

Karolinska University Hospital Research and Education Strategy 2021–2023

Research and education today shape the healthcare of tomorrow

(K 2020-8953)



Contents

1. Introduction and summary of objectives	1
2. Strategic priority areas	5
2.1 Develop Karolinska University Hospital's learning environments	5
2.2 Promote internationally competitive, high-quality research in university healthcare	10
2.3 Increase the number of clinical studies and promote cooperation with the life science sector	16
2.4 Strengthen cooperation to use resources more efficiently and boost competitiveness	20
2.5 Increase patient involvement and engagement for a sustainable society	25
3. FoUI staff at Karolinska University Hospital	29
4. Conclusion	30
5. APPENDIX	31

1. Introduction and summary of objectives

Karolinska University Hospital (K) is one of the largest university hospitals in northern Europe and in 2021 was ranked by Newsweek as the seventh best hospital in the world, number three in Europe and the highest ranked in the Nordic countries. In 2020, K and Karolinska Institutet (KI) were accredited as a Comprehensive Cancer Centre (CCC), the first in Sweden, by the Organisation of European Cancer Institutes (OECI), confirming that we meet the OECI's tough criteria in terms of quality, healthcare, education and research in the field of cancer. While this is an excellent starting point, challenges remain, including the degree of variation across the hospital itself, some of whose units are not currently operating at a sufficiently high academic level. A hospital functions as a network and we therefore need to ensure satisfactory quality in all clinical areas across the entire hospital, while continuing to be an international leader with outstanding groups in many fields.

The hospital is allocated approximately 80% of the region's research funding and also receives large external grants; in the past five years, the number of EU projects has grown from a handful to around 50 such projects. The hospital also has a major education mandate; half of the region's students in healthcare professions undergo their clinical training at K.

Recent years have seen widespread change at a historically rapid pace. In 2012, the hospital took over responsibility for bringing the new hospital New Karolinska Solna (NKS) on stream and for working with Regional Health Care Services to shape the content and functions of the new hospital. In parallel with these new developments, major investments have also been made in infrastructure at K in Huddinge, with a new surgery and intervention facilities plus step by step modernisation of the hospital's healthcare environments.

New healthcare mandates, including the expansion of healthcare patients-choice, have drawn a new healthcare map in the region and the hospital's mission is now more focused on highly specialised care and treatment. The most radical change in healthcare content has been seen at NKS, where Sweden's first intensive care emergency unit for adults was established in 2018. Certain groups of patients important for research and education (R&E), have been moved from the hospital, especially from NKS. At the same time as changes in its infrastructure and its care commission, the hospital's organisation has changed too and is now patient flow-based. This initially led to the fragmentation of certain activities, and the organisational model was therefore gradually modified. Changes in remit and organisation also bring about a need to adapt research and education (FoU) to this new reality, which requires expanded collaboration in several areas. It is important that impact analyses in the event of reorganisation always include impacts on the FoU remit. Several Government inquiries have also highlighted the importance of risk analyses and the need to expand knowledge regarding risks. The hospital's FoU expertise ought to be able to play an active role here.

Since spring 2020, the COVID-19 pandemic has had a major impact on the underlying factors affecting FoU. While the number of studies related to COVID-19 has virtually exploded, many other clinical studies have been rendered more difficult due to resources being reprioritised towards COVID-19 studies and clinical treatment, but also due to the restrictions imposed on both patients and staff involved in the research. The hospital has complied with European guidelines for conducting clinical

studies during the pandemic and many studies have been paused while the number of new studies has significantly reduced.

Research-related external revenues have also been reduced and several sources of funding are also announcing that there will be fewer opportunities to issue calls for grants in the future. Many wide-ranging changes have been seen in education, including students transferred between departments and a move to online teaching. To what extent it will be functional to retain some of these working methods after the pandemic is currently unclear. The pandemic has led to some researchers are unable to fully use their ALF funding (Government funding to the county councils for certain costs related to medical education, medical research and healthcare development) in 2020. It is positive that we have now received the long awaited decision from the Ministry for Education enabling ALF funding for 2020 to be used in 2021. Due to the development of the pandemic, a further extension for 2021 has been granted. The progress of the COVID-19 pandemic and its impacts on FoU are currently difficult to assess and may require a re-evaluation of the FoU strategy in certain areas.

As a university hospital, K is to take an integrated approach to its three mandates of healthcare, research and education. This is reflected in the hospital's vision: Tomorrow we will cure and relieve that which no-one can cure and relieve today. The hospital's FoU is to lead to research progress that will benefit the patients of today and tomorrow and promote good health in society while training tomorrow's staff to be even more highly skilled than we are today. Our ambition is world-class research, education and innovation – for the patient benefit of tomorrow.

In addition to the FoU staff's ordinary remit to support research and teaching and to operate and develop a number of core facilities, in the next three years a specific focus on the following five strategic areas is planned.

1. Develop Karolinska University Hospital's learning environments
2. Promote internationally competitive, high-quality research in university healthcare
3. Increase the number of clinical studies and promote cooperation with the life science sector
4. Strengthen cooperation to use resources more efficiently and boost competitiveness
5. Increase patient involvement and engagement for a sustainable society

2. Strategic priority areas

2.1 Develop Karolinska University Hospital's learning environments

KI and other higher education institutions are responsible authorities for healthcare education and have overarching responsibility for attainment of learning and examination goals. The region is responsible for the learning environment under placements/clinical rotations (VFU), which form part of work-integrated learning (VIL). Within the hospital we have a large number of university healthcare units (USV units) tasked with providing high quality learning environments. The National Board of Health and Welfare has produced a number of minimum criteria to safeguard this provision while the Education Council has clarified these criteria by developing instructions to the FoUU committees.

At K, VFU is run within 20 programmes at basic and advanced university level, four at upper secondary level and four supplementary programmes for students trained outside the EU/EEA. The total education remit covers more than 35,000 student weeks. Cooperation with KI is regulated in the regional ALF agreement. The hospital also works in close cooperation with other higher education institutions in a number of licensed professions.

Together with the higher education institutions, the hospital has great responsibility for ensuring that today's students are competent and confident in their roles when they go on to clinical work. In the majority of cases, VFU makes up a large proportion of the training time and is an opportunity to shape, prepare and increase the confidence of the staff of tomorrow. Inadequate preparation and a transition to working life that is not sufficiently well thought through places patient safety at risk and can also lead to high staff turnover, a factor that is particularly damaging in our highly specialised environment where a longer period of service is needed to attain high levels of expertise.



Photo: Catarina Thepper



Increase what students get out of work placements (VFU)

VFU seeks to give students an opportunity to apply and integrate theoretical knowledge and practical skills at the same time as developing a professional approach and a professional identity. To ensure a good educational environment, more staff need to complete supervisor training. Every unit that takes in students must be well aware of the learning objectives and take responsibility for ensuring that they are met for the respective VFU placement. Teaching, or encouraging education in other ways, is to characterise the academic environment and come naturally to all of the university hospital's employees. Our methods for measuring the quality of education and goal fulfilment need to be developed in order to feed the results back to each unit involved in the student's education.

According to the WHO, interprofessional education is when two or more professions learn about, from and with each other with the aim of enabling effective cooperation and improving people's health. KI has produced an action plan for interprofessional learning (IPL) (Ref: 3-4732/2017) with the aim of giving students the best possible future opportunities to work in, lead and continuously develop areas of activity in close collaboration with other professions. This incorporates three overarching learning objectives:

- identify and describe the competence of the professions working together in the future area of activity
- communicate and collaborate with other professions in the future area of activity
- analyse and reflect how collaboration between different professions contributes to evidence-based treatment and rehabilitation, improved health and high-quality research.

All education programmes, including clinical ones, have a designated IPL promotor and a number of IPL objectives have been defined, which are generally relevant to VFU at K. The opportunity for students on different education programmes to work with each other, e.g. at interprofessional training units at emergency departments (KUM) and clinical interprofessional training wards (KUA), have been found to be particularly valuable and our aim is to expand elements of interprofessional learning.

Improved collaboration in the new healthcare landscape – a vital question for the future

The changed healthcare content at K has affected our ability to fulfil our education mandate. This particularly concerns operations at Solna, which in recent years has gained a greater focus on highly specialised elective treatment. Primarily, collaboration is required between K Solna and K Huddinge, as has already been launched, to give the students experience of common diagnoses in emergency flows, since the introduction of the intensive care emergency unit, these patients are not treated at K Solna. In certain specialities, there is also a need for collaboration with care providers outside the hospital to give the students access to patients with less complex, but common diseases. However, there are major opportunities to train generic medical skills (e.g. obtaining patient history and carrying out a clinical examination) and to develop care skills also within highly specialised healthcare. External collaborations have been established over time but need to be developed further. This concerns healthcare patients-choice actors (e.g. in dermatology) and the Academic Specialist Centre (rheumatology, neurology and diabetes treatment), plus the emergency walk-in centres in Solna and Huddinge run by Stockholm County Council Health Care Services (SLSO).



Photo: Sanne Jonsson

Preparation for the New medical programme – a paradigm shift in Swedish medical training

The new medical programme, planned to begin in autumn 2021, will extend medical training from 11 to 12 semesters. It is planned that the teaching method will be team-based learning. Following training, the students will have achieved competence as a licenced medical doctor (läkarlegitimation), as is already the case in several EU countries. This means that in the future, the 18 months internship, “allmän tjänstgöring” (AT) will only apply to students who started the medical programme before or under the spring semester of 2021. For students entering the new medical programme, the specialist training will instead begin with a “base year” that includes emergency medicine, psychiatry and general medicine.

Staff working in education at the hospital have been involved in producing a curriculum model and syllabi for the new medical programme. Extensive work is now being launched to implement and ensure that VFU at the hospital leads to the students being able to attain the criteria for licence. Among other things, there is an increased need for multiple formative assessments, skills training and simulation in the Clinical Training Centre (KTC) – “patient first, but not first on the patient”. The Center for Advanced Medical Simulation and Training (CAMST) and the corresponding children’s centre, Barn-CAMST, offer advanced skills and team training and their remit may be expanded. It is also a need to increase the education period in all arenas for interprofessional learning, e.g. KUA and KUM. The educational remit of our supervisors in clinical activities needs to be made clear and greater skills are needed to judge students’ skills relative to the requirements for attaining licence.

The first students in the new medical programme will enter the clinical environment in the spring term of 2023. However, the new regulations will be introduced from 1 July 2021 and those currently on the old programme will need to show that their internship (AT) meets the requirements for basic in-service training. The change will also mean that doctors trained abroad, for example, seeking specialist training (ST) will be able to complete basic training from the autumn semester of 2021, which will require an increased number of student placements in our emergency departments.

Ensure functional premises for training and develop digital learning environments

When planning the hospital New Karolinska Solna, it was anticipated that the future education of students at basic and advanced levels would largely take place in smaller teacher-led groups. However, the trend has instead moved towards forms of teaching that require larger classrooms. The availability of medium-sized and large teaching rooms is therefore a limiting factor, as has become particularly clear with the impact of COVID-19 and the demand for physical distancing. The new medical programme will also have larger student groups and an educational approach that is intended to involve small groups in large rooms, known as team-based learning. A student centre was recently opened at K Huddinge, which has improved the situation on the southern campus. The problem of insufficient spaces for clinical teaching at the emergency department in Huddinge remains, however, and risks being exacerbated now that student numbers are increasing. The new medical programme has 20%–30% more training based in emergency departments.

A student centre needs to be created at K Solna, e.g. in building Q or the L buildings. Both K Huddinge and K Solna need to have access to modern audio-visual

equipment to achieve a training environment adapted to today's working methods and to benefit from digitisation. This need has become particularly clear in conjunction with the COVID-19 pandemic, as not only teaching but also certain examinations had to be run online.

Ensure sufficient time for the hospital's education mandate

Students must be a natural and integrated element of K's operations and all employees in the academic environment have a responsibility to promote good learning environments. Additionally, our clinical teachers need specifically ring-fenced time for their education mandate. It is therefore important that production planning for healthcare, education and research is coordinated to ensure the opportunity of providing a good education in the clinical environment.

This partly concerns employees with a defined education mandate, e.g. those responsible for courses, VFU and clinical adjuncts (AKA), but also the staff who are involved in education of our students as part of their clinical work. Today it is difficult to identify the time for teaching that is integrated in the healthcare mandate. Methods for this need to be developed. For example, this may involve a DRG code (diagnosis related group code) that shows that the healthcare contact included supervision of students. We will investigate the opportunity of gaining backing for such an initiative at regional and national level. In other situations, it may involve looking at how many patients a nurse is expected to care for in parallel with supervising students. At the same time, we need to work together with the higher education institution to develop teaching methods and safeguard high efficiency in our training activities too. Additional specific measurements that illuminate the quality of the education provided on work placements/clinical rotations also need to be developed.

Education and skills development council – a council for lifelong learning

An education training and skills development council has recently been set up at K with the aim, together with KI, of linking together the issues at the hospital surrounding basic and advanced education, in-service training and continued skills development /lifelong learning. In research, all FoU groups are to draw up a roadmap for development "from student to docent". Similarly, the hospital needs to draw up a plan to safeguard skills development "from student to retirement".

Several studies show that new graduates often feel that they are insufficiently prepared to enter working life. A good introduction paves the way for a more secure start to a medical career and can also raise patient safety levels, reduce staff turnover and improve cost-efficiency. In the majority of occupational groups at the hospital competency ladders have been set up providing guidance in continued development of professional skills. For nurses, for example, preparations for the future *specialist nurse* training course are now being drawn up, which include a new protected professional title for the advanced specialist nurse role. For doctors, specialist training goals are well-defined but the requirement for structured lifelong learning is often not formalised.

Responsibility for skills development thus lies both with the employee and locally with the unit in which they work, but the hospital needs to develop monitoring structures, e.g. via ProCompetence, which is currently only applied broadly within certain occupational groups. Financial aspects may appear challenging but also need to be addressed. Lifelong learning is particularly important at K in order to fulfil our role as

the final instance in the care chain and remain a trailblazer in knowledge development.

2.2 Promote internationally competitive, high-quality research

Work for strong academic environments and functionally organised university healthcare (USV).

As described above, the hospital's external and internal environments have undergone major changes in the past five years. Unfortunately, here FoU aspects have not always been fully addressed; some changes have led to a stronger FoU environment while others have led to challenges that we now need to tackle. Due to the pandemic, the Swedish National Board of Health and Welfare's evaluation of USV units has been postponed until 2022, but a working group has been appointed at regional level to conduct a preliminary evaluation. This evaluation is to take place with all due haste to enable measures to be taken ahead of the formal evaluation in 2022.

One problem area that has already been identified is the reduced number of clinically linked academic positions. The upcoming evaluation will take as its starting point each unit having at least one professor employed in both clinical and academic roles who heads FoU work in their area of specialisation. Healthcare, research and education must be integrated if we are to achieve success. Our clinical professors form the academic hub but the head of the unit must also take responsibility for creating a strong academic environment along with all their employees in university healthcare.

One focus looking ahead is to work with KI to complete the current inventory of needs for clinically active professors from a university healthcare unit (USVE) perspective and plan joint initiatives to fill today's gaps. Additionally, the average age is high and a plan needs to be drawn up for the generational shift. The hospital's FoU committee has already appointed a working group to draw up guidelines for strategic initiatives to encourage the recruitment of new professors.

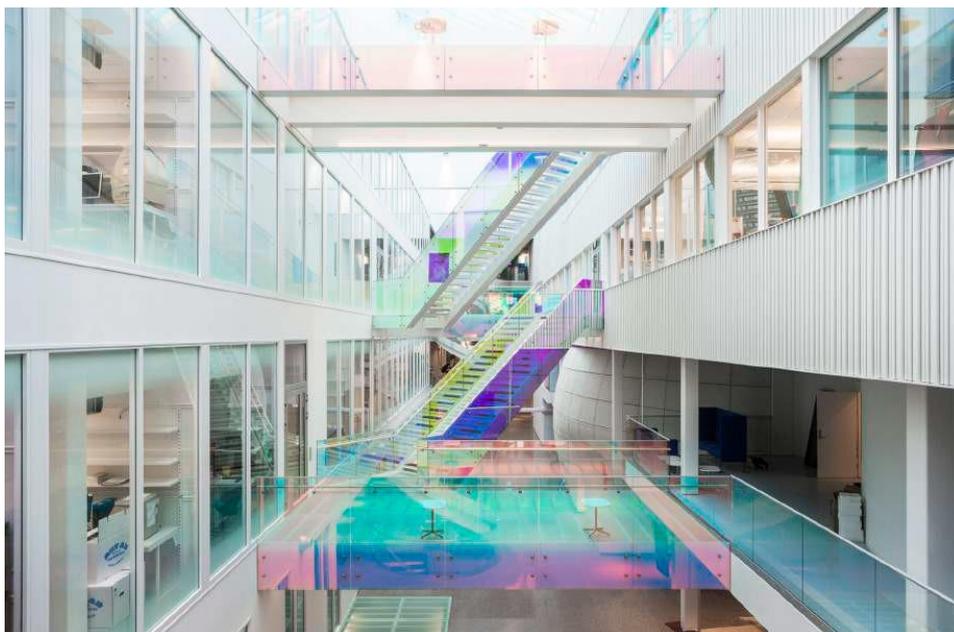


Photo: Martin Stenmark/Karolinska Institutet

To safeguard long-term access to academic expertise, the hospital has worked jointly with KI to establish a docent school aimed at clinically active researchers with doctoral degrees. 35 postdoctoral fellows were accepted to the docent school in 2019 and this number needs to increase. Major investments are also being made in clinical research posts at various levels. This is judged to be an important step in giving our clinical researchers ring-fenced time for research. The Research Council will now evaluate the outcome of these initiatives and we will be particularly following the career progress of the K-researchers who have held research posts, and developments in application pressure and allocation frequency for K employees, from a K perspective. To safeguard a strong academic environment, research and education qualifications must be important parameters when employing new members of staff and these must be constantly evaluated throughout their future careers.

One current issue of concern is access to administrative premises for healthcare staff active in FoU. The new infrastructure has enabled investments in modern wet labs and technology-heavy research premises. On the other hand, the need for offices for dry lab research has frequently been underestimated. Planning premises for administrative tasks in FoU has included a shift to flexible workstations, too many without a desk and with limited storage opportunities, which demands significant changes to individual working methods. Researchers are also finding that opportunities for mutual exchange within the group of researchers are poorer when there is no designated space for them to meet. This issue is now particularly acute at K Solna in conjunction with the move from the old hospital buildings. It is important that the hospital is able to guarantee adequate premises for its entire FoU remit. The use of administrative areas in “the Princeton building” is one opportunity to improve the situation.



In the past decade, the healthcare map has undergone major changes, especially in Stockholm, which has led to patient groups previously kept together in the hospital now being split between several healthcare providers. Some researchers describe a situation following the move where it is very difficult to recruit patients with common diseases but where there are excellent opportunities to conduct studies into rare conditions. This is naturally problematic from a public health perspective. Drivers behind the move from the university hospital include cost-efficiency and ideas of creating a structure in line with the LEON principle (lowest effective care level), but also achieving greater freedom of choice and better accessibility for the patients. The most recent ALF agreement (national 2015, regional 2016) decided that university hospital healthcare (USV) units were to be introduced. The original thinking behind this was that these units would tie together FoU across the boundaries of the new healthcare organisation. This has not yet been accomplished and instead K's USVE is only within the hospital and we now have two parallel systems, USV units that are evaluated and FoU groups which are where work often still takes place on the ground. Follow-up on activities and allocating activity funding also continues to take place at FoU group level.

FoU groups are normally equivalent to the medical units in the healthcare system. The majority of USV units are also equivalent to a medical unit, but in some cases, the USV unit instead covers a speciality (e.g. anaesthesia and intensive care) or a group of professions (e.g. the health professions). In other cases, two medical units/FoU groups have been merged into one USV unit, usually due to one of the units having failed to fulfil the criteria to become a USV unit in its own right. It appears to be necessary to consider a more functional organisation of FoU work and we will raise this in discussions in the FoU Committee (collaboration in line with the ALF agreement at K level) and the Research and Education Council (collaboration at regional level).

Clear and manageable procedures for access to data and samples for research GDPR and the Stockholm Medical Biobank

Acts regulate how data and samples may be handled and how they can be made accessible for research. Research on patient notes currently requires that this data is formally handed over to the researcher. Decisions on releasing patient data from a clinical department include assessing whether disclosure could harm an individual and are made by the head of department. This is the case even if the researcher is studying "their own" patients. However, in many cases, a study may incorporate data from several medical units and at K the decision has then been delegated to one senior consultant who is supported by legal expertise, expertise in IT security and FoU. The process is under development and application procedures and documentation need to be determined. Ideas are rarely completely unique and are often in tune with the times. It is therefore important to our researchers that disclosure can take place reasonably quickly although the need for haste must not impact on the quality of the process.

Region Stockholm currently also holds the health data of more than two million individuals which it has gathered since 1996. The newly established Stockholm Center for Health Data offers researchers a holistic process to support the release of data from several healthcare providers. Awareness of this opportunity needs to be spread in the research organisation and may give our researchers access to larger populations and unique opportunities to follow patients through the healthcare chain. Our quality registries are another increasingly important source of data for research

and development of healthcare, and K hosts 24 of Sweden's national quality registers. Strategic investments in bioinformatics and biostatistics plus capacity to handle huge amounts of data need to be safeguarded both in order to make use of these resources and for research in the field of AI – see also the section on cooperation for more efficient use of resources.

Streamlined processes for biobanking, rapid and safe access to samples for analysis and a functional infrastructure for strategic freezing are important components in a strong research environment. The Stockholm Medical Biobank (SMB) is responsible for samples from the healthcare sector and research. Our procedures on biobanking and making samples accessible need to be developed further. It is particularly urgent to bridge the organisational threshold between SMB and KI Biobank because many research samples taken in healthcare are analysed at KI. To ensure that samples are handled within the regulations, we must continue to create an inventory of old collections of research samples. Freezers containing valuable collections of samples need to be gathered in secure areas. The aim is for the work of surveying collections of samples and the strategic freezing project in progress currently being carried out by FoU staff (part-funded by the Swedish Research Council) to support the work of the Stockholm Medical Biobank to be completed during the planning period.

The hospital has a responsibility to take action to further safeguard good research practice and identify non-compliance

In January 2020, a number of amendments to the Swedish Ethics Review Act entered into force, including an obligation for the responsible research body to take preventive measures to ensure that all research in their own operations is conducted with ethics approval. This obligation is associated with criminal responsibility. The hospital also has an obligation to ensure regulatory compliance in our clinical research and to take measures when non-compliances are identified. To ensure compliance with the Ethics Review Act, guidelines have been produced (Riktlinje för efterlevnad av etikprövningslagen (2003:460, 1 Jan, 2020)) with the support of legal expertise. An implementation plan is currently being drawn up, including greater dissemination of information about the applicable regulations, guiding documents and support functions through heads of FoU and FoU groups.

The FoU staff will arrange spot checks and help with local self-inspections can also be offered by the Karolinska Trial Alliance (KTA). In line with recommendations from the supervisory authority the Ethics Review Appeal Board (ÖNEP), a council for good clinical research practice has been established at the hospital. Research today is encircled by a number of other acts and regulations and the measures depend on the area that the non-compliance concerns. On 1 January 2020, a new *Act on research misconduct* entered into force and under this act, the hospital has an obligation to report to the National Board for Assessment of Research Misconduct.

It is important that the hospital makes the requirements clear and creates a “set course” with a checklist with fundamental requirements and other documents as guidance. Besides such guiding documents, training in Good Clinical Practice (GCP), training at KI and Läratorget's online training “Grundläggande kurs i etik för kliniska studier”, practical support can also be received from KTA and other clinical trial units.

Precision medicine – from research to implementation in healthcare

Precision medicine is already applied today in certain areas of healthcare and it is

judged that it will be applied rapidly for an increasing number of diseases to improve diagnostics as well as treatment. Advanced Therapy Medicinal Products (ATMP) is an important part of precision medicine. Here K has unique expertise, including the Karolinska Cell Therapy Center (KCC) located at K Huddinge. Internationally leading research and development in different areas of cell therapy is taking place at K Huddinge and at K Solna.



Photo: Unsplash – Drew Hays

Precision medicine (PM) is prioritised in the Government's life science strategy and KI and K have created a joint task force, to survey measures to identify and accelerate important precision medicine initiatives in the Stockholm region. An initial survey of important components in PM, has identified more than 15 centres, units and projects that need to be involved. Important external partners include the Science for Life Laboratory and the Genomic Medicine Sweden project. A Precision Medicine Centre Karolinska is taking shape in partnership with the division (Theme and Function) heads concerned, with a vision of integrating precision medicine healthcare, research and education. A number of questions including organisation, the economic model, dealing with personal data and legal responsibility for the respective aspects will be worked on further. In addition, two working groups have been formed around diagnostic development in precision medicine, one in close cooperation with the diagnostic laboratory division (KUL) and the clinical imaging division (Bild & Funktion), and a second around data management, where data storage and calculation capacity are key issues. The introduction of PM will raise a major demand for development in large parts of the hospital's activities. The project is a high priority in both organisations and is reported on directly to the hospital's CEO and KI's President respectively.

Develop measurements able to more quickly reflect changes in research quality

The pace of change at the hospital has been high in recent years. Some changes have encouraged research while others have brought challenges. It takes a long time to build up strong internationally competitive research environments. Deterioration in our teaching environments is rapidly visible in our capacity to take care of our students and results in low points on course evaluations. Our traditional measurements for research, e.g. bibliometry, academic promotions and external grants have long cycles and research therefore risks a "silent death". We need to bring in additional measurements that more quickly reflect changes in research activity. A working group has been appointed within the FoU heads forum and new

measurements are being evaluated. One important area is to ensure that allocated time for research can really be used for research, a point that is difficult to evaluate in today's staff administration system. It would be desirable were this, like other new research measurements, able to be extracted easily from our different systems, although in some cases this would require modifications to what is recorded and some development of the systems.

Improved implementation of research results

Implementation of new knowledge from our own research and that of others has been a challenge in many areas. In the most recent national ALF evaluation, it was also judged that Region Stockholm needs to improve in this area, which led to a reduced allocation of ALF funding. However, our capacity in this field needs to be increased primarily to ensure that, following quality assurance, new knowledge can rapidly help patients. New knowledge should preferably influence overarching guidelines that are drawn up partly in different professional organisations, and partly in the new knowledge governance organisation where clinical research is represented at regional and national level, but then the new guidelines also need to be implemented at clinical level.

Implementation research shows that skills in implementation significantly improve the impact of new procedures. At K, the Innovation support and business collaboration office has specific competence in the area which has so far been applied in working with innovation. The department has now been given a new remit – to support implementation of research. The work being needs-based is an important factor. In early 2021, a survey of needs for implementation support will be implemented in the hospital's divisions as the basis of a plan for ongoing work. There will be a new, national ALF evaluation in 2022 and K is already working with the Region and KI on a shadow application in order to identify and initiate additional measures in the field of implementation.



Photo: Anders Norderman

2.3 Increase the number of clinical studies and promote cooperation with the life science sector

According to the Government's national life science strategy, the number of clinical drug trials has decreased in Sweden since year 2000. The over-all conditions for clinical research appear to be impaired and insufficient allocated time and resources in healthcare are considered problems. The Government aims for more clinical studies in partnership with business in Sweden and according to Region Stockholm's research strategy (Region Stockholm's Research and Development Strategy, 2020), the number of clinical trials in pharmacology and medical technology is to grow by 50% by 2022. It is likely that the COVID-19 pandemic will make it difficult to fulfil this assertion, but on the other hand, it does not exclude initiatives to improve K's prerequisite to attract and run clinical studies.

Work to improve conditions for clinical studies at the hospital is carried out in close collaboration with the Swedish Research Council's node for clinical studies, "Forum Stockholm-Gotland" based in the hospital. To enable clinical studies, access to data, samples, research staff and patients is needed, but there is also a need for competence and well-structured processes at the hospital. High quality and good capacity to deliver make us attractive as a hospital ("site") for both academic clinical studies and those sponsored by industry and also increases opportunities for results to be implemented and so benefit patients and healthcare.

Competent trial staff, research nurses and support functions

A number of departments at K have their own clinical trial units. A forum has been created for these units to spread knowledge and increase quality through all phases of a clinical study – from planning to implementation and conclusion. It includes improved support to all staff categories involved in a clinical study. Today 14 units have joined this forum which is led by our clinical studies coordinator. A checklist of fundamental requirements for clinical studies at K is being produced and will be applicable across the whole hospital. In collaboration with KI, a trial training course "Introductory course in clinical studies. From idea to archiving" is being drawn up and is planned to start in the autumn semester of 2021 at the Department of Oncology – Pathology. The course is primarily for doctoral students but is open to all those engaged in clinical studies. In partnership with HR, we will also initiate a discussion with the Region concerning the development of a competence ranking for research nurses.

The quality of a clinical study is largely determined as early as the design phase. It is usually important that expertise in biostatistics and bioinformatics is hired as early as the planning stage. In this phase, the funding of a study has often not yet been finally determined. Together with KI, we will evaluate the opportunity of allowing design advice to be covered by core facility support while the work of analysing the results of the study is instead charged for. As described above, the Research Support Office together with the Legal Office also contributes advice on regulatory and legal questions plus contract negotiation, financial calculations and contract writing.

Database of clinical studies

To follow the development of clinical studies, it is important not only to monitor the number of clinical studies and the number of patients in studies but also for the studies to be completed and for K to deliver the promised number included patients and good quality data.

Incomplete or interrupted studies may mean both loss of knowledge and financial consequences, and also affect our trustworthiness as a hospital to run high quality clinical studies. A database of clinical studies is being developed. The database will be a tool for the research nurse but also provide an overview of the studies being conducted at the hospital. Study documentation, permits and agreements will be collected here. The database is also planned to be a tool to enable the hospital to follow up and ensure correct financial compensation for work carried out. The aim is to implement a pilot version in the spring term of 2021.

Enable more clinical studies through collaboration in the new healthcare map

Since large groups of patients have been moved out of the hospital, there is a greater need for our sites to work together and to preserve the link between pre-clinical and clinical research in these areas. K is not always successful in finding new collaborative formats in the new healthcare map. The solution may involve collaborating to enable recruitment of patients to clinical studies at the hospital or to include patients of other care providers, but it may also involve helping to establish collaborative research and education nodes externally. The Academic Specialist Centre and the local emergency walk-in centre Närakuten Solna are two units currently run by SLSO where collaboration in both research and education has been established around patient groups that were previously treated at the university hospital. These examples represent care providers with a wider remit, which is important for cooperation in both research and education. Experiences from these collaborations will be compiled to guide our continued initiatives in this area.

There are some clinical specialities where many patients with less complex diagnoses have been distributed to many small care providers in a way that makes both research and education considerably more difficult. One such speciality was Ear Nose and Throat (ÖNH). After several failed reviews of our specialist training in Ear Nose and Throat, K was able to set up an external node in 2019 located at Danderyd Hospital. The hospital's "Speciality inquiry" evaluated whether a certain speciality had access to relevant patient populations for research and education. This is particularly important in specialities where K has regional responsibility for both education and research. In addition to Ear Nose and Throat, additional specialities with similar problems were identified. Measures to safeguard our competence in these specialities in the long term need to be produced in consultation with the region and KI.

Increase inclusion of patients from outside the county and outside the country in clinical studies

There are many practical advantages of including patients from our own region in clinical studies on the grounds of proximity and opportunity to interact with the patient. However, the hospital provides high-quality healthcare where for many diagnoses it is important to include patients from other parts of Sweden. This is especially true for areas where the hospital has been given a nationwide mandate. Here, providing an opportunity for patients from other regions to participate in studies is part of ensuring equitable healthcare throughout the country. At the same time, it is important that treatment teams in the home location are also involved. Especially with rare diseases, it may also be necessary to identify, screen and include patients from other parts of the world. Here, differences in countries' regulatory frameworks and a lack of insurance cover often complicate the process. Guiding documents are being drawn up in partnership with the unit for healthcare outside Sweden or outside the county.

One important strategy for the hospital is now to increase its proportion of patients from other regions and other countries. Excellent research and rapid implementation of new knowledge are important for our capacity to attract patients from other regions and other countries and to be successful in our applications for National Highly Specialised Healthcare (NHV). At the same time, higher patient numbers in highly specialise diagnoses also offer expanded opportunities for clinical studies. Besides the government appropriation, Region Stockholm invests considerable amounts in FoU. However, the knowledge generated will not only benefit the region's patients but all patients within the diagnosis group. It would therefore appear reasonable to evaluate if revenues for treating patients from other regions and other countries may contribute to our research resources. In the long term, this could be developed to a significant addition that the hospital can invest strategically in research that safeguards and further develops this part of the hospital's operations.

Promote cooperation with the life science sector

The hospital needs to become a more professional actor in partnership with the life science sector and other external partners. This involves shorter response times to expressions of interest, faster processing of proposed studies and simplified but quality assured contract negotiation and contract writing processes. There should be a clear contact route into the hospital, although many people often begin by contacting one of our researchers with whom they have worked before. The hospital has also recently created a research price list to ensure and simplify pricing across the hospital as part of efforts to become a more professional partner. This is part of the hospital-wide checklist referred to above. AI is a development area with particular challenges due to the need for large amounts of high quality patient data. In partnership with private actors, this may involve providing temporary access to data, e.g. by creating what are known as "data lakes" rather than transfer data.



Photo: Unsplash – National Cancer

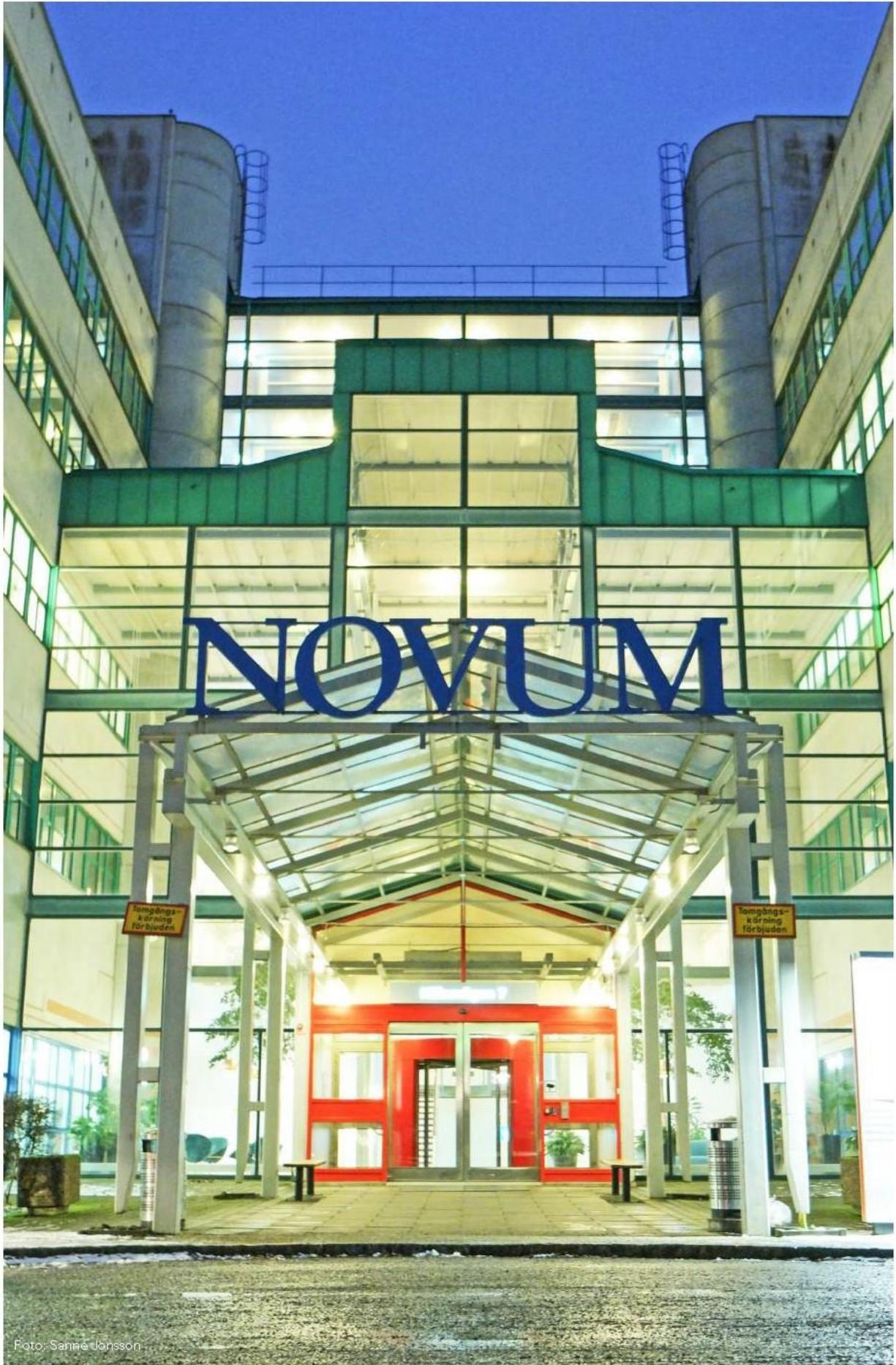


Foto: Sanna Jönsson

2.4 Strengthen cooperation to use resources more efficiently and boost competitiveness

KI is by far our largest collaborative partner for research and education and a large and mutual dependence exists in clinical research and education. Additionally, K has important, and in some cases growing, partnerships with other actors such as Royal Institute of Technology and Stockholm University, and in education also with institutions such as the Swedish Red Cross University College, Sophiahemmet and Ersta Sköndal Bräcke University College. Today's research often demands major investments in both hard and soft research infrastructure and education also has a growing need for investment in teaching environments and core facilities for individual skills training, team training and advanced simulations. Together, through joint planning, we can often achieve more effective use of resources and so release funding for new investments. Collaboration, not only regionally, but also nationally and internationally, is often a necessity to be competitive in major grant applications and projects.

Effective use of the infrastructure

As part of implementing the healthcare plan for the future, new cohesive research environments were created in K Solna at BioClinicum, also linked to KI's new research building, Biomedicum. In Solna, the hospital's researchers also work in the CMM Foundation environment and in Huddinge the hospital runs a research hotel, the Clinical Research Centre (KFC). The forecasts of local needs made in the planning phase have resulted in a certain surplus of wet lab premises and premises for comparative medicine. Certain other infrastructure has been duplicated, sometimes within the hospital, sometimes between the hospital and KI. A joint survey of research premises and teaching premises at K and KI has been launched to optimise use. The hospital will be engaged in working on the 2021 call for core facility grants and will be monitoring that it is supporting clinical research and combatting unnecessary duplication. The opportunity for groups of researchers to make use of KUL's (clinical diagnostic laboratories) accredited methods instead of setting up their own analyses will also be highlighted. It is important the profiling of care between the sites is coordinated with the profiling of clinical research, education and core facilities. Information about the profile and services of the respective site will be combined to show what we can offer. A clear offering needs to be disseminated internally and to academic institutions and the life science sector and other relevant parts of the business community.

Clinicum – an investment in improved support in bioinformatics and biostatistics

The direction of today's research and new technologies that generate big data means that demand is growing for support in bioinformatics and biostatistics. A survey conducted at Campus Syd shows that $\frac{3}{4}$ of the groups questioned would like to see additional competence in both bioinformatics and biostatistics and the funding available to pay for this support. However, it is difficult to find providers. A number of local initiatives are taken at the hospital, at KI, and at Danderyd and Södersjukhuset hospitals. However, in several cases it has proved difficult to recruit competent staff. K has signed up to the Clinicum initiative, a collaborative organisation launched by KI to form an umbrella organisation to coordinate these initiatives and create an environment capable of attracting and retaining staff with a high level of expertise in these areas. Clinicum is able to contribute to raising the quality of the clinical research, especially if the competence is included as early as the study design phase. To encourage this, it is being considered whether the design phase should be covered by core facility funding while the analysis work is charged for.

Optimising collaboration with KI

The basis for collaboration with KI is formally regulated in the regional ALF agreement, but is also facilitated by the KI department chairs linked to the K divisions (temaprefekter), heads of FoU, clinical professors (with appointments both at KI and K), adjunct professors and lecturers, all of whom are fundamental to the ability to provide good FoU environments. Changes in the hospital's organisation, mandates and profile have led to our organisations being less congruent than was previously the case. Forums for collaboration are sprawling in some cases and some questions may be addressed in several forums while others risk falling between two chairs.

Both the organisations would benefit from developing a more structured collaborative structure. Experiences from previous work on change in healthcare have clearly shown that strong local cooperation and a common vision for the hospital and the academic leadership is an important success factor in creating strong healthcare, research and education settings.

It is also important that there is mutual understanding of each other's responsibility, organisational structure and decision-making pathways. For example, this can be achieved by running certain leadership training sessions jointly. The remits of heads of FoU and FoU managers, as well as chairs of KI departments and KI representatives on collaborative issues need to be clarified. There is a need to attain a consistent approach regarding the need for new, united services plus adjunct posts and the conditions for these. Additional proposals that should be considered to optimise collaboration were drawn up in the project "Insatser för FoUU i samarbete mellan KI/K" (FoUU initiatives in partnership between KI/K).



Photo: Ulf Sirborn/Karolinska Institutet



Photo: Carin Tellström

Multi-faculty collaboration – a success factor

The current rapid development of technology opens up new opportunities but also often gives rise to complex questions outside the medical field; these may involve new technology, IT security and dealing with big data, but also law, privacy and ethics. These questions require cooperation with other faculties. Internationally, there is also a clear trend towards collaboration between several faculties.

One example of multi-faculty collaboration from our region is the "Stockholm trio" university alliance, a collaboration between KI, Royal Institute of Technology and Stockholm University. Another example is MedTechLabs, a multi-disciplinary centre for medical technology research. The establishment of MedTechLabs is to pave the way for healthcare to offer patients faster diagnosis and better treatment. The centre is run by the Royal Institute of Technology, KI and Region Stockholm and is to contribute to developing medical technology in a national and international perspective. The underlying idea is to establish an environment for advanced FoU in medical technology very close to the healthcare operations. MedTechLabs is housed in BioClinicum at K Solna and its location was chosen due to its proximity to patient flows and in order to safeguard patient safety. The lab environment will enable different groups of researchers in the Stockholm Region, especially at K, to carry out research in the field of medical technology close to the healthcare operations.

Campus Syd is particularly well placed for multi-faculty collaboration. In the immediate vicinity of K, as well as KI, we also find Royal Institute of Technology, Södertörn University, the Swedish Red Cross University College and Stockholm University College of Music Education (SMI). To support this trend, good examples of collaboration need to be highlighted. For example, here there are core facilities in the area of medical imaging working together to encourage clinical research : KI's Stockholm Medical Image Laboratory and Education (SMILE) which improves access to image data, education and analysis, KTH's Jonasson Centre for Medical Imaging, which provides advanced infrastructure, and K's expanded Preclinical Laboratory (PKL).

The foundation Flemingsberg Science, which also includes Region Stockholm, Huddinge and Botkyrka municipality, was formed to create cooperation in research, development and innovation in Flemingsberg at the intersection between academia, the business community and society. CIMED is a special investment by Region Stockholm to further reinforce the clinical research at Campus Syd. To support this trend, good examples of collaboration need to be highlighted. Resourcing specifically geared towards collaboration (such as the call Health, Medicine and Tech) also provides fertile soil for joint projects. Developing opportunities for shared positions should also be considered.

European University Hospital Alliance (EUHA)

Nine leading European university hospitals have joined forces in forming the European University Hospital Alliance (EUHA) with the aim of promoting expertise and innovation in healthcare, research and education and improving the quality of healthcare at European level. The initiative came from K. The presidency rotates and K began its second presidency in November 2020. The theme during K's presidency is "Leading by doing". Through their international networks, EUHA's members share expert skills and experiences in healthcare, research and education with the aim of strengthening the university hospitals' cutting edge expertise and innovation.

Together the university hospitals in EUHA run more than 300 funded research and development projects within the Horizon 2020 programme and more than 6,000 clinical studies. Cooperation within EUHA has also resulted in joint EU grants. Within the field of FoU, K needs to make strategic choices to engage in the areas that best promote our needs. To be able to deal with international competition for funding from the EU, specific expertise is needed on the research programme's application system and on regulations, something that is now being reinforced within the FoU staff's Research Support Office.

The network is a strategically important collaboration that not only provides an opportunity to make joint applications but also influence the direction of future calls. The activities extend far beyond FoU, and cooperation on clinical activities such as sharing experiences in tackling the pandemic, concerning rare patients in the European Reference Network (ERN), benchmarking and exchange programmes are also included.



Foto: Martin Stenmark/Karolinska Institutet



Photo: Jens Dahlborg

2.5 Increase patient involvement and engagement for a sustainable society

In the same way that universities and other higher education institutions are assigned with and engaging with society in what is termed their third task, the university hospital also needs to conduct outreach work. Our FoU remit gives us an opportunity to contribute to a society that is sustainable in the long term, both in terms of teaching our students and the direction and implementation of our research.

Our patients play an essential role in our ability to fulfil our mandate as a university hospital and we need to nurture their trust in healthcare and their willingness to participate in and contribute to research and education. The hospital's strategic patient and family councils are to work across the entire hospital on questions initiated by patients and relatives. The council will be involved in overarching work to raise the perspective of the patient in FoU. At the clinical departments level, patients and/or families are represented in many patient flow management groups and in individual diagnosis areas, patient associations and other stakeholder organisations can also be important partners.

Inform patients about the mandate of a university hospital and inspire participation in research and education

Many patients meet students during their hospital treatment and some patients will also be asked whether they are willing to participate in studies. To better prepare our patients for this, the university hospital's education and research mandate needs to be made clear, ideally when appointments are made, and through information via the hospital's communication channels. It is important to balance information on the benefit and the important role of the patient with information about the right to refuse. We are also planning to publish popular science descriptions of the clinical studies carried out at the hospital, including a contact person. The website is also a natural place to make information available about the hospital's mandate related to FoU and the way in which this can affect the patient. Work to review the content of research and education at karolinska.se is currently in progress.

Increasing patient involvement

Patients, families and patient organisations need to be seen as a resource to a greater extent and made more involved in both research and education issues at the hospital. Greater patient engagement involves strengthening the rights and opportunities of patients and relatives to influence research and the forms for participation in education. Good patient involvement can also contribute to greater transparency, and to trust in research, and increase willingness to participate in education and research at the hospital.

Patients who participate in a clinical study have the right to information required for their informed consent. The ethics review process must ensure that relevant information is provided. Patients must also be informed of how they can receive their individual data and the result of the whole study. However, it can also be valuable to include the patient perspective early on in the research process, for example when identifying research questions and when choosing research methodology. It is currently unclear how well patients are engaged in the research and education mandate of the hospital. A survey is needed to provide a picture of the current situation and identify good examples while raising the question of patient involvement locally in Themes and Functions. The question of patient involvement will also be included in the hospital-wide checklist for clinical studies being produced by the FoU staff's Research Support Office. The checklist for the conclusion of studies will include an item stating that normally information about the study must be fed back to the participants, something which is unfortunately currently not always the case.

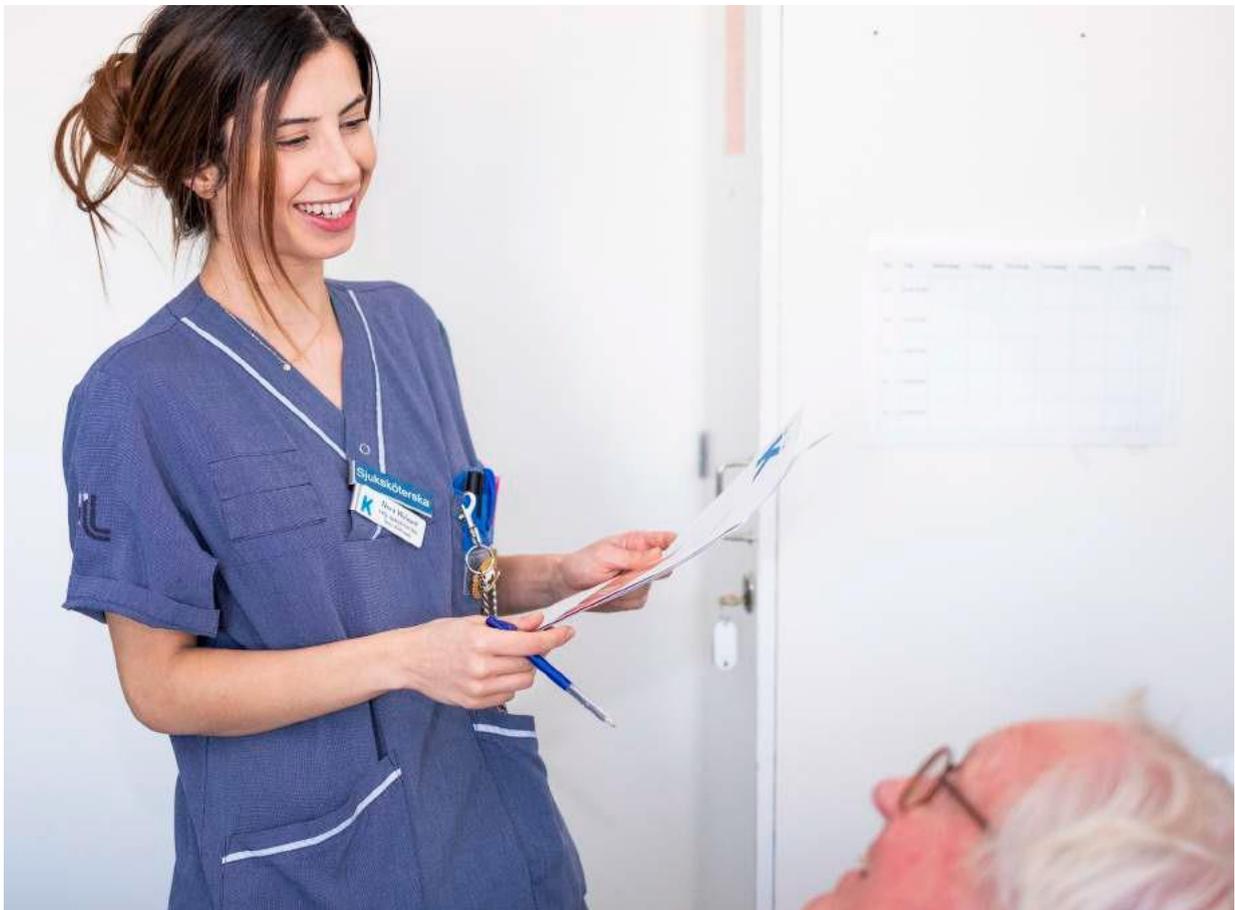


Photo: Jens Dahlborg

More clearly integrate work for a sustainable society in teaching

In 2005, K was the first university hospital to gain certification under the international environmental management standard ISO 14001. Since then, environmental work at the hospital has undergone regular audits and today environmental issues are a natural part of the hospital's processes in its clinical operations. FoU has essentially worked on the hospital's overarching objectives, and environmental work specific to FoU has mainly focused on chemicals handling and hazardous waste. On the other hand, up until now we have not worked clearly on how our FoU can make its own contribution to work on planetary health.

According to the KI strategy for 2030, work on the UN's Sustainable Development Goals is to be reinforced and efforts have begun to integrate these aspects in research as well as student education. Similarly, the hospital needs to shed light on the global sustainability questions in clinical education and the planning needs to be harmonised with KI and with the other universities. A plan to integrate sustainable development issues will be drawn up in consultation with KI and other higher education institutions concerned, and with our environment unit.

Research at Karolinska University Hospital can contribute to work on planetary health

Many of the patients currently treated at our hospital have conditions that are negatively affected by or have even been caused by environmental pollution. Biomimetics is a relatively new science which is about solving problems and creating new products by studying and imitating processes in nature. There are many examples of drugs and other products produced using this technology, but much remains unexplored. Nature provides examples of species that have developed mechanisms to deal with states that lead to illness or injury in humans. Today, many of the earth's ecosystems are under severe stress and global biodiversity is constantly being depleted. Besides the more obvious losses and imbalance created, this also leads to the loss of sources of valuable knowledge.

In 2019 KI hosted a Nobel Symposium on biomimetics and in autumn 2020 a grouping including representatives from KI, FoU K, the Stockholm Resilience Center at Stockholm University and the World Wildlife Fund (WWF) met to discuss potential collaboration in research, teaching and developing policies in the field of planetary health. For example, our choice of food has a major environmental impact but such considerations are not taken into account when we draw up dietary advice. Other possible areas for collaboration include joint doctoral student projects with multi-disciplinary angles.



Photo: Pixabay/Thanh Nguyen Gia

3. FoUI staff at Karolinska University Hospital

The Research, Education and Innovation (FoUI) staff serves as a support function which coordinates and administers the hospital's education and research remit and runs a number of hospital-related core facilities at both Huddinge and Solna. In 2020, the staff was reorganised, gaining a more consistent structure and the number of units (and managers) was reduced. The FoUI staff comprises the Research Support Office, the Education Support Office and Analysis and research infrastructure. Since 1 October 2020, it has also included the Innovation support and business collaboration office. The restructuring has been affected by the pandemic and is planned to also continue into 2021.

Research is currently encircled by a complex legal and regulatory framework, both nationally and internationally. Correct and rapid processing of complex agreements demands high levels of expertise which cannot be built up within each individual division and the FoU staff's Research Support Office works closely with the Legal Office in this area. A review of the operations within the staff is currently underway and two clinical trial units have been moved to the Cancer division and SLSO respectively to ensure a more joined-up approach and operational efficiency.

Transparency and clarity regarding our research costs relative to healthcare costs is important to our owners, to regions referring patients and to our research funding bodies and research partners. In the project Grants Office (GO) and Grants Management Office (GMO), the hospital has focused on improving support to researchers applying for external grants and collaboration, while ensuring that the hospital receives the right payment for our services and that they are invoiced in line with agreements. Support to the divisions on drawing up agreements and cost calculations (pre-contract) is coordinated by GO within the FoU staff while invoicing and follow-up (post-contract) is handled by a newly established unit within the finance staff (GMO). As part of this work, a research pricelist has been drawn up with the backing of the units concerned. Unfortunately, in the past, external partners have sometimes been given different prices for the same service by different hospital units. Overall, we estimate that this investment, which will be funded by 15% OH (overheads) on external appropriations, will lead to the hospital becoming a more professional and attractive partner while the divisions will receive correct payments for their input. Five percent of OH goes to the divisions to cover local administrative costs.

4. Conclusion

The hospital's FoU activities are an integral part of K's work to attain the hospital's vision: "Tomorrow, we will cure and relieve that which no one can cure and relieve today." The new hospital buildings in Solna and Huddinge form a highly advanced infrastructure capable of taking FoU to a new level. At the same time, the changed content of care in certain specialities means challenges in providing students with access to the right patient categories and for researchers in gaining access to patient data for large clinical trials. Following a period of many changes, we at the hospital now need to improve our capacity to work in the new healthcare map with our three mandates of healthcare, research and education, while simultaneously focusing on developing our processes such that we can more rapidly implement new knowledge in our clinical activities.

Region Stockholm's Research Promise has a clear objective that Stockholm is to be one of the five foremost life science regions in the world in 2023. The region is a dynamic environment with internationally trailblazing research involving many public and private actors. K is an important engine in this development and together with KI and other partners, we have a strong international network in the medical field. In the future, we need to focus on further increasing the number of clinical studies and promoting our cooperation with the life science sector.

We particularly need to protect and develop K's internationally prominent and nationally unique strong academic environment. This will leave us well placed to generate new knowledge and improve the healthcare results for the patients of today and tomorrow, while contributing to development in the region and raising the profile of Swedish university healthcare internationally.

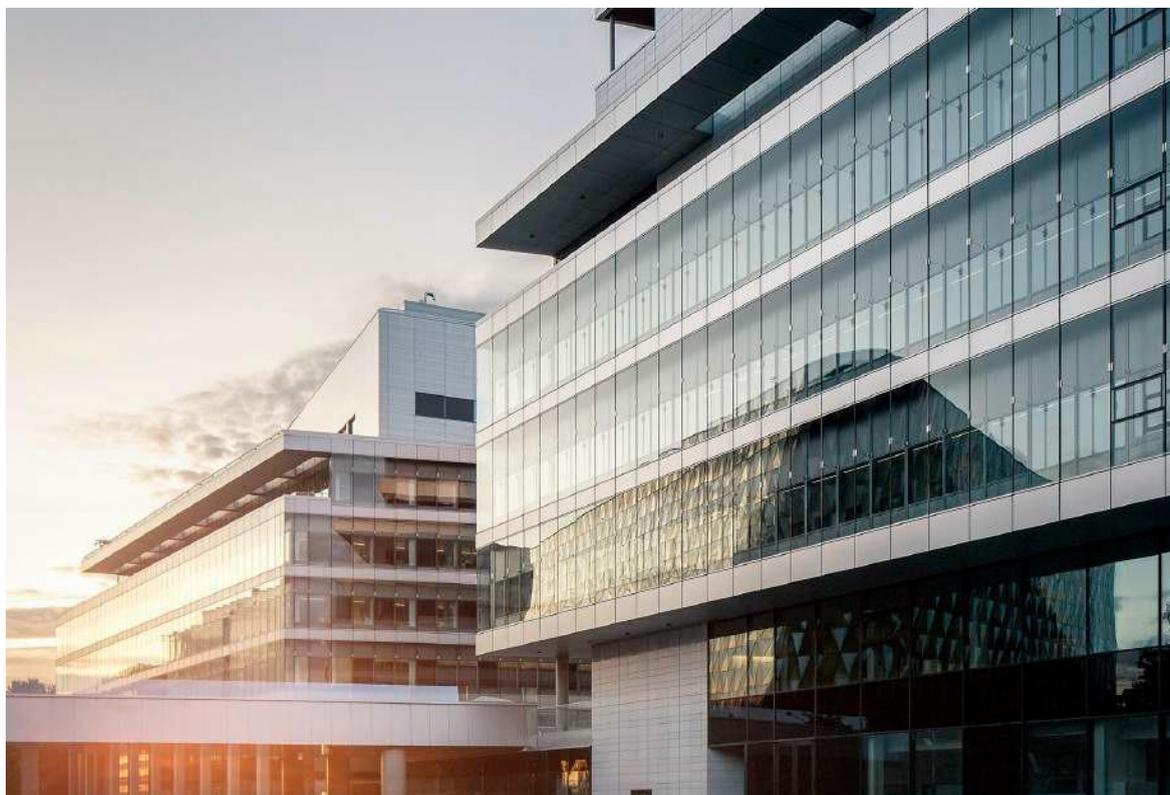


Photo: Felix Gerlach

5. APPENDIX – FoUI staff remits and core facilities

5.1 FoUI secretariat

The FoUI secretariat is responsible for overarching coordination and support for FoUI at Karolinska University Hospital and operates via the heads of FoU for the respective divisions, the FoU committee (ALF) and the departments and core facilities described below. The FoUI secretariat includes a Site Director at Huddinge and a House Director for BioClinicum.

The secretariat's remit is to improve the efficiency of and develop hard and soft infrastructure for clinical research at the hospital (premises, equipment, core facilities, processes, systems and models).

Research hotels

The FoUI secretariat provides research premises for clinical research with an experimental focus in three different research hotels: KFC (Clinical Research Centre) at Novum in Flemingsberg, BioClinicum and CMM (Center for Molecular Medicine) in Solna. Almost 1,500 researchers work in these laboratories for which the FoUI secretariat is responsible.

AT head, ST study director/head

The services facilitate the region's mandate of training interns (AT) and residents (ST) doctors in line with the National Board of Health and Welfare's regulations. The remit includes coordination and administration of education and courses, financing and monitoring quality for the hospital's approximately 650 residents in 47 specialities and approximately 110 interns. The AT head and ST study director/head report to the FoUI Director.



Photo: Sanne Jonsson

5.2 Research Support Office

The main mandate of the office is to support clinical researchers at the hospital. The remit mainly encompasses administrative support in research administration and regulatory questions, EU-funded research projects and the development of research and education data for hospital planning and following up core activities. The office is also responsible for coordinating and preparing all research and education questions regulated in the regional ALF agreement. The office also deals with donations and Karolinska University Hospital funds and foundations.

- **Forum Stockholm-Gotland Node**

Forum Stockholm-Gotland is one of six national nodes in the Clinical Studies Sweden partnership. The nodes mission is to improve conditions for clinical studies in Region Stockholm and Region Gotland.

- **Coordinator of clinical studies**

The coordinator works to increase the number and the quality of clinical studies and increase the number of patients included in studies.

- **KTA (Karolinska Trial Alliance)**

KTA Support has a regional mandate to offer support, advice and project management by planning and follow up clinical studies. KTA also offers courses and training in Good Clinical Practice (GCP).

- **KEP (Clinical EPidemiology)**

Clinical Epidemiology (KEP), combine clinical, epidemiological, and biostatistical expertise with the aim to improve the understanding and treatment of a broad range of medical conditions. This often means to follow long courses through the region's entire healthcare chain mastered by researchers at K. KEP also holds medical quality registries and runs a research school in epidemiology for clinical doctoral students.

5.3 Education Support Office

The office offers support and conditions for the hospital's extensive education remit in line with the Education instructions issued by Region Stockholm. The office works to ensure that the hospital, working jointly with higher education institutions and other education providers, is able to offer high quality intra- and interprofessional academic learning environments that are well integrated with the hospital's healthcare and research. The remit includes coordinating 11,000 VFU/APL/LIA weeks per year and coordination responsibility for the AKA function. There are also administrative support functions for interns and doctor's in specialist training (recidents) and development of supervisor skills. Improvement and development work constantly takes place in collaboration with higher education institutions, schools, providers and regions.

- **KTC (Clinical Training Centre)**

The centre operates in Solna and Huddinge and offers practical conditions to carry out training in elements and procedures from basic level to advanced surgical techniques and interventional radiology. The unit is responsible for the hospital's CPR remit: training, coordination, statistics and analysis.

5.4 Innovation support and business collaboration office

The remit includes work to further increase capacity to drive and spread innovation in the hospital. Support to the hospital's operations is provided at establishment, operation and commercialisation of innovation projects, but also via training initiatives. The following services are offered to the hospital's operations to support their innovation work.

Innovation support and support for accelerated implementation

- Training and coaching tailored to the target group: methods, tools and framework.
- Intelligence and support in drawing up the innovation strategy and focus areas of the clinical divisions
- Project and innovation leadership and/or support for innovation projects
- Support to meet criteria for implementing research and new knowledge, especially linked to criteria in ALF evaluation

Industrial partnerships and other cooperation with business

- Managing and pursuing selected innovation partnerships entered into
- Selecting and initiating new areas for long-term innovation collaboration with business actors
- Entry point for contact with business actors

Hospital-wide focus areas

- Intelligence on the internal and external situation for identifying potential areas
- Project and innovation management of prioritised initiatives

Research, development and innovation financing

- Analysis and identification of potential sources of financing for prioritised areas
- Coordination and production of prioritised applications.

5.5 Core facilities

KCC (Karolinska Cell-therapy Center)

Core facility with the purpose of facilitating the development of new treatments with advanced therapy medicinal products (ATMP) and cells for transplantation. The facility has a permit from the Swedish Medical Products Agency to manufacture ATMP intended for clinical trials and a tissue bank permit from the Swedish Health and Social Care Inspectorate.

Mutation Analysis Core Facility (MAF)

Core facility in the form of an accredited laboratory that helps researchers to study genetic variations to identify and assess how these affect the processes of different diseases. MAF is accessible for researchers at K, KI and other academic institutions and companies

Preclinical Laboratory (PKL)

Core facility in Huddinge with services in animal testing for preclinical research in all fields from transplantation, haematology, cancer and neurology to research into metabolic and cardiovascular diseases. The unit provides technical help and support, consultation on ethics approval applications, training, longitudinal large animal studies and surgery courses.

- **The Preclinical Imaging Facility (PIF)** offers a modern imaging modality (animals) including the latest equipment (Magnetic Particle Imaging, MPI) and is the first facility in the Nordic countries to offer this technology.

CAMST

The unit is tasked with providing courses in advanced procedural and team training in high-tech healthcare, including national courses at specialist and doctoral student level and instructor training. At the CAMST Simulator Centre, students and healthcare staff can train their skills and ability to work together with advanced simulators before they meet real patients, increasing patient safety and reducing the risk of errors.

Comparative Medicine (AKM)

The remit is to offer an animal research facility at Karolinska University Hospital Solna, a service organisation for experimental research with animal care, a clinical trial service, training and expertise on legislation. This operation is to maintain the quality required under the Swedish Animal Welfare Act and with the required permits from the Swedish Board of Agriculture.

KERIC (Karolinska Experimental Research and Imaging Center)

Service organisation for experimental surgery with advanced imaging equipment for research and courses plus skills training.

Library

There are libraries at Solna and at Huddinge which support clinical work, education and research by providing specialist literature, ordering articles and conducting searches. In addition to specialist literature, there is also health information for patients and relatives plus a public section with fiction and films. *Läratorget*, a learning platform for skills development through e-learning and teacher-led courses is part of the library's operations.