Annual Review 2024

KAROLINSKA
UNIVERSITY HOSPITAL

WE ARE PART OF
REGION STOCKHOLM

A day at Karolinska University Hospital

443 patient visits to emergency departments
83 by ambulance and **2** by helicopter

1,073 patients admitted to inpatient care

272 surgeries and interventions

1,337 pathology reports

766 radiological examinations

19 childbirths

4,820 physical visits, **157** video consultations and
1,031 telephone consultations

7 helicopter flights from Solna and Huddinge

217 chemotherapy treatments

3,440 consultant visits, **291** physical therapy visits and
1,655 nurse visits

120 dialysis treatments

5,077 medical dictations

SVANENMÄRKT
Trycksak
3041 0001

THIS REPORT WAS PRINTED ON PAPER CERTIFIED BY THE NORDIC ENVIRONMENTAL INITIATIVE "THE SWAN". THE PRINTING PROCESS WAS FULLY POWERED BY RENEWABLE AND TRACEABLE ENERGY.

Contents

■ Christophe Pedroletti.
Photo: Fredric Möller Eklund.

The power of Karolinska

For me, 2024 became the year I returned to Karolinska University Hospital and was entrusted with the responsibility of becoming the hospital director. It has been a long time since I first walked through the corridors as a young doctor, but much remains the same. The common thread is the dedication of our staff to our patients and the strong desire to continuously improve healthcare. Karolinska is constantly driven forward by employees, researchers, and clinical educators who set high ambitions for themselves and for the hospital every day. There is immense power within Karolinska, and it is no coincidence that we continue to be ranked as one of the best hospitals in the world.

This year's annual review highlights some of the hospital's everyday work. We talk about research and education conducted in collaboration with Karolinska Institutet, the medical advances that benefit our patients, how we are making healthcare more accessible, and how we are developing our operations. We also share insights into our collaborations with hospitals around the world. Of course, the list can go on, and not everything fits in the annual report.

I would like to extend my heartfelt thanks to everyone who has contributed to our continued success. Together, we are Karolinska!

Christophe Pedroletti, MD, PhD
CEO
Karolinska University Hospital

The key word is *'Together'*

Karolinska University Hospital can look back on a successful 2024. Despite the challenges in our external environment and continued economic difficulties, the hospital's employees have maintained their commitment, expertise, and professionalism, providing the best possible care to our patients. This year, more than ever, the key word has been *together*.

As a university hospital in the country's largest region, Karolinska holds a special responsibility; not only to develop the healthcare of tomorrow but also to contribute to equitable care. The hospital's vision to *"cure and relieve tomorrow what no one can cure or relieve today"* is a strong obligation, and throughout the year, Karolinska has taken on an increased responsibility to contribute to reducing waiting times for care, both regionally and nationally, where capacity allows.

In 2024, the hospital has continued to deliver care, research, and education of the highest quality, achieving world-class results in many areas (e.g., reducing 30-day mortality after open heart surgery) and improved outcomes throughout the year (e.g., for stroke patients placed directly in stroke units and hip fracture patients undergoing surgery within 24 hours). Accessibility remains one of the hospital's priorities, with the goal of as many patients as possible receiving care in time. The number of patients waiting for surgery beyond the national care guarantee has decreased significantly over the course of this year.

The hospital also continues to prioritize research and education. Key focus areas include the continued implementation of precision medicine and cell and gene therapy in clinical practice, further development of highly specialized healthcare at home, and artificial intelligence (AI). The hospital's excellent results and strong reputation continue to make an international impact, with Karolinska ranked among the top ten in the world for the fifth consecutive year according to Newsweek (the only global ranking of hospitals).

Karolinska aims to be a workplace people long to be part of, where trust and openness are guiding principles. Employee surveys show positive results for most areas of the hospital, compared to other hospitals in the region, but it has also become evident that challenges remain. As a result, a focused effort to promote a culture of trust has been initiated and will continue into 2025.

Economic conditions in 2024 have been challenging, with inflation, increased pension costs, and conflicts between labor market parties. The year's financial result shows a deficit of SEK 549 million. Throughout the year, the hospital has focused on measures to ensure production and reduce underlying costs. Thanks to structural and production-enhancing actions, the hospital is well-positioned to return to financial balance in 2025.

For the fifth consecutive year, Karolinska has delivered more care to the people of Stockholm than was commissioned by the region—106%. A key development in 2024 has been the expanded regional collaboration, in which Karolinska plays a unique role. Throughout the year, together we have reduced the need for temporary staff while ensuring good access to care for the people of Stockholm during the spring labor market conflicts. A regional joint production planning initiative for increased access to care will be intensified in 2025 through improved resource utilization.

Additional important themes this year have included a strengthening of the hospital's crisis and disaster preparedness—in times both of peace and war—as well as a continued focus on international cooperation in a turbulent global environment. This includes involvement in European and Nordic university hospital alliances and intensified efforts to support healthcare in Ukraine.

■ Photo: Sofia Frisk.

■ Photo: Carin Tellström.

One university hospital in several locations

Karolinska University Hospital is Stockholm Region's appointed university hospital with a specific task of providing specialized and highly specialized healthcare. Karolinska also treats patients from other regions and from other countries. Karolinska has been given the primary responsibility in the region to undertake research and to educate students in cooperation with Karolinska Institutet and other higher-education institutions and universities.

The hospital has some 16,000 staff across approximately 150 professions. Services are provided primarily in two locations: Solna Municipality just north of Stockholm city center and Huddinge Municipality to the south.

The hospital organization, divided into six theme areas and three functions, has been designed to follow the patient's path through the healthcare process. Central administrative functions support core clinical operations.

Theme areas and functions:

- Emergency Medicine and Reparative Medicine
- Pediatrics (Astrid Lindgren Children's Hospital)
- Cancer
- Heart, Vascular and Neuro
- Inflammation and Ageing
- Women's Health & Allied Health Professionals
- Medical Diagnostics Karolinska
- Perioperative Medicine and Intensive Care
- Perioperative Medicine and Intensive Care—Pediatrics

In each of these theme areas and functions, there is significant freedom to employ an organizational structure that meets specific needs. Several have chosen what is known as a two-legged structure: instead of having a traditional set-up with just one head of department, often a physician, this role works in tandem with the individual, usually a nurse, who heads the care unit and is in charge of nursing.

One of the World's Best Hospitals—for the fifth consecutive year

In 2024, Karolinska once again achieved a high ranking in Newsweek's 'World's Best Hospitals' list. For the fifth consecutive year, the hospital was ranked in the top ten, securing 7th place globally.

World-class specialized care

In the fall, Newsweek presented its fifth global ranking, World's Best Specialized Hospitals 2025, listing the leading hospitals in twelve medical fields. For the first time, Karolinska University Hospital made it to the top of the list in all areas.

Karolinska achieves the highest global ranking in cardiology, securing 20th place, followed by neurosurgery at 25th, neurology at 27th, and endocrinology at 28th. In the Nordic region, Karolinska University Hospital is considered unique. In ten of the twelve medica specialties, the hospital ranks as the best in Nordic countries, and in the remaining two areas, it is ranked second-best.

Still one of the world's smartest hospitals

2024 marked the fourth consecutive year that Newsweek published its world ranking of hospitals excelling in the use of advanced technology in healthcare. Karolinska University Hospital remained at the top, ranking as the 13th smartest hospital in the world.

The ranking examines how well hospitals implement new smart technologies and use them to provide better patient care. It evaluates the use of the most advanced technology in areas such as artificial intelligence, robotics, digital imaging, telemedicine, electronic functionality, and VR technology. Karolinska stands out, particularly for its use of artificial intelligence in diagnostics and treatment.

World-class medical results

Karolinska's world-class outcomes year after year are the result of the high level of expertise among Karolinska's staff, combined with a long tradition of developing and improving care. Below are some areas in which Karolinska's healthcare services have contributed to even more patients surviving advanced medical procedures and serious illnesses.

Increased survival after surgery for older patients

A new study analyzing over 600,000 surgeries performed at Karolinska University Hospital shows an increase in survival rates, despite patients being older and having more comorbidities.

The study was led by clinicians and researchers from Karolinska University Hospital and Karolinska Institutet and covers all surgeries, totaling 622,814, performed on adult patients at the hospital's Huddinge and Solna campuses between 2006 and 2021.

The study reveals that patient mortality decreased across almost all groups and time intervals examined.

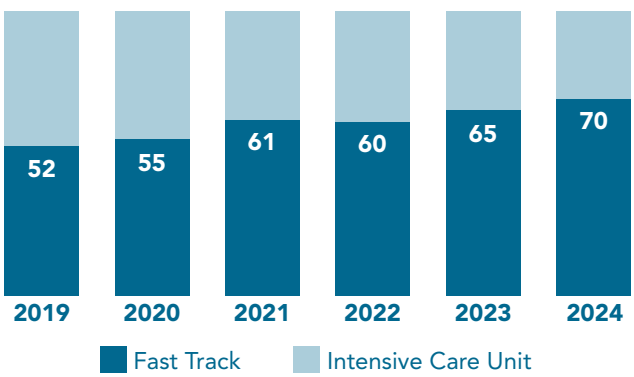
The most significant improvements in survival were seen among patients over 75 years of age, where mortality dropped both short-term (30 days) from 6.4% to 4.7%, and long-term (365 days) from 23.0% to 18.2%. Even after adjusting for age, gender, comorbidities, and emergency surgeries, the risk of death was about 25% lower during 2018–2021 compared to 2006–2009.

Continued success in heart surgery and lung surgery

A total of 69% of all minimally invasive heart surgeries in Sweden are performed at Karolinska University Hospital, totaling 218 procedures in 2024. This is the largest number of minimally invasive heart surgeries ever carried out at the hospital. An increasing proportion of heart surgeries are now done via the "fast track" approach, with 70% of surgeries in 2024 using this method. In a fast-track approach, patients are placed in a cardiac recovery unit after surgery, are quickly awakened, and have a lower level of monitoring, reducing the risk of complications. The mortality rate for fast-track patients was 0.3% in 2023. For aortic dissection type A, the mortality rate at Karolinska in 2023 was 5.6%, compared to the national average of 14.9%.

Karolinska also performs the highest number of lung surgeries in Sweden, with over 600 operations in 2024, the highest number ever. Of the lung cancer surgeries, 94% were performed using minimally invasive techniques, which typically allow for discharge within one to two days following the procedure.

The percentage of heart surgery patients cared for through a fast-track approach:



Sources: Swedeheart, Thorax-surgical quality record, et al.

■ Operation med singelport-robot. Photo: Karolinska.

First in Europe with new surgical robot offering significant patient benefits

Karolinska University Hospital has been using robotic surgery for over 20 years. In April 2024, the hospital was the first in Europe to perform operations using a new type of robot that was recently approved for the European market. Since then, several types of surgeries have been carried out with this robot.

Unlike other surgical robots, this one uses only one entry point. Both the camera and instruments enter the body through the same path and can then unfold at the surgery site. This approach allows for more patient-friendly surgeries, such as in the case of kidney cancer operations, and enables new types of surgeries that were previously unfeasible. The robot can also make a significant difference for patients, allowing the robot access through body orifices.

"For the individual patient, those with throat cancer benefit the most from the single-port robot, as the surgery can be done transorally, instead of having to split the jawbone to reach the tumor, as was done previously. The post-operative benefits are immense, both in terms of suffering and recovery time," says Signe Friesland, Director of the Medical Unit for Head, Neck, Lung, and Skin Cancer.

100 surgeries completed with the single-port robot in 2024

- 53 prostatectomies
- 18 other urological procedures
- 14 gynecological procedures
- 10 ENT cancer surgeries
- 5 colorectal procedures

Best in Sweden at benign gynecological surgery

The national results for women's clinics in Sweden were recently presented in the Swedish Society for Obstetrics and Gynecology's (SFOG) annual report. The report compiles quality measures in women's healthcare and compares them across all women's clinics in the country. Karolinska University Hospital has achieved the best results for benign gynecological surgery and is one of only two clinics in the country to meet all five quality targets.

Karolinska University Hospital's results* for gynecological surgeries included in

- Incontinence surgery: 100%
- Adnexal surgery: 99%
- Intrauterine surgery: 93%
- Reconstructive pelvic floor surgery: 87%
- Hysterectomy: 81%

** The target values measure various factors, including the extent of minimally invasive surgery, patient satisfaction after one year, whether patients report a feeling of bulging after one year, and whether patients sought care due to unexpected issues within eight weeks.*

■ Photo: Malin Jochumsen.

Evaluation by our patients

Karolinska University Hospital systematically works to increase patient involvement in healthcare. Patient-reported outcome measures (PROM) play a central role and are a way of capturing the patient's experience of the results and function after treatment or surgery. The survey is used across most departments and is available in both analogue and digital formats. The results provide valuable insights on how treatments impact the patient, how these outcomes change over time, and how they compare to other healthcare providers. PROM is used in the hospital's improvement efforts and contributes to enhancing the quality of care, treatment, and patient interactions.

Another important source of evaluation and insights regarding patient experience are the patient surveys called PREM patient surveys (Patient Reported Experience Measures), which are automatically sent out after visits to outpatient clinics, day care, or inpatient care. Patients receive the survey via 1177 and can easily answer questions regarding aspects such as interactions, information, and involvement. There's also an option for open responses, which are a valuable source for improvement work within the services. In 2024, Karolinska received 97,510 responses from adults, with 93.7% reporting that the visit was either "very good" or "good". Additionally, 6,982 surveys for children were answered by guardians, with 92.3% reporting the visit as "very good" or "good".

240 standardized PROM tools were used at Karolinska during 2024	
Cardiology	7
Cardiac Surgery	4
Endocrinology	40
Gastroenterology	15
Neurology	10
Neurosurgery	10
Obstetrics and Gynecology	5
Oncology	25
Orthopedics	10
Pediatrics	25
Pulmonary Medicine	15
Urology	9
Other	65

A valuable tool for achieving the best treatment outcomes

At the Rheumatology Clinics within the Gastro, Dermatology, and Rheumatology Department, patient-reported outcomes (PROM) are an integral part of every follow-up visit. Patients report their levels of pain, fatigue, mood, and several other metrics on a tablet in the waiting room. When they meet with their rheumatologist, the patient and the doctor can jointly evaluate the results, which, in combination with newly taken blood tests, provide an important basis for decisions regarding continued treatment and follow-up.

"Early follow-up with PROM in the disease course offers the opportunity to personalize treatment and focus appropriately from the start," says Jon Lampa, Head of Department and Rheumatologist, and he continues:

"Additionally, self-reporting facilitates discussions during the visit regarding symptoms such as pain and disease-related fatigue, which can significantly impact quality of life. The work with PROM has contributed to high-quality care that stands out well both nationally and internationally."

Improved use of patient-reported data at the Cancer Theme

Since 2021, patients at the Cancer Theme have been completing a health assessment questionnaire after finishing cancer treatment. The questionnaire includes common issues for cancer patients, where patients rate their symptoms on a scale from "no problem" to "very troublesome." These self-assessments are used as a basis for mapping and needs assessment, and serve as a foundation for discussions about rehabilitation needs between the patient and their contact nurse. The information can be analyzed based on variables such as age group, care unit, and gender, enabling more personalized and improved care.

"A current development project is exploring how we can use patient-reported outcome data for analysis and follow-up, by tracking trends in reported symptoms in relation to different types of cancer medications and surgical interventions. This could lead to further improvements in treatment methods and rehabilitation efforts, as more parameters can be considered during process changes," says Frans Karlsson, Senior Data Analyst at the Cancer Theme.

The patient's self-assessment serves as the basis for discussions about rehabilitation needs between the patient and their contact nurse.

■ Elsa Tiger.
Photo: Fredric Möller Eklund.

Research, education, and innovation

At Karolinska University Hospital practices, university healthcare is practiced, which means that care, research, and education form a threefold core mission. In collaboration with Karolinska Institutet and the life sciences industry, the hospital works to improve care and treatment for patients in Stockholm and around the world. Research at Karolinska remains strong, with several quality and quantity indicators showing improvement from the previous year. This year's strategic work was focused on simplifying the administrative aspects of research and on launching a hospital-wide follow-up of patient inclusion in interventional studies. Innovation is essential to fulfill Karolinska's vision of curing and relieving tomorrow what no one can cure or relieve today. Karolinska's operations are innovating in various ways to develop new treatment methods, work processes, and technologies. The goal is to create the best possible care based on patients' needs. Strategic focus areas in 2024 have included artificial intelligence, precision medicine, highly specialized hospital care at home, and industry collaboration based on healthcare needs.

2,587 active researchers

774 principal investigators

2.20 citation rate

2.44 billion SEK in external research grants in collaboration with KI

1,689 ongoing/planned clinical studies (as of January 2025)

New research platform reduces processing time for data retrieval

One of the key infrastructure issues for Swedish medical research and development is access to healthcare data. Recently, all completed radiological examinations at Karolinska University Hospital became searchable in the research platform Radiance, launched by the hospital in early 2024. By efficiently counting and significantly reducing processing times—from months to weeks—the platform aims to simplify and streamline researchers' work.

New findings on women's fertility

Researchers at Karolinska University Hospital have made new discoveries about follicles, the cell sacs in women's ovaries, which could have implications for future infertility treatments. A new study shows that there are two types of immature follicles in a woman's ovaries, and they likely serve different functions. According to the researchers, only one type of follicle is involved in egg production, while the other seems to be entirely dedicated to hormone secretion, a process called signaling. This discovery could influence how we assess female fertility in the future and how we treat infertility.

Collaboration to detect Alzheimer's disease earlier

The AD-RIDDLE program is focused on providing patients and healthcare systems with more and better tools to prevent, detect, and treat Alzheimer's disease earlier. These tools will be gathered on a digital platform that can be used in various healthcare environments such as memory clinics, primary care, and even outside traditional healthcare settings.

"Detecting dementia early, already in primary care, offers good opportunities to start effective, personalized treatment and preventive measures. This can truly improve the lives of those living with the disease," says Miia Kivipelto, geriatrician and Head of Research and Development at the Inflammation and Aging Theme at Karolinska, who leads the project, which involves 24 partners from several European countries.

■ Miia Kivipelto. Photo: Erik Cronberg.

Karolinska monitors patient inclusion in real-time for interventional studies

Ensuring that interventional studies meet their target patient inclusion numbers is crucial for both the studies' outcomes and the hospital's competitiveness in clinical trials. In 2024, Karolinska began tracking real-time patient inclusion statistics.

"It's all about delivering on patient inclusion. Sweden is a small country, and we can only be attractive as a study site and partner if we keep our promises. With the new statistics, both the department and individual investigators receive real-time feedback and can act if a study is at risk of missing its inclusion target," says Olof Akre, newly appointed Director of Research, Education, and Development (FoUU) at Karolinska University Hospital.

■ Olof Akre.
Photo: Ateljé Uggla.

■ Mammography.
Photo: Karolinska.

New study shows AI combined with MRI increases early detection of breast cancer

A new clinical study demonstrates that an AI-based method for selecting women for supplementary screening with magnetic resonance imaging (MRI) can significantly improve the detection of breast cancer missed by traditional mammography. The study, led by Fredrik Strand at Karolinska University Hospital, highlights how innovative AI technology could potentially revolutionize current breast cancer screening practices. Through deep learning, the AI technology is able to recognize more subtle patterns in the images compared to the established method based on radiologists' visual assessment of mammographic density across four categories.

In the study, 36 cancer tumors were detected among 559 women who had previously been declared cancer-free by conventional mammography. Compared to the results of an earlier clinical study based on mammographic density, the AI method was about four times more effective at detecting cancer, with 64 cases detected per 1,000 MRIs compared to 16.5 cases per 1,000 in the previous study. This AI-based method holds great promise for improving the detection of invasive and multifocal cancers, underscoring its potential to complement traditional mammography.

Precision medicine treatment with bacteriophages: A contribution in the fight against antibiotic resistance

The introduction of a precision medicine treatment, bacteriophage therapy, for difficult-to-treat bacterial infections could save lives in the battle against antibiotic resistance.

"We have a large collection of bacteriophages in our research group that are effective against some of the most common disease-causing bacteria. We can produce the bacteriophages in our research lab, study their effects and resistance development, and characterize them. With our partners, we have conducted animal studies and are planning the production of bacteriophages for use in a clinical drug trial to treat respiratory infections in people with cystic fibrosis," says Elin Loo, Specialist Clinical Microbiology Physician.

■ Elin Loo. Photo: Nneka Magnusson Amu.

First in Sweden with new treatment for vascular malformations

Patients with vascular malformations can now benefit from electric shocks. For some patients, traditional sclerotherapy has limited or no effect, and for these patients, the new method using electric shocks, called electrosclerotherapy, may provide a solution. Electrosclerotherapy uses an electrical current on the malformations, allowing the vessels to better absorb relevant medication, which then has a stronger effect on healing the malformations. In June 2024, Karolinska University Hospital became the first hospital in Sweden to use this new method for treatment.

■ Photo: Karolinska.

Virtual twin to provide better care for patients with type 2 diabetes

Karolinska University Hospital is participating in a large EU project in AI and precision medicine. A virtual twin will help doctors provide more personalized care to patients with type 2 diabetes. By training AI models, researchers can create virtual twins of patients. Hospitals can then use these twins to simulate how patients may respond to different types of treatments. In Stockholm, the plan is for up to 600 patients with type 2 diabetes to receive care with the aid of a virtual twin.

"With virtual twins, we can tailor the treatment of type 2 diabetes for each patient," says Paolo Parini,Senior Consultant at Karolinska University Hospital and leader of the Swedish Clinical Research Team in the project.

■ Paolo Parini (the image is a montage). Photo: Danish Saroee.

15 million SEK for precision medicine

The Theranostics Trial Center (TTC) at Karolinska University Hospital was awarded over 15 million SEK by Vinnova in fall 2024 to drive a new project in precision medicine. By combining image-guided diagnostics and therapy with radioactively labeled target-seeking drugs, the project aims to revolutionize cancer treatment in Sweden. The goal is to create a strong innovation environment where precision medicine and groundbreaking treatments with radioactively labeled targeted drugs can be developed and implemented into clinical practice.

AI coach to detect child abuse

Using an AI-based training tool, healthcare professionals can practice conversing with children to detect abuse. The tool, developed by the Child Protection Team at Karolinska, allows staff to engage in chats with child avatars with different background stories. There is also an opportunity for digital coaching and evaluation.

"It is crucial that healthcare staff can identify signs of abuse when children seek care for symptoms that may be related to it. Our model allows professionals to practice as many times as needed until they feel confident in asking questions and conversing to detect children who are exposed to various forms of abuse," says Helena Agenäs, Head of the Child Protection Team.

Over 23 million SEK for innovation in nursing

Karolinska University Hospital has been granted nearly 23 million SEK from the European Social Fund to strengthen innovation in nursing. The project runs until 2027 and initially focuses on nursing staff within the Acute and Reparative Medicine Theme, with the ambition to eventually expand the model throughout the entire hospital. The goal is to increase staff involvement in innovation processes and develop collaborations with industry, academia, and patients.

The Nordics' first Excellence Center in mycology

Mycology is the scientific study of fungi. Karolinska's Medical Diagnostics, a leader in mycological diagnostics, together with the Medical Unit for Infectious Diseases, has recently been designated the first Excellence Center in the Nordic region for mycology by the European Confederation of Medical Mycology (ECMM).

"Invasive fungal infections are often complex to investigate and can, in acute cases, be life-threatening. Rapid and accurate diagnosis, as well as access to effective treatment options, is therefore extremely important. Through the Excellence Center network, new opportunities are created to share knowledge and exchange experiences at an international level," says Ola Blennow, Associate Professor and Senior Consultant in the Infectious Diseases Department.

First in the Nordics with new technology for heart valve leak procedures

In April 2024, Karolinska became the first hospital in the Nordics to use a tricuspid prosthesis (artificial heart valve) for catheter-based procedures. The procedure lasted two hours and was performed through the groin without complications and with excellent results.

"A tricuspid prosthesis without open surgery provides improved quality of life for patients we couldn't help before. We have built a strong team with extensive experience, not just operators but also, for example, doctors specialized in ultrasound, which is crucial during these advanced procedures," says Andreas Rück, Senior Consultant in the Cardiology Department.

AI identifies risk for atrial fibrillation

An innovative project is making it possible to identify the risk of atrial fibrillation even when an EKG appears normal to the naked eye. By focusing healthcare resources on the right patients, AI can reduce the number of individuals needing additional screening, making the process faster and more accurate.

"We have developed a model that uses AI to assess a patient's risk for atrial fibrillation with a simple handheld single-channel EKG, even when the patient's EKG appears normal at the time. Many people live with undiagnosed atrial fibrillation, and if undiscovered, they cannot receive the proper treatment and care," says Emma Svennberg, Consultant in Cardiology.

■ Emma Svennberg. Photo: Fredric Möller Eklund.

Genetic mapping becomes clinical routine in sarcoma treatment

Whole-genome sequencing is now being integrated at Karolinska as part of the clinical routine for diagnosing and treating sarcoma, following a successful study. This means that patients will benefit from more accurate diagnostics and personalized precision medicine treatments based on the tumor's individual genetic profile.

"With greater certainty, we will be able to classify very rare tumors and offer more patients well-tailored treatments," says Felix Haglund de Flon, associate professor and Deputy Senior Consultant at the Department of Clinical Pathology and Cytology.

■ Photo: Fredric Möller Eklund.

Leadership and nurse-driven innovation in focus at collaboration with Mayo Clinic

In a joint meeting in October 2024, Karolinska University Hospital, Mayo Clinic, and Karolinska Institutet explored innovative methods for leadership and change within healthcare. The discussions emphasized the importance of new leadership models, patient-centered care, and the integration of precision medicine and AI to address future healthcare challenges. A highlight was the launch of a collaborative initiative between Mayo Clinic and Karolinska University Hospital, focused on driving nurse-led innovation.

The ongoing dialogue between Karolinska University Hospital and Mayo Clinic exemplifies the power of international collaborations to advance healthcare, with a shared commitment to leadership, innovation, and continuous improvement in patient care.

Third national training in robotic surgery held

Karolinska University Hospital began robotic-assisted surgery in 2002 and is now one of Europe's largest robotic centers, with eight robots across four models. For the third consecutive year, the Department of Perioperative Medicine and Intensive Care held a training course in robotic-assisted surgery. 100 participants from across the country attended the two-day training held in Stockholm in October. The program included lectures on surgical and anesthetic techniques, nursing lectures, smart and standardized workflows for both planned and emergency cases, as well as multidisciplinary group discussions.

■ Photo: Fredric Möller Eklund.

Pediatric cancer included in Karolinska Comprehensive Cancer Center

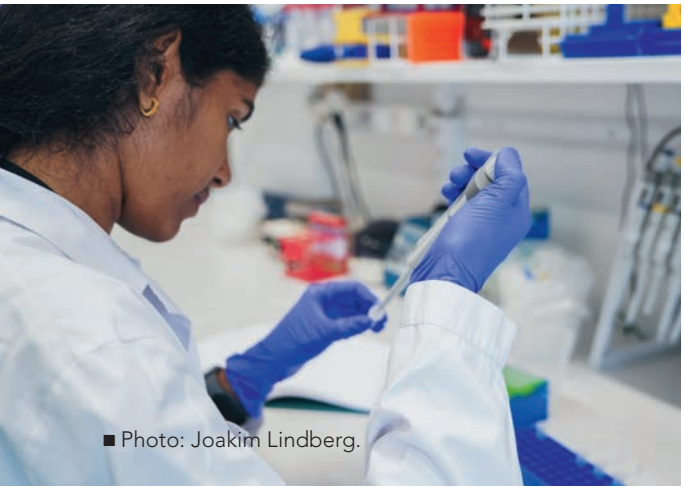
Karolinska Comprehensive Cancer Center (CCC) brings together top expertise in highly specialized cancer care and research. The center is a collaboration between Karolinska University Hospital and Karolinska Institutet. A high priority in 2024 has been the work on the re-accreditation process, with pediatric cancer now included in Karolinska CCC. One focus area has been palliative cancer care, and during the year, a dedicated team of doctors and nurses has been established. Another area of focus has been international engagement. As part of the EU's Beating Cancer plan, Karolinska CCC has engaged in eight different initiatives and continues to expand its involvement.

"I feel immensely proud of the dedication of all our staff at the cancer center and the highly specialized expertise we have in care, research, and education—always in close collaboration with our patient network," says Ann-Britt Johansson, Karolinska CCC Coordinator.

Karolinska ATMP Center—everything under one roof

Cell, gene, and tissue therapies, or "Advanced Therapy Medicinal Products" (ATMP), have the potential to treat and cure diseases in ways that traditional medications and treatments cannot. The collaboration between Karolinska University Hospital and Karolinska Institutet forms a leading ATMP center in Europe, with research, manufacturing, and treatment all under one roof. The center has high ambitions to strengthen and deepen collaboration with public entities and pharmaceutical companies. Currently, there are several approved treatments, including those using CAR-T cells, and more are being developed.

"Being able to treat, and sometimes cure, serious diseases with precise treatment methods in a safe manner will change healthcare. We need to focus on meeting the needs that exist now, as well as those that will emerge in the future. By coordinating the entire chain in one center, we can address and fulfill these needs. The patients are out there waiting," says Knut Steffensen, Director of Karolinska ATMP Center.



■ Photo: Joakim Lindberg.

Course on obstetric injuries with participants from across the country

For the third consecutive year, a national course on obstetric injuries was held at Karolinska. The course focused on second-degree perineal tears and aimed to increase knowledge of pelvic floor anatomy and injury mechanisms during childbirth, to explain how these tears can be prevented and treated in the best possible way. In addition to lectures, participants were able to watch a live, ongoing corrective surgery, via link.

■ The course leaders. Photo: Josefine Franking.

Guidance in focus at collaboration day

In November, for the second year in a row, a collaboration day was organized between Karolinska and academic institutions offering nursing programs at both undergraduate and advanced levels. Both academic institutions and healthcare organizations participated with several presentations on the theme of clinical supervision. The focus was on the exchange of knowledge and experience between universities and hospitals, as well as on education with an emphasis on both student achievement and patient safety.

35,768
completed student weeks 2024 (preliminary figure)

770
employees in Region Stockholm have been trained and received Good Clinical Practice certification in 2024

59
research nurses have been trained at Karolinska in 2024

■ Lena Forsberg. Photo: Josefine Franking.

Continuing to provide care for more patients

Access to care for patients is a top priority at Karolinska University Hospital. Therefore, the hospital continues its work to improve the conditions, in order to provide timely care. This is reflected in everything the hospital does, in which an important part is to strengthen the hospital's production and capacity planning to ensure that the hospital's many different resources are used in the best possible way. Focused efforts and targeted actions in several departments have contributed to improved accessibility. Collaboration within Region Stockholm to enhance accessibility across all hospitals has expanded during the past year, and further cooperation on joint production planning is planned for 2025.
The hospital has minimized the need for hired staff through successful initiatives, instead shifting focus to employing permanent staff. Benefitting both the work environment and accessibility of care.The cost of hiring external staff was reduced by 201 million SEK in 2024 compared to the full year of 2023, a decrease of 70%. Of this, 157 million SEK is attributed to the hiring of nurses, a decrease of 82%.

"Choosing Wisely" guidelines implemented in geriatrics

In 2024, the Aging Theme conducted a transformative project in collaboration with the Clinical Physiology Medical Unit. The goal was to reduce unnecessary examinations, and after six months, the results indicate success; among other outcomes, there has been a 30% reduction in echocardiograms.

"We need to know when the care we provide causes more harm than benefit. The goal is not to affect care flows or quality, but to avoid examinations that have low value, create displacement effects, and cause unnecessary suffering for the patient," says Masih Khedri, Specialist Physician and Head of Department at the Aging Theme at Karolinska, in charge of the project called "the multimorbid elderly patient".

At the end of 2023, employees at the Inflammation and Aging Theme initiated this change process, which is based on the "Choosing Wisely" guidelines. This aims to reduce 'low-value care'—interventions with no patient benefit, which can be summarized into overdiagnosis and overtreatment.

The review of procedures led to an updated approach. One example of this is the routine use of echocardiography. Today, there are 30% fewer echocardiograms performed on the geriatric patient group compared to 2023. Lena Forsberg, Head of the Department of Clinical Physiology, explains:

"We continuously assess whether an echocardiogram makes a difference for the patient. In many cases, a thorough medical history, physical examination, resting ECG, and a blood test are sufficient, and this way we can avoid subjecting patients to the discomfort that comes with an examination."

Here are the guidelines for geriatrics:

Five things to do less of:

- Perform pleural drainage on asymptomatic patients with small to moderate fluid volumes, unless for diagnostic purposes.
- Perform a brain CT scan for minor head trauma in patients without risk factors such as anticoagulants and coagulation disorders.
- Perform echocardiography if it does not alter management.
- Order blood tests for inpatients unless there is a specific indication.
- Conduct radiological and neurophysiological investigations of frail patients in early or late palliative stages when such investigations will not alter management.

Five things to do more of:

- Tailor the investigation for cognitive diseases or suspected underlying malignancies in frail patients. Consider what the patient can tolerate, and which results will impact management.
- Avoid routine radiological and physiological investigations of frail patients in the palliative phase when such investigations will not alter management.
- Have "serious illness conversations" with patients in the early and late palliative phases. This precedes the breakthrough conversation.
- Maintain openness and collaboration within the team regarding treatment decisions for patients with serious illnesses.
- Take recommendations from organ-specific consultants into consideration, but the primary responsibility remains with the attending consultant in geriatrics.

■ Isabell Dillström Gustafsson, Ann-Charlotte Lindström, and Ulf Gustafsson. Photo: Josefine Franking.

New preoperative clinic for frail elderly patients

A high-risk clinic for elderly patients undergoing major surgical procedures for colorectal cancer has been running as a pilot project. This is a collaborative project between Function PMI, the Cancer Theme, and the Inflammation and Aging Theme at Karolinska University Hospital.

As the population lives longer, an increasing number of elderly patients require surgery for cancer. The potential for improvement in the preoperative management of geriatric patients has driven the collaboration initiative at Karolinska.

A preoperative clinic for elderly patients undergoing colorectal cancer surgery was therefore launched in 2024 as a pilot project, led by Ann-Charlotte Lindström, Associate Senior Consultant at Peri-Operative Medicine & Intensive Care Function, alongside Isabell Dillström Gustafsson, Consultant in Geriatrics, and Ulf Gustafsson, Head of the Cancer Theme section.

"Previously, these patients did not receive sufficient preoperative optimization, but now a comprehensive assessment is made by a multidisciplinary team. The focus is on reducing complications and improving long-term outcomes. Both Function PMI, the Cancer Theme, and the Inflammation and Aging Theme are necessary to make a reasonable judgment on whether a patient should undergo surgery," says Ann-Charlotte Lindström.

The team holds a joint conference for each patient, where they identify risks that can be reduced preoperatively. Coexisting conditions, particularly heart and lung diseases, must be as well-controlled as possible before surgery. They also review nutritional status, physical function, medications, and assess any risks of confusion that may affect the patient's postoperative care needs.

The pilot ended in August, and during the fall of 2024, the team received funding to expand the clinic to include geriatric patients undergoing gynecological and urological cancer surgeries.

"The importance of geriatric expertise is becoming increasingly evident. We want to demonstrate the long-term benefits of the preoperative clinic, and our goal is to eventually offer it to all geriatric patients at the hospital," concludes Ann-Charlotte Lindström.

Efficient workflow cuts queues for thyroid surgeries

A multi-step effort has successfully eliminated the waiting time for endocrine neck surgeries at Karolinska, particularly for thyroid or parathyroid surgeries. The waiting list was reduced from 126 patients in August 2024, who had been waiting for more than the 90-day care guarantee, to zero by mid-November, resulting in increased availability for the hospital's patients.

Through a well-planned effort across several stages, the Norra Haga surgical department was able to eliminate the waiting times for patients requiring endocrine neck surgery. The goal is to make the process from deciding on surgery to the operation as quick and efficient as possible.

"Our staff needs to work together throughout the entire surgical flow. We must identify what needs to be done and how to shorten the waiting time between the decision to operate and the actual procedure. At the same time, we need to ensure the patient and their family are well-informed and comfortable with the process," says Minna Lönnstedt, Director of Care Unit Perioperative Medicine at Karolinska in Solna.

The reduction in waiting times was achieved by increasing the number of operating rooms, improving flow by starting earlier in the morning, and shortening turnover times in the newly opened Norra Haga surgical department. A mix of day care and inpatient patients optimized room usage. Eventually, the queue consisted only of patients requiring inpatient care.

The remaining patients were accommodated through close collaboration between Perioperative Medicine Unit and the Care Unit.

"We succeeded in increasing the number of inpatient beds by 'borrowing' vacant beds from another part of the hospital. With the help of the Staffing Center, we were able to open five extra inpatient beds several days a week for a limited period. All of this work led to us now being completely free of waiting lists*," says Anna Wiberg, Director of Care Unit at the Cancer Theme.

** This means that there are zero patients ready for operation, who have had to wait longer than the national care guarantee of 90 days. However, there may still be patients who are not ready for surgery due to health issues or personal reasons.*

■ Anna Wiberg, Fredrik Karlsson, and Minna Lönnstedt. Photo: Josefine Franking.

■ Linda Persson, Jenny Häggström, and Linda Nordin. Photo: Josefine Franking.

No waiting time to visit the Hearing and Balance Clinic for children

At the Hearing and Balance Clinic at Karolinska, several measures have been taken to reduce the waiting time for children aged 0-4 years. The efforts have been successful, bringing the waiting list down from over 1,200 patients to almost none.

In the fall of 2022, the clinic noticed that the queues were growing longer. At that time, there were 1,285 children waiting for appointments, even though they had already waited longer than 30 days. Jenny Häggström, section manager at the Hearing and Balance Clinic, explains that the issue was due to a lack of capacity; particularly a shortage of audiologists with expertise in pediatric care, as well as insufficient resources such as space.

A multi-step approach was initiated to address the waiting time. One step was to review the local guidelines for child healthcare centers (BVC) to ensure that only patients with specific needs for the hearing and balance clinic were referred. This was done alongside a review of the entire waiting list by two doctors.

"We made a targeted effort with intensive 'quick appointments' to prioritize those who had been waiting the longest, and where we felt it was important that they be seen by us," says Linda Persson, Care Team Manager.

After previous difficulties, they successfully recruited several audiologists during the summer of 2024. Both experienced professionals and newly graduated audiologists, all of whom have now been trained to work with children aged 0–4 years, were added to the team. This broad effort paid off. By September 2024 there were no children waiting for appointments longer than 30 days.

Increased accessibility of MRI scans

After the pandemic, the Huddinge Radiology department faced long waiting times for MRI scans. By January 2024, nearly 2,200 patients were waiting for appointments or scans. However, by the end of the year, the waiting list was almost nonexistent.

During the pandemic, the waiting lists for MRIs at Radiology Huddinge at Karolinska University Hospital grew significantly. Despite several targeted activities, the problem persisted. Among the patients affected were those at high risk of developing pancreatic cancer, as well as patients with chronic neurological diseases.

"At the turn of the year in 2024, nearly 2,200 patients were waiting for appointments or scans. We realized that we needed to approach the situation differently to meet the demand," says Head of Nursing Valdis Gudmundsdottir.

This marked the beginning of a project group led by Valdis Gudmundsdottir, along with Peter Ehrstedt, Head of Radiology, Marie Linné, Head of Care Unit, and Louiza Loizou, Head of Section. They are responsible for Radiology Huddinge and MRI Huddinge and have been meeting regularly since February to track various activities.

One early success factor was the installation of AI-based acceleration technology, Deep Resolve, in most of the MRI systems. This led to MRI scans being conducted nearly 40% faster, while also improving image quality.

In fall 2024, Radiology Huddinge continued to implement AI across several scans and machines. Additionally, staffing was increased with more radiology nurses, and schedules were adjusted, allowing the MRI machines to operate more often than before.

Another measure was task-shifting, adding competencies other than radiologic nurses to the MRI labs. This led to a new approach where radiology nurses and nursing assistants collaborate on certain types of scans.

In addition, there has been an improvement in filtering out referrals without clear clinical indications, as well as optimizing how appointments are booked and time slots are utilized. The guiding principle has been "right patient, right scan, right time."

"We've also worked cross-site with Neuroradiology in Solna and with Ersta Hospital, which has been performing some of our scans each month," says Louiza Loizou.

These measures have led to success in reducing the waiting list—by the end of 2024, the number of patients waiting for an MRI had dropped to nearly zero.

■ Soroush Sohrabian and Valdis Gudmundsdottir. Photo: Nneka Magnusson Amu.

New adult emergency department in Huddinge

On September 17, 2024, the newly built adult emergency department in Huddinge opened its doors, replacing the old facility that had been in operation for nearly 40 years.

The new department has the capacity to handle 70,000 visits per year, about 20,000 more than the old one, and is designed to meet the future emergency medicine needs of the southern Stockholm region. The facility spans 3,900 square meters, making it 1,000 square meters, or approximately 25%, larger than the previous one. It includes 25 treatment rooms, 25 observation spots, four complete emergency medicine rooms, and four isolation rooms.

"This is a significant expansion that gives us the conditions to provide even better care for our patients while also increasing our flexibility. We are also in a better position to reduce waiting times in the emergency department," says Sara Schulz, Head of the Emergency Department Huddinge.

When planning the new department, a strong emphasis was placed on improving the work environment for staff. The new facilities are much more spacious and brighter than the old ones, designed to support modern practices in emergency medicine.

"Our top priority is always to provide the best care for our patients. But the new facilities are also designed to improve the work environment. We've invested in ergonomically designed workstations and more observation spots, which makes it easier to monitor patient progress. More open spaces will also result in lower noise levels compared to the old facility," Sara Schulz adds.

■ Photos: Dylan Collin and Josefine Franking.

■ The Regional Healthcare Councilor, Talla Alkurdi, cuts the ribbon accompanied by Sara Schulz, Head of the Emergency Department.

■ Several departments gifted celebratory baskets during the inauguration.

■ Employees celebrated and mingled during the inauguration. Many employees took a closer look at the new emergency rooms.

■ Göran Stiernstedt, Chairman of the Board of Karolinska, and Carina Metzner, Head of the Inflammation and Aging Theme.

■ Roberta Nascimento. Photo: Joakim Lindberg.

A hospital for all of Sweden

Karolinska's ambition is to be a Hospital for all of Sweden, and in 2024, the hospital welcomed 20,551 patients from other regions. The hospital's departments offer support to other healthcare providers through services like consultations, on-call lines, and multidisciplinary conferences. Throughout the year, Karolinska has assisted other regions in reducing healthcare wait times and increasing access to specialized care. For example, Region Uppsala received help with planned caesarean sections before the summer, a collaboration with Region Gävleborg was established to reduce waiting times in gynecology, and Karolinska has assisted Västra Götaland Region by operating on patients with colorectal cancer.

In 2024, Karolinska developed a solution to efficiently receive electronic referrals directly into the TakeCare electronic health record system through Inera's e-referral service. The system, "One Path In," allows regions to easily send referrals directly to Karolinska. The hospital ensures that referrals are directed to the appropriate department, simplifying the process, reducing costs, and improving patient safety.

Karolinska has placed a special focus on patients with rare diagnoses and has intensified efforts to improve both knowledge and care for people of all ages living with uncommon health conditions.

"We welcome patients from all over the country to ensure that the specialist care we offer is accessible to everyone who needs it, regardless of where they live. By opening up our expertise and capacity to patients outside of our region, we contribute to more equitable healthcare for the whole of Sweden."

Caroline Hällsjö-Sander,
Chief Production Officer,
Karolinska University Hospital

97.1% of patients from outside the region are satisfied with their care

The Women's Health and Health Professions theme at Karolinska University Hospital treats patients from other regions for a variety of treatments, and 97.1% of out-of-region patients are satisfied with their care, according to the latest PREM survey (November 2024), compared to 95.4% for the entire hospital.

"What makes me especially happy are the comments about how good the reception has been. These are diagnoses that are difficult to talk about. We've worked really hard to make sure patients feel secure and well taken care of, during visits, while on the wards, and during follow-ups," says Emilia Rothstein, Senior Consultant in Gynecology and Reproductive Medicine.

The team that is always on stand-by

Karolinska's neurovascular team treats brain and spinal cord vascular diseases with a multidisciplinary approach that combines vascular neurosurgery, radiosurgery, vascular neurology, and interventional neuroradiology. The team diagnoses and treats a wide range of diseases, including cerebral aneurysms, arteriovenous malformations (AVMs), dural arteriovenous fistulas (AVFs), nerve-vessel conflicts, Moyamoya, Vein of Galen malformations, acute stroke, and neurovascular atherosclerosis.

A multidisciplinary team conference is held once a week, year-round. During these meetings, decisions are made about treatment using endovascular techniques (minimally invasive catheter procedures), microsurgery, or radiosurgery, either as standalone treatments or in various combinations, depending on the patient's condition.

"The multidisciplinary approach, where experts representing each treatment technique come together for each patient, is unique in Sweden," says Fabian Arnberg Sandor, neuroradiologist and neurointerventionalist.

The team is on-call 24/7 year-round to manage acute neurovascular events. For urgent cases, the on-call vascular neurologist, neurosurgeon, and neurointerventionalist meet as a team to decide on diagnostic measures and treatments.

■ The Gamma Knife.
Photo: Fredric Möller Eklund.

National Specialized Medical Care

Karolinska University Hospital is a leading provider of National Specialized Medical Care (NHV) in Sweden, serving patients from across the country. Karolinska holds the highest number of NHV licenses in Sweden, covering particularly rare or difficult-to-treat diagnoses and areas of care. According to Swedish law, national specialized medical care can be provided by a maximum of five healthcare units in the country, aiming to enhance expertise, quality, and patient safety. This centralization ensures that more patients have access to high-quality specialized medical care. Karolinska University Hospital holds 37 NHV licenses, with the newest ones—dysmelia and skeletal dysplasias—taking effect on September 1, 2025. Below is the full list of NHV licenses for which Karolinska University Hospital has been approved as a provider of National Specialized Medical Care.

Liver Transplantation
Treatment of children with cochlear implants
Anorectal and urogenital malformations and Hirschsprung's disease
Congenital diaphragmatic hernia
Esophageal malformations
Ex utero intrapartum treatment (EXIT)
Trophoblastic diseases
Fetal therapy (including intrauterine treatments)
Preimplantation genetic diagnosis (PGD)
Moyamoya disease
Intensive care where liver transplantation may be indicated
Cervical cancer
Neurosurgery for prolapse
Primary sclerosing cholangitis (PSC)
Transjugular intrahepatic portosystemic shunt (TIPS)
HIPEC (Hyperthermic Intraperitoneal Chemotherapy)
Curative treatment for vulvar cancer
Retroperitoneal lymph node dissection Osteogenesis imperfecta (OI)
Stem cell transplantation for systemic sclerosis
Neuroendocrine tumors in the abdomen and advanced adrenal tumors
Neuromuscular diseases
Spinal cord injuries
Chronic lung diseases in children
Pacemaker extraction
Intestinal rehabilitation for children
Certain care for gender dysphoria
Care for intestinal failure in adults
Advanced pelvic surgery
Congenital metabolic disorders, including newborn screening
Severe skin disorders
Systemic amyloidosis
High-level isolation care for highly contagious diseases
Coagulation disorders
Rare kidney diseases
Skeletal dysplasias
Dysmelia

Precision medicine analysis is key in treating inherited metabolic disorders

One of Karolinska University Hospital's latest NHV (National Specialized Medical Care) licenses is the care of inherited metabolic disorders and newborn screening. The Center for Inherited Metabolic Diseases (CMMS) is excited about this new medical care service, which began on July 1, 2024.

"Diagnosis and treatment of patients with inherited metabolic disorders is a complex task, requiring various kinds of expertise and cross-disciplinary collaboration. At CMMS, we have a consolidated multidisciplinary competence. We work very closely with several medical units within the thematic areas and are now forming an NHV unit with them. We have long supported other parts of the country with investigations and advice," says Anna Wedell, Professor and Senior Consultant at CMMS, as well as Director of the Precision Medicine Center Karolinska (PMCK).

Inherited metabolic disorders represent a large group of genetic diseases that involve metabolic disturbances. CMMS takes a comprehensive approach to patient investigations, which has been a key factor in the implementation of large-scale clinical genomics, the study of a person's entire genome. The advances in technology now allow for much larger data sets from individual patients, providing a foundation for the emerging precision medicine that focuses on delivering the right interventions at the right time for each patient.

"Having rapid diagnostics makes a big difference. Many of these diseases affect the brain and small children, and with early treatment, we can prevent severe damage and early death," says Anna Wedell.

■ Anna Wedell. Photo: Stefan Zimmerman.

LEARN MORE!

Scan the QR code to learn more about national highly specialized care at Karolinska.

■ Photo: Malin Jochumsen.

A global provider

As the university hospital of Region Stockholm, Karolinska plays a crucial role in international collaboration opportunities within highly specialized healthcare. Karolinska strives to assist patients from other parts of the world with care that their home countries cannot provide, and work is underway to establish clear processes for receiving an increasing number of international patients. As a member of the European University Hospital Alliance (EUHA) and European Reference Networks (ERN), Karolinska engages in extensive dialogues, exchanges, and collaborations with other healthcare providers across Europe.

Throughout 2024, collaborations and industrial partnerships continued to be central to Karolinska. The relationship with hospitals in Ukraine has deepened, including the signing of a third memorandum of understanding with Dnipro City Clinical Hospital No. 4. Another key partnership this year was the exchange with Singapore Health Services (SingHealth), focusing on health innovation and sustainability.

Interest in visiting Karolinska and exchanging experiences remains strong. Throughout the year, the hospital hosted more than 30 international visits, including delegations from Germany, Australia, Japan, and Singapore.

Some of Karolinska University Hospital's partners

Nordic university hospitals address healthcare challenges through new alliance

On May 24, 2024, the largest university hospitals from the five Nordic capitals signed a Memorandum of Understanding (MoU), forming a new alliance: the Nordic University Hospital Alliance (NUHA). It consists of Karolinska University Hospital, Rigshospitalet in Copenhagen, Oslo University Hospital, Helsinki University Hospital, and Landspítali—National University Hospital in Reykjavik.

The purpose of the alliance is to strengthen collaboration and create a joint strategy to meet healthcare challenges in the Nordic region.

Within NUHA, the focus is on four strategic areas: rare diseases, future health, benchmarking, and platform trials that enable more efficient clinical trials. By exchanging experiences and research results, and collaborating on education and innovation, NUHA aims to improve the quality of care and contribute to the development of health and healthcare systems. The goal is to create value for patients and the entire healthcare ecosystem while strengthening Nordic countries' positions in Europe in the fields of care, education, and research.

Advancing care for rare diseases within NUHA

One key initiative within the Nordic University Hospital Alliance (NUHA) is the collaboration on rare diseases, led by Anders Tidblad, Head of the Section of Pediatric Endocrinology and Metabolic Diseases at Astrid Lindgren Children's Hospital.

"The goal of our partnership on rare diseases is to develop joint solutions with our Nordic colleagues that enhance care for patients with complex and uncommon conditions. By mapping expertise, sharing knowledge, and strengthening collaboration in clinical studies and advanced treatments, we aim to provide world-class care and improve access to innovative therapies," says Anders Tidblad.

EUHA members' assembly 2024

In June 2024, representatives from the European University Hospital Alliance (EUHA) gathered at Karolinska University Hospital to conclude Karolinska's six-month presidency. The Members' Assembly event provided a platform to discuss important healthcare challenges and share innovative solutions to shape sustainable healthcare systems of the future.

A key feature was the symposium on "Rethinking Healthcare Systems", where hospital directors, leading experts in various medical fields, and representatives from the life science sector gathered to discuss the integration of artificial intelligence (AI) and new methods for high-quality care. The symposium also highlighted the importance of adapting healthcare systems to challenges such as the demographic changes of an aging population and a shrinking workforce.

Additionally, the need to strengthen education, promote research, and create cross-border collaborations was emphasized—all to build more sustainable healthcare systems that can meet the demands of tomorrow.

European University Hospital Alliance (EUHA)

University hospitals play a vital role in European healthcare systems, combining patient care, research, and education while facing shared challenges. The European University Hospital Alliance (EUHA), which includes Karolinska University Hospital, brings together 220,000 healthcare professionals and more than 300 research projects. Through collaboration, EUHA aims to enhance care quality by exchanging best practices, streamlining processes, and establishing a unified platform to engage policymakers, industry leaders, and other key stakeholders.

LEARN MORE!

In June 2024, representatives from EUHA gathered in Solna to conclude Karolinska's six-month presidency.

A secure and seamless platform for international patient contacts

NAIA is a digital platform developed by Karolinska University Hospital, created to provide patients with a seamless and secure space to contact the hospital for second opinions or care.

Over the past year, Karolinska has enhanced NAIA's capabilities, allowing third-party organizations to securely establish contact and share medical data. By creating an account, patients and organizations can communicate directly with Karolinska's International Patient Office, which facilitates contact with the hospital's departments—ensuring a more efficient and streamlined information flow.

"Through NAIA, we can now better meet the specific needs and requirements that come with international patient flows and strengthen communication between the hospital's various stakeholders," says Anna Sahlström, Head of National and International Affairs at Karolinska University Hospital.

■ Participants of the Nursing Management Program 2024. Photo: Fredric Möller Eklund.

Karolinska University Hospital strengthens nursing leadership in Europe

In the summer of 2024, Karolinska University Hospital launched its inaugural Nursing Management Program—a pioneering four-day event that brought together nursing leaders from across Europe. Designed to elevate leadership within the nursing profession, the program emphasized data-driven care and the critical role of nurses in driving innovation.

Through interactive workshops, participants engaged in hands-on learning, exchanged best practices, and explored practical applications to implement in their home countries. Key topics included integrating data into patient care, career progression, and leadership in nursing. The overwhelmingly positive feedback from last year's program has paved the way for further development and expansion of the initiative.

"The job shadowing was a unique experience that brought real-life application to the learning process."

Participant from 2024 year's program

■ Therese Brinck and Anna-Kathrin Breuer. Photo: Fredric Möller Eklund.

■ CAMST Children. Photo: Sara Dinwiddie.

High-quality care for children of all ages

Astrid Lindgren's Children's Hospital at Karolinska University Hospital cares for critically ill children from all over the country. Here, children with chronic diseases, congenital malformations, various acute conditions, and premature infants are treated. The hospital provides specialized and highly specialized care, and holds several NHV assignments (National Highly Specialized Care) in various areas. The children's hospital handles approximately 190,000 patient visits per year, including 60,000 emergency visits, and is involved in extensive clinical research, development, and education, with broad international collaboration. Care is provided at several locations of Karolinska University Hospital, including Solna, Huddinge, and Danderyd Hospitals.

Under the umbrella of the children's hospital, the Educational Resource Center (PRC) offers services in both Huddinge and Solna. The open activities of the Play Therapy Department, where children and their guardians are welcome for play and activities, have seen over 1,600 visitors in 2024. ThePlay Therapy Department also accepts referrals for children who experience specific anxiety about various types of medical procedures. Over 190 referrals have been processed, and in most cases, preparation work has enabled the child to successfully undergo their scheduled procedure. This is one of several ways that Astrid Lindgren's Children's Hospital works to ensure children's right to receive adapted and understandable information.

Training center strengthens healthcare team's communication and collaboration

Since 2006, there has been a training center for healthcare staff at Karolinska University Hospital in Huddinge within the hospital's pediatric care, CAMST Children. Realistic simulation exercises are conducted here to improve healthcare staff's communication, collaboration, and leadership—which can be life-saving in critical situations.

The environment in which the training takes place is designed to replicate a treatment room. It is equipped with tools and equipment that healthcare staff use in real-life situations. Great emphasis is placed on ensuring that all details feel authentic, allowing participants to train in conditions that reflect their everyday work environment.

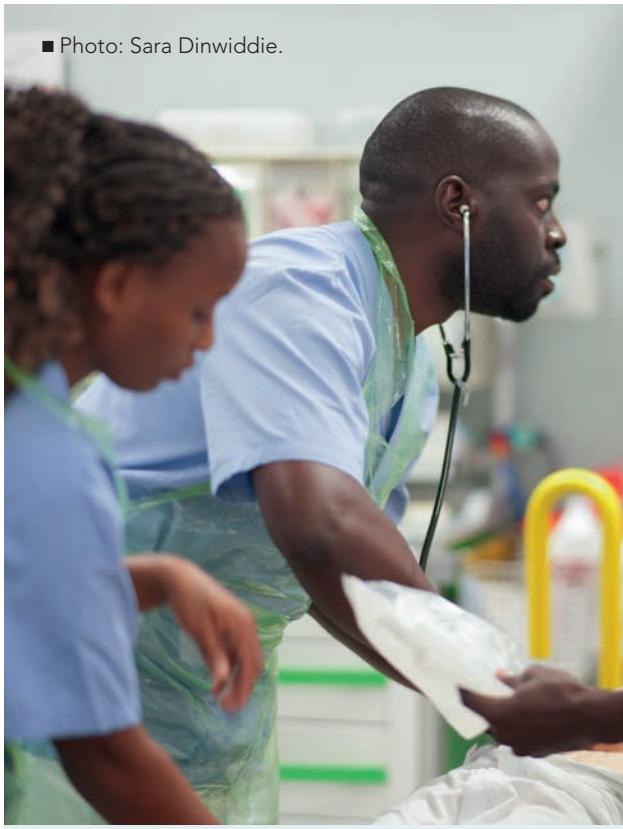
Various scenarios are practiced using advanced mannequins that can simulate different medical conditions and symptoms. The mannequins can move and produce sounds, such as difficulty breathing or crying, and their vital parameters, such as pulse, blood pressure, and oxygen saturation, are monitored, just like in a real hospital setting.

Although skill training, such as CPR or medication administration, is part of the exercises, the primary focus is on communication. The goal is to allow participants to practice effective teamwork and leadership in complex healthcare situations.

New center inaugurated

When the Center for Clinical Pediatric Studies (CKB) was established in 2022, it was one of several research and study units within Astrid Lindgren's Children's Hospital. This past summer, CKB was restructured, and all units are now combined within the new organization. The newly formed CKB was officially inaugurated in October and is now led by the Head of Center Nina Perrin, along with Unit Heads Amie Lindberg and Sofie Garpemo.

■ Photo: Sara Dinwiddie.



Ugandan healthcare staff visiting

Astrid Lindgren's Children's Hospital recently hosted colleagues from pediatric emergency care in Uganda. This visit was part of an ongoing regional partnership in pediatric care between Astrid Lindgren's Children's Hospital/Region Stockholm and Jinja City/Busoga Region in Uganda, as well as the two non-profit organizations Pediatric Health Initiative, Sweden, and Busoga Health Forum, Uganda.

The pediatric emergency project focuses on the implementation of Emergency Triage Assessment and Treatment Plus (ETAT+) at healthcare facilities in Uganda. ETAT+ is a method recommended by the WHO to quickly identify the medical needs of critically ill children and enable stabilization. In Uganda, the Ugandan Pediatric Association and the Ministry of Health recommend the use of ETAT+ in all hospitals, but implementation is challenging due to a lack of resources.

Whole-genome sequencing—now routine for all pediatric cancer cases

Each year, approximately 350 children in Sweden are diagnosed with cancer, with just over a third being treated at Karolinska. In 2024, whole-genome sequencing of tumor tissue and healthy tissue, along with analysis of genetic predisposition in pediatric cancer, became part of routine care at Astrid Lindgren's Children's Hospital.

The clinical implementation involves introducing a hospital-wide diagnostic flow and clinical collaboration between Pathology and Cancer Diagnostics, Clinical Genetics and Genomics Units, and Astrid Lindgren's Children's Hospital.

"Whole-genome sequencing can represent a significant step forward, enabling more targeted treatments and improved survival rates. It also makes more personalized long-term follow-up and identification of hereditary cancers possible," says Pernilla Grillner, Head of Specialized Pediatric Medicine at Astrid Lindgren's Children's Hospital. She continues:

"In the long run, this decision will also allow for more tailored treatments, such as pharmacogenetics and personalized immunotherapy, with hope of effective treatments for childhood cancers where options are still limited or where current treatments cause severe side effects."

The routine of whole genome sequencing follows several years of research and evaluation, with significant contributions from the Children's Tumor Bank.

"The Children's Tumor Bank has used whole genome sequencing since 2015 as part of

a research project. We are also involved in Genomic Medicine Sweden Pediatric Cancer (GMS Pediatric Cancer), which began whole-genome sequencing in the clinic in 2021. This started as a study and has now transitioned into clinical routine, although all data generated are still stored in the Children's Tumor Bank after consent is obtained," says Johanna Sandgren, Head of the Children's Tumor Bank Unit.

Currently, 22 research projects and several clinical studies nationwide are linked to the Children's Tumor Bank. Together, they range from basic research to new therapies, with the majority focused on precision medicine.

One of the researchers using the Children's Tumor Bank is Petter Brodin, Pediatrician at Astrid Lindgren's Children's Hospital and Professor of Pediatric Immunology. His research group has included over 300 children to study how children's immune systems function in cancer and during treatment. The group is developing new techniques to map the immune system but is also interested in what happens within the tumor itself, where the Children's Tumor Bank plays a critical role.

"The Children's Tumor Bank has been an amazing resource for us. With the large amount of data available on the tumors, we can compare what happens in the tumor with what happens in the blood, the immune system, and the body as a whole," says Petter Brodin.

Enhanced psychosocial support in pediatric cancer

When a child is diagnosed with cancer, the entire family is affected. At Astrid Lindgren's Children's Hospital, a major initiative is underway to provide enhanced psychosocial support to the child, parents, and siblings throughout the entire care process. By improving teamwork among all healthcare professionals involved in the patients care, the aim is to provide families with the best possible support.

"We hired a counselor dedicated solely to pediatric cancer, which has become an important resource. We've also worked on how families can contact the social worker and how this contact should be maintained in the long term. A lot has happened since this initiative started," says Pernilla Grillner, Head of Specialized Pediatric Medicine.

Close collaboration with a Ukrainian children's hospital

Astrid Lindgren's Children's Hospital and Region Stockholm have a partnership with Ukraine's largest children's hospital, Okhmadyt, in Kyiv, primarily focused on exchanging experiences and expertise. In spring 2024, three doctors and one nurse from Okhmadyt undertook fellowships at Astrid Lindgren's Children's Hospital, and during the fall, four additional Ukrainians shadowed staff for over two months.

"Pediatric care in Ukraine is under tremendous pressure due to Russia's war of aggression and repeated violations of international agreements that are meant to protect children during conflicts. Our close collaboration with Ukraine's specialized children's hospital, Okhmadyt, allows us to contribute to the professional development that our colleagues are requesting and in which we excel: highly specialized pediatric care," says Svante Norgren, Head of Astrid Lindgren's Children's Hospital. He continues: "I am proud of how many Karolinska staff members are committed to helping our colleagues, how they create long-term connections, and how we learn from each other. Astrid Lindgren's Children's Hospital has also become a better pediatric hospital through our collaboration."

In December, eight doctors and nurses were welcomed for a week-long course in ECMO, funded by the Emergency Preparedness Fund. This was to enable them to handle the ECMO machines that Okhmadyt received as a donation. The ECMO machine, which oxygenates blood outside the body, is the final life-saving option for critically ill patients.

■ During ECMO training, staff practiced on a realistic doll of a child. Photo: Josefine Franking.

"ECMO is the most advanced treatment available in intensive care. It is life-saving for patients for whom standard intensive care is insufficient. If you have the knowledge to handle ECMO, it can mean the difference between life and death for critically ill or injured children", says Lars Falk, course leader and Head of Intensive Care and Transport Unit at Karolinska.

■ The four Ukrainians who shadowed in the fall. Photo: Josefine Franking.

■ In the spring, three doctors and one nurse shadowed. Photo: Kristian Brangenfeldt.

■ Photo: Joakim Lindberg.

Sustainability at Karolinska

Karolinska has long been actively working on sustainability issues, focusing on three main areas: social, environmental, and economic sustainability. Sustainability at Karolinska involves combating long-term ill health—today's work in treating illness aims to ensure we don't increase the need for healthcare in the future. There is a guiding program for the years 2023–2027, with sustainability goals for the hospital. Operations are working daily to reduce environmental and climate impacts while strengthening social and economic sustainability.

Social sustainability at Karolinska is based on the principle of equality and includes patients, relatives, citizens, and staff. It encompasses ethics, public health, human rights, gender equality, equity, safety, children's rights, participation for individuals with disabilities, national minorities, and LGBTQI rights.

Environmental sustainability is the second main area. The hospital works daily to reduce its environmental and climate impact according to its environmental management system and environmental certification ISO 14001.

Economic sustainability aims to maintain and promote stable and long-term economic development. A crucial part of this is that sustainability aspects should be considered early in processes to minimize the risk of costly interventions in the future. This is achieved by, for example, considering sustainability in investments and establishing requirements in procurement.

9 sustainability efforts

1 Increased focus on rest and recovery

Recovery is a key factor for employee well-being, and the opportunity for rest and recovery affects aspects such as the work environment as well as patient safety. In 2024, recovery has been a focal point at Karolinska, and the Health Center has offered lectures, workshops, and various activities. The goal was to work on recovery in the workplace based on knowledge tailored to the specific opportunities and challenges of each individual workplace. In 2025, the Health Center will continue this work in collaboration with the hospital's health promoters.

2 Self-assessment for children's rights

In 2024, the Children's Rights Council launched a self-assessment checklist for employees. The checklist is an important tool to ensure that children's rights are met and includes questions about how the approach is adapted to the child, whether information is provided in an accessible way for the child, and to which degree we create opportunities for the child to be involved in their own care.

3 Reduced waste of medication

At Karolinska, medication usage is one key factor with significant environmental impact. An ongoing project aims to reduce medication waste, including documentation related to waste of off the shelf medication. Over the course of the year, Karolinska has reduced the cost of medication waste, saving over one million SEK.

4 Centralized responsibility for medical equipment

In 2024, the hospital worked on a project within the Medical Technology department—Anesthesia and Intensive Care. The project aims for the department to take hospital-wide responsibility for matters concerning medical equipment, meaning that the purchase and ownership of eusable as well as disposable medical equipment, such as EKG cables and saturation probes, will be managed by Medical Technology.

5 Reduced use of gloves

One of Karolinska's primary consumables are medical gloves. The hospital uses over 30 million gloves annually, generating approximately 600 tons of CO_2 emissions. Several projects aimed at reducing glove usage have been underway in 2024. The hospital is involved in the EU-funded project ReGlove, focusing on washing and reusing examination gloves. Phase one of the project has been implemented at the Endoscopy unit in Huddinge during the fall in 2024.

6 Recycling of disposable aprons

Disposable plastic aprons are recycled and used to produce new ones. In 2024, 100,000 circular aprons were used at Karolinska, reducing CO_2 emissions by 15.3 tons, amounting to a 66% reduction.

7 Sustainable investments

Transparent processes for investments and procurement are crucial for a sustainable economy. At Karolinska, sustainability assessments are conducted for all investments in medical technology, IT, and real estate and are presented to the investment council.

8 Strengthened work against sexual harassment and sexual violence

In 2024, the hospital, led by ANOVA, has further developed its work against sexual harassment and the prevention of sexual violence. This includes a new training program for healthcare staff and an anonymous chat service, an addition to the previous help hotline. The chat service makes help more accessible for young people dealing with issues of this nature, as well as for their relatives.

9 LGBTQI certification

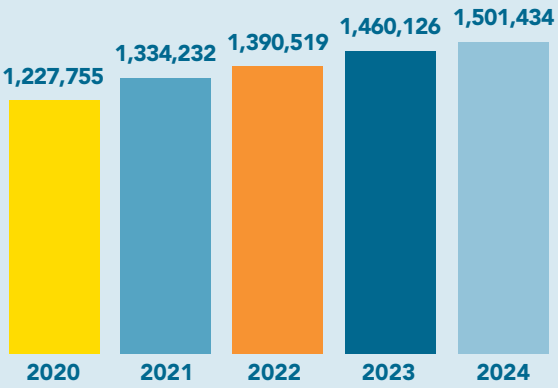
The medical unit of Plastic Surgery and Maxillofacial Surgery at Karolinska University Hospital was LGBTQI certified by RFSL in 2024. Read more on page 46.

■ Photo: Fredric Möller Eklund.

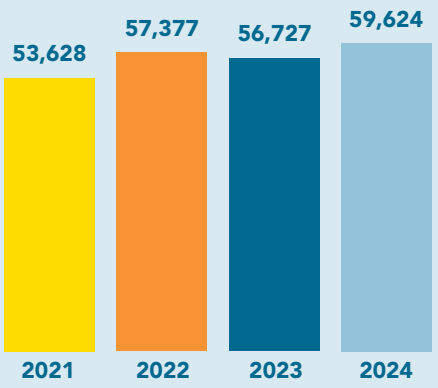
2024—A year in review

The economic conditions in 2024 have been challenging, with inflation, increased pension costs, and conflicts between labor market parties. The year's financial results show a deficit of 549 million SEK. Throughout the year, the hospital has focused on measures to ensure care production and reduce underlying costs. Production planning in collaboration with the region and efforts to strengthen governance and coordination have improved. Increased accessibility to care within Region Stockholm is a priority. Karolinska has significantly reduced the hiring of temporary healthcare staff this year, and efforts to ensure competence and optimal conditions for the hospital's employees have continued. The implementation of the scheduling tool Tessa is underway, which will simplify scheduling processes. Additionally, several initiatives aimed at increasing efficiency through generative AI are in progress. In the long term, efforts have continued to streamline and simplify hospital-wide processes and reduce administrative burdens within both support functions and clinical operations.

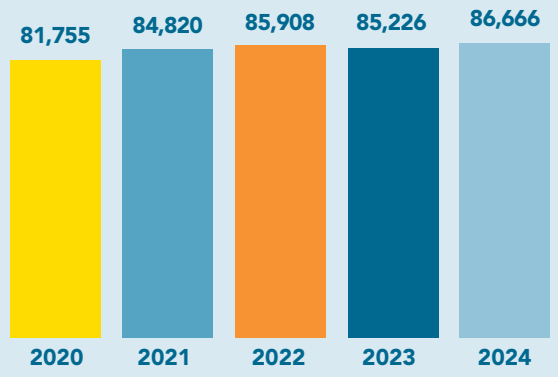
Number of outpatient visits



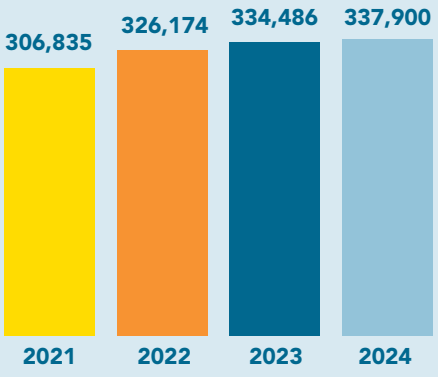
Number of operations



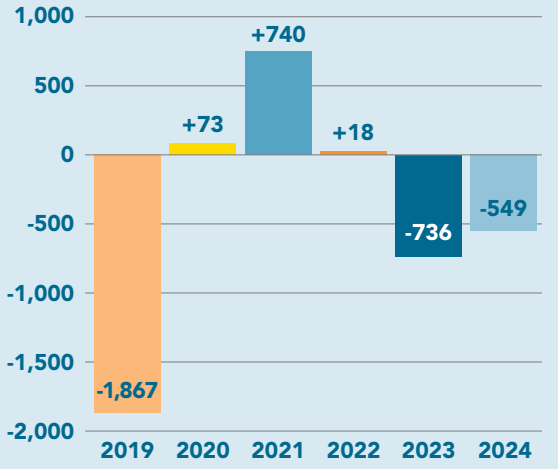
Number of inpatient episodes



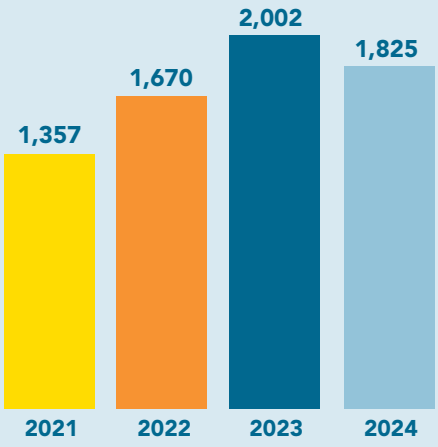
Number of patients



Net income 2019–2024 (million SEK)



Income out-of-region and international patients (million SEK)



2024 AWARDS

JANUARY

Marie Evans, Senior Consultant, received Bengt Rippes Research Award for 2023

Susanna Eriksson, Specialist Physician, received Stockholm Medical Students' Supervisor Award

General Pediatrics is named Section of the Year 2023 by the Residents at Astrid Lindgren Children's Hospital in Huddinge

Åsa Fowler is named Lifeline of the Year 2023 by the Residents at Astrid Lindgren Children's Hospital in Huddinge

Viveka Nordberg, Senior Consultant, is named Supervisor of the Year 2023 by the Residents at Astrid Lindgren Children's Hospital in Huddinge

Anna Östbring, Specialist Nurse, wins the Golden Apple Employee Award 2023

FEBRUARY

Ellen Eriksson, **Frida Berg**, and **Linda van den Tempel**, nurses, received a scholarship from the Heart Children Foundation

Yong Luc, Midwife, wins the Medical Students' Supervisor Award 2023

Medical Unit/Nursing Unit Aging becomes Silvia Home Certified

MARCH

Fernanda Costa Svedman, Senior Consultant, received a scholarship from the Swedish Oncology Society

Ursina Battaglia, Senior Consultant, received the 2023 Prussiluskan Award

APRIL

Annika Sjövall, Associate Professor and Senior Consultant, is honored with the 2023 Passionate Advocate Award by the Network Against Gynecological Cancer

Ruth Löllgen, **Carina Rinaldo**, **Emma Persad**, **Hanna Westergren**, **Fredrik Sandesjö**, **Annelies van't Westeinde** and **Hedvig Kvanta** are awarded scholarships from the Children's Research Foundation at Astrid Lindgren Children's Hospital

Jonathan Grip, Consultant, received a scholarship from the Swedish Society of Anesthesia and Intensive Care

MAY

Tuva Nilsson is awarded the Ygge Prize for best thesis

Gianluigi Savarese and **Camilla Hage** received prestigious positions within the Heart Failure Association (HFA), European Society of Cardiology (ESC)

Anna Weibull Wärnberg, Consultant, received a research scholarship from Pfizer and the Swedish Society of Infectious Diseases

Svetlana Bajalica Lagercrantz, Oncologist, is named Process Leader of the Year 2024

Erik Lidén, Consultant, and **Magda Carlsson**, Anesthesia Nurse, are named Supervisors of the Year at PMI in Huddinge

Hans Strid, Senior Consultant and Associate Professor, received the award for Best Specialty Training Supervisor in Sweden in Gastroenterology

Paolo Parini, Senior Consultant, received the Nikkilä Memorial Lecture Award 2024

JUNE

Emil Boström, Consultant, is awarded the Best Clinical Supervisor for Junior Doctors at Karolinska University Hospital

Soran Robin Bozorg, Resident, is named a "Top 10 Talent Under 35" in Healthcare and Life Science

Karolina Award 2024

Exemplary Staff Contribution Cancer: **Pernilla Ingers**
Exemplary Staff Contribution Astrid Lindgren's Children's Hospital: **Siham Daoud**
Exemplary Staff Contribution Astrid Lindgren's Children's Hospital: **Maryann Florbrant**
Exemplary Staff Contribution Acute and Reparative Medicine: **Susanne Axling**
Exemplary Staff Contribution Heart, Vascular and Neuro: **Hans-Anders Sjöstedt**
Exemplary Staff Contribution Heart, Vascular and Neuro: **Karin Persliden**
Exemplary Staff Contribution Women's Health & Allied Health Professionals: **Juha Leppämäki**
Exemplary Staff Contribution Inflammation and Aging: **Sara Törn**
Exemplary Staff Contribution Inflammation and Aging: **Erika Ving**
Exemplary Staff Contribution Medical Diagnostics Karolinska: **Yasemin Özbek**

Mikael Norman, pediatrician, is awarded the Hugo Lagercrantz Award 2024

O-huset in Huddinge is certified with Environmental build Gold

AUGUST

The Myositis Unit received the Heroes in the Fight 2024 Heroes in Healthcare Award from patient association The Myositis Association

SEPTEMBER

Theofanis Tsevis, Consultant, is awarded the title of Silvia Doctor

Daniel Helldén, Resident, received the Dimitris N. Chorafas Prize

OCTOBER

Team ROSC wins the A-CPR competition at the CPR Congress

John Pernow, Senior Consultant, is awarded the Alvarenga Prize

Susanne Rysz, Anesthesiologist and Senior Consultant, received the SLS Prize for Best Scientific Project Application

Regionalt 3D Center at Karolinska wins Implementation of the Year at the Innovation Fund Day

Sterilization Technology and Logistics wins the Swedish Lean Prize

Viveka Nordberg, Pediatrician and Neonatologist, received the Maria Röhl Scholarship of the Year

NOVEMBER

Annika Janson, Pediatric Endocrinologist, received the Olle Söder Award of the Year

The Section for Reconstructive Plastic Surgery is awarded the Hospital Doctors' Continuing Education Diploma

Bahira Shahim, Consultant, is awarded by the Sven and Ebba-Christina Hagberg Foundation

DECEMBER

The Nephrology Section is awarded the Section of the Year Prize by the Residents at Astrid Lindgren Children's Hospital in Huddinge

Kalle Hildebrand, Associate Senior Consultant, is named Supervisor of the Year by the Residents at Astrid Lindgren Children's Hospital in Huddinge

Pauline Levinson, Associate Senior Consultant, is named Lifeline of the Year by the Residents at Astrid Lindgren Children's Hospital in Huddinge

■ Karolina Award winners 2024. Photo: LIZAFOTO Liza Simonsson.

Exemplary Staff Contribution Perioperative Medicine and Intensive Care: **Tove Björklund**
Exemplary Staff Contribution Central Administration & IT: **Line Jern**
Exemplary Research Effort for Patient Benefit: **Angelica Lindén Hirschberg**
Exemplary Contribution to Creating World-Leading Competence: **Anna Lindberg**
Exemplary Leadership: **Per Wahlenius**
Exemplary Contribution to Achieving the Best Quality and Patient Safety: **Ulrika Grenholm**
Exemplary Contribution to Increasing Capacity and Improving Accessibility for Our Patients: **Jenny Hellstedt**
Exemplary Contribution to Increasing Capacity and Improving Accessibility for Our Patients: **Camilla Garmaeus**
Exemplary Contribution to Increasing Capacity and Improving Accessibility for Our Patients: **Fredrika Gauffin**
Exemplary Contribution to Increasing Capacity and Improving Accessibility for Our Patients: **Karin Pukk Härenstam**

■ Five employees at the medical unit for Plastic Surgery and Maxillofacial Surgery. Photo: Josefine Franking.

First medical unit at Karolinska to be LGBTQI certified

After two years of focused efforts, Plastic Surgery and Maxillofacial Surgery at Karolinska University Hospital has been LGBTQI certified by RFSL, the Swedish Federation for lesbian, gay, bisexual, transgender, queer, and intersex rights.

The LGBTQI certification is an important step toward creating a safer and more inclusive environment for patients, relatives, and staff, regardless of gender, gender identity, or sexual orientation. This is emphasized by the Head of Department, Alberto Falk Delgado:

"We are proud to be the first department at Karolinska to receive this distinction. Through lectures, workshops, and online training, we have gained tools to better understand and interact with both patients and colleagues, in a respectful and inclusive way."

The LGBTQI certification sets high demands on the organization to actively work on increasing knowledge about norms, diversity, and inclusion. At the Department of Plastic Surgery and Maxillofacial Surgery, patients with various needs and backgrounds are met daily, an insight that underlined the importance that the staff is equipped to meet patients in an inclusive way.

"We wanted to ensure that our operations are characterized by safety and equality—regardless of background or identity. The certification is also part of Karolinska's vision of a culture of trust, where each individual is seen and treated with respect. Together, we create a better and more inclusive workplace and provide better care, says Alberto Falk Delgado, who invited the employees to a colorful celebration of the official certification.

The management of Karolinska University Hospital welcomes the certification, stating:

"Creating an inclusive and safe environment for both patients and staff is a fundamental part of our mission. The LGBTQI certification is an important step to ensure that everyone, regardless of background, gender, or identity, feels welcome and respected. This strengthens us as an employer and the care we provide."

Together We Are Karolinska

VISION

We will **cure and relieve tomorrow** what no-one can cure and relieve today

MISSION

We are **best at the most difficult.** We take **responsibility for our common resources.**

VALUES

Responsibility
Compassion
Holistic Approach

OUR PRINCIPLES

A. Together as ONE hospital

B. Empowering local leaders

C. Simplifying and reducing administration

D. "Saying YES" and finding solutions

OUR FOCUS AREAS

1. Karolinska—a global provider
2. Capacity and access—at all times
3. World-leading competence
4. Best in quality and patient safety
5. From research to patient benefit
6. The smartest hospital

■ Cover: Ella Bogstedt. Photo: Josefine Franking. Photo back page: Danish Saroee.
■ Graphic design and production: Luxlucid, Stockholm, 2025