

Tyks Cancer Centre Annual Report 2023



FICAN West
LÄNTINEN SYÖPÄKESKUS



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Tyks Cancer Centre / Turku University Hospital Tyks

In November, 2019 the Tyks Cancer Center was approved as an accredited Cancer Center (CC) of the Organization of European Cancer Institutes (OECI).

The Cancer Center status confirms that the Turku University Hospital Tyks meets the same high-quality, peer-reviewed standards of cancer care and research as the other cancer institute members of the OECI in Europe.

In 2023, a comprehensive, national reform of all health and social services was initiated in Finland. The hospital districts in Finland have been replaced by 21 wellbeing services counties. Tyks, which is a hospital service unit, belongs to the Wellbeing Services County of Southwest Finland. The Tyks Cancer Center is a part of this unit as well as a part of the FICAN (Finnish Cancer Center network) and resides administratively in FICAN West together with the hospitals in Pori (Satakunta and Wellbeing Services County of Satakunta) and Vaasa (Vaasa central hospital and Wellbeing Services County of Ostrobothnia). The oncological functions of these collaborate within a comprehensive cancer research cluster which includes the University of Turku. In the wellbeing services counties, the voice of cancer patients and cancer research must be emphasized continuously, since the wellbeing services counties are responsible for the public administration of all branches of healthcare, social services and rescue services of Southwest Finland – an enormous workload and responsibility which needs a lot of human and funding resources.

Our mission is to establish Tyks as one of the leading centers of cancer care and science in Finland. The members of the Tyks Cancer Board (Clinical) represent all departments with operational responsibility for cancer care in the whole region of FICAN West, not only of Tyks.

We are committed to continuous development of personalised, precise medicine-based cancer care. In doing

this, we have, for example, developed a molecular tumour board working model within FICAN on a national level and supported the training of a pathologist especially in molecular pathology. The training took place at expert units abroad, since it is not currently available in Finland.

An executive committee of the Tyks Cancer Board meets four times yearly. Its main task is to reinforce the collaboration related to decision-making, implementation of cancer care and cancer research across Tyks and the University of Turku. The members of this executive committee have been nominated by the CEO of Tyks and they represent the heads of the departments involved in cancer treatment and research. The executive board operates in close collaboration with the Cancer Board (Clinical) and the Scientific Cancer Board which together cover all heads of departments and research directors involved in cancer treatment and research.

2023 was a challenging year for cancer care and clinical research. The Covid pandemic has permanently changed working conditions, but also updated digitalisation in meetings, many of which can now be arranged via Teams or Zoom. On the other hand, the shortage of health care professionals is increasing and our mission is to show how the demanding work to the benefit of cancer patients and together with cancer patients can be meaningful and satisfying, in spite of the need of continuous education in very sophisticated therapy areas. In addition, the lack of resources and commitment to basic and clinical cancer research is a problem: young physicians see research as less meaningful than before and research funding has been continuously curbed, in addition to the fact that there are substantial obstacles to funding applications for clinical research projects. This problem has been noticed in the Research Council of Finland, which has committed to strengthening the position of science and research via flagships in Finnish universities.



Pia Vihinen,
MD, PhD, Chief
physician, Director of
FICAN West



Mervi Siekkinen,
RTT, PhD,
Development
Manager of FICAN
West



Sirkku Jyrkkiö,
MD, PhD, Chief of
Tyks Operational
Division of Surgery
and Cancer Diseases

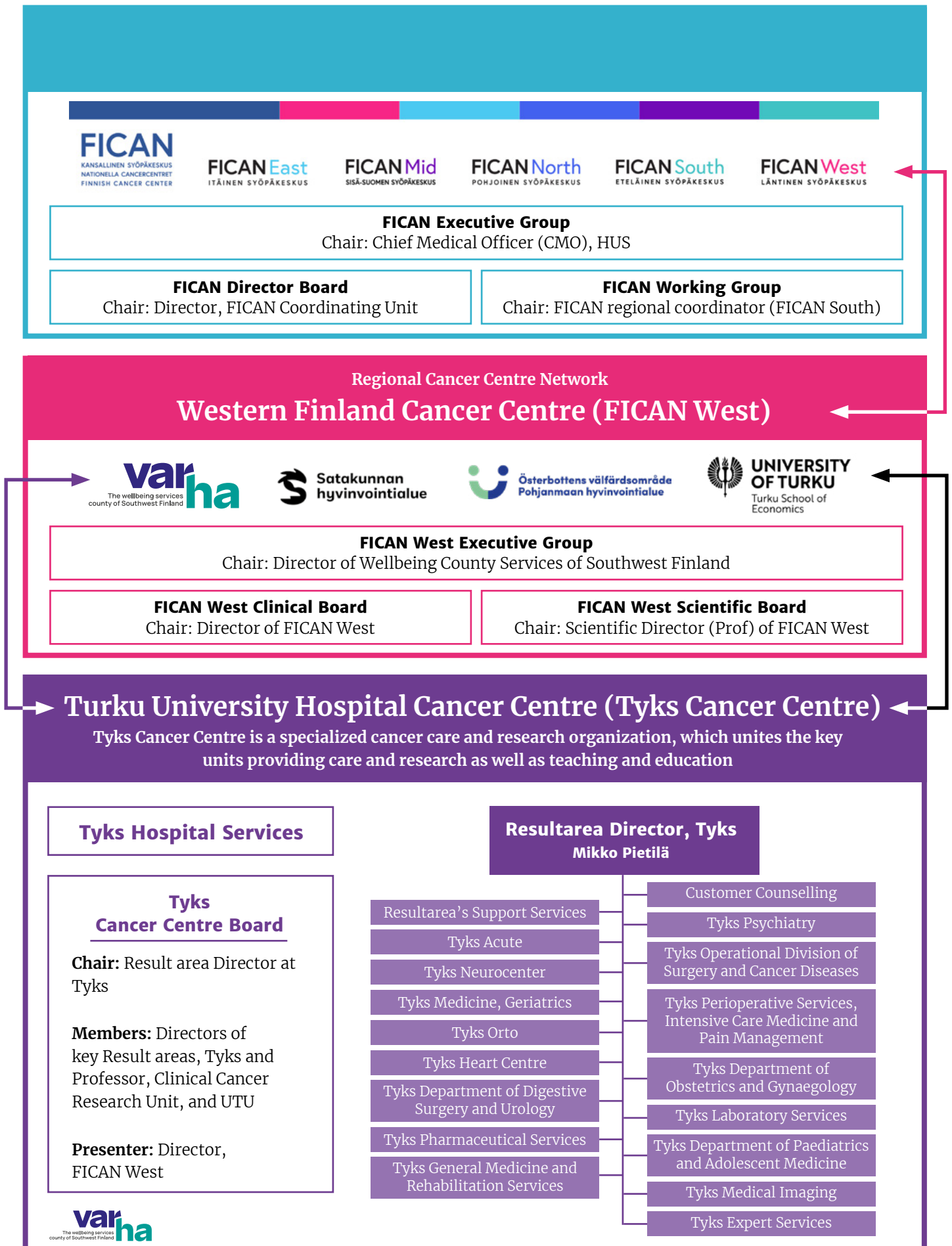


Panu Jaakkola,
MD, PhD, Professor,
Tyks Cancer Diseases
services, Clinical trial
Unit



Mikko Pietilä,
MD, Resultarea
director, Tyks
Hospital Services

Organizational structure



Clinical Cancer Board Members of Tyks, Satasairaala and Vaasa Central Hospital

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Roberto Blanco, MD, PhD, Head, Medical imaging, Tyks
Maria Gardberg, MD, PhD, Head, Patology, Tyks
Sakari Hietanen, MD, PhD, Head, Gynecologic Oncology, Tyks
Tuula Huumonen, Head Nurse, Oncology, Satahospital
Maija Itälä-Remes, MD, PhD, Head, Hematology, Tyks
Antti Jekunen, MD, PhD, Prof. Head, Oncology, Vaasa Central Hospital
Sirkku Jyrkkiö, MD, PhD, Director, Surgery and Oncology, Tyks
Marita Kilpeläinen, MD, PhD, Head, Pulmonary Diseases, Tyks
Minna Koskenvuo, MD, PhD, Head, Pediatrics & Adolescent Hematology and Oncology, Tyks
Ritva Kosklin, Head Nurse, Surgery and Oncology, Tyks
Jussi Liippo, MD, PhD Head, Skin Diseases, Tyks
Kalevi Pulkkanen, MD, PhD, Head, Oncology, Satahospital
Arto Rantala, MD, PhD, Director, Digestive Surgery and Urology, Tyks
Jaakko Rinne, MD, PhD, Prof. Director, Neurocentre, Tyks
Mervi Siekkinen, PhD, Development Manager, FICAN West
Tiia Sirkola, Head Nurse, Oncology, Vaasa Central Hospital
Tero Soukka, MD, PhD, Head, Oral and Maxillofacial Diseases, Tyks
Esko Veräjänkorva, MD, PhD Head, Plastic Surgery, Tyks
Vesa Vilkki, MD, PhD, Cardiothoracic Surgery, Tyks
Annika Ålgars, MD, PhD Head, Oncology and Radiotherapy, Tyks

Other operational experts of Tyks

Outi Akren, MD, PhD, Prof, Head, Palliative Care
Peter Boström, MD, PhD, Head, Urology, Tyks
Maria Haanpää, MD, PhD, Medical Genetic, Tyks

Pauliina Hartiala, MD, PhD, Plastic Surgery, Tyks
Johanna Hynninen, MD, PhD, Gynecologic Oncology, Tyks
Heikki Irjala, MD, PhD, Prof, Head, Head and Neck Surgery, Tyks
Panu Jaakkola, MD, PhD, Prof. FICAN West
Sari Johansson, Head Nurse, Neurocentre, Tyks
Nina Jumisko, Head Nurse, Hematology, Tyks
Veli Kairisto, MD, PhD, Genomic, Tyks
Gaber Komar, MD, PhD, Medical Imaging, Tyks
Ilkka Koskivuo, MD, PhD, Plastic Surgery, Tyks
Anne Laapotti-Salo, Head Nurse, Pulmonary, Skin Diseases, Tyks
Heidi Laine, Head Nurse, Cardiothoracic Surgery, Tyks
Päivi Lähteenmäki, MD, PhD, Researcher, Dep. of Pediatrics and Adolescent Hematology and Oncology, Tyks
Kristiina Pälve, MD, PhD, Cardiothoracic Surgery, Tyks
Maria Silvoniemi, MD, PhD, Pulmonary Diseases, Tyks
Sari Tanninen, Head Nurse, Digestive Surgery and Urology, Tyks
Aaro Turunen, MD, PhD, Oral and Maxillofacial Diseases, Tyks
Outi Tuominen, PhD, Head Nurse, Pediatrics and Adolescent cancer, Tyks
Leila Varakas, Head Nurse, Obstetrics and Gynecology, Tyks

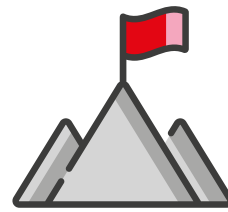
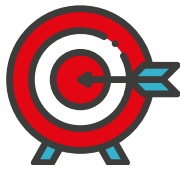
Scientific Cancer Board Members

Panu Jaakkola, prof, MD, PhD, UTU, Tyks, FICAN West, Scientific director, Chair of the board
Tero Aittokallio, prof, PhD, Statistics and Applied Mathematics, UTU
Peter Boström, MD, PhD, Urology, Tyks
Klaus Elenius, prof, MD, PhD, Director, Turku Bioscience, BioCity Turku, UTU
Laura Elo, prof, PhD, Turku Bioscience, UTU
Pauliina Hartiala, MD, PhD, Plastic Surgery, Tyks
Sakari Hietanen, MD, PhD, Gynecological Surgery, Tyks

Maija Hollmén, PhD, MediCity Research Laboratories, UTU
Riikka Huovinen, MD, PhD, Oncology and Radiotherapy, Tyks
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Johanna Ivaska, prof. PhD, Turku Bioscience, UTU
Antti Jekunen, prof, MD, PhD, Oncology and Radiotherapy UTU, Vaasa Central Hospital
Jani Keyriläinen, PhD, Medical Physics, Tyks
Ilpo Kinnunen, MD, PhD, Head and Neck Surgery, Tyks
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Riitta Lahesmaa, prof, MD, PhD, Director, Turku Bioscience, UTU
Janne Leivo, PhD, Department of Life Technologies, UTU
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Emilia Peuhu, PhD, Institute of Biomedicine, UTU
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Pekka Taimen, prof, MD, PhD, Pathology, Tyks, UTU
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Pia Vihinen, MD, PhD, Director, Oncology and Radiotherapy, Tyks, FICAN West
Jukka Westermarck, prof, MD, PhD, Turku Bioscience, UTU

Tyks Cancer Centre Strategy 2023–2025

The Tyks Cancer Centre Strategy 2023–2025 constitutes a strategic plan of the future, which will guarantee the population of the region high-quality and efficacious treatment of cancer, research and education in the context of a center of excellence to be.



VISION: The Tyks Cancer Center is an internationally acknowledged high-quality cancer center which produces evidence-based cancer treatment and high-level scientific research in a timely manner in an environment where the personnel experiences a high level of wellbeing. It will be one of the leading centers of Finnish cancer care and research.

MISSION: The Tyks Cancer Center is the heart of the cancer care and research produced by the FICAN West Cancer Center and it includes also the central hospitals in Pori and Vaasa and the Turku University Cancer Research cluster. FICAN West is an active part of FICAN (Finnish Cancer Center) together with FICAN South (Helsinki), FICAN Mid (Tampere), FICAN East (Kuopio), and FICAN North (Oulu).

Assets and specialties of the Tyks Cancer Centre

- The Tyks Cancer Centre has all diagnostics and treatments available in Finland to be used to the benefit of cancer patients.
- Highly specialized development in personalized medicine and genomic diagnostics. The Auria Biobank and the clinical information unit provide a unique setting that makes it possible to combine information on tumor molecular biology with patient records, a combination that will provide real-world evidence data for daily practice and research. The hospital campus area harbors one of the leading PET centers in Europe and the Auria Biobank for collection, storage and advanced research on biological specimens.
- Multilingual, highly competent professionals. Cancer care is routinely provided in Finnish or Swedish.
- The leading stem cell transplantation unit in Finland.
- Basic cancer research and clinical research are combined and form the FICAN West Research network located in the same campus area. More than 100 cancer-oriented biotechnology companies at the same campus generate and develop research innovations from bench to bedside.
- Nursing science research is integrated into a program of the Tyks Cancer Centre called Psychosocial care and survivorship care of cancer patients.
- All facets of cancer care and research are easily reached within the campus area.

Tyks Cancer Centre: Key strategic measures 2023–2025

1. Strengthen the involvement of FICAN West in the Finnish Cancer Center network (FICAN).
2. Be involved in the planning of the Finnish Cancer Strategy and commit to its work.
3. Continue work in the OECI accreditation program and in the European network of Rare Cancers (EURACAN).
4. Support precision medicine-based treatment, the collection of fresh tumour biopsies (Finprove, Pro-exmet and iCAN studies), and continue to develop the work of molecular tumour boards (MTB).
5. Increase the number of clinical trials (also radiotherapy trials) in the most common cancer groups (breast cancer, prostate cancer, lung cancer) and improve patient accrual to trials.
6. Strengthen the research network among the partners of FICAN West and promote investigator-initiated studies and thesis projects.
7. Continue to develop biological imaging of cancer with new tracers (PET).
8. Be active in various research networks and organisations and in obtaining EU funding, when possible.
9. Support career development and education of cancer care professionals, e.g., by education events, mentoring and exchange programs.
10. Be active in establishing nationwide quality registers on cancer treatment and develop solutions for electronic follow-up of patients and how patient contacts are managed and supported.
11. Develop further patient-centered supportive care and cancer rehabilitation.

Core activity data 2023



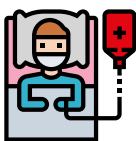
Diagnosed (new) patients
3 457 in 2022



Radiotherapy patients
1601



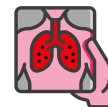
Molecular Tumour Board
patient cases 50



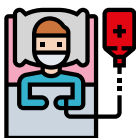
Chemotherapy patients 4158



Stereotactic radiotherapy patients
157



Total number of medical imaging
studies 17 051 (MRI, PET, PET-MRI,
PET-CT, CT)



Chemotherapies 7299



Ward care periods 6726



Molecular pathological studies
7402



Outpatient appointments
133877



Ward care days 21878

Relative survival

The Finnish Cancer Registry maintains the national registry of all the diagnosed cancer cases since 1953. It is also a statistical and epidemiological research institute that does active collaboration both nationally and internationally.

Year 2021 there were 36 543 new cancer cases and 13 355 cancer-related deaths in Finland. 315 000 patients diagnosed with cancer were alive. About 70% of all patients diagnosed with cancer live at least 5 years. There were 3825 new cases of bowel cancer, 5105 new cases of breast cancer, and 5214 new cases of prostate cancer in Finland. These amounts of new cases are a little bit

under the estimate, probably due to detected delay in diagnosis due to Covid pandemia.

This table shows the data on relative survival of patients treated at the Wellbeing Services County of Southwest Finland area. Survival data originates from the Finnish Cancer Registry (www.cancerregistry.fi). Five-year patient survival (%) in patients diagnosed 2017–2021 for the five most common cancer diagnoses in Finland and for cutaneous melanoma by gender. The number of patients treated at the FICAN West Cancer Centre area are also shown.

ICD-10	Tumor location	Gender	5-year survival Finland 2019–2021	5-year survival FICAN West 2019–2021	Patients (n) FICAN West 2021
C50	Breast	Female	91.61	92.72	539
C18–20	Colon		70.38	69.62	319
C54	Uterus		81.21	82.74	149
C33–34	Lung		22.24	23.30	177
C43	Melanoma		93.85	91.90	142
C65–68	Urinary tract		65.31	Unknown	55
C61	Prostate	Male	94.52	94.04	892
C18–20	Colon		66.08	64.93	363
C33–34	Lung		13.98	13.33	303
C65–68	Urinary tract		75.08	71.77	203
C43	Melanoma		94.22	95.97	113

Quality system



Wellbeing services county of Southwest Finland has been a member of Organization of European Cancer Institutes (OECI) Cancer Centre since 2016. Cancer Centre status received at 2019 confirmed that Tyks meets all high quality standards of cancer care and research when compared and peer-reviewed with other cancer institutes in Europe. Tyks has been also a member of European Reference Network (ERN) since 2016 and re-audited to European Cancer Network (Euracan) 2023.

Quality management means operative leadership, assessment and improvement aimed at reaching preset quality goals.

The goal of the quality management plan of Tyks 2023 is to support systematic and continuous development of quality and patient safety. The quality management plan is based on national legislation, organizational strategy, operative quality goals and on systematic assessment and continuous improvement of what is done.

In general, the SHQS quality program is used by all departments in the Tyks hospital that manage cancer patients. In addition, the work done within the Tyks laboratory functions (clinical chemistry, pathology, genomics, microbiology, Auria Biopank) are accredited clinical laboratory activities (SFS-EN ISO 15189: 2013, FINAS). Medical imaging (clinical neurophysiology, clinical physiology, nuclear medicine, and – within PET – also production of radiopharmaceuticals) are accredited diagnostic functions. An external clinical audit of the use

of medical radiation in the department of nuclear medicine, in the PET center and in radiotherapy has been carried out, as required by the Radiation Act.

Measures of quality of care and follow-up

Together with Tyks Information Service, with 2M-IT and with the Finnish Cancer Registry, FICAN West coordinates the development of cancer quality registries and a dashboard so that they support clinical work and the monitoring of the treatment effectiveness more effectively and facilitate scientific research. The unified operative model is created, and indicators of quality and follow-up will also be determined.

Quality registry

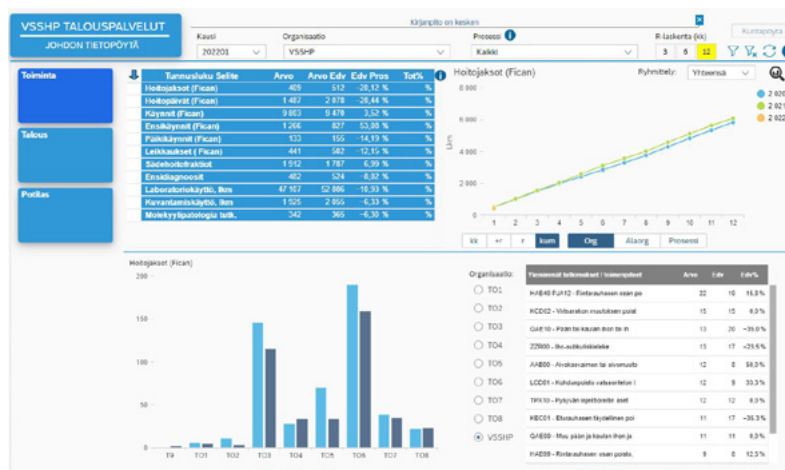
A central part of the quality register for cancer treatment and research is the national Finnish Cancer Registry. The Finnish Cancer Registry automatically receives information about new cases of cancer, histologically confirmed. The challenge is to create comprehensive clinical reports. The aim of the Cancer Registry is to expand the registry to allow for extensive clinical and epidemiological research.

FICAN West works on a national level closely with other cancer centers, including the Finnish Cancer Registry, with the aim of improving coverage of the information of the entries of the Finnish Cancer Registry.

Quality registers, implemented in surgery, are expected to unify the way operative reports. Currently, systems are in place for collection of information on adverse events experienced by patients receiving oncological drugs and on disease follow-up (this is the case, e.g., in gynecology, hematology, lung diseases, pediatrics, oncology and urology). This has been made possible through modern technology which allows commercial companies or the Health village system to analyze data. During 2023 the unification of datapool of Wellbeing services country of Southwest Finland (Varha) has been started.

Dashboard

FICAN West has, in collaboration with resultareas of the Tyks that treat cancer patients, developed a dashboard for the administration. The dashboard covers a major section of the traditional parameters of daily administrative tasks and facilitates cancer treatment follow-up in the hospital.



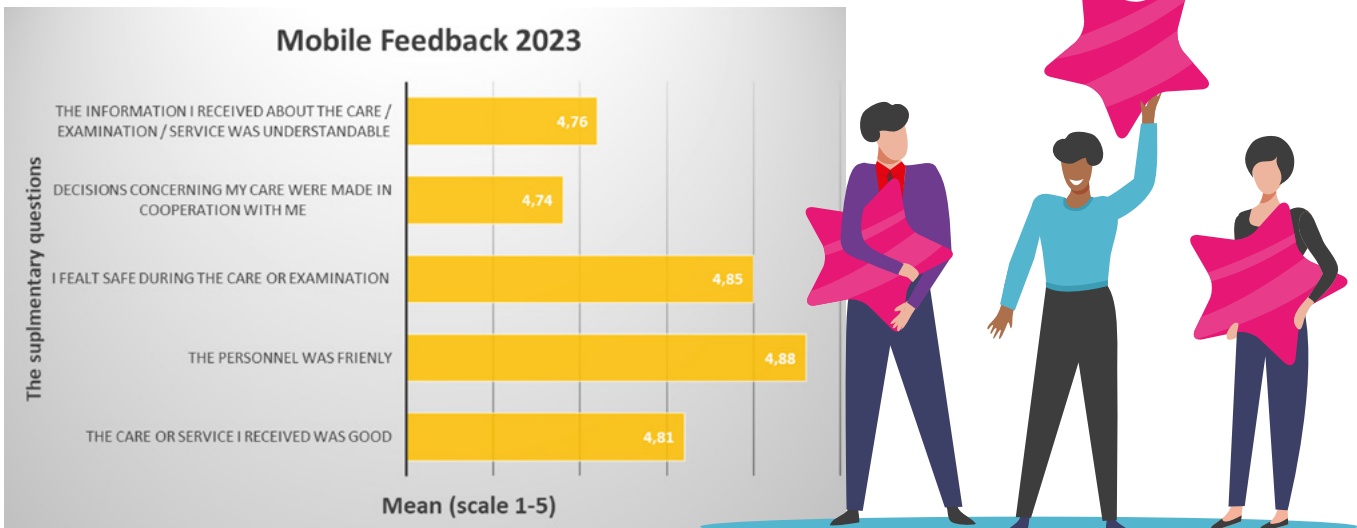
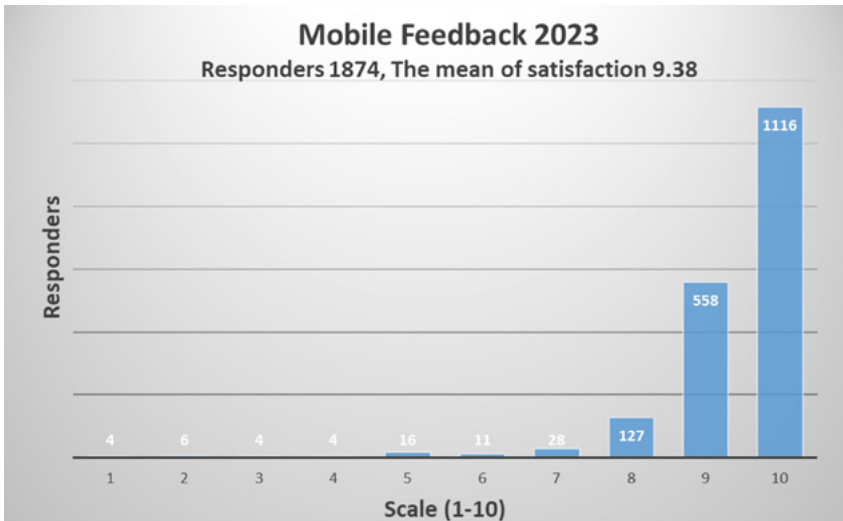
Patient satisfaction and feedback in 2023

Patient feedback and recognition of patient needs are extremely important for improving the services of FI-CAN West. Patients can continuously provide us with feedback in several ways. An electronic feedback form is available on the tyks.fi website, smiley terminals are at the disposition of clients, and traditional feedback forms on paper may be used. The paper forms can be returned into a feedback box in the care unit. All feedback is collected in the Roidu system, implemented last summer. Since this time has been quite short, there is still only little feedback available in the Roidu system, and hence patient satisfaction and feedback are analyzed here only by using another feedback system that has been used for a longer period, i.e., feedback by text message (SMS): The patient receives a text message on

his/her mobile phone and a hyperlink for providing immediate feedback after a treatment visit.

A total of 1,874 patients treated in the oncology unit provided feedback in 2023. The feedback was provided on a score from 1 to 10 and it turned out to be very positive indeed: no less than 60% of the respondents gave the overall service a score of 10 with an average score of 9.38.

In addition to the overall rating, respondents could evaluate the service by scoring five preprepared statements. The scale ran from 1 to 5. The statement that scored the lowest was Decisions concerning my care were made in cooperation with me, with a mean of 4.74 score points, and the one that scored the highest was The personnel was friendly, with a mean of 4.88 points.



Respondents provided also free comments, which were, in general, positive. Some examples:

All treatment that I have received over five years has been really good, friendly, and empathic. I could trust that everything possible was being done for my recovery. I felt I was the only patient in the world, and the patient sees no signs of rush from the personnel.

Human encounter was excellent. Things were explained clearly and understandably. During talks we had eye contact. Although the reason for the visit was unpleasant, the visit was pleasant.

Lovely nurses although the work they are doing must be psychologically tough.

Thank you for a good treatment encounter with the doctor. The doctor interviewed me and explained the instructions I got. I got also a prescription for an additional dose of medicine to treat my cancer-anemia.

The doctor made the usual clinical examination (not very common in my case). Treatment at the outpatient clinic went as usual – just wonderful. Thanks to everyone.

Some comments suggested improvement:

More information could be provided on the side effects of medicines and on how to manage them.

The encounter with the doctor was uninspiring. The doctor didn't really take much of a stand on anything, and I didn't feel that I got proper answers to my questions. The doctor didn't even bring up the possibility that I might need treatment because of the study results until I mentioned that another doctor had advised me to ask about it.

Unfortunately, the doctor was so busy that I didn't really get the support and information I needed. Amid all cancer treatments, visits to doctors are important to the patient, and the visits are eagerly awaited. After all, it's the patient's life that is at stake. Due to the rush, I couldn't ask all my questions about my treatment.

The young resident doctor seemed a bit unsecure, but that's ok at this stage of the doctor's training. Nor did this affect my treatment and treatment decisions – the process was smooth and the doctor followed it carefully.

The doctor didn't speak, was busy minding other things. It was up to me to ask and the doctor did respond. The visit left me with a bad feeling.

Patient Treatment

Standardization of patient care

The Tyks Cancer Centre follows ESMO, ASCO and national recommendations on the treatment of cancer.

To standardize and equalize the treatment in Finland, the national Finnish Cancer Centre (FICAN) has issued recommendations for treatment and follow-up of cancer patients. The first version of these recommendations has now been piloted by two associations for cancer specialists. Current national care recommendations (treatment guidelines) are available at terveysportti.fi intranet, which are limited to health care professionals (Current Care Guidelines). Our plan is to standardize all patient information and treatment instructions

of the entire Wellbeing services county of Southwest Finland. In addition, a standardization group for radiotherapy protocols was set up. These harmonized instructions are available for professionals at the proprietary intranet of FICAN West (FICANintra).

For citizens, several cancer-related treatment instructions are available in the national web page www.terveyskyla.fi and www.terveysportti.fi. The web page www.hoito-ohjeet.fi, also containing information on treatments for patients and the general public, is maintained by FICAN West. The websites maintained by TYKS and www.ficanwest.fi for patients provide the following information:

- All recruiting clinical trials of the Cancer Centre.
- Updated information on waiting times for referral to the first treatment contact, to surgery, to chemotherapy and to radiotherapy for the most common cancer types.
- Cancer-specific patient pathways for most cancer illnesses. These pathways include information on the cancer and on how to support and improve patients' understanding on their illness, diagnosis and self-care.

New pathways are being updated continuously.

FICAN
KANSALLINEN SYÖPÄKESKUS
NATIONELLA CANCERCENTRET
FINNISH CANCER CENTER

FICAN East
ITÄINEN SYÖPÄKESKUS

FICAN Mid
SISÄ-SUOMEN SYÖPÄKESKUS

FICAN North
POHJOINEN SYÖPÄKESKUS

FICAN South
ETELÄINEN SYÖPÄKESKUS

FICAN West
LÄNTINEN SYÖPÄKESKUS

Examples

14th meeting of the Colorectal Cancer Treatment Standardization Working Group

The first meeting of the working group took place on September 9, 2015. At the outset, the meeting was part of a project agreed upon with the Ministry of Social Affairs and Health to demonstrate the benefits of regional cancer center operations. The initiative to the meeting was taken by Arto Rantanen (surgery), Raija Ristamäki (oncology), Päivi Rautava (FICAN West), and Mervi Siekkinen (FICAN West). Early on, meetings were held twice annually at the Satasairaala hospital rather than in Turku to promote networking. The working



group has been multidisciplinary and multi-professional throughout these years and has had representation from the clinical and research functions of the hospitals of. The goal of the working group has been to support and standardize the treatment of colorectal cancer in the region which covers the hospitals Tyks, Satasairaala, and Vaasa Central Hospital.

This 14th meeting was special because the directors of the working group, Arto Rantanen and Raija Ristamäki, are retiring. An overview of the achievements of the Colorectal Cancer Treatment Standardization Working Group was presented. This included the creation of a diagram covering the pathway of care for colorectal cancer patients.

The diagram was published online on the websites of the involved hospitals, and it provides essential information on how the treatment of colorectal cancer is organized in FICAN West and where treatment is available. These web pages have now been transferred to the new website for Tyks. The goal of having healthcare professionals participate in multidisciplinary tumor board (MTB) meetings by remote access is

attainable, regardless of the hospital where they are working. Over these years, there has been a systematic effort to refer patient cases to remote meetings. Several professional and patient instructions and management practices have been standardized. Since the working group has access to the results of registry and biobank research projects, it is now possible to compare treatment outcomes between

hospitals. A new goal has been set to ensure that all patients have access to the digital treatment pathway and to electronic communication with staff and other healthcare professionals, regardless of where the patient is being treated. The working group will continue its work with new members – we extend a warm welcome to Pirita Varpe from surgery and Annika Ålgars from oncology!

Transition to paperless processes for radiation therapy and for referrals at the Tyks Radiotherapy outpatient clinic

A multidisciplinary way of working has been introduced in the Radiotherapy Outpatient Clinic at the Tyks cancer clinic with the ultimate goal to move over to a paperless radiotherapy process. This is a significant change and will affect the entire unit. The Tyks Radiotherapy Outpatient Clinic provides treatment for approximately 1,600 patients annually, and about 110 patients receive radiation therapy daily. The radiation therapy pathway includes several different stages, like referral processing, appointments with physicians and related activities, radiotherapy planning by imaging techniques, determination of the target area for radiation therapy and for delineating the healthy tissue area, radiation dose planning, and provision of the actual radiation therapy course. The staff at the Radiotherapy Outpatient Clinic performing all of these functions is, of course, multidisciplinary.

Formerly, some of the referrals to the clinic were processed on paper, but in the spring of 2023 electronic processes took over referral management. The new electronic



processing of referrals has streamlined the referral process and improved the management of queues. However, paper is still used for certain steps in the radiation therapy information flow process, e.g., images for dose planning and radiation therapy cards. The goal of the outpatient clinic is to transition entirely to a paperless radiation therapy process during 2024, so that all information and communication related to the patient's radiotherapy path are transferred electronically, either in the Aria radiotherapy system or the Uranus medical records system.

In 2023, a multidisciplinary working group was formed within the Radiotherapy Outpatient Clinic to work on the transition to electronic

radiotherapy processes. The group meets regularly and receives expert assistance to carry out the process. Some members of the group were trained at a radiotherapy center in England, where electronic radiotherapy processes are used. In the spring of 2024, the stages of the radiotherapy process will be assessed, along with an analysis of how information and communication can be transferred electronically rather than on paper. The entire staff will be involved in the project as needed. The new electronic procedures are expected to be in place in the system by next fall, so that the staff can be trained before the reform comes into effect in late autumn 2024.



¹⁷⁷Lu-PSMA team at Turku University Hospital

¹⁷⁷Lu-PSMA radioligand therapy

Recently, ¹⁷⁷Lu-PSMA radioligand therapy has been shown to improve the survival of patients with metastatic, castration-resistant prostate cancer who have received chemotherapy and novel hormonal agents (1). Prostate cancer cells have a high expression of PSMA (prostate specific membrane antigen). PSMA-PET-CT imaging is used to identify patients with PSMA-positive tumor lesions. ¹⁷⁷Lu-PSMA therapy is used to deliver beta-particle radiation selectively to PSMA-positive cells thereby killing prostate cancer cells.

In Finland, ¹⁷⁷Lu-PSMA therapy has been available in Helsinki

and Kuopio. During 2023 and early 2024, intense collaboration has been ongoing between the cancer clinic and the nuclear medicine unit to start ¹⁷⁷Lu-PSMA therapy at the Tyks Cancer Centre. The ¹⁷⁷Lu-PSMA radioligand is administered to patients intravenously every 6 to 8 weeks for 4 to 6 cycles. Specialized nurses give the ¹⁷⁷Lu-PSMA radioligand injections to patients at the oncology ward (TA3). Usually, patients will be admitted home on the same day. Some patients will stay at the oncology ward overnight. Patients have to be well informed about radiation hygiene and adverse events. Safety and response to treatment are monitored with laboratory tests and PSMA-PET-CT imaging.

¹⁷⁷Lu-PSMA therapy requires close collaboration between the nuclear medicine unit and the cancer clinic. The first patient is expected to be treated at the Turku University Hospital in February 2024. Experiences gained from the first patients will be studied prospectively with the intention to develop the treatment process at our site.

1. Sartor O, de Bono J, Chi KN, et al.; VISION Investigators. Lutetium-177-PSMA-617 for Metastatic Castration-Resistant Prostate Cancer. *N Engl J Med*. 2021 Sep 16;385(12):1091-1103.



CAR-T therapy now available in Turku

CAR-T (chimeric antigen receptor T-cell) therapy is an innovative type of cellular immunotherapy designed against relapsed or refractory B-cell lymphomas and leukemias.

CAR-T therapy is specifically developed for each individual patient. The patient's own immune cells – the T-cells – are collected from the blood and sent off to the manufacturer's commercial laboratory where the T-cells are programmed to target CD19 positive B-lymphocytes, i.e., the B-cell lymphoma cells. This procedure takes about one month. The manufactured CAR-T cells are then transported back to the hospital where they are infused into the patient after brief lymphodepletion treatment (with chemotherapy).

The adverse events associated with CAR-T cell therapy are of a new type. The most common adverse events are CRS (cytokine release syndrome) and neurological side effects. Treatment is with corticosteroids and immunosuppressive drugs. Patients need to be in the hospital for about two weeks after the CAR-T infusion. Intensive care professionals and neurologists have been trained to treat the side effects.

In Finland CAR-T-cell therapy is currently approved for treatment of patients with diffuse large B-cell lymphoma (DLBCL) after two lines of treatment or after one line of treatment if the disease progresses or relapses within 12 months after first line treatment. CAR-T therapy is also approved for treatment of mantle cell lymphoma, follicular lymphoma and B-ALL (acute lymphoblastic leukemia) if several lines

of traditional chemoimmunotherapy have failed.

After referral from a treating specialist anywhere in Finland, a national panel of expert clinicians decides on which individual patients are eligible for CAR-T therapy. These national experts convene weekly on Teams.

In Finland, CAR-T therapies started in the Helsinki University Hospital a few years ago and the Oulu university hospital has provided CAR-T therapy for a few months. CAR-T therapies are now available also in the Turku University Hospital and first patients have been treated in the hematology department in Turku in November 2023 in close collaboration with the oncology department where patients with lymphoma are usually treated.

Multidisciplinary team (MDT) meetings at the Tyks Cancer Centre and FICAN West



In 2023, 20 regular clinical multidisciplinary team (MDT) meetings focusing on different cancer types were organised in Tyks, 14 of which were skyped weekly. The MDT includes a surgeon, a pathologist, a radiologist, a medical oncologist, a radiotherapy oncologist and nurses from the surgical and oncological departments. Meetings on cancer of the head and neck, lung, brain, female genital tract and gastrointestinal tract cancers used also a video conference connection with the central hospitals in Pori and Vaasa. The MDT provides recommendations on how the patient is to be treated, and these

recommendations are registered in the patient records. The final decision about the treatment is taken face-to-face by the patient's physician and the patient MDT meetings deal with specific tumour types of individual patients. Thus, every patient with breast cancer, colorectal cancer and testis cancer is discussed in an MDT after or before surgery. Patients suitable for neoadjuvant therapy, e.g., patients with breast cancer, gastric cancer and urothelial cancer, are brought to an MDT to ensure an uninterrupted treatment path for the patient from diagnosis to chemotherapy and surgery. The treatment of brain tumours, head

and neck cancers and lung cancers demand close collaboration between a radiologist, pathologist, surgeon, and radiotherapy oncologist and patients with these tumour types are a given and recurring topic at MDT meetings. Lymphoma patients who require high-intensity chemotherapy and stem cell transplantation rely on the collaboration between oncologists and haematologists who also convene at MDT meetings. Difficult cases and rare tumour types are typically discussed and decided upon at MDT meetings. Patients eligible for ongoing clinical trials are also often identified at MDT meetings.

Example of multidisciplinary team (MDT): Immuno-oncological group

Some of our clinical oncologists use immune checkpoint inhibitors (ICI) or combination therapies to treat cancer patients with immuno-oncological therapies. Since 2018, an active consultation group has been operative in our hospital. This group includes medical oncologists who mainly manage patients with melanoma, renal cell cancer, urothelial cancer, and breast cancer. In addition, we have a pulmonologist for managing patients with lung cancer. Our group would not be complete without other specialists: an endocrinologist, a radiologist, a neurologist, a gastroenterologist, and a cardiologist. Together, we can solve efficiently problems related to adverse events due to immuno-oncological treatments. In addition to discussion of patients cases our group regularly meet also around a dinner table.

And here listed some of this groups research activity in Finnish:

1. Kalle Mattila, Esko Veräjänkorva, Ilkka Koskivuo, Eetu Heervä, Pia Vihinen ja Micaela Hernberg: Paikallisesti edenneen ihomelanooman hoito ja ihomelanooman esiliitännäishoito. Duodecim 2023;139(17):1343-50.
2. Kalle Mattila, Pilvi Riihilä, Esko Veräjänkorva ja Siru Mäkelä: Ei-melanoottisten ihosyöpien nykyhoito. Duodecim 2023;139(3):203-10.
3. Kalle Mattila, Kirsi Penttilä ja Pia Vihinen: Tutkijalähtöinen kliinisen lääketutkimus syöpäpotilailla - miten pystytän ja hoidan. Duodecim 2022;138(21):1913-9.
4. Kalle Mattila, Katriina Peltonen ja Panu Jaakkola: Edenneen munuaissyövän hoito. Duodecim 2022;138(17):1525-33.
5. Sanna Laurila, Kalle Mattila, Otso Arponen ja Tanja Skyttä:

Immuuniaktivaation vapauttajien, kaksoisspesifisten vasta-aineiden ja CAR-T-soluhoidojen sydänhaitat. Duodecim 2022;138(10):929-37.

6. Kalle Mattila, Pia Vihinen, Tanja Skyttä, Leena Tiainen, Meri-Sisko Vuoristo, Tiia Kettunen, Kristiina Tyynelä-Korhonen, Sanna Iivanainen, Laura Kohtamäki, Siru Mäkelä ja Micaela Hernberg: Ihomelanooman onkologinen hoito päivittyi. Duodecim 2021;137(7):721-8.

7. Pia Vihinen, Kalle Mattila, Siru Mäkelä, Micaela Hernberg ja Jussi Koivunen: Immuno-onkologisten lääkkeiden käyttö, haittavaikutukset ja niiden hoito. Duodecim 2019;135(21):2095-103.

FICAN West Molecular tumor board (MTB) – work continues successfully



The increased use of comprehensive genomic profiling has led to a growing need for considering gene panel reports at the FICAN West Molecular Tumor Board (MTB). The aims of the MTB are to identify actionable mutations and associated drugs for selection of treatments and for directing patients to available clinical trials. Diagnoses need to be confirmed and potential germline mutations identified for further genetic testing and for counseling of patients and their family members. During 2023, Fican West MTB has met more frequently than previously at a current rate of about every second week. At these meetings approximately 50 patient cases have been evaluated.

The multidisciplinary MTB team consists of cancer physicians, molecular pathologists, pathologists, clinical geneticists, clinical chemists, molecular biology experts and study nurses. Molecular pathologists interpret the comprehensive genomic profiling reports and present the functional effects of the detected genomic alterations to the MTB. The clinicians and molecular pathologists work together to review the literature on treatment options based on these findings and clinical geneticists consider the heritability of the genetic changes. Study nurses, together with clinicians, attend to the care and needs of the patients who are offered treatment in a clinical trial.

The MTB of FICAN West has worked closely with the FINPROVE MTB to provide treatment in the FINPROVE trial for cancer patients. FINPROVE is a nationwide Finnish Phase II study that aims to facilitate the patients' access to targeted anti-cancer drugs by evaluating the efficacy of these drugs in treating advanced or metastatic cancers with a known molecular profile. FINPROVE started to recruit patients in 2022 in FICAN West and since then several patients from the Turku University Hospital have been treated in the FINPROVE study. MTB plays also an important role in the PROEXMET study launched in 2023: the MTB analyzes the results of the comprehensive genetic profiling of tumor samples collected during the study.

Palliative Care Center moved to a new result group

As of the beginning of 2023, the former health center departments, home hospitals, and the Palliative Care Center of Southwest Finland were moved to a new result group within the result area of Tyks hospital services residing under the Wellbeing Services County of Southwest Finland (Varha). The result group harbors nearly one thousand professional employees in four different service areas (western, central, and eastern service areas and Palliative Care Center). The result group provides hospital care in 27 hospital wards and in the homes of patients through 9 home hospitals across Southwest Finland.

The goal is to provide holistic care to patients, and this puts focus on collaboration among experts like physicians, nurses, physiotherapists, nursing assistants, etc. This serves our population well, especially the aging population which has multiple illnesses. The treatment needs of the senior citizens are better fulfilled, since the level of care is comparable to hospital care, but care is provided in the very surroundings where the patient lives. The task of care coordinators is to guide patients to the appropriate form of care.

Patients with incurable and progressive diseases are treated at the Palliative Care Center. The aims of palliative care are effective management of the patient's symptoms, maintaining quality of life, and supporting the patient's family. The Palliative Care Center guides and directs palliative and end-of-life care in all of southwest Finland and implements complex care as an independent actor, when needed. The center also coordinates palliative care and end-of-life care throughout the Western collaborative area of healthcare and social welfare and participates in the development of palliative care on a national level.

The Palliative Care Center includes the following functions: referral outpatient clinic and consultation team in the Turku University Hospital; ward supporting end-of-life care in the Kaskenlinna Hospital; palliative ward; respiratory unit; and the Karinakoti hospice in Hirvensalo. A home hospital for palliative care operates from the Kaskenlinna Hospital and provides palliative care and end-of-life care for patients who manage living at home.

The head physician of the center is Outi Akrén, who is an oncologist and professor of palliative medicine. She was appointed professor in August 2023. The position is part-time (20%) and temporary, donated by the Moikoinen Cancer Research Foundation and the Southwest Finland Hospice Foundation. Her research, carried out in close collaboration with researchers in Helsinki, focuses on end-of-life care for cancer patients. Dr. Sofia Miinalainen, oncologist, was appointed for five years part-time (20%) as a clinical teacher in the field of palliative medicine in the University of Turku. Dr. Miinalainen, supervised by professor Akrén and adjunct professor Sirkku Jyrkkö, is preparing her dissertation on end-of-life care of patients with pancreatic cancer.



Cancer Center Client Board and Patient Involvement

The year 2023 concluded the fourth year of operation of the Cancer Center Client Board. The board members were cancer patients and relatives within the catchment areas of Tyks, the Satasairaala (Pori), or the Vaasa Central Hospital. As Client Board members, the patients had the opportunity to give input to the development of the Cancer Center and to Varha (the Wellbeing Services Counties of Southwest Finland). Also representative of the Cancer Society of Southwest Finland (LSSY) participated in the activities of the board. Member participation was voluntary.



In 2023, the development targets were:

...of the Cancer Center Client Board

- Evaluation of the redesigned Tyks web pages. The clients' views were obtained regarding the new layout and the readability of the cancer pages.
- Participation in the audit of ERN-Euracan (European Rare Cancers) network. Auditors assessed the experiences of six Client Board members with rare cancers from the viewpoint of patient orientation.
- Preparation for accreditation of Tyks by the OEI (Organization of European Cancer Institutes) network. Discussions were held on the role of Client Board members in connection with self-assessment and auditing in 2024. The development needs identified in the previous audit were reviewed and it was decided that, next, development of psychosocial support will be in focus.

...of the Client Board of the Tyks Main Hospital and the Tyks Vakka-Suomi Hospital in collaboration with Varha

- How should participation and customer experience be developed in Varha? The Client Board members discussed openly the advantages and disadvantages of integrating primary and specialized healthcare services.
- Presentation of Varha's Participation Program. The Client Board members had the opportunity to participate and discuss the brand-new program in a workshop.
- Introduction of Varha's service strategy and open discussions.

At the end of the year, a recruitment project for new members starting in 2024 was kicked off. Some of the members who started in 2019 wanted to continue their participation. The new Client Board consists of 16 members.

Promoting FICAN West clinical and supportive personnel and cancer patient organisations network



Collaboration with the cancer associations in Southwest Finland

Annual joint meetings of FICAN West and the Cancer Society of Southwest Finland (LSSY), Satakunta, and Ostrobothnia Cancer societies are held on the premises of LSSY. The situation and future plans of the associations were discussed at the 2023 meeting. Researchers running a program called Empowering Patient Education (EPE) in the Department of Nursing Science of the University of Turku attended and thoughts about potential research collaboration were exchanged.

Markus Kirjonen, psychologist at the newly opened psychosocial support unit at LSSY, shared the early experiences of the unit at the meeting. The services are free of charge and available to the members of the association. The unit is located on Itäinen Pitkätatu 30, Turku, and it is open on Tuesdays and Thursdays from 4:30 pm to 7:30 pm. Maarit Lehtinen, coordinator of the activities in the Turku area, discussed the SAAVA model for training of volunteers for the care of patients at the end-of-life and the new plans for facilitating home care. Ville Viitanen, CEO of LSSY, guided the attendees through the newly

launched website of the Moikoinen Cancer Research Foundation and the announcements for grants and grant applications. The meeting also discussed, together with professor Helena Leino-Kilpi and Heli Virtanen from the EPE research group, research collaboration in the areas of psychosocial support for cancer patients and professional expertise.

Recognition of efforts to control cancer at Tyks

The cancer associations in southwest Finland award annually recognitions and grants in connection with the Cancer Control Day event. This year, professor Veli-Matti Kähäri was awarded the Osmo Järvi medal. This medal is named after the founding member of the LSSY and a pioneer in the field of cancer control. Table flags were awarded in recognition of contributions to control cancer and Mervi Siekkinen was among the recipients. She is the development manager of FICAN West and received the award in recognition of her work on joint projects and as a liaison of actors in FICAN West.

Professor Jouko Suonpää received the Matti Koivurinta medal, which has been awarded annually since 2001. The volunteer service medal

was awarded jointly by the Cancer Society Associations of Southwest Finland to Marjo Öhrnberg, member of the board and secretary of the local association of the Cancer Society of Southwest Finland in Vakka-Suomi. At the event, the cancer associations gave a total of 159,700 euros in grants for scientific research and education in the fields of cancer and palliative care.

Tyks Cancer Center continued hosting remote physical exercise sessions for cancer patients in co-operation with the Cancer Society

In Finland, the Western Cancer Center region (FICAN West), the Turku University Central Hospital (Tyks) Cancer Center and the Cancer Society of Southwest Finland launched a project in early 2021 to provide cancer patients with exercise guidance through a remote, web-based platform. In the fall of 2021, a model was designed for how to best organise remote training sessions, which subsequently have been organised within the entire region of FICAN West. During 2022, co-operation among remote physical exercise sessions was further expanded by the Cancer Society of Finland. The goal was to provide all cancer patients in Finland with an opportunity to exercise safely at

home via remote technology. The goal of the remote exercise sessions was to encourage cancer patients to pursue physical activity and to exercise in a versatile fashion during and after cancer treatments and to help them get peer support. The purpose was to encourage cancer patients – by participating through a web-based learning platform – to attain and maintain the level of exercise recommended by international experts.

Remote physical exercise sessions consist of muscle strength training, lymphatic exercises, Fascia-Method, relaxation and exercise in Swedish. Each training session has a duration between 20 and 45 minutes. Videos of the 2023 physical activity sessions were also made and recorded on the Youtube channel of the Cancer Society of Southwest Finland, where they are available to everyone at no charge. During 2023, the responsibility for organising the exercise sessions was transferred to the Cancer Society of Finland. Tyks Cancer Center will continue to provide expert assistance when needed.

Weight Management Path event in collaboration with the Cancer Society of Southwest Finland (LSSY)

The event took place during the European Cancer Week, which is an



annual campaign held from May 25 to May 31. The Association of European Cancer Leagues (ECL) organizes the campaign. The goal is to share information about cancer prevention and treatment access and to provide support to patients who have survived cancer. Here in western Finland, we organized an exhibition on the premises of the Cancer Society of Southwest Finland (LSSY), where visitors could explore the weight management path. Along the path, there were presentations and booths which highlighted the benefits of weight management, exercise, and a healthy diet. Participants could also have their body composition measured and their fitness checked. The event was a success – it attracted more participants than the venue could accommodate. The Cancer Society of Southwest Finland (LSSY) posted on Instagram: “We had a fantastic

day yesterday! Nearly four hundred visitors attended the Weight Management Path event! A big thanks to everyone...” Next time, the event will extend outdoors.

Information desk of the Cancer Society of Southwest Finland

The information desk of the Cancer Society for cancer patients is situated on the first floor of the Tyks T hospital in the lobby between the cancer clinic and the radiotherapy clinic. It provides

- time to discuss with a health-care professional,
- emotional support,
- information on Cancer Society activities,
- information on rehabilitation,
- information on the availability of peer support

During 2023 the information desk has been open by professionals and volunteers from the Cancer Society of Southwest Finland who were there to respond to questions on rehabilitation in general as follows:

- The nurse of the Society was available on Wednesdays from 9 to 12 AM. Betjäning även på svenska. Service also in english.
- The expert on family work of the Society was available on Thursdays from 12 to 2 PM. The expert provides information specifically on services directed to families and on activities for adults.

PAINONHALLINNAN POLKU -ILTA

AIKA	OHJELMA	PAIKKA
17.10-17.25	Turun Urheiluliiton Vanhojen voimistelijoiden esitys	1. Aivisto 1 & 2
17.30-18.00	Tanssi-liiketerapiatreeni	7. Pitkäsaari
18.00-18.45	Kari Ahlman: Terveellinen ruokavalio	1. Aivisto 1 & 2
18.45-19.15	FasciaMethod-treeni	7. Pitkäsaari
19.15-20.00	Kiika Elomaa: Liikunnan merkitys painonhallinnassa	1. Aivisto 1 & 2

NON-STOPPINA TAPAHTUMAN AJAN

Opastettu kuntosalitreeni
Vastuskuminauhatreeni
Puristusvoimamittaus
Kehonkoostumusmittaus
Liikunta- ja toimintakykylaboratorion esittelypiste
Lounais-Suomen Syöpäyhdistyksen esittelypiste
Turun kaupungin liikuntapalvelujen esittelypiste
Roberts Berrien maistiaispaiste
Raisioin maistiaispaiste
Meri-Karinen ravintolan maistiaispaiste

8. Heikin Piha
8. Heikin Piha
8. Heikin Piha
8. Heikin Piha
4. Pikkupeukama
8. Heikin Piha
2. Niityla
5. Pääla
3. Pääla
5. Aula
6. Ruokasali

Palautekyselyn palautus- ja arviointipaiste löytyy Niitylausta!

- Volunteers from the volunteer group ETUSET which handles questions related to prostate cancer were available on Tuesdays from 9 to 12 AM.
- Peer support person was available on Thursday from 9 to 12 AM.

At that time, when nobody is available in the information desk, it is possible for clients and patients to have some information via TV screens and brochures and take with information leaflets of Cancer Society activities.

Launch of a network of professionals supporting young adults with cancer

A network of professionals supporting young adults with cancer was launched by the Tyks Cancer Center. The planning work involved professionals from the Tyks Cancer Center and the Cancer Society of Southwest Finland (LSSY). The network is a multidisciplinary team that collaborates within the Tyks Hospital Services area, FICAN West, and the Cancer Society of Southwest Finland (LSSY). The objectives of the network include:

- Developing and streamlining the treatment and care pathway for young cancer patients
- Recognizing and addressing the needs of the close relatives involved in the care pathway
- Organizing training sessions
- Sharing information
- Compiling and, if necessary, editing guidelines for professionals and young adults
- Organizing and facilitating peer meetings for young adults
- National collaboration with the Finnish Cancer Institute (FICAN)

The network is designed to meet more frequently initially, about every 1–2 months, and later less frequently, maybe every 4–6 months. Participation in the network

provides professionals with the opportunity to observe and to influence matters related to young adults and to contribute to the network of experts in terms of interacting with an innovative team with whom the activities can be developed and thoughts shared. Launch of the network is expected to take place in 2024.

Educational events

Cancer Nursing Network afternoons

The network organises networking events, training sessions, and workshops and distributes science-based information electronically. Operations are constantly being developed to respond to the needs of the healthcare staff. Organisationally, the cooperation between patient organisations and the Cancer Nursing Network involves collaboration among three hospitals: the Tyks Hospital and the central hospitals of Pori and Vaasa. In 2023, two cancer nursing network afternoons were organised. The first one was on radiotherapy. The aim of the first event was to increase participants' knowledge about radiotherapy for cancer patients. The afternoon provided information on radiotherapy and its side effects, patient counselling and pain management. The second session was an introduction to the care of elderly cancer patients. The aim of the event was to raise awareness about the care of elderly cancer patients. The session covered the oncogeriatric practice at Tyks and the role of the nurse, identifying the risk of malnutrition in elderly patients, care and support of the elderly patient. The training afternoons were very popular and were attended by 50 professionals. According to the feedback the training session corresponded very well to

the expectations and provided the audience with new information and new ways to look at cancer nursing. The network of cancer nursing is active, and a future goal is to organise trainings and other events for the network.

The second seminar for nursing managers and clinical specialists on nursing research in clinical practice

One of the goals of the competence assurance efforts of FICAN West is shared knowledge about evidence-based practices. Here, we learned about the research on how research may be made useful in practice. The presentation focused on the new Research Lighthouse concept and on research utilization viewed from a national perspective and from the perspective of various professional groups.

The event included an update, presented by Dr. Heidi Parisod from the Nursing Research Foundation (Hokus), on the state of implementation of evidence-based nursing in Finland. The views and positive research attitudes of healthcare professionals were presented by Tuula Mattila and Heini Myllyoja, both Master's students who also presented their own results documented in their pro gradu theses. Dr. Outi Tuominen (Tyks) presented the Research Lighthouse initiative and Dr. Laura Laukkanen presented excerpts from her thesis on the ethical activities of nursing leaders and on the support for these activities within the organization. Research shows that evidence-based practices do not enjoy a very high level of activity. A suggestion was put forward that the next training event should address evidence-based practices in the context of ordinary, daily life nursing – practices that are constantly present, albeit covertly.

Selected highlights in psychosocial and rehabilitation support projects



Psychosocial support and rehabilitation support for cancer patients

In 2023, the following measures were taken to implement the program of Psychosocial and rehabilitation support 2021–2023: 1) launching of the Survivorship Care Plan project into practice 2) taking part of new projects for children, young people, and young adults after cancer 3) working as a mentor for rehabilitation development projects for the professionals during their studies at Tyks Cancer Centre 4) ensuring competence by organizing two educational events: Symposias on how to draft Survivorship Care Plans and how to support exercise. 5) continuing integration of exercise into the daily lives of cancer patients (see co-operation with the Cancer Society) page 22) drafting an application for a EU project coordinated by the Turku University of Applied Sciences (Melody – project of rehabilitation competence) and waiting for acceptance.

Rehabilitation plan (Survivorship Care Plan) – from project to permanent tool for health care professional

The vision of the Survivorship Care Plan project is to construct a rehabilitation plan for each and every cancer patient in collaboration with the patient. The project aimed at increasing the awareness of rehabilitation among the healthcare personnel treating cancer patients and at promoting interdisciplinary collaboration in the field of rehabilitation and support services. This was achieved through interdisciplinary training sessions and by provision of unified guidelines. During the project, a standardized form was drafted to assess rehabilitation needs. A goal was to produce uniform rehabilitation guidelines and services for every unit in the region treating cancer patients.

The project was launched in the fall of 2022 with a benchmarking visit to the Rehabilitation Unit of the

Skåne University Hospital in Lund, Sweden. At the start of the project, a literature review and an analysis of the current state and development needs of the Tyks Rehabilitation Plan were conducted. In early 2023, the project adapted four key measures: a) planning how to evaluate to the need for rehabilitation support and implementing rehabilitation, b) standardizing documentation, c) describing the levels of rehabilitation support and creating a referral-feedback system (Rehabilitation PYRAMID), and d) organizing targeted and national training. After completion of the project, implementation began under the auspices of “agent pairs of evolution”. The responsibility for developing rehabilitation further will be turned over to a Rehabilitation Working Group, which convenes monthly. The number of participants in the working group will gradually increase and include members from Professional Services of the Varha organization. The needs of children,

young adults, and adolescents will be taken into account.

The project team included Development Manager Mervi Siekkinen (FICAN West), Director Pia Vihtinen (FICAN West), Result Group Manager Sirkku Jyrkkiö (Tyks/T41), Area Manager Annika Ålgars (Tyks/T41 Oncology and Radiotherapy), Administrative planner Maijastina Rekunen, Administrative planner Marianne Himberg (both FICAN West), and Chief Physician Outi Akren (Tyks/Palliative Center).

New projects to support rehabilitation of children, young people, and young adults with cancer

The first development project of FICAN West was the STEP project: Selviytyjien Terveys ja Elämänlaatu Paremmaksi – Improving Survivors' Health and Quality of Life. The project is still going strong and has even spawned two follow-up projects: one for improving assessment of the functional capacity of children and young people after cancer, and the other for developing a service path for young adults with cancer.

STEP is a long-term follow-up system for children and young people who have had cancer. The system became operational in 2015 within the Tyks special responsibility area as one of the demonstration projects of FICAN West. It has been included in the draft strategy of FICAN in an effort to maintain the system and to create a similar operative model at the national level.

The working title for the national follow-up project is Psychosocial and physical rehabilitation service path for children, young people,

and young adults after cancer. The service path will now also include young adults who have had cancer. In addition to identifying physical late effects, the goal is to develop psychosocial support models. Central to this will be to organize psychosocial support processes, regardless of the risk level for physical late effects of the survivor. Effectiveness and equality of the support processes are sought by effectively using digital techniques, which are crucial resources especially for survivors who, based on their treatments, cannot be referred to any group with a high risk for late effects and who thus may not need visits to the cancer center nor face-to-face meetings with the coordinating nurse at the cancer center.

Adjunct professor Päivi Lähdenmäki (Tyks) and project coordinator Anna-Elina Rahikainen (FICAN South).

FICAN West
LÄNTINEN SYÖPÄKESKUS

FICAN South
ETELÄINEN SYÖPÄKESKUS

Project of psychosocial support for young people when a parent has been diagnosed with cancer

When someone in a family is diagnosed with cancer, it touches every member of the family in some way. Young people strive to survive independently despite their parent's cancer, but anxiety about the parent's survival and future is present. Young people are at a particularly vulnerable age, when traumatic experiences can have a delayed impact

on psychological development, even years later.

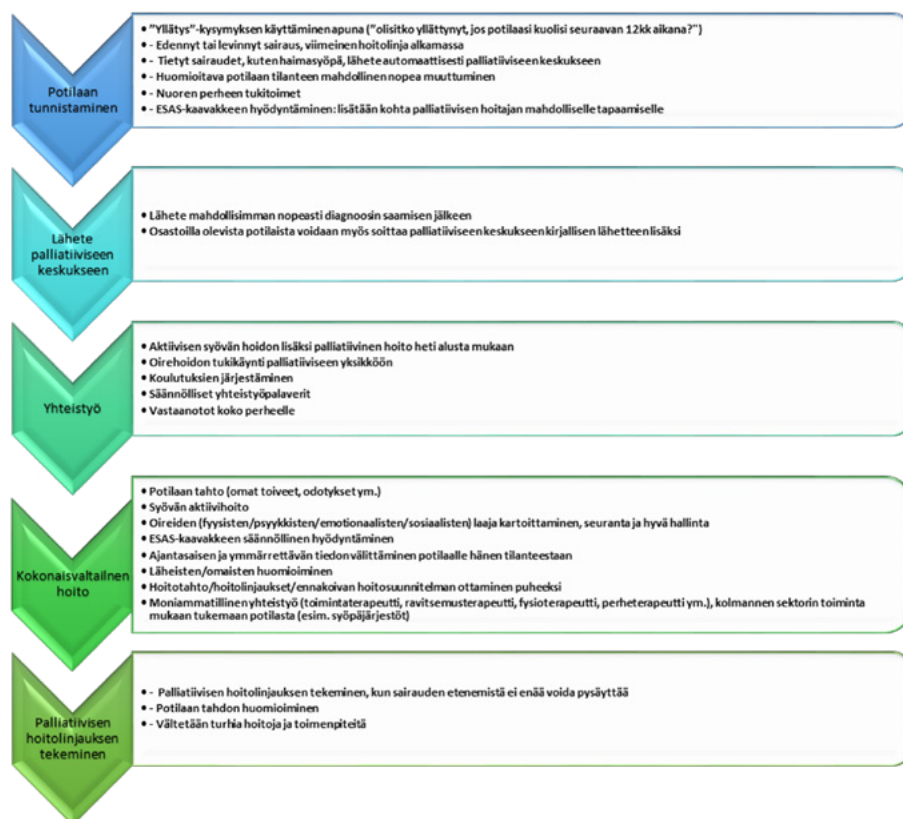
The need for this development project was based on the need identified by Turku University Hospital's Cancer Outpatient Clinic to develop psychosocial support for young people when a parent is diagnosed with cancer. The aim of the development project was to create an information pack for young people who had a parent with cancer. The methods used to develop the information pack were a literature review and a Flinga workshop for young people. The aim of the workshop was to identify the psychosocial support needs of young people who had a parent with cancer and find the ways how to respond to the needs. The information pack was piloted at a family course offered by the Cancer Society of South-West Finland and published on the "Good question" website, which is produced by the Family Federation of Finland.

Having a parent with cancer can be a difficult psychological experience for a young person. The information package developed in this development project is one way of responding to the psychosocial support needs of young people when a parent has cancer. Research shows that psychosocial support for loved ones has a major impact on the well-being of both the person with cancer and their loved ones.

Satu Helminen
Master's thesis,
Applied Sciences of Turku

Psychosocial support on cancer patients transition to palliative care with anticancer treatment cessation

Cancer is a significant mental burden on the patient. Progression of the disease and the transition to palliative care, when curative care no longer exists, is particularly stressful for the patient. The goal of palliative care is to alleviate patient's symptoms and suffering and to promote quality of life. As part of it, psychosocial support helps the patient cope with the challenges caused by the illness by aiming at to reduce mental burden. The aim of this study was to describe cancer patients psychosocial support provided by healthcare professionals during the first two months after patients transition to palliative care. The aim was also to describe the development targets of cancer patients psychosocial support identified by health care professionals during that time. The data for this descriptive qualitative study was collected in one Finnish university hospital as focus group interviews between December 2022 and January 2023. Healthcare professionals working with cancer patients at the time they are informed of their transition to the palliative care and/or within two months of receiving such information were selected using purposive sampling principles. Psychosocial support provided by health care professionals extended for different areas of the patient's life, such as support for functions that make everyday life easier and support for the implementation of resources related to the support network. The quality of psychosocial support was described as necessary, individual, challenging and insufficient, among other things. Psychosocial support after transition to palliative care became more holistic than earlier on patient's path. It also changed in terms of content. Health care professionals identified several targets



and suggestions for developing psychosocial support in health care. According to these results, targets for development include, for example, the development of the patient's treatment pathway, the development of cooperation related to psychosocial support and the development of methods related to psychosocial support. As a conclusion, health care professionals provide diverse kind of support after the patient has transitioned to palliative care. The quality of psychosocial support was described with both positive and negative adjectives. In addition, the study participants described several different development targets and suggestions for psychosocial support, which can be used to develop cancer patients psychosocial support in health care. There is a need for further research of the topic.

Veera Kulmala
Master's thesis 2023,
Nursing Science University of Turku

Project of early palliative care model for adult cancer patients

This development project constitutes a thesis published in 2023 in collaboration with the Turku University of Applied Sciences, the Turku University Hospital, and FI-CAN West. The project aimed to promote the integration of early palliative care by enhancing collaboration and expertise within specialized healthcare for cancer patients. The goal was to identify drawbacks in the current state of early palliative care and to find ways of improvement while increasing the awareness of healthcare professionals on the need for integration with early palliative care. The project included a research component on the views of the multidisciplinary staff of the palliative center concerning the current state of early palliative care for cancer patients. The method was thematic interviews and the setting a university hospital. The results were discussed in workshops which produced valuable data for

the thesis. The workshops yielded an early palliative care model (Figure 1) and an implementation plan to be followed by multidisciplinary teams. The model was applied clinically in the hematology and stem cell transplant unit and in the units treating adult lung cancer patients and patients with other forms of cancer. The model and implementation plan aim to facilitate the integration of palliative care into the cancer patient's overall care at an optimal time. The idea is that this approach will lower the threshold for introducing palliative care to patients and enable them to have the best possible quality of life for their remaining lifetime.

Piritta Lehtonen
Master's thesis 2023,
Applied Sciences of Turku

Educational events:

Cancer patient rehabilitation – collaboration at every stage of patient care

The training took place on September 15, 2023, in collaboration with experts from the Rehabilitation Unit of the Skåne University Hospital in Lund. This event served as the final seminar of the Survivorship Care Plan project with more than one hundred healthcare professionals participating in hybrid format. The seminar presented models on best implementation of rehabilitation and included workshops to generate ideas for further development. Chaired by Sirkku Jyrkkö (Tyks) and Pia Dellson (Lund), the event was bilingual with lectures mainly in English and workshops in both Finnish and English.

The themes of the workshop were: What is a Rehabilitation Team? How should the need for rehabilitation be assessed? How should a patient's personalized rehabilitation plan be

documented? There was consensus on the need for a team, for an assessment form, and for standardized documentation. Efforts to improve and develop rehabilitation will continue in the rehabilitation team of FICAN West. Those interested in participating in the development are free to contact mervi.siekkinen@varha.fi. Feedback on how we succeeded in carrying out the training day, conducted in two languages, is also most welcome.

The take-home messages from the lectures and workshops were:

- Carry out a structured inquiry for patients on their rehabilitation needs.
- Plan implementation together with the patient.
- Find out where you can refer the patient to for individual support in areas like exercise, nutrition, mental health, finances, and sexuality.

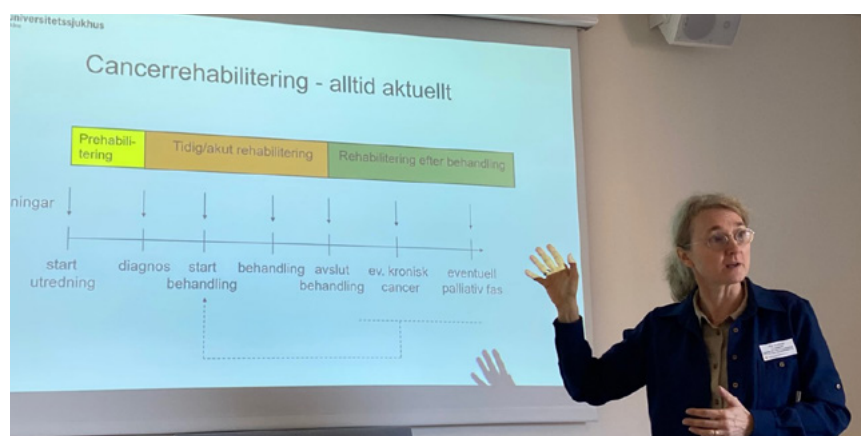
Bringing up the question of exercise for treating cancer patients

During the European Week Against Cancer, FICAN West also organized a training event entitled Broaching exercise in the treatment of cancer patients. The training generated interest on a national level, and there were participants across all of Finland. Most participants interacted remotely online at this hybrid training event.

The event included a presentation by an oncologist on the benefits of exercise for cancer patients; presentations by representatives of the Cancer Society and regional and local cancer associations about exercise as a form of rehabilitation and about exercise guidance by remote communication; a presentation by a physiotherapist on the association between lymphedema and exercise; a presentation by a Master's student on the current state of exercise counseling; and a presentation on the experiences gained from an ongoing intervention study on the effects of exercise among patients who have undergone cancer treatment. A model for broaching exercise to these patients was also presented. The model has been developed as a collaborative effort of rehabilitation experts in FICAN West and the Cancer Society. A PDF version of the model is available here:

<https://frantic.s3.eu-west-1.amazonaws.com/syopa-jarjestot/Puhu-liikunnasta-syopaan-sairastuneen-kanssa.pdf> and a YouTube video here: <https://www.youtube.com/watch?v=VCmKL4bKL-g>

Feel free to initiate discussions about exercise at a low threshold and use the model (PDF guide) in your workplace.



Highlights of digital development projects



Digital pathway to support the information needs of cancer patients

Since 2019, the patients of the Tyks cancer clinic have been offered an electronic service channel – a digital treatment path built on the Health village platform. By using the electronic service channel the patient can contact the hospital personnel and vice versa. The service channel contains information on cancer, rehabilitation, support services, and coping with cancer.

The nursing personnel may use the electronic service channel for individualising patient education. The service channel may also be used by the patient for reporting symptoms. An example: the symptoms and wellbeing of patients on

immuno-oncological treatments are followed up during treatments through weekly symptom surveys entered into the system by the patient. The goal is for the patients and the personnel at Tyks to find the digital service channel easy to use, helpful, and uniform for the different cancer types.

In 2023, the use of the digital treatment path for cancer patients increased further. The Tyks Cancer Center and the different clinics at Tyks that treat cancer patients collaborated in an effort to check and unify the instructional content of the digital treatment path. Implementation of a patient pilot for the digital care pathway was planned for 2023 to be used by patients with gynaecological cancer, prostate cancer, and bowel cancer. Due staff

shortage and organisational changes the pilot has been postponed and is to be launched in 2024.

In 2023, the data collected from the digital care pathway were made available in a data pool. In the future, the data pool can be used, for example, for managing dashboards. Future plans will routinely evaluate using the data in the data pool. During 2023, automation of the digital care pathway was also developed, and a robot that opens the patient's digital care pathway was implemented in the cancer clinic's digital care pathway in August 2023. The robot will automatically provide each patient of the cancer clinic with a digital care pathway.

In 2022, a pilot project was launched alongside the cancer



patient treatment path: an electronic service which the patient herself can use for booking appointments with the breast cancer nurse. The pilot was launched in the oncology clinic in late 2022. During the pilot, the usability and functionality of the system will be surveyed by patient inquiries and feed back will be collected. In 2023, the pilot continued and the usability survey was continued. In 2024, the results of the usability survey will be available. Based on the results and experience, a decision will be made on the future of the electronic appointment system.

In 2022, a multiprofessional team ventured on planning a pilot project for following up the quality of life of cancer patients. This pilot is planned to start in 2023 and it will assess and follow up systematically the quality of life of cancer patients. The pilot had to be postponed due to staff shortages and organisational changes. The plan is to launch the pilot in 2024. The functionality of the digital treatment path as a follow-up tool will also be assessed.

Tyks Cancer Center participates 2023–2026 in the DigiCanTrain project: Digital Skills Training for Oncology Healthcare Professionals

Cancer is one of the most common diseases in Europe. Correct and appropriate use of eHealth technology can be a useful tool for facilitating a dialogue among health care professionals (HCPs) and for health care to aid people affected by cancer to meet their need for care and better health. Digital technology is an inevitable and essential part of future healthcare in Europe. Despite the current use of e-technology and despite its positive effects and its potential, most health professionals feel insufficiently trained to deal with the digital revolution.

The project aims at up-skilling and re-skilling the health care workforce regarding cancer care. This will support the development of effective, person-centered health care, digital cancer care services, and the use of contemporary eHealth technology by HCPs.

The project also contributes to shaping the lifelong learning dimension in higher education (EQF levels 6–8) by integrating micro-credentials to accompany ECTS and CME credit systems. The purpose of the project is to design, pilot, and evaluate the DigiCanTrain education and training programme for trainers, clinical HCPs, and non-clinical HCPs. The ultimate goal is to improve access to continuing professional education and to increase digital skills and the use of eHealth technology of clinical and non-clinical HCPs working and interacting with people affected by cancer.

The project is carried out by the following partners: Turku University of Applied Sciences, Finnish Institute of Health and Welfare (THL), University of Turku, European Oncology Nursing Society, European Cancer Organisation, University of Galway, Tallinn Health Care College, Turku University Hospital, Wellbeing Services County of Southwest Finland (Varha), Institute Oncologic “Prof. Dr. Ion Chiricuta” Cluj-Napoca, Universitat Oberta de Catalunya, National & Kapodistrian University of Athens, Catalan Institute of Oncology, National Cancer Control Programme Ireland, Cancer Society of Finland CSF, Health Campus Turku and FI-CANWest.

The project is funded by: EU4Health programme.

Research



Tyks Cancer Centre and FICAN West Research Cluster

Cancer research at FICAN West encompasses the University hospital of Turku (Tyks) at Wellbeing Services County of Southwest Finland, the Central Hospital of Pori (Sata-sairaala) at Wellbeing Services County of Satakunta, the Central Hospital of Vaasa at Wellbeing Services County of Ostrobothnia, and the cancer research at the University of Turku. The aim of FICAN West is to bring together and support basic and clinical cancer research.

Both academic laboratory research as well as investigator-initiated and industry-based clinical trials are run at FICAN West. The FICAN West cancer centre research laboratory is located at Medisiina D building since 2018, and it is dedicated for basic cancer research of approximately 14 research groups and 65 laboratory researchers. In total, FICAN West cancer research network includes about 33 research groups and nearly 200 scientists working full-time in translational and basic

research in the campus area. On the hospital side over hundred physicians are dedicated to the treatment of cancer patients and about half of them are actively involved in clinical trials.

The estimated annual research budget in 2023 for Tyks Cancer Centre clinical research was ca. 2.3 mil €, where the portion of Finnish state research funding was 0.5 mil €. For translational and basic research, the estimated annual research budget in 2023 was ca. 9.5 mil €. For translational and basic research, 40% of the funding is provided by national public organizations and 60% by national private sources, EU, other international sources and by commercial co-operation organizations. In 2023 more than 210 cancer associated articles were published in international peer review journals by the clinical divisions and translational and basic research in FICAN West.

Clinical trials are pursued at several hospital divisions. The clinical cancer trial unit (FICAN West CTU) runs studies for the Departments of oncology and radiotherapy, gynecologic oncology and lung cancer as well as urology. The division

employs 6 study nurses and 2 study coordinators. The stem cell transplantation unit employs 3 study nurses and department of urology 3 study nurses. The clinical trial division has trial dedicated physician (medical oncologist) allocated for clinical trials. A number of physicians across the departments as well as central hospitals in Pori and Vaasa take part in the trials as principal or subinvestigators. Clinical trials that are recruiting are listed on the website (www.ficanwest.fi).

The Tyks Cancer Centre is a member of the Nordic Network for Early Clinical Trials (NECT). We have research collaboration with the Department of Nursing Science at University of Turku which is highly ranked. FICAN West research activity and strategy are discussed in the common boards of the Tyks Cancer Centre and of FICAN West. The Scientific Cancer Board includes senior members from all cancer related Tyks divisions, and Pori and Vaasa Central Hospitals, as well as scientists pursuing cancer research at diverse departments of the University of Turku. The science and research strategy of the Tyks Cancer Centre and FICAN West is described below.

Western Finland Cancer Centre (FICAN West): science and research strategy 2023–2025

The strategy for 2023–2025 is a part of the strategic planning of the future of the entire FICAN West. It is aimed at securing effective and high-quality treatment, research and training in the field of oncology for the population in the catchment area.

Vision

FICAN West and its Scientific Cancer Board coordinate the cancer research in the FICAN West region and guarantee uninterrupted funding of high-quality cancer research. They secure rapid and effective adaptation of scientific research results into practice and innovations. FICAN West also unifies and develops collaboration in the field of education.

Values

FICAN West operates by the following values:

- Values of the science and research strategy of the Turku University Hospital (Tyks): ethical, critical, patient/client centered and clinically and socially efficient.
- Strategic values of the University of Turku: ethical, critical, creative, open-minded and societal.
- Strategic values of the FICAN West: patient oriented, equal admission to treatment and high-quality care, innovative and capable personnel, high-quality scientific research and comprehensive, innovative and international collaboration networks.

Strategic goals

The strategic goals of the FICAN West Cancer Centre overlap with those of the research activities of the working environment.

1) High-quality scientific research

- supports the strongholds of the working environment: 1) drug development and diagnostics, 2) bioimaging, 3) research into the molecular biology, genetics and immunology of cancer and 4) clinical drug and stem cell trials
- has established functional structures and sufficient material and human resources
- funding is secured and has an established financial strategy which covers the topics and areas needing financing – public financing, foundations, international funding and research collaboration agreements
- has access to vast patient registry data and biobank material
- guaranteed by up-to-date assessment and follow-up of clinical research

2) Improving research effectivity through networking

- functions as the central coordinating unit and integrates cancer research within the FICAN West research environment
- guarantees that research collaboration with the projects undertaken by the Health Campus of Turku functions smoothly and effectively across administrative borders and between universities, faculties and hospital districts
- guarantees that the infrastructure related to cancer research (e.g., Auria Biobank and the

Turku Clinical Research Center) functions well

- guarantees smooth cooperation with the functions of the biotechnology business cluster within the region
- takes place with companies only through the FICAN research center (one-stop-shop principle)
- guarantees continuity of research through training, clinical scientists' positions and recruitment

3) Promoting application of new information

- Promotes, within its working environment, the transfer of information on cancer research outcomes from basic research to the clinic by communicating and by arranging joint meetings
- manages the introduction of new procedures and quality assessments in the domains of cancer prevention, diagnostics, treatment and rehabilitation, new drug treatments, new diagnostic methods, psychosocial support and patient instruction
- strengthens the knowhow of the personnel and promotes a research-oriented atmosphere
- guarantees patient involvement and adherence to research and development projects

4) Promoting innovation

- supports collaboration with the Health Campus of Turku and with its innovation ecosystem platforms

- is strengthened by collaboration with companies and relies on the thematic entity of drug development and diagnostics within the University of Turku

5) Making a national and international impact

- on the national level, this is done through collaboration within the entire FICAN (national and regional cancer centers)
- collaboration is pursued with cancer organizations and patient organizations

- acts as a member of the European cancer network OEIC (Organization of European Cancer Institutes), the European reference network on rare adult cancers (ERN EURACAN) and the European reference network on pediatric oncology (ERN PAEDCAN)
- extensive activity (e.g., memberships and specialist assignments) within national and international research teams and teams working to improve and develop cancer treatment

6) Promoting assessment of research effectiveness

- the research strategy is assessed as a part of the overriding science and research strategy, center-of-excellence-strategy and accreditation by the OEIC

7) Dissemination of research information

- consists of national and international activity and is part of the overriding strategy of the FICAN
- is presented in plain language for stakeholders and interest groups

Key indicators 2023



212

Total number of journal publications produced across divisions and basic research.



33

Number of cancer research groups in basic and translational research



4

Academic projects funded by EU



39

Number of publications with impact factor (IF) > 10



€ 11.9 million

Estimate of total research budget



1

Academic project with other international funding



14

Number of publications with IF > 20



65

Academic projects with national private funding



26

PhDs



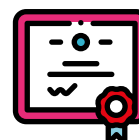
97

Number of clinical drug trials



48

Academic projects with national public funding



7

Disclosures of invention

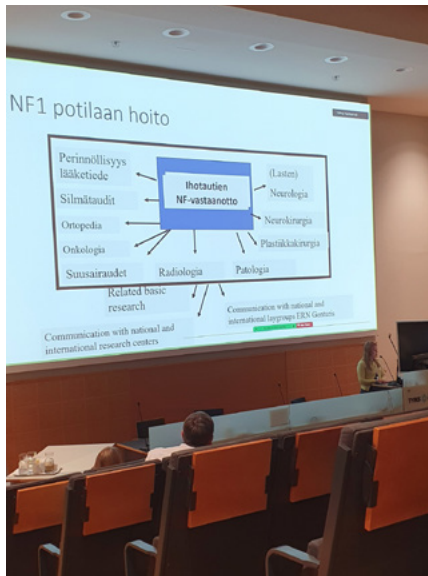


282

Number of all clinical studies

Promoting FICAN West Research Network

The environment for pursuing advanced cancer research is excellent. With more than one hundred biotechnology companies, with the first biobank in Finland (Auria), with the nationally leading center of nursing science and with profiling research projects of the Research Council of Finland (Academy of Finland), cancer research is targeted for success.



FICAN West collaboration with Turku Cancer Research Society

FICAN West has been partnering with Turku Cancer Research Society (TCRS) since 2018 to arrange scientific program for academic and clinical cancer researchers. Monthly Cancer Research Seminars Series have continued until summer 2023. Now the co-operation continues strong in organizing separate seminars and events, including the traditional Christmas Seminar and newly established annual event called FICAN West Science Day. Docent Pilvi Riihilä, MD PhD, started as the new President of TCRS in March 2023. In addition to FICAN West and TCRS, for example BioCity Turku and InFLAMES flagship project organize cancer related seminars as part of their wide activities on the campus.

During the spring 2023, TCRS and FICAN West jointly arranged 3 monthly seminars. The seminars have traditionally had one local presentation on translation-al or clinical research and one on basic research. This year, we also had guest speakers from Oulu University Hospital and University of Tampere. In April 2023, a special seminar was arranged with the topic of Rare disease as a predisposing factor for cancer – Neurofibromatosis. This seminar was of wide interest especially among clinicians as many topics concerned the diagnosis, follow-up and treatment of NF-patients. ERN GENTURIS program in which Tyks is a participant was presented by geneticist docent Maria Haanpää, MD PhD. The number of participants in these hybrid events ranged from 30 to 120 attendees. The 1st FICAN West Science Day, organized on May 9th, gathered more than one hundred local cancer scientists on site to this very successful event. These events were eligible for including in MD and PhD studies.

The traditional Christmas Seminar Event was arranged on-site on December 12th 2023 with 65 registrants. Once again, the traditional Christmas Event was a success with both social activities and fascinating presentations with the theme Microbiota and Cancer.

The PhD Thesis of the Year Award was given to MD Pertti Nurminen for his thesis “Adverse effects of Bacillus Calmette-Guérin (BCG) therapy in the treatment of non-muscle-invasive bladder cancer”. The work was supervised by Associate Professor Peter J. Boström, Department of Urology, Turku University Hospital, and by Adjunct Professor Antti Kaipia, Department of Urology, Tampere University Hospital.

The feedback about these seminars has been exclusively and continuously positive.



Winner of the PhD Thesis of the Year Award Dr. Pertti Nurminen got greetings from TCRS President Pilvi Riihilä.

New mentoring program to support cancer research network

FICAN West initiated a new type of mentoring program to enhance local cancer research and co-operation. Open to researchers at various career stages, whether in clinical, translational, or basic research, the program aims to foster network development, encourage professional growth in cancer care or research, and facilitate concrete local research collaborations, particularly between clinicians and academic researchers at both individual and community levels.

This mentoring initiative is part of the joint research project “Cross-mentoring in the development of network-like research collaboration” by the University of Turku School of Economics and FICAN West, funded by The Finnish Work Environment Fund (<https://sites.utu.fi/ristiinmentorointihanke/>). Distinct from traditional mentor-mentee setups, pairs consist of clinical work experts and academic researchers at similar career stages. Learning revolves around shared topics of interest, providing fresh perspectives and expertise exchange.

From the applications, 11 pairs were matched by organizers, with 10 pairs completing the seven-month program that started in February 2023. Participants represented different career stages from Tyks and the University of Turku. With general guidance, they engaged in one-to-one meetings to discuss topics of mutual interest and related to cancer treatment, diagnostics and

research, in a relaxed and confidential atmosphere. The themes, such as the challenges in interaction, encounters of different work cultures, co-operation and insights to advance common interests, were discussed at general level in the two joint seminars.

Survey results showed 85% of participants found the mentoring program very or extremely useful, with 46% attributing significant benefits to advancing their own research. All respondents would recommend the program to their colleagues. Thirteen participants answered the survey. The cross-mentoring program for cancer researchers will likely become a regular feature in FICAN West’s annual calendar, occurring either annually or biennially.

FICAN West
LÄNTINEN SYÖPÄKESKUS



Työsuojelurahasto
Arbetarskyddsfonden
The Finnish Work Environment Fund

Joint FICAN Seminar Series

One of the main goals in the science and research strategy of FICAN West is improving research effectiveness through networking. This includes supporting collaborations across institutional and administrative borders as well as giving

an input to the scientific training. In 2022, FICAN West, jointly with the other four regional FICAN units started a seminar series, now called FICAN webinars. In 2023, the newly established national FICAN has taken the coordination duty. The seminar series provides an easy-access chance to hear the well-established scientists’ presentations across Finland. The information about the seminars is communicated in all regional FICAN units coordinatedly. This seminar series is arranged completely on-line in Microsoft Teams -platform which is easily accessed also in the hospital environment.

In 2023, each regional FICAN had their turn hosting the webinar and giving one presentation. The presentations were given by Docent Leena Latonen, University of Eastern Finland and FICAN East, by Professor Katri Pylkäs, University of Oulu and FICAN North, by Professor Toni Seppälä, University of Tampere and FICAN Mid, by Professor Sampsa Hautaniemi, University of Helsinki and FICAN South, and by Professor Jukka Westermarck, University of Turku and FICAN West. The presentations can be either from clinical or translational and basic science background but they always show a strong contact surface for patient care or diagnostics. In 2023, the number of participants ranged between 65–140 attendees, while some of the topics were from quite specific fields. The webinar series is continuing this year with one presentation from each regional FICAN.

FICAN
KANSALLINEN SYÖPÄKESKUS
NATIONELLA CANCERCENTRET
FINNISH CANCER CENTER

FICAN East
ITÄINEN SYÖPÄKESKUS

FICAN Mid
SISÄ-SUOMEN SYÖPÄKESKUS

FICAN North
POHJOINEN SYÖPÄKESKUS

FICAN South
ETELÄINEN SYÖPÄKESKUS

FICAN West
LÄNTINEN SYÖPÄKESKUS



FICAN West Science Day - Co-operation in translational cancer research

FICAN West's first "FICAN West Science Day - Co-operation in translational cancer research" event brought together over a hundred local cancer researchers at the new Aurum building of Åbo Akademi and the University of Turku. The event was organized on May 9. The primary goal was to unite cancer experts from the hospital and universities, showcase ongoing cancer research in the region, and provide opportunities for the emergence of new collaborative ideas. Participants included representatives from the University of Turku, Åbo Akademi, Turku University Hospital (Tyks), Auria Biobank, and several companies.

Following the welcome speech by FICAN West's Scientific Director, Professor Panu Jaakkola, the scientific program comprised three

sessions: "Targeting Cancer Vulnerabilities," "Molecular Tumor Profiling," and "Translational Immunology." Presentations covered topics such as treatment strategies for residual disease, the development of diagnostic tests, immunological treatments in clinical trials, and successful collaboration effort related to systematic prostate cancer sample collection. Two keynote speakers were invited: Dr. Bruno Sainz from Instituto Ramón y Cajal de Investigación Sanitaria (IRYCIS), Instituto de Investigaciones Biomédicas Alberto Sols CSIC-UAM, from Spain, and Professor Satu Mustjoki from the University of Helsinki and Helsinki University Hospital (HUS).

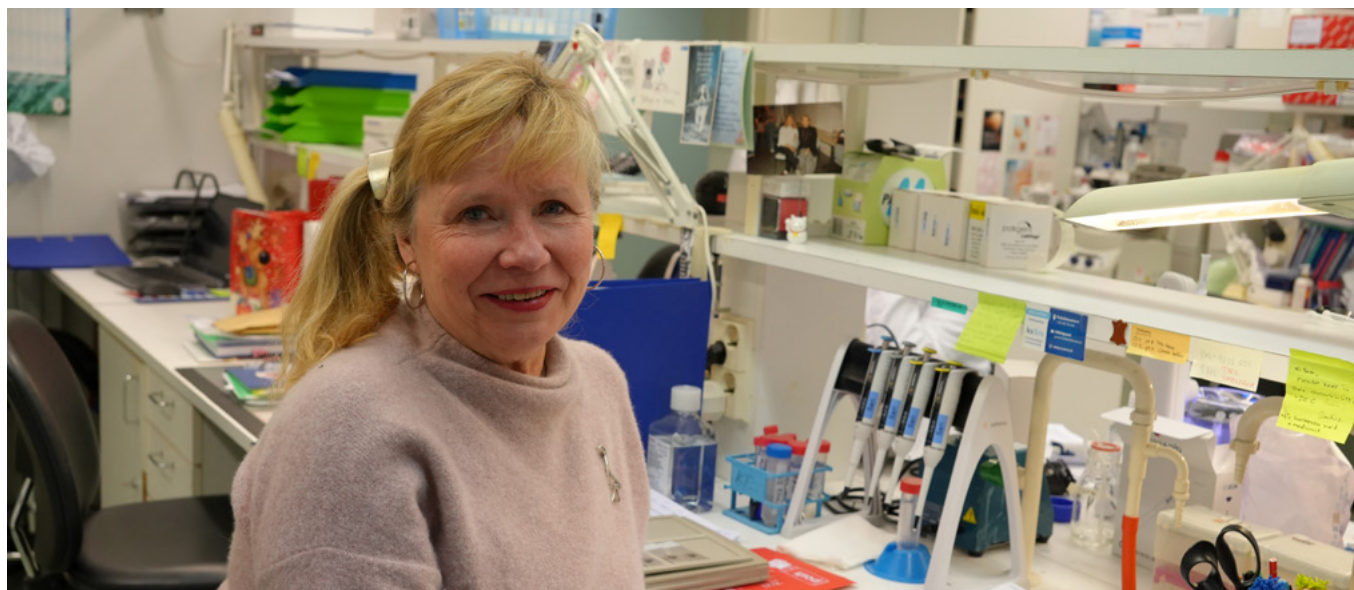
In between the scientific sessions, a brief development activity took place, where participants were asked to anonymously list on paper three small or large factors hindering research and their own ideas for resolving them. The results will help

FICAN West to identify further development needs. The day concluded with a relaxed social gathering over good food.

Participation in the event earned study points for PhD students at the University of Turku and for various fields in medical specialist training. The event was organized in collaboration with Turku Cancer Research Society (TCRS), and funding for inviting external speakers was provided by the PGE unit of the Faculty of Medicine at the University of Turku.

The excellent feedback received during the event and through the questionnaire proves the great success of the event. We aim to establish "FICAN West Science Day" as a recognized annual event with this concept that is focused on collaborative cancer research with esteemed guest speakers and otherwise a local twist.

Highlights in basic and translational research activities



Cancer: the solution is in immunity

The InFLAMES Research Flagship, a joint organisation of the University of Turku and Åbo Akademi University, has several research groups that focus on different aspects of cancer and thus belong to FICAN West research network. Panu Jaakkola, the Scientific Director of FICAN West, is affiliated with InFLAMES. The research topics within InFLAMES cover a wide spectrum from basic research to clinical trials, patient care, health economics and ethics. New cancer diagnostics and drug development, particularly those concentrating on the immune system, immunological parameters and tools, are central to the mission of InFLAMES. As an example, the CLEVER-1 molecule originally discovered by InFLAMES researchers is now a target in clinical trials for several solid tumours and myeloid leukaemias. Bexmarilimab, a humanised antibody against CLEVER-1, is well tolerated, and disease control rates of 25%–40% are observed in cutaneous melanoma, gastric, hepatocellular, oestrogen

receptor-positive breast and biliary tract cancers. In addition, Figueiredo and his collaborators demonstrated that lipid metabolism contributes to immune responses in uveal melanoma, a finding that may have implications for therapeutic innovation in uveal melanoma.

InFLAMES has an extensive ecosystem, including several organisations, such as Turku Bioscience Centre, Turku PET Centre, Structural Bioinformatics Laboratory, Turku Centre for Disease Modelling, Turku Bioimaging, Drug Discovery Platform, Central Animal Facility and Auria Biobank, as well as several startups and big pharma companies.

InFLAMES offers top-level expertise in a multitude of modern methods utilizing the most advanced technology and other infrastructure, disease models and clinical issues.

<https://inflames.utu.fi/>

Director of InFLAMES Flagship:
Academician Sirpa Jalkanen, MD, PhD, University of Turku

Publications:

Viitala Miro, PhD Thesis 2023.

“Re-educating Macrophages to Activate Antitumor Immunity – One Clever Immunotherapy”,

Rannikko JH, Verlingue L, de Miguel M, Pasanen A, Robbrecht D, Skytta T, Iivanainen S, Shetty S, Ma YT, Graham DM, Arora SP, Jaakkola P, Yap C, Xiang Y, Mandelin J, Karvonen MK, Jalkanen J, Karaman S, Koivunen JP, Minchom A, Hollmén M*, Bono P*. Bexmarilimab-induced macrophage activation leads to treatment benefit in solid tumors: The phase I/II first-in-human MATINS trial. *Cell Rep Med.* 2023, 4:101307. (*correspondence)

Matareed M, Maranou E, Koskela SA, Mehmood A, Kalirai H, Coupland SE, Figueiredo CR. Novel prognostication biomarker adipophilin reveals a metabolic shift in uveal melanoma and new therapeutic opportunities. *J Pathol.* 2023, 260:203–221.



Drug repurposing approach and novel diagnostics for B cell lymphomas

Diffuse large B cell lymphomas (DL-BCLs) are the most common type of aggressive lymphomas worldwide, with ~600 yearly diagnoses in Finland. The disease subtypes have vast molecular and clinical heterogeneity which results in varying treatment responses and survival rates. Thus, new treatment options as well as diagnostics to identify different subtypes and assess treatment responses, are needed.

Characteristic for B cell lymphoma pathogenic proliferation is the persistent kinase activation which can be targeted by e.g. the Bruton's tyrosine kinase (Btk) inhibitors. Lysosomes and extracellular vesicles (EVs) are important in mediating antigen-induced activation in B cells but their functions in B lymphoma pathogenesis are unknown.

Our new research group (09/2023-) focuses on understanding the DL-BCL disease subtype heterogeneity. Using drug screens, sensitive biomarker analytics, 3D cell cultures and DLBCL patient samples, the group aims to identify 1) lysosomal drugs (FDA-approved) that inhibit DLBCL kinase activation and proliferation and 2) EV biomarkers that would differentiate the major DL-BCL subtypes and guide treatment options in the future.

The group has recently started (09/2023) at FICANWEST Cancer Laboratory and is funded by Research Council of Finland. Our international team consists of 4 different nationalities: two PhD students and two Master students. The group is collaborating both nationally and internationally, including researchers from Denmark.

Intercellular Communication Laboratory
<https://hamalistolab.utu.fi>

Principal investigator:

Finnish Research Council Fellow
 Saara Hämälistö, Ph.D., FICAN West Cancer Laboratory, Institute of Biomedicine, University of Turku.

Publications

Hämälistö, S., Del Valle F., Yuseff, M. and Mattila, P. Endolysosomal vesicles at the center of B cell activation. *Journal of Cell Biology* (2024), 223 (3).

Hämälistö, S., Stahl-Meyer, J., Favaro, E., Qing Yang, Bin Liu, Line Christoffersen, Ben Loos, Claudia Guasch Boldu, Johanna A. Joyce, Thomas Reinheckel, Barisic, M., and Jäätelä, M. Spatially and temporally defined lysosomal leakage facilitates mitotic chromosome segregation. *Nature Communications* 2020 Jan 13;11 (1):229.

Hämälistö S, Jäätelä M. Lysosomes in cancer- living on the edge (of the cell). *Current Opinion of Cell Biology* 2016 Apr; 39:69-7.



Extracellular matrix as a target – searching for new strategies for cancer therapeutics

Solid tumors are complex ecosystems that consist not only of tumor cells but also of stromal cells, immune cells and extracellular matrix (ECM). The ECM in solid tumors differs significantly from that in normal organs and tissues, and changes in macromolecule components, signaling, stiffness and enzyme degradation influence the tumor growth and malignancy as well as response to therapies. Altered ECM in the tumor microenvironment is regarded as one of the hallmarks of cancer, and therefore has become the focus of cancer research in recent years.

At our “Extracellular Matrix and Cancer” research group we have focused on cutaneous squamous cell carcinoma (cSCC), which is the most common metastatic skin cancer with increasing incidence worldwide. At present, in the absence of targeted effective treatment, the prognosis of patients with metastatic disease remains poor. We have shown that tumor-associated fibroblasts can drastically promote cSCC invasion by altering cancer cell signalling and secretion of tumor-promoting ECM components, and our recent results also highlight the benefits of targeting multiple

signaling pathways simultaneously in order to prevent cSCC progression and drug resistance.

In our lab we utilize advanced 3D cell culture models to recapitulate solid cSCC tumors in vitro. Our 3D models consist of tumor cells, stromal cells and immune cells, and they are carefully designed to study the complex tumor–stroma interactions and the alterations in the tumor matrixome. Our current projects focus on unravelling how different macrophage phenotypes change the tumor matrixome and affect the invasive properties of the tumor. We will also investigate the role of neutrophils in specific post-translational modifications of matrixome proteins.

The 3D models are coupled with quantitative proteomics, high-throughput sequencing and cutting-edge imaging technologies. Our ultimate goal is to find new biomarkers and to discover molecular-level mechanisms to prevent cSCC growth and metastasis. In addition, we aim to develop novel, mass spectrometry-based diagnostic techniques to detect the detrimental changes in ECM and ECM-associated proteins in cancer. We are also partnering in the international consortium ELMI (European Leukemic Matrixome Interface),

where we study ECM in bone marrow in acute myeloid leukemia.

https://ficanwest.fi/en/portfolio-item/extracellular-matrix-and-cancer_jyrki-heino/

Principal investigator:

Professor Jyrki Heino, MD, PhD
Department of Life Technologies
and InFLAMES Research Flagship
University of Turku

Publications:

Siljamäki E, Riihilä P, Suwal U, Nissinen L, Rappu P, Kallajoki M, Kähäri V-M and Heino J. Inhibition of TGF- β signaling, invasion, and growth of cutaneous squamous cell carcinoma by PLX8394. *Oncogene* (2023). Dec;42(49):3633–3647.

Rappu P, Suwal U, Siljamäki E, Heino J. Inflammation-related citrullination of matrixome proteins in human cancer. *Front Oncol.* (2022). Dec 1:12:1035188.

Siljamäki E, Rappu P, Riihilä P, Nissinen L, Kähäri V-M and Heino J. H-Ras activation and fibroblast-induced TGF- β signaling promote laminin-332 accumulation and invasion in cutaneous squamous cell carcinoma. *Matrix Biol.* (2020). May;87:26–47.

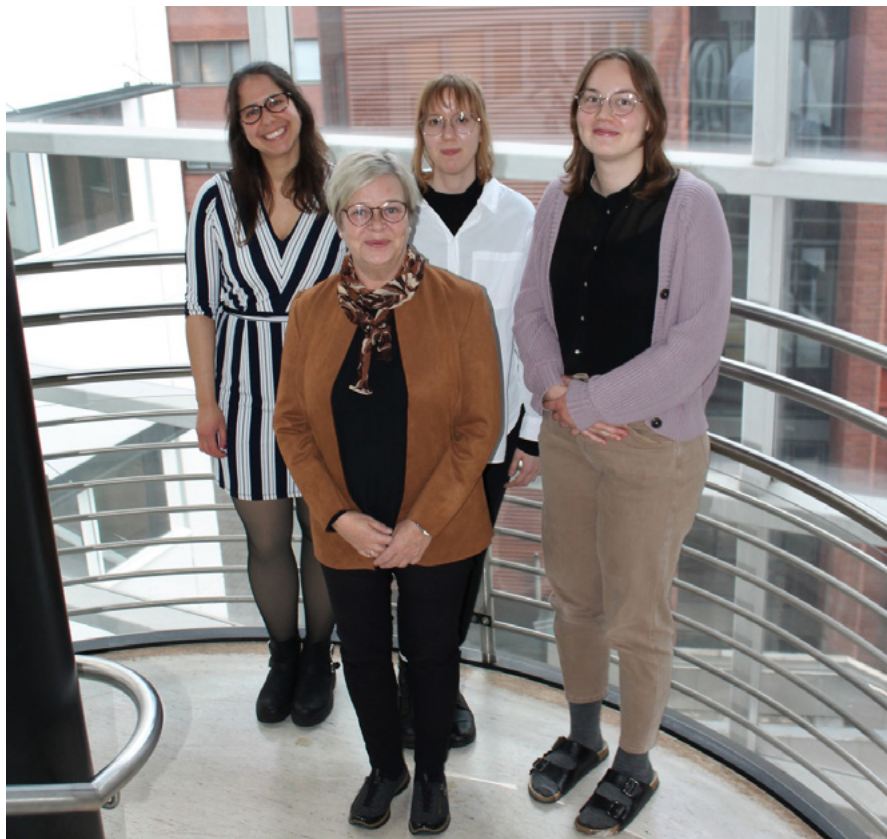
PET Imaging of Cancer

Our research focuses on evaluating and validating positron emission tomography (PET) tracers for imaging the tumor microenvironment.

The main goal is to have a clinical noninvasive imaging biomarker that will help establish prognosis and indicate response to radiotherapy (RT) treatment strategies. Major technological innovations have resulted in substantial improvements in the planning and delivery of RT during the last decades. The integration of multimodality imaging such as PET using [^{18}F]FDG and computed tomography (CT) or magnetic resonance imaging (MRI) for RT planning has improved the targeting and management of biological and geometric uncertainties in clinical practice. However, due to non-specificity properties, e.g. uptake by inflammatory cells, [^{18}F]FDG-PET is not useful for evaluating RT treatment response. Identification of a robust prognostic biomarker that could accurately predict the radiosensitivity in the context of multimodality treatment would be highly valuable.

Ongoing efforts aim to integrate our understanding of head and neck cancer biology to identify predictive biomarkers that will enable the delivery of the most effective, least-toxic therapies. This project can also contribute to the development of new potential therapeutic targets and drugs for cancer patients.

<https://ficanwest.fi/en/portfolio-item/pet-imaging-of-cancer-tove-gronroos/>



Principal investigator:

Adj. Prof. Tove Grönroos, Head of Preclinical Imaging, Turku PET Centre and Medicity Research Laboratories

Publications:

Tuominen S, Nissi L, Kukkula A, Routila J, Huusko T, Leivo I, Minn H, Irjala H, Löyttyniemi E, Ventelä S, Sundvall M, Grönroos TJ. TSPO is a potential independent prognostic factor associated with cellular respiration and p16 in head and neck squamous cell carcinoma. *Front. Oncol.* 13:1298333. doi: 10.3389/fonc.2023.1298333.

Tuominen S, Keller T, Petruk N, López-Picón F, Eichin D, Löyttyniemi E, Verhassel A, Rajander J, Sandholm J, Tuomela J, Grönroos TJ. Evaluation of [^{18}F]F-DPA as a target for TSPO in head and neck cancer under normal conditions and after radiotherapy. *Eur J Nucl Med Mol Imaging.* 48:1312–1326, 2021

Silvoniemi A, Suilamo S, Laitinen T, Forsback S, Löyttyniemi E, Sautavaara V, Solin O, Grönroos TJ, Minn H. Repeatability of tumor hypoxia imaging using [^{18}F]EF5 PET/CT in head and neck cancer. *Eur J Nucl Med Mol Imaging.* 5:161–169, 2018

New translational project in FICAN West

PROEXMET “Prospective proteogenomic analysis and ex vivo drug sensitivity screening of tumor cells and cancer stem-like cells in solid tumors” is an ongoing prospective trial collecting blood and tumor tissue samples from cancer patients. The main goal is to analyze the potential actionable genomic changes in metastatic tumors. This information can be used in patient treatment e.g. in clinical trials such as FINPROVE-trial if targetable mutations are found. Main exploratory objectives include to screen sensitivity of tumor cells ex vivo to a panel of FDA-approved and different investigational drugs, assess the cancer stem-like cell (CSC) content of different solid tumors and characterize potential tumor-type specific markers of CSCs, to characterize mechanism of treatment resistance for immune checkpoint therapies and targeted drugs, and analyze molecular mechanism linked to aggressive cancers using patient-derived cell and organoid models. Ultimately the aim is to help develop diagnostic tools and better therapeutic strategies. The study collaborator network involves several clinicians from oncology, pathology, surgery and radiology clinics, and approximately ten biomedically oriented cancer research groups. Trial has started to recruit patients at the end of the year 2023 and first PROEXMET tumor samples have been analysed by comprehensive genomic profiling and fresh tumor tissue provided to cancer research groups.



Principal investigators:

Erika Alanne, MD PhD, Medical Oncologist, Department of Oncology, Turku University Hospital, FICAN West Cancer Centre, Kalle Mattila, MD PhD, Medical Oncologist, Department of Oncology, Turku University Hospital, FICAN West Cancer Centre, Maria Silvoniemi, MD PhD, Pulmonologist, Department of Pulmonary diseases, Turku University Hospital, FICAN West Cancer Centre

Maria Sundvall, MD PhD, Docent, Medical Oncologist, Department of Oncology, Turku University Hospital, FICAN West Cancer Centre, and Institute of Biomedicine, Cancer Research Unit, University of Turku, Pia Vihinen, MD PhD, Docent, Medical Oncologist, Department of Oncology, Turku University Hospital, FICAN West Cancer Centre

Selected abstracts of doctoral theses



Tools and Strategies for RNA-sequencing Data Analysis

Arfa Mehmood,
Disputation: 2023-08-25

RNA-sequencing (RNA-seq) has enabled the in-depth study of the transcriptome. Numerous methodologies have been developed in recent years for analyzing RNA-seq data to detect differentially expressed (DE) and differentially spliced (DS) genes. However, it is difficult for researchers to decide which methods they should adopt to optimize the analysis of their datasets.

The DE can remain undetected when the expression varies across the gene due to reasons such as alternative splicing. Hence, to account for this problem, an alternate analysis approach has been suggested in which the statistical testing of lower feature levels (e.g. transcripts, transcript compatibility counts, or exons) is performed initially, followed by aggregating the feature-level results to the gene-level results using two methods (Lancaster and empirical brown methods (ebm)). The results suggest that the exon-level estimates improve the detection of

the DE genes when the ebm method is used for aggregating the results. Accordingly, R/Bioconductor package EBSEA was developed using the winning approach.

In addition, a comprehensive comparison of ten popular and recent DS tools was performed. We concluded that exon-based and event-based (rMATS and MAJIQ) performed overall best across the different evaluation metrics considered. Furthermore, we observed overall low concordance between the results reported by the different tools making it recommendable to use more than one tool when performing DS analysis.

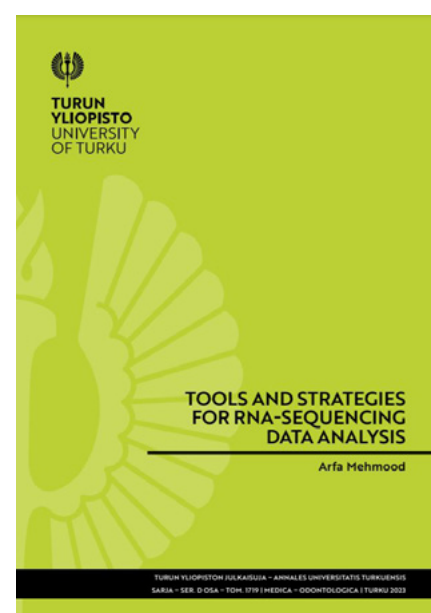
Original Publications:

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2. Mehmood A, Laiho A, Elo LL. Exon-level estimates improve the detection of differentially expressed genes using RNA-seq studies. *RNA Biology*, 2020; 18(11): 1739-1746
3. Mehmood A, Laiho A, Venäläinen MS, McGlinchy AJ, Wnag N, Elo LL. Systematic evaluation of differential splicing tools for RNA-seq studies. *Briefing in Bioinformatics*, 2019; 21(6): 2052-2065.

Supervisors: Professor Laura Elo, Turku Bioscience Centre, University of Turku and Abo Akademi Turku, Finland
Professor Matti Poutanen, Institute of Biomedicine, University of Turku Turku, Finland

Dr. Asta Laiho, Turku Bioscience Centre, University of Turku and Abo Akademi
Turku, Finland

Opponent: Professor Inge Jonassen, Head of Department of Informatics, University of Bergen, Bergen, Norway





Re-educating macrophages to activate antitumor immunity: one clever immunotherapy

Miro Viitala,
Disputation 2023-04-14

Cancers often shut down antitumor immunity or even manipulate the immune system to support tumor growth and progression. Immune checkpoint inhibitors, designed to reactivate adaptive antitumor immunity, can be remarkably efficacious, but are unfortunately beneficial only for the minority of patients. Thus, new options are required to help patients with refractory cancers.

Macrophages of the innate immune system support tumor growth and progression. In this dissertation, the preclinical proof-of-concept, putative mechanism of action and early results from clinical trials were presented for a novel experimental immunotherapeutic antibody bexmarilimab, which targets the macrophage receptor Clever-1 in order to re-educate tumor-promoting macrophages towards an antitumor phenotype.

This dissertation establishes Clever-1 as an endogenous immune suppressor that restrains macrophage overactivation and adaptive immune responses. Macrophages re-educated by Clever-1 inhibition promoted antitumor immunity by activating cytotoxic T cells in preclinical tumor models. This was mechanistically linked to increased antigen cross-presentation in macrophages following Clever-1 inhibition.

Results from early clinical trials indicated that Clever-1 inhibition may boost antitumor immunity specifically in a subset of patients with noninflamed tumors for whom checkpoint inhibitors are rarely efficacious. Overall, the results were highly encouraging for the continued clinical development of bexmarilimab.

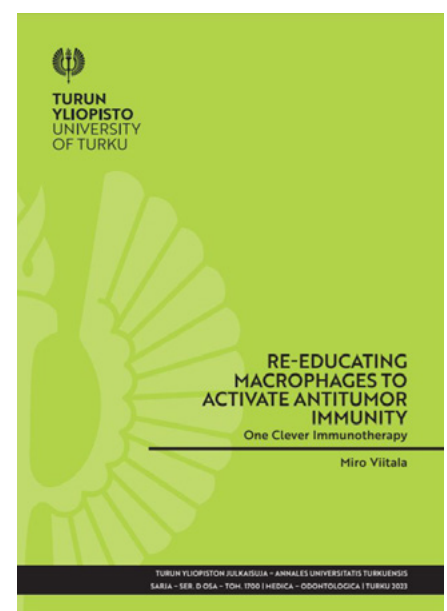
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results from a phase I/II clinical trial. *Clin Cancer Res.* 2021; 27(15): 4205–4220.

Supervisors: Docent Maija Hollmén and Academician Sirpa Jalkanen, MediCity Research Laboratory, University of Turku

Opponent: Associate Professor Cecilia Garlanda, Department of Biomedical Sciences, Humanitas University, Milan, Italy





Empowering education in patients with colorectal cancer

Leena Tuominen,
Disputation 2023-10-6

Today, the effectiveness of nursing interventions is emphasised in cancer care. Research on empowering education in patients with cancer is, however, limited.

Purpose of this study was to produce new knowledge of the effect of empowering patient education in patients with colorectal cancer. In the first phase, an overview of systematic reviews ($n=17$) produced knowledge of nursing interventions and their effectiveness in cancer care. Interviews described expectations of patients with colorectal cancer ($n = 15$) for nursing during chemotherapy. In the second phase, an empowering patient education intervention was tested in a randomised controlled trial for patient-reported outcomes (activation level, knowledge level, risk of malnutrition, quality of life, prevalence and intensity of chemotherapy induced side-effects) and register data (emergency room visits, contacts to outpatient clinic) among patients with colorectal cancer (43 + 40).

The overview identified educational, psychosocial, psychological, activity-based interventions, as well as interventions supporting patients' coping. In the intervention,

we used empowering education that supported patients' coping. Interviews showed that patients' expectations consisted of (1) empowering knowledge, (2) human encounters, and (3) good care. In intervention, we offered empowering knowledge of nutrition impact side-effects with teach-back method to support self-care. In intervention study, the difference in change was nearly significantly higher in the activation level and statistically significant in the knowledge level of malnutrition and in the number of additional contacts to outpatient clinic favoring the intervention group.

As a conclusion, empowering patient education can improve patients' activation and knowledge level. It can also reduce contacts to outpatient clinic due to nutrition impact side effects, thus reduce health care costs.

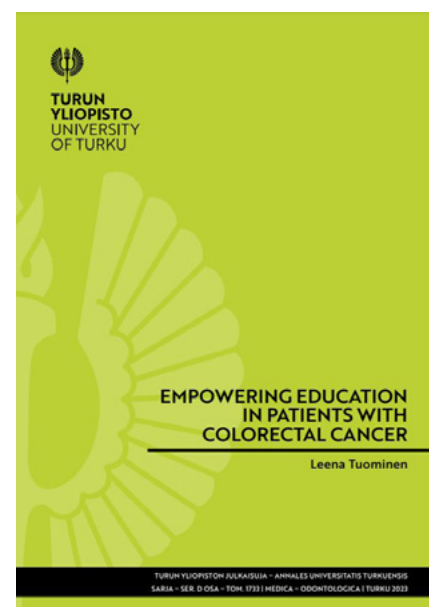
Original publications:

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2. Tuominen L, Leino-Kilpi H, Meretoja R. Expectations of patients with colorectal cancer towards nursing care – a thematic analysis. *European Journal of Oncology Nursing*, 2020; 44, 101699.
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with colorectal cancer undergoing chemotherapy: A randomised trial. *Patient Education and Counseling*, 2023; 107895.

Supervisors: Professor (emerita) Helena Leino-Kilpi, Department of Nursing Science, University of Turku; Marita Ritmala, Helsinki University Hospital, Nursing Management

Opponent: Docent Päivi Kankkunen, Department of Nursing Science, University of Eastern Finland





Adverse effects of Bacillus Calmette-Guérin (BCG) therapy in the treatment of non-muscle-invasive bladder cancer

Pertti Nurminen,
Disputation 2023-09-22

Bacillus Calmette-Guérin (BCG) is the standard treatment option for non-muscleinvasive bladder cancer. The mechanism of BCG relies on live mycobacteria inducing an immune response in the bladder wall and is therefore associated with inflammatory side effects and rarely, mycobacterial infectious complications.

We studied the diagnostic options of erythematous bladder lesions encountered during follow-up of BCG-treated patients. We found that 90% of erythematous bladder lesions were benign manifestations of an inflammatory response to BCG and most unnecessary biopsies of erythematous lesions can be avoided with the use of urine cytology, and routine biopsy is not recommended.

In the second part, we identified patients who had developed a BCG infection following BCG therapy in Finland during a 20-year period and described the incidence, mortality, and clinical presentation of BCG infections. These studies showed BCG therapy to be associated with a 1.9% risk of BCG infections presenting either as systemic or local

genitourinary infections. Emphasizing the severity, BCG infections were associated with an overall mortality of 10%.

Finally, we compared BCG administration schedules with monthly instillations and the Southwest Oncology Group (SWOG) protocol in terms of tolerability and oncological efficacy. We found that monthly instillations may be considered a comparable option to the SWOG protocol in terms of tolerability and efficacy. These studies describe the challenges BCG-therapy and highlight the risk of potentially severe adverse effects of BCG therapy.

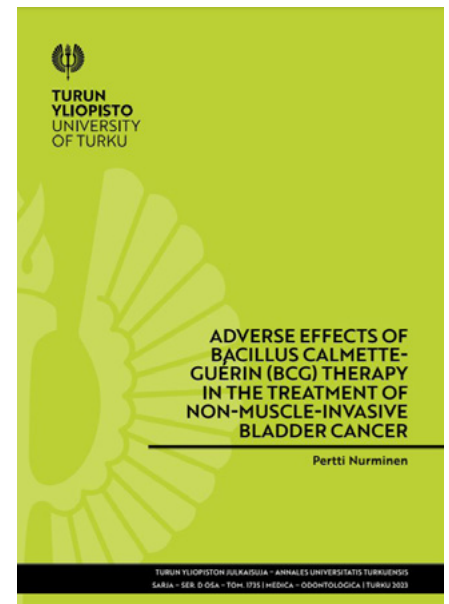
Original publications:

1. Nurminen P, Ettala O, Seppänen M, Taimen P, Boström PJ, Kaipia A. Urine cytology is a feasible tool for assessing erythematous bladder lesions after bacille Calmette-Guérin (BCG) treatment. *BJU Int.* 2019;123(2):246–51.
2. Nurminen P, Ettala O, Uusitalo-Seppälä R, Nummi A, Järvinen R, Antti K, Boström PJ. Incidence of and mortality from Bacille Calmette-Guérin (BCG) infections after BCG instillation therapy. *BJU Int.* 2022 Jun;129(6):737–743.
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Supervisors: Associate Professor Peter J. Boström, Department of Urology, Turku University hospital, Turku, Finland

Adjunct Professor Antti Kaipia, Department of Urology, Tampere University Hospital, Tampere, Finland

Opponent: Professor Ashish M. Kamat, Department of Urology, Division of Surgery, The University of Texas MD Anderson Cancer Center Houston, TX, United States of America



Highlights in clinical research activities



Clinical cancer trial unit

Strong patient recruitment and intake of new cancer trials continued at the clinical cancer trial unit (FICAN West CTU) during 2023. 7 new trials were started and recruitment of new patients proceeded as expected. In 2023 the clinical trial unit had 61 open trials of which 50 were drug trials. Of the 61 trials, 47 were sponsored commercial trials and the rest academic researcher-initiated trials. About 25 were actively recruiting trials and the rest were in follow-up phase. One phase 1 trials continued recruitment during 2023 and negotiations for one first-in-man trial was initiated in 2023.

The clinical trial unit employed 9 full time personnel; two study coordinators, 6 study nurses and in total one trial dedicated investigator on top of approximately 10 part-time PIs and subinvestigators. The unit is headed by professor Panu Jaakkola and medical oncologist Kalle Mattila. All personnel were funded by the income from sponsored clinical trials. The estimated turnover, excluding drugs, was over one million euros. There have been marked savings in cancer drug costs for the hospital. It is worth mentioning that just the immuno-oncological drugs given in clinical trials during 2017-2020 have been estimated to be worth of 1,5 million euros.

Director of FICAN West CTU:
Prof. Panu Jaakkola, MD, PhD

Turku Urology Research Unit

The Urology research team has long-standing track-record of clinical, translational and basic research especially within uro-oncology focusing especially on prostate and bladder cancer. The team has significant research activity on both pharma-sponsored and academic trials. Dr. Boström is the PI in several national prospective randomized trials. Detailed information of ongoing research activity can be found in <https://urologyresearch.utu.fi>

Within the field of prostate cancer, the clinical research has lately focused on medical imaging, e.g. the use of MRI in the detection of

prostate cancer and the use of PS-MA-PET in primary staging of high-risk prostate cancer as well as TULSA (transurethral ultrasound ablation of prostate) as a novel ablation for localized prostate cancer. In bladder cancer research focus has been mainly on BCG therapy of non-muscle invasive cancer and markers and quality parameters of muscle-invasive cancer treated with radical surgery.

Next to the clinical studies, the urology research team is running multiple translational and basic science projects. One of the biggest translational science projects is Turku prostate cancer consortium study, TPCCS <https://tpcc.utu.fi>. The basis for these studies is the high-volume University clinical unit, which is responsible for the entire prostate cancer diagnosis and treatment in the south-west Finland and it serves as a tertiary care referral center for the west-coast of Finland. The prostate cancer surgeries have been carried out with robotic surgery since 2010.

The Urology clinical research team consists of academic urologists, clinical and translational research coordinators and research nurses. The team is supported by a data manager/biostatistician.



High-lights in 2023:

Acknowledgements: Peter Boström, Syöpäsäätiö, Cancer Foundation Finland

<https://www.varha.fi/fi/ajan-kohtaista/tyksin-urologian-ylilääkari-peter-bostrom-vuoden-syop-alaakari>

Dissertations: Pertti Nurminen, Turun yliopisto

<https://www.utu.fi/fi/ajankohtais-ta/tapahtumat/vaitos-kirurgia-ll-pertti-nurminen>

Principal investigator:

Peter Boström, MD, PhD

Clinical Hematology Research Unit

Clinical hematology research group is committed to performing innovative research in stem cell transplantation and hematological diseases, including hematological cancers like acute and chronic leukemias and multiple myeloma. We participate actively both in international and national patient-oriented research, including interventional clinical trials. The immediate aim is to constantly develop treatments

and apply new findings to the treatment of our patients. Participation in clinical trials also ensures that our patients are able to receive the most advanced forms of hematological treatment.

Our research group comprises of physicians, all of whom carry out research projects and trials along with the routine clinical work. Furthermore, many of our physicians acted as sub-investigators. In addition, our research group consist of three full-time study nurses and a part-time research coordinator.

The hematology research group is located in the T-hospital. Our stem cell transplantation unit, a part of the Western Cancer Centre (FI-CAN West), has been nominated as a Centre of Excellence in the Hospital District of Southwest Finland since 2019. This is a proof of our high-level research as one of the leading criteria for granting the Centre of Excellence status is active and qualified research work.

We report the results of our stem cell therapy to the registry of the European Society for Blood and Marrow Transplantation (EBMT). We participate annually in

numerous EBMT's registry studies regarding stem cell transplantation/therapies and also in EBMT's prospective studies.

In 2023, we had nine interventional clinical trials ongoing:

Academic clinical trials:

- International "HO141 Vision", "CLL13" and "CLL17" trials for CLL patients.
- "VenEX" trial for newly diagnosed AML patients unsuitable for intensive chemotherapy, in which the combination of azacytidine and venetoclax was used.
- "ALLTogether1" trial for children and young adults with ALL, which we perform in collaboration with the department of pediatric and adolescent hematology.

Industry sponsored trials:

- CARTITUDE-5: CAR-T trial for newly diagnosed patients with myeloma, which compares CAR-T –treatment to standard maintenance therapy.
- EXCALIBER-RRMM, MAGNETISM-5 and MAGNETISM-7 trials for multiple myeloma patients.

Head of the research group:

Professor Maija Itälä-Remes, MD, Chief Physician, Head of Hematology section.



MULTIPLE MYELOMA TRIALS

Multiple myeloma (MM) is a B-cell neoplasm that stems from the malignant transformation of

clonal plasma cells, which accumulate in the bone marrow. Multiple myeloma accounts for about 10% to 18% of hematologic malignancies. The incidence in Finland is about 6–8 cases/100 000 people per year.

MM treatment has improved remarkably over the last 2 decades with the introduction of ASCT and the introduction of numerous novel agents, including 3 generations of immunomodulator agents, 2 generations of PIs and most recently anti-CD38 antibodies. Despite recent advancements, multiple myeloma remains incurable. The median overall survival for patients with MM ranges from 2 to more than 10 years with approximately 15% of patients dying within 2 years after diagnosis. Most MM patients experience sequential relapses and require multiple lines of therapy. Long-term disease control may be best achieved by combining therapies that have distinct mechanisms of action, especially those that target key components of the immune system.

EXCALIBER-RRMM

Iberdomide is a type of drug called a cereblon-modifying (CM) agent. It works by targeting and destroying proteins that help produce myeloma cancer cells. EXCALIBER-RRMM study has started in Tyks on October 2022. It is a multicenter, randomized, controlled, open-label, phase 3 study comparing the efficacy and safety of Iberdomide, daratumumab and dexametason to globally use compound daratumumab, bortezomib and dexamethasone in patients with relapsed or refractory multiple myeloma. Principal investigator in Tyks: Mervi Putkonen, MD, PhD.

MAGNETISMM-5 and MAGNETISMM-7

Bispecific antibodies represent a new treatment option for patients with myeloma. These antibodies activate the patient's own T-cells to kill their tumour cells and have shown impressive results in relapsed refractory myeloma.

MAGNETISMM-5 is a phase 3, open-label, 3-arm, multicenter, randomized study to evaluate the efficacy and safety of elranatamab monotherapy and elranatamab + daratumumab versus control (daratumumab + pomalidomide (IMiD) + dexamethasone) in participants with relapsed or refractory myeloma and who have received at least 1 prior line of therapy, but not more than 3, including lenalidomide and proteasome inhibitor. The study has started in June 2022 in our hospital.

MAGNETISMM-7 is a phase 3 study with elranatamab versus lenalidomide in patients with newly diagnosed multiple myeloma after autologous stem cell transplantation. Patients who receive an ASCT, the median time to relapse is 17.2 months. Therefore, there remains an unmet need for new therapeutic options for the frontline setting directed at alternative MoAs that can better control the disease and provide deeper, more sustained responses and better long-term outcomes. In this study the primary endpoint is to compare PFS with elranatamab versus lenalidomide, which already is indicated as monotherapy for the maintenance therapy of patients with newly diagnosed multiple myeloma. The study has started in Tyks in August 2022.

Principal investigator in Tyks:
Mervi Putkonen, MD, PhD.

Health and quality of life in patients with early age onset cancer

There are several ongoing projects in the department of paediatric and adolescent haematology/oncology which aim at recognising and alleviating the adverse effects of cancer and its treatment. Another research focus is genetic background of malignancies and sequelae of their treatment.

Milli-C (Microbiota and later life of childhood cancer patients) is still recruiting, and evaluates the association between immune reconstitution and metabolic adverse effects (e.g., obesity) and changes in the gut microbiota. Project is led by Anu Huurre and Liisa Järvelä.

A local project, called Digital tools in detecting late effects in adult childhood cancer survivors (LERACA), has started at our late-effects clinic, and first two publications based on the use of datalakes have been finalized. One of these publications is describing the possibilities of using text-mining in prediction of need for psychosocial support at the end of cancer treatment.

A Nordic project on the late effects of high-risk acute lymphoblastic leukaemia survivors, the HAL-LON-study, has started recruitment in 2022 together with another late-effect study (ALLStar) that examines low and intermediate risk ALL-patients. Project leaders for high-risk study are professor Arja Harila-Saari from Uppsala University and Päivi Lähteenmäki from University of Turku.

Palliative care is also one main topic of our research group, and here the principal investigator is MD, PhD Marika Grönroos.

A new project PeCCAPs concentrates at first on the ethics of germline testing in childhood cancer patients.



Principal investigator for this project is MD, PhD Laura Korhonen.

iCAN-PEDI (Functional Precision Medicine For Pediatric Solid Tumors) is a project led by docent Minna Koskenvuo in Turku and Vilja Pietiäinen in Helsinki. The project aims to improve the selection of right treatment for a right patient by studying how a patient's tumor cells respond to the drugs, and what are the molecular alterations resulting in cancer. New analytical methods are developed to improve diagnosis and treatment of patients with pediatric solid cancers. For next term, the aim is to further utilize their findings by directing the patients to clinical trials based on the molecular and functional profiling, and by establishing novel clinical trials. Further aim is to expand the study as a longitudinal follow-up study for childhood cancer survivors, to enable their healthier adulthood.

Studies on immunosuppression, vaccinations and infections after non-SCT treatment of childhood cancer patients are led by MD, PhD Linnea Schuez-Havupalo.

PACS (Pregnancy associated cancer and survival) is a Nordic study

on the short-term and long-term consequences of pregnancy-associated cancer in women and their offspring. The study runs in collaboration with scientists from Denmark, Sweden and Norway. PhD student in this project is MD Riikka Kuvaja.

Dr Lähtenmäki is the principal investigator of a Nordic study on the epidemiology, biology, treatment and survival of children with cancer and severe haematological diseases (NOPHO-CARE). This study is funded by the Swedish Childhood Cancer Foundation.

Project on "Immune reconstitution in children after allogeneic stem cell transplantation (SCT)" has started by docent Minna Koskenvuo in 2012 in Helsinki University Hospital: the first aim is to bring forth new knowledge of immune system regeneration following HSCT, with special focus on the susceptibility to viral reactivations along with the T cell reconstitution. The second aim is to gather data on the effects of reduced intensive conditioning on immune reconditioning and to compare it to the immune reconstitution after myeloablative conditioning. The third aim of the study is to perform detailed functionality tests on T-cells following HSCT.

The fourth aim is to discover new connections between genetic predisposition and risk of HSCT complications, such as infection, viral reactivation, and graft versus host disease (GvHD).

Another SCT-related project by docent Koskenvuo is called: Monitoring the hemostasis following allogeneic HSCT. It focuses on changes in hemostasis and thrombin generation followed by HSCT. The detailed studies concerning the thrombin generation has been done in collaboration with professor Riitta Lassila, Helsinki University.

<https://www.tyks.fi/tietoa-tyksista/tyksin-organisaatio/potilas-hoidon-toimi-ja-palvelualueet/lasten-ja-nuorten-10>

Senior scientists: Päivi Lähtenmäki, docent, MD, PhD, and Minna Koskenvuo, docent, MD, PhD

Project leaders: Anu Huurre, MD, PhD; Liisa Järvelä, MD, PhD; Marika Grönroos, MD, PhD, Laura Korhonen, MD, PhD, Linnea Schuez-Havupalo, MD, PhD

PhD-students: Riikka Kuvaja, MD, Tuomas Lähtenmäki Taalas, MD



Gynecologic cancer research

High-grade serous ovarian cancer (HGSOC) kills more than 44,000 women in Europe every year due to lack of effective and long-lasting therapeutic regimens. Although most patients respond initially well to surgery and chemotherapy, more than half experience relapse and develop resistance to chemotherapy. This leads to 5-year survival of only 43%.

Tyks Gynecologic oncology unit has strong research background and high-quality prospective ongoing sample collection for translational research purposes. We also provide essential clinical expertise to the projects. To date, over 560 patients have been recruited. We collect tissue and ascites samples at surgery for tumor genome analyses, 3D organoid cultures and longitudinal blood samples before and during chemotherapy for ctDNA and biomarker analyses <https://sites.utu.fi/ovariancancer/fi/>.

PERSONALIZED TREATMENTS FOR CHEMORESISTANT HGSOC

Tyks is a partner in Horizon 2020 granted consortium DECIDER (2021–2026) coordinated by the University of Helsinki (prof Sampsa Hautaniemi) and has partners in Denmark, Germany, Italy, Spain, and Sweden. Importantly, all patients participating DECIDER are recruited and treated in the Tyks/FICAN West area. The main goals are to develop diagnostic tools and treatments for HGSOC with the help of AI methods. The aim is to identify earlier those patients who do not respond well to the first-line treatments, and to find effective treatments to patients with a drug-resistant cancer. Treatment response is predicted using e.g. histopathological and genomic data from the patient. Genomic changes and aberrations in gene functions are used to find effective, personalized treatments. Using this information, doctors can more easily identify effective drugs for their patient. The tissue samples are analyzed by

WGS, RNA seq, drug screenings are made with patient derived organoids and tumoroids.

In 2023, our tumor evolution study (Lahtinen et al, Cancer cell) revealed three evolutionary states, which have distinct genomic features, morphological phenotypes, and significant association with treatment response. We also reported, that HRD signature 3 predicts clinical outcome in our Tyks cohort (Koskela et al, Gynecol Oncol).

Funding: EU

Principal investigator in Tyks:
Johanna Hynninen Adj prof, MD, PhD

FUNCTIONAL DNA REPAIR IN OVARIAN CANCER

Chemotherapy induces damage to the DNA of tumor cells. In most HGSOC patients, tumors eventually overcome chemotherapy-induced DNA damage, typically leading to resistance and fatal refractory

disease. The overall goal is to develop optimal anti-cancer drugs/drug combinations and doses. We scrutinize the multi-faceted cellular response induced by DNA-damaging platinum agents (the current first-line therapy in ovarian cancer), by PARP inhibitors (emerging, clinically highly promising therapy) and by their combination. Ex vivo experiments will be conducted directly on clinical tumor tissue. These include performing state-of-the-art (and beyond, developed by the consortium) molecular measurements of drug transport and metabolism, DNA repair proficiency, bioenergetic pathways, mitochondrial function and PARP activity. By consolidating these read-outs with carefully recorded clinical information and with the mutational status affecting pharmacokinetics and tumor genes from the same patients into a systems-level model, we will deliver a predictor of which anti-cancer drugs are expected to provide maximal efficacy and minimal toxicity.

Funding: Academy of Finland, Cancer Foundation Finland

Principal investigator:

Sakari Hietanen Adj prof, MD, PhD

HYPOXIA IN OVARIAN CANCER

Hypoxia is one of the most important drivers of chemoresistance. Tumor hypoxia can be evaluated pre-operatively with PET and with the use of a novel hypoxia-specific tracer, 18F-EF5. The feasibility of 18F-EF5 PET/CT-imaging in EOC patients with widespread carcinosis has not been established. The objectives of the OVANOX project is to identify and localize hypoxic sites in ovarian tumors with 18F-EF5 PET/CT in a diagnostic and neoadjuvant setting and to characterize comprehensively the molecular pathways, aberrations and bioenergetic profile in targeted samples of hypoxic EOC tumors. Hypoxic tumor areas have so far been identified in EF5 PET/CT in 46 % of these patients.

Principal investigator in Tyks:

Sakari Hietanen Adj prof, MD, PhD

Funding: VTR-funding, EU project Hercules

ctDNA IN OVARIAN CANCER

In solid cancers, such as HGSOC, ctDNA (circulating tumor DNA) profiling is currently the only technique that permits longitudinal assessment of genomic alterations throughout treatment and follow-up. Our prospective patient cohort with longitudinal plasma sample collection is ideal to study early detection of chemoresistant patients and the usefulness of ctDNA in clinical decision making in disease relapse. We use ctDNA to study tumor evolution during treatment and search for druggable targets.

In 2023, we showed with an extensive ctDNA panel (bioinformatics analyses by prof Hautaniemi's group, HY) that ctDNA detects novel mutations appearing at disease relapse and has potential to guide HGSOC clinical treatment (Marchi et al, Translational Oncology).

Funding: Sakari Alhopuro foundation, EU, VTR-funding.

Principal investigator in Tyks:

Johanna Hynninen Adj prof, MD, PhD

MOLECULAR CLASSIFICATION AND ACTIONABLE TARGET SEARCH IN ENDOMETRIAL CANCER

Endometrial cancer is the most common gynecologic cancer. Surgery is curative for most patients in early stage and favourable histology. Adjuvant radiation, chemotherapy or their combination is used to reduce recurrence in patients with histopathological features that have been associated with poor prognosis. Although universally applied, current risk assessment for potential adjuvant therapy has proven suboptimal.

The current prognosis for recurrent endometrial cancer is poor and adjuvant therapy is currently based mostly on conventional chemotherapy, radiation or hormone therapy. For this group of patients, actionable genetic alterations might reveal specific targets for more effective treatment.

Since the days of the TCGA results in 2013 next generation sequencing has greatly advanced allowing nowadays the use of formalin fixed material. FoundationOne by Foundation Medicine has been successfully used in our hospital for search for actionable mutations in different cancers of patients that cannot be offered an effective standard treatment. This analysis offers also the possibility to study endometrial cancer in archival material and classify the results according to the original TCGA classification. In addition, the results of this test provide mutation analysis on >300 genes related to cancer. Some of the found mutations may prove to be of critical importance for the tumor growth (driver mutation) and may be targeted in case of recurrence.

We have been studying a cohort of endometrial cancers gathered in Turku University Hospital during 2008–2021. Our main focus is to 1) search for molecular alterations which predict the recurrence in low-grade low-stage endometrial cancers, 2) perform molecular classification of cancers, and to 3) search for potentially actionable mutations.

Principal investigator:

Sakari Hietanen Adj prof, MD, PhD

Funding: VTR-funding



Clinical Research Activities at Vaasa Cancer Clinic

The Vaasa Cancer Clinic, located at the Ostrobothnia Wellbeing Services County in FICAN West, is Finland's most active cancer unit among central hospitals. Annually, approximately 3,500 patients receive active treatment in our department, with around 1,250 of them undergoing radiotherapy. Since its establishment in 2012, our clinical research unit has been deeply engaged in clinical research. Presently, we can conduct 6–8 clinical trials simultaneously. Our research is primarily conducted by GCP-trained physicians and nurses specializing in clinical trials, supported by our in-house cell biologist who plays a pivotal role in advancing our gene analysis techniques. As an EMA-listed study site, we're at the forefront of clinical drug development trials and a clinic-wide

project aimed at enhancing current cancer treatments. This includes the introduction of new diagnostics and treatments into clinical practice and streamlining existing treatment procedures. Our expertise extends to gene-targeted therapies and refining surveillance protocols for patients receiving active cancer treatment or post-treatment monitoring.

Our clinic's compact and dynamic nature allows us to swiftly adopt pilot treatment processes and launch new research initiatives. We were the pioneers in Finland in selecting patients for fluoronucleoside-based treatments based on DPD enzyme defects, applicable in both adjuvant and metastatic settings. Committed to transparency, we produce approximately ten scientific reports

annually. Currently, we are expanding our focus to include our own research protocols, like stereotactic radiotherapy for treating oligometastases. The Vaasa Clinical Cancer Research Unit is also a sought-after site for students from the University of Umeå for their diploma works, which cover a range of topics from treatment outcomes in melanoma, lung, and breast cancers to the influence of socioeconomic factors in treatment decisions.

Principal Investigator: Professor, Chief Physician Antti Jekunen, MD, PhD

Investigators: Ravichandra Ravi, MD; Heidi Andersen, MD, PhD; Natalja Eigeliene, MD, PhD; Jatta Saarenheimo, PhD; Nelli Nähls, MD; Karagiannis Vasileios, MD; Wahid Nesna, MD



Clinical Cancer Research Activities at Satasairaala

The clinical research group of the Cancer Unit of Satakunta Wellbeing Services County is involved in drug treatment studies of breast cancer, colon cancer and GIST tumors as follows:

Breast cancer:

- phase III adjuvant trial for hormone receptor positive and Her-2 negative tumors using standard hormonal therapy (group A and B) plus abemaciclib (group A) vs. placebo (group B)
- phase III second line trial for hormone receptor positive and Her-2 negative tumors using ARV-471 (group A) vs. fulvestrant (group B) in chemotherapy naïve patients after progression on AI plus CDK4/6

Colon cancer:

- phase III first line trial in patients with B-Raf V600E mutated colorectal cancers

GIST:

- phase III adjuvant trial for 3 vs. 5 years of imatinib

Principal Investigator: Kalevi Pulkkanen, Chief of Oncology, M.D., Ph.D.

Physics research in radiotherapy



Four physics projects are based on a collaboration between local collaborators, national and international hospitals and institutes, national radiation safety authority, and manufacturers. One of the main objectives is to produce postgraduate degrees for the physics students, in particular for those targeting a vocational certified degree in medical physics. Currently, there are three physics postgraduate students working in the projects described in the following sections.

Dosimetry and dose calculation in radiotherapy

The capacity of radiation therapy (RT) is based on the dose response of cells, which describes the response of the biological object for the ionizing radiation. The dose response is characteristic for different types of cells, and the difference between the response of tumor cells

and the response of normal cells is the base from which all the doses for clinical treatment are chosen. The clinical requirements on dose accuracy are based on evidence from dose response curves for tumor control probability (TCP) and for normal tissue complication probability (NTCP). The steepness of the given TCP or NTCP curve versus dose defines the change in response expected for a given change in delivered dose. Thus, uncertainties in delivered dose translate into either reductions in TCP from the optimized expected value or increases in NTCP from the optimized expected value, both of which worsen the clinical outcome.

Treatment with ionizing radiation using small photon fields has been an established practice in stereotactic RT for many years. At the same time, there has been an increasing availability of novel treatment

units specifically designed for intensity-modulated RT or volumetric-modulated arc therapy treatments. These technical improvements implicitly encourage the use of small treatment field sizes on equipment originally designed and commissioned for treatments based on traditional, broad photon fields. An experimental determination of small field dosimetric data is challenging and the use of radiotherapy planning (RTP) systems and treatment units not designed nor commissioned for small fields can introduce significant errors in the delivery of treatments.

This project is designed to investigate and understand the physics and challenges behind the small photon fields in terms of measurement, calibration and calculation. The most suitable equipment, detector systems and methods for the determination of dosimetric parameters as

well as quality assurance aspects relevant to the use of narrow collimated fields are reviewed. The overall objective is to improve the accuracy of RT for cancer patients. The factors that influence the accuracy of measurement and determination of absorbed dose distribution in a tissue equivalent phantom and the calculation accuracy of RTP system in the particular case of small and composite fields are studied. Topics are carefully conducted with extensive measurements by several types of radiation detectors and subsequently compared to the most accurate Monte Carlo simulations. The project is run by the physicists working at Tampere and Turku University Hospitals and at the Radiation & Nuclear Safety Authority (Helsinki, Finland).

MRI-only in radiotherapy planning

Superior soft-tissue contrast obtainable in magnetic resonance imaging (MRI) compared with other clinical imaging methods enables more accurate definition and delineation of treatment target and organs at risk (OAR) volumes. Also, monitoring of treatment outcome and evaluation of treatment response can be accurate using MR images.

Current practice in the use of MR images for RTP is based on the co-registration of computed tomography (CT) and MR images. This enables the utilization of additional anatomical details provided by MRI, although the dose calculation is based on electron density information available by CT. The use of two different imaging modalities, however, requires additional work and raises costs. Moreover, the error associated with co-registration increases the uncertainty in treatment accuracy. For the aforementioned

reasons, it would be ideal to create a practice which is based on a single imaging modality only.

The overall objective of this project is to improve the accuracy of target and OAR definition. The specific aim is to examine the effect of MRI's geometric distortion to dose calculation accuracy in MRI-only-based RTP. Significant distortions in MRI are possible, especially when larger field-of-views are used. A particular branch of examination is the magnitude of geometric distortions produced during diffusion-weighted MRI (DW-MRI). In rapid imaging sequences the gradient magnetic fields required in image encoding produce local eddy currents that cause permanent distortions to both geometry and image intensity. This complicates the definition of treatment volume, hence reducing the usability of DW-based imaging techniques for MRI-only RTP.

In the project, the possibilities of using the MRI for dose calculation are studied in pelvic, brain and head and neck cancers that could diminish the need for CT. On MR images, the tumor and other structures

can be differentiated better than on CT images, but they do not contain the electron density information required for dose calculation. The MRI scanner located at the RT department of Turku University Hospital is equipped with a software, which is capable of producing so-called synthetic CT images based on MR image information. These images can be utilized directly in a clinical RTP system. This project is conducted by a close co-operation with other hospitals and the MRI manufacturer Philips (Amsterdam, The Netherlands).

In addition to reduced radiation exposure for the patients due to the use of non-ionizing radiation, the methods reduce the number of hospital visits for patients and amount of work for the personnel. This may cause significant savings in time and costs. Clinical advantage for patients is the result of the improved target and OAR definition. In the long term, this may manifest itself as a reduction of complications caused by increased tumor control probability. Determining this would, however, require a large clinical material and a long follow-up period.



Adj. Professor Jani Keyriläinen, PhD, Department of Medical Physics, Turku University Hospital

Automated segmentation tools for radiotherapy using deep learning algorithms

Manual segmentation of the OARs per patient can take a long time even for an experienced clinician. Depending on the disease and its location, it can vary from a few minutes to an hour. By using accurate and robust automated segmentation algorithms, up to several hours of segmentation work can be automated, whilst the contributions of clinicians can be relieved for other important tasks, such as a doctor's practice.

The automated segmentation tool uses branches of machine learning called deep learning (DL). DL is a subfield of machine learning concerned with artificial neural networks, which are models inspired by the structure and function of the brain. DL models try to find good multiple level representations of the unknown input distribution in a hierarchical fashion, similarly as e.g. in the human visual cortex. These automatically learned abstract features allow the constructed multidimensional functions to produce an output from input without the features of human designed functions. In this project, the problem distribution is a medical imaging dataset and the target output to be learned by the artificial neural network are the segmented contours of regions of interest, such as target and OARs.

A tool capable of producing automatically segmented target and OAR structures on CT and MR images of various cancer sites, e.g. prostate, breast and brain, is studied, developed and validated. The overall objective of the work is to automate the entire process of target and OAR

segmentation required for the RTP. Hundreds of anonymous CT and MR images with manually segmented target and OAR structures are retrospectively collected to be used as an input distribution for level-feature learning of the DL algorithm.

The retrieval and anonymization tasks of the patient images and corresponding segmentations from the image database can be automated by a database daemon script. This project is carried out in a close collaboration with other hospitals and MVision AI Oy (Helsinki, Finland) that is able to provide the development work and training for the DL-based workflow. Evaluation, validation and testing parts are put into an action by the clinicians and physicists. Traditional evaluation metrics, e.g. Dice coefficient, difference between the volumes and the 95% Hausdorff distance, are used to compare the outcome with the ground truths defined by clinicians. Obviously, the project also includes fitting the application into a clinical workflow in order to significantly lower the working hours spent for image segmentation.

Publications:

Kiljunen T, Akram S, Niemelä J, Löyttyniemi E, Seppälä J, Heikkilä J, Vuolukka K, Heikkilä V-P, Lehtiö K, Nikkinen J, Gershkevitch E, Borkvel A, Adamson M, Zolotuhhin D, Kolk K, Pang EPP, Tuan JKL, Master Z, Chua MLK, Joensuu T, Kononen J, Myllykangas M, Riener M, Mokka M, Keyriläinen J. A deep learning-based automated CT segmentation of prostate cancer anatomy for radiation therapy planning – a retrospective multicenter study. *Diagnosics*. 10:959, 2020.

Biologically guided radiotherapy

The RT department collaborates with Turku PET Centre in combining anatomical, metabolic positron emission tomography (PET) and functional MRI with RT. Our interdisciplinary research includes both dose painting by numbers based on the hypoxic agent EF5 and investigation of predictive factors for head and neck cancer patients, as well as acetate based dose escalation of intraprostatic lesions. The research conducted includes both long-term evaluation of treatment outcomes and development of future methods for RT delivery.

Recent publications (2022–2023)

Saikkonen A, Ojala J, Sipilä P, Boman E, Keyriläinen J. Validation of HDR brachytherapy doses in the treatment of keloid scars using the egs_brachy Monte Carlo application, *Phys Med Biol*. 68: 084003, 2023.

Ranta I, Wright P, Suilamo S, Kemppainen R, Schubert G, Kaponen M, Keyriläinen J. Clinical Feasibility of a Commercially Available MRI-only Method for Radiotherapy Treatment Planning of the Brain, *J Appl Clin Med Phys*. e14044, 2023.

Kuisma A, Wright P, Suilamo S, Seppälä J, Koivisto M, Lindholm P, Minn H. Long-term outcome of biologically guided dose-escalated radiotherapy of localized prostate cancer. *Acta Oncol*. 61:97–103, 2022.

Highlights in research infrastructure



Auria Biobank

The aim of biobanks is to promote health by providing a research infrastructure for biomedical research. Biobanks collect biological samples and related clinical data from patients who have given biobank consent to be used for research purposes. The donation of a sample to biobank is voluntary but highly valuable for biomedical research. The data generated in the biobank studies helps to understand diseases and supports the development of new personalized therapies. The results from biobank studies return to biobank adding value to the samples.

Auria Biobank is the oldest Finnish hospital biobank established in 2012 by University of Turku and the hospital districts of Southwest Finland, Satakunta and Vaasa. Auria is the operating biobank in the respective wellbeing services counties established from 2023. Auria Biobank, part of Turku University Hospital's Laboratory Division, achieved the ISO 20387:2020 accreditation for Human material biobanking in December 2022. Auria was accredited by the Finnish accreditation service FINAS and is the only accredited biobank in Finland so far. Accreditation is the verification of competence according to international criteria. Researchers, authorities and operators in the industry can rely on the service quality of an accredited operator. The current scope of accreditation includes acquisition,

processing, storage and distribution of certain liquid samples.

The biobank samples are collected in context with normal diagnostics or treatment. Over 1,5 million human biological FFPE tissue samples are stored at Auria Biobank. There is also an ongoing collection of other sample types such as plasma, serum, cerebrospinal fluid, urine and DNA. Genotype data is available for over 62 500 samples. Approximately one fourth of Auria's tissue samples are from cancer patients.

Clinical data collected as part of patient treatment in the hospital can be linked to the biobank samples. Based on e.g. genotype information and clinical parameters, Auria Biobank is able to recall defined groups of patients who might be suitable for clinical trials. Auria has extensive experience in serving both academic researchers as well as pharmaceutical and diagnostic industry. The abstracts of the >200 biobank studies are collected at Auria's web pages (www.auria.fi/biobank).

Lila Kallio, Director
Merja Perälä, Project Manager



Turku Center for Disease Modeling

The TCDM is a research and research service organization of the Faculty of Medicine in the University of Turku. It is also a part of the Biocenter Finland "Model Organisms" network. TCDM provides state-of-the-art research facilities and expertise in studies involving experimental animals to support preclinical research for academic and industry

purposes. Rodent studies in vivo are an essential part of studies aiming to understand mechanisms of tumor growth and treatment responses. TCDM offers expertise, e.g., 1) to generate and study xenograft models in mice, 2) to generate and maintain genetically modified mouse models for cancer research, and 3) to perform chemically induced cancer models in mice. TCDM personnel are qualified to perform various surgical and pharmacological interventions in preclinical studies. The experimental studies in rodents are supported by several image-analyzing techniques allowing to follow tumor growth, including optical, PET and ultrasound imaging. Direct connections have also been built to facilities providing histology and molecular pathology services at the Institute of Biomedicine, University of Turku. TCDM holds a spectrum of slide scanners enabling digital pathology services for experimental cancer models. We have also recently established a platform for high-resolution laser microdissection of histological sections and cells and created methods for image quantification on histological sections. In activities carried out together with Auria Biobank and Turku Prostate Cancer Consortium, TCDM has established methods to generate patient-derived cell lines from various cancers and their benign counterparts, providing the potential to generate models for personalized cancer models and e.g. for drug sensitivity testing to be carried out e.g. together with Misvik Biology.

<https://www.tcdm.fi/>

Matti Poutanen, Professor, Director of TCDM
Petra Sipilä, Adjunct Professor, Vice Director of TCDM

Auria Clinical Informatics

Auria Clinical Informatics (ACI) supports scientific research, education and data-driven management based on the secondary use of patient records in specialized health-care. ACI serves both basic academic research and industry-sponsored scientific studies and its services for researches include:

- Feasibility reports on data availability
- Study planning support
- Data extraction
- Statistical analyses
- Access to a secure data analytics platform

Cancer studies based on patient records often require tight collaboration between ACI and local clinicians. The suitability and coverage of the patient records data need to be evaluated from a technical and clinical perspective. For this purpose, ACI has created a wide network of oncologists, surgeons and pathologists treating cancer patients and doing cancer research at the Wellbeing services county of Southwest Finland

ACI has supported more than 100 cancer studies based on patient records in 2019–2023. In the future, we see the demand for patient records data growing for cancer research. A rising trend is to form control cohorts for clinical studies based on patient records.

For the Tyks Cancer Center, ACI has created and maintains statistics for

times to treatment in selected cancer types for presentation on the public website of Tyks. In addition, ACI maintains a more detailed internal cancer treatment dashboard for the Tyks Cancer Center for data-driven management purposes.

Arho Virkki

Chief Analytics Officer at the Well-being services county of Southwest Finland

Head of Auria Clinical Informatics

<https://www.auria.fi/tietopalvelu/en>



Turku PET Centre

The Oncology research group assesses prospectively new hybrid imaging technologies and acquisition protocols with standard and new tracers at the Turku PET Centre. The aim is to increase the clinical impact and diagnostic accuracy of PET

imaging and PET-related research. Moreover, possibilities of new AI technologies with deep learning capabilities are being investigated for facilitating and improving diagnostic analysis of oncological PET images.

Innovations through translational research by local and international collaborators are being evaluated for immune cell interaction studies, for circulating tumor DNA and microenvironment in relation to molecular imaging, which may guide immunotherapy, for biologically planned adaptive radiotherapy, and for particle therapy.

We are currently studying the development of chemotherapy resistance and hypoxia in ovarian cancer with PET imaging in clinical studies by developing artificial intelligence methods to identify effective treatment modalities. Hypoxia is one of the most important drivers of chemoresistance in cancers. Tumor hypoxia can be evaluated preoperatively with PET with the novel tracer EF5 (18F-[2-82-nitro-1-H-imidazol-1-yl)-N-(2,2,3,3,3-pentafluoropropyl) acetamide]).

Prostate specific membrane antigen (PSMA) targeted PET/CT or PET/MRI represents a very promising imaging method for prostate cancer diagnosis, staging, and treatment response evaluation. To improve the diagnostic accuracy in staging of high risk prostate cancer, we have multiple ongoing studies comparing the new novel imaging methods to conventional guideline imaging (Bone scintigraphy and CT) in primary staging of prostate cancer.

Fibroblast activation protein (FAP) is a very promising molecular target for imaging and therapy in cancer. ¹⁸F-labelled FAP inhibitors PET-CT/

MRI research will be one of the major interests of our group in the near future in various types of cancers. We have been setting up the synthesis of ¹⁸F-FAPI-74 for this purpose and the first human studies are starting in the near future. We expect that ¹⁸F-FAPI-74 will be another “work horse” (in addition to ¹⁸F-FDG) for clinical cancer diagnostics in the future.

Theranostics refers to the use of molecular probes that have both diagnostic and therapeutic properties. These probes, such as ¹⁸F-rhPSMA-7.3, that we have been developing together with Blue Earth Diagnostics, can have another radionuclide attached for treatment purposes, e.g., ¹⁷⁷Lu or ²²⁵Ac. We are also studying PSMA receptors and somatostatin receptors in phase I trials and in archival biobank material for their potential as targets for alpha- and beta-emitting radionuclide therapy.

We also have ongoing a prospective study to investigate the effects of physical activity and acute physical exercise on the response to anticancer treatment. The study is supported by Research Council of Finland.

In June 2022, a new total body PET/CT scanner, Siemens Vision Quadra was installed in Turku PET Centre. The scanner has been highly used both in clinical diagnostics and in oncological research. This scanner allows dynamic whole torso imaging in patients with cancer as well as significantly reduces scanning

time and improves accuracy in diagnostic scans. These will further enhance our possibilities for both academic and commercial cancer research.

Besides the Research Council of Finland, our cancer research is supported by Finnish Cancer Organization, the Nordic Cancer Union, and European Union among other smaller funders.

<https://turkupetcentre.fi/>

Professor Juhani Knuuti, Director of Turku PET Centre.



Research services of Varha and Turku Clinical Research Center (TurkuCRC)

The goals of the research services of Varha and TurkuCRC are to reinforce the prerequisites of scientific research, to guarantee the quality of research, to ease the workload of the study groups by managing the administration of the research and to make co-operation with external stakeholders faster and more efficient.

The tasks of research services include:

- Processing of Varha's research permits, thesis permits and data permits
- Organisation of the activities of the Regional Committee on Medical Research Ethics
- Contracts relating to scientific research
- Management of government research funding and organisation of project funding application rounds
- Management and reporting of research funding
- Monitoring services to investigator initiated research projects

- Publication data collection
- Advisory services for various research-related questions
- Biostatistician services

<https://www.varha.fi/fi/tietoa-varhasta/tieteellinen-tutkimus/tutkimuspalvelut>

<http://www.turkucrc.fi/>

Finnish Functional Genomics Centre

Finnish Functional Genomics Centre (FFGC) is a national core facility for genomics services and a testing laboratory No. T351 accredited by FINAS Finnish Accreditation Service for production of sequence raw data for various further analyses from genomic DNA with next-generation sequencing (accreditation requirement SFS-EN ISO 17025:2017).

FFGC operates at the Turku Bioscience Centre, which is a joint department of University of Turku and Åbo Akademi University and belongs to the national Biocenter Finland infrastructure network. FFGC supports high level research by

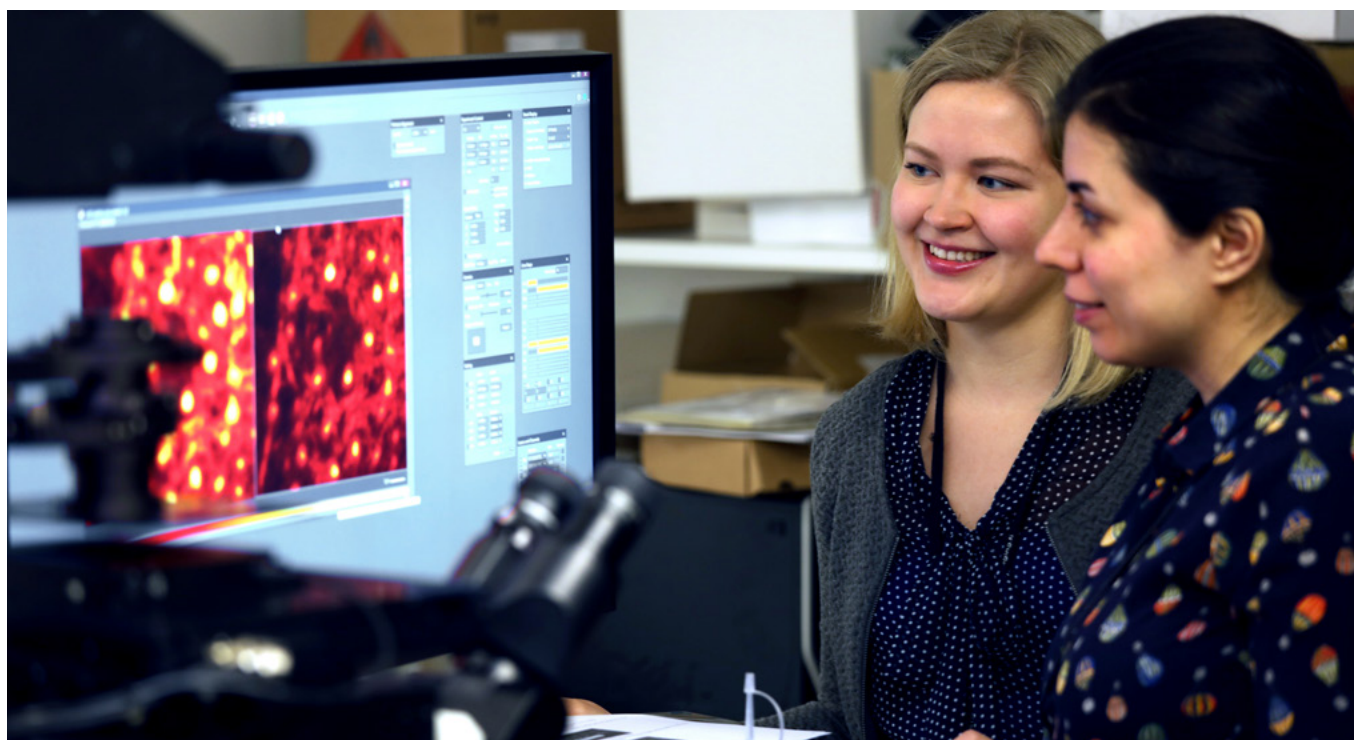
providing open access to the state-of-the-art technologies and services with the latest methods available for genome analysis. Currently the most important services include next-generation sequencing based analysis of genomes, exomes, transcriptomes, epigenomes and metagenomes. The service users include academic and government's research units, health care units and organizations from private sector.

FFGC continuously develops and improves the provided services in close collaboration with the key stakeholders and in collaboration with the Genomics Unit of Turku University Hospital Laboratories provides services for exome and whole genome sequencing.

<https://bioscience.fi/services/functional-genomics/services/>

Minna Kyläniemi, PhD, Head of FFGC





Turku BioImaging

Turku BioImaging (TBI) is an umbrella organization connecting Turku-based biological and medical imaging activities, facilities, and people, and integrally linking them with national and international imaging organizations and projects. TBI has its own Operations Team, which takes care of coordination tasks and directly provides some of the services, and TBI-associated imaging facilities encompass state-of-the-art technologies, ranging from molecular and cellular imaging to high content analysis and whole animal and human imaging.

TBI coordinates the collaboration of different imaging facilities in Turku. Internationally, TBI manages Euro-BioImaging Finland, the Finnish service organization of the Euro-BioImaging infrastructure (www.eurobioimaging.eu). Euro-BioImaging, hosted by Finland and Turku, provides open access to imaging technologies, training, and data services across Europe. Euro-BioImaging Finland provides imaging services also within the canSERV initiative, where user

projects related to cancer research and translation into personalized oncology get support and free access to cutting-edge imaging services. TBI has been very successful in getting canSERV applications to Finland.

Together with its national and international partners, TBI is also very active in several other networks and projects, such as Bio-Image Informatics Finland, Global BioImaging, and ISIDORE, and collaborates with both Finnish and international units of several European life science infrastructures, such as EU-OPENSEREN and ELIXIR.

TBI coordinates the most significant imaging funding proposals for the whole Finland, the latest one bringing in 7.2 M€, of which almost 2.5 M€ to Turku for new microscopes, staff salaries, and service development to local imaging facilities. TBI also provides open-access image analysis, deep learning, and data management services, organizes workshops and imaging-related events, operates an international MSc programme in biomedical imaging (BIMA), and leads Field of

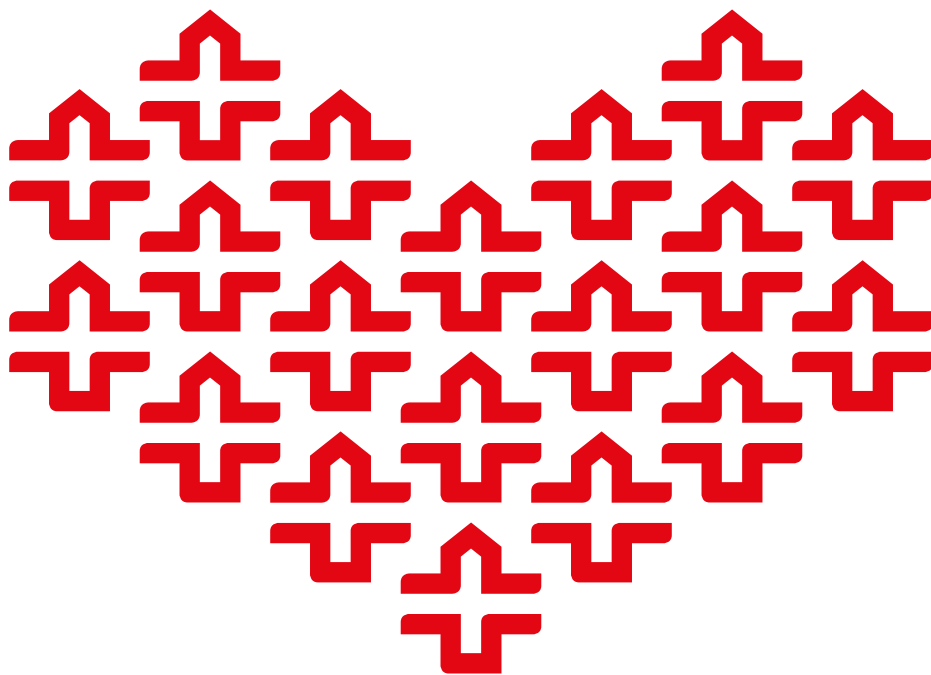
View, a research program of BioCity Turku focused on imaging. Both the University of Turku and Åbo Akademi University are active in TBI, with numerous services offered by units such as the Cell Imaging and Cytometry Core of Turku Bioscience Centre and Turku PET Centre.

Imaging, on all different levels, plays a fundamental role in cancer research. For instance, in Turku PET Centre, oncology research aims to increase the clinical impact and diagnostic accuracy of PET imaging. Multidisciplinary research teams develop and evaluate novel PET ligands and explore new hybrid imaging technology and acquisition protocols. As an example, a recent study showed prostate specific membrane antigen PET/CT to be an accurate diagnostic tool that might become a new reference standard in prostate cancer metastasis detection.

www.bioimaging.fi

Pasi Kankaanpää, Head of biological imaging

Tiina Saanijoki, Head of medical imaging



Parannamme joka päivä