Vol 33 ISSUE 3/24 • September 2024

EUROPEAN HOSPITAL

THE EUROPEAN FORUM FOR THOSE IN THE BUSINESS OF MAKING HEALTHCARE WORK

Insights from the German senology congress

The future of breast cancer therapy: how will we treat women in 2034?

The year: 2034. Breast cancer patients benefit from perfectly personalised diagnostics and therapies. The tedium of follow-up treatments is a thing of the past, thanks to AI, augmented reality and robotics. Just a tale from the realm of science fiction, or could this soon be clinical reality? At the annual meeting of the German Senologic Society, Prof Dr Marc Thill from the Agaplesion Markus Hospital in Frankfurt cast a glance into the crystal ball, exploring the potential of new technologies, but also pointing out bottlenecks in diagnostics and professional personnel.

© greenbutterfly – stock.adobe.com

The trend is clearly moving towards further streamlining treatment pathways and de-escalating surgical therapies, the expert noted. 'Of course, our patients benefit from not having so many appointments and having fewer procedures performed on them.' For example, a reduced number of pre- and post-treatments minimizes the risk of cosmetically poorer results and surgery-related complications such as infections. Thill is therefore convinced that this goal of streamlining will lead to the outpatientisation of breast cancer treatment – a development that is already well advanced in countries such as UK and Denmark.

The establishment of non-radioactive tracers for labelling sentinel lymph nodes (SLN), such as indocyanine green (ICG) and superparamagnetic iron oxide (SPIO), will also contribute to streamlining the processes, the expert predicted. These substances offer a detection rate on par with radiotracers, but without involvement of nuclear medicine. In the case of ICG, not even a preparation appointment is required to administer the tracer, explained Thill – it is simply given ten minutes before the operation.

3D-printing, VR surgeries and more: what does the future hold?

In Germany, radioactive markers such as technetium-99m (99mTc) are used for the majority of interventions with SLN labelling. However, their availability is by no means guaranteed, the expert remarked – only few reactors produce these markers, and an outage would suffice to cripple the supply.

The number of patient appointments can also be reduced by using probe-based marking procedures, skipping the intermediate step of wire or clip localisation. In the future, the treatment pathway could be streamlined even further, Thill predicted: a new procedure from US manufacturer Cairn Surgical uses personalised, 3D-printed breast caps with integrated wire guiding ports, meaning that preoperative marking can be completely dispensed with.

This is taken even further in approaches based on virtual reality (VR), in which the operator has the position of the lesions in the breast and other information from various imaging modalities in view via a heads-up-display. Thill, who had the opportunity to try out one such VR procedure at the annual meeting of the American Society of Breast Surgeons (ASBrS), was fascinated by the technology. 'However, we probably won't be quite there yet within the next ten years,' he said.

The expert also expects progress in the field of ultrasound imaging for the intraoperative localisation of lesions: For him, the inclusion of the technique into recent guidelines reflects the added diagnostic value of sonography – as long as the equipment is adequate, and the diagnostician has appropriate expertise. In this context, Thill pointed to a new generation of "hockey stick" probes, which serve as a technical advance to facilitate diagnosis.

Predicting therapy response with AI: 'Freaky, but it works'

Optical coherence tomography (OCT) – known mainly for its use in ophthalmology – is another imaging technique that is showing promise for senology. Using OCT, it is possible to distinguish subtle differences in tissue, for example to detect tumour residues after surgery. Current clinical studies are already exploring the combination of OCT with AI and machine learning methods for diagnostic support. AI support is also already in the wings for analysing pathology tissue scans or being integrated into handheld MRI systems.

In the future, however, AI will probably be capable of much more, Thill anticipates: machine learning could predict which patients will respond well enough to chemotherapy not to require any surgery at all. Taking this one step further is a new approach from US company SimBioSys: their algorithm combines biopsy results, various imaging and other clinical parameters to create a 4D model, which uses biophysical simulations to predict which patient will respond to which therapy. 'It's really freaky, but it works,' said the expert, with regard to initial results from large cohort studies.

Robot helpers, supporting scaffolds, and staff shortage

Thill pointed to two further promising techniques that are currently experiencing a number of challenges: robotic assistance could improve the results of nipple-sparing mastectomies (RNSM). However, the procedure currently has too many weaknesses, which means that it will probably take a while before entering routine clinical practice.

The expert also looked with great interest towards implant-free breast reconstruction using lipotransfer. This involves "flooding" a surrounding scaffold structure with the body's own fat to create a biocompatible replacement. In contrast to conventional procedures, this would ideally require only one operation. However, Thill reported that progress in this technique apparently has come to a standstill for the time being.

Finally, the expert addressed a future topic which is already clearly relevant today: 'Please be kind to our employees, because they are currently much harder to come by than patients are.' This tongue-in-cheek appeal was of course in reference to the increasing shortage of skilled labour, which is also affecting the field of senology. 'We have to take care of our trainees, because otherwise we will lose quality and jeopardise the provision of care,' Thill concluded. ■

Article: Wolfgang Behrends

CONTENTS

Professional perspectives

Theranostics: A career opportunity for Nuclear Medicine Technologists

Theranostics radiophamaceutical drug treatments are expected to revitalize interest in nuclear medicine as an innovating imaging technology. Theranostics also offer new opportunities for nuclear technologists. But they need to prepare and act now to become an advanced clinical practitioner (ACP) in radionuclide therapy, attendees at the 2024 annual meeting of the Society of Nuclear Medicine and Molecular Imaging (SNMMI) held in June in Toronto, Ontario were advised.

In a presentation entitled 'What's Next for Technologists?', Luísa Roldão Pereira, an ACP in Nuclear Medical Therapies at Maidstone and Tunbridge Wells NHS Trust in the United Kingdom (UK), urged nuclear medicine technologists to step outside their comfort zone, educate themselves and take on additional responsibilities. Pereira works in a large, acute hospital trust in southeast England serving a population of about 760,000. Its cancer centre provides specialist services to about 1.9 million people living in Kent, Medway, and East Sussex.

'The position of ACP is being established in the UK and offers opportunities in research and clinical management for nuclear technologists,' said Pereira. 'Advanced level practice is not a doctor or medical physicist substitute. It is a hybrid approach between nursing, allied health care professionals, and medicine to meet patient needs to provide a range of additional value and benefits. It complements and supplements the care that a multi-professional team can deliver.'

A deep dive into the complexity of patient cases

She pointed out that technologists have not historically had many opportunities for advancement if they wish to still interact with patients. Traditionally, after starting as a technologist, they may progress to senior technologist level, eventually become a department manager, and/or leave a clinical position to work in industry.

'Current demand exceeds capacity for ACPs,' she explained. 'It is an excellent time to bring research into our work, and to take a more proactive role with respect to our knowledge of nuclear medicine. In addition to volunteering to participate in clinical trials, we can help implement new guidance and protocols, work on service improvement committees, and become subject matter experts in nuclear medicine.'

ACPs who are nuclear technologists are "naturals" to have personal in-depth conversations with patients. Patients may be confused about their treatment, their stage of disease, and how they will be impacted. They may have no one to openly talk to about their treatment or the long-term implications of having cancer. The technologist can proactively probe and act on concerns, as well as ask or alert a clinical colleague to have these difficult conversations.

'Don't assume that one patient is like another. A patient with bone metastases requiring six radium injections may be a more complex patient than initially appears,' cautioned Pereira. 'They may have a bowel condition that interferes with excretion routes. They may be increasingly experiencing difficulties in pain management, or have comorbidities that can be impacted by cancer therapy. An ACP delves into the potential complications, alerts the care team of potentially overlooked needs, and works collaboratively to address them.'

Details matter

It's important to learn a patient's profile and be confident in risk assessment, finding out what matters to the patient and consider practicalities: How do they get home after a treatment? Will they be accompanied by family member, are they planning on using public transport or taking a taxi, and if the latter, are they physically able to do so unaided after treatment? Is the patient independent in daily life? Do they need personal assistance? What are their home circumstances? Are there children at home? Even details such as the number of toilets at home may be important. What is going to be done about decontamination of a bathroom at home – and at the workplace, if the patient is still working?

An ACP needs to make physical, psychological, and social assessments each treatment cycle. If clinical red flags of deterioration become apparent, the ACP should alert the wider patient's care team. This is especially important in cases when an oncologist is remotely located.

'If a patient needs hospital admission following radionuclide treatment, the ACP should review radiation safety practicalities with hospital staff. Sometimes we only consider a "standard patient", but in reality, we must think about the practicalities of the inpatient's needs, such as a private room set up to minimize decontamination clean up, handling of laundry, waste management, feasibility of visitors, and unique to patient issues such as decontamination of dialysis equipment,' said Pereira.

'Theranostics is on our doorstep'

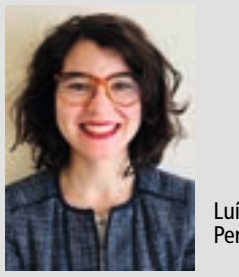
She added, 'You should check on response to therapy on a personal level, too. Make a follow-up call to see how the patient and the family are coping. Is the patient experiencing toxicities, and do these need additional clinical management? A personal telephone conversation is also an opportunity to reinforce compliance by reminding the patient of radiation protection requirements.'

'In the role of ACP, questions to ask ourselves include: Are we doing enough and providing the best care that we possibly can? Are we struggling with other professions' overprotective attitude? Are we hiding behind our professional barriers? We should never lose sight of the main goal – exceptional patient care,' she said.

Nuclear medicine technologists who wish to become an ACP also need to be aware about professional insurance and should learn about liability and statutory regulations. They need to spend time with leadership teams, learn about and offer to participate in studies and in department and/or hospital improvement and innovation projects.

'What is next for nuclear technologists is not next, it is now. Theranostics is on our doorstep. It represents a huge opportunity for career development. But if we don't prepare for this role, another healthcare professional will,' cautioned Pereira. ■

Article: Cynthia E. Keen



Luísa Roldão Pereira

Luísa Roldão Pereira, based in the United Kingdom, is currently an Advanced Practice Trust Lead at Maidstone and Tunbridge Wells NHS Trust, bringing experience from previous roles at Maidstone and Tunbridge Wells NHS Trust, European Association of Nuclear Medicine Technologists Committee and NHS England. She takes on roles in the training and equivalence assessment of Nuclear Medicine Technologists, through the Institute of Physics and Engineering applied to Medicine, and the in the Register of Clinical Technologists. She also has a keen interest for Quality and Audit, participating in external assessments and inspections.

Prostate cancer: benefits of therapy deescalation

Two reduced dose radiopharmaceutical therapy approaches for advanced stage metastatic castrate-resistant prostate cancer have been shown to be just as effective as the standard dose, according to new research now published in the Journal of Nuclear Medicine.

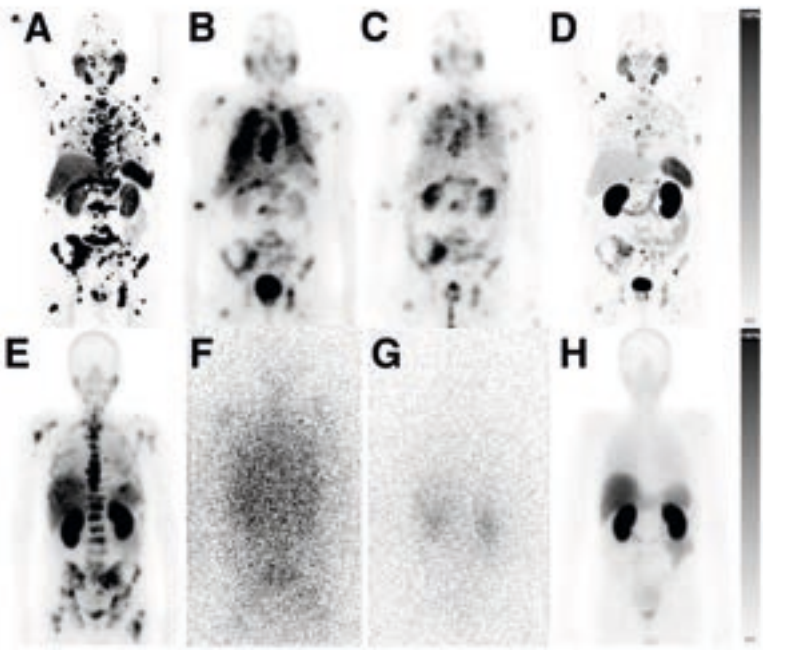
Treatment with deescalated ^{225}Ac-PSMA-617 or a cocktail therapy of ^{177}Lu/^{225}Ac-PSMA-617 resulted in similar median overall survival and prostate specific antigen (PSA) response rates as the standard ^{225}Ac-PSMA-617 dose and was better-tolerated among patients.

The standard dose for ^{225}Ac-PSMA targeted radiopharmaceutical alpha-therapy is 100 kBq per kilogram of body weight or an approximation of eight MBq. After multiple treatment cycles of this dose, salivary gland toxicity often increases and patients experience dry mouth. For some patients this impact on their quality of life causes them to discontinue treatment. 'Preliminary data from other studies has shown that reduced doses of PSMA treatment result in lower rates of dry mouth while still maintaining promising anti-tumour activity,' said Hendrik Rathke, MD, from the Department of Nuclear Medicine at Heidelberg University Hospital, Germany. 'In our study we aimed to determine the tolerability, PSA response rate, and overall survival observed in patients who received a regimen of less than 100 kBq of ^{225}Ac-PSMA or an ^{177}Lu/^{225}Ac-PSMA-617 cocktail therapy.'

Researchers conducted a retrospective analysis of 233 patients who were treated with ^{225}Ac-PSMA; 104 received a median of six MBq of ^{225}Ac-PSMA monotherapy and 129 received an ^{177}Lu/^{225}Ac-PSMA-617 cocktail therapy.

Of the patients who received ^{225}Ac-PSMA monotherapy, 55 patients (53%) presented with a best PSA response of at least 50%. In the ^{177}Lu/^{225}Ac-PSMA-617 cocktail group, a best PSA response of at least 50% was observed in 74 patients (57%). The median overall survival was nine months in the ^{225}Ac-PSMA monotherapy and 15 months in the ^{177}Lu/^{225}Ac-PSMA-617 cocktail group. Adjusted for prognostic baseline characteristics, the efficacy of both regimens was not significantly different. ■

Source: Society of Nuclear Medicine and Molecular Imaging



©SNMMI; from: Rathke H et al, Journal of Nuclear Medicine 2024

Interdisciplinary diagnostics

Crossing the radiology-pathology boundary

© Alex Boyd – unsplash.com (editing: EH/Behrends)

In diagnostics, there used to be a hard divide between radiology and pathology, where methods were largely considered incompatible with one another. However, to pave the way for next-generation diagnosis, Professor Regina Beets-Tan urged both sides to come out from their trenches and appreciate the synergies the fields have to offer. In her presentation at the European Congress of Radiology (ECR) in Vienna, the Chair of the Radiology Department at the Netherlands Cancer Institute in Amsterdam explained how imaging and pathology complement each other in the diagnostic pathway, becoming more than the sum of the parts.

Prof Regina Beets-Tan

Professor Regina Beets-Tan is Past President of the European Society of Radiology (ESR) and Chair Department of Radiology at the Netherlands Cancer Institute, Amsterdam.

True to the theme of "building bridges" – the ECR 2022 congress motto, where she served as president – Beets-Tan urged radiologists to attain a better knowledge of pathology. At a time when artificial intelligence (AI) is becoming increasingly proficient in analysing patterns in diagnostic images to detect disease and measure lesions, any radiologists who purely defines his working role over these tasks will soon find themselves at risk of being obsolete, she cautioned. Instead, the added value provided by radiologists will be in synthesizing and integrating imaging and pathology information, together with other biomarkers, to feed predictive models for clinical decision-making.

Seeing beyond the confines of radiology

To make a successful collaboration work, Beets-Tan said it is crucial to be aware of the respective strengths and weaknesses of radiology and pathology: For example, while MRI alone might not be reliable for identifying risk factors in rectal cancer,? it is a valuable tool to discern between low- and high-risk patient populations for local recurrence.? 'This is information the clinical team can use,' the expert said, as it gives a good indication which patients have so-called "ugly tumours" and require more than just surgery. On the other hand, the additional insight can be used to spare patients with low-risk tumours from additional radio- or chemotherapy and its debilitating effects.

Including molecular risk profiles for certain genetic mutations further contributes to effectively determine which patient will respond to which treatment approach. 'This knowledge of the various biomarkers, including molecular markers, is relevant for any radiologist, as it will enhance their role as a valuable sparring partner in the multidisciplinary team,' the expert appealed. Biomarkers such as RAS (KRAS, NRAS) and BRAF V600E mutations or MSI/dMMR status are part of any standard cancer workup – and radiologists should be able to understand their significance, even though it is not part of their specialty, she urged.

Understand the markers and treatments to understand the image

This knowledge is especially relevant for radiologists, as it may help make sense of imaging results, Prof Beets-Tan said: For example, patients with the aforementioned mismatch repair-deficient (dMMR) colorectal cancer – which make up 5–10% of all CRC patients – will generally respond very well to immunotherapy. However, this is not reflected in the typical manner in diagnostic imaging, as cancerous masses may still show up on scans, even though the treatment is working.?

To drive home the synergistic potential between the disciplines, the expert talked about radiomics: 'Radiology can play a complementary role here. Oncologists have already successfully modelled and used CT radiomics to assess the level of tumour-infiltrating T cells in the micro-environment of a tumour.'? Current studies further explore these aspects, some even incorporating artificial intelligence to analyse CT results. 'But again, we have to work together – radiology and pathology – to integrate all biomarkers and feed accurate prediction models of outcome, that will be leveraged by an AI,' Beets-Tan looked ahead. ■

Article: Wolfgang Behrends

Transformative technology

Generative AI: More than a chatbot

'Computer, why did the doctor take that MRI scan of my leg? And what did it show?': Popularized by OpenAI's ChatGPT, generative artificial intelligence (AI) is already beginning to see practical applications in medical settings. The technology holds immense potential, with benefits for patients, clinicians, and even hospital administration, according to Shez Partovi, MD. We spoke with the Chief Innovation & Strategy Officer and Chief Business Leader of Enterprise Informatics at Philips about personalized medical information, hospital workflow optimization, digital clinical twins, and other plans the company has for generative AI in healthcare.


© Philips


Shez Partovi, MD

Shez Partovi, MD is Chief Innovation & Strategy Officer and Chief Business Leader of Enterprise Informatics at Royal Philips, where he drives cloud transformation and AI in healthcare. Previously, he spearheaded global business development efforts at Amazon Web Services.

Talking about how healthcare can benefit from this technology, Partovi does not seem afraid to set the bar high: 'The shift that generative AI will bring is nothing like anything that we have seen. It will be like the discovery of penicillin or insulin; it will be the most tectonic shift for healthcare that we will see in our lifetime.' Unlike predictive models, which rely on extensive datasets and meticulous training, generative AI finds associations between data points to generate new content, the expert explains. To harness this potential, Philips is developing several products based on the technology, some of which have already arrived in clinical practice.

'In the future, people will talk to their medical record'

Among these is a tool that rephrases physician's notes in a way that is easier to understand. Previous research has shown that medical information, even material intended for patients, is often too complex. 'The idea is that the AI translates this complicated medical terminology to simple high-school level English and other languages,' Partovi explains.

With its ability to quickly generate customized text, generative AI will take this approach even further, the expert predicts: 'In the future, people will talk to their medical record. They can ask the AI why their doctor performed an MRI scan on them, or why they were prescribed specific medication, and it will explain the medical indication in a way they can understand.' With planned market introduction later this year, this conversational access to a patient's medical record could be used to bridge the knowledge gap between doctors and patients, and help patients make informed decisions about medical procedures, Partovi is convinced.

A similar approach can be applied to provide physicians with relevant patient information, for example before consultations: 'Reviewing a patient's medical history can be very time-consuming. To mitigate this, the AI can quickly analyse the dataset and generate a summary which provides the physician with the relevant background information.' As a result, less time is spent on preparation, leaving more for the actual visit, Partovi argues. 'More and more medical data is generated for each patient, which can prove overwhelming for the clinicians. For a three-minute visit, the doctor may have to spend up to 20 minutes to look through the medical records. We want to use AI to reverse that ratio, so the doctor has more time for the patient.'

Finally, generative AI can contribute to more efficient workflows – both on department and hospital levels, Partovi points out. For example, at the beginning of their shift, the director of a hospital's emergency department could task the AI with generating a succinct overview of the situation – patient volume, staff attendance, even a prediction of upcoming workload changes – to be able to act and plan ahead. 'This, too, will take place as a conversation with the AI, which represents a digital twin of the hospital,' the expert describes, pointing out that the applications can benefit every member of the hospital team up to the administrative level.

Liquified data to enable comprehensive analyses

However, to exploit this potential, the existing data must be liquidated, made available to the AI, he continues: 'Almost every medical device is generating data, but most of this information is sitting inside silos, and the AI cannot make associations because it is all separate. We have therefore created a solution called Capsule, a platform to integrate all the medical device data. These can then be used by the AI for predictive and generative models.' ■

Article: Wolfgang Behrends

Deep Learning improves image quality, reduces radiation dose

DL reconstruction in paediatric imaging

Recent developments in deep learning techniques are enhancing clinical imaging quality and reducing radiation exposure for patients while also maintaining diagnostic accuracy. The latest AI component to clinical imaging – referred to as deep learning reconstruction (DLR) – is having a particular benefit in paediatric imaging, according to Dr Samuel Brady from Cincinnati Children's Hospital Medical Center, US.

Speaking during a series of webinars hosted by Canon Medical Systems Europe, providing in-depth insights into aspects of paediatric imaging, his presentation specifically focused on the impact of AI on CT image quality and dose.

Brady discussed advantages and limitations of FBP (filtered back projection) and IR (iterative reconstruction) algorithms for CT image reconstruction. He noted that while IR is good at removing spurious image noise and helps see body structures/organs clearer, it can soften structural and organ boundaries, leading to an image that may appear slightly blurry to the eye. However, DLR has demonstrated the ability to remove image noise while maintaining and sharp image and providing the 'potential to further reduce radiation dose to patients undergoing CT,' said Brady. As a result, the technique is increasingly preferred within paediatric imaging as it enables lower radiation dose, thus reducing risks for children where tissues are still developing and are more susceptible to radiation damage.

Increasing diagnostic confidence

The expert noted how CT reconstruction has undergone substantial changes, particularly with the ability of DLR to improve image quality and offer low-contrast detectability. Brady, who is Chief of the Clinical Medical Physics Section in the Medical Center's Department of Radiology, said AI for CT reconstruction enables cleaner, noise reduced and sharper images with a stronger edge definition than current IR algorithms. 'These improved images have been shown to increase diagnostic confidence for radiologist performance: they are able to see smaller, more subtle, structures with greater confidence – even at the lower radiation dose levels afforded by DLR.' The reduction of image noise – the statistical fluctuation in the reconstruction algorithm that overlays the image and can obscure the underlying anatomy – has been a major benefit, the expert pointed out. 'For the last 15 years, IR algorithms have reduced image noise in CT images, but at the cost of softening organ boundaries, giving the image a blurry, soft, and sometimes plastic look. That interferes with radiologist's ability to identify low-contrast objects, such as cancer or infections, in the image. DLR now removes the image noise while keeping object edges sharp.'

'A huge win for paediatric imaging'

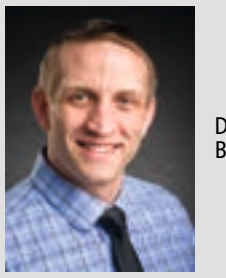
Historically, the only way to remove image noise in a CT image was to increase patient radiation exposure. But with DLR trained to differentiate between noise and anatomical structure, image noise can be removed without turning up the radiation dose, said Brady.

He pointed to Canon's proprietary DLR algorithm called "Advanced Intelligent Clear-IQ Engine (AiCE)" on CT platforms as advancing the field and particularly the new version of DLR, "Precise IQ Engine (PIQE)", designed to further increase object-edge sharpness. 'The ability to see small objects sharper and more conspicuous is a huge win for paediatric imaging, since children have smaller internal organs, vasculature, and other structures,' said Brady.

He said DLR is making a difference by enabling low noise and low dose imaging in CT. For IR, the consensus was that dose reduction should be limited to 15–30% to preserve low-contrast detectability. But Brady pointed out that initial phantom and patient observer studies in DLR have shown acceptable dose reduction between 44–83% for both low- and high-contrast object detectability tasks.

Ultrasound for abdominal emergencies

A second element of the Canon webinar saw paediatric radiologist Dr Elisa Aguirre from Hospital 12 de Octubre in Madrid, Spain, outline how abdominal symptoms are the most common reason for paediatric emergency department visits, with ultrasonography usually the first line and main technique in enabling the diagnosis. She explained how Doppler ultrasound and microvascular imaging can add relevant information in paediatric abdominal emergencies. ■


Dr Samuel Brady

Dr Samuel Brady is Chief of the Clinical Medical Physics Section in the Department of Radiology, Cincinnati Children's Hospital Medical Center and Associate Professor of Radiology, University of Cincinnati. As a medical physicist, his primary experience lies in developing and maintaining protocols for imaging efficacy and safety with a particular interest in dose-minimization for CT imaging techniques.

Report: Mark Nicholls

Liver, renal, pancreas, paediatric and multi-organ transplants

Important role for ultrasound in transplantation imaging

Ultrasound plays a pivotal role in the assessment of organ transplant patients. It enables physicians to safely and easily assess progress, identify complications and resolve problems, as well as deliver long-term monitoring. The value of ultrasound in the transplant space was highlighted in a session at ECR 2024, covering liver, renal, pancreas, paediatric and multi-organ transplants with clinicians discussing how it enables them to offer better care for their patients.

Session co-chair Paul Sidhu, Professor of Imaging Sciences at King's College London, said that in the 1980s before the much wider use of ultrasound, physicians had little to guide them if a problem arose with a transplant such as with an abnormal liver test function, clotting, thrombosis, or organ rejection. 'But the introduction of ultrasound transformed how they managed patients,' he said. 'They could then clearly move into a different direction – immunosuppressant therapy, angiography, or revascularization.' The expert argued that, while ultrasound imaging has become a vital part of transplantation, it should be performed more still, and everyone should have the knowlegde of how to do this.

Detecting complications

Dr Gibran Timothy Yusuf from King's College Hospital NHS Foundation Trust – one of Europe's biggest transplant centres, conducting 200 liver transplants a year – highlighted how ultrasound in liver transplantation offers an understanding of the anatomy and potential complications, including the hepatic artery and vein, the portal vein and biliary duct.

'Ultrasound lends itself very well to that evaluation,' he said. 'One of the best ways to look at how to use ultrasound is by thinking what the complications can be and how we can potentially detect them.' This includes vascular complications including formations of pseudoaneurysm, stenosis or occlusion of major vasculature, stenosis of bile ducts, reflux and microlevel ischaemia angiopathy. 'Ultrasound has a role in the early follow-up, and then also longer term with rejection or recurrent disease,' he added.

Yusuf also outlined the importance of knowing when to use other modalities for an accurate imaging assessment, particularly when needing to view a wider area.

However, he pointed to the clear benefits of ultrasound; it is radiation free, has bedside use, is repeatable, accurate, safe and can be conducted in real time with uses including angiographic assessment, micro- and macrovascular perfusion dynamics.

He said: 'Multiparametric ultrasound provides comprehensive liver assessment, and the role of B mode and Doppler is critical. Contrast enhanced ultrasound (CEUS) is useful for problem solving, particularly in the early follow-up period. There is a developing role with sheer wave elastography, though we must also acknowledge that complimentary imaging may be needed.'

Dr Gibran Timothy Yusuf

Dr Gibran Timothy Yusuf is Consultant Interventional Radiologist at King's College Hospital NHS Foundation Trust. He also has a specialist interest in abdominal imaging and ultrasound, including advanced techniques such as contrast enhanced ultrasound, elastography and fusion for which he regularly publishes and is an invited speaker.

Dr Annamaria Deganello

Dr Annamaria Deganello is a consultant radiologist at King's College Hospital, having qualified in 2004 from the University of Padua in Italy before undertaking specialist radiology training. Her specialist interest is in paediatric imaging of complex surgical cases, trauma and hepatobiliary diseases as well as liver transplantation.

Prof Paul Sidhu

Paul Sidhu is Professor of Imaging Sciences at King's College London and a Consultant Radiologist at King' College Hospital. He has published on many aspects of ultrasound and pioneered the introduction of contrast-enhanced ultrasound in the UK. He is Past-President of the European Federation of Societies in Medicine and Biology.

Paediatric transplants: a wholly different ballgame

Dr Annamaria Deganello, a consultant radiologist at King's College Hospital since 2013, discussed paediatric liver and multi-visceral transplantation. She focused on the main surgical techniques, post-surgical complications and the role of ultrasound in the post-operative monitoring of paediatric transplants.

She said: 'There is a major difference between paediatric and adult transplantation and the grafts that children receive are very different from the grafts used in adults.'

Deganello said ultrasound, specifically Doppler, remains the most powerful tool to follow these patients up. 'CEUS microvascular imaging can be used in doubtful cases, especially because you are dealing with tiny vessels,' she added. 'But what is really beneficial is that when you are scanning patients, the parents are with you, and you can reassure them immediately rather than waiting for a CT.'

"An excellent problem solver" for renal transplantation

Professor Thomas Fischer, Head of the Ultrasound Centre at Charité in Berlin, Germany, concentrated on the monitoring strategy of the early phase after kidney transplantation using MPUS, the benefits of elastography, new broadband Doppler techniques, and contrast enhanced ultrasound in the early phase after transplantation.

He said that ultrasound is the most common modality for assessing kidney transplants and has a role in the post-operative phase from the first 48 hours through to longer term follow-up and is 'an excellent problem solver'.

Dr Jose Angel Jimenez Lasanta from Hospital Vall d'Hebron in Barcelona discussed ultrasound in the realms of combined kidney and pancreas transplantation. He discussed the role of ultrasound, including Doppler, in assessing renal/pancreas transplants and indicted when to turn to other imaging modalities for assessment. ■

Report: Mark Nicholls

Joint action

A pan-European effort to tackle cancer and NCDs

This February, the Norwegian Institute of Public Health officially launched the "Joint Action on cancer and other non-communicable disease prevention project" (JA PreventNCD). In the four-year-initiative, 22 mem-ber states of the European Union (EU) plus Iceland, Norway and the Ukraine have joined forces to combat the increasing burden of non-communicable diseases (NCDs) across national borders.

The Norwegian Directorate of Health leads the project and its Professor Knut-Inge Klepp, scientific coordinator of the project, emphasizes the need for the collaborative approach: 'The pandemic has underscored the importance of cross-border cooperation in addressing health crises. NCDs, while slower in their progression, represent a significant health crisis that requires coordinated action.'

Investing in prevention

Given the fact that a large proportion of NCD-related deaths are avoidable and expenditures on prevention stand only at around 3% of national health budgets in the EU, this initiative is a worthwhile endeavour. It has a total budget of €95.5 million, of which the EU funds €76.4 million within the framework of its EU4Health programme. The EU contribution represents 20% of the EU's total health budget. Linda Granlund, project coordinator and head of the Public Health and Prevention Division at the Norwegian Directorate of Health said on the project launch in Oslo: 'Cancer and other NCDs constitute a large proportion of the total burden of disease in Europe. NCDs can be prevented, and sadly we have not managed to tackle the challenges in an effective and coordinated way up until now. This project represents a paradigm shift, with 20% of health budgets dedicated to prevention - a symbol of Europe's evolving approach to health.'

A framework for addressing common risk factors

At the core of JA PreventNCD is its commitment to unify efforts, reduce fragmentation and avoid duplication when it comes to reducing cases of NCDs. The project wants to establish a holistic approach to prevention amongst the participating countries whilst addressing the common underlying risk factors both on a personal and societal level. To do so, the initiative combines a healthcare focused agenda with other topics like taxation and regulation in addition to a healthy living environment. It also aims to strengthen national authorities across different levels to implement measures to promote health such as raising coherence in policies addressing risk factors and social inclusion. Furthermore, it foresees to assess the effects of prevention strategies with the help of rigorous evaluation processes to optimize them. A key goal of the initiative is to tackle social inequalities in view of their contribution to NCD risks. A core instrument for the project is the establishment of a robust European infrastructure for monitoring NCD-related health determinants such as inactivity, unhealthy diet, overweight and obesity as well as harm related to alcohol consumption.

The medical agenda

The medical agenda of JA PreventNCD incorporates efforts to advance the early detection of people at risk, including the use of genetic profiling. Prof Dr Anke Katharina Bergmann, Lead Personalised Genomics, Deputy Director Institut for Human Genetics at Hannover Medical School, which takes part in the project on the German side, emphasis the role of genetic profiling for the prevention of NCDs. In her view, genetics will be increasingly essential for early diagnoses and prevention: 'As part of the "Joint Action Prevent NCD", we will develop new interdisciplinary care pathways in the area of genetic (cancer) predisposition in the European context in order to ensure structured, resource-adapted care systems and thus detect (cancer) diseases earlier, treat them better or ideally prevent them.' The project also investigates more patient-centered interventions, integrated care pathways and eHealth solutions. As part of its monitoring agenda, JA PreventNCD has the goal to improve data capture management and will use AI-based algorithms for analysis and modelling purposes. Prof Dr Lars Schaade, President of the German Robert Koch Institute (RKI), which is also a stakeholder in the initiative, explains: 'One of the main tasks will be to systematically collect and collate relevant health data. The RKI will contribute such "data for action" from its own and international studies and projects in order to strengthen the prevention of major common diseases, promote health equity and promote health and well-being for all people.'

AI will be an invaluable tool to drive the prevention agenda

There is a strong momentum in healthcare systems to shift towards a prevention-centered approach to avoid suffering as well as render healthcare delivery more sustainable. Technological and medical progress have made it possible to jointly analyse individuals' genetic information and the gathered medical, lifestyle and environmental data to gain new insights into human health. The algorithms used for analysing those data and modelling health scenarios are based on artificial intelligence (AI).

The project's collaborative approach resembles in many aspects the UK's largest ever research project Our Future Health (see our report on page 12). Both put the notion of prevention rather than curation at their core and will help to enable a paradigm shift in how we view health. ■

Report: Cornelia Wels-Maug

Cancer care in Europe: alarming gaps remain

Ulrika Årehed Kågström, President-elect of the Union for International Cancer Control (UICC), and former UICC Board Members Nick Grant and Cristiana Fonseca offer their insights and solutions to the widening gaps in preventing and surviving cancer for people living in Sweden, the UK, Portugal and Europe more widely.

Europe accounts for about 20% of the global cancer incidence and mortality, with about four million new cancer cases recorded in 2020 and an estimated 1.9 million people who died from cancer.

Yet even in countries in Europe, such as Sweden, the UK and Portugal, which have a tradition of robust healthcare, disparities exist in the risks of developing cancer, having it detected early and successfully treated. These disparities are a result of inequitable access to reliable information, screening, diagnostics, treatment and care services due to where people live, their economic status, level of education, ethnicity, age, physical and mental capabilities, age, gender and gender norms, sexual orientation and other socioeconomic factors.

Ulrika Årehed Kågström, Secretary-General of the Swedish Cancer Society and President-elect of UICC, explains: "For people with low socioeconomic status, the risk of dying from cancer in Sweden is notably higher compared to those who belong to more privileged groups. People with higher education generally spend more time with healthcare professionals to ask questions when seeking care than those with only primary school education, who are more likely to refrain from care-seeking in the first place. Socioeconomic status can also influence the degree to which a cancer patient is likely to follow through on treatment."

Nick Grant, Executive Director of Strategy and Philanthropy at Cancer Research UK and former UICC Board Member, says that, in the UK, limited progress has been made in addressing inequities in the past ten years. These have even worsened since the Covid-19 pandemic. "Life expectancy has stalled, and the gaps in life expectancy between the most and least underprivileged areas has widened. Many of the causes lie not in the health system itself, but in the broader environment – which makes it harder for some groups to live a healthy life. Smoking accounts for half the difference in life expectancy between the lowest and highest income groups in England. Bold action to reduce smoking rates – such as the legislation proposed by the UK Government to raise the age of sale of tobacco products – can help create a healthier society for all," says Nick Grant.

Cristiana Fonseca, Health Education and Capacity Building Head of Department at the Portuguese League Against Cancer – Northern Branch, says about the situation in her country that "while there are national screening programmes for various cancers, their implementation and attendance rates vary across regions, and investment in research and treatment has improved cancer prognosis, but disparities persist in resource distribution and management practices in different regions and institutions." Ms Fonseca also highlights inconsistencies in strategies to address environmental and other risk factors for cancer.

As modifiable behavioural factors contribute to over 40% of all cancer deaths, UICC's World Cancer Day 2024 Equity Report emphasises overall that implementing cost-efficient and evidence-based prevention measures, such as limiting the marketing, sales and consumption of tobacco, alcohol and unhealthy foods that can lead to overweight and obesity, are crucial to reducing health inequity and the cancer burden.

Cristiana Fonseca further recommends "multisectoral policies targeting modifiable determinants of cancer, prioritise equitable access to treatments, and continuously monitor and reduce inequalities, especially for specific groups such as migrants and those not fluent in the country's official language."

Screening programmes, the early detection of cancer and access to timely treatment and care for people who develop cancer – regardless of their ability to pay – are also vital. The chances of treating cancer successfully are generally higher the earlier it is diagnosed.

Dr Cary Adams, CEO of UICC, says, "Where you live, how much money you make, your age, your health, your gender, who you love or the colour of your skin shouldn't dictate whether you have access to cancer care. But the sad reality is, it does. That's why UICC's Equity Report is so crucial – it shines a light on the obstacles people face in getting the care they need, and suggests strategies to help overcome them." ■

Source: Union for International Cancer Control

Next-generation pathology

Multiplexed staining techniques in the fight against complex diseases

Bringing digital pathology together with novel multiplexed staining techniques may answer key questions about complex diseases. Pathologist Lukas Marcelis, MD, PhD, believes such combinations will have benefits for clinicians and patients and can help unravel some of the mysteries surrounding a range of conditions. Marcelis discusses these advances in his presentation to the 35th European Congress of Pathology in Dublin.

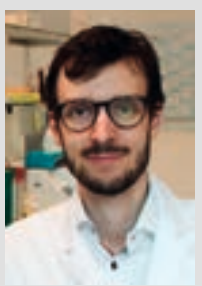
A medical physician and trainee pathologist at University Hospitals Leuven in Belgium, he is continuing research into new multiplexed stain technologies. He believes next-generation pathology using digital images analysis will offer significant benefits.

MILAN gives better context

In a transition that sees pathologists no longer reading slides with their eyes but using computer digital image analysis, he points to the importance of correcting artefacts, and good quality control. 'One advantage is that you can identify very specific immune cell subtypes, with spatial context,' he added. With multiplexed immunohistochemistry allowing for significantly more markers on a slide (each cell can have 50+ markers), he has embraced the MILAN (multiple iterative labelling through antibody neodeposition) technique which uses immunofluorescent markers.

Potential in EBV-driven lymphomas

In haematological malignancy, he notes this is of particular interest in his research area of EBV-driven lymphomas, which can arise in immune-compromised patients, such as those receiving immune suppression to prevent organ rejection post-transplantation. He said: 'One question is why some develop EBV-driven lymphoproliferative disorders (EBV-driven LPD) and others do not, and why sometimes if we reduce immunosuppression the disease disappears and sometimes not.



Lukas Marcelis, MD, PhD

Lukas Marcelis, MD, PhD is a pathologist from the Department of Pathology at University Hospitals, Leuven, Belgium. His research focus is on multiplexed stain technologies in haematological malignancy. He is a co-founding member and secretary of the Young European Association for Haematopathology.

'In EBV-driven LPD there is a lot of interaction between immune cells, the virus and the malignancy itself which requires a multitude of antibody stains to adequately characterize.' The technique may help in predicting why in some, mainly younger, patients the immune system can control the condition better than in older people, for example.

Introduction into clinical practice almost within reach

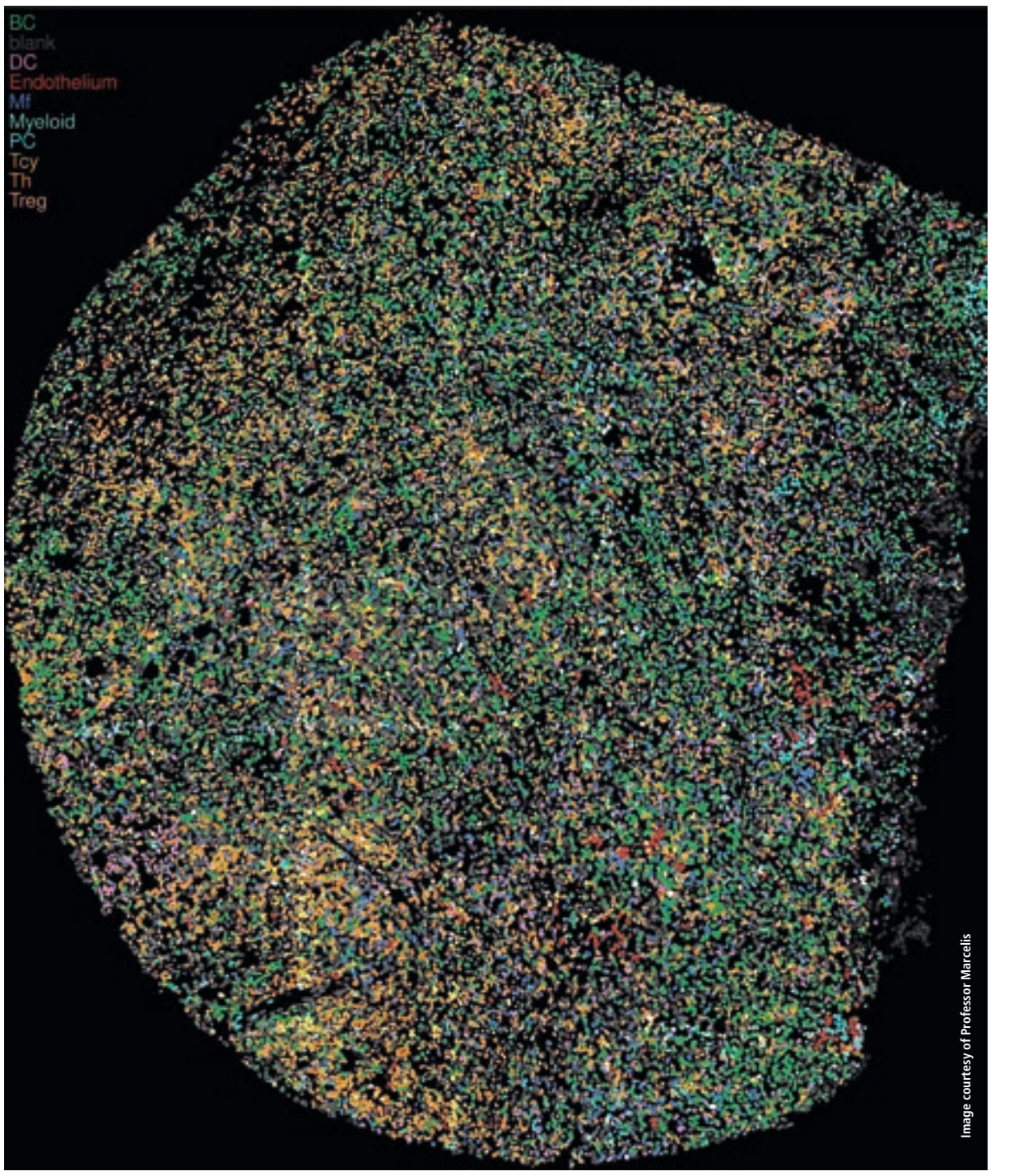
A possible advantage for patients, he added, is that the microenvironment can be more fully characterized. This is currently highly interesting in research settings. He believes there is potential for this to be implemented into future clinical practice. Questions, however, remain around quality control, guidelines agreement and image quality.

For example, he stressed the importance of the machine adequately recognising individual cells and avoiding over-segmenting and splitting up one cell into different parts, or under-segmenting and grouping cells together. 'Many different methods for cell segmentation exist, but for clinical practise a consensus on "gold standards" would be needed,' he said.

'But there is definitely a future in this digital image analysis using high-multiplexed stains because it can give a lot of information that cannot be obtained with classic immunochemistry.'

Dr Marcelis suggests there are benefits on a therapeutic and diagnostic level, such as in helping identify immune microenvironment "state" of the patient to predict the behaviour of EBV-driven LPDs or potential therapeutic options. 'Next-generation pathology and digital image analysis and multiplex will allow to identify complex immune cell types in a spatial context and do neighbourhood analysis, all things not possible with traditional immunochemistry or flow cytometry.' The big step is looking at a combination of 50-plus markers digitally on a single slide rather than through a microscope and examining and interpreting the slide differently. 'Many questions will need to be answered,' he said, 'since these techniques often identify new immune cell clusters where we do not always know enough to name these cell types and if they are genuine or an artefact. But the future is that we are going to work more and more digitally and will have to use these techniques since they will have advantages for patients,' he concluded. ■

Report: Mark Nicholls



Digital tissue reconstruction of a DLBCL biopsy (tissue micro array core) stained using MILAN. BC: B-cell, DC: dendritic cell, Mf: macrophage, PC: plasma cell, Tcy: cytotoxic T cell, Th: helper T cell, Treg: regulatory T cell.

mgo fachverlage

Publisher
mgo fachverlage GmbH & Co. KG
E.-C.-Baumann-Str. 5
95326 Kulmbach/Germany
Phone +49 (0) 9221 949-311
Fax +49 (0) 9221 949-377

Managing Directors:
Eva-Maria Bauch, Stephan Behrens

Editor and Production Manager:
Tim Hofmann (TH)
Phone: +49 (0) 9221 949-176
E-Mail: redaktion@european-hospital.com

Editor: Wolfgang Behrends (WB)

Founded by Heinz-Jürgen Witzke
ISSN 0942-9085

Correspondents
Austria: Michael Krassnitzer (MK)
Germany:
Cornelia Wels-Maug (CWM)
Dr Christina Czeschik (CC)
Great Britain:
Mark Nicholls (MN)
Spain:
Mélisande Rouger (MR)
USA: Cynthia E. Keen (CEK)

Subscriptions
Lena Krauß
kundenservice@mgo-fachverlage.de
Subscription rate
4 issues: 32 Euro, Single copy: 8 Euro.
Printed by: mgo360 GmbH & Co. KG, Bamberg, Germany
Publication frequency: quarterly

Representatives
Germany, Austria, Switzerland:
Toni Lauterbach
Phone: +49 9221 949-374
E-Mail: t.lauterbach@mgo-fachverlage.de
France, Italy, Spain: Eric Jund
Phone: +33 493 58 77 43
E-Mail: jund@european-hospital.com
GB, Scandinavia, BeNeLux:
Simon Kramer
Phone: +31 180 6200 20
E-Mail: kramer@european-hospital.com
Taiwan: Charles Yang
Phone: +886 4 232 236 33
E-Mail: medianet@ms13.hinet.net
USA & Canada:
Hanna Politis, Media International
Phone: +1 301 869 66 10
E-Mail: hanna@media-intl.com

New measures to assess fracture risk in older women

Osteoporosis and menopause: new insights

Bone fractures caused by osteoporosis are a common major global health risk. The International Osteoporosis Foundation (IOF) reports that one in three women over the age of 50 will sustain a potentially life-threatening fragility fracture in their remaining lifetimes.


© Sebastian Kaulitzki – stock.adobe.com

Over 25.5 million women have osteoporosis, according to 2019 IOF estimated statistics. At least 23.8 million European Union (EU) residents are at high risk of osteoporotic fractures. Currently, the annual cost of osteoporosis-related fractures in Europe alone is estimated to be more than €56 billion for its population. Early diagnosis and proactive treatment to keep bones healthy, including prescription medication and lifestyle changes, has the potential to significantly reduce this risk and its financial burden.

Yet osteoporosis and osteopenia are among the most undiagnosed and untreated medical conditions, not only in Europe, but throughout the world. Governments and healthcare providers need to prepare for a skyrocketing number of cases, due in great part to an increasingly aging population, with Europe alone facing an estimated 25% increase in osteoporotic fractures between 2019 and 2034.

Finding a public health strategy

In February 2023, the World Health Organization (WHO) and the European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Disease (ESCEO) signed an agreement to develop a strategic roadmap on bone health and aging, advocating for a public health strategy to prevent fractures among older people. This complements the IOF's 2021 initiative to create an interactive Scorecard for Osteoporosis in Europe (SCORE) recording the burden of disease, policy framework, service provision, and service update of 29 EU countries.

A bone mineral density (BMD) test is the best method to diagnose osteoporosis and assess bone strength. A dual-energy X-ray absorptiometry scan (DEXA), the most common and most versatile test, not only assesses bone strength, but also can provide a vertebral fracture assessment (VFA) to detect previously unrecognized spine fracture, a trabecular bone score (TBS) that assesses internal structure of bones in the spine at a microscopic level, full-length femur imaging to recognize thickening of the thigh bone that could lead to a stress fracture, and a hip structural analysis (HSA) to assess how the size, shape, and confirmation of hip bones can influence the strength of a hip. However, the cost of a BMD is prohibitive to many, and there are not enough DEXA scanners to meet global needs.

A free-of-charge Fracture Risk Assessment Tool (FRAX), created in 2008 by researchers at the University of Sheffield, calculates the absolute risk of fracture in 10 years independent of BMD assessment. This algorithm analyzes the clinical risk factors of age, current smoking, alcohol consumption, rheumatoid arthritis, family history of hip fracture, previous fragility fractures, and use of glucocorticoids.

New research from Asia

Current research studies are focusing on different indicators of fracture risk. A multi-institutional group of researchers from the Republic of Korea have validated a hypothesis that oral health is correlated with FRAX scores. Their study, published in Scientific Reports, is based on national survey data from over 2,300 Korean women over age 65 years. It statistically demonstrates that there are significant relationships between the number of teeth missing and FRAX 10-year probabilities of hip fracture risk.

The researchers from Kangbuk Samsung Hospital in Seoul and Ajou University School of Medicine in Gyeonggi-Do explain that 'losing teeth […] may lead to chewing difficulty, contributing to changes in food selection, malnutrition, and low bone and muscle mass. Good oral health influences the quality of life in a myriad way, including social interactions, communications, self-esteem, resilience, and adequate nutritional intake. As the tooth number in the elderly is an indicator of physical, mental, and social well-being, it can be considered as a potential parameter of fracture risk in the elder population.' They advocate that dentists become aware of this association.

Another study by researchers at Shanghai General Hospital in China of over 1,200 post-menopausal women who sustained an osteoporotic bone fracture focused on the correlation between BMD and bone metabolic markers and levels of bone reabsorption. Bones consist primarily of calcium phosphate, a mineral compound that hardens the skeletal framework and type-1 collagen, a protein network that gives bone its tensile strength and framework. Bone marker testing helps determine if the rate of bone resorption is increasing, suggesting a potential bone disorder. Bone loss occurs when bone resorption occurs faster than the rate of bone formation.

The women included 1,008 who had sustained a single fracture and 231 who had a second fracture. The fracture sites included vertebrae, hip, pelvis, ankle, distal forearm and proximal humerus. None were caused by violent, high-energy impacts, bone metastases, or bone weakening from drug use.

Lead investigators Li You, MD, Xiaonan Zhu and colleagues determined that the higher the levels of the bone markers serum CTX and osteocalcin, which indicate bone resorption, the lower the BMD score. BMD scores were significantly lower for women who sustained second fractures than women who only sustained one. The researchers reported that women with high body mass index (BMI) and those not receiving anti-osteoporosis treatment were also at higher risk of sustaining a second fracture.

This fact is reinforced by the Brazilian Society of Rheumatology's published endorsement of fracture risk assessment in the Revista da Associacao Medica Brasileira. The article states that almost nine million fractures annually occur worldwide due to osteoporosis, one occurring every three seconds. Additionally, if a person has already sustained an osteoporotic fracture, the risk of a second increases by 86%.

The Chinese researchers point out in menopause that although DEXA scans provide good estimates of bone tissue loss, the time elapsing between scans may be a period of high bone loss. Also, DEXA scans do not directly reflect bone metabolic status. They suggest that 'early recognition of the correlation between BMD and bone metabolic markers can better prevent further bone loss in women with post-menopausal fractures and thus reduce the risks of later fracture.' ■

Report: Cynthia E. Keen

Interdisciplinary senology: which imaging modality at which time?

Interdisciplinary collaboration between gynaecologists, radiologists, pathologists and breast care nurses following a palpation finding makes a decisive contribution to the success of further breast cancer treatment. This was the consensus among the speakers at the Annual Congress of the German Society of Senology in Dresden. The experts provided clear explanations of which imaging is best for which patient.

PD Dr Susanne Wienbeck, a specialist in radiology at St. Josef-Stift Bremen, made it clear that both mammography and sonography are first choice methods for clarifying the next steps after an initial palpation finding. Which of the imaging procedures should be used depends largely on age: 'Patients under 40 should always have a clinical ultrasound scan first,' emphasised Wienbeck. 'If the result is clearly benign, for example a cyst or fibroadenoma, no further clarification is necessary,' she continued. 'In the case of suspicious or unclear findings with a low risk, a sonographic punch biopsy should be performed. Advanced imaging such as mammography, followed by an open or percutaneous biopsy, is only recommended for high-risk findings.'

R0 resection as the primary goal

Things are different however for patients over 40. Here, the radiologist recommends mammography as a first step, followed by extended imaging if there are multiple or unclear findings. In addition to the palpation diagnosis, suspicious skin changes, histologically confirmed lesions or unilateral mastodynia are also indications for a mammogram.

Pre-operative MRI has long been suspected of increasing mastectomy rates. 'However, this has been proven not to be the case,' said PD Dr Heike Preibsch, Senior Physician at the University Hospital of Tübingen. 'Current studies further show that preoperative MRI reduces the number of resections in breast-conserving surgery.' The expert explained that not only patients with dense breasts would benefit from this, but that the advantage applies across all entities, stages and risk constellations. 'Our ultimate goal should always be primary R0 resection.'

Dr Anna Marie Maier from LMU Klinikum Munich sensitised the audience to the importance of comprehensive communication of findings. 'Discussing further diagnostics and the intended markings is essential, as is intraoperative assessment. All professional groups involved should be included in order to be able to describe their point of view,' said Maier. Further, presentation to the tumour board is also absolutely essential, both pre- and post-operatively. ■

Article: Sonja Buske

Emergency Department

Taking extra care of pregnant women with severe hypertension

Emergency care specialists must be aware of critically-important factors when treating pregnant women with severe hypertension. Experts say criteria for severely high blood pressure sits at a lower threshold for expectant mothers in comparison with non-pregnant individuals. As a result, detailed diagnosis and treatment protocols are essential with clinicians needing to adopt a specific approach when treating these patients in the Emergency Department (ED).


© interstid – stock.adobe.com

Dr Timo Suonsyrjä, Chief Physician for the Emergency Department at Helsinki University Hospital in Finland, highlighted the key approaches and warning signs during a session on Emergency Medicine in Pregnancy at the EUSEM (European Society for Emergency Medicine) 2023 conference in Barcelona. During his presentation, he said: 'About 5–10% of pregnancies are complicated by hypertensive disorder. It is quite common, and hypertension is among the leading causes of maternal and fetal morbidity and mortality.' However, he emphasised that it is preventable and can be treated and managed. He also underlined the importance of people being aware of their blood pressure levels.

Characteristic curves in blood pressure levels

Dr Suonsyrjä said hypertension risk factors for pregnant women include previous pregnancies, obesity, extremes of maternal age (under 18 or over 40), and pre-existing medical disease. The main hypertensive disorders of pregnancy, he explained, are chronic hypertension, gestational hypertension and preeclampsia with patient history, examination and blood, urine and uric acid tests part of the evaluation protocol.

While gestational hypertension and preeclampsia are pregnancy-related, chronic hypertension is the presence of hypertension before the pregnancy; before 20 weeks of gestation; or if it continues twelve weeks after delivery. 'Normal physiology,' said Dr Suonsyrjä, 'is that blood pressure levels go down during early pregnancy and then slowly up before last couple of weeks of pregnancy, so if a woman has hypertension in early pregnancy, then something is wrong.'

Patients with chronic hypertension require careful monitoring in pregnancy with their condition controlled with drugs, though with awareness that ACE inhibitors, angiotensin receptor blockers and direct renin inhibitors are contraindicated for these patients.

High blood pressure in pregnant women where there are no signs of end organ complications can be treated with outpatient care with anti-hypertension medication. But it becomes an emergency care scenario needing in-patient treatment where there are signs of end organ complications and an impact on the kidneys and cardiovascular and central nervous systems.

Gestational hypertension, which normally occurs after 20 weeks of gestation, can be transient and resolved without treatment and normally after labour. 'The most severe pregnancy-related hypertension disorder is preeclampsia or eclampsia and that needs extra follow up or even emergency care,' the expert added.

Differences in blood pressure thresholds

In non-pregnant individuals, severely high BP is where a systolic reading is above 180 mmHG and diastolic over 110 mmHg. 'But with pregnant women, the criteria is when the systolic reading reaches 160 mmHg, meaning that the threshold for severe hypertension is lower compared to non-pregnant people,' said Suonsyrjä. 'This is important because the risk of stroke is higher with pregnant women when the systolic blood pressure is over 160.'

When a severely hypertensive pregnant woman is seen in the ED, he said there is a need to establish whether it is chronic or pregnancy-related hypertension, and if there are signs of end organ damage or failure.

Blood pressure should be lowered slowly at first to avoid additional damage to vital organs and using drugs that will not have any adverse effects. Labetalol (a non-selective beta blocker), hydralazine (direct acting smooth muscle relaxant), and nifedipine (calcium channel blocker) are widely used. Suonsyrjä said treating pregnant women with severe hypertension is a multi-disciplinary team effort, including obstetric expertise, and underlined the importance of hospitals having clear protocols in this area. While there is good awareness of how to respond to such cases in the ED, he stressed the importance of acknowledging the differing threshold criteria for pregnant and non-pregnant individuals with severe hypertension. ■

Report: Mark Nicholls

Pregnancy and diabetes: reducing complications with technology

Women with type 1 or type 2 diabetes often have difficulty getting pregnant, due to complications from the disease, being obese or seriously underweight, or having conditions like polycystic ovary syndrome. Once pregnant, they face challenges of having a safe pregnancy and delivering a healthy baby. Recent advances in diabetes technology, including continuous glucose monitoring (CGM) and most recently hybrid closed-loop (HCL) insulin delivery systems, can help women meet their pregnancy glucose targets and achieve significantly better health outcomes for themselves and their infant.

Prof. Helen R. Murphy, MD, a practicing clinician at Norfolk & Norwich University Hospital NHS Trust, UK, and a Professor of Medicine in Diabetes and Antenatal Care at the University of East Anglia, co-led both major clinical trials evaluating the impact of CGM and HCL. She now advocates for the rapid adoption of HCL over CGM, explaining the advantages of each when delivering the American Diabetes Association's Norbert Freinkel Award Lecture, an annual honorary recognition of outstanding contributions to the understanding and treatment of diabetes and pregnancy.

For one, HCL is easier to use, the expert pointed out. The technology, also known as an "artificial pancreas", links an insulin pump and CGMs to enable delivery of insulin automatically using a calculation based on continuous glucose measurements. In December 2023, NICE published recommendations that the technology should be used by diabetic patients who have a high HbA1c, as well as for women who are pregnant or planning to be.

CONCEPTT trial insights

The international, randomized CONCEPTT (Continuous Glucose Monitoring in Women with Type 1 Diabetes in Pregnancy Clinical Trial) led to changes in clinical guidelines for pregnant pre-pregnancy diabetic women. CGM systems track blood sugar levels in real time 24 hours a day and enable a diabetic person to take immediate action to restore blood sugar to appropriate levels. The pregnant cohort who used a real-time CGM system maintained better and more consistent glycaemic control than those who were self-monitoring their capillary blood glucose (SMBG) levels. Use of CGM is now recommended as standard of care, because it is significantly better than SMBG, which only provides a single glucose value at a given time.

Hyperglycaemia is associated with increased risk of preeclampsia, developing an excessive amount of amniotic fluid (polyhydramnios) in the womb that can cause pregnancy and delivery complications, requiring a caesarean section, or having a miscarriage or stillbirth. Infants may have increased rates of congenital abnormalities, premature delivery, being large for their gestational age, and/or require admission to a neonatal intensive care unit (NICU). Obesity also causes pregnancy risks, and many pregnant women are also obese.

The CONCEPTT trial demonstrated that, with strict adherence to CGM, 16% fewer oversized infants were born, 13% fewer had low blood sugar levels, and that half as many were admitted to NICUs, with 16% fewer staying for more than 24 hours. The trial's findings have been deemed by experts similarly applicable to women with type 2 diabetes.

'But the CONCEPTT trial data revealed that CGM alone will not be adequate for most women to achieve and maintain optimal glucose levels throughout T1D pregnancy,' said Murphy. 'Secondary analyses from CONCEPTT demonstrated that 10% of participants achieved the recommended time-in-target-range during the first and second trimesters, only rising to 35% by 35 weeks' gestation.'

Communication with care providers is critical

The Augmented Insulin Delivery Amongst Pregnant women with Type 1 diabetes (AIDAPT) randomised clinical trial investigated if HCL improved outcomes over CGM. It did, on many levels: Almost all patients were using CGM prior to pregnancy. For the trial, half were switched to HCL. These women had significantly improved maternal glucose levels by the end of the first trimester and maintained a high level of glycaemic control compared to the CGM group. They had 3.7 kg average less weight gain. Their babies were delivered 4.5 days earlier, with lower rates of large-for-gestational-age birth weight babies.

Research studies with larger groups are needed to validate these clinical findings. Use of the HCL system was still challenging for many of the AIDAPT participants. All agreed that interactive communication with care providers is of critical importance, because they received better and more timely health care team input. And some were able to stay at their jobs longer before taking maternity leave, a very important factor for low-income women.

Murphy is optimistic that continuing technology advancements will continue to improve the odds of a less troublesome pregnancy and a healthy infant for women with pre-pregnancy diabetes. ■

Report: Cynthia E. Keen

Oxford debate at senology congress

DCIS: pros and cons of radiotherapy


© My Ocean studio – stock.adobe.com

Radiologists and gynaecologists entered a veritable bout during the Oxford debate at the 43rd annual congress of the German Senologic Society in Dresden. Controversy was sparked by the question of whether all patients with a ductal carcinoma in situ (DCIS) should undergo radiotherapy.

Kicking off the debate, Prof Dr Christoph Mundhenke expressed his bewilderment that the necessity of radiotherapy was called into question in the first place: 'Data evidence is excellent and strongly in favour of radiotherapy for all patients,' the expert from Klinikum Bayreuth argued. This was in reference to a large 2010 meta-analysis, covering four clinical studies with more than 3,700 patients over a 10-year follow-up. 'This work highlights the benefits of adjuvant radiotherapy after breast-conserving DCIS treatment. Occurrence of ipsilateral events was cut in half – not only in high-risk patients, but also in older women, who are constantly debated to be excluded from radiotherapy because of their age,' he added.

Pro: 'virtually overwhelming' evidence in favour of radiotherapy

Another meta-analysis from 2015, also covering a 10-year follow-up, even included more than 9,000 patients from 26 clinical studies. This research pointed to statistically significant benefits of post-operative radiotherapy, both for DCIS patients and those with invasive recurrence, Mundhenke elaborated. 'After breast-conserving surgery, the risk for local recurrence was at 25%. Combined with post-op radiotherapy, this number was reduced to just 14%.' While this evidence was 'virtually overwhelming', he conceded that in certain cases, other factors, such as the patients' age, their life expectancy and will to treatment, should also be included.

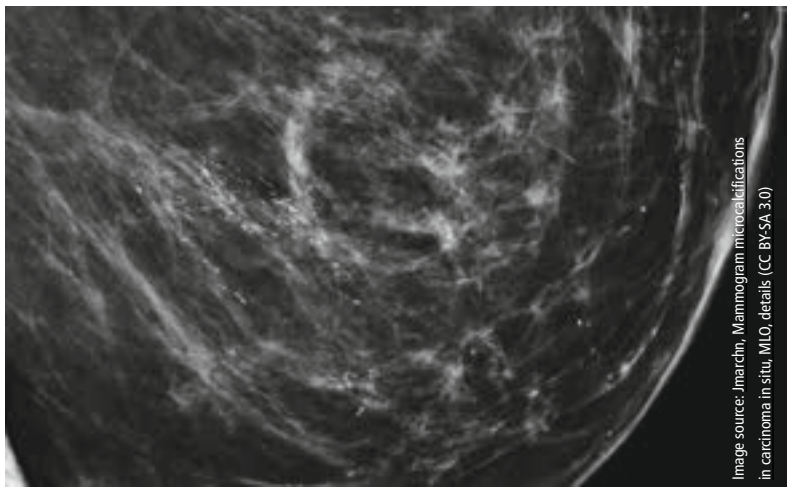


Image source: Jmarchn, Mammogram microcalcifications in carcinoma in situ, MLO, details (CC BY-SA 3.0)

On this mammogram, microcalcifications can be seen as white dots, a typical sign for DCIS.

This last aspect was taken as a cue by Prof Dr Stefanie Corradini to launch into her counterargument. The perspective of the patients should not be ignored, the radiation oncologist from LMU Klinikum Munich appealed to her colleagues. 'A DCIS diagnosis can be very disheartening. Even though it is just a pre-cancerous stage with a good prognosis, it is treated like early invasive breast cancer. This can be life-changing for these women, who are often haunted by the fear of facing recurrence or an actually invasive form of cancer for years,' Corradini stressed. 'We have to do everything in our power to prevent recurrence in DCIS.' For the radiation therapist, the question was therefore not about how, rather than if irradiation should be performed. She argued that an individualised therapy, with adapted fraction and dose regiments as well as reduced irradiation volume was the way to go.

Con: no survival advantage

Prof Dr Bernd Gerbers from Klinikum Südstadt in Rostock saw things differently. He could see neither a survival advantage nor meaningful impact on distant metastases in DCIS radiotherapy, and therefore advocated the adequate treatment of recurrence. 'Surgical therapies have become better and safer. With the help of mammography, the fringes of microlesions are clearly visible, so that surgery can be performed confidently within safe borders,' the gynaecologist argued. 'There are even considerations to drop surgery entirely, in favour of a watch-and-wait approach followed by conservative treatment. In case of recurrence, irradiation is still an option.'

Promising molecular biomarkers

Also in opposition of radiotherapy was Prof Dr Volker Budach, from the private practice RadioOnkologie – at least for low-risk patients with decreased local recurrence rates. In high-risk patients, however, radiotherapy is an absolute necessity, he suggested. He pointed out the great potential of molecular biomarkers: 'Most clinical studies do not yet use molecular biomarkers for DCIS therapy de-escalation,' Budach explained. 'Today, there are three individualized molecular biomarker tests, which make it possible to predict whether a patient will develop local recurrence, after breast-conserving surgery with or without adjuvant radiotherapy. To assess the clinical validity of these biomarkers, thorough predictive modelling, calibration and external validation is necessary, as well as level 1B evidence.'

DCIS does not equal cancer

At the end of the session, the speakers and their audience agreed that DCIS is often overtreated, and radiation therapy does not have a beneficial impact on overall survival. Good communication with the patient was seen as crucial. Furthermore, the universal consensus was that the term "carcinoma" should be removed from the condition's name, to not cause unnecessary alarm for affected women. ■

Article: Sonja Buske

Prof Dr Christoph Mundhenke is Chief Physician of the Clinic for Gynaecology and Obstetrics at Klinikum Bayreuth GmbH. He previously worked at the University Medical Centre Schleswig-Holstein in Kiel. The 49-year-old specialist in gynaecology and obstetrics is a proven expert in the field of gynaecological oncology.

Prof Dr Stefanie Corradini is Deputy Director of the Clinic and Polyclinic for Radiation Therapy at the LMU Hospital Munich since 2023. Her clinical and scientific focus is on gynaecological tumours and breast carcinomas, MR-guided radiotherapy (MR-Linac) and image-guided radiation therapy procedures with surface scanners.

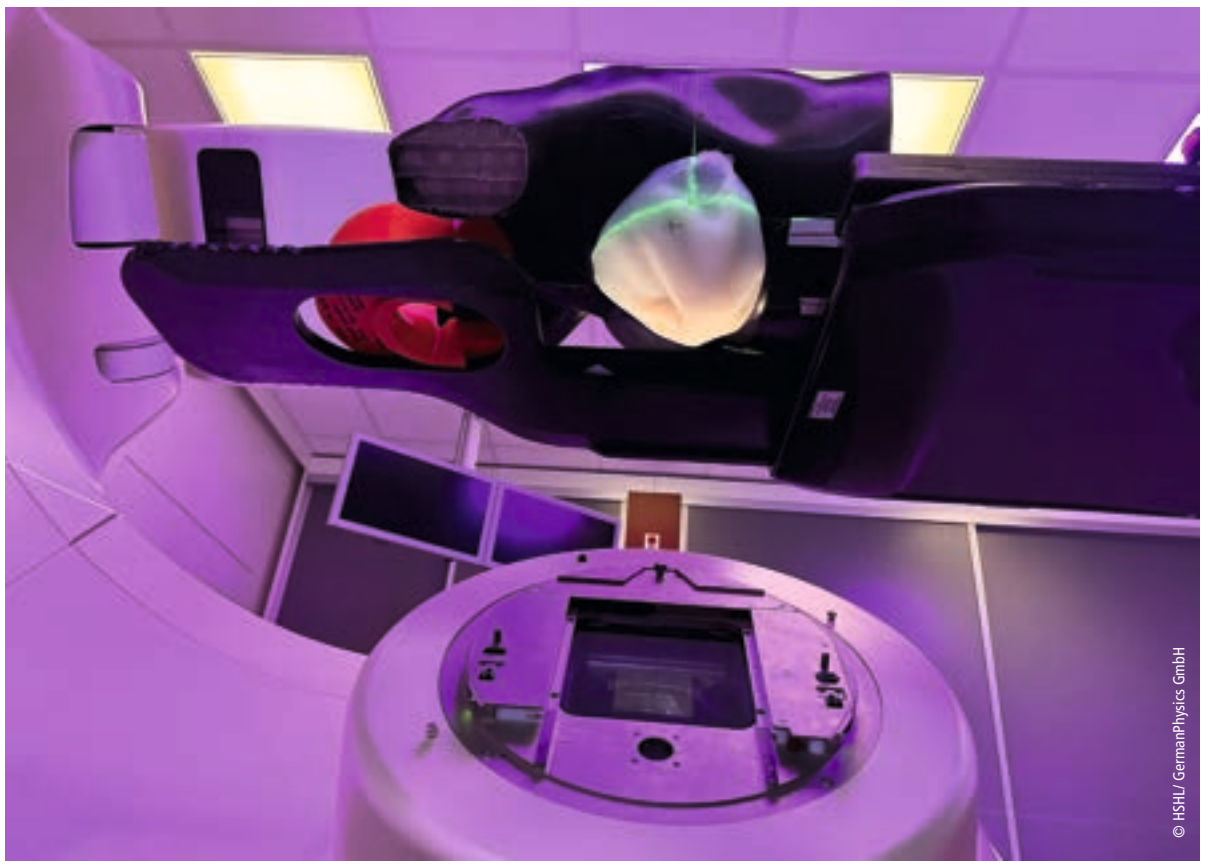
Prof Dr Bernd Gerber is Director of the University Women's Hospital at Klinikum Südstadt in Rostock. His focus is on gynaecological oncology, where he has established gentler operations for patients with breast cancer and thus set new treatment standards in oncology. Prof. Gerber also investigates pregnancy-related diseases (gestosis).

Prof Volker Budach is a radiologist and radiation therapist at the private practice RadioOnkologie in Berlin. Previously, he was clinical director of the Department of Radiooncology at the Charité as well as Past President of the German Society of Radiation Oncology (DEGRO). His scientific and clinical focus includes the treatment of head and neck tumours, sarcomas and breast cancer.

Patent for promising medical product / study in the planning stages

Breast cancer radiotherapy: positioning system protects surrounding organs

Radiotherapy for breast cancer is always associated with the risk of damage to organs or surrounding tissue. A new positioning system, which has now been patented by the Hamm-Lippstadt University of Applied Sciences (HSHL), positions the breast far away from the upper body and thus increases the distance to the organs at risk. The medical device called „X-Akt Mamma RTX" is now set to be tested as part of a study and is expected to enter the market in 2025.



X-Akt Mamma RTX with breast phantom during a radiotherapy session

Radiotherapy for breast cancer is usually carried out in the supine position. However, larger breasts in particular are sometimes placed sideways around the thorax, which means that parts of the heart and lungs are also exposed to radiation. In addition to direct side effects such as reddening of the skin, this can also have long-term consequences at cellular level, as medical physics expert (MPE) Christopher Stegmann explains: ‚The lung seam can form necrosis and the coronary arteries can become porous. This can lead to shortness of breath, reduced exercise tolerance and even a heart attack. Although there are guidelines on how much dose an organ can receive, a compromise often has to be made in order to irradiate the tumour effectively.'

The challenging issue of patient positioning

This fact irritated Stegmann, who currently works in radiotherapy at the MVZ Aurich-Norden, to the extent that he started looking for an alternative. Initial research revealed that all clinics appear to be facing the same problem. 'Some facilities have patients lie on their side for radiotherapy, but then the table is positioned between the radiotherapy machine and the breast to be treated, which can severely damage the skin,' the MPE realised. ‚Some manufacturers offer solutions for radiotherapy in the prone position. However, these are all superstructures that are placed on the radiotherapy table and therefore severely restrict the degree of freedom of the accelerator.' Other solutions involve complete tabletop systems, which are very expensive to purchase. 'This is hardly feasible in everyday clinical practice and is therefore rarely used.' In his opinion, a good approach involves respiratory gating systems, where radiation is only delivered when the patient is in the deep inspiration phase and the organs at risk in the thorax are as far away from the breast as possible. 'The problem here, however, is that some patients can't hold their breath for as long as they would need to. As a result, radiation is then delivered without breath gating or, as a compromise, even at half inspiration, which cancels out what is actually a good idea,' Stegmann explains the problem.

'I was looking for a solution in which the patient would receive radiotherapy in the prone position, without having to do anything herself, and the product could be installed quickly and easily by the medical technicians.' With his plans, he finally turned to the HSHL, where he had studied and now works as a lecturer for radiation protection classes. His proposal was well received by medical technician Prof Dr Jürgen Trzewik. 'I was immediately enthusiastic about the idea,' the expert recalls. 'Our prototype laboratories and workshops provided the perfect environment for the project, so I immediately confirmed my support to Christopher Stegmann and worked with him to apply for funding, all of which was approved.'

A wooden prototype, followed by a carbon fibre model

The first prototype was made of wood in 2021, followed in April 2024 by the final version made of carbon fibre. It is attached to the existing irradiation table, which extends rather than raises it. 'The challenges were high,' explains Stegmann. The material must be permeable to radiation, cannot bend or break, and the system needs to be symmetrical so that it can be used for both breasts. The customer requirements analysis also revealed that it must not be too heavy and should be quick and easy to assemble. The latter is ensured by a snap-in double mechanism.

In order to convince the ethics committee of the function and effect of the X-Akt Mamma RTX, Stegmann and Trzewik's team developed a breast phantom from existing, anonymised data sets. As soon as the commission gives its approval, the study can start with a so-called 0 series of several radiotherapy sessions. „We hope that this will occur within this year," says Stegmann with confidence. Whether a series production will start with a partner from industry after the successful trial or whether the researchers will establish their own company has yet to be decided. At any rate, Stegmann hopes that every radiotherapy centre will be able to afford the new product and it will benefit as many women as possible. ■

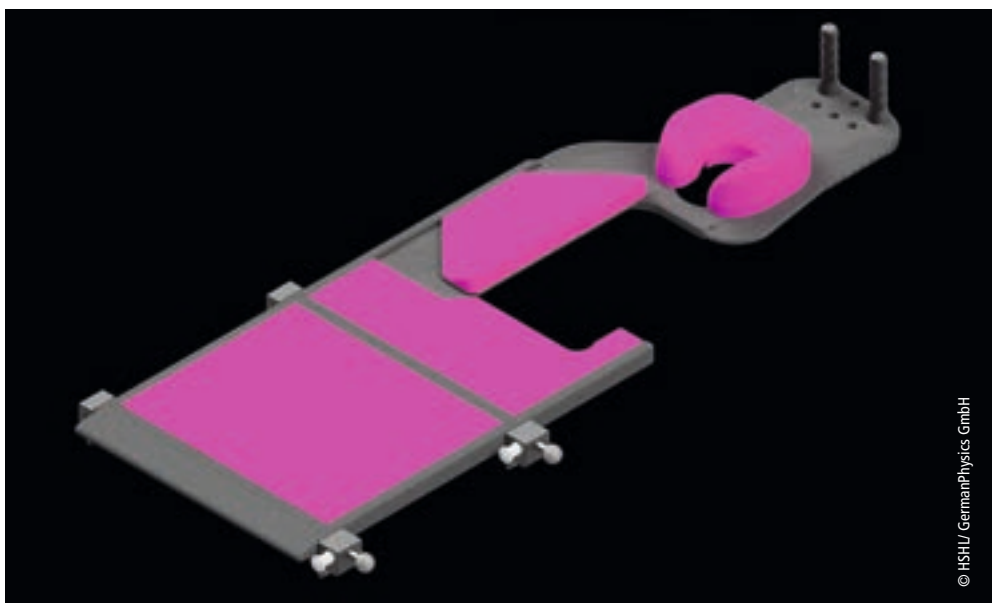
Article: Sonja Buske

Christopher Stegmann

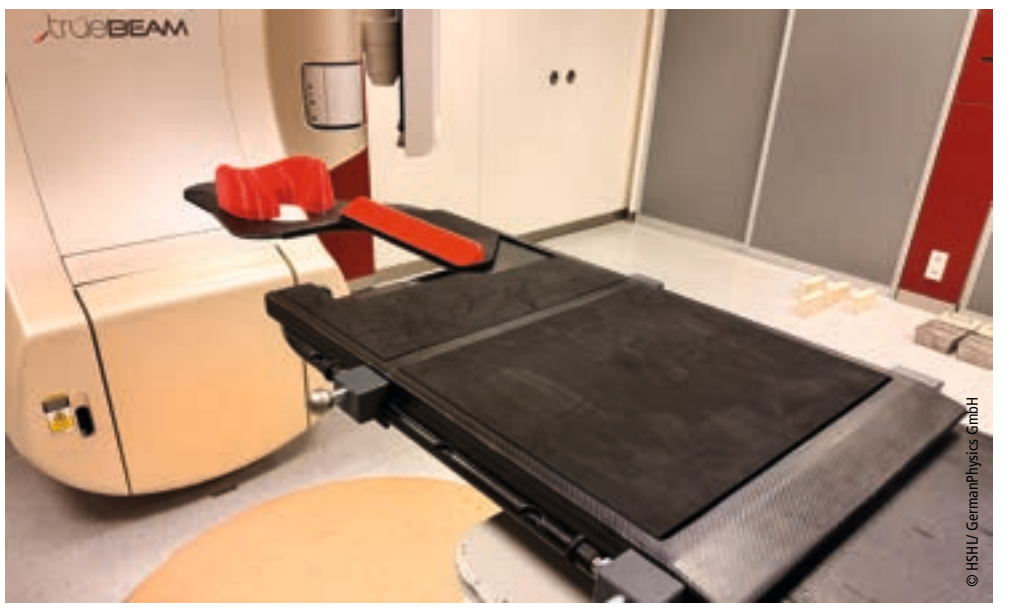
Christopher Stegmann is employed as a Medical Physics Expert (MPE) at GermanPhysics GmbH since 2014 and works in radiotherapy at the MVZ Aurich-Norden. He studied Biomedical Technology and Applied Biomedical Engineering at Hamm-Lippstadt University of Applied Sciences (HSHL) and has MPE expertise in the fields of teletherapy, X-ray diagnostics and X-ray therapy. In 2022, he took over as Head of the Department of Medical Physics in Aurich. He is also a lecturer at the HSHL in the field of radiation protection.

Prof Dr Jürgen Trzewik

Prof Dr Jürgen Trzewik is a graduate engineer in the field of physical engineering/medical technology and holds a professorship for medical technology at Hamm-Lippstadt University of Applied Sciences (HSHL) since 2011. He previously worked as a research and development engineer and in management in the industry.



Model of the X-Akt Mamma RTX



The X-Akt Mamma RTX is affixed to the radiotherapy table

UK research project

"Our Future Health": Shifting from curative to preventive care

In the face of increasing longevity and the rise of chronic diseases in later life, shifting from curative to preventive care will become vital for healthcare systems as they primarily focus on treating symptomatic individuals in the late stages of diseases.


© Deemerwha studio – stock.adobe.com

The UK's National Institute for Health and Care Research, for example, predicts that by 2035, 67.8% of those aged 65 will have at least two serious conditions or impairments, up from 54% in 2015. Sir John Bell, former Regius Professor of Medicine at Oxford University, concludes that as the burden of chronic diseases is escalating, health systems must address underlying pathologies rather than focus primarily on managing late-stage diseases: 'Before you know it, the health system is overwhelmed by late-stage disease that is very, very difficult to manage.'

The key challenge lies in addressing the underlying pathologies before they manifest as symptoms. Bell emphasizes the need to transition healthcare from a broad, reactive approach to a targeted, preventive one. This shift, he argues, not only enhances individuals' quality of life but also alleviates financial strains on healthcare systems.

At the Economist Impact event "Future of Health 2023 Europe" in October 2023, Bell proposed a prevention agenda that identifies high-risk individuals and intervenes with behavioural changes that delay either the onset of a disease or make it obsolete: 'Right now, we treat people at high costs three months before they die. However, identifying and treating chronic diseases before they show symptoms, increases the efficacy of therapies,' explains Bell.

He proposes a targeted approach, concentrating resources on populations at risk rather than adopting a broad strategy. 'What you need to do is concentrate your resources on the people who are going to suffer from a disease rather than the whole population,' he says. 'Up until recently, we haven't really been able to do that, because we have had to do everything to everybody, which is massively inefficient. However, developments in the last five to ten years such as large-scale epidemiology as well as molecular tools such as biomarkers and genome sequencing have paved the way for a more preventative approach to healthcare.'

Based on the results of genome sequencing, polygenic risk scores can establish a measure of an individual's risk to develop a specific medical condition due to one's genes. Combining polygenic risk scores with other factors that influence disease risk allows for a more accurate estimation of how likely a person is to develop a specific disease than considering either alone. The algorithms used for calculating those likelihoods are based on artificial intelligence (AI). All of these approaches complement traditional measures like blood pressure and cholesterol levels and offer a gamut of tools for a prevention-centered healthcare delivery.

Paradigm shift: Putting preventative healthcare into action

The UK's Our Future Health programme, which Bell chairs, exemplifies the paradigm shift to a prevention-centered healthcare approach. The goal is to revolutionize healthcare by combining genetic analysis with lifestyle data, providing insights into human health on an unprecedented scale. The study aims to explore the potential uses of genetic risk scores in health screening, facilitating the development of new ways to identify diseases before they become symptomatic as well as to improve health outcomes and life quality.

The project targets to recruit five million volunteers by 2025 and collect comprehensive data on their genetics, health, and lifestyle to understand the factors influencing health conditions. The initial focus of the study lies on cancer, Alzheimer's, heart disease, arthritis, diabetes and stroke. Our Future Health, which is the UK's largest ever health research programme, also wishes to showcase that collecting these data inexpensively can significantly impact health outcomes. 'Now you can tell people at the age of 25 that they are in the top 5% of risk for cardiovascular disease, so they need to pay attention to it,' says Bell.

Although invitations to sign up for the programme were sent out initially to households in West Yorkshire, West Midlands, Greater Manchester and Greater London, any resident in the UK above 18 can partake. The first volunteer signed up on July 12th, 2022, and by January 19th, 2024, the number of participants had grown to 1,163,710 with about 3,000 new people joining daily. Volunteers' data will be de-identified and held in "trusted research environments" that meet strict security criteria.

An access board, including independent experts and members of the public, will ensure the resources are only used for health research in the public interest. 'When we started Our Future Health, we set out to create a health research programme on a scale never seen before anywhere in the world. Hitting one million volunteers over the last year is a truly remarkable achievement and means we're now rapidly turning that ambition into reality,' Bell concludes.

Our Future Health is run by a charity of the same name and is supported by the UK government together with the NHS. It is set up as a public private partnership with partners from the industry as well as disease-related charities, both groups bringing their expertise in discovering and developing new prevention and treatment methods to the table. A third of its £239 million budget is financed from UK Research and Innovation with the remaining funds coming from leading life sciences companies and charities. Although initial recruitment of volunteers is planned to be concluded by end-2025, they will remain enrolled for life unless they decide otherwise, making for a long outlook of the programme. ■

Report: Cornelia Wels-Maug

Prof
Sir John Bell

Prof Sir John Bell is President of the Ellison Institute of Technology (EIT) Oxford. A former Regius Professor of Medicine at the University of Oxford, he has made significant contributions to the UK's life sciences endeavours, and his research has contributed significantly to the understanding of immune activation in a range of autoimmune diseases.

Climate change brings new diseases to Europe – using AI to prepare

It is possible to forecast how different infectious diseases will spread across Europe in relation to global warming. This is done by using artificial intelligence and mathematical modelling of changing travel patterns and disease effects such as expected case fatalities of novel outbreaks.

In this way, it will be possible to take countermeasures and build up preparedness. This is shown in a new doctoral thesis at Umeå University, Sweden. „It will become increasingly important to predict how and where infectious diseases will spread. Several serious diseases are next in line to reach many countries in Europe as the climate changes and we also travel more. Through access to technology and data-driven forecasts, there is room to make decisions about capacity in healthcare and measures to curb the spread," says Zia Farooq, doctoral student at Umeå University.

In his thesis at the Department of Public Health and Clinical Medicine, Zia Farooq shows models that, by combining different types of data with artificial intelligence and mathematical modelling can predict the spread of infectious diseases. One example is the disease West Nile fever. The spread of this viral disease via host animals is partly driven by climate change with rising temperatures, longer springs and drier winters.

The thesis shows that the forecast model that Zia Farooq and the research group he is part of would have been able to predict with good precision the latest and unusually large outbreak of West Nile fever in Europe in 2018. The methodology is based on applications of AI and machine learning algorithms that process disease occurrence data with climate and environmental, sociodemographic and trading data.

Another viral disease that is transmitted via mosquitoes is dengue fever. It can cause high fever, severe pain and life-threatening sequelae. Previously considered a tropical disease, it is now spreading in Europe, mainly as a result of increased travelling and climate change. Zia Farooq shows that imports of dengue virus through infected travellers during the five-year period 2015–2019 increased by 588% compared to 20 years earlier. Effective imports require the presence of certain mosquito species that can carry dengue between humans, which is realized by increasing average temperatures in Europe. The fact that dengue fever can spread in this way means that human travel patterns are important in general for also other similar diseases, such as Zika fever, yellow fever and chikungunya.

„Of course, it is important to reduce emissions and thus limit climate change. But we may not entirely be able to escape this problem as climate change is already happening. This is why it's important to have tools to be prepared to face the challenges of climate sensitive and emergent infectious diseases," says Zia Farooq. ■

Source: Umeå University