Interview with dr. Oleksandra V. Ivashchenko

Reducing imaging-associated radiation dose in childhood cancer to minimize the risk of secondary cancer later in life

Oleksandra ("Sasha") Ivashchenko is a Medical Physics Expert and Assistant Professor at the Department of Nuclear Medicine and Molecular Imaging, University Medical Centre Groningen (UMCG). Her research focuses on personalized dosimetry and optimizing the image quality-to-radiation dose balance in PET/CT and SPECT/CT, with special attention to vulnerable groups such as children and pregnant patients. She leads AI-driven projects that aim to reduce imaging-associated radiation exposure without compromising diagnostic accuracy. Sasha is active in international standard-setting and collaboration as a member of the SNMMI MIRD Committee and as a leader within EFOMP working groups on internal dosimetry. Recently, she received a grant from the Hanarth Fonds, an AI-focused foundation supporting innovations that improve cancer care, with a particular interest in rare cancers.

Can you briefly explain the goal of your research project?

If I explain it in one sentence: we want to make PET/CT safer for children with cancer without losing diagnostic reliability.

Children diagnosed with cancer often require multiple PET/CT scans throughout diagnosis, treatment, and long-term follow-up. Although survival rates exceed 80%, these repeated imaging procedures, despite being of vital clinical value, expose children to ionizing radiation at a young age—when tissues are most radiosensitive and life expectancy is long. This increases the lifetime risk of radiation-induced secondary malignancies, including rare brain tumours.

Our objective is to use AI to lower both components of PET/CT radiation—the injected tracer dose and the CT dose—without compromising lesion detectability, quantification accuracy, or clinical decision-making. Ultimately, this project aims to protect long-term survivorship while maintaining high-quality oncologic imaging.

How will you approach this problem?

We approach the problem technically, clinically, and systematically.

First, we address PET dose reduction for two most commonly used paediatric PET applications: [^{18}F]FDG and [^{18}F]F-DOPA imaging. Using high-quality paediatric PET datasets, we will train AI models—such as convolutional neural networks, transformers, and generative models—to reconstruct diagnostic-quality images from low-count or sparsely sampled data. This enables reduced tracer activity or shorter acquisition times.

Second, we focus on CT. Since CT is primarily used for attenuation correction and anatomical localization, we explore three AI-based strategies:

- enhancing ultra-low-dose CT using AI denoising;
- generating synthetic (pseudo-)CT images from 2D preview images (scanograms);
- exploring alternative attenuation correction pathways when technically feasible.

All models will be evaluated using objective image quality metrics, quantitative PET accuracy (SUV preservation), and blinded clinical expert assessment. Importantly, we validate across scanner types and institutions using external data from the RHYTHM EU consortium, ensuring generalizability.

The key principle is: dose reduction is only meaningful if clinical confidence remains intact.

Who are your (research) partners in this project and what is their role?

This project is inherently multidisciplinary.

At the UMCG, prof. Andor Glaudemans serves as the clinical lead, ensuring alignment with paediatric oncology practice. Nuclear medicine physicians contribute to expert image quality evaluation and define clinical acceptability criteria.

CT expertise and reconstruction validation are supported internally by imaging physics specialists.

Externally, Erasmus MC contributes

additional paediatric datasets and clinical validation input. The RHYTHM EU4Health consortium provides multi-centre external datasets essential for robust validation and harmonization. We also collaborate with Siemens Healthineers on simulation tools and reconstruction environments, enabling realistic low-dose modelling and practical integration pathways.
Each partner plays a distinct role—clinical validation, technical development, harmonization, or deployment—ensuring that the project is scientifically rigorous and clinically relevant.

How does this specific research project fit your overarching research line?

This project is a natural continuation of my broader research program on dose-optimized, quantitative imaging. My work consistently focuses on balancing radiation exposure with diagnostic accuracy. Whether in paediatric PET/CT, pregnancy imaging, or radionuclide therapy dosimetry, the central question remains: how do we obtain the necessary biological information while minimizing unwanted harm?
This Hanarth Fonds project expands that philosophy into an AI-driven framework. It combines methodological development, validation, and clinical translation—three pillars that define my research approach.
Importantly, it reinforces my belief that innovation must be grounded in measurable, reproducible standards rather than technological enthusiasm alone.

What inspires you to come up with new research questions or potential solutions?

Honestly, most of my best ideas come from the clinic. When a technologist says “We can do this, but it takes too long”, or a clinician says “I trust this scan, but I worry about cumulative dose”, that’s where research questions appear.
I’m also inspired by ‘mismatches’ in healthcare: places where technology exists but isn’t yet used optimally because protocols, standards, or validations are missing. And finally, international collaboration inspires me—when you see how much practice varies between hospitals, it becomes obvious where standardisation and robust tools can make a real difference.

You are a medical physicist in a nuclear medicine department. From that perspective, what are the biggest opportunities and challenges for the coming years?

I see enormous opportunities in nuclear medicine right now. We are at a technological tipping point. Total-body PET systems, advanced quantitative SPECT/CT, and AI-driven reconstruction allow us to extract much more information from less data. That means we can either improve diagnostic precision or significantly lower radiation dose – and ideally, do both at the same time.
Theranostics is also rapidly expanding. Personalized radionuclide therapy requires accurate quantification and dosimetry, and medical physicists are uniquely positioned to contribute meaningfully there. I think our field will move from ‘beautiful images’ to ‘measurable, predictive biomarkers’.
At the same time, the challenges are substantial. AI must be validated properly – not only technically, but clinically and ethically. Generalizability, bias, regulatory integration, and workflow compatibility are real hurdles. Another challenge is balancing innovation with safety: dose reduction should never come at the expense of diagnostic reliability.
There is also a structural challenge. I am, first and foremost, a clinical medical physics specialist. Research is something I often describe as my ‘hobby’ – not because it is not serious, but because I am officially hired to support clinical care. That means research must always align with real clinical needs. If it does not improve patient care or workflow, then it should not be done.
Finally, growth brings responsibility. Two years ago, my research group did not exist. Today it has grown to seven people. Taking on projects like the Hanarth Fonds grant means welcoming new personnel, mentoring them, and building sustainable structure. That leadership dimension is both an opportunity and a serious responsibility.

If we look five years into the future, what do you hope to have achieved with this specific Hanarth Fonds grant?

Scientifically, I hope we will have developed a methodology that is robust, clinically meaningful, and technically mature enough to move beyond the research environment.
My ambition is not only to publish results, but to create an approach that can realistically be picked up by our industry partner, Siemens Healthineers, and translated into a clinical solution that can impact PET/CT installations more broadly. If we are able to demonstrate—under controlled research conditions—that a certain AI-driven dose-reduction strategy is safe, robust, and generalizable, and if we can prepare a clear technical pathway that industry can further refine into a certified clinical tool, that would be a major success.
For me, real impact means scalability. If the methodology we develop can ultimately influence how paediatric PET/CT is performed across multiple centres—rather than remaining a local innovation—that is when research truly fulfils its purpose.
At the same time, success is also about people. This project involves training new researchers and expanding my group. Over the past two years,

my team has grown from zero to seven members. That growth carries responsibility. It is essential that the PhD student and postdoc not only contribute technically but also develop into independent professionals who can carry this knowledge forward.

In my view, a research project only has lasting value if it invests in the next generation. Otherwise, it risks becoming an intellectual exercise without durable societal return.

So in five years, I hope we will have:

- clinically validated dose-reduction methodology;
- a translational pathway toward industrial implementation;
- and a team of well-trained researchers who continue building on this foundation.

That combination would represent meaningful, sustainable impact. ◆