Joint Action on Networks of Expertise

Deliverable number D10.1

Blueprint: Recommendations for the Implementation of a Sustainable Network of Expertise on Hi-tech Medical Resources in Europe

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11 – French National Cancer Institute	Thomas Dubois, Margaux Le Gall
12 – Region Zealand	Julie Karen Geld, Keld Hundewadt

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0.1	26/08/2024	Muriel Santoro, Jean-Yves Blay	First draft
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0.3	11/09/2024	Venice Hancock, Jean-Yves Blay	Final version

LIST OF ABBREVIATIONS

Abbreviation	Definition
AIR	Advanced Interventional Radiology
CCC	Comprehensive Cancer Center
CCI	Comprehensive Cancer Infrastructures
CCCN	Comprehensive Cancer Care Networks
ERNs	European Research Networks
ESMO	European Society for Medical Oncology
MTBs	Molecular Tumor Boards
NoE	Network of Expertise
NGS	Next-generation sequencing
WP	Work Package

RECIPIENTS OF THIS DOCUMENT

This document is addressed to the whole JANE consortium. It is an official deliverable for the project and shall be delivered to the European Commission and appointed experts.

Table of Contents

1. Executive Summary

This report is the final deliverable of Work Package 10 (WP10), dedicated to the future European Network of Expertise (NoE) on Hi-Tech Medical Resources of the European Joint Action, JANE. It outlines the working methods and main advances achieved between October 1st, 2022 and September 30th, 2024 by the WP10 working group under the leadership of Professor Jean-Yves Blay, President of Unicancer, the French federation of comprehensive cancer centers.

It is structured in three main sections: a description of the working methodology, a description of the future NoE, and the detailed structure carried out during the development of the next Joint Action (JANE-2) still concerning this same NoE.

2. Introduction

The development of precision cancer medicine has led to considerable progress in the diagnosis, locoregional treatment, and advanced phase treatments of numerous neoplastic diseases.
Innovative, personalized, local treatments and systemic treatment have been shown to significantly improve outcomes.
However, the deployment of precision cancer medicine conceals numerous organizational challenges and complexities. It often requires expensive, complex, rare technical platforms, dependent on equally rare expert human resources, and still necessary for the diagnostic and therapeutic development of cancer medicine in 2024.

Drawing upon the experience in many countries, the European Union is committed to the construction of a network of integrated cancer centers or Comprehensive Cancer Centers (CCCs). These have been the overall sites on which the EU has been able to develop this precision medicine. Many countries have long-standing CCCs, some still have too limited a number of CCCs for their population, others have not yet identified any. Almost all of the technology necessary for diagnosis and patient care is integrated into these CCCs. They often interact in national or even international networks, which we have seen for rare cancers. However, in many countries CCCs remain under construction, and will require the support of other networks beyond their own borders. These CCCs must be able to rely on broader networks for rare, diagnostic, or therapeutic technologies required for precision cancer medicine.

The aim of WP10, in this context of rapid development of resources, treatments, and therapeutic progress, was to define which Networks of Excellence were necessary to support CCCs in all countries of the European Union, particularly for rare, complex, expensive technological resources that can be shared across several centers or several countries.

The work carried out by the WP10 partners makes it possible to propose several networks in response to the challenges of the development of precision cancer medicine in the perspective of European CCCs, and a cross-border collaboration which must be deployed over the years to come. The report presented here summarizes the provision of this working group.

3. Methodology used (i.e. to design the NoE)

Working group and work schedule

Initially, the WP10 working group was made up of just seven Member States (Belgium, France, Greece, Lithuania, Poland, Romania, Spain) and a small number of experts too, as follows:

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Figure 1: WP10 participants in JANE JA

Before setting up a working methodology, we agreed on a work schedule for the two years of the joint action. This timetable was designed based on the tasks common to all the NoEs described in the grant agreement.

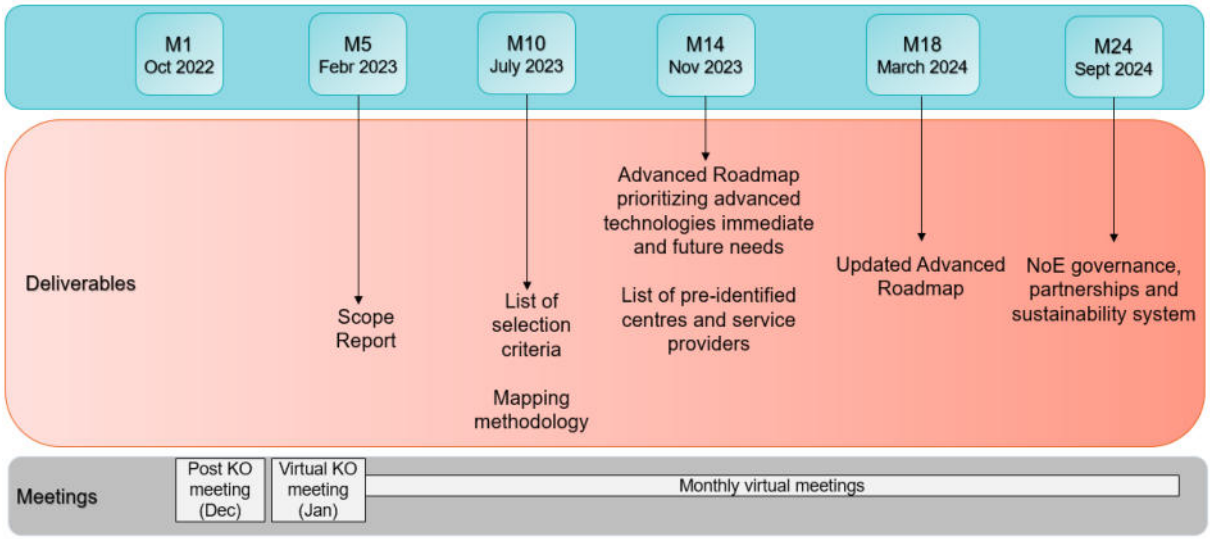

Figure 2: WP10 timeline

The participants list and meetings list and details are available in Annex 1 and Annex 2.

Hi-tech medical resources key speakers meeting

To define the scope of the future European NoE on Hi-tech medical resources, we consulted experts in the field:

- Prof Andrés Cervantes, the European Society for Medical Oncology President (ESMO) spoke about the **"Perspective of ESMO vs Clinical Practical Guidelines"**. ESMO President highlighted that several hi-tech resources are recommended by the ESMO Guidelines across malignancies, namely:

  - Molecular profiling platforms: NGS, ISH, IHC, RNA-seq
  - Liquid biopsies: tumour-informed and tumour-agnostic NGS profiling assays
  - Pharmacogenetics tests: DYPD
  - Interventional Radiology infrastructures, personnel and know how
  - Radiation Oncology resources: IMRT, IGRT, proton beam therapy
  - Clinical trial capacity, infrastructures and expertise.
  - Multidisciplinary Tumour Boards, Molecular Tumour Boards
  - Selected AI applications and tools

  Prof Andrés Cervantes also mentioned:

  - ESMO recommendations on the use of circulating tumour DNA assays for patients with cancer
  - ESMO recommendations for the use of NGS for patients with metastatic cancers: a report from the ESMO Precision Medicine Working Group – including a Framework to rank genomic alterations as targets for cancer precision medicine: the ESMO Scale for Clinical Actionability of molecular Targets (ESCAT)

- Prof Frédérique Penault-Llorca, General Director of Centre Jean-Perrin in Clermont-Ferrand, spoke about **"Molecular diagnosis platforms"** (molecular characterization, biomarkers, Next-generation sequencing (NGS) platform).

  Some challenges were identified:

  - Securing the upstream and the downstream & ensuring coordination
  - Cost, depending of the reimbursement system of each Member State (quite cost-effective)
  - Sample acquisition
  - Bio-informatics
  - Reporting
  - Very complex and diverse Molecular Tumor Boards (MTBs)

- Drug availability
- Access to clinical trials

- Prof Eric Deutsch, Head of the Radiotherapy Department at Gustave Roussy, spoke about **"Innovative Radiotherapies"**, including MRI guidance combined to radiotherapy allowing adaptive radiotherapy, stereotactic radiotherapy, proton therapy, carbon ions, flash radiotherapy (in development) and precision medicine in radiotherapy.

  Despite the accessibility and cost challenges of this type of resources, innovative radiotherapies offer real advantages, such as:
  - Better efficacy
  - Less toxicity and side effects decrease
  - Mainly ambulatory treatment
  - Better dose distribution

- Prof Thierry de Baer, Head of the Therapeutic Imaging Department (interventional radiology) at Gustave Roussy, spoke about **"Interventional radiology"**.

  The opportunities of Interventional radiology that were described are as follows:
  - Mini-invasive
  - Transversal: prevention, detection, treatment, palliative care
  - New specific competency with dedicated training (Advanced Interventional Radiology – AIR)

- Prof Jean-Yves Blay, President of Unicancer and General Director of Centre Léon Bérard in Lyon, spoke about **"Rare cancer networks European Research Networks (ERNs)"**.

- Prof Christophe Le Tourneau, Head of the Department of Drug Development and Innovation (D3i), Curie Institute in Paris, spoke about **"Early phase clinical trials"**.

  Early phase clinical trials are a real bridge between research and care. Related challenges are:
  - Expertise needs
  - A need to map resources in each Member State that support academic studies (not only EU funded, also National) to ensure better coordination at the EU level.

The key speakers meeting has been of a great help in determining the domains of expertise of this future NoE (as explained further on).

Exploration of collaborations with other future NoEs of JANE

WP10 (NoE on Hi-tech medical resources) and WP9 (NoE on Omics) have worked very closely together since the beginning of JANE. This close interaction relies on the fact that the aim of both WPs shares similar characteristics and face common challenges, even if they have different scopes, partners and collaborators. Indeed, omics technologies and Hi-tech medical resources cover very promising and innovative resources, which will profoundly modify and strengthen tomorrow's management of cancer. However, these resources are very expensive, not necessarily available in each cancer centre nor equally accessible or available in each EU Member State.

In practice, the scope, objectives, activities, mission and vision of the NoE on innovative resources as well as the endorsement criteria for partnership and the synergies within the European cancer ecosystem were discussed and elaborated together during two joint face-to-face meetings.

4. Hi-tech medical resources NoE description

Principles and domains

Hi-tech medical resources, as well as Omics, are **promising and innovative resources** which have to address common issues. On the one hand, the future action of the corresponding NoEs should facilitate reaching **better access** to these resources in the EU by reducing disparities, and on the other hand, they must strive for **excellence and high-quality services** for the users. Moreover, the **rapid integration** of these innovative techniques into care is essential so that cancer patients may benefit from them as quickly as possible. Those principles will require some level of **flexibility** in line with particular, contextual features in the Member States, e.g., reimbursement, ethical concerns, professional expertise, technical capacity.

These innovative resources, infrastructures as well as expert human resources, should be available in a **minimal number of Comprehensive Cancer Centers (CCCs), Comprehensive Cancer Infrastructures (CCI), Comprehensive Cancer Care Networks (CCCN)**, whose European network is being defined and implemented within 'twin' Joint actions (CraNE and European Network of CCCs), to cover the whole European population.

The working group defined the principles of the Hi-tech medical resources NoE as follows:

- **Excellence** (quality)
- **High impact** in terms of survival (quality, efficiency)
- **Uneven presence** in Member States (equity of access)
- **Promising / innovative** and in development resources (exploration, sustainability)

The working group agreed to define five domains or sub-networks of expertise able to structure the network, namely:

- Innovative radiotherapy
- Interventional radiology
- Nuclear medicine
- Cellular therapies
- Ex-vivo agent testing

Figure 3: WP10 scope presented during the JANE Annual General Assembly Barcelona, 16-17/11/2023

2 additional domains or sub-networks of expertise were envisaged at the time:

- Innovative surgery
- Radiomics

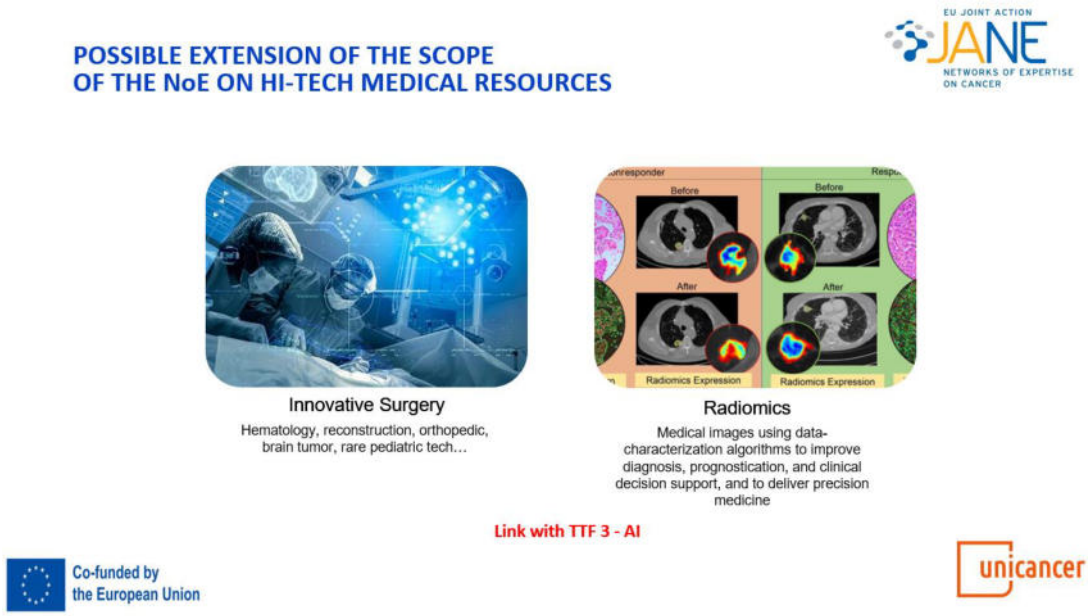

Figure 4: WP10 extended scope presented during the JANE Annual General Assembly Barcelona, 16-17/11/2023

Objectives

The following objectives were identified as priorities for the NoE on Hi-Tech Medical Resources:

1. **To map the current situation in each domain of the NoE**, regarding: available resources, academic studies through National funding (not only EU funding), available expertise / centers of reference, available education and training programs, existing networks working on hi-tech medical resources and innovation (to avoid duplication)
2. **To identify the biggest gaps and inequalities between the Member States**
3. **To formulate the most urgent needs (graduation in time),** regarding resources accessibility, academic studies, expertise and skills
4. **To facilitate the training of health professionals on hi-tech medical resources**, in cooperation with scientific societies (possibility to create a handbook of education needs), in collaboration with the future EUnetCCC Joint Action (CraNE JA follow-up) and the Horizon Europe CCI4EU project
5. **To develop patient-centered care pathways**
6. **To conceive public health awareness campaigns**
7. **To build partnerships in order to be upfront the most innovative and promising resources**, including AI tools

Field of applications

This NoE should be dedicated to the **needs of the healthcare providers** who use these resources within CCIs/CCCs/CCCNs, such as radiation oncologists, nuclear physicians, radiologists, etc. They are the "end users" of the services which will be provided by the NoE.

Endorsement criteria

The NoE on Hi-tech medical resources and the NoE on Omics have worked very closely together especially on defining the endorsement criteria for their respective network.

This close interaction was based on the fact that their scope shares **similar characteristics** and face **common challenges**. On the one hand, the two future NoEs must aim to reach **better inclusion in the EU** by reducing disparities in access to these resources, and on the other hand, they must **strive for excellence and high quality services for the users**. Those principles will need to be flexible given the Member States' specificities: the **adaptation to the national organisations, guidelines and regulations** will be crucial.

Figures 5 and 6: WP10 and WP9 joint meeting
Paris, 19/09/2023

The expert participants in the NoE should work in collaboration with CCIs/CCCs/CCNs at the national, regional or local level. WP10 and WP9 jointly discussed and developed criteria to characterize networks, to which experts belong, driven by the following principles:

- **Prerequisite of quality and inclusivity**
- Definition of **3 different categories**
    - Category 3: participants are leaders in the field, with mature and autonomous networks, able to combine care, research and education, involved in enhancing reimbursement, participating in twinning programs with a Category 1 network as a mentor;
    - Category 1: participants with resources (although incomplete), interested in increasing their resources (care, research, training) and in participating in clinical trials, involved in twinning programs with a category 3 network as a mentee;
    - Category 2: participants filling the criteria between categories 1 and 3 (intermediate category) with mature and autonomous networks; they should be able to entera partnerships with level 3 participants.

Thirteen different criteria were identified, which can be grouped into 3 main sets:

A: Type and volume of activity

1. Available resources
2. Field of application
3. Activity volume
4. Cancer types (very open criteria because of specialisation of some cancer centres, e.g. haematology, paediatric cancers…)

B: Infrastructure, resources, capability

5. Available infrastructure and core facilities
6. Human resources and expertise
7. Quality management (even though quality is a prerequisite, there are different levels)
8. Track record

C: Workflow, accessibility, collaboration

9. Integration into care
10. Accessibility
11. Connection with clinical cooperative groups, clinical trials, ERNs and other EU networks
12. Clinical practice guidelines, training and education

13. Cost and NIHDI reimbursement (only category 3 has to facilitate and engage discussion for NIHDI reimbursement according to national regulations)

It has been proposed that experts participating in the NoE represent category 3 (or category 2 if not available). In countries having only category 1 networks, a representative from one of these networks would need to be involved in a twinning program with a category 3 network from another country in order to join the NoE on Hi-Tech Medical Resources.

The endorsement criteria are detailed in Annex 3. The five domains that were confirmed at that time described their methodology which is detailed in Annex 4.

Now that the JANE JA has nearly come to an end, it is important to highlight that **these criteria are not binding**, since the partners selection in the different NoEs (for JANE-2) did not have time to apply them. Nevertheless, they could be **very useful for a capacity building exercise at the national/regional level within JANE-2**.

5. Towards JANE-2

Stabilization of domains of expertise

While developing WP10 in view of JANE-2 proposal, we stabilized the domains of expertise of this NoE and also listed them in a more logic way. As anticipated, the NoE on Hi-Tech Medical Resources will focus on **technologies that work across all cancers and are highly specialised and innovative**.

List and brief description of the seven domains of expertise:

1. **Nuclear Medicine.** This modality is well established across Europe in cancer centres. However, current developments with novel tracers reveal hitherto unseen possibilities for precise diagnostics and consequently treatment.
2. **Radiomics.** This novel discipline allows an extension of imaging not only to describe disease morphology, but also to decipher information about cancer biology.
3. **Innovative radiotherapy.** Radiotherapy is a cornerstone of cancer therapy. Novel, innovative and highly specialized techniques such as hadron therapy allow new advances in treatment efficacy.

4. **Innovative surgery.** Novel surgical approaches are being developed, and integration with, for example, machine learning based decision support systems or imaging modalities with integration of robotics during surgery, allows improved patient outcomes in surgery.
5. **Physical methods of ablation (formerly called Interventional Radiology).** For example, ultrasound, radiofrequency, electroporation, etc. Their rapid development and increasing use for oligometastatic disease allows more treatment options.
6. **Cell therapies.** Cell therapies encompass the use of immune cells from patients and donors to treat cancer and are gaining increasing relevance in cancer treatment. Cell therapies are highly specialized and require extensive lab facilities.
7. **Ex-vivo testing of agents.** Techniques involving patient-derived cell cultures as a network to investigate cancer drugs efficacy in specific patients. The setup requires expertise and extensive lab facilities to grow samples from a larger number of patients.

The seven domains represent diverse hi-tech fields, yet they all have in common the fact that there is a gap in access, compounded by an information gap for patients that further widens this access gap. This NoE aims at **finding solutions that allow patients across the EU to benefit from increased knowledge and expertise and more accessible health services**. As emerging resources tend to be expensive and rare, **particular attention will be paid to more equity of access to these resources for EU citizens**.

Organisation and Governance

Once the seven domains of expertise had been stabilized, **the number of partners in this network grew exponentially**. It has now become **the largest NoE of JANE-2**. Indeed, in view of JANE-2, the Hi-Tech Medical Resources NoE will gather 17 Member States and Ukraine, 53 partner organizations and close to 200 identified experts who committed to contribute to the seven domains. JANE-2 WP10 will still be led by **Unicancer**, with the support of a new co-leader from Denmark, **Region Zealand** (Prof Julie Karen Geld). The participants list is available in Annex 5.

The governance of this large network will be crucial. It needs to be **simple and clear**, maybe inspired by the governance model developed by the ERNs. It needs to be **thought through and agreed among all the new partners of the network**. It will include domains leaders, co-leaders and participants, representatives of patients and carers and stakeholders.

Tasks division

The governance of WP10 will include representatives of patients and carers and will address how domains **may work independently yet mutually inspire to address these challenges**.

Therefore, some operational tasks are **set across all domains** (in blue in Figure 7 below):

- Task 1 – Governance of the NoE: organizing the governance of the network.
- Task 2 – Advocacy: establishing recommendations for Member States regarding urgent needs and biggest gaps across Europe.
- Task 3 – Innovation Observatory: positioning the network at the forefront of innovation.

Since these technologies are also at different levels of maturity and possibilities for access across the EU, and that infrastructure needs differ between them, **other, thematic, tasks are domain-specific** (in brown in Figure 7 below):

- Task 4 – Infrastructural and procedural support: supporting centres, regions and countries to better integrate innovative therapies.
- Task 5 – Education and Training: improving continuous education of health care professionals and enhancing patient and public literacy and involvement.
- Task 6 – Dissemination & Sustainability: ensuring the visibility and the sustainability of the network through dissemination activities and evaluation criteria set-up.

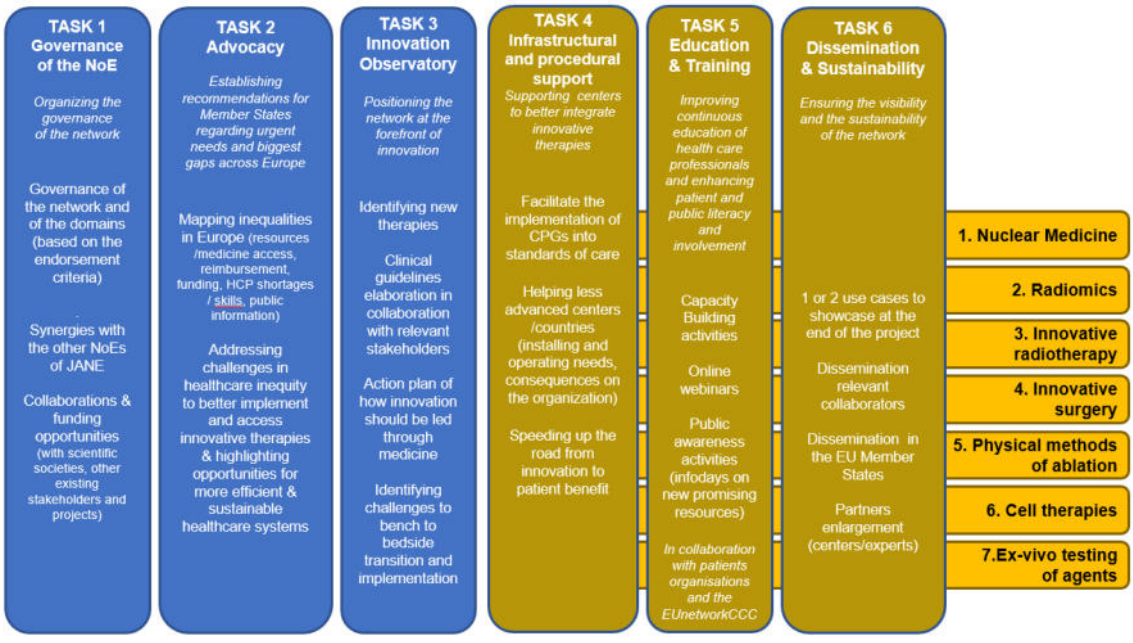

Figure 7: WP10 Tasks overview – JANE-2 JA

Synergies and integration in the EU Cancer landscape

Both WP10 and WP9 worked closely together to identify synergies between their future NoEs and the other European stakeholders and networks. The goal of this exercise was to elaborate the **future NoEs' position within the general cancer landscape**, in order to clarify their missions and avoid duplication.

It will also be crucial to consider the **synergies with other European projects**, especially those supporting the implementation of the CCCs, the CCI and the European network of CCCs (JA CraNE, EUnetCCC, CCI4EU).

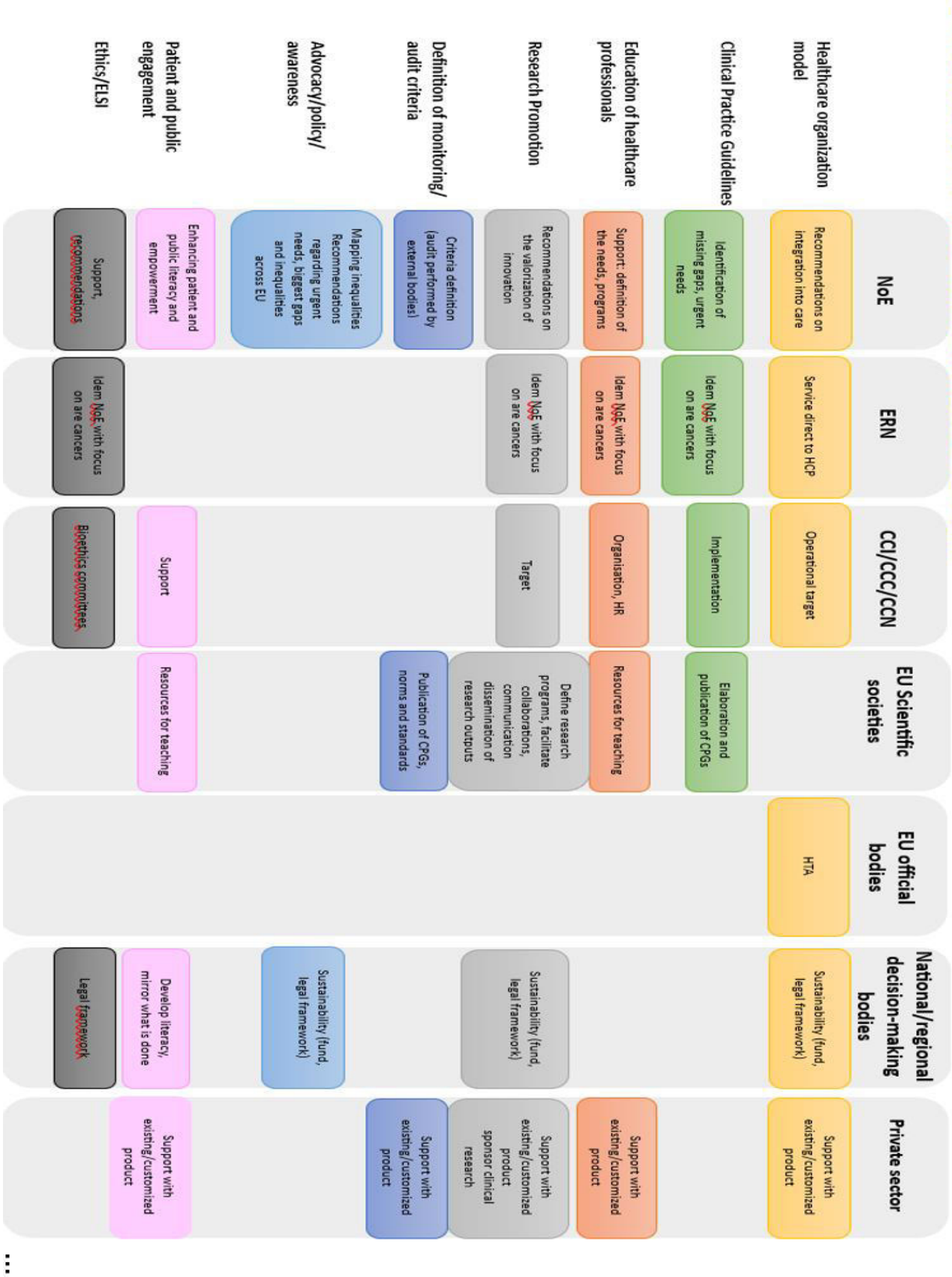
SYNERGIES IN THE CANCER ECOSYSTEM
NoE
ERN
CCI/CCC/CCN
EU Scientific societies
EU official bodies
National/regional decision-making bodies
Private sector
Healthcare organization model
Recommendations on integration into care
Service direct to HCP
Operational target
HTA
Sustainability (fund, legal framework)
Support with existing/customized product
Clinical Practice Guidelines
Identification of missing gaps, urgent needs
Idem NoE with focus on are cancers
Implementation
Elaboration and publication of CPGs
Education of healthcare professionals
Support: definition of the needs, programs
Idem NoE with focus on are cancers
Organisation, HR
Resources for teaching
Support with existing/customized product
Research Promotion
Recommendations on the valorization of innovation
Idem NoE with focus on are cancers
Target
Define research programs, facilitate collaborations, communication dissemination of research outputs
Sustainability (fund, legal framework)
Support with existing/customized product sponsor clinical research
Definition of monitoring/ audit criteria
Criteria definition (audit performed by external bodies)
Publication of CPGs, norms and standards
Support with existing/customized product
Advocacy/policy/ awareness
Mapping inequalities Recommendations regarding urgent needs, biggest gaps and inequalities across EU
Sustainability (fund, legal framework)
Patient and public engagement
Enhancing patient and public literacy and empowerment
Support
Resources for teaching
Develop literacy, mirror what is done
Support with existing/customized product
Ethics/ELSI
Support, recommendations
Idem NoE with focus on are cancers
Bioethics committees
Legal framework

Figure 8: WP10 table of synergies in the cancer ecosystem

Sustainability & Collaborative stakeholders

Key collaborative stakeholders have been identified in each of the seven domains of expertise of this NoE.

Scientific societies contribute by providing expertise, setting standards, and ensuring the network's alignment with cutting-edge research and clinical practices. Private sector companies can drive innovation, offer technical resources, and support scalability through partnerships. Academic institutions can contribute to the NoE through research, education, and training, thus building the capacity of the network. In addition, involving patient associations is crucial to ensure that the network addresses patient needs, incorporates their perspectives, and enhances accessibility and equity. These will all be key stakeholders that will contribute to the domains of this NoE.

It will be essential to **include the stakeholders** listed below in the discussions, so as to **work as far upstream** as possible to **ensure the sustainability** of this new European NoE. By involving key stakeholders, the NoE ensures sustainability by fostering collaboration, securing diverse expertise, and maintaining alignment with patient and healthcare system needs. Their active participation enhances long-term commitment, while ensuring the network remains relevant, impactful, and widely supported.

1. **Nuclear Medicine.**

- European Association of Nuclear Medicine (EANM)
- PRISMAP Medical Radionuclide
- European Association of Medical Physicists (EFOMP)
- Nuclear Medicine Europe
- Siemens

2. **Radiomics.**

- Euro-BioImaging
- Euro-BioImaging ERIC
- European Society of Medical Imaging Informatics (EUSOMII)
- European Federation of Organisations for Medical Physics (EFOMP)
- European Organisation for Research and Treatment for Cancer (EORTC)
- ESTRO Framework (Netherlands Groups)
- European Institute for Biomedical Imaging Research (EUCAIM Cancer Image Europe)

- European cancer imaging network for enhanced Artificial Intelligence in oncology (EuCanImage)
- Institutions /Research Groups
- LITO INSERM Institut Curie
- Maastricht University
- LaTIM INSERM UMR 1101
- DKFZ Radiomics Research Group
- D-lab (Netherlands)
- Lifexsoft
- Radiomics.bio

3. **Innovative radiotherapy.**

- European Society for Radiotherapy and Oncology (ESTRO)
- European Council for Nuclear Research (CERN)
- International Society for Neutron Capture Therapy (ISNCT)
- TheraPanaCea
- Siemens
- RaySearch

4. **Innovative surgery.**

- European Union of Medical Specialities/surgery (EUMS)
- European Society of Surgical Oncology (ESSO)
- The Peritoneal Surface Oncology Group International (PSOGI)
- PelvEx Collaborative
- European Society of Gynaecological Oncology (ESGO)
- European Society of Coloproctology (ESCP)
- European Association of Endoscopic Surgeons (EAES)
- Society of American Gastrointestinal and Endoscopic Surgeons (SAGE - US)
- Radspherin: Oncoinvent A/S, Oslo, Norway
- Companies producing systems for: Navigation-Assisted Surgery
- Delcath Inc. (US) Interventional oncology with percutaneous hepatic perfusion
- Endomag. (UK) Superparamagnetic iron oxide for sentinel node detection. Also, magnetic seeds for tumour localisation
- Cambridge Medical Robotics

5. **Physical methods of ablation (formely called Interventional Radiology).**

- European Society for Medical Oncology (ESMO)
- European Society of Surgical Oncology (ESSO)
- International Society for Electroporation-Based Technologies and Treatments (ISEBTT)
- United European Gastroenterology (UEG)
- European Association of Urologists (EAU)
- International Society for Sharing Practices on Electrochemotherapy
- European Society for Paediatric Oncology (SIOP Europe or SIOPE)
- European Association of Nuclear Medicine (EANM)
- European Society of Medical Imaging Informatics (EuSoMII)
- European Society for Radiotherapy and Oncology (ESTRO)
- European Society of Radiology (ESR)
- European Association for Cancer Research (EACR)
- European Medicines Agency (EMA)
- European Society of Surgical Oncology (EJSO)
- Cardiovascular and Interventional Radiology Society Europe (CIRSE)
- UCL Cancer Institute: Pioneering clinical trials and translational research in ablative techniques and improving clinical protocols.
- Institute of Cancer Research (ICR), London: Radiotherapy and Imaging Division
- Gustave Roussy Cancer Campus, France:Department of Interventional Radiology
- MD Anderson Cancer Center, University of Texas: Division of Cancer Medicine
- Johns Hopkins University: Department of Biomedical Engineering: Research in minimally invasive devices and interventional technologies.
- Stanford Cancer Institute: Cutting-edge research in interventional oncology and vascular device innovations.
- Karolinska Institute, Sweden:Department of Oncology-Pathology; research in the integration of new technologies in oncology treatment protocols.
- University Hospital Zurich (Universitätsspital Zürich) - Switzerland
- Leiden University Medical Center (LUMC) - Netherlands
- University of Turku, Finland
- "Charité – Universitätsmedizin Berlin: Department of Radiology”
- Johns Hopkins University: conducts extensive research in microwave ablation and other minimally invasive therapies for cancer treatment.

- IGEA medical
- Mirai
- Angiodynamics
- Taewong companies
- Medtronic: is a global leader in medical technology, providing a range of ablation solutions, including microwave ablation systems.
- Boston Scientific
- Johnson & Johnson Institute
- Merck Oncology
- BioNTech developing innovative cancer treatments
- OncoSec Medical Incorporated: Specialized in intratumoural cancer immunotherapies using electroporation-based gene delivery.
- TheraBionic: focuses on targeted electromagnetic therapy for the treatment of cancer
- Merit Medical Systems: Supplies a range of products for interventional oncology, including microcatheters and embolotherapy solutions.
- Cook Medical: Offers comprehensive solutions in vascular and interventional oncology.
- Terumo Corporation: Offers a broad range of medical devices, including interventional oncology and vascular intervention products.
- Stryker Corporation: Provides various medical technologies, including devices for oncology and vascular procedures.
- MedWaves, Inc.: specialized in microwave ablation technology with their AveCure™ microwave ablation system, used for treating tumours in various organs.
- NeuWave Medical (part of Ethicon, a Johnson & Johnson company): NeuWave Medical focuses on microwave ablation technology, particularly the NeuWave Flex Microwave Ablation System, used for soft tissue ablation.

6. **Cell therapies.**

- European Society of Gene Therapy (ESGT)
- European society of bone marrow transplant (EBMT)
- EUX
- ESMO
- European Hematology Association (EHA)
- Advancing cooperation on health technology assessment (EUnetHTA)

- T2 EVOLVE (DE)
- ATMPs
- UNITC (FR)
- DESCART
- Miltenyi Biotec
- Bristol Myers Squibb
- Gilead
- Novartis
- The Lymphoma Coalition

7. **Ex-vivo testing of agents.**

- EUROoCS (organ-on-chip expertise)
- Erasmus Rotterdam/Dik van Gent (Tumor slices expertise)
- HUB organoids (organoid expertise)
- Janvier labs (PDX and humanized mice expertise)
- TissUse (organ-on-chip expertise)
- EurOPDX

Annexes

Annex 1 – Partners involved in WP10

7 countries	**11 institutions**
Belgium	Sciensano *Marc Vandenbulcke* *Hélène Antoine-Poirel* *Aline Hébrant*
France	Unicancer *Jean-Yves Blay* – president of Unicancer & CEO of Centre Léon Bérard (Lyon) *Christian Chabannon* - Institut Paoli-Calmettes (Marseille) *Eric Deutsch* – Institut Gustave Roussy (Paris) *Anne-Laure Giraudet* - Centre Léon Bérard (Lyon) *Vincent Grégoire* - Centre Léon Bérard (Lyon) *Christophe Le Tourneau* – Institut Curie (Paris) *Frédérique Penault-Llorca* – Centre Jean Perrin (Clermont-Ferrand) *Sergio Roman Roman* – Institut Curie (Paris)
France	French National Cancer Institute (INCa) *Thomas Dubois* *Margaux Le Gall*
Greece	National Hellenic Research Foundation *Alex Pintzas* *Panagiotis Georgiadis* *Olga Papadodima*
Greece	National and Kapodistrian University of Athens *Antonis Kattamis* *Vassilis Koutoulidis* *Angela Moulopoulou*

	Evangelia Panourgia
Lithuania	National Cancer Institute of Lithuania *Audrius Dulskas* *Jonas Vinius*
Lithuania	Hospital of Lithuanian University of Health Sciences *Sigita Liutkauskiéné*
Lithuania	Vilnius University Hospital Santaros Klinikos *Aiste Gulla*
Poland	Maria Sklodowska-Curie National Research Institute and Oncology Centre (MSCI) *Iwona Lugowska*
Romania	The Oncology Institute – Cluj-Napoca *Delia Nicoara*
Spain	Servicio Andaluz de Salud *Carlos Miguel Sanchez*

Annex 2 – Meetings / Activities

06/12/22 (online meeting)

- *Kick-off meeting debrief*
- *1 referent person per organization*
- *Task 1 launch preparation*
- *Face-to-face meeting before the summer*

13/01/23 (online meeting)

- *NoE Scope definition*
- *Physical meeting in Paris preparation (14/2)*

14/02/23 Key speakers online meeting

- *JANE presentation*
- *WP 10 content and objectives*
- *Perspective of ESMO vs CPGs*
- *Molecular diagnosis platforms*
- *Innovative RT (proton, carbon ions, MRI linac)*
- *Interventional radiology*
- *Rare cancer networks ERNs*
- *Early phase clinical trials*
- *Other expertise needed*

18/04/23 (online meeting)

- *Scope*
- *Endorsement criteria methodology*

22/06/23 (online meeting)

- *Scope*

- *Endorsement criteria methodology*
- *Mapping of potential experts*

15/09/23 (online between WP leaders of WP9 and WP10)

- *Methodology for endorsement criteria*

19/09/23 (1 day F2F joint meeting with WP10 - Paris)

- *Endorsement criteria and maturity levels*
- *Synergies of the NoEs Omics and Hi Tech Medical Resources in the Cancer Ecosystem*

15-16/11/23 (F2F mid-term meeting - Barcelona)

- *Presentation of the progress of the WP10 in tandem with WP9 on Omics*

20/02/24 (1 day with JANE 1 & JANE 2 participants to WP10 - Paris)

- *Partners final lists in the 7 domains*
- *Member States representation in the NoE*
- *Overview of leads, co-leads and participants per tasks and domains*
- *Updated proposal*
- *Next steps*

17/04/24 (online meeting between Unicancer and Region Zealand, co-leader of WP10 within JANE 2)

- *JANE 2 WP10 Kick-off meeting preparation (28-29/11/24)*
- *Draft agenda*

22/04/24 (online meetings)

- *Brainstorming meeting on stakeholders' identification for the Ex-vivo testing of agents domain*
- *Brainstorming meeting on stakeholders' identification for the Innovative Radiotherapies domain*

24/04/24 (online meeting)

- *Brainstorming meeting on stakeholders' identification for the Physical methods of ablation domain*

29/04/24 (online meeting)

- *Brainstorming meeting on stakeholders' identification for the Radiomics domain*

30/04/24 (online meeting)

- *Brainstorming meeting on stakeholders' identification for the Nuclear medicine domain*

06/05/24 (online meeting)

- *Brainstorming meeting on stakeholders' identification for the Cell therapies domain*

15/05/24 (online meeting)

- *Brainstorming meeting on stakeholders' identification for the Innovative surgery domain*

24/05/24 (online meeting with JANE 1 & JANE 2 participants)

- *End of JANE 1 & JANE-2 start-up schedule*
- *WP10 objectives, organization per domain and tasks*
- *Results of the online brainstorming per domain*
    - *General conclusions*

- *Domain-specific results presented by leaders and co-leaders of the 7 domains*

- *Next steps:*
  - *Coordination support to reach key stakeholders*
  - *WP10 kick-off meeting*
  - *Next online meetings*

Annex 3 – Detailed endorsement criteria for expert participants

Annex 4 – Explanation of the endorsement criteria in the five domains

Annex 5 – Partners involved in the establishment of the NoE on Hi-Tech Medical Resources moving forward

Annexes 3, 4 and 5 are attached to this report.

Endorsement criteria for Cell Therapies platforms to participate to the NoE

Prerequisites			
Quality management: In the process or accredited			
Quality management: -In the process / Accreditation	* Preparative phase for certification	* Certification (FACT-JACIE or equivalent) is in place * CAR-T Cells program is qualified by at least one manufacturers of commercial CAR-T Cells	* Certification (FACT-JACIE or equivalent) is in place * CAR-T Cells program is qualified by at least one manufacturers of commercial and investigational CAR-T Cells or other Immune Eeffector Cells (IECs) * The center is additionnally qualified by manufacturers of other types of ATMPs than IECs
Integration into care (MTB, DST, …): In the process of integration or integrated			
Integration into care (MTB, DST, …): - In the process of integration into MTB - Integrated into MTB - (available DST ?)	In the process of integration into MTB	Integrated into MTB	Integrated into MTB
Accessibility: Provide part/full/assisted access to services			
Accessibility: - Provide part/full/assisted access to services		Provide assisted access to services	Provide full access to services
Cost, NIHD reimbursement: Affordable SOC tests ; facilitate NIHD reimbursement according to national regulations			

Criteria	Level 1	Level 2	Level 3
Available resources (panel, size, etc.)			
Cancer types: - common cancers - rare cancers - paediatric cancers …	* Common cancers	* Common cancers	* Common cancers * Rare cancers * Pediatric cancers * Collaborates with extrenal partners, including the procuremenht of service for other diseases than cancers (globin disorders, SCID, chronic inflammatory diseases…)
Field of application : - standard of care - clinical research - translational, basic research - public health…	* Standard of care	* Standard of care * Clinical research (excluding early phase)	* Standard of care * Clinical reserach, including early phases : firts-in-man and phase I, phase I/II trialsand * Translational research, with ability to translate to early clinical trials
Available infrastructure / core facilities (equipment, AI, …): - Minimal equipment, resources ? - Autonomous platform - Continuous technological development	* Clinical facilities available for the delivery of cellular therapies as Standard of Care * Connection with in-house or external Cell Collection and Cell Processing Facilities	* Clinical facilities available for the delivery of cellular therapies as Standard of Care, or for the administration of investigational cellular therapies, in the context of mostly industry-sponsored clinical trials * In-house cell processing facility for cell transplants (non-substantial engineering of primary collected cells), including ISO7 suites (class C)	* Clinical facilities available for the delivery of cellular therapies as Standard of Care, or for the administration of investigational cellular therapies, in the context of mostly industry-sponsored clinical trials * Center serves as referal center for complex forms of cellular therapies, including caring for frail patients or caring for advanced / poor prognosis subgroups of relatively common diseases * In-house cell collection and cell processing facility for cell transplants collaborate to develop innovative processes that result in substantial manipulation of primary collected cells, with the resulting manufactured product being classified as a medicinal product; the infrastructure includes ISO7 suites (class C)
Human resources, expertise: - On-site/network with scientists, bio-IT, pathologist, oncologist, hematologist, - On-site/network with geneticist, hemato-onco pediatrician - Continous professional development	On site hematologist and intensivist *network with pathologist, geneticist, *Continous professional development	*On site hematologist oncologist and intensivist *network with scientists, bio-IT, pathologist, geneticist, *Continous professional development	*On site hematologist oncologist and intensivist *On-site scientists, bio-IT, pathologist, geneticist, * hemato-onco pediatrician (if pediatric activity) *Continous professional development *network with university
Connexion with clinical cooperative groups, CT: - in the process of connection with cooperative groups, CTs - Connected with cooperative groups, CTs, with 4 Cancer ERNs ?	In the process of connection with other EU platforms	Members of EBMT	Connected with cooperative groups
Network at the European level, interoperability / harmonisation: - In the process of connection with other EU platforms - Connected with other EU platforms	In the process of connection or minimally connected with other EU platforms. Sporadic participation as partner.	* Connected with other EU platforms. Plays a role as partner in several programs over teh last 10 years	* Connected with other EU platforms. Plays a role as project leaders in several programs over the last 10 years
Clinical Practice guidelines, Training, Education: - Twinning program ? - Involvment in setting up international CPG, in (inter)national teaching program (for scientists, technicians, bio-IT…) - Involvment / Organisation of seminars, paractical courses	Participation in seminars, paractical courses	Participation in seminars, paractical courses	Organisation of seminars, paractical courses Involvment in (inter)national teaching program for physicians, scientists, technicians, bio-IT…)
Tract record: - Nb of publications/yr (peer-review journal)	none	5-10 publications/yr (peer-review journal)	> 10 publications/yr (peer-review journal)
Activity level	* 50 - 100 cellular therapy products / year	* 100 - 250 cellular therapy products / year	* > 250 cellular therapy products / year

Endorsement criteria for Ex-vivo testing of agents platforms to participate to the NoE

Prerequisites			
Quality management: In the process or accredited			
Accessibility: Provide part/full/assisted access to services			
Criteria	**Level 1**	**Level 2**	**Level 3**
Available resources (panel, size, etc.): PD cell lines PD tumor cultures organoids tumor-on-chips PD esplants PDXs			at least 2 types of technologies and more than 100 models
Cancer types: - common cancers - rare cancers - paediatric cancers …			at least 2 cancer types
Field of application : - clinical research - translational, basic research			trials ongoing and translational/basic resarch
Quality management: -In the process / Accreditation			accreditation (to be determined) at least in progress
Available infrastructure / core facilities (equipment, AI, …): - Minimal equipment, resources : Animal facility, Imaging tools - Autonomous platform - Continuous technological development			minimal equipment in place, autonomous platform, and continuous technical development
Human resources, expertise: - On-site/network with scientists, bio-IT, pathologists, oncologist, hematologists, geneticists, hemato-onco pediatricians - Continous professional development			existing network and continous professional development
Connexion with clinical cooperative groups, CT: - in the process of connection with cooperative groups, CTs - Connected with cooperative groups, CTs, with 4 Cancer ERNs ?			connected
Network at the European level, interoperability / harmonisation: - In the process of connection with other EU platforms - Connected with other EU platforms			coonected
SOPs, Training, Education: - Twinning program ? - Involvment in setting up international CPG, in (inter)national teaching program (for scientists, technicians, bio-IT…) - Involvment / Organisation of seminars, paractical courses			organisation of seminars and practical courses; agreement to participate in twinning programs and to be involved in future international teaching programs
Accessibility: - Provide part/full/assisted access to services			full assisted access to services
Tract record: - Nb of publications/yr (peer-review journal)			more than 5

Endorsement criteria for Interventional Radiology platforms to participate to the NoE			
Prerequisites			
Quality management: In the process or accredited			
Integration into care (MTB, DST, …): In the process of integration or integrated			
Integration into care (MTB, DST, …): - In the process of integration into MTB - Integrated into MTB - (available DST ?)	In the process integration in at least one MTB	AT lest 1 tumor board is covered on regular basis by 1 physicians	Standing in multidisciplinary tumor board
Accessibility: Provide part/full/assisted access to services			
Accessibility: - Provide part/full/assisted access to services	All patients	All patients	All patients according to National rules / tertiary cancer centers
Cost, NIHD reimbursement: Affordable SOC tests ; facilitate NIHD reimbursement according to national regulations			
Cost, NIHD reimbursement: - Affordable SOC tests ?, - Facilitate NIHD reimbursement according to national regulations	Routine	Reimbursed for routine + grants for supporting innovative research (optional)	Reimbursed for routine + grants for supporting innovative research (mandatory)
Criteria	**Level 1**	**Level 2**	**Level 3**
Available resources (panel, size, etc.)	At least 100 image guided biopsies and 50 treatments Both US and CT guidance Thermal ablation in at least one organ		At least 200 image guided biopsies and 100 treatments Image guided biopsy to lung, kidney, soft tissue, and bones with both US and CT guidance Thermal ablation in at least two different organs Endovascular therapy for liver Bone consolidation
Cancer types: - common cancers - rare cancers - paediatric cancers …	No pediatric IR	Pediatric IR optional	All cancers to be targeted including ERN Pediatric patients are diagnosed and treated if any pediatric dept in the hospital
Field of application : - standard of care - clinical research - translational, basic research - public health…	Patient are followed on regular wards by IR even if not in their own beds Out-patient consultation for interventional oncology	Patient are followed on regular wards by IR even if not in their own beds Out-patient consultation for interventional oncology Day hospital	Out-patient consultation for interventional oncology Day hospital and standard hospital beds for IO treatment Cooperative group section
Available infrastructure / core facilities (equipment, AI, …): - Minimal equipment, resources ? - Autonomous platform - Continuous technological development	Radiology room dedicated to IO at least 50% of the time including access to Multidetector CT	Radiology room dedicated to IO 100% of the time including access to Multidetector CT Regular and scheduled access to general anesthesia through anesthesiology department	Radiology room dedicated to IO at least 50% of the time including access to Multidetector CT Regular and scheduled access to general anesthesia through anesthesiology department Access to acute post-treatment care 7 days and 24 hours resources
Human resources, expertise: - On-site/network with scientists, bio-IT, pathologist, oncologist, hematologist, - On-site/network with geneticist, hemato-onco pediatrician - Continous professional development	At least one physician is European Board of interventional Radiology certified At least two physicians are working > 50% of their time in IO	2 physicians are European Board of interventional Radiology certified At least two physicians are working > 50% of their time in IO	At least two physicians is European or equivalent Board of interventional Radiology certified At least two physicians are working full time in IO Continuity of care to be ensured
Integration into care (MTB, DST, …): - In the process of integration into MTB - Integrated into MTB - (available DST ?)	In the process integration in at least one MTB	AT lest 1 tumor board is covered on regular basis by 1 physicians	Standing in multidisciplinary tumor board
Connexion with clinical cooperative groups, CT: - in the process of connection with cooperative groups, CTs - Connected with cooperative groups, CTs, with 4 Cancer ERNs ?	Participation to at least 3 clinical trials?	Participation to at least 6 clinical trials nclusing 3 clinical trials in IO	Participation to at least 6 clinical trials including 3 clinical trials in IO + 1 trial as local investigator?
Network at the European level, interoperability / harmonisation: - In the process of connection with other EU platforms - Connected with other EU platforms	Optional / should be part of a National network	Optional	Mandatory
Clinical Practice guidelines, Training, Education: - Twinning program ? - Involvment in setting up international CPG, in (inter)national teaching program (for scientists, technicians, bio-IT…) - Involvment / Organisation of seminars, paractical courses	Part of at least one recommendation, guidelines, SOP at national or international level in the last 5 years	Part of at least 2 recommendation, guidelines, SOP at national or international level in the last 5 years	Part of at least 4 recommendation, guidelines, SOP at national or international level in the last 5 years Teaching dept for physicians
Track record: - Nb of publications/yr (peer-review journal)	3 publications in peer reviewed journals during the past 3 years	6 publications in peer reviewed journals during the past 3 years	12 publications in peer reviewed journals during the past 3 years

Endorsement criteria for Innovative Radiotherapy platforms to participate to the NoE				
Prerequisites				
Quality management: In the process or accredited				
Integration into care (MTB, DST, …): In the process of integration or integrated				
Accessibility: Provide part/full/assisted access to services				
Cost, NIHD reimbursement: Affordable SOC tests ; facilitate NIHD reimbursement according to national regulations				
Criteria	**Category 1**	**Category 2**	**Category 3**	
Available resources (panel, size, etc.)				
Cancer types: - common cancers - rare cancers - paediatric cancers …	All common cancer. No rare cancer and no paediatric	All common cancer. No rare cancer and no paediatric	All 3 required (nuance: specific centers dedicated only to pediatric patients). At least 1 pediatric cancer patient per week.	For pediatric cancers, based on the French recommendations.
Field of application : - standard of care - clinical research - translational, basic research - public health…	Standard of care	Standard of care and clinical resarch	All 3 required	
Available infrastructure / core facilities (equipment, AI, …): - Minimal equipment, resources ? - Autonomous platform - Continuous technological development	State of the art linacs with TPS and RVS; no stereo, no brachytherapy, no PT, no carbon ions	Convention with a PT or carbon ion facility	State of the art equipemnt including stereo RT, RVS, IT, TPS, brachytherapy including interstitial.. Potentially requiring PT or Carbon ions	
Human resources, expertise: - On-site/network with scientists, bio-IT, pathologist, oncologist, hematologist, - On-site/network with geneticist, hemato-onco pediatrician - Continous professional development	What is required for standard clinical care, but no pediatrics RT, … (thus including physicist, dosimetrist, …). At least 1 Rad Onc per 250 patients, 1 physicst per 450-500 patients and 3 RTT per linac per working hour (based on ESTRO recommendations 2005)	Idem catgory 3, but no expert in pediatric oncology	All 3 required in the Cancer Center. At least 1 Rad Onc per 200 patients, 1 physicst per 400 patients and 3 RTT per linac per working hour (based on ESTRO recommendations 2005) For pediatric RT, at least 2 radiation oncologists expert per centre with mandatory MOC and re-certification.	Slotman BJ, Cottier B, Bentzen SM, Heeren G, Lievens Y, van den Bogaert W. Overview of national guidelines for infrastructure and staffing of radiotherapy. ESTRO-QUARTS: work package 1. Radiother Oncol. 2005 Jun;75(3):349-54.
Connexion with clinical cooperative groups, CT: - in the process of connection with cooperative groups, CTs - Connected with cooperative groups, CTs, with 4 Cancer ERNs ?	Appreciated but not mandatory	In between	All 3 required	
Network at the European level, interoperability / harmonisation: - In the process of connection with other EU platforms - Connected with other EU platforms	Appreciated but not mandatory / should be part of a National network	In between	All 3 directly or indirectly required	
Clinical Practice guidelines, Training, Education: - Twinning program ? - Involvment in setting up international CPG, in (inter)national teaching program (for scientists, technicians, bio-IT…) - Involvment / Organisation of seminars, paractical courses	Need to follow good guideline, but don't need to be a leader	In between	The last 2 element should be required; the first one could be a plus	
Track record: - Nb of publications/yr (peer-review journal) -	For MDs, at least associated to 3 publications et year.	In between	For MDs, at least 3 publications (first or last) authors per year per MD or at least 10 publications in total; for the physicists, at least one publication as first or last autor per year.	
Research activity :	participate to ≤5 research program	participate in > 5 research program	Leads > 5 orginal research programs	
External reviews starting from dummy runs to external audits	none	no more than 2 per year	> 2 times per year	

Endorsement criteria for Nuclear Medicine platforms to participate to the NoE Application to RadioNuclide Therapy (RNT)

Prerequisites			
Quality management: In the process or accredited			
Integration into care (MTB, DST, …): In the process of integration or integrated			
Accessibility: Provide part/full/assisted access to services			
Cost, NIHD reimbursement: Affordable SOC tests ; facilitate NIHD reimbursement according to national regulations			
Criteria	**Level 1**	**Level 2**	**Level 3**
Available resources (panel, size, etc.)			
Cancer types:			
Common cancers	Mandatory	Mandatory	Mandatory
Rare cancers			Mandatory
Paediatric cancers			Mandatory
Field of application : - standard of care - clinical research - translational, basic research - public health…			
Nuclear medicine for diagnosis	Mandatory	Mandatory	Mandatory
Routine RNT	Mandatory	Mandatory	Mandatory
Research programs as investigator site		Mandatory	Mandatory
Sponsor of research programs			Mandatory
Available infrastructure / core facilities (equipment, AI, …):			
Database		Mandatory	Mandatory
SPECT-CT	Mandatory	Mandatory	Mandatory
Access to PET-CT	Mandatory	Mandatory	Mandatory
Dosimetry tools (organs-at-risk, tumour)		Mandatory	Mandatory
In-house technological development			Mandatory
In-house production of radiopharmaceuticals for diagnosis		Option	Mandatory
In-house production of radiopharmaceuticals for RNT			Mandatory
Ability to conduct phase II-III trials		Mandatory	Mandatory
Ability to conduct early phase trials in RNT			Mandatory
Ability to conduct pediatric phase I-IV trials in case of on-site onco-pediatric unit			Mandatory
Preclinical studies			Option
Human resources, expertise: - On-site/network with scientists, bio-IT, pathologist, oncologist, hematologist, - On-site/network with geneticist, hemato-onco pediatrician - Continous professional development			
Number of trained nuclear physician in the structure	1	> 1	> 1
Number of trained radiopharmacists	1	> 1	> 1
number of trained medical physicists	1	> 1	> 1
Number of trained technologists	1	> 1	> 1
Number of trained coordinator	1	> 1	> 1
Number of trained radioprotection competent staff	1	> 1	> 1
Research ccordinator dedicated to RNT	0	1	> 1
Attend to multidisciplinary meeting	recommended	Mandatory	Mandatory
Continuous professional training	recommended	Mandatory	Mandatory
Connexion with clinical cooperative groups, CT: - in the process of connection with cooperative groups, CTs - Connected with cooperative groups, CTs, with 4 Cancer ERNs ?			
	Possible	National	National and international
Network at the European level, interoperability / harmonisation: - In the process of connection with other EU platforms - Connected with other EU platforms			
	Possible	National	National and international
Clinical Practice guidelines, Training, Education: - Twinning program ? - Involvment in setting up international CPG, in (inter)national teaching program (for scientists, technicians, bio-IT…) - Involvment / Organisation of seminars, paractical courses			
Training program, fellowship	Possible	Mandatory	Mandatory
Tract record: - Nb of publications/yr (peer-review journal)			
Publications	Optional	1	>1

Endorsement criteria for Nuclear Medicine platforms to participate to the NoE Application to Artificial intelligence (AI)

Criteria	Level 1 = data provider	Level 2 = model evaluation	Level 3 = model conception
Clinical application			
Workstation / Server with adequate computing power for inference	Mandatory	Mandatory	Mandatory
Secure connection for SaaS software	Option	Option	Option
CE-marked AI software	Mandatory	Mandatory	Mandatory
Human warranty	Mandatory	Mandatory	Mandatory
Research			
DPO on site	Mandatory	Mandatory	Mandatory
Information Systems Security Manager on site	Mandatory	Mandatory	Mandatory
Access to an ethic comitee	Mandatory	Mandatory	Mandatory
Medical image anonymisation software available in the hospital	Mandatory	Option	Mandatory
Image quality assurance/control tool available in the hospital	Mandatory	Option	Mandatory
Use of AI models for image interpretation or quality improvement	Option	Option	Option
Specific hospital unit/department dedicated to healthcare data management	Option	Mandatory	Option
Access to hospital-based health data warehouse	Option	Option	Option
Center with academic or industrial partnerships for clinical evaluation of AI models		Mandatory	
Publication(s) in international peer-reviewed journal on the clinical evaluation of AI models		Mandatory	
European or national accreditation as third-party experimental sites in digital health		Option	
Internal access to a GPU-equipped worstation dedicated to the AI project		Option	Mandatory
Raising national and international fundings for AI projects (past 5 y)			Mandatory
Publication(s) on the design of new diagnostic or predictive AI models			Mandatory
Hosting digital health M2 or PhD students in hospital facilities			Mandatory
Hosting researchers in digital health on hospital facilities			Option
Employment fully dedicated to AI projects (data scientist, data manager…)	≥ 0,5	≥ 1	≥ 2
Patent registration / code protection			Mandatory
Hospital agreement with a valorization unit			Mandatory
CE marking for a digital healthcare solution			Option

Annex 4 – Explanation of the endorsement criteria in the five domains

INNOVATIVE RADIOTHERAPY

The following Excel table intends to summarize the criteria that would be used to characterize European Radiation Oncology Centers in the framework of their participation to a NoE.

The criteria have been divided into 7 main items:

- Level of clinical expertise in the Radiation Oncology Dept., e.g. common tumors, rare cancers, pediatric cancers
- Infrastructure of the Radiation Oncology Dept., e.g. equipment, personal, processes, affiliation to European clinical and/or research Societies (e.g. ESTRO) or network (e.g. EORTC)
- Infrastructure of the institution to which they belong to, e.g. availability of medical oncologists, oncologic surgeons, hematologists, pathologists, geneticists, molecular biology platforms, affiliation to a University
- Research implication, i.e. basic, translational, clinical
- Implication in training of radiation oncologists, medical physicists, radiographers
- Academic achievement, e.g. publication metrics
- Accreditation by national and/or European bodies, e.g. OECI, QART

For example, an academic and teaching Radiation Oncology Center treating pediatric and rare cancers, providing stereotactic treatments and/or protontherapy treatments, involved in clinical and basic research, having an OECI accreditation and heavily involved in knowledge dissemination through peer-reviewed publications and participation to seminars would be labeled “Level 3 Centers”. On the other hand, a non-academic center mainly treating common cancers such as breast, lung and metastatic tumors, involved in clinical research, but occasionally leading publications would be labeled “Level 1 Center”.

Needless to say that irrespective of this categorization, each Radiation Oncology center will have to fulfill the standard quality level of practice, including for example Radiotherapy Quality Assurance program, participation to multidisciplinary tumor board, etc.

Last, it should be emphasized that such categorization does not intend to ostracize centers, but on the opposite to ensure that centers participate to European projects fit to their qualification.

INTERVENTIONAL RADIOLOGY

The following Excel table intends to summarize the criteria that would be used to characterize European Interventional Radiology Teams in the framework of their participation to a NoE.

The criteria have been divided into 7 main items:

- Level of clinical expertise in Interventional Radiology Dept., e.g. common cancers treated, Biopsy in all organs, pediatric cancers
- Infrastructure of the Interventional Radiology Dept., e.g. equipment (CT/US), access to anesthesiologists on regular basis processes, affiliation to European clinical and/or research Societies (e.g. CIRSE)
- Infrastructure of the institution to which they belong to, e.g. : Standing at tumor board, affiliation to a University
- Research implication, i.e. basic, translational, clinical
- Implication in training of Interventional Radiologist, radiographers
- Academic achievement, e.g. publication metrics

For example, an academic and teaching Interventional Radiology Center treating pediatric and rare cancers, providing thermal ablation tumor destruction for various tumor type in various organs as well as intra-arterial therapies for liver tumors, and pain treatment for palliation of bone metastases, also involved in clinical and basic research, and disseminating his knowledge through peer-reviewed publications would be labeled “Level 3 Centers”. On the other hand, a non-academic center mainly treating liver tumors and performing biopsies, not involved in clinical research, but occasionally leading publications would be labeled “Level 1 Center”.

Needless to say that irrespective of this categorization, each interventional radiology center will have to fulfill the standard quality level of practice, and a minimal participation to multidisciplinary tumor board.

Lastly, it should be emphasized that such categorization does not intend to ostracize centers, but on the opposite to ensure that centers participate to European projects fit to their qualification.

NUCLEAR MEDICINE

We are observing an extremely rapid development of nuclear medicine procedures in oncology, with a theragnostic aim but above all with a therapeutic aim. Beyond traditional indications sometimes concerning rare tumours (neuroendocrine tumours or neuroblastomas for example), the development of RadioNuclide Therapy (RNT) is a booming field, especially for particularly common tumours such as metastatic prostate cancer. This involves the management, preparation and even production of new radiopharmaceuticals (linked to the installation of cyclotrons in certain locations). This also involves fitting out premises to meet radiation protection constraints (alpha and beta emitters) and the need of performing tumour and organs-at-risk dosimetry for efficient and safe treatments with better outcomes (Directive - 2013/59 - EN - EUR-Lex (europa.eu)). Finally, this implies a strong articulation with Tumours Board in order to properly establish the indications, the integration into multimodal

strategies, an updating of the training of nuclear medicine physicians in these new therapeutic modalities, and finally a good interface with the care of support.

The following Excel table intends to summarize the criteria that would be used to characterize European Nuclear Medicine departments in the framework of their participation to a NoE.

This includes 4 prerequisites and 7 criteria.

The 4 prerequisites are as follows:

- Quality assurance process: accreditation in progress or obtained according to the framework imposed in each country by the authorities
- Nuclear medicine activity must be integrated into interdisciplinary care (for example, contribution to tumor boards)
- This nuclear medicine activity must be objectively made available for patient care (accessibility)
- This nuclear medicine must be reimbursed according to local constraints.

The 7 criteria, allowing recognition and gradation, are as follows

- Level of clinical expertise., e.g. common tumors, rare cancers, pediatric cancers
- Fields of application,
    - Nuclear medicine for diagnosis (e.g. initial work-up for tumor diagnosis)
    - Nuclear medicine for treatment (Radionuclide therapy, RNT) (e.g. everyday practice of PSMA-lutetium treatment, MIBG-based therapy for neuroblastoma …)
    - Investigator site for clinical research (the nuclear Medicine Dpdt. contributes to academic or industrial sponsored studies)
    - Sponsor of research program (e.g. the entity is a trial sponsor)
- Infrastructure of the Nuclear Medicine departments, e.g. equipment, personal, processes, affiliation to academic groups
    - Database (the entity has developed a database concerning patients treated, which can provide nuclear medicine data...)
    - In-house technological development (the entity has the capacity for technological development, whatever the field: AI, bioinformatics, development of IT tools …)
    - In-house production of radio-products
    - Equipment and tools for image quantification and tumour and organ dosimetry
    - Ability to conduct early phase trials (the entity has the authorizations, human expertise, logistics, quality processes to carry out phase I or phase II trials involving RNT)
- Human resources and expertise
    - Number of trained nuclear physician in the structure
    - Number of radio-pharmacists, technologists, medical physicists...
- Connection with clinical cooperative groups, Network at the European level
- Interoperability / harmonization
- Clinical Practice guidelines, Training, Education (active contribution to training and teaching of the discipline)
- Track record (number of publications)

In summary, we adopted the same principles as the Radiotherapy group.

Nuclear medicine includes diagnosis and therapy parts.

4 prerequisites:

- Accreditation
- Integration of interdisciplinary discussion
- Availability to patient
- Cost coverage

7 criteria defining 3 levels:

- 1st level very good clinical everyday activity (diagnosis of common cancer and classical treatment such as radioiodine)
- 2nd level (clinical research as investigator for phase II to IV RNT trials)
- 3rd level (management of rare cancer, pediatric cancers, investigator site for early phase RNT trials sponsor of clinical research, translational research, in-house production of radiotracers)

In the 2nd part of the excel table, a proposal is made on the criteria to be met by nuclear medicine centers in the framework of their participation to a NoE in Artificial intelligence.

Three levels of implications for AI projects are anticipated:

- Level 1 (Data provider) corresponds to hospitals able to provide structured, anonymized, RGPD-compliant and qualitative imaging data, as part of national or European consortia for AI research projects.
- Level 2 (model evaluation) corresponds to hospitals with expertise in the clinical validation process of AI models applied to medical images, either developed by academic or industrial partners, in compliance with best practices defined in the literature
- Level 3 (model conception) corresponds to hospitals with expertise in the design of new AI models, including structuration of data, model training and its clinical valorization.

CELLULAR THERAPIES

Historically, the proof of clinical utility of cellular therapy essentially relied on stem cell transplantation: autologous as a supportive care measure for intensive chemo and allogeneic HSCT for immunotherapy.

The field has recently been transformed by the advent of CART cells. Of note, the impacts of these innovations largely extend beyond the scope of oncology with new indications in inflammatory diseases. Genetically manipulated HSC are also used in rare genetic disorders.

Finally, the recent demonstration of the clinical benefit of TILs in melanoma may resuscitate an old concept.

Current indications are essentially for heme malignancies: leukemia and chronic myeloid malignancies for allo HSCT, lymphomas and myeloma for autologous HSCT and CART.

The number of patients is slightly increasing for allo, decreasing for auto and steeply increasing for CART due to recent use in myeloma.

The current challenges are related to uncertainties regarding the place of CART in solid tumors, the economic model (industry vs academics) and manufacturing capabilities. Several academic centers in EU currently produce CARTs for clinical use. In addition, many research centers specialized in immune-oncology have the potential to design new CARs (with new targets, alternative effectors like NK, gdT cells or optimized costimulatory systems etc…) and these efforts must be supported.

European cooperations may play a major in fastening and opening the access of these new technologies (ie delivery of cell therapy products and possibly their manufacturing thanks to the development of point of care devices like Prodigy), and also in the discovery of new products and their preclinical development in an academic setting. European initiatives should also aim at accelerating the valorization to ensure fast dissemination and economic impact.

Extract from the FACT-JACIE International Standards for Hematopoietic Cellular Therapies v8R2, which can help us decide on thresholds for levels of activities for HCT, adult vs pediatric activities:

MINIMUM NUMBER OF NEW PATIENTS FOR ACCREDITATION

Clinical Programs shall transplant at least the following number of new patients[1] before init accreditation and annually thereafter:

Transplant Population	Clinical Site(s)	Type of Transplant	Twelve (12) Months Prior to Initial Accreditation	Average Per Year Within Accreditation Cycle
Adult OR Pediatric (only one of these two)	Single Clinical Site	Autologous only	5 autologous	5 autologous
		Allogeneic and Autologous	10 allogeneic recipients	10 allogeneic recipients
	Multiple Clinical Sites	Autologous only	5 autologous recipients at each site	5 autologous recipients at each site
		Allogeneic and Autologous	• 5 allogeneic recipients at each applicable site[2] • 5 autologous at each applicable site[2]	• 5 allogeneic recipients at each applicable site[2] • 5 autologous at applicable each applicable site[2]
Combined Adult AND Pediatric	Single Clinical Site	Autologous only	• 5 adult autologous • 5 pediatric autologous recipients	• 5 adult autologous • 5 pediatric autologous recipients
		Allogeneic and Autologous	• 5 adult allogeneic recipients • 5 pediatric allogeneic recipients	• 5 adult allogeneic recipients • 5 pediatric allogeneic recipients
	Multiple Clinical Sites	Autologous only	• 5 adult autologous at each applicable site • 5 pediatric autologous recipients at each applicable site	• 5 adult autologous recipients at each applicable site • 5 pediatric autologous recipients at each applicable site
		Allogeneic and Autologous	• 5 adult allogeneic recipients at each applicable site • 5 pediatric allogeneic recipients at each applicable site • 5 adult autologous at each applicable site[2] • 5 pediatric autologous at each applicable site[2]	• 5 adult allogeneic recipients at each site • 5 pediatric allogeneic recipients at each site • 5 adult autologous at each applicable site[2] • 5 pediatric autologous at each applicable site[2]

EX-VIVO AGENT TESTING

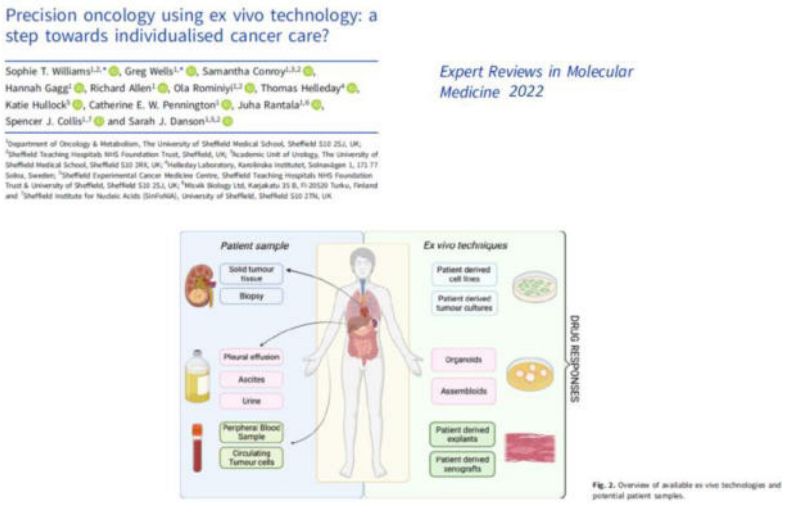

Fig. 2. Overview of available ex vivo technologies and potential patient samples.

Genome sequencing of tumor samples is not sufficient to efficiently predict response to anticancer therapies and validated **patient-derived tumor ex vivo models** represent a useful complementary tool to select the best therapy to be proposed to cancer patients. Importantly, some ex vivo approaches

are currently under evaluation in clinical trials and have shown promising results. Ex vivo techniques include cell lines, tumor cultures, organoids, tumor-on-chip, tissue slices/explants, and xenografts in mice.

Patient-derived cell lines are generated from primary or metastatic tumor tissues after dissociation and passaging in appropriate media conditions. The main advantage of this models is that many different drugs can be evaluated at different concentrations in a high-throughput manner. The main limitation is the absence of tumor microenvironment.

Patient-derived tumor cultures are primary cell cultures established from the patient cancer cells isolated directly from the tumor tissue or the patient body fluids. Compared with the epithelial-only organoid models, or coculture of peripheral blood cells with organoids, these models preserve the primary tumor cells with their endogenous TME components. Some limitations include the lack of complete tumoral vasculature and physical barriers.

Organoids mimic human 3D tissue architecture compared to 2D cell-based models and display features of anatomical variation and tumor heterogeneity observed in primary tumors and metastases. Organoids have self-renewal and self-organization capabilities and retain the characteristics of the physiological structure and function of their source tumor. However, organoids lack a vascular system and immune cell components. Several attempts have already been made towards incorporating aspects of the tumor micro-environment into the cancer organoid system including co-culture of tumor cells and immune cells.

Microfluidics-based **tumor-on-a-chip** systems can recapitulate complex in vivo tumor features at a microscale level, such as the tumor microenvironment, three-dimensional tissue structure, and dynamic culture conditions, thus improving the correlation between results derived from preclinical and clinical trials in evaluating anticancer nanomedicines. Although several microfluidic based models have been reported and used for testing drugs and therapeutic responses, most of them remain at the proof-of-concept level and do not find tangible applications in clinics.

The use of **tumor explants**, also known as organotypic tissue slices, has steadily increased because they retain the intact TME of the original tumor and have been shown to replicate characteristics and chemosensitivity profiles of in vivo patient tumors. However, the main challenges faced by tumor explant culture platforms are tissue viability in the absence of an intact vasculature system and the low throughput of drug screening assays due to limited tumor material.

Patient-derived xenografts (PDX) models are generated by transplanting fresh tumor tissue from patients subcutaneously or orthotopically into immunodeficient mice. The take rate of common subcutaneous xenografts varies across different cancers and is less than 50% on average. Although PDX models can nicely predict drug responses, their application in medicine is limited because they are expensive and time- and resource-consuming. A major limitation of these models is the Immunotherapies cannot, in general, be evaluated in PDX models given the compromised immune system of the mice. Humanization of mice may circumvent this major limitation of PDX models.

Annex 5 – Partners involved in the establishment of the NoE on Hi-Tech Medical Resources moving forward

	Organisation name	Country	CA/AE	Contact person	Domain 1 Nuclear medicine	Domain 2 Radiomics	Domain 3 Innovative radiotherapies	Domain 4 Innovative surgery	Domain 5 Physical methods of ablation	Domain 6 Cell therapies	Domain 7 Ex-vivo testing of agents
Annexes 3, 4 and 5 are attached to this report.											
	Clinique universitaire Saint-Luc	Belgium	AE	Prof. Jean-Pascal Machiels			OBSERVER			OBSERVER	
CUSL	Clinique universitaire Saint-Luc	Belgium	AE	Guillaume Dachy			OBSERVER			OBSERVER	
IJB-ULB	Institut Jules Bordet	Belgium	AE	Jonathan Cimino	OBSERVER	HIGH	HIGH				
IJB-ULB	Institut Jules Bordet	Belgium	AE	Patrick Flamen	OBSERVER						
IJB-ULB	Institut Jules Bordet	Belgium	AE	David Bergemann	OBSERVER	HIGH	HIGH				
	Institut Jules Bordet	Belgium	AE	Ioannis Karfis	LOW						
KU Leuven	KU Leuven	Belgium	AE	Evy Lobbestael	OBSERVER		OBSERVER			OBSERVER	OBSERVER
KU Leuven	KU Leuven	Belgium	AE	Johan Van Lint	OBSERVER		OBSERVER			OBSERVER	OBSERVER
SC	Sciensano	Belgium	CA	Marc Van Den Bulcke							
SC	Sciensano	Belgium	CA	Hélène Antoine-Poirel							
VUB	Vlaamse Universiteit Brussel	Belgium	AE	Karin Vanderkerken							
VUB	Vlaamse Universiteit Brussel	Belgium	AE	Prof Mark De Ridder							
VUB	Vlaamse Universiteit Brussel	Belgium	AE	Prof Bart Neyns							
UZGhent	Universitair Hospitaal Gent	Belgium	AE	Kathleen De Preter		LOW		LOW	LOW		LOW
UZGhent	Universitair Hospitaal Gent	Belgium	AE	Gwen Sys		LOW		LOW	LOW		LOW
USHATO	University Specialized Hospital for Active Treatment in Oncology "Prof. Ivan Chernozem	Bulgaria	CA	Neli Gesheva							
USHATO	University Specialized Hospital for Active Treatment in Oncology "Prof. Ivan Chernozem	Bulgaria	CA	Pavlin Tsonev							
RM	Central Denmark Region - Aarhus University Hospital, Danish Center for Particle Therapy	Denmark	AE	Cai Grau			LOW				
REGIONH	Region Hovedstaden - Herlev Hospital, Department of Oncology	Denmark	AE	Inge Marie Svane						LOW	
REGIONH	Region Hovedstaden - Rigshospitalet, Department of Oncology	Denmark	AE	Malene Fischer	LOW						
RSYD	The Region of Southern Denmark - Odense University Hospital, Department of Oncology	Denmark	AE	Henrik Jørn Ditzel							LOW
ZEALCO	Region Zealand - Zealand University Hospital - Center for Surgical Science	Denmark	CA	Ismail Gögenur				LOW			
ZEALCO	Region Zealand - Zealand University Hospital - Dept. of Clinical Oncology and Palliative C	Denmark	CA	Julie Gehl					LEADER		
ZEALCO	Region Zealand - Zealand University Hospital - Dept. of Clinical Oncology and Palliative C	Denmark	CA	Keld Hundewadt	LOW		LOW	LOW	LEADER	LOW	
PERH	Põhja-Eesti Regionaalhaigla	Estonia	AE	Kätlin Tiigi			LOW				
FHF	Fédération Hospitalière Française	France	AE	Vincent Bourbonne		HIGH	LOW				
FHF	Fédération Hospitalière Française	France	AE	Vincent Ollivier		HIGH	LOW				
FHF	Fédération Hospitalière Française	France	AE	Cédric Le Maréchal							
INCa	Institut National du Cancer	France	CA	Caroline Le Dour			OBSERVER		OBSERVER	OBSERVER	
INCa	Institut National du Cancer	France	CA	Margaux Le Gall			OBSERVER		OBSERVER	OBSERVER	
Unicancer	Unicancer	France	AE	Prof Jean-Yves Blay							
Unicancer	Unicancer	France	AE	Muriel Santoro							
Unicancer	Unicancer - Centre Léon Bérard (Lyon)	France	AE	Anne-Laure Giraudet	LEADER						
Unicancer	Unicancer - Centre Henri Becquerelle (Rouen)	France	AE	Pierre Vera	x						
Unicancer	Unicancer - ICT (Toulouse) & SFMN president (French Society of Nuclear Medicine and M	France	AE	Frédéric Courbon	LEADER						
Unicancer	Unicancer - Centre Jean Perrin (Clermont-Ferrand) & president of CNP MN (French Natic	France	AE	Florent Cachin	LEADER						
Unicancer	Unicancer - Centre Antoine Lacassagne	France	AE	Olivier Humbert	LEADER						
Unicancer	Unicancer - IUCT (Toulouse)	France	AE	Soleakhena Ken		LEADER					
Unicancer	Unicancer - Centre Oscar Lambret (Lille)	France	AE	David Pasquier		HIGH	HIGH				
Unicancer	Unicancer - Centre Oscar Lambret (Lille)	France	AE	Eric Lartigau		HIGH	HIGH				
Unicancer	Unicancer - Institut Gustave Roussy (Paris)	France	AE	Eric Deutsch			LOW				
Unicancer	Unicancer - Centre Léon Bérard (Lyon)	France	AE	Vincent Grégoire			Co-LEADER				
Unicancer	Unicancer - Centre Oscar Lambret (Lille)	France	AE	Anne-Laure Gagez			LOW				
Unicancer	Unicancer - Institut Gustave Roussy (Paris)	France	AE	Matthieu Faron				HIGH			
Unicancer	Unicancer - Institut Paoli-Calmettes (Marseille)	France	AE	Norbert Vey						LEADER	
Unicancer	Unicancer - Institut Paoli-Calmettes (Marseille)	France	AE	Christian Chabannon						LEADER	
Unicancer	Unicancer - Institut Curie (Paris)	France	AE	Sergio Roman Roman							LEADER
Unicancer	Unicancer - Centre Oscar Lambret (Lille)	France	AE	Nicolas Penel							HIGH
Unicancer	Unicancer - ICANS (Strasbourg)	France	AE	Delphine Antoni			LOW				
INSERM	INSERM/Institut Curie	France		Fanny Orlahc		OBSERVER					
Essen	Essen team	Germany		Ken Herrmann	OBSERVER						

NHRF	ETHNIKO IDRYMA EREVNON	Greece	CA	Dr Alexandros Pintzas			HIGH				Co-LEADER
NHRF	ETHNIKO IDRYMA EREVNON	Greece	CA	Dr Theodora Katsila			HIGH				Co-LEADER
NHRF	ETHNIKO IDRYMA EREVNON	Greece	CA	Dr Dimitra Mitsiou			HIGH				Co-LEADER
NHRF	ETHNIKO IDRYMA EREVNON	Greece	CA	Dr Christos Chochos			HIGH				
NKUA	ETHNIKO KAI KAPODISTRIAKO PANEPISTIMIO ATHINON	Greece	AE	Prof Antonis Kattamis		Co-LEADER			LOW	LOW	
NKUA	ETHNIKO KAI KAPODISTRIAKO PANEPISTIMIO ATHINON	Greece	AE	Prof Lia Angela Moulopoulos		Co-LEADER			LOW	LOW	
NKUA	ETHNIKO KAI KAPODISTRIAKO PANEPISTIMIO ATHINON	Greece	AE	Assoc Prof Vassilis Koutoulidis		Co-LEADER			LOW	LOW	
NKUA	ETHNIKO KAI KAPODISTRIAKO PANEPISTIMIO ATHINON	Greece	AE	Ass Prof Evangelia Panourgias		Co-LEADER			LOW	LOW	
OOI (NIO)	National Institute of Oncology	Hungary	CA	Prof. Peter Tenke				LOW		OBSERVER	
OOI (NIO)	National Institute of Oncology	Hungary	CA	Dr. Zoltan Novak				LOW			
OOI (NIO)	National Institute of Oncology	Hungary	CA	Dr. Aron Ghimessy				LOW			
OOI (NIO)	National Institute of Oncology	Hungary	CA	Dr. Daniel Horanyi				LOW			
OOI (NIO)	National Institute of Oncology	Hungary	CA	Dr. Andras Masszi				LOW		LOW	
OOI (NIO)	National Institute of Oncology	Hungary	CA	Edit Marosi				LOW		LOW	
OOI (NIO)	National Institute of Oncology	Hungary	CA	Dora Kiricsi				LOW		LOW	
CNAO	Centro Nazionale di Adroterapia Oncologica	Italy	AE	Ester Orlandi			LEADER				
CNAO	Centro Nazionale di Adroterapia Oncologica	Italy	AE	Tiziana Golme			LEADER				
CNAO	Centro Nazionale di Adroterapia Oncologica	Italy	AE	Lisa Licitra			LEADER				
CNAO	Centro Nazionale di Adroterapia Oncologica	Italy	AE	Chiara Marazzi			LEADER				
CRO-Aviano	CRO Aviano IRCCS	Italy	AE	Maurizio Mascarin		LOW	LOW				
CRO-Aviano	CRO Aviano IRCCS	Italy	AE	Lorenzo Vinante		LOW	LOW				
CRO-Aviano	CRO Aviano IRCCS	Italy	AE	Andrea Dassie		LOW	LOW				
CRO-Aviano	CRO Aviano IRCCS	Italy	AE	Paolo Chiovati		LOW	LOW				
CRO-Aviano	CRO Aviano IRCCS	Italy	AE	Michele Avanzo		LOW	LOW				
FSGT	Fondazione IRCCS San Gerardo dei Tintori	Italy	AE	Andrea Biondi						LOW	
INT Milano	INT Milano	Italy	CA	Salvatore Provenzano							
IOV-IRCCS	Veneto Institute of Oncology	Italy	AE	Dr. Antonio Sommariva				LOW			
IOV-IRCCS	Veneto Institute of Oncology	Italy	AE	Chiara Ghizzini				LOW			
IRCCS AOUBO	IRCCS Azienda Ospedaliero-Universitaria di Bologna	Italy	AE	Francesca Bonifazi						HIGH	
IRCCS AOUBO	IRCCS Azienda Ospedaliero-Universitaria di Bologna	Italy	AE	Enrico Maffini						HIGH	
IRCCS AOUBO	IRCCS Azienda Ospedaliero-Universitaria di Bologna	Italy	AE	Salvatere Nicola Bertuccio						HIGH	
IRCCS AOUBO	IRCCS Azienda Ospedaliero-Universitaria di Bologna	Italy	AE	Daria Messelodi						HIGH	
IRCCS AOUBO	IRCCS Azienda Ospedaliero-Universitaria di Bologna	Italy	AE	Salvatore Nicola Bertuccio						HIGH	
IRCCS AOUBO	IRCCS Azienda Ospedaliero-Universitaria di Bologna	Italy	AE	Cristina Mosconi		HIGH			HIGH		
IRCCS AOUBO	IRCCS Azienda Ospedaliero-Universitaria di Bologna	Italy	AE	Francesco Modestino		HIGH			HIGH		
IRCCS ISNB	IRCCS Istituto delle Scienze Neurologiche di Bologna - AUSL di Bologna	Italy	AE	Enrico Franceschi		HIGH					
IRST	Istituto Romagnolo per lo Studio dei Tumori Dino Amadori	Italy	AE	Massimiliano Petrini						Co-LEADER	
IRST	Istituto Romagnolo per lo Studio dei Tumori Dino Amadori	Italy	AE	Laura Ridolfi						Co-LEADER	
NCCP	National Cancer Control Programme	Ireland	AE	Patricia Heckmann							
LU	University of Latvia	Latvia	AE	Mārcis Leja						HIGH	HIGH
LU	University of Latvia	Latvia	AE	Iveta Eniņa						HIGH	HIGH
LU	University of Latvia	Latvia	AE	Una Riekstiņa						HIGH	HIGH
LU	University of Latvia	Latvia	AE	Elīna Sīviņa						HIGH	HIGH
PSCUH	Pauls Stradins Clinical University Hospital	Latvia	CA	Reičela Heinrihsone			HIGH			HIGH	
PSCUH	Pauls Stradins Clinical University Hospital	Latvia	CA	Aija Geriņa-Bērziņa			HIGH			HIGH	
REUH	Riga East University Hospital	Latvia	AE	dr. Aina Kratovska					LOW		
REUH	Riga East University Hospital	Latvia	AE	dr. Nauris Zdanovskis					LOW		
LSMUL KK	Hospital of Lithuanian University of Health Sciences Kauno klinikos	Lithuania	AE	Assoc. Prof. Sigita Liutkauskienė		HIGH	LOW	LOW		HIGH	HIGH
LSMUL KK	Hospital of Lithuanian University of Health Sciences Kauno klinikos	Lithuania	AE	Gailė Venclovienė		HIGH	LOW	LOW		HIGH	HIGH
LSMUL KK	Hospital of Lithuanian University of Health Sciences Kauno klinikos	Lithuania	AE	Viktoras Rudzianskas		HIGH	LOW				
LSMUL KK	Hospital of Lithuanian University of Health Sciences Kauno klinikos	Lithuania	AE	Laimonas Jarusevicius		HIGH	LOW				
LSMUL KK	Hospital of Lithuanian University of Health Sciences Kauno klinikos	Lithuania	AE	Algimantas Tamelis				LOW			
LSMUL KK	Hospital of Lithuanian University of Health Sciences Kauno klinikos	Lithuania	AE	Domas Vaitiekus						HIGH	
LSMUL KK	Hospital of Lithuanian University of Health Sciences Kauno klinikos	Lithuania	AE	Rolandas Gerbutavicius						HIGH	
LSMUL KK	Hospital of Lithuanian University of Health Sciences Kauno klinikos	Lithuania	AE	Rasa Ugenskiene							HIGH
LSMUL KK	Hospital of Lithuanian University of Health Sciences Kauno klinikos	Lithuania	AE	Erika Korobeinikova			LOW				
SAM	Ministry of Health of the Republic of Lithuania	Lithuania	CA	Vilija Kondrotiene	LOW				LOW		
SAM	Ministry of Health of the Republic of Lithuania	Lithuania	CA	Inga Cechanoviciene	LOW				LOW		
VULSK	Vilnius University Hospital Santaros Klinikos	Lithuania	AE	Dr.Marius Kurminas				LOW	LOW		LOW

VULSK	Vilnius University Hospital Santaros Klinikos	Lithuania	AE	Dr. Marius Kryžauskas							
CFB	Centre François Baclesse	Luxembourg	AE	Prof. Guillaume Vogin			LOW				
CHL	Centre Hospitalier de Luxembourg	Luxembourg	AE	Dr Caroline Duhem	LOW			LOW	LOW		
HRS	Hôpitaux Robert Schuman	Luxembourg	AE	Prof. Gilbert Massard	LOW				LOW		
INC	Institut National du Cancer	Luxembourg	CA	Dr Nikolai Goncharenko	LOW		LOW		LOW	LOW	LOW
INC	Institut National du Cancer	Luxembourg	CA	Dr Amélie Gaignaux			LOW		LOW	LOW	LOW
LIH	Luxembourg Institute of Health	Luxembourg	AE	Dr Tatiana Michel						LOW	LOW
LNS	Laboratoire National de Santé	Luxembourg	AE	Prof. Michel Mittelbronn							LOW
PMSI IO	PMSI Institute of Oncology	Moldova	CA	Horia Vulpe			LOW				
PMSI IO	PMSI Institute of Oncology	Moldova	CA	Minzatean Artiom			LOW				
Maastro Clinic	Maastro Clinic | Maastricht University Medical Centre+ | Maastricht	Netherlands		Andre Dekker		OBSERVER					
Amsterdam UMC	Stichting VUmc	Netherlands	AE	Ronald Boellaard	LOW						
Amsterdam UMC	Stichting VUmc	Netherlands	AE	Danielle Vugts	LOW						
Amsterdam UMC	Stichting VUmc	Netherlands	AE	Ben Zwezerijnen	LOW						
Amsterdam UMC	Stichting VUmc	Netherlands	AE	Elsmarieke vd Giessen	LOW						
OUS	Oslo University Hospital, Department of Oncology	Norway	CA	Per Magnus	x						
OUS	Oslo University Hospital, Department of Oncology	Norway	CA	Ingrid Jenny Guldvik	x						
OUS	Oslo University Hospital, Department of Oncology	Norway	CA	Jan Rødal			LOW				
OUS	Oslo University Hospital, Department of Oncology	Norway	CA	Marianne G. Guren			LOW				
OUS	Oslo University Hospital, Department of Oncology	Norway	CA	Erik Rokkones				Co-LEAD		LOW	
OUS	Oslo University Hospital, Department of Oncology	Norway	CA	Almira Babovic							
OUS	Oslo University Hospital, Department of Oncology	Norway	CA	Dag Josefsen						LOW	
OUS	Oslo University Hospital, Department of Oncology	Norway	CA	Kyrre Eeg Emblem		LOW					
OUS	Oslo University Hospital, Department of Oncology	Norway	CA	James Patrick Connelly	LOW						
OUS	Oslo University Hospital, Department of Oncology	Norway	CA	Anna Pasetto						LOW	
IBB PAN	Institute of Biochemistry and Biophysics Polish Academy of Sciences	Poland	AE	Tomasz Sarnowski						HIGH	HIGH
MSCI	M. Sklodowska-Curie National Research Institute of Oncology - National Research Institu	Poland	CA	Tomasz Rutkowski			LOW				
MSCI	M. Sklodowska-Curie National Research Institute of Oncology - National Research Institu	Poland	CA	Slwomir Blamek			LOW				
MSCI	M. Sklodowska-Curie National Research Institute of Oncology - National Research Institu	Poland	CA	Barbara Bobk Billewicz							
MSCI	M. Sklodowska-Curie National Research Institute of Oncology - National Research Institu	Poland	CA	Daria Handkiewicz Junak	LOW						
MSCI	M. Sklodowska-Curie National Research Institute of Oncology - National Research Institu	Poland	CA	Gabriela Kramer Marek	LOW						
MSCI	M. Sklodowska-Curie National Research Institute of Oncology - National Research Institu	Poland	CA	Sebastain Giebel						LOW	
MSCI	M. Sklodowska-Curie National Research Institute of Oncology - National Research Institu	Poland	CA	Tomasz Czerw						LOW	
MSCI	M. Sklodowska-Curie National Research Institute of Oncology - National Research Institu	Poland	CA	Tomasz Cichon							LOW
MSCI	M. Sklodowska-Curie National Research Institute of Oncology - National Research Institu	Poland	CA	Monika Pietrowska							LOW
MSCI	M. Sklodowska-Curie National Research Institute of Oncology - National Research Institu	Poland	CA	Dominik Walczak				LOW			
MSCI	M. Sklodowska-Curie National Research Institute of Oncology - National Research Institu	Poland	CA	Alexander Cortez		LOW					
MSCI	M. Sklodowska-Curie National Research Institute of Oncology - National Research Institu	Poland	CA	Agata Wilk		LOW					
MSCI	M. Sklodowska-Curie National Research Institute of Oncology - National Research Institu	Poland	CA	Michal Zorniak					LOW		
MUL	Medical University of Lublin	Poland	AE	Katarzyna Drabko						HIGH	
MUL	Medical University of Lublin	Poland	AE	Joanna Zawitkowska						HIGH	
MUL	Medical University of Lublin	Poland	AE	Renata Piorowska						HIGH	
MUL	Medical University of Lublin	Poland	AE	Katarzyna Jedynak-Pukas						HIGH	
MUW	Medical Univesity in Warsaw	Poland	AE	Radoslaw Zagozdzon						HIGH	HIGH
MUW	Medical Univesity in Warsaw	Poland	AE	Anetta Pszczolowska						HIGH	HIGH
i3S	INSTITUTO DE INVESTIGACAO E INOVACAO EM SAUDE DA UNIVERSIDADE DO PORTO	Portugal	AE	Luísa Pereira							HIGH
IPO Porto	Instituto Português de Oncologia do Porto Francisco Gentil, EPE	Portugal	AE	Júlio Oliveira						LOW	
IPO Porto	Instituto Português de Oncologia do Porto Francisco Gentil, EPE	Portugal	AE	Susana Roncon						LOW	
IPO Porto	Instituto Português de Oncologia do Porto Francisco Gentil, EPE	Portugal	AE	Inês Lucena Sampaio	LOW						
IPO Porto	Instituto Português de Oncologia do Porto Francisco Gentil, EPE	Portugal	AE	Luísa Carvalho			LOW				
IPO Porto	Instituto Português de Oncologia do Porto Francisco Gentil, EPE	Portugal	AE	Olga Sousa			LOW				
IOCN	INSTITUTUL ONCOLOGIC PROF DR ION CHIRICUTA CLUJ-NAPOCA (IOCN)	Romania	CA	Andrada Turcas		HIGH					
IOCN	INSTITUTUL ONCOLOGIC PROF DR ION CHIRICUTA CLUJ-NAPOCA (IOCN)	Romania	CA	Paul Kubelac		HIGH					
IOCN	INSTITUTUL ONCOLOGIC PROF DR ION CHIRICUTA CLUJ-NAPOCA (IOCN)	Romania	CA	Andrei Roman		HIGH	LOW		LOW		
IOCN	The Oncology Institute, Cluj-Napoca	Romania	AE	Delia Nicoara		HIGH	LOW		LOW		
OI Ljubljana	Institute of Oncology Ljubljana	Slovenia	CA	Ibrahim Edhemovic				LEADER			
OI Ljubljana	Institute of Oncology Ljubljana	Slovenia	CA	prof. Gregor Sersa					Co-LEADER		
OI Ljubljana	Institute of Oncology Ljubljana	Slovenia	CA	Maja Cemazar					Co-LEADER		
OI Ljubljana	Institute of Oncology Ljubljana	Slovenia	CA	Pečoler Nina					Co-LEADER		
OI Ljubljana	Institute of Oncology Ljubljana	Slovenia	CA	Čerin Alma					Co-LEADER		

OI Ljubljana	Institute of Oncology Ljubljana	Slovenia	CA	Ursa Lampreht Tratar								LOW
UKCL	University Medical Centre Ljubljana,Department of Haematology	Slovenia	AE	Barbara Skopec							LOW	
UKCL	University Medical Centre Ljubljana, Department of Nuclear Medicine	Slovenia	AE	Katja Zaletel	LOW							
UKCL	University Medical Centre Ljubljana, Department of Nuclear Medicine	Slovenia	AE	Petra Kolenc	LOW							
UKCL	University Medical Centre Ljubljana, Department of Abdominal Surgery	Slovenia	AE	Blaz Trotovsek					LOW			
UKCL	University Medical Centre Ljubljana, Department of Urology	Slovenia	AE	Simon Hawlina				LOW			LOW	
BIOSISTEMAK	Biosistemak	Spain	CA	Sarah Berrocoso Cascallana								
BIOSISTEMAK	Biosistemak	Spain	CA	Ane Fullaondo								
BIOSISTEMAK	Biosistemak	Spain	CA	Dolores Verdoy								
CSGVA	Conselleria de Sanitat, Generalitat Valenciana	Spain	AE	Mariola Penadés Fons		HIGH	HIGH	HIGH			HIGH	HIGH
CSGVA	Conselleria de Sanitat, Generalitat Valenciana	Spain	AE	Luís Martí Bonmatí	Co-LEADER							
CSGVA	Conselleria de Sanitat, Generalitat Valenciana	Spain	AE	Irene Torres	Co-LEADER							
CSGVA	Conselleria de Sanitat, Generalitat Valenciana	Spain	AE	Maite Teresa Gandia	Co-LEADER							
CSGVA	Conselleria de Sanitat, Generalitat Valenciana	Spain	AE	Stefan Prado	Co-LEADER							
CSGVA	Fundació Privada per a la Recerca i la Docència Sant Joan de Déu	Spain	AE	Andrés Morales La Madrid			OBSERVER	OBSERVER			OBSERVER	
HUMV-IDIVAL	Fundación Instituto de Investigación Marqués de Valdecilla	Spain	AE	Fernando Rivera Herrero			LOW				LOW	
HUMV-IDIVAL	Fundación Instituto de Investigación Marqués de Valdecilla	Spain	AE	Ignacio José Durán Martínez			LOW				LOW	
HUMV-IDIVAL	Fundación Instituto de Investigación Marqués de Valdecilla	Spain	AE	Carlos López López			LOW				LOW	
HUMV-IDIVAL	Fundación Instituto de Investigación Marqués de Valdecilla	Spain	AE	Itziar Gardeazábal González			LOW				LOW	
HUMV-IDIVAL	Fundación Instituto de Investigación Marqués de Valdecilla	Spain	AE	Fernanda Genre Romero			LOW				LOW	
SAS	Servicio Andaluz de Salud	Spain	AE	Carlos Míguez Sánchez								
SAS	Servicio Andaluz de Salud	Spain	AE	Alberto Moreno Conde								
SAS	Servicio Andaluz de Salud	Spain	AE	Sophie Monteau								
AUH	Akademiska University Hospital	Sweden	AE	Gunilla Enblad							HIGH	
AUH	Akademiska University Hospital	Sweden	AE	Mats Hellström							HIGH	
VGR	Västra Götalandsregionen, Sahlgrenska University Hospital	Sweden	AE	Roger Olofsson Bagge				LOW				
SoS	National Board of Health and Welfare (Socialstyrelsen)	Sweden	AE	Hillevi Rylander			LOW					
NCI	National Cancer Institute	Ukraine	CA	Andrii Horodetskyi			LOW	LOW				