Ministry of Health, Welfare and Sport

Roadmap

For the development of nuclear medicinal products

Ambition 2035 nuclear medicinal products

National Coordination Platform

- well-known and recognised point of contact for partners within and outside the field of nuclear medicine;
- structural cooperation and supported choices;
- improving and accelerating patients' access to innovations.

Knowledge and innovation agenda

- basis for broad cooperation;
- basis for identifying unmet clinical needs;
- guiding principle for making choices and setting priorities.

Read the online version of the Roadmap:

Our ambition

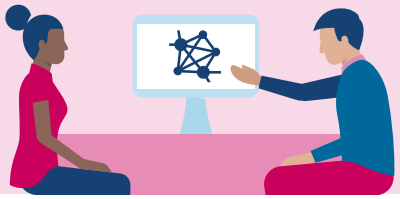
Dutch development of nuclear medicines is world leading and leads to broad patient access to new treatment perspectives.

Better representation of grant-issuing and other bodies

- proactively giving shape to the preconditions for further development;
- actively participating in designing grant programmes and other forms of funding.

Communication strategy

- greater recognition and more cooperation outside of nuclear medicine;
- greater recognition among politicians, policymakers and the general public;
- acquiring influence on policy and financing instruments.



International cooperation

- reinforcing the international position;
- increases in scale;
- structural access to international developments and innovations.

Foreword

Nuclear medicine, a medical speciality that applies radioactive medicinal products (radiopharmaceuticals) for medical imaging and treatment, is going through turbulent growth worldwide due to several major innovations. New, advanced equipment and especially new radiopharmaceuticals and new applications are the driving forces behind this growth. In our universities, hospitals, companies and supporting organisations in the Netherlands all necessary components are available to play a very important role at the international level in the further development of these radiopharmaceuticals – from scientific research to application in daily patient care, allowing all patients to benefit from these improvements in diagnostics and therapy.

In autumn 2023, the Medical Isotopes Directorate of the Ministry of Health, Welfare and Sport appointed the Medical Isotopes coordinator, whose task was to improve cohesion and cooperation in the development and application of nuclear medicinal products in order to make them available for daily patient care faster, at an acceptable price, making optimal use of the potential and infrastructure of nuclear medicine in the Netherlands for the benefit of our patients. The infrastructure necessary for success is already in place or will be achieved in the coming years. By initiating and improving structural collaboration, it should become possible to bring all components of the chain together and achieve the desired results.

The present document is the final report containing recommendations for structuring cooperation and making correct, widely supported choices. Identifying and tackling potential bottlenecks in good time and making optimal use of human and other resources should result in accelerated developments, but more importantly, it should also result in radiopharmaceuticals actually becoming available to our patients in daily care.

Many thanks to everyone who contributed to this report, either directly or indirectly, by participating in the numerous interviews, round table discussions and meetings and to those who subsequently contributed to the creation of this roadmap towards a bright future for innovative and flourishing nuclear medicine in the Netherlands.

Amsterdam, October 2024

Prof. Wim J.G. Oyen
Special Envoy Radiopharmaceutical Development,
At the request of the Ministry of Health, Welfare and Sport

Astrid Freytag (Ministry of Health, Welfare and Sport) and Marlous Kooijman (FAST) contributed to the creation of this product.

Ministry of Health, Welfare and Sport

FAST | CENTRE FOR FUTURE AFFORDABLE SUSTAINABLE THERAPY DEVELOPMENT

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Roadmap for the development of nuclear medicinal products

There is significant potential in the Netherlands to provide patients access to the best and most innovative forms of nuclear medicine health care: all important components of the production chain are represented in the Netherlands, along with a leading infrastructure for scientific research and an extensive network of multidisciplinary care professionals, specialised in all aspects of nuclear medicine. The objective of this roadmap is to outline the necessary steps for achieving faster and more affordable availability of innovative nuclear medicinal products (radiopharmaceuticals) for daily patient care, together will all partners in the chain. The applications of nuclear medicine in oncology were chosen as the role model in this roadmap, mainly because radiopharmaceuticals are being developed and applied for both diagnostic and therapeutic purposes. As nuclear medicine is also being deployed in numerous other medical disciplines (mainly for diagnostic purposes), expansion into other medical specialties in the future is a logical step.

Ambition
The contribution of the Netherlands to the development of radiopharmaceuticals is globally leading and giving patients broad access to new treatment perspectives, including for conditions for which there are currently few treatment options.

Roadmap towards 2035

In order to realise breakthroughs in nuclear medicine research, solid partnerships and targeted choices are crucial. That is why parties are committing to drawing up and implementing a national Knowledge and Innovation Agenda 2025–2035 (KIA). Apart from major clinical indications, the KIA also specifically focuses on unmet medical needs. In this agenda, the research ambition is focused and made concrete by means of tracks to set up and carry out multiple multicentre trials in public-private partnership, so multiple radiopharmaceuticals can be further developed and introduced into daily patient care. In addition to setting up joint research protocols, data and registers, a joint intellectual property and knowledge valorisation strategy will be necessary to facilitate the public-private partnership.

A National Coordination Platform is being created to ensure a KIA that is widely supported and successful implementation of this KIA. The platform will ensure commitment and cooperation and connect new and existing partners in concrete development tracks. The platform will also monitor the progress and implementation of the KIA and act as a formal point of contact for bodies such as the Topsector Life Sciences and Health, the Netherlands Organisation for Health Research and Development (ZonMW), KWF Dutch Cancer Society, the Dutch Research Council, etc.

Multidisciplinarity will be an important success factor for the coming years, as a result of which a culture of collaboration between academic and regular hospitals and private enterprises in the Netherlands and abroad should become self-evident. To achieve the ambitions, structural cooperation (from concept to execution) will take place with other medical disciplines and the private sector, based on the win-win principle: after all, applications of nuclear medicine in diagnostics could be a crucial supporting technology for facilitating and accelerating research into medicinal products in the non-nuclear domain. At the same time, successful

applications in this domain and collaborations with other medical disciplines will be beneficial to innovations in nuclear medicine and bring about accelerated availability for regular patient care. In this regard, it is crucial that future nuclear medicine research should link up seamlessly with the need for diagnostics and treatment options within other medical disciplines, as well as patients' treatment needs, of course.

To make this a reality, the field of nuclear medicine will need to actively work to increase its recognition in the medical world and among a wider public, including policymakers and decisionmakers in politics, in both the Dutch and the European grants landscape. Greater recognition, and with it new collaborations, should result from lobbying and other activities to encourage and position key opinion leaders to become members of committees and advisory bodies that are responsible for setting up and allocating international programme grants. This greater recognition and involvement will ultimately also result in access to more programmatic funding to achieve the ambitions set out in the KIA. To this end, the focus will emphatically be on international cooperation. Development of radiopharmaceuticals will only become truly promising once public-private partnerships start collaborating on technological and other development, including multicentre trials, at the international level. Similarly, European funding will only become feasible if we work as part of coherent European or even global partnerships and consortiums.

This integrated approach will ensure that fundamental research better aligns with clinical practice, allowing us to make innovative solutions available faster and more effectively, not just for patients in the Netherlands but all over the world.

Objectives

In order to achieve the above ambition, we will need to meet several objectives:

- National Coordination;
- Demand-based approach;
- Cooperation with partners;
- Structural funding;
- Stakeholder management and communication.

The ambition will be unachievable as long as the above objectives have not been met. These objectives are interrelated to a significant extent, and real progress in achieving the ambition is only possible if all conditions are met by the parties jointly.

National Coordination

Objective

1. National Coordination of and jointly steering towards research and further development of radiopharmaceuticals and associated production technologies: carefully designed governance for this National Coordination, to encourage all relevant partners to join in these partnerships as much as possible and ensure that they do so

Focus and a vision on the academic development of radiopharmaceuticals should accelerate and improve their further development and integration into daily patient care. There is currently too much fragmentation and relatively intense academic and other competition. The shortage of professionals and scarcity of resources will increasingly be felt in a relatively small medical discipline such as nuclear medicine and may limit full further development of radiopharmaceuticals. Given the challenges presented by legislation and regulations, as well as the amendments to legislation and regulations due to European initiatives, carefully considered choices will become increasingly important in relation to radiopharmaceuticals, such as medical isotopes and molecules, and the clinical pictures that should be the subject of focus. Combining knowledge and infrastructure should allow the requirements for radiopharmaceuticals set by GMP (Good Manufacturing Practices) to be met more effectively and allow promising scientific developments to be translated from the laboratory to the first applications among patients. The relative scarcity in terms of infrastructure and production capabilities for scientific research, in relation to regular patient care, makes these choices even more relevant. In this regard, it is important not to lose sight of the social responsibility to contribute to diagnostics and treatments for less common or even rare clinical pictures, even when limited infrastructure is available. To tackle these challenges, it is crucial to match all expertise, knowledge and resources of the patients, the academic and clinical world and the public and private stakeholders in a vision that is supported by all stakeholders. The academic world's commitment to apply more focus to the joint development of pharmaceuticals for application in daily patient care and the willingness to

make use of knowledge that is often available at private parties are important components of this vision.

Joint efforts by the university medical centres (UMCs) based on a guideline on how to deal with intellectual property, licensing costs and future revenue will help simplify negotiations with private parties and will likely serve to put the UMCs in a better negotiating position. Collaboration by the UMCs in this domain, for example in connection with the Netherlands Federation of University Medical Centres (NFU), is seen as an important point by the private parties as well.

Collaboration between UMCs and the *Samenwerkende Topklinische Ziekenhuizen* (STZ), the Dutch collaborative association of top clinical hospitals, is crucial for further development in large-scale clinical studies, as STZ is responsible for a considerable share of the healthcare provided in the Netherlands. The STZ has repeatedly indicated a desire to actively participate in the further development of radiopharmaceuticals. This will require coordination, so the selection of radiopharmaceuticals and indications matches the key objectives of various hospitals as much as possible. This will also allow hospitals to collaborate outside the existing regions where collaboration in the field of care, training and science is already regularly taking place. Different academic and top clinical hospitals' commitment to a KIA is a precondition for this. However, the focus should not be limitative but focused on stimulating positive developments. Facilitated by the Centre for Future Affordable Sustainable Therapy Development (FAST), collaboration could take the form of a 'National Coordination Platform for Nuclear Medicine', analogous to hubs in other domains previously created by Fast.

Timely and coordinated consultation with the supervisory authorities (the Authority for Nuclear Safety and Radiation Protection (ANVS), the Health and Youth Care Inspectorate (IGJ)) should help the STZ in particular obtain the necessary licenses and permissions. The same applies to consultation with care insurers: if promising developments are rolled out in UMC-STZ collaborations in the form of large-scale clinical trials, this will be very important, so these clinical trials can answer all questions relevant to admission to basic care. When the (relative) rarity of conditions gets in the way of traditional randomised studies involving large patient numbers, consensus will need to be sought regarding an alternative design, which can still lead to implementation in care following a positive result. At the European level, a dialogue has already started between the EMA and the European Organisation for Research and Treatment (EORTC) regarding the development of medicinal products for treating rare and very rare forms of cancer. Furthermore, the development of care that is both innovative and affordable is a shared responsibility, which can only benefit from such a timely discussion.

Independent control that takes account of the necessary subject expertise, but without a direct interest in the choices that need to be made, offers perspective to obtain support for difficult decisions as well. Successful consortiums in the Netherlands and abroad could serve as models to develop such control for nuclear medicinal product research in the Netherlands as well. Examples include the networks developed by the *Deutsches Krebsforschungszentrum* (DFKZ) in Germany and the most recent ARTnet (Australasian Pharmaceutical Trials network) public-private partnership in Australia and New Zealand, which have already brought about valuable contributions to applications of radiopharmaceuticals.

DFKZ (Germany)
The *Deutsches Krebsforschungszentrum* (DFKZ) is the national German centre for oncological research, established in Heidelberg. Here, more than 100 scientific groups are working on fundamental research, to improve diagnostic and therapeutic possibilities and prevention. In addition to the central facility, '*Nationales Centrum für Tumorenkrankungen*' (NCT) in Heidelberg, with a complete infrastructure to facilitate and carry out research, broad collaboration with various NCTs also takes place at various locations (Berlin, Dresden, Tübingen/Stuttgart-Ulm, Würzburg/Erlangen/Regensburg/Augsburg, Essen/Cologne). The PSMA and FAPI molecules, the most important innovations in Nuclear Medicine in the past 15 years, were developed in DFKZ Heidelberg and applied to patients with cancer for diagnosis and treatment for the first time there.

ARTnet (Oceania)
The Australasian Radiopharmaceutical Trials network (ARTnet) is a collaborative network in which medical specialists, technologists, scientists and researchers from the field of nuclear medicine and molecular imaging are united by a shared interest in multicentre clinical studies that make use of radiopharmaceuticals for imaging or therapy. The network is a joint venture by the *Australian and New Zealand Society of Nuclear Medicine* (ANZSNM) and the *Australasian Association of Nuclear Medicine Specialists* (AANMS). The goal of the network is to promote and facilitate joint innovative clinical research using radiopharmaceuticals for imaging and therapy. Networking between clinical locations, harmonisation of research protocols, facilitating connections (other networks, the pharmaceutical industry, finance institutions), supporting multicentre clinical research (including the collection, management and analysis of data) and promoting collaborations are a central part of ARTnet's vision.

Demand-based approach

Objective

2. A demand-based approach to the development of nuclear medicinal products with a focus on unmet medical needs (UMN)

In addition to control, management and vision, a more carefully considered approach to the development track of a radiopharmaceutical or medical device is crucial, especially with a view to both the Netherlands and the global market. It is important to gain insight into the best times for different stakeholders to join the process. For example, what would be the best time to involve the pharmaceutical industry with interests in nuclear medicine? When is a public-private partnership the best option, and when does an academic setting present the best opportunity for further development? In the latter case as well, the expertise of private parties can serve to facilitate the correct decisions.

Health Technology Assessment (HTA) has become a crucial element for the introduction of medicinal products in care. That is why it is important to consider when and how specific expertise relating to HTA should be brought in during the development process. A better understanding of development tracks will result in a more well-considered approach, which should lead to further development towards patient care. Timely involvement of stakeholders is essential to prevent delays in development and missing or unusable research data. This should prevent promising technologies from never reaching patients. A strategic and inclusive approach should ensure that innovations in nuclear medicine actually contribute to improved care in the Netherlands and at the global level.

A solid connection to fundamental research in nuclear medicine for themes that are relevant to its application in clinical practice will significantly contribute to the further development of radiopharmaceuticals towards clinical application. Fundamental research makes a significant contribution to answering questions around the mode of action, to the relation between desired effects and side effects and, therefore, to optimal patient selection: the right care for each individual patient. Timely consultation (as early as the fundamental research phase) with

clinical stakeholders (including patients) is important to clearly identify relevant clinical questions and gaps in care, to help steer the fundamental research. For example, one way to do this is to put greater emphasis on unmet medical needs. Timely involvement of knowledge valorisation experts and private partners in the development track should likewise help create a framework and ensure proper protection of intellectual property. Through better cooperation and in consultation with the National Coordination Platform, the focus should be on studies that are innovative, necessary and supported, increasing the chance of actual application in patient care. This way, fundamental research can contribute more effectively to innovative solutions that directly benefit care and the well-being of patients in the Netherlands and all over the world.

The development of radiopharmaceuticals for major indications is already taking place on a large scale at the global level. The pharmaceutical industry is a driving force in this regard. However, technology companies also play an important role, as the technologies they develop can make the production of isotopes, for example, easily scalable, which lowers the pricing, increases their availability and security of supply and in some cases even contributes to making production of medicinal products more sustainable. Especially for smaller or even niche indications, for which private parties are not or barely developing medicinal products, there is a social responsibility to deploy promising technologies for this purpose, often primarily at the initiative of academic hospitals. The facilities for this are available in the Netherlands but should preferably still go hand in hand with cooperation at the national level and guidance from the National Coordination Platform.

Cooperation with partners

Objective

3. More strategic cooperation with partners outside the nuclear medicine domain: a culture in which all nuclear medicine stakeholders, both public and private organisations, collaborate and draw on each other's expertise in order to create important innovations and solve issues

Traditionally, most developments within nuclear medicine took place within the discipline itself. Radiopharmaceuticals were developed, produced and implemented within nuclear medicine. With increasing development, complexity, and legislation and regulations, among other things, not only cooperation within the discipline but especially cooperation outside it is of crucial importance.

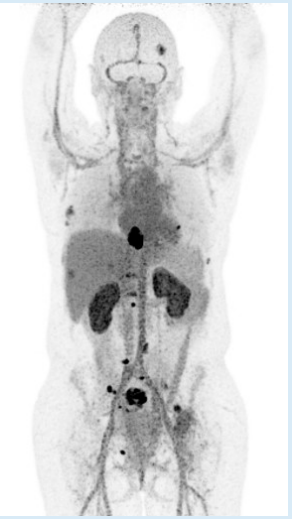
To reinforce the radiopharmaceuticals development chain, from fundamental research to clinical practice, not only should parties from the nuclear medicine sector be connected with each other, it is crucial that structural collaborations with external parties are established as well. Coordination with scientific sister associations for other medical specialties is paramount in this regard. Nuclear medicine works with practically all clinical disciplines in the hospital through the application of diagnostic radiopharmaceuticals for SPECT/CT and PET/CT. The applications of nuclear medicine in oncology were chosen as the role model in this roadmap, mainly because radiopharmaceuticals are being developed and applied for both diagnostic and therapeutic purposes. As applications of nuclear medicine play a role in nearly all medical specialities, a comparable dialogue and cooperation in the field of innovation seems logical outside of oncology as well.

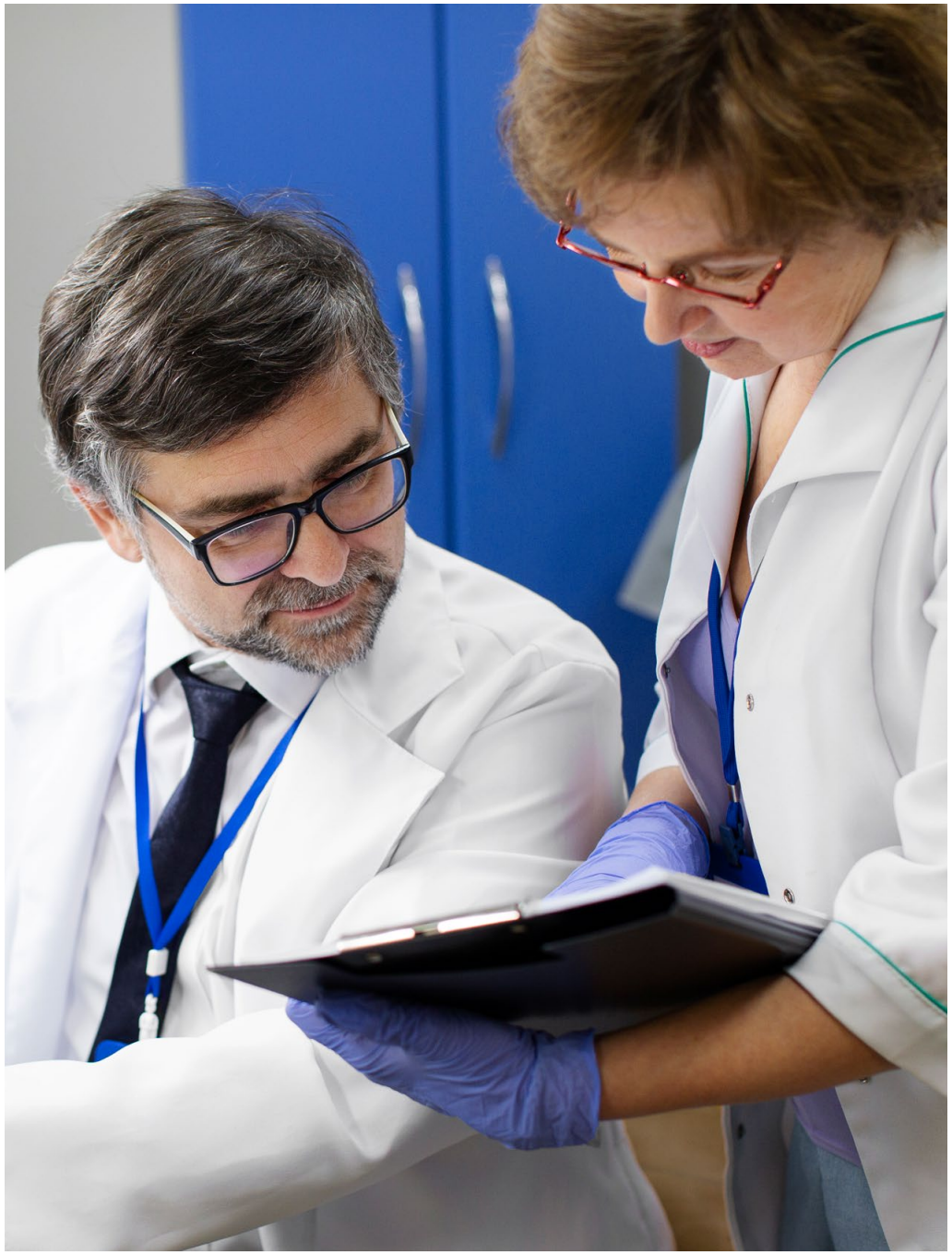
Setting up broader partnerships with stakeholders outside the nuclear field is very important. This includes public-private partnerships with target and tracer developers, reinforcing ties with the wider Life Science and Health (LSH) sector, including the Topteam LSH, and exploring the possibilities within the broader field of medical technology. Public-private partnerships, central datacentres, central

radiobiology and dosimetry expertise, figuring out the role of artificial intelligence and specific applications of nuclear software are examples of possible partnerships that could arise.

Nuclear medicinal product development could benefit from exploration of previously developed non-radioactive medicinal products that could be given new applications through radiolabelling. Cooperation with private parties, in which new industrial molecules are labelled in order to study the biodistribution and effectiveness of medicinal products at an early stage, could result in accelerated development and greater cost effectiveness of new medicinal products by bringing about an earlier industrial go/no go decision for further development. In this context, it is important for external stakeholders to be aware of developments in nuclear medicine and know where to find and utilise the necessary information.

An example of molecular imaging is Zr-89-labelled trastuzumab, a monoclonal antibody developed for breast cancer treatment. Radiolabelling with Zr-89 allows the medicinal product to be turned into a radiopharmaceutical. This in turn allows researchers to visualise the biodistribution and effectiveness of the product in the body using PET/CT scans. This approach will accelerate the development of new applications by giving detailed insights into the operation of the medicinal product in vivo.





Structural funding

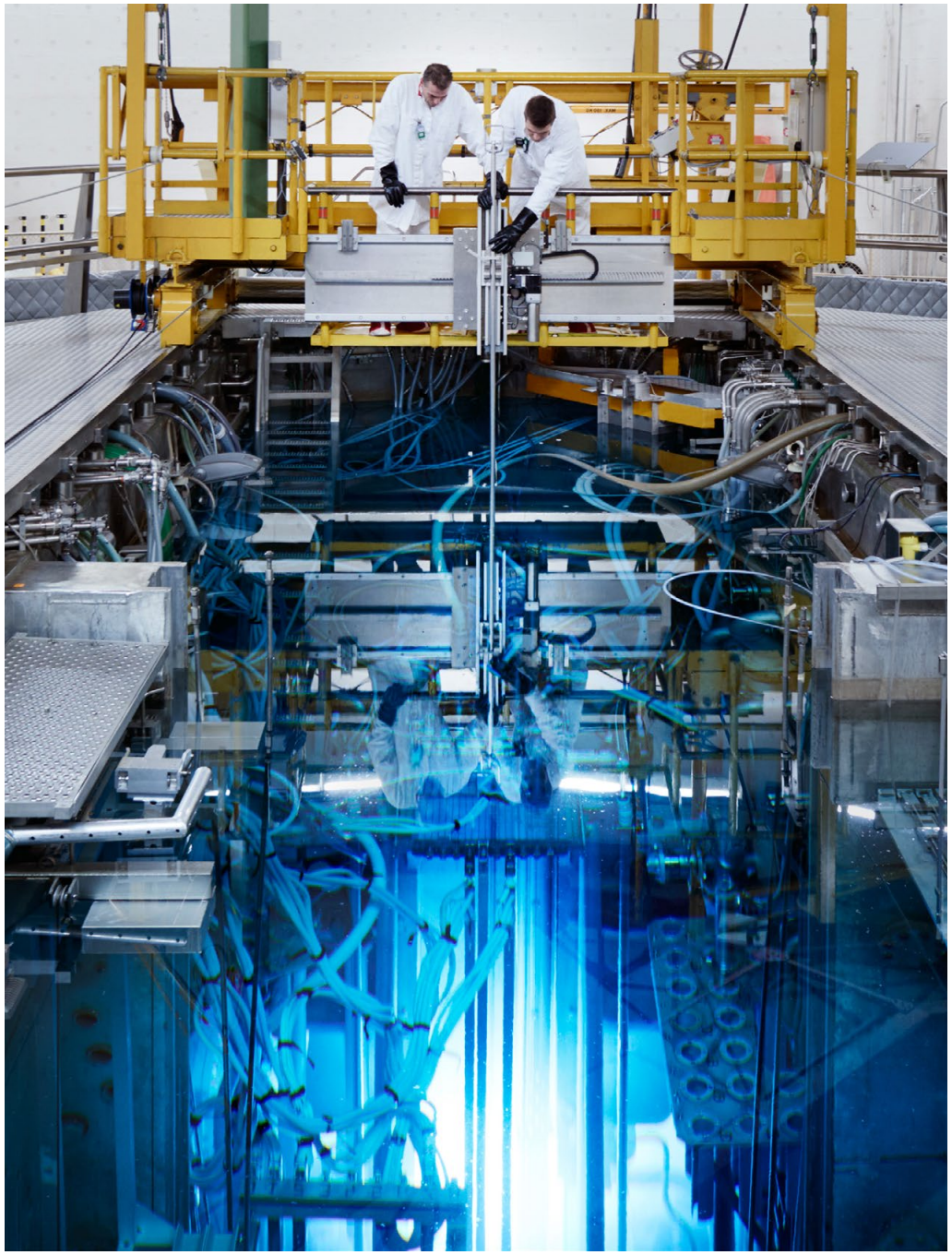
Objective

4. Structural funding: better participation in the networks and bodies of grant providers, as well as new funding models (including combined funding models)

Accomplishing structural funding for the entire field, which is involved in the development of affordable and available radiopharmaceuticals in all stages of research, is one of the preconditions for achieving the ambition. The termination of the National Growth Fund necessitates exploration of other possibilities for funding, so the necessary developments and expansions of the entire Dutch nuclear medicine ecosystem can be made possible. In addition to the unmistakable importance of funding for smaller projects to explore innovative radiopharmaceuticals, more structural investments are necessary, which can be achieved by reinforcing contacts with public grant providers in the Netherlands and the EU, health funds and the industry. UMCs must be prepared to jointly engage in dialogue with private parties, financiers and grant providers through the National Coordination Platform. The NFU will play an important role in this.

For smaller (niche) indications, additional funding is even more important, and more and more often, co-funding from various sources of funding will be necessary. In addition to obtaining grants, the option of saving or earning money can also result in funding. Private partnerships, e.g. through blended finance (grants combined with risk-bearing funding, converting grants into loans in case of success), will promote a ‘business mindset’ within a development project to promote quick and effective development.

Funding of scientific research in non-academic hospitals is a major bottleneck. This must be designed in such a way that STZ participation is not hampered in advance due to the lack of incentives, including financial resources for conducting the research.



Stakeholder management and communication

Objective

5. Stakeholder management and communication: towards greater understanding and recognition

"Our imaging technologies are excellent to visualise disease, but nuclear medicine often fails to be seen"

The investments in the construction of the PALLAS reactor and other initiatives such as the development of SHINE facilities in Veendam, the Novartis facility in Baarle-Nassau, the already existing infrastructure of other companies active in nuclear medicine and of cyclotrons in hospitals, and leading scientific expertise and patient care offer the Netherlands the opportunity to maintain and strengthen its leading position in the field of nuclear medicine. However, important national and international stakeholders are often not or only partially aware of these possibilities.

The ambition is to put nuclear medicine more actively on the map by demonstrating the ways in which nuclear techniques and treatments excel and provide added value for patients and companies, with the goal of achieving widespread recognition of the discipline's potential. Stakeholder management and a good communication strategy are essential to significantly increase the recognition of nuclear medicine in the Netherlands and beyond. The focus will be on different stakeholder groups, in the first place among other medical disciplines, and to involve these in and make them enthusiastic about developments in nuclear medicine and informing the Dutch public about the unique possibilities of nuclear medicine for effective and personalised healthcare. Finally, specific attention will be paid to informing politicians and policymakers in order to obtain greater and more direct influence on policy and funding, both during the development stage and subsequently in application in daily care.

Building blocks

National Coordination Platform

Knowledge and Innovation Agenda (KIA)

Better representation

International cooperation

Communication strategy

National Coordination Platform

To meet the objectives, a platform will be set up where parties within nuclear medicine can find each other.

The Coordination Platform will serve to connect researchers and the industry, such as producers of isotopes and radiopharmaceuticals. It will facilitate the translation of fundamental research into small-scale clinical trials and contribute to meeting the objectives by supporting in setting up larger-scale multicentre clinical studies and providing guidance, including through structured consultation with the supervisory authorities (IGJ, ANVS) and the care insurers. The Coordination Platform will support parties in obtaining structural funding. In addition, the platform can provide supplementary knowledge on subjects such as quality of life, Health Technology Assessment (HTA) and effectiveness studies.

The role of the Coordination Platform will to a large extent be determined by the involvement of various stakeholders in nuclear medicine. Prior to this, it must be determined what specific role the platform can play and what the platform's limits are. The definition of the mandate and giving shape to the governance are crucial. It is essential that patients' association and grant providers also actively participate, alongside representatives of academic institutions, STZ hospitals, professional organisations and the industry. Involving foreign experts without direct interests could significantly increase support, as it did for the DKFZ and ARTnet.

FAST has indicated that it could facilitate the process of giving shape to the Coordination Platform in the form of a nuclear medicine hub.

FAST
FAST (the Centre for Future Affordable Sustainable Therapy Development) promotes the faster and smarter development, production and making available of new therapies for patients in a way that is future-oriented, sustainable and affordable. This is possible by experimenting with new technologies and methods for medicinal product research and by facilitating knowledge valorisation and application based on the needs and desires of patients. This puts the Netherlands at the forefront of medicinal product development anwd makes our country an attractive location for medicinal product research, with high-grade production, activity and employment opportunities following in its wake.

FAST hubs
FAST has set up hubs such as InFECT-NL and RARE-NL to promote cooperation between different stakeholders in the development of innovative therapies. These hubs facilitate knowledge sharing, joint research projects and the acceleration of translating scientific research into clinical applications, which serves to increase the effectiveness and accessibility of new therapies.

Knowledge and Innovation Agenda (KIA)

Following the establishment of the Coordination Platform, setting up a shared KIA is one of the main building blocks for achieving the ambition. This shared KIA can provide guidance and direction to the nuclear field. Choices based on the potential of innovations to develop into products that are available in daily patient care, which should be a self-evident guiding principle, will be unavoidable. Shared efforts with a successful introduction in patient care as a demonstrable result will definitely motivate grant providers to contribute to these developments. Aside from that, smaller initiatives aimed at innovation will of course remain necessary as well.

In drawing up the KIA, it is important to link up with existing national knowledge agendas, such as the KIA of the Dutch Society for Nuclear Medicine (NVNG), the Topsector LSH, the Dutch Cancer Agenda (KNA), other specific KIAs and key technologies. The KIA will emphatically take into account the possibilities within the EU to link up with such agendas (such as Europe Beating Cancer). Making smart use of various funding options will provide more room to manoeuvre for decisive action.

The knowledge and innovation agendas of the NVNG, the NKA and the Topteam LSH overlap in their focus on progress in medical technologies. The knowledge agenda of the NVNG identifies important research questions that will lend themselves to care evaluation over the coming years. The majority of the research questions concern imaging and treatment in oncology, a priority that is also supported by the NKA for early detection and monitoring of cancer. Both agendas also focus on targeted therapies and personalised treatments in which nuclear techniques play an important role. The Topteam LSH promotes broader integration of these innovations in the spectrum of life sciences and health. Together, they promote the development of new tracers and techniques that contribute to both cancer research and broader health innovations.

Better representation of grant-issuing and other bodies

To follow up on the selected focus and priorities in the KIA, linking up with the existing and future programmes of grant providers (such as ZonMW, EU, health funds) will become exceedingly relevant in order to achieve further development towards patient care. One-off subsidies can be used to kick things off before obtaining structural, long-term funding, with a greater focus on supply chain finance. Supply chain finance ensures that resources are available to further develop an innovation into a product.

Different actions are necessary to increase the amount of funding for nuclear medicine and make optimal use of the available resources. Knowledge about access to different flows of funds (the second, third and especially fourth flow of funds) needs to be increased. Lobbying will be necessary to create room for nuclear medicine with regard to different subsidy instruments. Timely cooperation with private parties will be crucial for this last point.

Greater transparency and cooperation will be necessary when submitting proposals in response to various calls. Initiatives such as Oncode Institute, which focuses on cooperation and sharing information, can serve as a guide, allowing everyone at the national and international level to benefit. Oncode Institute aims for win-win situations that convince competitors to work together. The Coordination Platform could be effective in taking over this task of sharing information.

Oncode institute
Oncode Institute is a collaboration between leading researchers at various Dutch institutes. Oncode Institute translates fundamental insights that the members jointly develop into new treatments as fast as possible by means of knowledge exchange between laboratories, hospitals and industry, triage innovation, support with applying for patents and licence negotiations, help with setting up start-ups, clinical studies and involving patients in the research.

International cooperation

A dialogue with stakeholders in Belgium could be the first step towards structural international cooperation and coordination. The Belgian company Inovigate is working on a comparable track of setting up a network in and around nuclear medicine. EORTC, a large non-profit organisation that sets up and carries out international clinical trials, is also participating in the Belgian plan. This makes EORTC an important link in the development of oncological treatments. Many Dutch centres are already participating in the EORTC groups, and EORTC has chosen to actively participate in the development of radiopharmaceutical treatments.

Structural cooperation could also be set up with other countries in the EU and beyond (such as Germany, the United Kingdom, Canada and Australia), especially with those countries that participate in or are full-fledged partners in EU programmes such as Horizon. Setting up this kind of international cooperation could strengthen nuclear medicine through exchange of knowledge, joint projects and combining resources and expertise.

Communication strategy

As described above, the way nuclear medicine is presented is a critical success factor. Stakeholder management, lobbying and communication are key themes within the different objectives and the above building blocks. The following three targets will be pursued, with stakeholder management playing a crucial role:

1. **Greater recognition and collaboration with other medical disciplines:** involving other medical disciplines in and making them enthusiastic about nuclear medicine and informing them about the added value for their patients and discipline.

2. **Recognition of nuclear medicine among politicians, policymakers and the public:** informing the public about the unique possibilities of nuclear medicine for effective and personalised healthcare.

3. **Influencing policy and funding:** providing input, exerting influence on policy and participating in decision-making on the funding of scientific research and patient care.

Increasing the recognition of nuclear medicine will promote strategic collaborations and open the way for stakeholders towards possible applications of solutions involving nuclear medicine. It is therefore important to develop a strategy for effective cooperation for the specific actors, both the well-known and the less well-known stakeholders. For example, this could be done via government, pharmaceutical industries, radiopharmaceutical developers and various fields of research that could profit from nuclear applications to accelerate their research.

Additionally, lessons can be learned from various parties such as regulatory authorities, Zorgverzekeraars Nederland and valorisation experts. Strategic collaborations with the aforementioned parties could be used to make agreements with grant providers on specific research themes, in line with the national knowledge agendas.

Through this approach, the unique advantages of nuclear medicine can be better utilised and integrated into the wider medical and scientific community, creating a solid foundation for future innovations and applications.

Next steps

1. Together with FAST, a National Coordination Platform for Nuclear Medicine will be set up. The initiative to set up the platform lies with the professional organisations active in nuclear medicine (NVNG, in collaboration with NVKF, NVZA and NKRV). All of the work that has already been carried out by the DECISIVE collective can serve as a starting point for this. Private parties are full-fledged partners and can participate through the NMEU delegation. Representation of UMCs and the STZ is another important precondition for successfully scaling up development tracks and implementation in daily patient care.

2. Based on existing collaborations (NFU, STZ), the National Coordination Platform will identify and address obstacles for cooperation, in order to obtain a **mandate** from the involved parties to make rational choices based on potential and quality following consultation with the field regarding further development of promising innovations with the most potential for impact in care (**Knowledge and Innovation Agenda**).

Points 1 and 2 are absolute conditions in order to give shape to a broad, successful collaboration in the Netherlands. The points set out below can be addressed in parallel afterwards.

3. From the National Coorqq n Platform, structural and intensive contacts with scientific sister associations and research groups outside of nuclear medicine, patient associations and grant providers can be initiated to maintain a focus on **unmet clinical needs.**

4. The National Coordination Platform will set up a committee that actively identifies potential **sources of funding** for the purpose of translating and further developing radiopharmaceuticals and develops a long-term relationship with them.

5. The National Coordination Platform will prioritise the strategy relating to communications and stakeholder management for both the long and short term.

6. The National Coordination Platform will set up a committee responsible for **structured consultation** with the supervisory authorities and care insurers to create preconditions for streamlining centralised and other production of new radiopharmaceuticals, standardised and other protocols and optimal participation in clinical trials, so clinical research with a positive result can also be implemented in patient care.

7. The National Coordination Platform will initiate and facilitate participation in relevant **national n**etworks such as Topsector LSH (Health Holland), Oncode Institute, etc., with the twofold goal of identifying pharmaceuticals with potential for radiolabelling and highlighting the possibilities presented by nuclear medicine technology for accelerating the development of medicinal products.

8. From the National Coordination Platform, international contacts will be maintained to facilitate possibilities for increases in scale and obtaining EU grants.

List of abbreviations

AANMS	Australasian Association of Nuclear Medicine Specialists
ANVS	Authority for Nuclear Safety and Radiation Protection
ANZSNM	Australian and New Zealand Society of Nuclear Medicine
ARTnet	Australasian Radiopharmaceutical Trials network
CT	Computer Tomography
DKFZ	Deutsche Krebsforschungszentrum
EMA	European Medicines Agency
EORTC	European Organisation For Research And Treatment
FAPI	fibrogen activation protein inhibitor
FAST	Centre for Future Affordable Sustainable Therapy Development
GMP	Good Manufacturing Practice
HTA	Health Technology Assessment
IGJ	Health and Youth Care Inspectorate
KIA	Knowledge and innovation agenda
LSH	Life Science and Health
NCT	Nationales Centrum für Tumorkrankungen
NFU	Netherlands Federation of University Medical Centres
NMEU	Nuclear Medicine Europe
NKRV	Netherlands Clinical Radiochemistry Association
NVKF	Dutch Association for Clinical Physicists
NVNG	Dutch Association for Nuclear Medicine
NVZA	Netherlands Association of Hospital Pharmacists
NWO	Dutch Research Council
PET	Positron Emission Tomography
PSMA	prostate-specific membrane antigen
SPECT	Single-Photon Emission Computer Tomography
STZ	Samenwerkende Topklinische Ziekenhuizen
UMC	University Medical Centre
UMN	Unmet Medical Needs