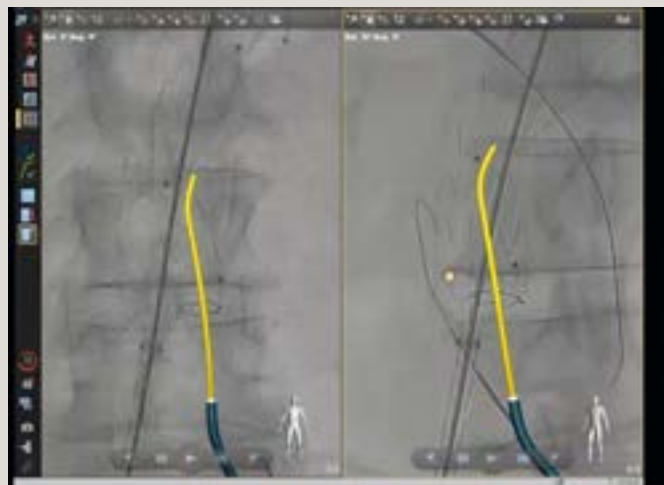


FIGURE 3 LumiGuide-guided cannulation of the contralateral limb in standard EVAR. The three-dimensional, colour-coded image shows the real-time position of the guidewire, enabling navigation without fluoroscopy. The biplane view makes it possible to look from two angles simultaneously.

TRANSATLANTIC REGISTRY STUDY

The largest study conducted so far concerns an analysis of the FORS Learn Registry, by Charlotte Lemmens (CARIM+HVC PhD), Jurre Klaassen (UMCU) and colleagues, representing the FORS Learn Registry Study Group, which was recently accepted for publication in the European Journal of Vascular & Endovascular Surgery. This prospectively collected and retrospectively analysed multicentre registry involved seven high-volume centres in Europe and the United States, including Maastricht UMC+, UMCU, University Medical Centre Eppendorf in Hamburg, Beth Israel Deaconess Medical Center (Harvard), University of Alabama at Birmingham, University of Massachusetts Medical School and University of Texas Southwestern Medical Center.

In all, 313 complex EVAR procedures were analysed, in which 1037 visceral target vessel catheterisations (catheterisations of renal arteries and mesenteric arteries) were carried out. For the 812 catheterisations for which FORS was used, the overall technical success rate was 62.8%. Stratification for configuration showed a statistically significantly higher success rate for catheterisation via fenestrations (66.2%) compared to branches (54.1%; $P = 0.001$). Factors associated with technical failure included the presence of ostial stenosis, calcifications and previously placed stents in the target vessels. In terms of radiation reduction, successful FORS catheterisation resulted for all measured parameters, fluoroscopy time (FT), fluoroscopy rate (FR), cumulative AirKerma (CAK) and kerma-area product (KAP), in statistically significant reductions compared to primarily conventional catheterisations, both for fenestrations and for branches. For instance, the median fluoroscopy time for fenestrations fell from 4.1 minutes in conventional

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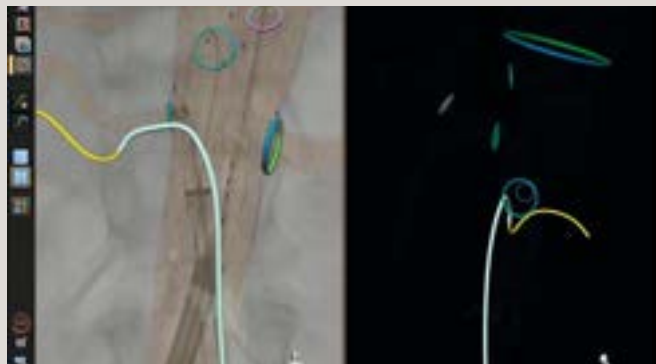


FIGURE 4 Visualisation of target vessel catheterisation via a fenestration for the right renal artery using LumiGuide. The three-dimensional reconstruction shows the guidewire and catheter navigating through the fenestration in the stent graft to the target vessel. The left panel shows a combination of the arterial vascular tree with marked ostia of the target vessels (from a preoperative CT-scan) and the LumiGuide imaging. The right panel shows only the LumiGuide imaging and the marked ostia in a lateral projection.

catheterisation to 0.9 minutes in successful FORS catheterisation, and the median CAK fell from 93.9 mGy to 16.5 mGy. The catheterisation time was significantly shorter with successful FORS catheterisation via fenestrations, but not via branches. The authors emphasise that the registry design has inherent limitations, including selection bias due to non-randomised assignment to catheterisation methods and the fact that only successful FORS catheterisations were compared with the conventional group.

MAASTRICHT UMC+ DATA

Additional insights have been presented in a single-centre study which is currently undergoing peer review at the

Journal of Endovascular Therapy and was carried out at Maastricht UMC+ (Charlotte Lemmens and colleagues). This study described the results of 96 successive patients who underwent a complex EVAR with visceral target vessel catheterisation between December 2020 and December 2023. Of the 319 identified catheterisation tasks, 176 involved the use of FORS, with a technical success rate of 63.6%. Ostial stenosis and ostial calcifications were both statistically significantly associated with technical failure. The use of the 3D-Hub resulted in a significant improvement of the technical success rate, from 60.0% to 80.6% ($P = 0.039$), underlining the clinical added value of this hardware iteration.

A methodologically distinguishing feature was the intention-to-treat analysis, in which all attempted FORS catheterisations were compared with primarily conventional catheterisations, regardless of the eventual technical outcome. This analysis showed that the radiation parameters in the FORS group were statistically significantly lower than in the conventional group, while the catheterisation time did not differ significantly. The three-group comparison, successful FORS, failed FORS and conventional, showed that the radiation doses in technically failed FORS catheterisations did not differ significantly from those in primarily conventional catheterisations. This implies that initiating a catheterisation attempt using LumiGuide does not introduce an additional radiation load compared to a primarily conventional approach, even with eventual conversion to conventional fluoroscopy. At procedure level, no significant differences regarding the total duration of the procedure or the cumulative radiation dose were found between FORS procedures and fully conventional procedures, which can be explained from the fact that

HIGHLIGHT DIVISION VESSELS



FIGURE 5 LumiGuide-guided catheterisation of the celiac trunk via a branch in the stent graft. The 180-degree turn at the top of the catheter/guidewire is caused by a steerable sheath, which is not visible with LumiGuide.

LumiGuide in its current development stage can only be used for target vessel catheterisation, and not for other procedural steps.

APPLICATIONS OTHER THAN AORTIC SURGERY

Although complex endovascular aortic repair is currently the primary application, the spectrum of LumiGuide applications is potentially wider. At Maastricht UMC+, this technology is also being used in CERAB procedures (Covered Endovascular Reconstruction of the Aortic Bifurcation), for the treatment of aorto-iliac occlusive diseases, with three-dimensional real-time navigation supporting the catheterisation of the aortic bifurcation and iliac segments. In addition, LumiGuide is being applied at Maastricht UMC+ in complex deep-venous recanalisation, a domain in which accurate intraluminal navigation through occluded or severely stenosed venous trajectories is technically

challenging and in which reduction of the radiation exposure is clinically relevant.

PROSPECTS

LumiGuide represents a technologically promising innovation in the pursuit of a radiation-reduced or even radiation-free intervention room. The consistent finding of a technical success rate of about 60 to 65% for the current generation of devices, combined with the proven radiation reduction in successful application and the absence of an additional radiation load in case of technical failure, constitutes a solid basis for wider implementation. Further hardware and software developments, including qualitatively improved and backloadable guidewires and visualisation of other endovascular devices, such as PTA balloons, stents and stent-grafts, are necessary to realise the full potential of this technology. The international RadFree trial, a prospective randomised multicentre study comparing LumiGuide with conventional fluoroscopy during FEVAR procedures, is currently underway. The aim of this study is to definitively prove to what degree this technique actually leads to a reduction of radiation, procedure duration and use of contrast agents.





HEART AND VASCULAR OUTPATIENT CLINIC AND DIAGNOSTIC SERVICES

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SHAPING THE FUTURE: EDUCATION & TALENT

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CARIM+HVC offers a flexible and integrated education and training programme tailored to the individual ambitions of its students and PhD candidates. The clinical and preclinical staff of CARIM+HVC are intricately involved in the development and implementation of the FHML Bachelor's and Master's programmes in Biomedical Sciences, Medicine, and the Physician-Clinical Investigator Programme (MSc/MD). CARIM+HVC also contributes to the education programme of the Faculty of Science and Engineering. In addition, CARIM+HVC's staff is involved in the design of a contiguous and state-of-the-art PhD (doctoral) training programme. The content of the PhD education programme has been developed by our leading researchers, while its framework has been created by senior educators at Maastricht University, internationally recognised for their didactic approach based on problem-based learning.

RESEARCH MASTER

In the master programmes offered at FHML, students are introduced to CARIM+HVC and the programmes of the other FHML research institutes during the start of the master phase. CARIM+HVC staff members actively participate in the design and implementation of teaching within the master programmes. Students can attend institute-specific lectures and parallel programmes organised by researchers. In the second year, students who are attracted to cardiovascular research can undertake their senior research internship and master thesis at CARIM+HVC. These internships are also accessible to students from other master programmes, provided that they have a suitable academic background. Talented master students can subsequently pursue their scientific career as PhD candidates within CARIM+HVC.

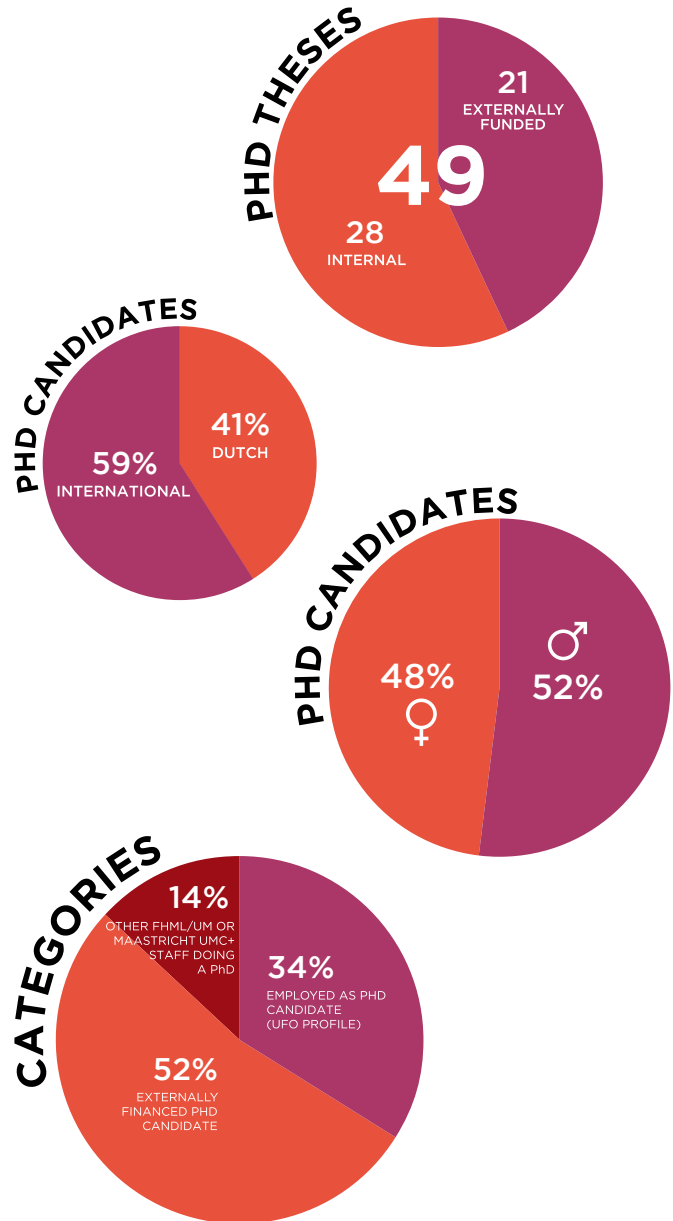
PHD PROGRAMME

Our PhD programme is accessible for talented and motivated graduates from national and international Medical and Basic Sciences master's programmes. At the beginning of 2025, a total of 382 PhD candidates (both internal and external) were enrolled in our PhD programme. In 2025, about 60% of our PhD candidates came from abroad, contributing to an exciting multicultural and international atmosphere. To advance cardiovascular knowledge and the treatment of cardiovascular disease, CARIM+HVC considers both basic and clinical research equally important, and thrives on research at their interface. The translational nature of CARIM+HVC's research is exemplified by the mix of PhD candidates with a background in medicine and the basic sciences. The primary goal of the PhD training programme is

to support PhD candidates in developing into independent and mature researchers in the cardiovascular field.

To ensure high-quality PhD training, CARIM+HVC offers frequent interaction between PhD candidates and skilled and experienced supervisory teams, thereby providing a stimulating and critical environment to further develop research skills. PhD candidates are also offered a broad range of opportunities to attend general and institute-specific courses, seminars, and masterclasses. In addition to their supervisory team, they are offered the opportunity to receive support from a buddy (a senior PhD candidate) and a coach (an independent senior faculty member). PhD candidates are encouraged to attend symposia, present their research at national and international conferences, and publish their work in peer-reviewed international journals. The CARIM Educational Programme Committee (EPC) includes both senior scientific staff members and PhD candidates and coordinates the CARIM PhD programme while advising the EB on all issues related to the PhD programme.

In 2025, 69 new PhD candidates began their trajectory at CARIM+HVC. During the same year, 28 internally funded and 21 externally funded PhD candidates successfully defended their theses at our institute. At the start of 2025, the male-to-female ratio among newly CARIM+HVC appointed PhD candidates was close to 50:50.



CARIM+HVC THESES 2025

Judith Gulikers

Title: Improving safe and effective use of targeted therapies in non-small cell lung cancer

Supervisor: Prof. V.C.G. Tjan-Heijnen

Co-supervisors: Dr R.M.J.M. van Geel, Dr L.E.L. Hendriks, Dr S. Croes

16 January

Tijmen Koopsen

Title: Patterns with potential advancing cardiac resynchronization therapy through imaging-based personalized heart modeling

Supervisors: Prof. J. Lumens, Prof. T. Delhaas

17 January

Claudia Schönichen

Title: A jack of all trades: Platelets at the interface of endothelial inflammation and coagulation

Supervisor: Prof. J.W.M. Heemskerk

Co-supervisors: Dr M.J.E. Kuijpers, Prof. K. Jurk (Johannes Gutenberg University of Mainz, Germany)

20 January

Yentl Brandt

Title: Quantitative cardiac imaging in women with a history of preeclampsia

Supervisors: Prof. M.E. Kooi, Prof. M.E.A. Spaanderman

Co-supervisors: Dr S.C. Gerretsen, Dr C. Ghossein-Doha (Erasmus MC, Rotterdam, NL)

22 January

Zhewen Ren

Title: Socioeconomic determinants and cardiometabolic consequences of non-alcoholic fatty liver disease

Supervisor: Prof. M.C.G.J. Brouwers

Co-supervisor: Dr A. Wesselius

27 January

Joram Huckriede

Title: Extracellular histones as novel theranostic targets in severe infection and immunothrombosis

Supervisors: Dr G.A.F. Nicolaes, Prof. C.P.M. Reutelingsperger

Co-supervisor: Dr K. Wichapong

5 February

Floor Salden

Title: New-fashioned cardiac pacing: Spring forward, fall back to nature's way

Supervisors: Prof. F.W. Prinzen, Prof. K. Vernooy

6 February

Veerle van Hulten

Title: Bone strength, microarchitecture, and fracture risk in Type 2 Diabetes

Supervisors: Prof. J.P. van den Bergh, Prof. M.C.G.J. Brouwers

Co-supervisor: Dr J.H.M. Driessen

13 February

Henry Davies

Title: End of life and palliative care for vascular patients

Supervisors: Prof. B. Mees, Prof. J.A. Scott (Leeds University, UK)

11 March

Simona Esposito

Title: Diet and biological aging: a thorough analysis in the Moli-Sani study cohort

Supervisors: Prof. H. ten Cate, Prof. L. Iacoviello (IRCCS Neuromed, Italy)

Co-supervisor: Dr M. Bonaccio (IRCCS Neuromed, Italy)

12 March

Siyu Sun

Title: Platelets, red blood cells, fibrinogen and endothelial cells: Essential components in blood clotting

Supervisor: Prof. J.W.M. Heemskerk

Co-supervisors: Dr B. de Laat (Synapse Research Institute Maastricht, NL), Dr M. Roest (Synapse Research Institute Maastricht, NL)

24 March

CARIM+HVC THESES 2025

Myrthe Willemars

Title: Untangling the threads of the heart: Sex differences in cardiac metabolism and the role in cardiac hypertrophy
Supervisor: Prof. J.F.C. Glatz
Co-supervisors: Dr M. Nabben, Dr J.J.F.P. Luiken, Dr D. Neumann
2 April

Ahmed Beela

Title: The paradox of mechanical dyssynchrony in cardiac resynchronization therapy: Reflections on diastolic function, guidelines, and sex differences
Supervisors: Prof. J. Lumens, Prof. T. Delhaas
Co-supervisor: Dr L. Herbots (Jessa Hospital, Hasselt, Belgium)
7 April

Wenting You

Title: Reversing fate: Rescuing dying neurons from regulated cell death
Supervisors: Prof. C.P.M. Reutelingsperger, Prof. C.A.B. Webers
Co-supervisors: Dr T.G.M.F. Gorgels, Dr T.T.J.M. Berendschot
17 April

Yuandi Zhao

Title: Multimodal analytical strategies in drug discovery
Supervisors: Prof. M. Honing, Prof. I. Dijkgraaf
Co-supervisor: Dr D. Hadavi
22 April

Afrak Malik

Title: Bridging the gap: Developing screening tools for the early detection of carotid artery disease
Supervisors: Prof. T. Delhaas, Prof. W.H. Mess
Co-supervisor: Dr K.D. Reesink
6 May

Rogier Veltrop

Title: Mechanosensitive signalling pathways in cardiomyopathy: LMNA mechanobiochemistry and cardiac cell signalling
Supervisor: Prof. L.J. Schurgers
Co-supervisor: Dr M. Harakolova
15 May

Daniëlle Holthuijsen

Title: Unraveling the role of the kynurenine pathway in colorectal cancer survivorship: associations with dietary intake and domains of quality of life
Supervisor: Prof. M.P. Weijenberg
Co-supervisors: Dr S.J.P.M. Eussen, Dr E.H. van Roekel, Dr M.J.L. Bours
16 May

Inge Luu

Title: Diagnostic strategies for venous thromboembolism
Supervisor: Prof. H. ten Cate
Co-supervisor: Dr D.J.L. van Twist (Zuyderland MC, NL)
21 May

Xiaofei Zhao

Title: Microvascular dysfunction in cardiometabolic disease: A focus on hyperglycemia
Supervisors: Dr A.J.H.M. Houben, Prof. M.T. Schram
26 May

Giorgia D'Italia

Title: From platelets to long non-coding RNAs: Understanding heart failure with preserved ejection fraction
Supervisors: Prof. J.M.E.M. Cosemans, Prof. B. Schroen
27 May

Thomas Hutschalik

Title: In vitro modeling of atrial inflammation using human induced pluripotent stem cells
Supervisors: Prof. U. Schotten, Prof. E. Matsa (University College Cork, Ireland)
Co-supervisor: Dr M. Argenziano (Ncardia Leiden, NL)
2 June

CARIM+HVC THESES 2025

Maike Imkamp

Title: Clinical research in the era of data science

Supervisor: Prof. A.L.A.J. Dekker

Co-supervisors: Dr S.M.J. van Kuijk, Dr B.C.T. van Bussel

5 June

Bart Scheenstra

Title: The long and winding road to better cardiovascular health empowering patients to reduce the risk of adverse cardiovascular outcomes

Supervisors: Prof. A.W.J. van 't Hof, Prof. J.G. Maessen

Co-supervisor: Dr L.M.J. Hochstenbach

5 June

Claudia Manetti

Title: Virtual patients, real data: Exploring mechanistic and therapeutic advances in heart failure through virtual patients and cohorts

Supervisors: Prof. J. Lumens, Prof. T. Delhaas

Co-supervisor: Dr N. van Osta

12 June

Sarah D'Haese

Title: Mitigating diabetic cardiomyopathy: Evaluating exercise training and pyridoxamine as cardioprotective approaches

Supervisors: Prof. C.G. Schalkwijk, Prof. V. Bito (Hasselt University, Belgium)

Co-supervisors: Dr K. Wouters, Prof. B. Op 't Eijnde (Hasselt University Belgium), Prof. D. Hansen (Hasselt University, Belgium)

17 June

Hala Ajjour

Title: Mitochondrial function in aldosterone dependent human hypertension

Supervisors: Prof. L.J. Schurgers, Prof. G.P. Rossi (University of Padova, Italy)

Co-supervisor: Dr L. Lenzini (University of Padova, Italy)

18 June

Hedwig Nies

Title: Advances in cardiac magnetic resonance imaging a paradigm shift from diagnostics to therapy

Supervisor: Prof. J.E. Wildberger

Co-supervisors: Dr C. Muhl, Dr R.J. Holtackers, Dr S. Chaldoupi

25 June

Berta Ganizada

Title: A systems approach to aortic wall pathology: bridging fundamental research and clinical practice

Supervisors: Prof. L.J. Schurgers, Prof. J.G. Maessen, Dr E. Bidar

Co-supervisor: Dr K.D. Reesink

2 July

Sai Sundararaman

Title: Role of PCSK9 and CaSR in cardiovascular disorders

Supervisors: Prof. E.A.L. Biessen, Prof. J. Jankowski

Co-supervisor: Dr E.P.C. van der Vorst (RWTH Aachen University, Germany)

4 September

Silvia Mariani

Title: Current status and targets for improvement in postcardiotomy extracorporeal life support

Supervisors: Prof. R. Lorusso, Prof. J.G. Maessen

Co-supervisor: Dr B.C.T. van Bussel

16 September

Ngoc Tran

Title: The use of betaine as a novel senotherapy

Supervisors: Prof. L.J. Schurgers, Prof. P. Shiels (University of Glasgow, UK)

22 September

CARIM+HVC THESES 2025

Angeliki Darma

Title: Contemporary management of patients with structural heart disease undergoing catheter ablation of ventricular arrhythmias
Supervisor: Prof. K. Vernooy
Co-supervisors: Dr R. ter Bekke, Dr N. Dagues (Charite University Berlin, Germany)
24 September

Sanne Mourmans

Title: Paving the way for improved management of heart failure with preserved ejection fraction: the role of microvascular dysfunction and comorbidities
Supervisor: Dr V.P.M. van Empel
Co-supervisors: Dr C. Knackstedt, Dr E.C. Eringa
25 September

Liv Vossen

Title: The effect of vitamin K on vascular calcification
Supervisors: Prof. A.A. Kroon, Em. Prof. P.W. de Leeuw
30 September

Jeffrey Chan

Title: The impact of neighborhood environments on lifestyle, socioeconomic health disparities, and cardiovascular disease
Supervisors: Prof. H. Bosma, Prof. A. Koster
16 October

Anxhela Habibi

Title: Protease-activated receptors in vascular smooth muscle cells: a bridge between coagulation and vascular remodeling
Supervisors: Prof. L.J. Schurgers, Prof. W. Ruf (Johannes Gutenberg University Mainz, Germany)
Co-supervisor: Dr S. Kauschke (Boehringer Ingelheim, Germany)
17 October

Richard Dohmen

Title: Fat from muscle: Fibro-adipogenic progenitors as a source for cultured fat production
Supervisor: Prof. M.J. Post
Co-supervisor: Dr J.E. Flack
20 October

Jakob Weiß – CUM LAUDE

Title: Improving personalized risk estimation using routine medical imaging studies: An opportunistic screening approach
Supervisor: Prof. H. Aerts
Co-supervisor: Prof. M.T. Lu (Harvard Medical School and Massachusetts General Hospital, USA)
20 October

Sara Mokhtar

Title: Eyes on neurodegeneration: The Maastricht Study
Supervisor: Prof. C.A.B. Webers
Co-supervisors: Dr C.J.H. van der Kallen, Dr T.T.J.M. Berendschot
27 October

Maurits Sicking

Title: Immune-mediated dilated cardiomyopathy next steps towards targeted immunotherapy
Supervisor: Prof. S.R.B. Heymans
Co-supervisors: Dr M.T.H.M. Henkens, Dr J.A.J. Verdonchot
30 October

Thijs Delnoij

Title: ExtraCorporeal Membrane Oxygenation: How, where, who and at what cost?
Supervisors: Prof. I.C.C. van der Horst, Prof. R. Lorusso
Co-supervisor: Dr M. van de Poll
30 October

Faysal Benali

Title: Brain resilience and heparin flush in endovascular thrombectomy for acute ischemic stroke, challenging current literature
Supervisors: Prof. W.H. van Zwam, Prof. R.J. van Oostenbrugge, Prof. M. Goyal (University of Calgary, Canada)
5 November

Victor Gonçalves Marques

Title: Navigating atrial fibrillation: A modeling perspective into mapping and ablation
Supervisor: Prof. U. Schotten
Co-supervisors: Dr S. Zeemering, Dr P. Bonizzi, Dr S. Pezzuto (University of Trento, Italy)
6 November

CARIM+HVC THESES 2025

Melania Buonocunto

Title: Stretching boundaries: Bridging mechanical and electrical functions of the heart: a multiscale in silico characterization of the pro-arrhythmic effects of stretch-activated ion channels

Supervisors: Prof. J. Lumens, Prof. T. Delhaas, Prof. J. Heijman
(Medical University of Graz, Austria)

14 November

Ellen Denessen

Title: Cardiac troponin: Tracking its journey in cells and patients

Supervisor: Prof. O. Bekers

Co-supervisor: Dr A. Mingels

28 November

Kelly Nies

Title: Personalized ischemic stroke risk prediction utilizing plaque vulnerability in symptomatic carotid artery disease

Supervisor: Prof. M.E. Kooi

Co-supervisors: Prof. R.J. van Oostenbrugge, Prof. L.J.M. Smits,
Prof. M.A. Joore

2 December

Aaron Iding

Title: Residual venous obstruction and long-term outcomes after deep vein thrombosis: Towards improved prediction and prevention

Supervisors: Dr A.J. ten Cate-Hoek, Prof. H. ten Cate, Prof. P.S. Wild (Johannes Gutenberg University Mainz, Germany)

10 December

Bob Knapen

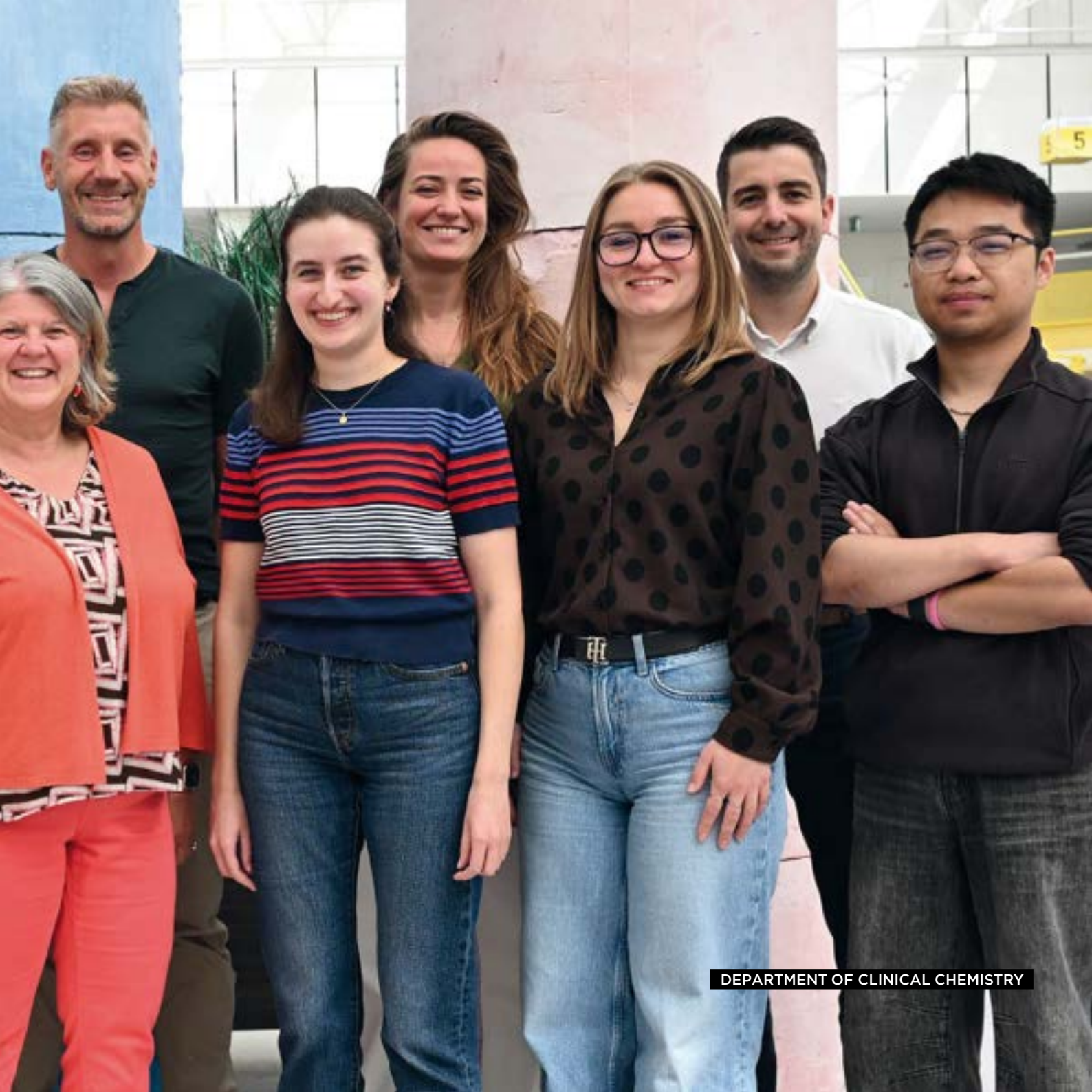
Title: Optimizing recanalization in acute ischemic stroke patients: Encompassing intravenous thrombolysis and endovascular treatment

Supervisors: Prof. W.H. van Zwam, Prof. R.J. van Oostenbrugge

Co-supervisor: Dr C. van der Leij

18 December





DEPARTMENT OF CLINICAL CHEMISTRY

MEDICAL SPECIALIST TRAINING

HVC provides a dynamic and academically rigorous environment for medical specialist training in cardiology, cardiothoracic surgery, and vascular surgery. This is supported by the expertise of the Academy for Medical Specialist Training, ensuring high-quality education and continuous curriculum development.

Cardiology training spans six years and combines internal medicine with dedicated cardiology instruction. Maastricht UMC+ holds indefinite accreditation for the final three years, including the subspecialisation year. Advanced clinical subspecialties offered include electrophysiology and devices, heart failure, interventional cardiology, intensive care cardiology, and advanced imaging. As lead institution in the South training cluster, Maastricht UMC+ collaborates closely with Zuyderland MC and VieCuri Medical Center. In 2025, the core training team included Drs Trang Dinh (Programme Director), Dr Dennis den Uijl (Deputy), Eliane van Caldenborgh (Secretary), and two resident representatives. There is a strong and constructive collaboration with the local and national training committees.

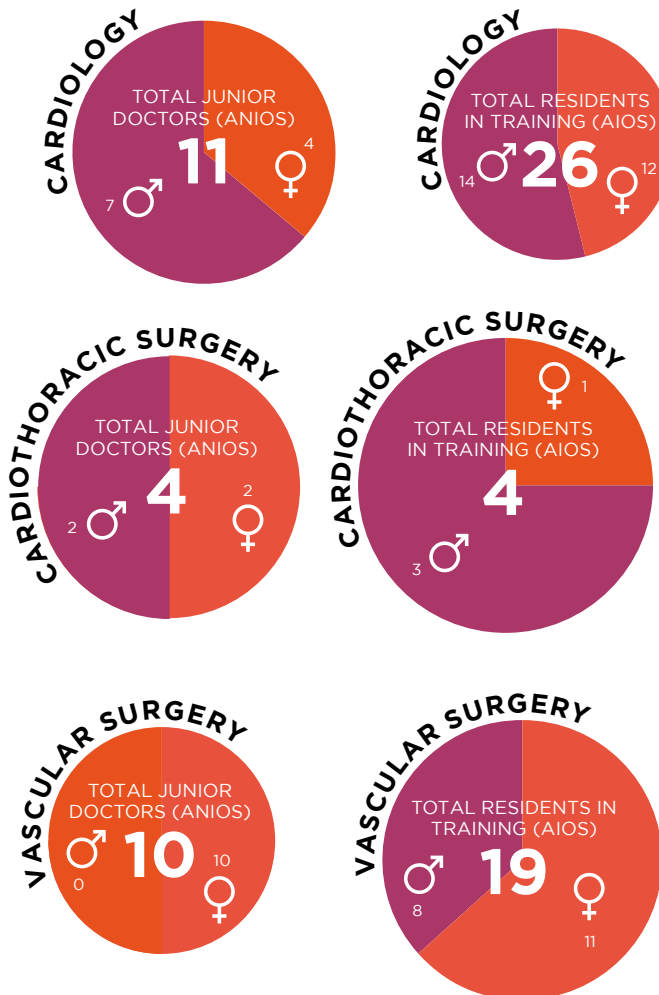
Cardiothoracic surgery training is a 5.5-year programme focussed on acquiring advanced surgical competencies through progressive, supervised clinical practice. The curriculum includes rotations in pulmonology, intensive care medicine, cardiology, congenital heart surgery, and academic development. Training is delivered across a regional network, with each partner institution contributing its specific areas of expertise. In 2025, the core team consisted of Dr Patrique Segers (Programme Director), Dr Bart Maesen (Deputy

Programme Director), and Winnie Heijns (Programme Secretary), in collaboration with Prof. Jos Maessen (Head of Department until April 2025) and subsequently with Prof. Elham Bidar (Head of Department from April 2025 onward). The implementation, evaluation, and continuous development of the training programme are carried out in close collaboration with all relevant stakeholders, including accredited training institutions, the College of Medical Specialties, the Registration Committee for Medical Specialists, the Federation of Medical Specialists, De Jonge Specialist, educational supervisors and training groups, the Capacity Body, the Healthcare and Youth Inspectorate, and other organisations and individuals that contribute directly or indirectly to the quality and delivery of cardiothoracic surgery training.

Vascular surgery training is offered in the final two years of the national General Surgery programme and focusses on both open and endovascular techniques. At Maastricht UMC+, this subspecialty phase takes place in the Department of Vascular Surgery and is supervised by Prof. Geert Willem Schurink. The programme includes internships in several other vascular surgical departments, with a focus on open and endovascular procedures, vascular diagnostics, and multidisciplinary collaboration. Upon completion and successful examination, trainees qualify for registration as vascular surgeons. The programme aligns with the national surgical curriculum (SCHERP) and is accredited by the RGS in partnership with the Dutch Association for Surgery (NVvH).

In 2025, the departments of Cardiology, Cardiothoracic Surgery, and Vascular Surgery hosted a total of 74 physicians in training. Cardiology had the largest group, with 37 trainees and a near-even gender split. Vascular Surgery hosted 29 trainees, while Cardiothoracic Surgery trained eight physi-

cians. Overall, the training programmes reflect strong participation and a healthy gender balance.



POSTGRADUATE PROGRAMMES

The expertise of the three divisions is transferred to international colleagues through three clinical postgraduate programmes: CAS-AM (Blood), EVC (Vessels) and DAS-CAM (Heart). CAS-AM (Certificate of Advanced Studies in Antithrombotic Management) is specifically designed for physicians who are active in the management of patients with thromboembolic diseases and have the ambition to improve their knowledge and skills in order to become leading professionals in antithrombotic management. The EVC (European Vascular Course) aims to provide outstanding training and education for specialists in arterial, venous, vascular access and cardiovascular fields. DAS-CAM (Diploma of Advanced Studies in Cardiac Arrhythmia Management) trains future leaders in cardiac electrophysiology by integrating state-of-the-art cardiac arrhythmia management with leadership skills, biostatistics and health technology assessment. All three professional development courses are endorsed by prominent international societies: CAS-AM by the International Society on Thrombosis and Haemostasis (ISTH) and the European Congress on Thrombosis and Haemostasis (ECTH); EVC by the Aortic Association and Vascular International; and DAS-CAM by the European Heart Rhythm Association (EHRA) and the European Society of Cardiology (ESC).



FIGURE CARIM division structure with professional education.

As of September 2025, the EVC is led by a new leadership team succeeding Prof. Michael Jacobs, who has played a pivotal role over the last 27 years in shaping EVC into a globally recognised event. The newly appointed EVC Executive Board is led by Prof. Barend Mees, vascular surgeon at Maastricht UMC+. Together with Dr Marie Josee van Rijn (vascular surgeon at Erasmus MC Rotterdam), Dr Çağdaş Ünlü (vascular surgeon at NoordWest Ziekenhuisgroep Alkmaar) and Ernst Jan Broer (Chief Financial Officer), he forms the new board that will guide EVC into its next chapter. This team brings a wealth of expertise across vascular surgery, endovascular innovation, and medical education.



DISSERTATION PRIZE 2024

The CARIM Dissertation Prize 2024 has been awarded to Dr **Jeremy Weerts** (Dept of Cardiology) for the thesis 'Expanding the horizon of heart failure with Preserved Ejection Fraction (HFPEF): advancing knowledge and detection through novel approaches'.



Jeremy has been selected for his outstanding and original contribution to cardiovascular research. His thesis represents a remarkable combination of scientific depth, methodological innovation, and clinical relevance. The work spans multiple

domains, from mechanistic studies on microvascular and atrial dysfunction to pioneering diagnostic strategies integrating digital tools and registry-based research, demonstrating both conceptual breadth and technical excellence. The thesis is strongly embedded within CARIM+HVC, with active involvement of numerous CARIM+HVC researchers across different scientific disciplines, ranging from basic and translational to clinical research. Jeremy's pivotal role is evident in the conception, coordination, and execution of multicentre and international studies, as well as in his leadership within research consortia. His creativity, independence, and collegial spirit make him an exemplary ambassador of CARIM+HVC's values and an outstanding early-career scientist.

KNOWLEDGE TRANSFER

CARIM COURSES

From 16 to 20 June, CARIM+HVC hosted its annual Course Week, featuring a diverse range of parallel courses covering key aspects of CARIM+HVC's research. Alongside the academic programme, a social programme was organised by I'MCARIM, the association for our PhD candidates. In 2025, our researchers led two specialised courses: 'Non-invasive Cardiovascular Imaging' and 'Heart Failure and Rhythm'. More than 40 PhD candidates participated in these sessions. Additionally, the 'Advanced Optical Microscopy' course, which is open to CARIM+HVC PhD candidates, was organised by the Department of Molecular Cell Biology.

The 'Vascular Inflammation and Thrombosis' course is coordinated by Dr **Rob Holtackers** and Prof. **Eline Kooi** (Dept of Imaging). The aim of this course is to provide participants with insight into the basic principles and cardiovascular applications of various non-invasive imaging methods. The course focusses on the most frequently applied imaging modalities, including ultrasound, CT, PET and SPECT, X-ray angiography, MRI, and hybrid imaging modalities. Topics covered include the basic physical principles, the imaging characteristics, the requirements for human and animal studies, and the possibilities and limitations of each of these imaging modalities in relation to specific cardiovascular research questions. During the course, PhD candidates become acquainted with experts in non-invasive imaging at CARIM+HVC.

The 'Heart Failure and Rhythm' course, led by Dr **Twan van Stipdonk**, Dr **Vanessa van Empel** and Prof. **Blanche Schroen** (Dept of Cardiology and Dept of Physiology), explores clini-

cal and preclinical approaches to understanding and treating heart failure. The course covers what translational research entails, as well as topics that extend beyond the basic understanding of heart failure. The programme takes participants on a journey through heart failure research from the laboratory to the clinical, from basic academic to applied commercial research, and from the first steps of a research career to an established academic career in heart failure research. The programme also included a mentoring session. All lectures were interactive and led by experienced researchers from the clinical and preclinical fields.

In addition to the scientific sessions, PhD candidates also participated in a workshop on societal impact. The week concluded with a social activity organised by I'MCARIM, fostering connections among researchers in an informal setting.

CARDIOVASCULAR GRAND ROUNDS MAASTRICHT

The Cardiovascular Grand Rounds is a lecture series, organised by CARIM+HVC researchers since 2010. In recent years, the scientific organisation has been managed by a broad committee representing the CARIM divisions and the full spectrum of research, from clinical to basic research. Additionally, I'MCARIM plays a vital role in involving younger researchers by promoting lectures and organising workshops with invited speakers. The lecture series continues to provide an engaging programme featuring excellent speakers.

In 2025, a total of 14 speakers contributed to the programme, including CARIM+HVC researchers and several distinguished guest speakers from interna-

tional institutions. The committee is grateful for the financial support provided by the *Stichting ter Bevordering van Cardiovasculair Onderzoek en Onderwijs*.

CARIM+HVC SYMPOSIUM 2025

The CARIM+HVC annual scientific symposium took place on Wednesday 26 November. The morning featured presentations by our recent NWO Talent Programme laureates, an update on Topsector Prevention by Dr Armand Jaminon, and the PhD abstract competition, followed by a lively poster



session showcasing CARIM+HVC's latest research. In the afternoon, behavioural biologist Patrick van Veen delivered an engaging lecture on social behaviour in apes and humans, after which our Dutch Heart Foundation Dekker laureates presented their work.

This year's traditional Robert Reneman Lecture, held in honour of the Institute's founding Director, was delivered by Prof. Henk Marquering, who shared insights into AI-driven innovations in stroke care. The day concluded with the announcement of the Harry Crijns Research Grant winner and the CARIM prizes and awards. The CARIM Priori members were selected by lottery. As of January 2026, Suus Segers and Kristiaan Wouters have joined the CARIM Executive Board for a one-year term. The following poster presentations received awards:

- **DIVISION BLOOD:** Jip de Kok
- Socioeconomic disparities and the role of comorbidity in hospital mortality of intensive care patients
- **DIVISION VESSELS:** Lia Bica
- Patient-derived vascular smooth muscle cells as a translational platform for risk stratification and drug discovery in aneurysm disease
- **DIVISION HEART:** Peter Deissler - Mechano-Electrical Trigger Mechanisms of Torsades-de-Pointes Ventricular Tachyarrhythmias



OTHER CARIM LECTURES, SEMINARS AND SYMPOSIA 2025

Complementing the Cardiovascular Grand Rounds Maastricht and the CARIM+HVC Symposium, several additional lectures, seminars and conferences were organised by our staff in 2025. Some of them are highlighted below.

The **Cardiorenal Seminars** are a joint lecture series organised by CARIM+HVC and the Institute of Cardiovascular Research (IMCAR) of the University Hospital RWTH Aachen (headed by Prof. Joachim Jankowski) and provide a platform for international top scientists in the fields of vascular biology

and nephrology to present their recent work. The lecture series alternates between Aachen and Maastricht. In 2025, seven keynote lectures were given by Dr Marten Hoeksema (Amsterdam UMC, 13 February), Prof. Jan van den Bossche (Amsterdam UMC, 27 March), Prof. Ellen Blaak (Maastricht UMC+, 3 April), Dr Sahir Kalim (Harvard Medical School, 22 May), Prof. Jana Holmar (Tallinn University of Technology, 30 June), Prof. Riste Stojanov (Ss. Cyril and Methodius University, 3 July), and Prof. Norbert Gerdes (Heinrich-Heine-University Düsseldorf, 23 September).

The **Maastricht Immunology Seminar Series (MISS)** brings together researchers from Maastricht who are interested in immunology and inflammation. These informal meetings are ideal for expanding local networks, and sharing research techniques and experiences. Each seminar features an external speaker and two PhD candidates or postdocs from Maastricht, who present their research. The meetings are organised by Dr **Kristiaan Wouters** (Dept of Internal Medicine) and Dr **Lotte Wieten** (Dept of Transplantation Immunology). The organising committee also includes young researchers from different research institutes: Tia Adelaar (Dept of Internal Medicine), Vera Valckx (Dept of Transplantation Immunology), and Dr Marina Mané-Damas (Dept of Psychiatry and Neuropsychology). In 2025, two meetings were held. Invited speakers included Prof. Mirjam Heemskerk (Leiden University, Tumour immunotherapy), and Dr Amanda Foks (Leiden University, B-cells in atherosclerosis). Local speakers were Dr Rianne Vaes (Maastricht), Vera Valckx (Internal Medicine), Renée Ysermans (Clinical Immunology), and Elias Wieland (Pathology).

The **Vascular Rounds** are a regional continuing medical education series organised by the Department of Internal Medicine, Vascular Medicine. They bring together clinicians, researchers, and healthcare professionals to discuss current topics in vascular medicine, with a focus on cardiovascular risk, thrombosis, and innovative treatments. The sessions combine scientific lectures with opportunities for discussion and networking. In 2025, the programme covered a range of topics, including nephrology and vascular health, percutaneous vascular interventions, e-health applications, heart failure, and adrenal-related vascular conditions. The series attracted over 160 participants (more than 40 per session), and each session provided three accredited continuing professional development credits. The scientific

committee of the lecture series includes Prof. **Bram Kroon**, Prof. **Roger Rennenberg** and Dr **Renske Olie**.

Prof. **Henri Spronk** (Dept of Internal Medicine) held his inaugural lecture titled '*In de ban van stolzels*' on 17 January 2025.



Dr **Ben Janssen** retired after more than four decades of service in the Department of Pharmacology by delivering a farewell lecture entitled '*Duurzaam leren •••• ratten, riolen en studenten*' on 17 April.

In May, two ERC Writing Room sessions were organised to support researchers considering an application to the European Research Council. Hosted by funding advisor Dr Gwynned de Looijer, these informal gatherings provided a low-threshold environment for participants to exchange ideas, reflect on the application process, and dedicate focussed time to proposal writing. Open primarily to CARIM+HVC researchers across all career stages, the ses-

sions also welcomed colleagues from across FHML, encouraging interdisciplinary interaction. Each session combined goal-setting discussions with independent writing time and opportunities for peer feedback, offering practical support and fostering a sense of community among prospective applicants.

On 13 May, Division Heart organised a topic-focussed afternoon on **'Advanced Modeling of Cardiovascular Diseases Using Stem Cell Technology'**, with presentations by researchers from Division Heart, focussing on innovative approaches to modelling cardiovascular diseases. The session concluded with a keynote lecture on the 'Heart-Brain Axis on a Chip' by Dr Verena Schwach from the University of Twente.

On 12 June, Prof. **Hugo ten Cate**, internist and vascular medicine specialist delivered his official valedictory lecture: *'Trombose zorg(en) anno 2025'*, marking his retirement. In recognition of his long-standing contributions to patient



care, research, and education, he was awarded the Maastricht UMC+ Medal by Executive Board Chair Dr Helen Mertens.

From 9-11 October, the first **CARIM Postdoc Retreat**, organised by Dr Sabine Daemen, Dr Job Stoks and Dr Alessandro Giudici, took place in the heart of the Belgian Ardennes, set against the backdrop of an enchanting castle. CARIM+HVC postdocs and assistant professors came together for two days filled with science and open discussions about career paths and life in academia. Informal networking continued beyond the sessions, around late-night fires, through a challenging pub quiz and during beautiful Ardennes hikes. The relaxed atmosphere made it easy to meet new people and strengthen collaborations across CARIM divisions (see page 128).

On 23 October, Dr Kristiaan Wouters, Dr Lieve Temmerman, and Erwin Wijnands organised the yearly **Flow Cytometry Course**, targeted at first-time users with limited flow cytometry experience. The morning session consisted of a theoretical course covering a general introduction to flow cytometry, the latest technological advances in the field, and information on the flow cytometry capabilities in Maastricht. In the afternoon, participants engaged in a hands-on practical session to learn how to operate the flow cytometers and to become familiar with data acquisition, analysis, and troubleshooting.

In 2025, the **CARIM working group on Diversity, Inclusivity and Social Safety** hosted three training activities by Şeydâ Buurman-Kutsal, accessible to all employees. The 'Anatomy of Bias' workshop on 24 March and the follow-up session on efficient collaboration on 23 April aimed to foster a better understanding of how discrimination and bias manifest in professional relationships and how practical steps can be

taken towards creating a more inclusive environment. During the workshops, participants worked together to deepen their understanding of diversity-sensitive practices, explore their own biases, and reflect on possible ways to act more inclusively in daily situations. In addition, on 12 November

a workshop entitled 'Micro-interventions' was organised in which participants learned how to identify and apply small, strategic actions that can shift conversations, challenge norms, and spark meaningful change.

CARIM POSTDOC RETREAT 2025





DEPARTMENT OF IMAGING



CARIM'S TALENT DEVELOPMENT PROGRAMME

Early recognition of talent is one of the key strategies of CARIM to coach and prepare gifted young academics for their future academic careers. CARIM stimulates and supports talented students and staff by offering grants for research fellowships at each step of their career, whether at Bachelor, Master, postgraduate, PhD or postdoc level. These grants are enabled through our 'Harry Struijker-Boudier Award for Talented Academics' (HS-BAFTA). The HS-BAFTA programme is intended for three groups of young scientific researchers.

1. HS-BAFTA TALENTED FUTURE PHD CANDIDATES

The fellowship is intended for:

- a. Talented Bachelor students in Health, Medicine or Life Sciences, who have demonstrated their ability to combine their studies with an active involvement in scientific research. It can be used to interrupt their studies and undertake a research project within CARIM for 6 to 12 months during their Bachelor phase.
- b. Talented Master students in Health, Medicine or Life Sciences, who have demonstrated their ability to combine their studies with an active involvement in scientific research. It can be used to interrupt their study and undertake a research project for 6-12 months within CARIM during their Master phase.
- c. Talented future PhD candidates in Health, Medicine or Life Sciences, who have recently graduated, to

bridge the time between graduation and the start of an official contract as a PhD candidate within CARIM. The fellowship must start within the first year after graduation and is open to students not yet contracted by or enrolled in a PhD programme.

The fellowship covers the candidate's full salary for 6 to 12 months including a bench fee. For Bachelor's and Master's students the regular curriculum should be interrupted to perform the research project within CARIM.

2017 William van Doorn

2018 Jasper Demandt

2019 Mohamed Kassem

2020 Anne-Marije Hulshof, Yentl Brandt

2021 Daniek Meijs

2022 Peter Deissler

2023 Daria Majcher, Yesim Kaya

2. HS-BAFTA TALENTED PHD CANDIDATES

The fellowship is intended to support PhD candidates who want to spend time abroad, at a renowned research institute or clinic, during their PhD to gain experience and improve their chances of obtaining a personal grant (i.e. Rubicon; Veni; Dekker) after their PhD. The fellowship provides up to 6 months of supplementary living allowance, as well as travel costs.

2018 Mueez Aizaz, Jens Posma

2019 Federica de Majo, Cengiz Akbulut,
Walid Chayoua, Rogier Veltrop,
Valeria Lo Coco, Rob Holtackers

2020 Stefan Reinhold, Anouk Geraets,
Job Verdonchot, Raquel Videira, Jorik Simons,
Anne Willers

2021 Kim Maasen, Job Stoks, Jordy Kocken,
Renée Tillie, Rachel van der Velden

2022 Jerremy Weerts, Shaiv Parikh, Mitch Ramaekers,
Deepak Balamurali, Vanessa Bröker,
Bob Knapen, Maurits Sicking

2023 Aaron Iding, Eline Berends, Ellen Denessen

2024 Femke de Vries, Pim Bouwmans,
Floor Pinckaers, Elias Wieland, Anouk Achten,
Guiliana Lezzoche, Juul Bierens

2025 Pepijn Sarabèr, Nick Wilmes, Madelon Engels,
Mobina Izadpanah

3. HS-BAFTA TALENTED POSTDOCS

The fellowship is intended for recently graduated CARIM PhD candidates. The fellowship is designed to keep top CARIM talents connected to our institute by providing them with the opportunity to go abroad, thereby establishing international cultural and scientific exchange and gaining the experience required for acquiring personal grants. Therefore, a main requirement for this fellowship is that approximately 9 months (max. 12) must be spent at a research institute outside the Netherlands to acquire (further) foreign experience and strengthen the international network of the candidate and the Section Leader(s) involved.

The fellowship covers the candidate's full salary for 12 months including a bench fee. The candidate should use this year to establish international collaborations and prepare a proposal for a postdoctoral grant (i.e. Rubicon; Veni; Dekker) and will be judged on their intention to conduct the proposed research from within CARIM if the grant is awarded. The ultimate goals are to acquire or increase international research experience, broaden the laureate's professional network, and enhance the chances of obtaining prestigious grants in order to strengthen their personal and professional ties to Maastricht University and specifically CARIM.

2016 Stijn Agten

2017 Robin Verjans

2018 Mitchell Bijnen

2020 Federica de Majo

2021 Jens Posma

2022 Mohamed Kassem

2023 Amée Buziau

2024 Victor Gonçalves
Marques

CARIM'S DEVELOPMENT PROGRAMME

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HS-BAFTA winners 2025

ROBERT RENEMAN LECTURE



The Robert Reneman Lecture is delivered during the annual CARIM+HVC Symposium, and is named in honour of the founding Scientific Director of CARIM. The lecture is presented by a renowned scientist in the field of cardiovascular diseases, and the lecturer is awarded a bronze sculpture by Caius Spronken.

1993	M. Verstraete	Leuven, Belgium
1994	J. Sixma	Utrecht, NL
1995	P. Vanhoutte	Courbevoie, France
1996	W. Schaper	Bad Neuheim, Germany
1997	P. Davies	Philadelphia, USA
1998	M. Pfeffer	Boston, USA
1999	Y. Nemerson	New York, USA
2000	V. Fuster	New York, USA
2001	M. Schneider	Houston, USA
2002	F. Rosendaal	Leiden, NL
2003	A. Zeiher	Frankfurt, Germany
2004	P. Poole-Wilson	London, UK
2005	D. Wagner	Boston, USA
2006	S. Wickline	St. Louis, USA
2007	J. Molkentin	Cincinnati, USA
2008	B. Furie	Boston, USA
2009	K. Walsh	Boston, USA
2010	J. Lusis	Los Angeles, USA
2011	W. Ouwehand	Cambridge, UK
2012	D. Kass	Baltimore, USA
2013	J. Yudkin	London, UK
2014	P. Reitsma	Leiden, NL
2015	S. Hatem	Paris, France
2016	S. Laurent	Paris, France
2017	J. Griffin	San Diego, USA
2018	M. Giacca	Trieste, Italy
2019	V. Ramachandran	Boston, USA
2020	H. Büller	Amsterdam, NL
2021	B. Casadei	Oxford, UK
2022	P. Stenvinkel	Stockholm, Sweden
2023	M. Cushman	Vermont, USA
2024	K. Shivkumar	Los Angeles, USA
2025	H. Marquering	Amsterdam, NL

PROFESSORSHIPS

HEIN WELLENS VISITING PROFESSORSHIP



The Hein Wellens Visiting Professorship is endowed by the St. Annadal Foundation to stimulate clinical research in the field of cardiovascular disease. The purpose of this chair is to give renowned scientists the opportunity to teach and apply their knowledge at CARIM+HVC.

The chair is named after Prof. Hein Wellens (1935-2020), a Dutch cardiologist and one of the founding fathers of the cardiology subspecialty of clinical cardiac electrophysiology. From 1978 until 2002, Prof. Wellens held a chair at Maastricht University as Professor and Head of the Department of Cardiology.

2004 - 2005	J. Narula	Irvine, USA
2007 - 2008	M. Krucoff	Durham, USA
2008 - 2010	Y. Rudy	St. Louis, USA
2010 - 2011	R. Kim	Durham, USA
2011 - 2013	K. Mayo	Minneapolis, USA
2013 - 2014	M. Stoll	Münster, Germany
2016 - 2017	A. Zaza	Milano, Italy
2020 - 2023	Th. Münzel	Mainz, Germany

EDUCATION AND TALENT DEVELOPMENT

CARIM+HVC CHAIR

The programme is funded by CARIM+HVC and aims to strengthen the translational cardiovascular axis.

2020 - 2025	C. Hughes	University of California at Irvine
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STICHTING TER BEVORDERING VAN
CARDIOVASCULAR ONDERZOEK EN ONDERWIJS

2020	P. Kirchhof	University Heart and Vascular Center UKE Hamburg
2022 - 2023	P. Stenvinkel	Karolinska Institute Stockholm, Sweden
2024 - 2025	C. Shanahan	King's College London, UK
2025	R. Foo	National University of Singapore, Singapore

SINT ANNADAL FOUNDATION

2014 - 2019	J. Hoorntje
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CARIM COMMITMENT AWARD

In 2015, the CARIM EB introduced the CARIM Commitment Award. This award is intended for any CARIM member who has devoted their heart and soul to CARIM in an exceptional way, whether on an academic, managerial, service or community level. The award consists of a bronze coin by the sculptor Marina van der Kooi (www.marinavanderkooi.nl) and an exclusive restaurant dinner voucher for two. In 2025, the CARIM Commitment Award was presented to Prof. Judith Cosemans. Judith's career has been defined

by resilience, purpose, and a commitment to change. She has transformed challenges into strength, championing the advancement of female researchers and bringing fresh ideas and bold thinking to CARIM. Known for her direct and honest communication, she always speaks in the interest of progress. Her dedication, sincerity, and tireless efforts have made her a driving force for positive change within our community.

CARIM COMMITMENT AWARD WINNERS

2015	Rob van der Zander
2016	Frits Prinzen
2017	Peter Leenders, Agnieszka Brouns-Strzelecka, Nicole Bitsch, Helma van Essen, Jacques Debets (Muroidean Facility)
2018	Koen Reesink
2019	Kristiaan Wouters; Tara de Koster
2020	Carla van der Kallen; Harry Crijns
2021	Stella Thomassen
2022	Myrthe van der Bruggen, Renée Tillie, Valeria Saar-Kovrov, Kim Maasen, Adele Ruder (I'MCARIM); Marc van Bilsen
2023	Sandrine Seyen
2024	Marc Hemmelder
2025	Judith Cosemans





DEPARTMENT OF PHARMACOLOGY & TOXICOLOGY



**I'MCARIM
2025**

I'MCARIM 2025

As we reflect on 2025, I'MCARIM looks back on a year marked by growth, opportunity, and meaningful progress. These achievements have not only strengthened our PhD community but also highlighted where we can, and must, continue to evolve.

At I'MCARIM, we are committed to representing, empowering, and supporting all PhD candidates within CARIM+HVC. We bring our community together through social and networking initiatives, contribute actively to shaping the PhD programme, and serve, in an advisory capacity, the CARIM Executive and Faculty Boards on matters concerning life as a PhD candidate.

This year, we were closely involved in key institutional activities, including the visit of the ERC, the organisation of the abstract competition, and ongoing discussions within the diversity and inclusivity board. Reflecting on these activities is essential: it allows us to celebrate what works well, while also confronting areas where improvement is needed. Progress requires openness.

To better understand the experiences of our community, we actively seek their input. Their perspectives on challenges, needs, and aspirations are crucial. After all, we cannot grow into what we aspire to be if we remain unchanged. In response to such input, we initiated open discussions during the end-of-year gathering and will continue to expand these conversations throughout the coming year. Additionally, we have introduced a physical letterbox to enable anonymous feedback, ensuring every voice is heard.



A strong academic environment depends on a connected and supportive community. PhD life can be demanding, and the workplace often becomes a central part of daily life. That is why fostering meaningful connections remains a priority. Through regular social events, we aim to create spaces where colleagues can meet, exchange ideas, and build lasting relationships. CARIM Café, held every first Monday of the month at SAAM, offers an informal setting to connect and have a drink and some snacks, with CARIM+HVC footing the bill.

This year also marked changes within the I'MCARIM committee. We expressed our gratitude to outgoing members (Minke Rijpkema and Lisa den Brok) for their valuable contributions, and warmly welcomed new members Yesim Kaya, Pepijn Sarabèr, and Giuliana Lezzoché. The resulting balance between continuity and renewal strengthens our ability to represent diverse perspectives within the PhD community.

Looking ahead to 2026-2027, we aim to deepen our understanding of the challenges faced by PhD candidates in an evolving academic landscape. While these challenges are real, they also present opportunities to rethink, improve, and build a more supportive and sustainable research environment.

We will move forward with energy and commitment, working together to further enhance PhD wellbeing and community at CARIM+HVC.

I'MCARIM 2025

Stan Muijtens

Rita Chamoun

Sophie van de Walle

Margarita Pencheva

Yesim Kaya

Pepijn Sarabèr

Giuliana Lezzoché





DEPARTMENT OF PHYSIOLOGY



HIGHLIGHT DIVISION HEART

JOB VERDONSCHOT, SASKIA VAN DER CRABBEN, INGRID KRAPELS

Cardiogenetics: Advancing cardiovascular care through genetics

Genetics is transforming our understanding of disease and reshaping modern clinical practice. In cardiovascular medicine, where many conditions arise from complex genetic interactions, translating genetic discoveries into patient care remains both a challenge and an opportunity. The field of genetics has evolved rapidly. Only a few decades ago, sequencing the complete human genome was considered a scientific milestone. Today, whole-genome sequencing has become part of routine clinical practice within the Department of Clinical Genetics. However, Maastricht UMC+ continues to invest in innovation, with new genetic techniques such as long-read sequencing to improve diagnosis, risk assessment, and treatment for patients with inherited cardiovascular diseases. As a recognised academic centre of excellence, Maastricht UMC+ and HVC are at the forefront of cardiogenetics, delivering highly specialised care while driving innovation in research and diagnostics.

Interpretation of clinical genetic test results, their translation into care, and guidance of family members require highly specialised clinical expertise. Clinical geneticists Ingrid

Krapels, Saskia van der Crabben and Job Verdonchot lead the cardiogenetics programme, supported by genetic laboratory specialists Debby Hellebrekers, Lieve Claes and Arthur van den Wijngaard. Together, they provide highly specialised genetic care for patients across the entire southeastern region of the Netherlands. Since 2015, Maastricht UMC+ has been officially recognised as a national centre of expertise (ECZA) for inherited cardiomyopathies and arrhythmia syndromes, including dilated cardiomyopathy, hypertrophic cardiomyopathy, arrhythmogenic cardiomyopathy, Brugada syndrome, long QT syndrome, and idiopathic ventricular fibrillation, for both adults and children. Together with Radboud UMC in Nijmegen, Maastricht UMC+ is also an ECZA for inherited aortic diseases, aligning with the specialty of Ingrid Krapels. This designation reflects the centre's outstanding clinical care and scientific leadership. On the European stage, Maastricht is a full member of the European Reference Network (ERN) GUARD-Heart, further recognising its expertise in rare and complex cardiovascular diseases.

HIGHLIGHT DIVISION HEART

MULTIDISCIPLINARY CARE FOR RARE GENETIC HEART DISEASES

Cardiologists Jelte Ellenbroek, Christian Knackstedt and Stephane Heymans combine clinical expertise with translational research in the care for patients with genetic cardiomyopathies. Dedicated cardiologists (including paediatric cardiologists) trained in cardiogenetics are essential for the recognition of clinical clues that are unique to genetic forms of the disease, to ensure the correct diagnosis in patients and to initiate evolving therapies for inherited cardiomyopathies. In 2026, the VISUALIZE-DCM trial was started, funded by Job's Veni grant: this involves the use of a newly developed form of echocardiography to detect genetic heart disease at an early stage [1]. This is a perfect example of the close collaboration between the departments of Cardiology and Clinical Genetics to achieve clinical innovation.

In addition to inherited cardiomyopathies, Maastricht UMC+ offers specialised care for patients with inherited arrhythmia syndromes [2, 3], for which a new multidisciplinary outpatient clinic was started in 2026. This outpatient clinic focusses on the clinical interpretation of variants of unknown significance (VUS; i.e., genetic variants for which there is currently insufficient evidence to classify them as causing the disease) in genes associated with channelopathies, as well as on evaluating bereaved family members of a sudden death victim suspicious for inherited heart disease. Genetic causes of sudden cardiac death and strategies to improve clinical diagnostics in sudden cardiac death victims and their bereaved family members constitute a growing field of research [4]. In this clinic, Saskia evaluates patients jointly with cardiologists Rachel ter Bekke and Paul Volders, creating a seamless pathway from diagnosis to personalised treatment and family screening. Additionally, complex arrhythmia

patients are discussed at weekly multidisciplinary meetings, which also include molecular geneticists, for further evaluation of more complex or unclear genetic test results.

Despite significant advances in our knowledge and genetic technologies, many genetic findings remain unexplained. "Genetics is a clinical field in which much remains unknown. It is not uncommon to identify variants that have never been described before." Through close collaboration with Martijn Hoes and researchers at CARIM+HVC, novel genetic variants can be studied using patient-derived induced pluripotent stem cell (iPSC) cardiomyocytes. This unique translational approach helps to establish diagnoses, improve risk stratification, and provide clarity for patients and their families.

FROM GENETIC DIAGNOSIS TO CLINICAL ACTION

One of the most significant developments in recent years has been the growing clinical impact of genetic testing. Increasingly, identification of a genetic and likely pathogenic variant directly influences patient management, preventive strategies, and family care. This evolution has three important consequences:

- Demand for genetic testing continues to increase;
- Healthcare professionals must have greater knowledge and awareness of genetics;
- Multidisciplinary academic collaboration is becoming increasingly essential.

To meet these challenges, Maastricht UMC+ continues to pioneer new models of care. As the first centre in the Netherlands, Maastricht UMC+ introduced the DNA-first approach, led by Ingrid, enabling cardiologists to request genetic testing for patients with cardiomyopathies, with-

HIGHLIGHT DIVISION HEART

out requiring an initial referral to the Department of Clinical Genetics. This way, patients will get a genetic diagnosis sooner. All results remain subject to expert review by clinical geneticists through multidisciplinary case discussions, ensuring both efficiency and quality. This innovative healthcare model reduces waiting times for patients and facilitates broader implementation of genetic testing throughout regional hospitals. Moreover, patients identified with an inherited heart disease will be seen with priority, to enable swift genetic counselling and start cascade genetic screening to identify other family members at risk.

In addition, clinical geneticists can make use of local, but also peripheral, outpatient genetic clinics for tailored genetic and family counselling of clinically established diagnoses, including congenital heart disease and connective tissue disorders. These peripheral outpatient clinics, combined with teaching to local cardiologists, enable the sharing of cardiogenetic knowledge and make cardiogenetic testing more accessible to all patients, not only those requiring academic clinical care. Beyond clinical practice, Job plays leading roles within the European Society of Cardiology (ESC), helping to develop international guidance on how genetics should be integrated into cardiovascular care (Figure 1) [5, 6]. As an ECZA and full member of the ERN Guard-Heart, there are also multiple national and international collaborations with other centres of expertise to provide the best possible patient care.

EXPANDING REPRODUCTIVE OPTIONS THROUGH PREIMPLANTATION GENETIC TESTING

Maastricht UMC+ occupies a unique position in the Netherlands as the only centre authorised to perform preimplantation genetic testing (PGT). This reproductive technology

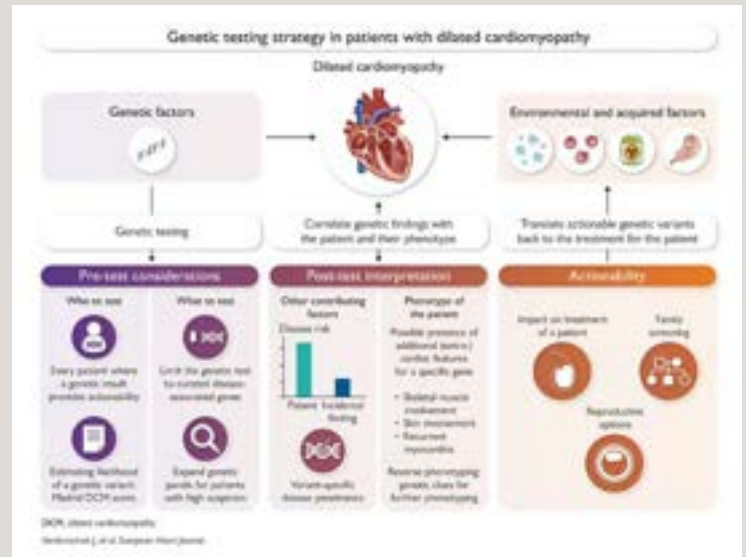
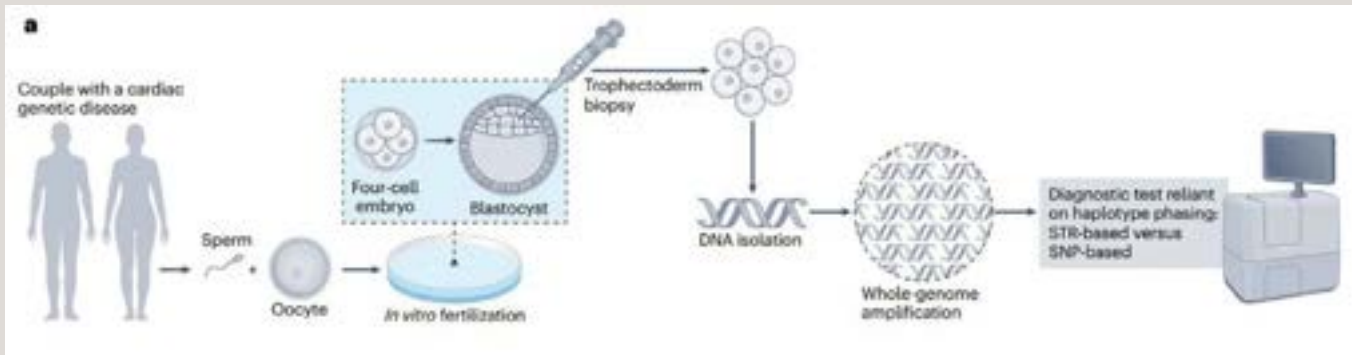


FIGURE 1 Genetic testing in patients with dilated cardiomyopathy. Central illustration of the European consensus statement on genetic testing in patients with dilated cardiomyopathy, showing the impact and considerations of genetic test results [6].

enables individuals with inherited genetic diseases to prevent transmission of disease-causing variants to future generations through embryo selection (Figure 2). Since 2025, several inherited cardiomyopathies have been formally recognised as indications for PGT, significantly expanding reproductive options for affected families [7]. Job has played an important role in making PGT for inherited cardiovascular diseases more accessible [8], and is currently also leading the development of a European consensus statement on behalf of eight professional societies on the current state and future of PGT for inherited cardiovascular diseases.

HIGHLIGHT DIVISION HEART



BUILDING THE FOUNDATIONS FOR FUTURE THERAPIES

Since inherited cardiac diseases are rare, collecting high-quality clinical data and biological samples is essential for advancing scientific knowledge and developing future therapies. As a recognised centre of expertise, Maastricht UMC+ carries a responsibility not only to deliver care, but also to generate knowledge that benefits patients worldwide. All patients with inherited cardiac diseases are included in the multidisciplinary Cardiac Monitoring Platform (mCMP) registry, developed within the Department of Cardiology [9]. This comprehensive database serves as a valuable resource for international collaborations, facilitates translational research, and creates opportunities to identify and recruit patients for future clinical trials, including emerging gene therapy programmes. This registry has formed the basis for >15 PhD trajectories, and continues to attract talented young scientists to work with the data.

FIGURE 2 The steps of preimplantation genetic testing (PGT). After an IVF trajectory, biopsies of the embryo are taken at the blastocyst stage for genetic testing on the familial variant. Only those embryos without the familial variant are transferred for a potential pregnancy.

SHAPING THE FUTURE OF PRECISION CARDIOVASCULAR MEDICINE

Genetics is inseparably linked to cardiovascular health. As genetic technologies become increasingly powerful and clinically actionable, the ability to accurately interpret and translate genetic information into patient care will play a defining role in the future of cardiovascular medicine. Through clinical excellence, scientific innovation, and international collaboration, the cardiogenetics team at Maastricht UMC+ continues to establish itself as a leading centre of excellence, dedicated to improving the lives of patients and families affected by inherited cardiovascular diseases.

HIGHLIGHT DIVISION HEART

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DEPARTMENT OF VASCULAR SURGERY

A portrait of a woman with curly red hair, wearing glasses and a beige cardigan over a blue shirt. She is smiling and looking at the camera. The background is a blurred blue and white pattern with circular motifs.

INTERVIEW
**ELISA
D'ALESSANDRO**

Turning back time

Elisa D'Alessandro feels lucky. She knew what she wanted to do after university: pursue a research career. "Learning has always been fun for me, and I was passionate about molecular biology." The only puzzle so far has been where to do this, since the best opportunities were not in her home region, the south of Italy. "I see my parents grow older through my phone screen. You don't realise that when you start a PhD in Maastricht at age 24." Hence, she was very happy to have been able to share some of her recent success moments in the presence of her parents.

It was through an Italian postdoc in Bristol, where Elisa D'Alessandro did an internship for her Master's thesis, that she heard about the many attractive PhD opportunities in the Netherlands. She managed to secure the first one she applied for, at Maastricht University's Department of Physiology. After getting used to the rather direct communication styles in the Netherlands, and the lack of hierarchy ("I remember the moment when I first sent an e-mail to my professor, addressing him by his first name"), she had a lot of fun. "My PhD project was a bit unconventional. I worked closely together with a colleague in a huge project, where he focussed on the electrophysiological aspects of atrial fibrillation and I on molecular biology aspects, including blood coagulation, thrombosis and stroke. In the end we produced a shared booklet and defended our theses on the same day." Of course, when Covid struck and they had to take care of 'their' goats in the animal facility, that was a bit stressful, but she mainly remembers the support they received from their supervisors and CARIM.

WHERE TO WORK?

During the last part of her PhD project, she started to wonder where she would pursue her research career. "I left home when I was 19 to study in Tuscany, and I was 24 when I started my PhD in Maastricht. I wanted to have the abroad experience, and in my home region, opportunities were not that great. But I didn't realise that when you turn 30, you are really grown up, and your parents ... grow old. Research opportunities in Italy were mainly in the north, so I would have to leave an environment that I loved and a research line in which I could see some growth, and still be twelve hours away from them." She decided to stay in Maastricht, and her parents supported her.

CURIOSITY-DRIVEN

After three years of working as a postdoc at the Department of Physiology, where she learned more about the different aspects of adipose tissue and how it influences the functioning of the heart, she decided to go after what she was really curious about. She wanted to combine her recently obtained knowledge with her original topic: atrial fibrillation (AF). She wrote a project proposal for a Dekker Postdoc grant of the Dutch Heart Foundation worth 300,000 euros, which was granted at the second attempt. "I remember that I was with my parents when I received the invitation for the interview by phone. Preparing for that was quite intense, but I got help from my supervisor, the department, and from the CARIM Research Council. It was really helpful to practise with people outside my field of expertise, since the review committee also consists of experts from different fields." On the day of the selection meeting, the committee turned out to be "very friendly" and Elisa left the room "happy and excited." "I even used some humour, at least I recall them laughing at a certain point and I think it was not because I said something stupid."

MODEST FAMILY

A few months later, it was already 2026, she also received the 2026 Anna Maria van Schurman Stipendium worth 100,000 euros, which CARIM annually grants to a promising female researcher. This was also the second of her attempts that was successful. She knew about a week before the Anna Maria van Schurman Symposium that the grant would be awarded to her, and at that moment her parents were in the Netherlands visiting. "So I said to them upfront: 'They're gonna give a prize, but don't have high expectations.' I wanted to see their faces when I would bring it home. So, when my parents saw the beautiful statue and diploma I came home with, my dad said: 'Oh, Elisa, how nice that they

THEY'RE GONNA GIVE A PRIZE, BUT DON'T HAVE HIGH EXPECTATIONS

gave you this for participating!” She laughs at the memory. “It was so nice to see how happy they were when they understood that I had won. Especially because they did a lot to get me where I am now. I’m from a modest family and it was quite a financial effort to let me go to university. I’m glad I can make them happy this way.”

LET’S TALK RESEARCH

So let’s talk about research: what is she going to do with the two grants? Her main topic is AF, a progressive heart disease associated with changes in the atrial myocardium (the muscle tissue of the heart’s upper chambers). These molecular, cellular, electric and functional changes make the disease very complex and difficult to treat. “One of the aims of my research is to understand the mechanisms that drive the remodelling of the myocardium. I hope to find the key to slowing down its progression or even preventing it.” In the Dekker project, she focusses on the role of the fat around the heart and how it communicates with the atrial myocardium. “Due to factors such as ageing, the fat changes from protective to more inflammatory, and fibrotic, worsening the development of the disease.”

COMPLEX TECHNIQUES

She will study these changes in human fat tissue using spatial transcriptomics and mass spectrometry. Using these advanced and complex techniques, she will study the very heterogeneous atrial muscle, and how cells behave in relation to their environment. “With spatial transcriptomics, we can understand cell identity and observe how tissue may change over time, what cells may become fibrotic or inflammatory and how their surrounding environment can influence these processes. With spatial mass spectrometry we can see what the cells are actually doing at that moment. This allows us to study both the predicted changes and the current state of affairs of cells, in cardiac tissue from AF patients as well as healthy persons.” The huge data set she will generate will also specifically focus on the so-called PAR receptors, which are expressed in different cell types across our organs. “When they are activated, they can boost inflammation and fibrosis, so more remodelling of the myocardium.” Her hypothesis is that targeting PAR receptors might slow down some of the harmful processes in AF.

FUTURE IN MAASTRICHT

For the future, Elisa hopes she will continue doing the things she likes, leading her to the next steps in her career. This will hopefully be in Maastricht, as she bought a house here, together with her boyfriend who is from the region. Thanks to the Dekker grant she has secured a permanent position in the Department of Physiology at CARIM. "That's really nice and opens up a lot of opportunities. My life is here.

I play volleyball with a local team of mixed ages; they speak Limburgish, which I sometimes understand", she laughs. Scheduling time for these and other relaxing activities is the best tip she can give to colleagues for a fair work-life balance. "I also had moments when I thought: this is just a busy period, it will get better. But it doesn't. And despite the fact that you like what you do, and you get interesting results, you're still working all the time. So now I schedule in dedicated time for friends, sports and of course my partner. He plays a big role in my balance. Despite his demanding job, he supports me when I'm busy writing a grant proposal, from cooking to listening to me when I'm frustrated. And I search for opportunities to do the same for him when he's busy. So, success is never a solo effort; behind every person there is support, and it goes both ways."

Elisa D'Alessandro is a molecular biologist who studied at the University of Siena, Italy, and obtained her PhD at Maastricht University in 2022, on a thesis entitled: 'Atrial fibrillation and hypercoagulability: A two-way street with many side-roads.' She obtained a Dekker Postdoc grant from the Dutch Heart Foundation in 2025 and the CARIM Anna Maria van Schurman Stipendium in 2026. She works at the Department of Physiology of Maastricht University.

FOR DUTCH





DEPARTMENT OF ORGAN AND TISSUE TRANSPLANTATION

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BEYOND LAB & CLINIC: SOCIETAL OUTREACH

06

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CARIM+HVC actively engages in a variety of public outreach activities aimed at promoting health and advancing cardiovascular research. A key highlight is the **annual 'Walk, Cycle, and Swim with Your Doctor'** series, organised by the Health Foundation Limburg (HFL). These events bring together patients, healthcare professionals, and the general public to participate in physical activities while fostering informal, meaningful conversations with doctors. Proceeds from these events directly support cardiovascular research at Maastricht UMC+ and its partner hospitals.

The year 2025 saw several successful editions of these events:

- On 5 April, the second edition of '*Zwem met je Dokter*' (Swim with your Doctor) took place, where heart and vascular patients swam alongside vascular surgeons, general practitioners, and other healthcare professionals to raise funds for cardiovascular research.
- On 14 June, '*Fiets met je Dokter*' (Cycle with your Doctor) was organised for the third time, promoting a healthy and active lifestyle through a community cycling event. The ride brought together doctors, patients, and cycling enthusiasts in a fun and inspiring atmosphere.
- On 27 September, the 17th edition of '*Loop met je Dokter*' (Walk with your Doctor) took place, organised in partnership with Zuyderland MC, and regional general practitioners. This walking event offers patients a unique, informal setting where doctors lead by example, emphasising the importance of a healthy lifestyle. Several CARIM+HVC members served as team captains during the event.

Together, these initiatives raised a total of € 70 in 2025, which will fund cutting-edge cardiovascular research and contribute to improving patient outcomes. In addition, HFL annually organises the RESCAR congress for patients, their relatives, and other interested parties. Researchers and doctors from CARIM+HVC share the latest insights and developments in scientific research on cardiovascular diseases, bridging the gap between science and patient care.



On 14 February, the **HeART Ma'at project** (Dr **Rachel ter Bekke** and **Yesim Kaya**, Dept of Cardiology) in collaboration with Marres, House for Contemporary Culture in Maastricht organised the event 'How to Mend a Broken Heart?', combining art and science to explore heart health and emotional well-being. Visitors engaged in interactive installations and informal measurements, offering insights into the physical and emotional workings of the heart.



On 1 March, **Pulse Day** took place, encouraging people to take simple but effective steps to keep their hearts healthy, such as checking their pulse regularly and seeking medical advice when in doubt. Prof. **Dominik Linz** (Dept of Cardiology) set an ambitious goal in Maastricht: collecting more than 10,000 digital heartbeats. Pulse Day is an international awareness campaign by the European Heart Rhythm Association, highlighting that one in three people worldwide will develop a heart rhythm disorder. To increase awareness, an easy-to-use smartphone app allows users

to measure their heart rate and instantly see whether it is normal or irregular, in a fully anonymous way. The initiative also explores the broader potential of such apps for early detection of conditions like high blood pressure or diabetes. The initial target of 1,000 measurements was quickly surpassed, with over 10,000 digital heartbeats collected even before Pulse Day.



Heart failure is a serious but often underrecognised condition. During **National Heart Failure Week**, which took place from 14 to 19 April 2025, CARIM+HVC together with Deltaplan Heart Failure, raised awareness of the disease. In the Netherlands, over 241,000 people are living with heart failure, while an estimated 315,000 remain undiagnosed. The condition occurs when the heart can no longer pump blood effectively, leading to significant symptoms and reduced quality of life. Increasing awareness of its causes, symptoms, and risks is essential, as early recognition and treatment can significantly improve outcomes.

On the occasion of **World Sepsis Day** (13 September), staff from CARIM+HVC organised an awareness event in the main hall of Maastricht UMC+ on Friday, 12 September. Throughout the morning, visitors, patients, and staff were invited to learn more about sepsis, a life-threatening response to infection that requires rapid recognition and treatment. To raise awareness, the team distributed informational flyers, offered an interactive quiz, and provided opportunities for attendees to speak with experts, who answered questions and shared insights about this urgent medical condition. With at least 11 million deaths worldwide each year, sepsis remains one of the leading causes of mortality, yet public awareness is still limited. Through this initiative, CARIM+HVC aimed to improve understanding, promote early recognition of symptoms, and highlight the importance of timely treatment.



On 13 October, CARIM+HVC celebrated **World Thrombosis Day** for the twelfth time, focussing on awareness, education, and prevention of thrombosis. The programme featured expert lectures and an information market covering key aspects of thrombosis. Topics included atrial fibrillation as a hidden cause of stroke, anticoagulation therapy in older patients, and endovascular treatment of pulmonary

embolism. The event successfully informed and inspired attendees, highlighting the importance of early recognition and effective management of thrombosis.



BEYOND LAB & CLINIC: SOCIETAL OUTREACH

The first **technical staff (OBP) team-building event**, organised on 4 November, was a great success, bringing together more than 30 colleagues for an enjoyable and informal afternoon. Hosted at De Zwaan in Maastricht, the event combined a convivial lunch with updates on important OBP developments, including representation in the external

audit and the importance of keeping skills up to date in UMPLOYEE (UM's intranet). The afternoon continued with a lively bowling competition at Olround Bowling, with prizes awarded for the highest and lowest scores. A bowling pin, signed by all participants, provided a lasting memento of the event and a symbol of the future of OBP team building.





DEPARTMENT OF EPIDEMIOLOGY

INTERVIEW

A photograph of three women standing in front of a large, vibrant abstract painting. The painting features bold strokes of red, orange, yellow, blue, and white. The woman on the left is wearing a green and white striped polo shirt and black pants. The woman in the center is wearing a white sweater with a colorful floral pattern and black pants. The woman on the right is wearing a black long-sleeved shirt and black pants. All three women are smiling and looking towards the camera.

**NIENKE MESKES,
YVONNE HENSKENS
AND FLOOR
HEUBEL-MOENEN**

A serious bleeding problem for women

The detection of rare coagulation defects in women must and can be improved. That, briefly, is the mission of *'Bloedserieus'* (bloody serious), the project that received the 2025 Marja van Dieijen Award, worth 25,000 euros. A moderate sum for an ambitious project. "But we mainly see this as a recognition, both for this problem in women and for our group", says Yvonne Henskens. In a joint interview with Floor Heubel-Moenen and Nienke Meskes, she recounts the story behind the project.

One in five women with heavy menstrual bleeding has a coagulation defect, but on average it takes 11 years before this defect is diagnosed. General practitioners, but also gynaecologists, tend not to think immediately of a coagulation defect, as these are rare, and they usually prescribe oral contraceptives, with variable effects. The disorder not only creates restrictions in everyday life – women may be discharged from their job because they are too often absent from work, or women may forgo having children as they are afraid to discontinue the pill for fear of blood loss – it is also a dangerous disorder. “If you are unaware of having such a disease, a simple dental treatment may already be dangerous”, says internist-haematologist Floor Heubel-Moenen. Together with Yvonne Henskens (interim head of the Department of Clinical Chemistry) and PhD candidate Nienke Meskes, she is hoping to make a difference for these women.

FROM 0.6% TO 6%

The guideline issued by the Dutch College of General Practitioners (NHG) currently recommends doing three lab tests to detect a coagulation defect: platelet count, prothrombin time (PT) and activated partial thromboplastin time (aPTT). These lab tests, however, cannot detect the two most common coagulation defects: von Willebrand disease (VWD) and platelet function disorder (PFD). In a pilot study, Yvonne showed that adding the Platelet Function Analyser (PFA), which does screen for severe VWD or PFD, raises the percentage of coagulation defects found from 0.6% to 6%. In addition, thorough history-taking is important to decide whether a patient is eligible for further diagnostics or for referral. The ‘Bleeding Assessment Tool’ (BAT) has been used by internist-haematologists for ten years, but is not used in primary care (by GPs). Yvonne: “It’s a fairly long

questionnaire, so we will try to reduce the workload of GPs by asking women to complete the self-administered BAT. We’re hoping that the use of this questionnaire will lead to more targeted requests for lab tests, and allow women with a coagulation defect to be diagnosed sooner.”

VON WILLEBRAND DISEASE

The most common coagulation defect is von Willebrand disease. It is possible to determine the presence of von Willebrand factor in the blood, and the team intends to use the money from the Marja van Dieijen Award to do just that, in all blood samples of women for whom GPs have requested an analysis of their tendency to bleed. They hope that this will enable them to identify patients sooner with this most common coagulation defect. And if they can scientifically prove this, the recommendation might become that this factor should be routinely tested for. “But before you can recommend this, you first have to prove that this represents a useful addition to the chain of care, in other words that it’s cost-effective”, says Yvonne. “The only thing is: how can you express in money terms the impact on the life of a woman of 40 who has this disease without having been diagnosed with it?”

This impact is what motivates these three researchers. Floor: “It’s unacceptable that women get fired due to heavy menstrual bleeding, or are unable to have children because of this problem. If you dig deeper into the impact on their lives, the answers are sometimes shocking.” Nienke: “Some women regard the blood loss as normal, as it’s something their mother or grandmother also had. In addition, bleeding in women is still a taboo subject.” Yvonne adds: “The tendency is sometimes to regard it as something you just have and have to put up with, so you shouldn’t make a



fuss about it, even though there are numerous specific treatments for this target group, such as pills which reduce the amount of bleeding during menstruation. And once the diagnosis has been established, care providers can be alert to this, during childbirth or dental treatment.”

GUIDELINE DEVELOPMENT

At Maastricht UMC+, Nienke is working on the development of a national guideline for the analysis of bleeding tendency, and is investigating how the process of lab-testing can be further streamlined. She is looking at secondary and tertiary care (hospital and academic, specialist care) and is also collecting information about primary care (GPs). “Such a national guideline will hopefully also help to draw more attention to the problem.” Together with the NVHP, the Dutch patient organisation for people with bleeding disorders, Nienke Meskes is contributing to the publication of a set of questions and decision rules for general practitioners, developed through interviews with experts and haematologists. The guideline for secondary care should be completed by 2027, and GPs will also be asked to comment on it. Yvonne: “In the Maastricht-Heuvelland district, we have already been collaborating with a group of GPs for some time, and we’re already applying more extensive diagnostics than those prescribed in the NHG guidelines. And staff at Maastricht UMC+’s ‘stadspoli’ (a community-based specialist outpatient clinic) includes GPs and a gynaecologist who are involved in our project. We’re hoping to start experimenting with tablet computers in the waiting room, on which the women can complete the self-administered BAT. This will provide us with research data, in order to validate the self-BAT in primary care. That’s another element we can fund with the award money.”

FROM SMALL TO BIG

Floor summarises: “We want to extend secondary care into primary care, so that we’ll really be able to collaborate closely. We’re doing the same for instance with the NVHP, the association of people with a hereditary coagulation defect. They are going to put the self-administered BAT on their website. And thanks to our contacts with the college of GPs (NHG), the questionnaire will also be made available on the *thuisarts.nl* site.” These are the kind of successes the team likes to celebrate, because as Vincent van Gogh once said: Doing small things well is a step towards doing great things better.

Prof. Yvonne Henskens has been a professor of clinical chemistry since 2020 and is currently interim head of the central diagnostic laboratory at Maastricht UMC+, where she has been working since 2003. She studied biochemistry and toxicology at Wageningen University.

Dr Floor Heubel-Moenen is an internist-haematologist at Maastricht UMC+, where she also completed her specialist training in 2017. In 2022, she obtained her doctorate under the supervision of Prof. Yvonne Henskens and others, with a PhD thesis entitled ‘Diagnostics and Mechanisms of Hemostasis in patients with mild bleeding disorders and thrombocytopenia’. In addition, she is leading a national study into patients with a bleeding disorder of unknown cause, the BDUC-iN study.

Nienke Meskes studied health sciences at VU Amsterdam, followed by a Master’s degree in biomedical sciences at Maastricht. Since September 2024, she has been engaged in a PhD project at Maastricht University, supervised by Dr Floor Heubel-Moenen, Prof. Yvonne Henskens and Prof. Erik Beckers.





DEPARTMENT OF VASCULAR INTERNAL MEDICINE

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FACTS AND FIGURES

07

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CARIM FUNDING AND EXPENDITURE (K€) 2025

FUNDING



10,713	1,118	12,217	2,777
DIRECT FUNDING STRUCTURAL	DIRECT FUNDING SPECIFIC PROGRAMMES	THIRD PARTY FUNDING (EU, CHARITY, INDUSTRY)	RESEARCH FUNDS (NWO, ZONMW)
11,831	14,994		
DIRECT FUNDING TOTAL	EXTERNAL FUNDING TOTAL		
26,825			
TOTAL FUNDING			

EXPENDITURE



17,710	5,988
PERSONNEL COSTS	OTHER COSTS
23,698	
TOTAL EXPENDITURE	

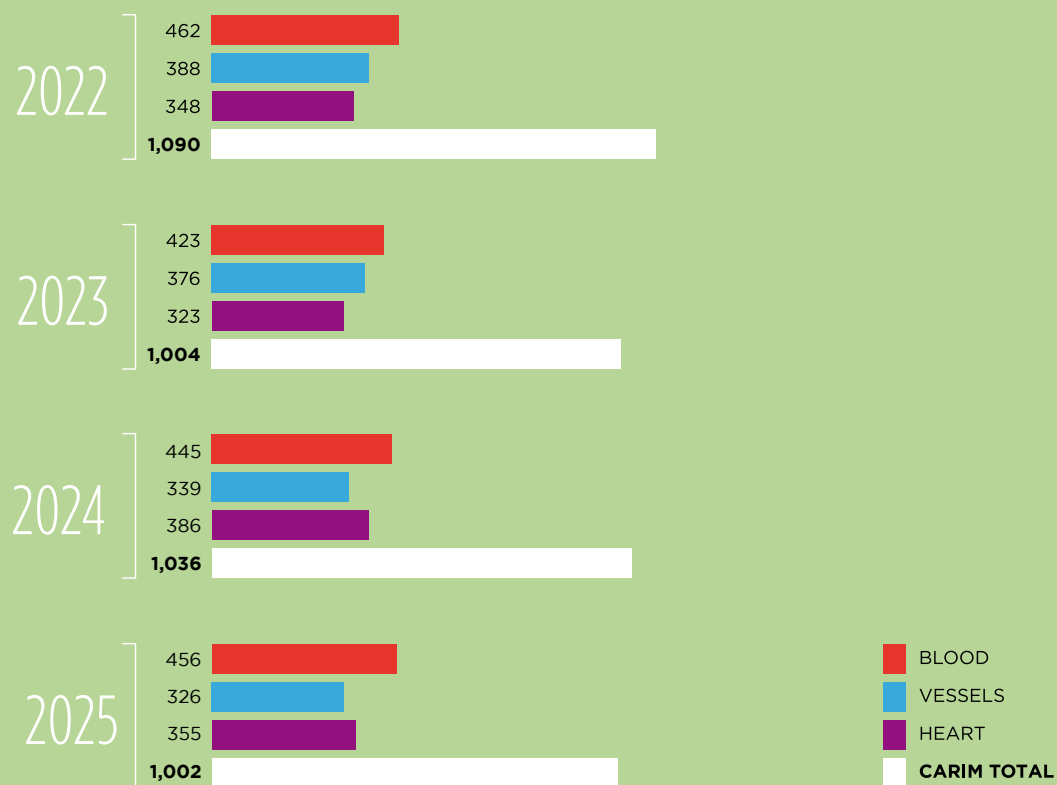
RESULT



3,127

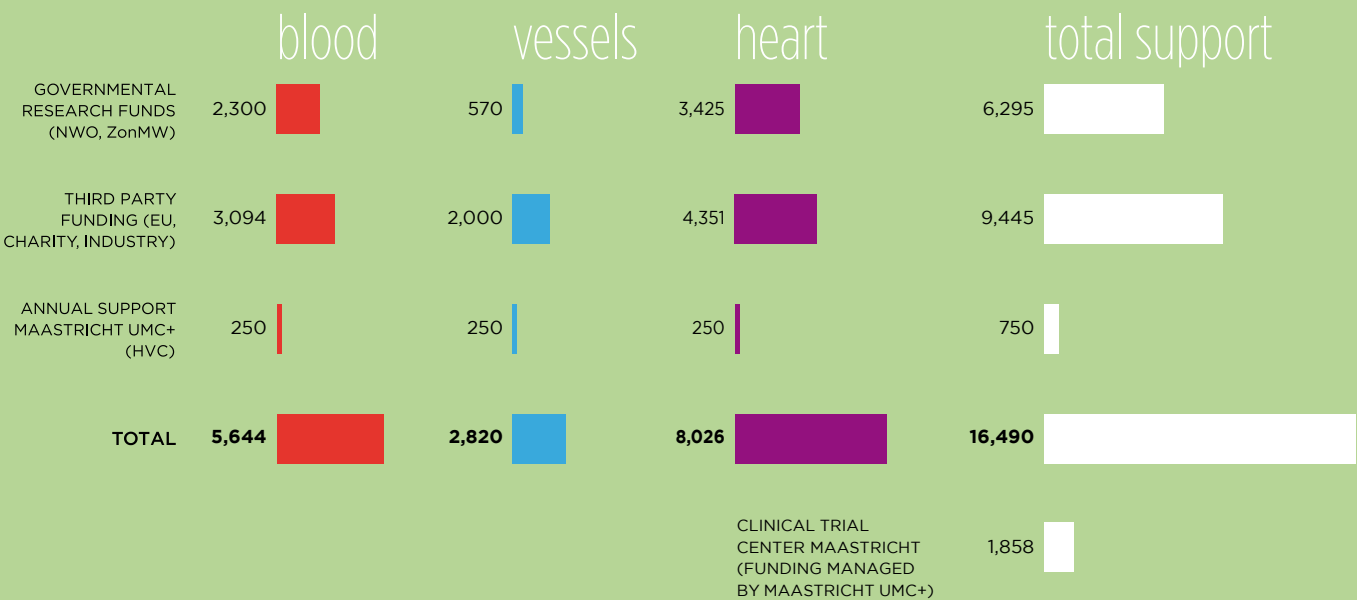
RESEARCH OUTPUT IN 2025

SCI JOURNAL ARTICLES

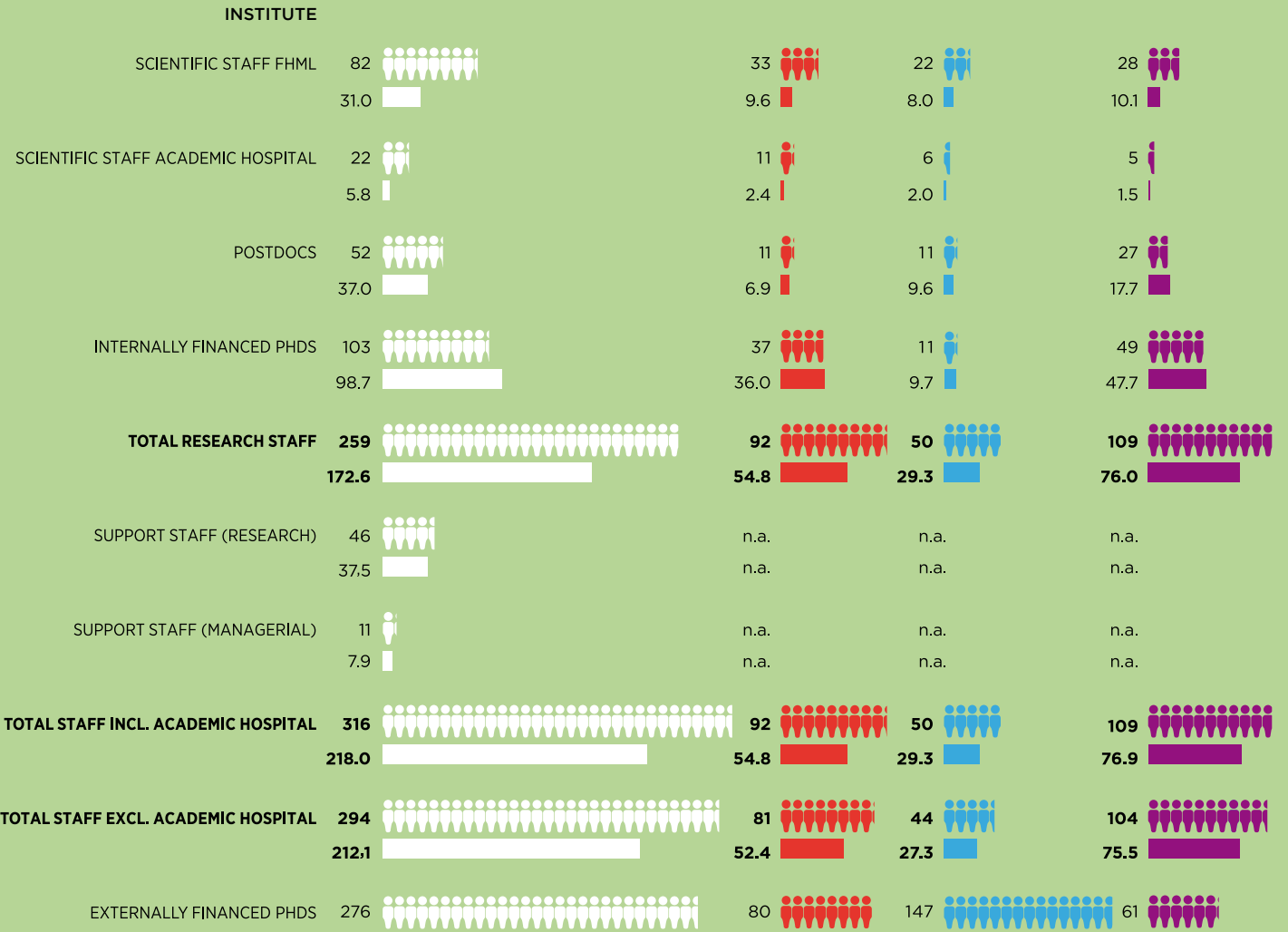


Note: the sum of publications in the divisions exceeds the total number of publications at Institutional level due to double counting of publications with authors from different divisions.

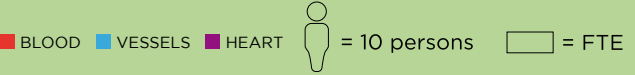
NEW CONTRACTS AND GRANTS (K€) AWARDED IN 2025



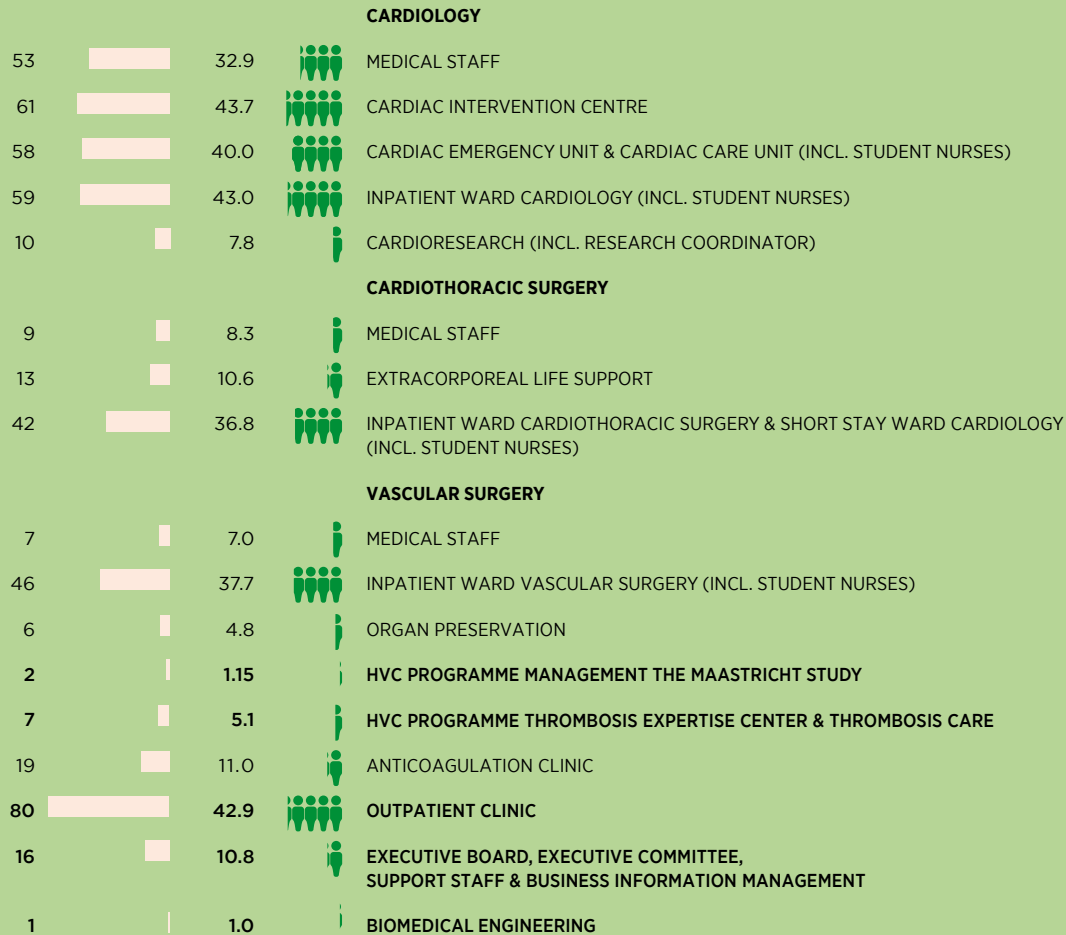
CARIM STAFF 2025



Note: the sum of staff in the divisions does not add up to the number at institute level due to double affiliations and separately appointed institute-central staff



HVC STAFF 2025



Note: This overview excludes AIOs, ANIOs, and staff not employed directly by Maastricht UMC+

 = 10 persons  = FTE





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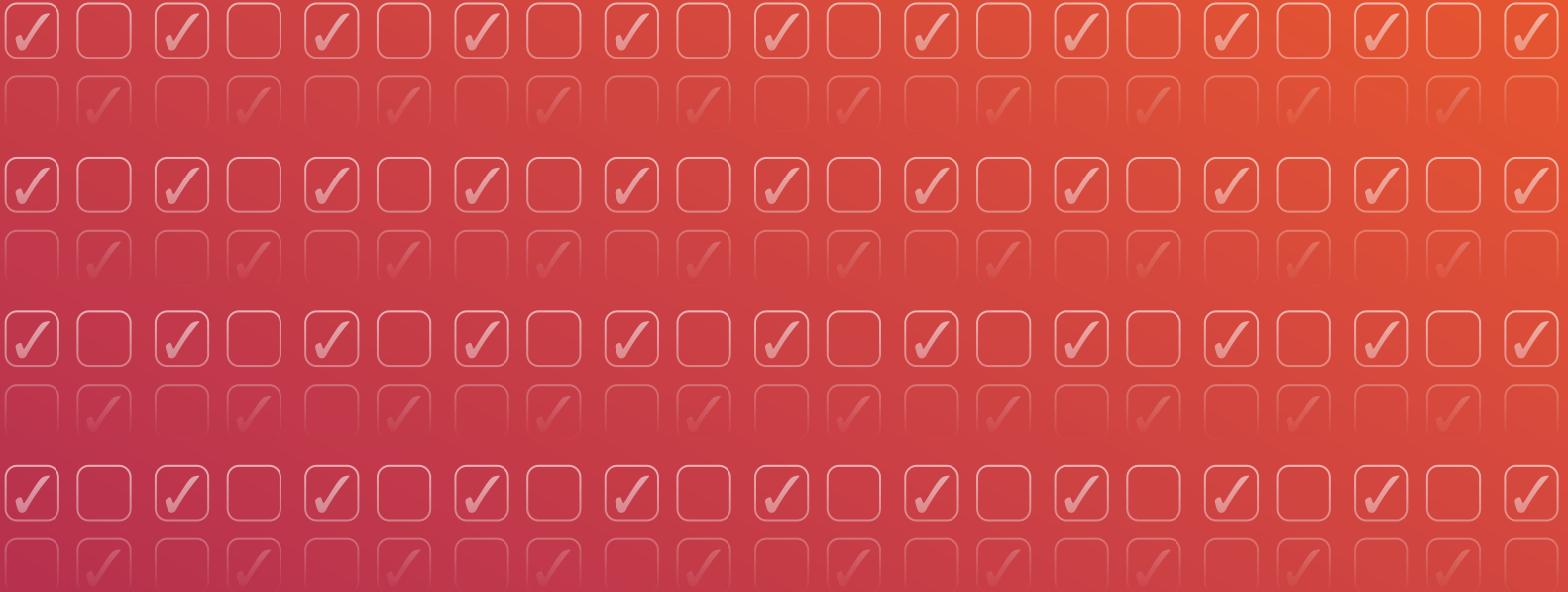
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