Evaluation of Medicine and Health (EVALMEDHELSE) 2023-2024

Self- assessment for administrative units

Date of dispatch: **15 September 2023**
Deadline for submission: **31 January 2024**

Institution (name and short name):
Name: Akershus University Hospital and Institute of Clinical Medicine, University of Oslo
Short name: **Ahus and Campus Ahus**

Administrative unit (name and short name):
Name: Akershus University Hospital and Institute of Clinical Medicine, University of Oslo
Short name: **Ahus_Campus Ahus**

Date: 31 January 2024

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Content

1.Strategy, resources and organisation

1.1 Research strategy

Describe the main strategic goals for research and innovation of the administrative unit. You may include the following:

- ***How are these goals related to institutional strategies and scientific priorities?***
- ***Describe how the administrative unit's strategies and scientific priorities are related to the "specific aspects that the evaluation committee should focus on" indicated in your Terms of Reference (ToR)***
- ***Describe the main fields and focus of research and innovation in the administrative unit***
- ***Describe the planned research-field impact; planned policy impact and planned societal impact***
- ***Describe how the strategy is followed-up in the allocation of resources and other measures***
- ***Describe the most important occasions where priorities are made (i.e., announcement of new positions, applying for external funding, following up on evaluations)***
- ***If there is no research strategy – please explain why***

During the period 2012-2022, research output from Akershus University Hospital (Ahus) has doubled, and from being the Norwegian teaching hospital with lowest research output, Ahus is now ranked #4 overall and close to #3 for clinical interventional trials - please see *Summary of Annual reports* for data. This progress has been a result of strategic work and priorities, with plans evolving over time.

Research at Ahus is important to improve clinical care for patients at Norway's largest acute hospital (catchment area for Ahus >600,000 inhabitants, which is >10% of the Norwegian population). Research at Ahus has improved care for patients regionally, nationally, and internationally, as demonstrated in the "Impact cases" and by level 2-assessments from the research groups. Ahus is also a major teaching hospital in Norway, educating all categories of health care professionals (*Education strategy 2017-2030* with *action plan)* and Ahus has experienced 10-fold increase in active/ongoing clinical interventional trials during the period (please see *Clinical interventional trials at Akershus University Hospital*).

Research at Ahus (hospital-level) in the period 2012-2022 has been strongly influenced by priorities and strategic documents also from the University of Oslo (UiO). As one of two teaching hospitals in the greater Oslo region, developments in research and innovation at Ahus has been greatly improved by the collaboration with UiO. Economic investments in personnel and infrastructure comes both from Ahus (hospital) and from UiO (university), including administrative staff and local leadership from UiO located at Ahus (referred to as “Campus Ahus”). Accordingly, for this evaluation, we present research at Ahus (hospital) and Campus Ahus (UiO) together, as the interaction is tightly interconnected with most senior researchers at Ahus having joint positions between Ahus (hospital) and UiO (university).

The question related to research strategy therefore includes strategies at both Ahus and UiO. During the period, several strategic documents have been guiding for priorities, including general documents at UiO and Ahus, and documents from the individual clinical divisions at Ahus. Both UiO and Ahus enforce freedom for researchers to study areas of interest, within legislative regulations. Hence, overarching strategies at Ahus and UiO provide direction for research focus, but research groups can have other benchmarks, as also demonstrated in level 2 reports from Ahus/Campus Ahus.

To focus on overarching research and innovation strategies at Ahus/Campus Ahus, we highlight five important documents with strategic importance for research at Ahus/Campus Ahus 2012-2022: ***(1)*** *The strategy for Life Science at UiO from 2014,* ***(2)*** *Strategic plan for the molecular laboratory (EpiGen) and clinical trial unit from 2014*, ***(3)*** *Strategic plan for Akershus University Hospital 2035 from 2017*, ***(4)*** *Self-assessment on the hospital-level (level 1) during internal review of research from 2019*, *and* ***(5)*** *Strategic plan for Akershus University Hospital 2040 from 2022 with relevant sub-documents, including for research and innovation*.

The first two documents are connected, with ***The strategy for Life Science at UiO from 2014*** providing a framework for the direct Ahus/Campus Ahus-related strategy ***Strategic plan for the molecular laboratory (EpiGen) and clinical trial unit from 2014***. Document #2 was developed to position Ahus within the life science strategy of UiO (document #1). From the start of Ahus as a teaching hospital affiliated with UiO (from year 2001), the molecular laboratory EpiGen was highlighted as a core infrastructure to develop research at Ahus. Document #2 supports EpiGen as the nucleus for molecular and translational research at Ahus. Document #2 also represents the starting point for strategic work to build large-scale, universal research infrastructure for clinical trials at Ahus. Convergence and translational medicine are emphasized in document #2.

We believe document #2 has been followed-up, as demonstrated by several of the "Impact cases for Ahus", the self-assessment by EpiGen and many research groups for level 2-assessment, and the increase in clinical interventional trials at Ahus from 2012-2022.

Document #3, ***Strategic plan for Akershus University Hospital 2035 from 2017***, supported the research priorities of document #2, including to prioritize EpiGen, focus on translational research, and to build strong, universal research infrastructure at Ahus. The strategic plan from 2017 also highlights the multidimensional health service research being performed at Ahus. Health service research at Ahus is nationally leading and has contributed to the introduction of the “4 habits model” for communication training, which is now used throughout Norway for improving communication between health care personnel and patients and relatives (see self-assessment from Health Service Research Group, level 2).

Document #4, ***Self-assessment on the hospital-level (level 1) during internal review of research from 2019***, built on prior strategic documents. This document also introduces the ambition to utilize the leading data warehouse of Ahus for novel designs in clinical interventional trials, especially pragmatic electronic health record (EHR)-based randomized controlled trials (RCTs). Document #4 has been followed-up with one finalized EHR-RCT during the covid-19 pandemic with high impact publications (two articles in Nature Communications) and two ongoing EHR-RCTs (ClinTrials.Gov NCT05699564 and NCT05045612), and two major pseudo-randomized clinical interventional trials, which are all executed by a dedicated research infrastructure to support all aspects of clinical research (Akershus Clinical Research Center (ACR)). Document #4 also enforces improved use of the major biospecimen repositories at Ahus, which is on-going work. Assessments by two external, independent reviewers from 2020 to the status of research at Ahus in 2019 and document #4 are provided here: Evaluation of the research at Akershus University Hospital (level 1) - Gjertsen and Evaluation of the research at Akershus University Hospital (level 1) - Ikdahl.

The current strategic document for research at Ahus is the ***Strategic plan for Akershus University Hospital 2040 from 2022***. For this strategic plan there are several sub-documents, including one document for *research and innovation*. The sub-document for research has more system-oriented focus and identify six areas of importance to achieve sustained research growth at Ahus. We include these documents from 2022 as they demonstrate consistency in strategic planning with *(A)* emphasis on economic support to EpiGen and other universal research infrastructures at Ahus, *(B)* focus on collaboration with the University sector, *(C)* prioritizing translational medicine by improving systems for collected biospecimens (biobanks), and *(D)* to use data warehouse Ahus for pragmatic clinical trials. These elements are included in the SWOT analysis in *Section 1.8*.

In addition to the strategic documents, **Ahus has had "to strengthen Ahus as a University Hospital" as a top strategic aim from 2019.** The specific criteria to evaluate "strengthen Ahus as a University Hospital" are ***(1)*** increment in the number of published peer-reviewed original research articles annually, and ***(2)*** increment in number of clinical interventional trials conducted annually. This aim has been followed-up systematically with clinical divisions performing self-review of the status (x3/ year), and subsequently the Board of directors, Ahus determining overall status for Ahus (x3/ year). Head of Research at Ahus also discusses status with the leadership of the individual clinical divisions twice a year. The clinical divisions then need to prioritize internal funds or obtain external funds to deliver on these specific aims. Head of Research, Ahus can also provide some dedicated start-up funding for prioritized projects, like funding part-time positions (20%) as "*Medical Lead*" for 1-2 years in the clinical divisions to start more interventional trials, including researcher-initiated pragmatic clinical interventional trials.

We have added "Clinical interventional trials" and "collaboration with industry" as specific Terms of Reference (ToR) for Ahus (*Section 5.1*), which we find are in alignment with strategic priorities at Ahus/Campus Ahus for 2012-2022.

Table 1. Administrative unit`s strategies
For each category present up to 5 documents which are most relevant for the administrative unit.

Research strategy		
No.	**Title**	**Link**
1	The strategy of Life Science at UiO from 2014	UiO strategy for the life sciences - UiO:Life Science
2	Strategic plan for the molecular laboratory (EpiGen) and Clinical Trial unit from 2014	strategic-plan-for-the-molecular-laboratory-epigen-and-clinical-trial-unit-from-2014.pdf (ahus.no)
3	Strategic plan for Akershus university Hospital 2035 from 2017	strategic-plan-for-akershus-university-hospital-2035-from-2017.pdf (ahus.no)
4	Selfassessment on the hospital-level (level1) during internal review of research from 2019	Selfassessment on the hospital-level (level1) during internal review of research from 2019
5	Strategic plan for Akershus University Hospital 2040 from 2022 with relevant subdocuments, including for research and innovation.	strategic-plan-for-akershus-university-hospital-2040.pdf (ahus.no)
Outreach strategies		
No.	**Title**	**Link**
1	Strategy for Communication at Ahus	strategy-for-communication-at-ahus.pdf
2	Communication and dissemination Strategy at the Institute of Clinical Medicine	Communication and dissemination strategy at the Institute of Clinical Medicine (uio.no)

Open science policy		
No.	**Title**	**Link**
1	Strategy for open access at UiO	https://www.ub.uio.no/english/writing-publishing/open-access/documents/strategy-open-access.html
2	Policies and guidelines for research data management UiO	Policies and guidelines for research data management - For employees - University of Oslo (uio.no)
3	Data management plan for digital research data	ahus---data-management-plan-for-digital-research-data-eqs-35413.pdf

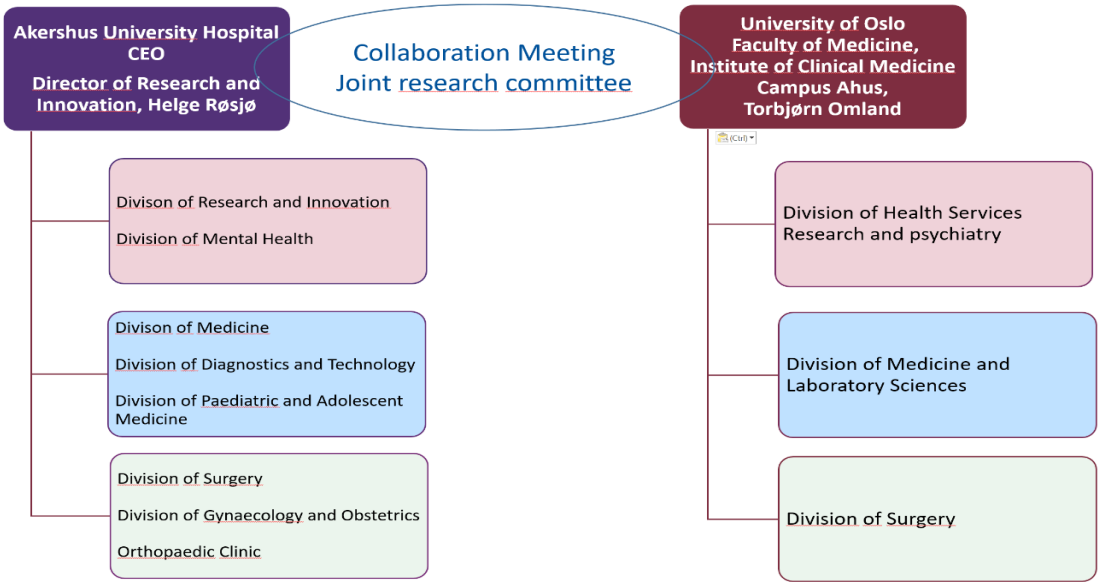
For all strategic and other documents related to this evaluation, please see our website for Ahus/Campus Ahus.

1.2 Organisation of research

a) Describe the organisation of research and innovation activities/projects at the administrative unit, including how responsibilities for research and other purposes (education, knowledge exchange, patient treatment, researcher training, outreach activities etc.) are distributed and delegated.

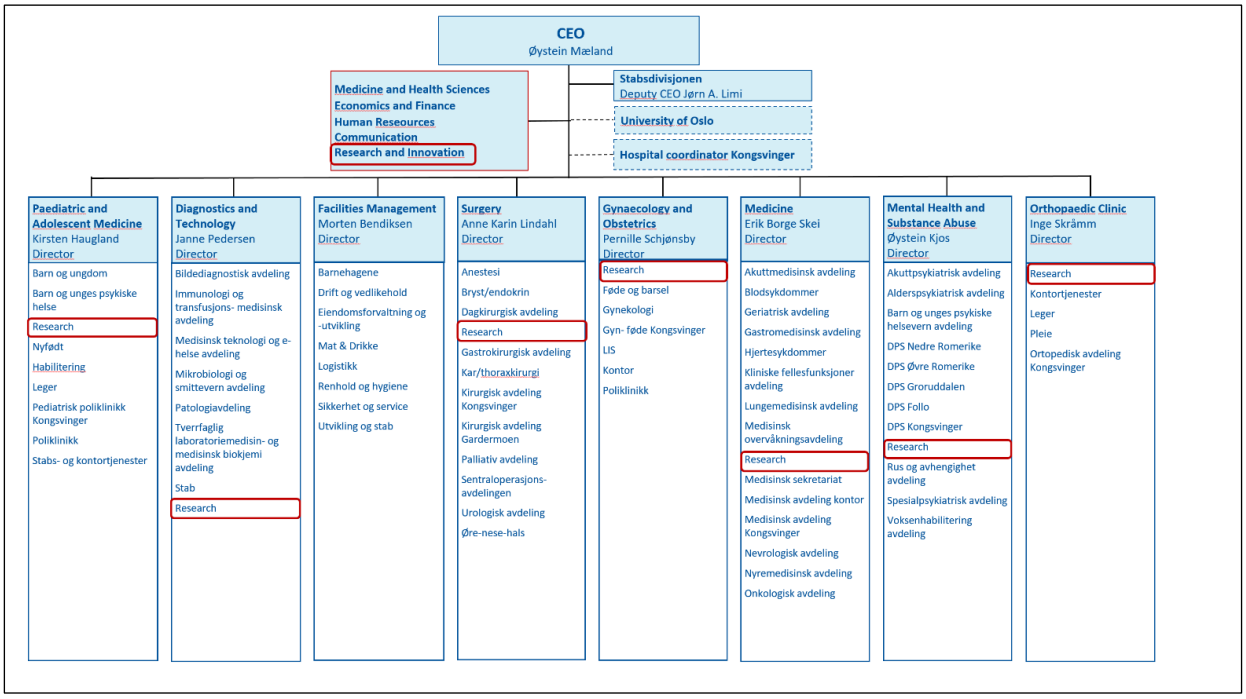
Research at Ahus and UiO - especially the Faculty of Medicine – is interconnected through common research groups and with the majority of senior researchers having shared positions. In total, 80% of the publications in 2022 had joint affiliation Ahus and UiO, which reflects the close integration between Ahus and Campus Ahus/UiO. We present the organizations of Ahus (hospital) and Campus Ahus (UiO), and coordinating meetings between the organizations below. Figure 1 shows an overview of the clinical divisions in Ahus (hospital) with robust research activity (left) and the corresponding divisions in the UiO organization at Ahus (i.e., Campus Ahus, right side), as of 2022. The divisions in Campus Ahus incorporate several of the hospital divisions and this organization is reflected by the color of the boxes (e.g., the clinical divisions in the blue box on the left side are all integrated into the Division of Medicine and Laboratory Sciences, Campus Ahus (UiO) on the right side).

Fig. 1. Organizations of Ahus (hospital) and Campus Ahus (UiO), and coordinating meetings



Ahus has organized the activity into 14 divisions. All responsibility for clinical operations, employees, budget, and academic medicine lies with the division head and their subordinates. Accordingly, the responsibility for research and innovation follows the organization of the hospital, including funding of research. All clinical divisions at Ahus have a research unit in their organization, which is led by the Head of Research in each division (**Fig. 2**).

Figure 2: Organization map Akershus University Hospital



Reimbursement for academic publishing is returned to the clinical divisions and used to strengthen research in the individual divisions. In addition, Ahus every year allocate >8 MNOK for internal project-based research funding, which is distributed according to excellence, as determined by external reviewers. The Head of Research at the hospital level can also allocate some funding, based on overhead, to start prioritized projects like infrastructure to molecular research and clinical research.

Campus Ahus is organized with a local head and with 3 divisions that each has a division leader (**Fig. 1**). The UiO divisions at Ahus (Campus Ahus) integrate research in several of the clinical divisions at the hospital (Ahus) with the Division of Medicine and Laboratory Sciences (Campus Ahus) incorporating 3 clinical divisions at Ahus (*blue color in Fig. 1*): Division of Internal Medicine, Division for Diagnostics and Technology, and the Division for Pediatrics and Adolescence Medicine. The Division of Surgery (Campus Ahus) incorporates 3 clinical divisions at Ahus (Division of Surgery, Division of Gynecology and Obstetrics, and Division of Orthopedics) (*green color in Fig. 1*), and the third division of Campus Ahus includes the Division of Mental Health and the Section for Health Service Research, Division of Research and Innovation (*pink color in Fig. 1*). The local head of Campus Ahus also serves as Deputy Head of the Institute of Clinical Medicine, Faculty of Medicine, UiO and participates in the bi-monthly Board of management meeting in the Institute of Clinical Medicine, UiO. Campus Ahus provides fixed funding to all professors and associate professors (100,000 NOK/year) and post-doctoral fellows (25,000 NOK/year). Campus Ahus also provides administrative support to researchers and students affiliated with UiO. Researchers at Ahus can also utilize joint, central research infrastructure in the region, like

external funding office and section for comparative medicine for experimental molecular research (UiO affiliated researchers primarily).

The interaction between Ahus and UiO is regulated in signed agreements to ensure coordination and growth for both organizations (**Fig. 1**). The Head of Campus Ahus (UiO) is member of the Board of Directors, Ahus, which ensures integration between the organizations at the top level. The Head of Research at Ahus and some staff members have regular meetings with the Head of Campus Ahus and the leaders of the UiO divisions at Ahus. Furthermore, the heads of research in the clinical divisions and the leaders of all UiO divisions constitute Faculty Ahus/Campus Ahus and have meetings every 6th week ("Joint research committee" in **Fig. 1**). The leadership for this meeting alternates between Head of Research Ahus (hospital) and the Head of Campus Ahus (UiO). The Research Dean at the Faculty of Medicine, UiO, representative from Oslo Metropolitan University, and user representative also participate in the Faculty Ahus/Campus Ahus meetings. Biannually, there is a meeting between the leadership at the Institute of Clinical Medicine, Faculty of Medicine, UiO and the directors of the clinical divisions at Ahus. Once a year, there is a top-level Ahus-UiO meeting that includes the CEO of Ahus and the Rector at UiO.

Ahus participates in regional meetings to ensure optimal coordination and to develop research and innovation in the region, including meetings between universities in the region and the South-Eastern Regional Health Authority. Ahus also participates in national meetings and networks.

b) Describe how you work to maximise synergies between the different purposes of the administrative unit (education, knowledge exchange, patient treatment, researcher training, outreach activities etc.).

Formal structures to ensure coordination and growth for Ahus/Campus Ahus are reported in *Section 1a)*. For training, most PhD fellows enter the doctoral program of the Faculty of Medicine, UiO, which is the largest in Norway and offers state-of-the-art training to early-career researchers. UiO also offers postdoctoral training and innovation programs, and researchers at Ahus enter both programs. Ahus also offers training for researchers and research personnel with introduction to research regulations and protocols, mainly related to clinical research.

All research is performed in the research groups, and it is mandatory for researchers at Ahus/Campus Ahus to be associated with a research group. The research groups are co-located within the hospital and new research groups are approved both by research leadership at Ahus (hospital) and Campus Ahus (UiO) – (Mandate for research groups). Ahus and UiO have agreements for combined academic research positions, and these positions are crucial to integrate education, research, and innovation between Ahus and UiO. It is mainly associate professors or professors with joint positions at Ahus and Campus Ahus who lead the research groups. The research groups have internal meetings, like Journal Club and/or research meetings for academic discussion, coordination, and strategic decisions. Both Ahus and Campus Ahus strive to build common interdisciplinary research environments, with high standards of research quality, integrity, and ethics. Ahus and Institute for Clinical Medicine, UiO (and Oslo University Hospital) have a joint common Commission of Research Integrity and a joint research ombudsman.

Researchers at Ahus/Campus Ahus have access to common research infrastructure, which has been a strategic priority at Ahus from 2012. This includes infrastructure for all aspects of clinical research, both for biospecimens/biobank, clinical trial unit with legislative competence, statistics, and health economics, health service research, and administrative support from both Ahus and UiO (research support). The Department of clinical molecular Biology, EpiGen, which receives funding from both Ahus and UiO, represents an important nucleus for translational and basic science at Ahus/Campus Ahus. EpiGen offers direct support to research projects and organizes regular research meetings open to all interested scientists with focus on molecular and translational research. Research is also presented in

the *Friday morning lecture*, which is organized by Head of Research Ahus, and this meeting is open to all employees at Ahus/Campus Ahus. Both Ahus and UiO have dedicated units for communication and outreach activities and these units collaborate to disseminate research findings at Ahus/Campus Ahus.

Ahus has recently signed agreements to regulate combined academic positions between Ahus and Oslo Metropolitan University. Oslo Metropolitan University has a representative in the Faculty Ahus/Campus Ahus meeting (**Fig. 1**, denoted as Joint research committee), and Ahus and Oslo Metropolitan University have an annual top-level meeting between the organizations.

1.3 Research staff

Describe the profile of research personnel at the administrative unit in terms of position and gender.Institutions in the higher education sector should use the categories used in DBH, *https://dbh.hkdir.no/datainnhold/kodeverk/stillingskoder.*

Ahus is a relatively young academic institution with status as university (teaching) hospital affiliated with UiO as recently as 2001. Most clinical academic staff at Ahus and Campus Ahus have a Medical Doctor (MD) background, but there is also an increasing group of researchers with non-MD background, especially in the molecular laboratory EpiGen and in the Health Service Research group. Data from 2022 (National survey on research, Statistics Norway (SSB)), demonstrate that Ahus/Campus Ahus has balanced research population with regards to sex and with mean age <50 years for both male and female researchers.

Table 1.1. Publishing researchers distributed by gender and age – numbers from the Annual Report for research from 2022:

Men		**Women**		**Total**	
Number	Average	Number	Average	Number	Average
166	49,7	191	46,0	357	47,7

Table 2 Research staff shows how many employees Ahus and Campus Ahus have in the different categories for researchers.

At Ahus/Campus Ahus, we have the following employment categories related to research:

- Campus Ahus: Professor I, Professor II, Associate Professor, Postdoctoral fellow, Clinical Research Fellow, PhD Candidate (research fellow), Administrative Staff
- Ahus: Senior Researcher, Researcher, Postdoctoral fellow, PhD Candidate, Senior Advisor/Advisor, Research Coordinator, Research Nurse, Bioengineer

Table 2. Research staff

	Position by category	No. of researcher per category			Share of women per category (%)			No. of researchers who are part of multiple (other) research groups at the admin unit			No. of temporary positions		
		Ahus	UiO	Tot.	Ahus	UiO	Tot.	Ahus	UiO	Tot	Ahus	UiO	Tot.
No. of Personell by position	Associate professor	-	24	**24**	-	25	**25**	*			**	5	-
	Professor I	-	5	**5**	-	60	**60**	*			**	0	-
	Professor II	-	26	**26**	-	24	**24**	*			**	0	-
	Senior Researcher/ Researcher	240	9	**249**	43	44	**43**	*			**	7	-
	Postdoctoral fellow	31	3	**34**	61	100	**65**	*			**	3	-
	PhD candidate (research fellow)	66	19	**85**	62	68	**64**	*			**	19	-
	Research nurse/coordinator	79	-	**79**	91	-	**-**	*			**	-	-
	Research support	84	7	**91**	85	71	**84**	*			**	0	-

*We are not able to provide complete data on this

**We are not able to provide complete data on this, but we have made a general assumption that the average distribution for temporary positions in the different positions would be:
Researchers: 50%; Postdocs: 50%; PhD candidates: 70%; Research nurse/coordinator: 20 %; Research support: 50 %. Note that many of our research personnel has permanent positions in the clinic, which affect these distributions.

1.4 Researcher careers opportunities

a) Describe the structures and practices to support researcher careers and help early-career researchers to make their way into the profession.

The critical importance of structures and practices to facilitate the training and support of early-career researchers and research career development for recruitment of senior academic staff and research productivity, is recognized by both Ahus and Campus Ahus. Accordingly, both UiO and Ahus provide structures and programs aimed at this group. The Faculty of Medicine, UiO offers both PhD and postdoctoral fellowships, including 4- or 5-year Clinical fellowships that include 25% or 40% teaching responsibilities, respectively, and 3-year fellowships without teaching responsibilities. All PhD and postdoctoral fellows are formally associated with a research group and receive regular research education and training within that framework. Moreover, for postdoctoral fellows The Postdoctoral program at the Faculty of Medicine offers courses in Career development, Communicating research, Innovation, Research management, Supervision and Writing grant applications, and a Peer mentoring scheme: The Postdoctoral Programme - Faculty of Medicine (uio.no) as well as Research leadership programmes, UiO: Research leadership programmes - For employees - University of Oslo (uio.no) –

Starting Level and Consolidating Level. In addition, UiO offers an educational program focused on innovation: SPARK Norway – a two-year innovation programme - UiO:Life Science.

Locally at Ahus, several clinical departments, including Gastroenterology, Orthopedic Surgery and Radiology have established and internally funded combined (50/50) clinical and research fellowships, which are considered attractive positions for doctoral and postdoctoral fellows with ambitions for a career as physician/scientists. Moreover, in the case of externally funded 50%/6-year fellowships the hospital has generally shown great flexibility in combining these with 50% clinical fellowships. Finally, Ahus and Campus Ahus have on several occasions collaborated in facilitating careers of particularly gifted young researchers by establishing hospital-funded temporary academic positions, permitting these candidates to qualify and be competitive for permanent senior academic positions. This strategy both facilitates the research career development and reduces the risk of these productive researcher talents finding it necessary to apply for positions at other institutions and is in line with strategic priorities at Ahus/Campus Ahus.

b) Describe how research time is distributed among staff including criteria for research leave/sabbaticals.

Research time among senior academic staff in combined UiO and Ahus positions is regulated in a collaborative agreement between UiO and Ahus. Accordingly, in the case of combined senior consultant (100%) and professor II (i.e., 20% adjunct professor/associate professor) position, the agreement states that at least one additional academic day per week on average should be allocated by the hospital, securing that a minimum of 40% of the total work time is reserved for academic work. In most cases, 50% of the total work time is reserved for academic work. There are few full-time (i.e., professor I) clinical professorships at Ahus, one in internal medicine, one in surgery, and one (externally funded) in psychiatry. These positions are as a rule combined with 20% hospital positions. Research time for professor I is estimated at 50%, while teaching/supervision is also 50%. There are also four academic positions (professor I or associate professor) at EpiGen with 100% position at UiO and 20% position at Ahus.

Concerning early career academic staff, most PhD fellowships are full-time, but UiO-funded clinical doctoral fellowships include a relatively high proportion of teaching obligations, estimated at 25-40% of the total work time.

In accordance with the institutional rules of UiO, senior academic staff may apply for sabbaticals from the UiO position. After 6 years of employment, a one-year sabbatical may be applied for. If desirable, staff may also apply for shorter sabbatical periods (2 months per year served as professor or associate professor). In the hospital axis, a similar system exists in which the senior consultant may apply for a paid research leave (minimum 4 months per 5 year).

c) Describe research mobility options.

Both inward and outward research mobility is encouraged by UiO and Ahus. Concerning inward mobility, a high proportion of senior academic staff has been recruited from abroad. The basic and translational science groups at the Department of Clinical Molecular Biology (EpiGen) have a very high proportion of scientists who have been recruited internationally, and all current UiO senior positions at EpiGen (2 full professors, 1 full associate professor) were born and had their previous employment abroad (Germany, Sweden, USA). Moreover, EpiGen have been the host of several Erasmus exchange students as well as 5 postdoctoral researchers funded by the EU Marie-Sklodovska-Curie Scientia Fellows program. Although language barriers may make recruitment of non-Scandinavian physician-scientists more challenging, recent international recruitment of clinical professors/associate

professors include professors in pathology from Germany, anesthesiology from Denmark, psychiatry from Finland, and child psychiatry from Sweden.

Concerning outward mobility, stays of shorter or longer durations at leading research institutions abroad are strongly encouraged both for junior and senior academic staff. Several of the young academic staff in clinical research have had research stays abroad, including at institutions such as Harvard Medical School, Brigham and Women's hospital (Boston, MA, USA) and Uppsala Clinical Research Center, Uppsala, Sweden. To facilitate outward mobility, there exist both institutional and external funding sources (including Research Council of Norway and South-East Norway Regional Health Authorities) to support research stays abroad. As mentioned above, for senior academic and clinical staff, both UiO and Ahus encourage and have regulated the rights for sabbatical stays abroad.

1.5 Research funding

a) Describe the funding sources of the administrative unit. Indicate the administrative unit´s total yearly budget and the share of the unit's budget dedicated to research.

Ahus and Campus Ahus receive basic funding for research and also obtain competitive external research funding from national and international founding bodies.

Ahus does not receive direct funds from the Ministry of Health and Care Services as funding is channeled through the South-Eastern Regional Health Authority. It is the regional health authority that distributes this funding and the regional health authority decides the overall framework for the budget for Ahus, with the hospital deciding the budget for research. However, as basic funding has not been revised in the South-Eastern Norway Regional Health Authority according to the growth of Ahus in clinical services, education, and research, Ahus receives a proportionally smaller budget compared to other university hospitals, which is included as a Threat in the SWOT analysis.

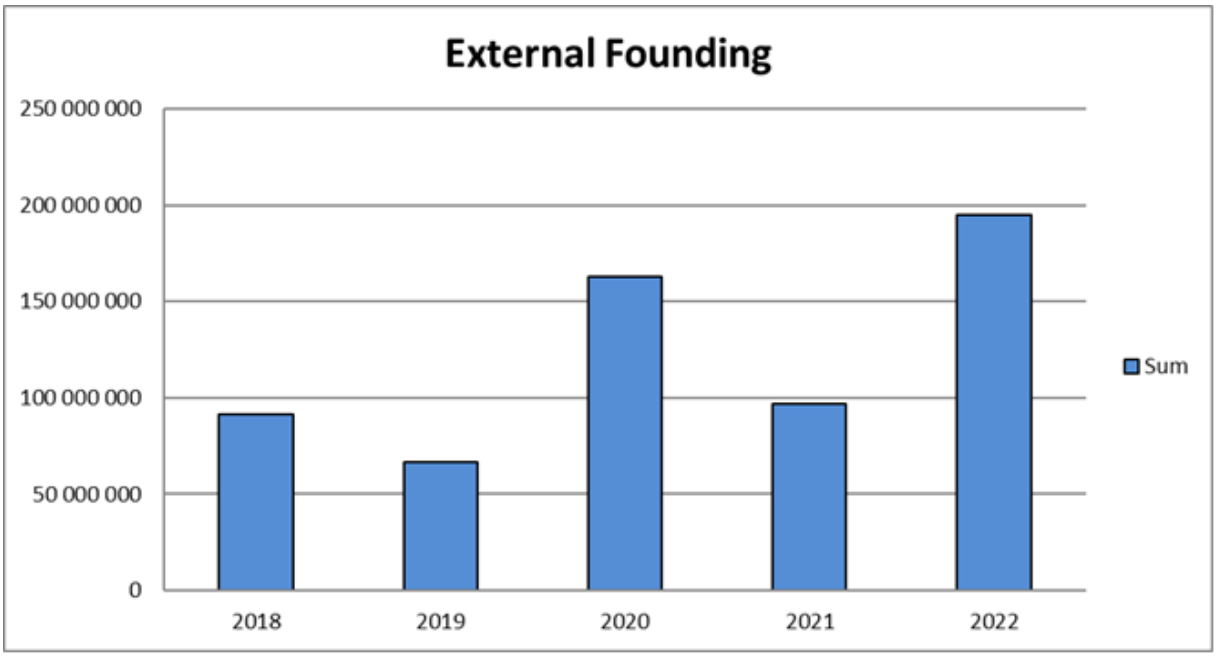
The amount reported in **Table 3** as "Direct R&D funds" corresponds to the average in expenses for R&D over the hospital's basic budget reported for 2018-2022 (national survey, SSB). The estimate is partly based on amounts obtained directly from accounting (such as salaries for defined research positions), and partly calculated from estimated time for clinical personnel used for R&D, including support functions in divisions, as well as operating costs. As an average, Ahus used 152 MNOK per year in internal funding to research. In 2022, Ahus used 190 MNOK for research within a total hospital budget of NOK 13 billion, which constitutes 1.46% of the total budget used for research.

As an important part of the Institute of Clinical Medicine, Campus Ahus receives its basic funding from the Faculty of Medicine, University of Oslo, which again receives funding from the Ministry of Education and Research. The majority of this funding is used to cover expenses related to the salaries of university employees. In addition, academic staff receive some research funding, currently NOK 100.000 annually for professors and associate professors and NOK 25.000 annually for research and postdoctoral fellows. Campus Ahus employees also receive competitive funding from UiO in calls for applications for scientific equipment. As presented in **Figure 3** and detailed in **Table 3**, Campus Ahus employees have received competitive external funding form national and international funding bodies, including the Research Council of Norway, the Kristian Gerhard Jebsen Foundation, and EU.

b) Give an overview of the administrative unit's competitive national and/or international grants last five years (2018-2022).

Ahus has experienced a significant increase in external research funding from 2018 to 2022 with a total of almost 200 MNOK in external competitive research funding won by Ahus/Campus Ahus PIs in 2022 (**Fig. 3)**. The funding is recorded for statistical purposes in the year it is allocated from the funding source. Most allocations are granted for a duration of 3 years.

Figure 3. External Competitive Research Funding won by Ahus/Campus Ahus Principal Investigators 2018-2022



Of almost 200 MNOK in total external research funding in 2022, Ahus (hospital) received 128 MNOK and Campus Ahus (UiO) received 66 MNOK. Funding bodies with donations to Ahus (hospital) included the South-Eastern Norway Regional Health Authority, The Research Council of Norway, the Norwegian Cancer Society, and EU. In 2022, funding bodies supporting Campus Ahus (UiO)-hosted projects included the Research Council of Norway, the Norwegian Cancer Society, the Kristian Gerhard Jebsen Foundation, and EU. For Campus Ahus projects, the Research Council of Norway grants in 2022 included the prestigious *"Large Inter-disciplinary Research Project"* and a grant co-funded by the *National Institutes of Health* and the large-scale grant from the *Kristian Gerhard Jebsen Foundation*. With co-funding by UiO and Ahus, the donation from the Kristian Gerhard Jebsen Foundation permitted the establishment of a K.G. Jebsen Center of Excellence; the K.G. Jebsen Center for Cardiac Biomarkers (see also "Impact case" *Cardiac biomarkers*). Ahus and UiO have an agreement related to distribution of externally funded projects where clinical projects are hosted by Ahus (hospital) and basic science projects are hosted by Campus Ahus (UiO).

The increase in external competitive research funding follows strategic initiatives to improve grant proposals at Ahus/Campus Ahus. Following a disappointing acceptance rate in 2019 (**Fig. 3**), the research leadership initiated an internal review system to improve research proposal quality. Action taken includes increased attention to all aspects of grant proposal preparation via a local research support office (Grants team). The Grants team assists applicants with review of project plan with input on hypothesis, text, and layout, including illustrations. The team also have staff to help with budget and control of applications for formal errors, as well as both experienced, top-level researchers for academic advice and experienced administrative personnel for budget work and control.

During the period 2018–2022, Ahus has seen an increase in the number of EU projects with Ahus researchers as project partners. Ahus/Campus Ahus affiliated researchers have also applied for projects as coordinator, but these projects have not been funded.

The increase in successful competitive external research funding won by Ahus/Campus Ahus affiliated researchers have been sustained beyond 2022. For 2023/2024, 16 projects with Ahus Principal Investigators (PIs) (hospital) received competitive research funding from the South-Eastern Norway Regional Health Authority, which represent donation of 76 MNOK from one funding body alone in 2024. Campus Ahus Associate Professor Evandro F. Fang and collaborators on Ahus/Campus Ahus recently also received a 60 MNOK grant from Wellcome Leap, which makes it likely that the total grant funding for Ahus/Campus Ahus in 2024 will be >200 MNOK, which will make 2024 the year with most external research funding won by Ahus/ Campus Ahus PIs.

Table 3. R&D funding sources
Please indicate R&D funding sources for the administrative unit for the period 2018-2022 (average NOK per year, last five years).

For Higher Education Institutions: Share of basic grant (grunnbevilgning) used for R&D. For Research Institutes and Health Trusts: Direct R&D funding from Ministries (per ministry)	**Ahus NOK**	**Campus Ahus NOK**
Ministry of Health and Care Services	152 135 000	
Ministry of Education and Research		25 512 000
	152 135 000	**25 512 000**
National grants (bidragsinntekter) (NOK)		
From the ministries and underlying directorates	188 917	
NEW: Grants from Regional Health Authorities (HSØ)	41 857 160	
NEW: Grants from Research Council of Norway	25 553 275	11 443 000
NEW: Grants from Klinbeforsk	6 932 486	
From Industry	2 281 494	
From public sector	1 768 244	
Other national grants	15 355 455	9 400 000
Total National grants	**93 937 030**	**20 843 000**
National contract research (oppdragsinntekter) (NOK)		
From the ministries and underlying directorates		
From industry		
From public sector	2 235 400	
Other national contract research		
Total contract research	**2 235 400**	
International grants (NOK)		
From the European Union	4 362 324	
From industry	12 650 721	
Other international grants	3 066 425	
Total international grants	**20 079 470**	
Total funding related to public management/special hospital tasks		
Total all R&D budget items (except basic grant) NOK	**116 251 900**	**20 843 000**

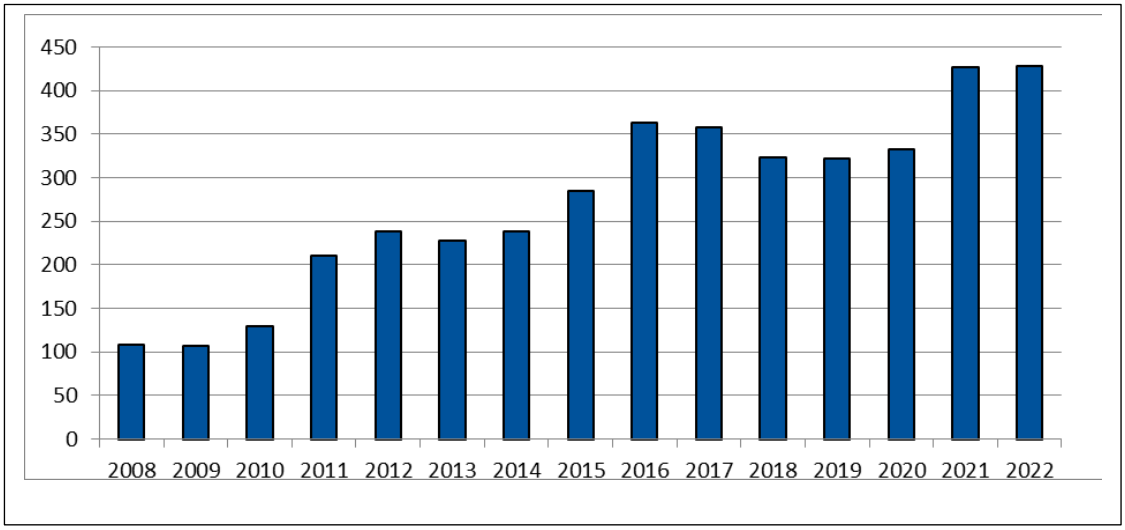
1.6 Collaboration

Describe the administrative unit's policy towards national and international collaboration partners, the type of the collaborations the administrative unit have with the partners, how the collaboration is put to practice as well as cross-sectorial and interdisciplinary collaborations.

- ***Reflect of how successful the administrative unit has been in meeting its aspirations for collaborations***
- ***Reflect on the importance of different types of collaboration for the administrative unit: National and international collaborations. Collaborations with different sectors, including public, private and third sector***
- ***Reflect on the added value of these collaborations to the administrative unit and Norwegian research system***

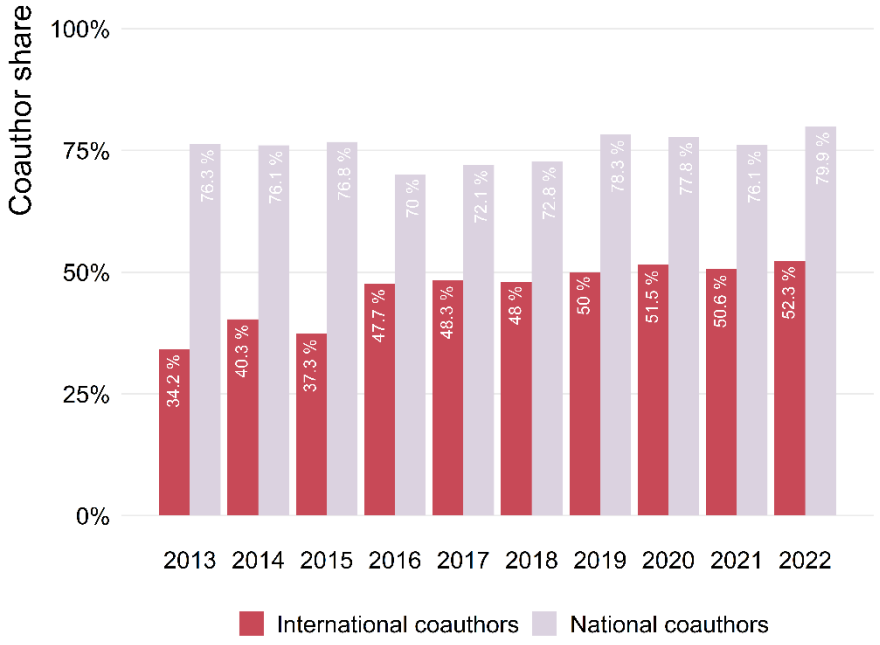
The number of peer-reviewed scientific publications from Ahus/Campus Ahus researchers have more than doubled from 2011-2022 (**Fig. 4**).

Figure 4. Scientific publications from Ahus/Campus Ahus 2008-2022



Research at Ahus is highly integrated with regional, national, and international partners. This is reflected in research publications at Ahus, as reported in the Annual reports from 2012-2022 and presented in **Figure 5**. Of note, the total scientific output from Ahus/Campus Ahus increased significantly during this period (see **Fig. 4**), which means that both percentage of articles with external co-authors and absolute numbers of articles with external co-authors increased significantly during the period.

Figure 5. Share of publications with national and international co-authors 2013-2022 (NIFU report)



The collaborating institutions can be found in the Annual reports 2012-2022. The primary collaborating partners are Ahus and UiO, which is coherent with UiO being defined in the strategic documents as the principal partner for research at Ahus (hospital). Collaboration with researchers at Oslo University Hospital is also extensive, and there is increasing collaboration with the other Norwegian university hospitals. We believe this benefits patients and society, as interactions between clinical researchers across Norway will improve clinical care for patients at Ahus and nationally.

International collaboration has increased during the 10-year period (**Fig. 5**). In 2012, 32% of the publications included an international co-author. In contrast, the Annual report from 2022 shows that 52% of publications had international co-authors. In 2022, researchers at Ahus collaborated most with researchers from US, UK, and Sweden. International collaborations are crucial to increase the competence and to develop research and clinical care at Ahus.

Several associate professors and professors at Ahus/Campus Ahus have either been recruited internationally or have spent time abroad during post-doctoral research and clinical stays. Accordingly, researchers at Ahus/Campus Ahus have received training that are not available in Norway and have networks for later collaborative projects, (basic or clinical) and can get access to international data bases and biospecimen repositories.

Ahus has dramatically increased the number of clinical interventional trials. As reported in the *Summary of Clinical Interventional Trials at Ahus,* Ahus had 22 active clinical interventional trials in 2014 compared to 230 active clinical interventional trials in 2022 (>10-fold increase and includes both industry-initiated and researcher-initiated clinical interventional trials). This is in line with strategic plans at Ahus and efforts to streamline infrastructure for clinical interventional trials, which we believe have made Ahus successful to attract clinical trials. The work at Ahus to attract more clinical interventional trials is presented in the *Summary document for clinical interventional trials*. Some research groups at Ahus/Campus Ahus also have long-standing partnerships with Norwegian life science industry partners, as presented in several of the "Impact cases" in the section for innovation activities in the self-evaluation.

The collaboration with industry partners enables researchers at Ahus to offer patients at Ahus new and innovative diagnostics and new therapeutic approaches. For example, in cancer care, it is imperative

for Ahus, as a leading university hospital, to offer patients who no longer respond to standard therapy access to clinical interventional studies that are testing out new therapeutic compounds and strategies. Ahus was also the second hospital in Norway to improve diagnostics by introducing gene sequencing for precision diagnostics for inclusion into clinical trials (InPred Ahus). This work was spearheaded by EpiGen and researchers affiliated with Ahus/Campus Ahus, together with the Division for Diagnostics and Technology, Ahus (hospital). This example with diagnostics demonstrates the value of the strong research collaboration between Ahus (hospital) and Campus Ahus (university), thereby improving Ahus as a university hospital and improving care for patients. Several of the "Impact cases" also represent translational work and biomarker development.

Improving education, research, and life science innovation at Ahus will strengthen Norwegian research, especially in life science and clinical health research. As Ahus is Norway's largest acute medicine hospital, progress at Ahus will improve care for large patient groups and benefit the Norwegian society at large. With stronger research infrastructure and competence, Ahus can also strengthen pan-Norwegian initiatives in research, such as NorCRIN, NorTrials and initiatives to strengthen diagnostics and therapeutics.

Ahus is nationally leading in pragmatic clinical trials with a dedicated research structure for all aspects of clinical trials and the excellence of data warehouse Ahus permits innovative trials like pseudo-randomized, large-scale trials and EHR-RCTs (see Akershus Clinical Research Center (ACR)). We are now using pragmatic trials also in collaboration with industry partners. The large catchment area of Ahus ensures major biospecimen repositories available in the hospital with clinical data available from data warehouse Ahus. Hence, Ahus can improve Norwegian translational medicine and be relevant for industry partners by combining large-scale biospecimen repositories and databases.

Ahus prepares an "Annual Report" every year. These reports include, among other things, an overview of national and international collaborations involving Ahus and Campus Ahus. Statistics/overviews are sourced from Cristin, which is the national database for research publications and results.

Table 4a. The main national collaborative constellations with the administrative unit
Please categorise the collaboration according to the most important national partner(s): 5-10 institutions in the period 2012-2022.

Collaboration with national institutions - 1	
Name of main collaboration or collaborative project with the admin unit	University of Oslo (multiple collaborative constellations
Name of partner institution(s)	University of Oslo
Sector of partner/institution(s)/sectors involved	University/higher education
Impacts and relevance of the collaboration	There have been 938 co-publications in 2020-2022
Collaboration with national institutions – 2	
Name of main collaboration or collaborative project with the admin unit	Oslo University Hospital (multiple collaborative constellations)
Name of partner institution(s)	Oslo University Hospital
Sector of partner/institution(s)/sectors involved	Hospital trust
Impacts and relevance of the collaboration	486 co-publications in 2020-2022
Collaboration with national institutions – 3	
Name of main collaboration or collaborative project with the admin unit	Norwegian University of Science and Technology (multiple collaborative constellations)
Name of partner institution(s)	Norwegian University of Science and Technology
Sector of partner/institution(s)/sectors involved	University/higher education
Impacts and relevance of the collaboration	176 co-publications in 2020-2022
Collaboration with national institutions – 4	
Name of main collaboration or collaborative project with the admin unit	University of Bergen (multiple collaborative constellations)
Name of partner institution(s)	University of Bergen
Sector of partner/institution(s)/sectors involved	University/higher education
Impacts and relevance of the collaboration	173 co-publications in 2020-2022
Collaboration with national institutions – 5	
Name of main collaboration or collaborative project with the admin unit	Bergen Hospital Trust - Haukeland University Hospital (multiple collaborative constellations)
Name of partner institution(s)	Bergen Hospital Trust - Haukeland University Hospital
Sector of partner/institution(s)/sectors involved	Hospital trust
Impacts and relevance of the collaboration	128 co-publications in 2020-2022

Collaboration with national institutions – 6	
Name of main collaboration or collaborative project with the admin unit	OsloMet – Oslo Metropolitian University (multiple collaborative constellations)
Name of partner institution(s)	Oslomet - Oslo Metropolitan University
Sector of partner/institution(s)/sectors involved	University/higher education
Impacts and relevance of the collaboration	113 co-publications in 2020-2022
Collaboration with national institutions – 7	
Name of main collaboration or collaborative project with the admin unit	St. Olavs Hospital, Trondheim University Hospital (multiple collaborative constellations)
Name of partner institution(s)	St. Olavs Hospital, Trondheim University Hospital
Sector of partner/institution(s)/sectors involved	Hospital trust
Impacts and relevance of the collaboration	110 co-publications in 2020-2022
Collaboration with national institutions – 8	
Name of main collaboration or collaborative project with the admin unit	UiT The Arctic University of Norway (multiple collaborative constellations)
Name of partner institution(s)	UiT The Arctic University of Norway
Sector of partner/institution(s)/sectors involved	University/higher education
Impacts and relevance of the collaboration	110 co-publications in 2020-2022
Collaboration with national institutions – 9	
Name of main collaboration or collaborative project with the admin unit	Stavanger Hospital Trust - Stavanger University Hospital (multiple collaborative constellations)
Name of partner institution(s)	Stavanger Hospital Trust - Stavanger University Hospital
Sector of partner/institution(s)/sectors involved	Hospital trust
Impacts and relevance of the collaboration	109 co-publications in 2020-2022
Collaboration with national institutions – 10	
Name of main collaboration or collaborative project with the admin unit	Norwegian Institute of Public Health (multiple collaborative constellations)
Name of partner institution(s)	Norwegian Institute of Public Health
Sector of partner/institution(s)/sectors involved	Research institute
Impacts and relevance of the collaboration	104 co-publications in 2020-2022

Table 4b. The main international collaborative constellations with the administrative unit
Please categorise the collaboration according to the most important international partner(s): 5-10 international institutions in the period 2012-2022.

Collaboration with international institutions – 1	
Name of main collaboration or collaborative project with the admin unit	Proteomic signatures to identify pathways underlying the progression to heart failure.
Name of partner institution(s)	Harvard University/Brigham and Women's Hospital (BWH)
Sector of partner/institution(s)/sectors involved	University and Hospital sectors
Impacts and relevance of the collaboration	The current collaboration is based on a fruitful long-term collaboration between the University of Oslo/Akershus University Hospital and Harvard University/ BWH. Prof Omland and Assoc Prof Myhre from the Cardiovascular Research Group have spent 2 and 1 years, respectively, working as postdoctoral fellows at Harvard University/ BWH. The current project is co-funded by the National Institutes of Health and Research Council of Norway. The project involves using state-of-the-art blood proteomics methodology to analyze samples from two major epidemiological studies, the ARIC study in the US and the HUNT study in Norway, to identify new biomarkers and pathophysiological pathways associated with high heart failure risk. An initial article based on the collaboration has recently been published in Nature Communications (PMID: 38225249).
Collaboration with international institutions – 2	
Name of main collaboration or collaborative project with the admin unit	Personalized medicine in Alzheimer's disease (PMI-AD) Developing a non-invasive biomarker for early BBB breakdown in Alzheimer's disease (DEBBIE)
Name of partner institution(s)	Amsterdam University Medical Center (UMC). Netherlands.
Sector of partner/institution(s)/sectors involved	Medical Research
Impacts and relevance of the collaboration	One EU project headed and administered at Ahus (PMI-AD). Collaboration in one EU project administered at UMC Amsterdam (DEBBIE).

Collaboration with international institutions – 3	
Name of main collaboration or collaborative project with the admin unit	NEOLETRIB-trial
Name of partner institution(s)	Memorial Sloan Kettering Cancer Center, New York, USA
Sector of partner/institution(s)/sectors involved	Prof. Andrew Koff, Basic Cancer Research Unit
Impacts and relevance of the collaboration	Collaboration, providing exceptional competence in cell cycle regulation and cancer dormancy etc.

Collaboration with international institutions – 4	
Name of main collaboration or collaborative project with the admin unit	Pragmatic clinical trials and studies of cardiovascular biomarkers
Name of partner institution(s)	UCR - Uppsala Clinical Research Center - Start (uu.se)
Sector of partner/institution(s)/sectors involved	Medical Research
Impacts and relevance of the collaboration	Professor Røsjø worked from 2017-2019 as a postdoctoral fellow at UCR and clinical fellow at the Department of Cardiology, University Hospital Uppsala. During his stay in Uppsala, Dr. Røsjø worked with leading cardiac researchers such as Professor Stefan James and Professor Lars Wallentin to learn pragmatic clinical trials and perform studies on cardiac biomarkers (PMID: 32350915). Professor Røsjø has also learned from UCR when establishing Akershus Clinical Research Center (ACR), which aims to provide support to all aspects of clinical trials.

Collaboration with international institutions – 5	
Name of main collaboration or collaborative project with the admin unit	The perineum study studying impact of perineal obstetric tears grade on pain and sexual function.
Name of partner institution(s)	Pelvic floor center Karolinska University Hospital, Stockholm, Sweden Pelvic floor center Skåne University hospital Malmö
Sector of partner/institution(s)/sectors involved	Collaboration between three medical centers
Impacts and relevance of the collaboration	We are presently studying the prevalence and impact of perineal obstetric tears grade 2. The three centers includes both gynecologists, gastrointestinal surgeons and physiotherapists have vast experience in studying injuries on different parts of the pelvic floor using different complementary ultrasound modalities The collaboration will result in a more conclusive results.
Collaboration with international institutions – 6	
Name of main collaboration or collaborative project with the admin unit	Sleep Revolution
Name of partner institution(s)	Reykjavik University
Sector of partner/institution(s)/sectors involved	IT and medicine
Impacts and relevance of the collaboration	Coordinator of the project “Sleep Revolution”

Collaboration with international institutions – 7	
Name of main collaboration or collaborative project with the admin unit	Identification of cancer biomarkers using human papillomavirus whole genome sequencing
Name of partner institution(s)	FIMM – Institute for Molecular Medicine Finland, Technology Centre, Sequencing unit, University of Helsinki
Sector of partner/institution(s)/sectors involved	University of Helsinki, Finland
Impacts and relevance of the collaboration	<u>Direct impacts of the collaboration:</u> - Development of a method using next generation sequencing to identify HPV mutations and chromosomal integration profiles in HPV associated lesions and cancer - Funding from HSØ for PhD-student at Ahus (PI: Irene Kraus Christiansen) – FIMM important collaboration partner - Funding from HSØ for Postdoc project at Ahus (PI: Irene Kraus Christiansen) – FIMM important collaboration partner - Increased knowledge and expertise on next generation sequencing and bioinformatics at the department and at Ahus <u>Impact of the HPV WGS method:</u> - Development and qualities of the method have been essential for three PhD projects, one Postdoc project and two master projects (in collaboration with FIMM, OsloMet, Cancer Registry of Norway and several international partners), with seven publications, one submitted and one manuscript in progress. <u>Publications:</u> **Løvestad AH, Stosic MS, Costanzi JM, Christiansen IK**, **Aamot HV**, Ambur OH, Rounge TB. TaME-seq2: tagmentation-assisted multiplex PCR enrichment sequencing for viral genomic profiling. Virol J. 2023 Mar 8;20(1):44. **Løvestad AH, Repesa A, Costanzi JM, Lagström S, Christiansen IK**, Rounge TB, Ambur OH. Differences in integration frequencies and APOBEC3 profiles of five high-risk HPV-types adheres to phylogeny. Tumour Virus Res 2022 Dec;14:200247. **Lagström S**, **Løvestad AH**, Uğur Umu S, Ambur OH, Nygård M, Rounge TB, **Christiansen IK**. HPV16 and HPV18 type-specific APOBEC3 and integration profiles in different diagnostic categories of cervical samples. Tumour Virus Res 2021 Jun 25;12:200221. Dube Mandishora RS, Rounge TB, Fitzpatrick M, **Christiansen IK**, Ambur OH, **Lagström S**, Stray-Pedersen B, Tommasino M, Palefsky J, Chirenje ZM. Self-collected and clinician-collected anal swabs

	show modest agreement for HPV genotyping. PLoS One. 2021 Apr 26;16(4). **Lagström S,** van der Weele P, Tounge TB, **Christiansen IK**, King A, Ambur OH. HPV16 whole genome minority variants in persistent infections from young Dutch women. J Clin Virol. 2019 Aug 12;119:24-30. **Lagström S,** Ugur Umu S., **Lepistö M, Ellonen P**, Meisal R, **Christiansen IK, Ambur OH,** Rounge TB. TaME-seq: An efficient sequencing approach for characterization of HPV genomic variability and chromosomal integration. Scientific Reports 2019; 9: 524. Dube Mandishora RS**,** Gjøtterud KS, **Lagström S**, Stray-Pedersen B, Duri K, Chin'ombe N, Nygård M, **Christiansen IK**, Ambur OH, Chirenje MZ, Rounge TB. Intra-host sequence variability in human papillomavirus. Papillomavirus Res. 2018 Apr 30;5:180-191.
Collaboration with international institutions – 8	
Name of main collaboration or collaborative project with the admin unit	Objective Performance Criteria in Arthroplasty
Name of partner institution(s)	• US Food and Drug Administration, Mariland, USA • Weill Cornell Medical College, New York, USA • Hospital for Special Surgery, New York, USA
Sector of partner/institution(s)/sectors involved	1. FDA: Office of Product Evaluation and Quality at the Center for Devices and Radiological Health 2. Weill Cornell: Department of health policy and research 3. HSS: Sports Medicine Institute
Impacts and relevance of the collaboration	Big data /real world data evidence aggregation to evaluate safety and efficacy of orthopedic medical implant, necessary for regulatory bodies, such as the FDA. Publications: • Jiang et al, Foot and Ankle Int DOI: 10.1177/10711007221134284 • Niewenhuise et al, Int. J Surg DOI: 10.1097/JS9.0000000000000169 • Randsborg et al JBJS Open Accsess DOI: 10.2106/JBJS.OA.21.00136 • Randsborg et al BMJ Surg Interv Health Technol DOI: 10.1136/bmjsit-2021-000092 • Liebeskind et al BMJ Surg Interv Health Technol DOI: 10.1136/bmjsit-2021-000079 • Randsborg JBJS Am DOI: 10.2106/JBJS.21.00111 • Randsborg et al AJSM DOI: 10.1177/03635465211060333

Collaboration with international institutions – 9	
Name of main collaboration or collaborative project with the admin unit	-Longitudinal impact of perinatal factors on maternal and offspring health (KuBiCoRe) -Implementing e-therapy for young people (Digibup Implement)
Name of partner institution(s)	Karolinska Medical University, Sweden
Sector of partner/institution(s)/sectors involved	University
Impacts and relevance of the collaboration	1. Collaboration with a researcher (Dr Josephine Savard) who has self-funded part time work focusing on publishing from our cohort. 2. Collaboration with researchers (Drs. Eva Serlachius and Sarah Vigerland) focusing on development and evaluation of e-therapy and publishing.
Collaboration with international institutions – 10	
Name of main collaboration or collaborative project with the admin unit	COFFI-konsortiet
Name of partner institution(s)	Kirby institute, University of New South Wales, Sydney, Australia.
Sector of partner/institution(s)/sectors involved	University
Impacts and relevance of the collaboration	The Collaborative on Fatigue Following Infection (COFFI) The Collaborative on Fatigue Following Infection (COFFI) - home (coffi-collaborative.com)

1.7 Open science policies

a) Describe the institutional policies, approaches, and activities to the Open Science areas which may include the following:

- *Open access to publications*
- *Open access to research data and implementation of FAIR data principles*
- *Open-source software/tools*
- *Open access to educational resources*
- *Open peer review*
- *Citizen science and/or involvement of stakeholders / user groups*
- *Skills and training for Open Science*

Ahus operates with a positive approach towards open-access publishing, emphasizing adherence to Plan S and specific requirements set by research project funders even though institution-wide policies currently have not been implemented. Furthermore, the internal Ahus procedure for the mandatory registration of clinical trials on ClinicalTrials.gov encourages open-access publication of results. Some clinical divisions at Ahus/Campus Ahus also have internal policies and funds to support open access publishing. UiO has also in the period provided financial support for open access publishing, which Ahus/Campus Ahus researchers have benefitted from.

Ahus/Campus Ahus actively engage in “publish and read” (PAR) agreements through organizations such as SIKT – Norwegian Agency for Shared Services in Education and Research, and others. Researchers are encouraged to embrace open-access publishing by providing a range of publishing agreements and incorporating discussions on open access throughout various stages of the research process, including considerations related to funding.

Currently, there is limited emphasis on the FAIR data principles (Findability, Accessibility, Interoperability, and Reusability) or open access to research data. This is attributed to concerns about privacy, as well as a lack of infrastructure and expertise for evaluating data suitability for sharing.

b) Describe the most important contributions and impact of the administrative unit’s researchers towards the different Open Science areas cf. 1.7a above.

The library handles inquiries regarding open access publishing according to the library's transformative agreements.

c) Describe the institutional policy regarding ownership of research data, data management, and confidentiality. Is the use of data management plans implemented at the administrative unit?

Ahus follows current legislation, for example the Health Research Act, General Data Protection Regulation (GDPR) and the Vancouver Convention for rights to authorship and for publication of research data. Ahus/Campus Ahus also specifies the need to, and help to arrange, cooperation agreements between Ahus/Campus Ahus researchers and external collaborators. These contracts regulate access and rights to research data between the partners. A template for a data management plan has also been published on the website of Ahus. Upon request, we provide data sets in de-identified or anonymized form to external parties, according to Norwegian legislation and granted approvals for the specific project.

UiO aims to manage research data according to international standards, such as the FAIR principles, CARE principles (collective benefit, authority to control, responsibility, and ethics) and thereby support the development of a global research community in which research data is widely shared. The UiO Open Access policy follows the "open as standard"-principle in terms of access to research data. Scientists and students are responsible for managing research data according to the principles and requirements stated above. Supervisors of PhD-fellows and students have a special responsibility for ensuring that candidates and students attend courses and manage research data according to the guidelines.

1.8 SWOT analysis for administrative units

Internal	**Strengths** • Young, ambitious, competent academic staff • Systematic research plans that have been consistent over time • High-quality research support systems, both in the clinical divisions and hospital level • Several research groups demonstrate higher output and impact • Financial ability last years to strengthen research infrastructure • Strong position for clinical interventional trials • Broad research portfolio, including translational research and health service research	**Weaknesses** • Ahus receives a proportionally smaller budget compared to other teaching hospitals • Increase in research has been funded mainly by external research grants • Need for robust long-term funding scheme for permanent research operations • Massive strain on clinical services, which requires attention and prioritization from Ahus • Uneven quality of research • Few full-time researchers • Activity dependent on limited number of key persons • Research leaders with competing clinical/administrative commitments
External	**Opportunities** • Largest primary hospital catchment area in the country corresponding to 11 % of the Norwegian population • Location in fast growing region of Norway • Unselected patients • Talent pool of young researchers • Collaboration with strong research institutions • Momentum in some research groups that facilitate career development • Systems for complete data coverage (data warehouse) • Large biospecimen repositories already collected and organized	**Threats** • Budget provided to Ahus do not parallel clinical services, research production, and contribution to education performed by Ahus • Lack of robust research funding scheme to enable stable, planned increase in research operations • Lack of robust funding scheme to invest in and renew research infrastructure • Research talents and senior researchers gravitate towards other institutions • Strong competition for internal and external funding • Clinical/administrative responsibilities for leading researchers, which impair research production and innovation

Internal Strengths	Mean age for researchers at Ahus/ Campus Ahus is <50 years (Table 1). The relatively younger research staff produces an ambitious and progressive research environment, which is also demonstrated by sustained growth during the period. Systematic and consistent research plans and follow-up of results have also contributed to the success. Ahus/ Campus Ahus has prioritized high-quality research infrastructure, including support on the hospital-level that is available to all researchers at Ahus/ Campus Ahus. The economic situation for Ahus/ Campus Ahus has permitted upgrade of research infrastructure the last years. The quality of research has improved for several groups, including translational research and health service research, and Ahus has a prominent position for clinical interventional trials in Norway.
Internal Weaknesses	Ahus is a relatively young university hospital with increasing research production, but do not receive the same basic funding as other university hospitals in Norway with longer history. As basic funding to Ahus is restricted, the progress in research at Ahus has mainly been performed with external research funding. The lack of robust internal funding is a liability as no long-term funding scheme is in place for sustained research growth. The catchment area of Ahus is 11% of the Norwegian population and with subpar funding Ahus must prioritize clinical services over funding to research, education, and innovation. The research quality is also heterogenous at Ahus/ Campus Ahus and most researchers also have competing administrative or clinical commitments. Research at Ahus is also more dependent on a small group of senior researchers and several of these researchers also have administrative duties, mainly related to research at Ahus or Campus Ahus.
External Opportunities	The catchment area of Ahus is 11% of the Norwegian population, which permits large-scale clinical studies and collection of data and biorepositories from unselected patients. Many health care personnel start their training at Ahus, which represent a talent pool also for research and innovation. The greater Oslo area is among the fastest growing regions in Norway and Ahus is close to other strong research institutions, such as UiO, Oslo University Hospital, Oslo Metropolitan University, and Life Science industry in Norway. The data warehouse Ahus and large biospecimen repositories represent an asset for Ahus/ Campus Ahus researchers and will be interesting for academic and industry partners. The increase in research at Ahus and the relatively young research population provides a thriving environment and there are systems in place to ensure research talent recognition and development.
External Threats	The budget provided to Ahus do not parallel clinical services, research production, and contribution to education performed by Ahus, which is a threat as too much will be dependent on external research funding. There is a lack funding for investment and renewal of research infrastructure. With strong research institutions in the area, both early-career researchers and senior researchers may move to another institutions. Competition for research funding is strong, both for internal research funding and external research funding. This means that younger and historically weaker research environments often do not obtain funding and therefore do not see progress. Several leading researchers at Ahus/ Campus Ahus also have other responsibilities, which reduces the time available for research and innovation for these senior researchers at Ahus/Campus Ahus.

2. Research production, quality and integrity

2.1 Research quality and integrity

Please see the bibliometric analysis for the administrative unit developed by NIFU (available by the end of October, 2023).

a) Describe the scientific focus areas of the research conducted at the administrative unit, including the unit's contribution to these areas.

Based on the classification system in the Norwegian database for research publications and results (Cristin), which divides the content of the publication by theme, Ahus has primarily published within the subjects "Public, Environmental and Occupational Health", "Neurology", "Biomedicine", "Surgical sciences", "Cardiovascular and respiratory systems", and "Psychiatry". A more detailed description of the distribution can be found in the NIFU report.

The citation indicators reveal that, on average from 2019 to 2021, 12.2% of publications featuring authors from Ahus were included in the top 10% most cited works, spanning various publishers, journals, and series. The report offers an overview of the highly cited publications during this period, highlighting, among others, an article in Nature Neuroscience with five out of 20 authors from Ahus/ Campus Ahus. In the years 2020 to 2022, most publications from Ahus/ Campus Ahus were in BMC Health Services Research (2.2%), followed by PLOS ONE (1.9%) and Scientific Reports (1.4%), respectively.

b) Describe the administrative unit's policy for research integrity, including preventative measures when integrity is at risk, or violated.

Ahus is responsible for ensuring that all research with Ahus researchers is conducted in a responsible and trust-building manner. The research also must be planned, carried out, and concluded in accordance with statutory requirements and recognized norms for research ethics. In collaboration, Ahus and UiO have increased their attention, structures, and policy for research integrity:

- Guidelines ethics and integrity at Ahus (draft)
- Standard for Research Integrity - For employees - University of Oslo (uio.no) and Institutional arrangements have been jointly established between UiO and Ahus as follows:
- Guidelines for the handling of cases concerning potential violations of recognized norms of research ethics ,with the appointment of *The Commission on Research Integrity* for the Institute of Clinical Medicine at the Faculty of Medicine, University of Oslo, Oslo University Hospital and Akershus University Hospital: The Commission on Research Integrity - Faculty of Medicine (uio.no)
- The Research ombudsman: The research ombudsman is a service to employees at the University of Oslo, Institute of Clinical Medicine, Akershus University Hospital and Oslo University Hospital, as well as other researchers and students without employment who conduct research at these institutions.

Preventative actions:

- The importance of research ethics and integrity is strengthened through increased attention in existing courses, and establishment of new courses regarding research ethics, both at the PhD level and in the training of supervisors:
- Ethical guidelines for supervisors: https://www.med.uio.no/english/research/about/ethics/the-commission-on-research-integrity/ethical-guidelines-supervisory-relationships-med.html
- Scientific staff receive training in research ethics in various ways, including as part of the PhD program where both PhD candidate and supervisor must participate together.
- Ahus offer a series of courses to researchers and other research staff, this includes a variety of topics such as research ethics, research integrity, legal responsibilities etc.
- Experiences and examples of cases are annually presented by the ombudsman and by the Chair of the Commission on research integrity, in one of the coordinating meetings ("Felles forskningsutvalg") between the heads of research in the divisions, the Director of research at Ahus and the Head of Clinmed., Campus Ahus. Furthermore, the Research Ombudsman and the Chair of the Commission on Research Integrity are regularly invited to seminars in the divisions.
- Research integrity and the responsibilities of leaders and project leaders is regularly discussed in meetings between the hospital management and the management teams in the clinical divisions.

2.2 Research infrastructures

a) Participation in national infrastructure

Describe the most important participation in the national infrastructures listed in the Norwegian roadmap for research infrastructures (Norsk veikart for forskningsinfrastruktur) including as host institution(s).

Research represents one of the four statutory responsibilities of the Norwegian university hospitals to continuously deliver, develop and improve health care services. In 2021, The Norwegian government released the *Action Plan for Clinical studies* (2021-2025) (in Norwegian) with an overarching vision of making clinical studies an integrated part of patient care. The objectives of the Action Plan reflect *the Government Audit Office report* concluding that the number of clinical treatment studies and patients participating should be increased, and the Regional Health Authorities need to strengthen their focus on clinical research. The strategic goals of *the Government's Long-term Plan for Research and Higher Education* (2023–2032) encompass cultivation of outstanding academic communities and the elevation of research and education quality. The objectives of these strategic plans coincide with the core obligations of The Norwegian Clinical Research Infrastructure Network (NorCRIN) and the continuous commitment to collaboration both nationally and internationally. NorCRIN (founded in 2012) is a consortium formed by the six university hospitals in Norway to harmonize standards for the conduct and quality assessment of clinical studies. Additionally, NorCRIN serves as the Norwegian node of the European Clinical Research Infrastructure Network - European Research Infrastructure Consortium (ECRIN-ERIC). The funding allocated to NorCRIN 1 (2015-2020) and NorCRIN 2 (2020-2025) by the Research Council of Norway have been instrumental in the establishment of the Network and the national Standard Operative Procedures for clinical research, which are aligned with national and European regulations and The International Conference on harmonization Good Clinical Practice guideline (ICG-GCP). The university hospitals are currently accountable for the majority of the clinical research performed in Norway.

The Department of Clinical Molecular Biology (EpiGen) maintains excellent relationship with ELIXIR Norway. “ELIXIR Norway is a national node of ELIXIR, the pan-European infrastructure for biological information, supporting life science research and its translation to medicine, environment, the bioindustries and society. (…) ELIXIR Norway provides service, infrastructure, support and training for life science researchers." (About - ELIXIR Norway Documentation (nels-docs.readthedocs.io).

One of EpiGen´s researchers is involved as an in-kind person in some of the ELIXIR's activities related to human sequencing data. Together with ELIXIR, we have initiated a discussion at Ahus about providing Ahus' researchers (including EpiGen's) access to Federated European Genome-phenome Archive Norway. Access to this archival service (developed and maintained by ELIXIR Norway) is instrumental in balancing controlled access to human sequencing data and application of FAIR principles to the same data category.

Computational power of a high-performance computing (HPC) cluster is needed to analyze large data sets generated in biological (for example sequencing) experiments.

In EpiGen, we rely on the access to HPC cluster Saga (owned by Sigma2 AS) and the access to Services for sensitive data (TSD), including access to an HPC cluster (owned by UiO and Sigma2 AS). Saga is operated by Norwegian Research Infrastructure Services (NRIS, collaboration of Sigma2 AS and Norwegian universities including UiO) and is dedicated to working with non-sensitive data while TSD is developed and operated by USIT at UiO and the service is dedicated to working with sensitive data.

For further reading, please see here: HPC and analysis with Colossus in TSD - University of Oslo (uio.no).

Table 5. Participation in national infrastructure

Areas in roadmap	Name of research infrastructure	Period (from year to year)	Description	Link to website
Biotechnology	**ELIXIR Norway**	2021-2023	In-kind person federated EGA workshop attendance	https://elixir.no
ICT	**Sigma2**	2018 - 2023	Saga (analyses of non-sensitive data), TSD (analyses of sensitive data)	https://www.sigma2.no/
Medicine and Health	**NorCRIN**	2012 - ongoing	Consortium partner, participates actively in work packages	Forside - www.norcrin.no
	Genomics Core Facility	2018-2022	Core facility	http://genomics.no/oslo/
	Norwegian Sequencing Centre	2018-2022	Core facility	https://www.sequencing.uio.no/
	Flow Cytometry Core Facility	2018-2022	Core facility	https://ous-research.no/flow/
	Proteomics Core Facility	2018-2022	Core facility	https://www.ous-research.no/proteomics/

b) Participation in international infrastructures

Not applicable for Ahus and Campus Ahus.

Table 6. Participation in international infrastructure

Not applicable for Ahus and Campus Ahus.

c) Participation in European (ESFRI) infrastructures

Not applicable for Ahus and Campus Ahus.

Table 7. Participation in infrastructures on the ESFRI Roadmap

Not applicable for Ahus and Campus Ahus.

d) Access to research infrastructures
Describe access to relevant national and/or international research infrastructures for your researchers. Considering both physical and digital infrastructure.

Local support

As presented in *Section 1*, to build research infrastructure has been a priority of Ahus/Campus Ahus over time. Ahus/Campus Ahus provides extensive clinical research support, including statistics, health economy assessments, large-scale biomarker facility, and full-scale clinical trial support at the hospital, division, and the department level. For researcher-initiated clinical trials, Ahus offers integrative support from clinical trial unit with integrated top-level academic personnel to provide research support from start to finish (Akershus Clinical Research Center [ACR], including the Center for Pragmatic Trials as one of five pillars).

Ahus also offers full-scale dedicated research support for economy, data protection and security assessments, research contracts, human resources, and to organize and run biospecimen repositories.

As part of the work to ensure that the research at Ahus takes place within the applicable laws and regulations, an audit of the area was carried out in 2016/2017. The audit resulted in an action plan for the hospital level and for each clinical division, and both were instrumental in the strengthening of the internal control for research from 2017 at Ahus. This work has improved the infrastructure for research support, including:

- Development of an electronic solution (eForm) for registering research projects with the data protection representative. Ensures anchoring of the project with the head of department, legal assessment of privacy and that Ahus has an overview of all registered research projects
- Dedicated resources to handle submissions of projects to the Data Protection Commissioner
- In-house Research Course series: Includes topics relevant for all research personnel, offered twice a year
- All documents related to a research project, for example protocol, consent, approvals, must be archived in the electronic file archive (P360) at Ahus.
- Research is now a separate part of the internal control system at Ahus and a separate category within deviations
- Routines and guidelines regarding all aspects of research at Ahus

Researchers with Campus Ahus (UiO) affiliation can also get state-of-the-art research support from UiO, such as pre- and post-grant support, project support, compliance-related matters, data management and privacy, contracts, and collaboration agreements, as well as advice and support in various aspects of the scientific publication process. See Research support - For employees - University of Oslo (uio.no). The Institute of Clinical Medicine provides HR services related to employment contracts, recruitment, and other practical issues. The institute also provides procurement and financial support such as budgeting. The communication team contributes to outreach activities in the research group. The research groups further benefit from the university library, as well as support services offered by UiO as IT computing services, innovation and commercialization support.

Regional support

The South-Eastern Regional Health Authority provides regional research support (Research support services), which includes a dedicated office for international research grant funding, which

complements the local infrastructure at Ahus related to competitive, external research funding. Ahus is also partner in national initiatives to standardize and improve clinical research, NorCRIN and NorTrials, and these networks also provide digital research support in the form of standard operating procedures and templates for protocol and contracts, and digital and physical meetings to permit dissemination of knowledge between partners.

e) FAIR- principles

Describe what is done at the unit to fulfil the FAIR-principles.

As highlighted in section 1.7c above, UiO and Ahus are committed to managing research data according to the FAIR principles. Despite ongoing efforts, challenges persist in fully adhering to these principles, particularly concerning the sharing of sensitive health data. These challenges are tied to legal restrictions, GDPR compliance, and the availability of secure data systems. Moreover, a deficiency in the necessary skills and infrastructure further complicates supporting researchers in making their research data FAIR.

Nevertheless, we actively promote awareness among researchers, urging them to consider sharing their research data in line with the FAIR principles, as outlined in our data management plans. To fulfil these principles within both Ahus and Campus Ahus, key actions include the establishment of openly searchable research registries, quality registries, general biobanks with broad consent, and the deposition of data in international databases, among other initiatives.

3. Diversity and equality

Describe the policy and practices to protect against any form of discrimination and to promote diversity in the administrative unit.

In addition to being highlighted in the Development Plan 2040, Akershus University Hospital has stated its policy for Diversity, Equity and Migration Health in a Long-term Strategic Plan (**Table 8**). The policy entails goals for work within diversity and migration health, and strategic focus areas and initiatives for 2022-2026. Among others, a specific goal for the field of research, is that "Ahus should contribute to research and innovation which safeguards the diversity perspective so that the hospital is better equipped to meet the needs of patients and their families". To achieve this and other goals, the three strategic focus areas related to diversity, equity and migration health is:

1) Competence, knowledge, and research

2) Communication and language

3) Recruitment and representativeness

Ahus also adheres to other strategic and governing documents that protect against discrimination and promotes diversity: Relevant laws and conventions, the Commissioner's Document from South-Eastern Norway Regional Health Authority, national strategies and action plans, and The Letter of Intent regarding a more inclusive working life (IA agreement).

The Faculty of Medicine's Action Plan for Diversity, Equality, and Inclusion 2023 - 2026 (**Table 8**) is established in University of Oslo's Strategy 2030 and in University of Oslo's Action Plan for Diversity, Equality, and Inclusion 2021 – 2024. The faculty's plan describes specific areas, goals, measures, and responsibilities for ***(1)*** management, ***(2)*** employees, and ***(3)*** students. While the management's goal is to raise awareness in the organization, the employees and students have goals relevant to their respective group. Such as to ensure that all employees have equal opportunities to be included in the working environment, or to increase diversity among students.

Table 8. Administrative unit policy against discrimination
Give a description of up to 5 documents that are the most relevant. If the administrative unit uses the strategies, policies, etc. of a larger institution, then these documents should be referred to.

No.	Name	Valid period	Link
1	Long-term Strategic Plan for Diversity, Equity, and Migration Health	2022-2026	Long-term plan for diversity, equity and migration health
2	Action Plan for Diversity Equality and Inclusion	2023-2026	Diversity Equality and Inclusion at MED - Faculty of Medicine (uio.no)

4. Relevance to institutional and sectorial purposes

4.1 Sector specific impact

Describe whether the administrative unit has activities aimed at achieving sector-specific objectives or focusing on contributing to the knowledge base in general. Describe activities connected to sector-specific objectives, the rationale for participation and achieved and/or expected impacts. Please refer to chapter 2.4 in the evaluation protocol.

- ***Alternatively, describe whether the activities of the administrative unit are aimed at contribution to the knowledge base in general. Describe the rationale for this approach and the impacts of the unit's work to the knowledge base.***

Ahus has four statutory responsibilities: patient treatment, education, research, and transfer of knowledge to patient and relatives. Hence, research and education are fundamental objectives for Ahus and Ahus has also prioritized "to strengthen Ahus as University Hospital" as a top aim since 2019. With increasing research output from Ahus between 2012 and 2022, the overall impact by Ahus to the Norwegian research in general, and health research and Life Science innovation more specifically, has increased during the period. The research groups at Ahus/Campus Ahus have contributed to improvements for Norwegian research and clinical care, as outlined in the Level 2-reports from the individual research groups. Some examples are contributions by Ahus researchers to health service research and communication training, important clinical studies from surgical researchers and researchers in Psychiatry and substance abuse, top-level research on female health and fertility from the research group in gynecology and obstetrics, and work on covid-19 and conditions with fatigue from researchers in the Division for pediatrics and adolescence medicine.

Ahus has also followed specific sector-related aims like the requirement to increase the number of clinical interventional studies. As summarized in *Clinical Interventional Trials at Ahus,* Ahus has increased the number of clinical interventional studies from 2012 to 2022 by 10-fold. Ahus has also contributed to other sector-specific aims in Norway, like introduction of gene sequencing diagnostics prior to inclusion into precision cancer trials, work that has been performed between the molecular laboratory EpiGen (Ahus/Campus Ahus) and the Division of Diagnostics and Technology in the hospital.

Research at Ahus/Campus Ahus also contributes to the overall performance of the hospital. Excellent research helps attract and maintain highly competent and motivated personnel at Ahus/Campus Ahus. Some of the research groups at Ahus have made important discoveries that influence patient care at Ahus, nationally, and internationally.

To maintain a world-leading universal health system is also prioritized across political groups in Norway and have widespread support in the population. As the catchment area of Ahus represents >10% of the Norwegian population, we believe improvements in research in Ahus will benefit large patient groups and help Norway maintain a world-leading universal health system. Increasing research output from Ahus also helps improve health-related research in general in Norway. Furthermore, the focus of Ahus to provide professional interaction with industry partners, contributes to the overarching aim of the Norwegian government to build Life Science industry in Norway. **As Ahus and the university hospitals have access to and systems for including large patient-groups into clinical interventional trials, Norway should consider strengthening research at Ahus and other high-performing hospitals to support national and international Life Science industry.**

4.2 Research innovation and commercialisation

a) Describe the administrative unit's practices for innovation and commercialisation.

Ahus has recently adopted a policy for innovation and business development. Innovation work internally at Ahus will be led by an innovation network, which will actively work to strengthen the field of innovation at Ahus by maintaining close dialogue with internal and external partners. The network will aim to play a central role in stimulating innovation, building competence among professionals and research with innovation processes, develop routines, etc. The Norwegian hospitals annually report innovation activities to the authorities, and Ahus has reported the highest numbers of innovation activities among Norwegian hospitals for the past two years.

Ahus has a contract with Inven2 AS to represent Ahus as Technical Transfer Office. Inven2, which is Norway's strongest technology transfer office, administer the commercial potential of inventions for Ahus and other hospitals in the South-Eastern Norway Regional Health Authority. Inven2 has a broad range of expertise from different professional fields, research, and industry, which makes Inven2 able to handle the value chain for innovation, clinical trials, and industry cooperation.

The commercialization regulations and principles are described in the policy documents listed in **Table 9** for Ahus and UiO. Both Ahus and UiO have internal support structures for innovation work.

b) Describe the motivation among the research staff in doing innovation and commercialisation activities.

Ahus and Campus Ahus have many researchers who are active in research-driven innovation. Companies have been established based on research, and in recent years, approximately 10 Disclosure of Invention (DOFIs) have been submitted to Inven2, with several innovation projects also reaching the stage of commercialization.

Ahus has regulated financial aspects for accounting and for the use of the income from innovations and clinical commissioned studies in Ahus. Ahus has an agreement with Inven2 for protecting intellectual property rights and to help commercialization/business development of inventions from Ahus. The agreement specifies that Inven2 is entitled to 1/3 of all net income from commercialization, and Ahus has also regulated internally that inventors receive 1/3 and the employer (Ahus/Campus Ahus) will receive 1/3 of the net income.

c) Describe how innovation and commercialization is supported at the administrative unit.

Ahus and UiO have internal support systems related to innovation and commercialization.

Internal innovation support at UiO

Innovation and commercialization is supported by the *UiO Growth House*, (est. 2022). The UiO Growth House's mission is to contribute to a stronger innovation culture and more knowledge from research being implemented into clinical medicine. The Growth House supports researchers, students, and other staff in maturing early-stage ideas through tailored counselling, seed funding, meeting places, innovation mentor program, student internship and more. UiO also offers courses related to innovation and entrepreneurship through the *School of Health Innovation.*

UiO: Life Science's innovation program for health-related topics in the life science domain SPARK Norway offers mentoring, milestone-based funding and education to further develop research ideas.

Internal innovation support at Ahus

Ahus has recently organized a network to oversee an innovation activity. There are also legal and counselling resources available to help researchers in the early phase of innovation and commercialization. Ahus also has the agreement with Inven2, which includes responsibility from Inven2 to guide and also counsel inventors.

Table 9. Policies for innovation including IP policies, new patents, licenses, start-up/spin-off guidelines

Describe up to 5 documents of the administrative unit's policies for innovation, including IP policies, new patents, licenses, start-up/spin-off guidelines, etc., that are the most relevant. If the administrative unit uses the strategies, policies, etc. of a larger institution, then present these documents. Please delete lines which are not in use.

No.	Name	Valid period	Link
1	Guidelines for innovation and business development at Akershus University Hospital	Dec. 2023 – d.d	guidelines-for-innovation-and-business-development-at-
2	Strategic plan for Akershus University Hospital 2040 from 2022 with relevant subdocuments,	April 2022 – 2040	strategic-plan-for-akershus-university-hospital-2040.pdf
3	Policy for intellectual property rights at the University of Oslo	Dec. 2011 – d.d.	Policy for intellectual property rights at the University of Oslo - University of Oslo (uio.no)

Table 10. Administrative description of successful innovation and commercialisation results

Please Describe up to 10 successful innovation and commercialisation results at your administrative unit in the period 2012-2022.

No.	Name of innovation and commercial results	Link	Description of successful innovation and commercialisation result.
1	Innovation: Secretoneurin as a cardiac biomarker Commercial result: CardiNor AS	CardiNor | Fighting the heart failure pandemic	Researchers from Ahus/ Campus Ahus have identified and developed secretoneurin as a novel cardiac biomarker. We have demonstrated that secretoneurin provides additional prognostic information to established risk indices, and that secretoneurin integrates information related to myocardial function, renal function, and systemic stress. The company CardiNor AS is currently commercializing secretoneurin and has establishing a CE-marked secretoneurin ELISA in collaboration with researchers from Ahus/ Campus Ahus.
2	Innovation: Unique Alzheimer disease-related degradation patterns of Aβ + other patents Commercial result: PreDiagnostics	Next generation blood tests - Read more - Pre Diagnostics (pre-diagnostics.com)	Researchers from Ahus/ Campus Ahus have several innovations related to early diagnosis and treatment of cognitive decline. The company PreDiagnostics holds some of these innovations, including a CE-marked assay to measure unique Alzheimer disease-related degradation patterns of Aβ, the main peptide forming brain amyloid plaques. Additional innovations from Ahus/ Campus Ahus researchers are also being developed and commercialized by PreDiagnostics.
3	Spinchip Diagnostics	Hjem - SpinChip	Researchers at Ahus/ Campus Ahus are the primary collaborator for the Norwegian biotech company SpinChip Diagnostics, who is developing a point-of-care multiplex platform for fast analysis of several biomarkers. The collaboration started in 2012 [redacted]

4	SomSagt		Researchers at Ahus/ Campus Ahus were among pioneers that introduced the “4 habits model” for communication training in Norway. Researchers at Ahus/ Campus Ahus are involved in training large groups of health personnel throughout Norway, and the company SomSagt was also established to use the model for professional training. The “4 habits model” is now used throughout Norway for improving communication between health care personnel and patients and relatives.
5	License to VitaDao	Molecule’s IP-NFT is now facilitating Alzheimer´s research at the University of Oslo	Based on the Fang lab ground-breaking discovery of turning up mitophagy as a therapeutic strategy in Alzheimer’s disease (Fang EF et al., Nature Neuroscience 2019; commentary in Nature Reviews Drug Discovery; highlighted in Nature 2022), the Fang lab has a License agreement with the anti-ageing company Molecule AG/VITADAO for further development and commercialization of ‘Inducers of mitophagy’. Funding 2,397,750 NOK.

6	Innovation: The AEGIS Dual Purpose Helmet - Surgical helmet and efficient respiratory protection in one device!	Orthecta AS	**Description of innovation:** The AEGIS dual-purpose helmet combines the advantages of facemasks, air-purifying respirators (PAPR), and surgical helmets (SH) into one novel respiratory protective device, tailored for the healthcare sector. The AEGIS helmet can be used as a modern SH in orthopedics. When needed, it can be converted into a PAPR within a few seconds providing several hundred times better protection against bacteria, viruses, and particulates compared to N95 masks. Disinfection does not require complicated procedures, machines, and logistics. After a few minutes, the helmet is ready for the next user. In an emergency situation, hospital staff can carry on using known equipment. **Commercialization results:** 15 pieces of the proof-of-concept device are still in use at Ahus with two departments. The AEGIS project arose from publicly funded research at the Dpt. Of Orthopedics at Ahus during the COVID-19 pandemic, initially under the project name "EURODAPTER". IP of the proof-of-concept prototype was secured. The project was transferred into a spin-off start-up company, headed by the inventor (ORTHECTA AS, Breg.: 927152479) and received 5 mill NOK funding from RCN as a verification project for publicly financed research under the "FORNY2020" program. The inventor has subsequently set up a team of experts and business developers and currently pursues the development of the device in a part-time position with the start-up company. Initial milestones have been accomplished.

7	Innovations: 3D-Lab: low-threshold innovation hub for medical devices at point-of-care		**Description of innovation:** the 3D-Lab at Akershus University is a low-threshold innovation facility for health-care personnel with innovative ideas to improve their daily clinical practice. Several small-scale innovations have been funneled through the 3D-Lab, some with commercial potential, many other without significant commercial potential or without the necessary funding. The 3D-lab can realize some of the small-scale innovations on site, which then directly serve clinicians and other personnel in their daily clinical practice. Furthermore, the 3D-lab was involved in several medium-scale innovation projects; mostly in the initial phase for a sketch-up and prototype, please refer to the specific project for more information. **Commercialization results:** one 3D-printed device developed in the 3D-lab is offered as an on-demand manufactured part by a commercial company, for other projects, please refer to the specific project in this report.
8	Mesenteric navigator holographic app: Superimposing personalized medical holograms in the operating as navigation maps during colon cancer surgery.	License to Holocare HoloCare AS	This is a subproject, among 3 other subprojects in different hospitals in HSØ, which had a collaboration with HoloCare AS for further technological development and implementation. At Ahus, the purpose was to bring CT-derived virtual 3D vascular models (holograms) inside the operation room so that they can work as “navigation maps” during surgery and become an imaging guiding tool for surgeons. In this way, they get an interactive and spatial view of the anatomy of interest. Initial pre-clinical testing results were acceptable but further development is needed.
9	Baby Segmentation Tool	Idéprisen 2021 går til avansert teknologi for fosterdiagnostikk – Inven2 Home - NordicCAD Automatic placental and fetal volume estimation by a convolutional neural network - PubMed (nih.gov)	Akershus University Hospital (Dep. of Obstetrics and Gynecology and Dep. of Medical Imaging) has, in collaboration with NordicCAD, developed a tool to rapid estimate the size (volume) of the fetus and the placenta in ongoing pregnancies. The method is based on machine learning (AI) of MRI (Magnetic Resonance Imaging) images of pregnancies. The estimation by Baby Segmentation Tool of fetal and placental size takes a few seconds, only. This method has the potential to improve the identification of high-risk pregnancies.

10	Precision microbiota profiling in COVID-19 in adolescents. Focus on diagnosis, prognosis and long-term effects	License to Bio-Me	The gut microbiome has been implicated in the interplay between COVID-19 (SARS-CoV-2) and the host. We explored associations between baseline fecal microbiota profiles and COVID-19 status, symptoms, severity and long-term consequences following COVID-19 in a cohort of non-hospitalized young patients. We found that pediatric and young SARS-CoV-2 infected patients had increased fecal abundance of Gemmiger formicilis and Faecalibacterium prausnitzii species compared to non-infected patients. The results have been published as abstracts at international conferences (DDW Chicago 2023) and a manuscript is underway and planned published in an international peer reviewed journal.

4.3 Higher education institutions

a) Reflect how research at the administrative unit contributes towards master and PhD-level education provision, at your institutions and beyond.

Ahus is a Norwegian university hospital, which includes the requirement that the hospital needs to be affiliated with the University sector to offer education and research training across disciplines and educational background. Ahus has close collaboration with UiO, which is the leading academic institution in Norway for health research. Ahus is also an integral part of Faculty of Medicine, UiO, and Ahus receives medical students throughout the 6-year curriculum at the Medical School at UiO. Ahus is a major contributor to post-MD training for Norwegian physicians with a large catchment area and almost complete coverage of all medical specialities.

Ahus also has close collaboration with other universities and health care training institutions, especially Oslo Metropolitan University. In total, Ahus receives >1000 non-MD health profession candidates per year with the majority coming from Oslo Metropolitan University.

Providing research fellowships and PhD training is an important task for a teaching hospital. Ahus has PhD fellows across the hospital, most with a MD background, and these candidates primarily enter the doctoral training program at the Faculty of Medicine, UiO. However, there are also candidates at Ahus that receive doctoral training from Oslo Metropolitan University and other universities. The number of research fellows that have qualified as PhD has increased steadily during the period, with an exception in 2021 due to the massive strain of the covid-19 pandemic on clinical services with Ahus receiving 25% of all hospitalized covid-19 patients in Norway.

Research plays a crucial role in providing quality education to medical students in the Professional program in medicine and to PhD fellows enrolled in the PhD program at the Faculty of Medicine, UiO.

Our academic employees and researchers are actively involved in writing research proposals for external funding and conducting research in their respective fields. There are several groups and centres that are at the forefront of research, which provides a fertile environment for medical students and PhD fellows. The presence of renowned researchers and their ongoing projects in diverse fields exposes PhD fellows to the latest methodologies, theoretical frameworks, and advancements in their

respective disciplines. Our research groups have extensive networks and can connect PhD fellows and postdoctoral candidates with national and international experts and collaborators in the field, further enhancing their research experience.

In addition, Ahus/Campus Ahus presents with a high percentage of international researchers. This international group of researchers adds a valuable dimension to the academic atmosphere. PhD fellows collaborate with and can learn from scholars from different countries and cultural backgrounds. This exposure to diverse perspectives broadens their understanding of global research trends and fosters innovative thinking.

The high-quality research done at Ahus/ Campus Ahus is also the basis for several specialised courses for PhD fellows, and we are responsible for one of the mandatory courses at the PhD program at the Faculty of Medicine, UiO.

Our researchers collaborate with other institutions and sectors to further promote research and education. This provides our students with opportunities to interact with experts from different fields, broaden their horizons and gain a more interdisciplinary perspective. It also helps to create a network of knowledge-sharing and collaboration, which benefits the wider academic and professional community.

b) Describe the opportunities for master students to become involved in research activities at the administrative unit.

Ahus provides research training for all categories of researchers, also early-career research training at the master level. For non-MD master students, the primary unit for master student training is the EpiGen lab. There is no formal program to include master students with a basic science background into operations at EpiGen, but the variety of research performed at EpiGen and the number of research groups and senior researchers enables EpiGen to train a large number of master students.

All medical students at the Faculty of Medicine, UiO, submit a 20 ECT project thesis during the 6-year curriculum. A substantial proportion of medical students at UiO executes their project work with Ahus/ Campus Ahus-affiliated mentor.

Master students have ample opportunities to engage in research projects and gain hands-on experience. This not only enhances their theoretical knowledge but also equips them with practical skills, making them more competitive in the job market.

c) ONLY for administrative units responsible for the Cand.med. degree programme, cf. Evaluation of the Professional programme in Medicine (NOKUT).

- ***Reflect on how research at the administrative unit contributes towards the quality of the Cand.med. degree programme at your institutions and beyond.***
- ***Describe the different opportunities for students on the Cand.med. degree programme to become involved in research activities at the administrative unit, and the extent to which students use those opportunities.***

As a university hospital affiliated with UiO and other universities, especially Oslo Metropolitan University, Ahus contributes to education and the PhD program of several universities.

Organization and structure of the medical studies reflects a close link between clinical practice, research, and education. The academic staff often have a secondary position at the university were teaching and research coexist, and the aim is to enable the individual teacher to extract the applicable elements of their research (both process and results) into teaching so that it is useful for the students' learning outcomes. A qualification target is clinically skilled professionals where research knowledge is used in a practice that is characterized by paradoxes, uncertainty, doubt, special situational and patient-specific characteristics. The best way a research-strong academic culture utilizes its strengths is to give the students a critical and analytical attitude to knowledge.

During the medical studies, all students work on a project assignment (20 ECT). The work gives the students insight into scientific method and critical source assessment, as well as planning, initiating, and implementing a scientific work or an innovation project. The research question can be from various medical areas and format such as scoping reviews, linked to clinical studies/clinical projects, qualitative studies, epidemiological investigations, experimental studies, development projects, etc.

The Medical Student Research Program (MSRP) at UiO is an optional program for medical students who want to develop a research project during their medical studies. MSRP is financed through RCN grants, and offers research funding and structured research training, and admits up to 20 students per year. The students start with one full-time year and thereafter two part-time years with 50% research in parallel with the medical studies. Around 50 % of those who have completed MSRP continues to build on the research-project to a doctorate.

Following up on the MSRP, the administrative unit from 2024 will provide funding for 1-2 PhD scholarships per year which are reserved for former Medical Student Research Program participants to complete their PhD.

4.4 Research institutes

a) Describe how the research and innovation activities/projects at the administrative unit contribute to the knowledge base for policy development, sustainable development, and societal and industrial transformations more generally.

Not applicable for Ahus and Campus Ahus.

b) Describe the most important research activities with partners outside of research organisations.

Not applicable for Ahus and Campus Ahus.

4.5 Health trusts

a) Reflect on how the administrative unit's clinical research, innovation and commercialisation contribute towards development, assessment and implementation of new diagnostic methods, treatment, and healthcare technologies.

All research and innovation at the hospital aims to improve patient care. As demonstrated in the "Impact cases" and the reports from the individual research groups, translational and clinical projects by Ahus/ Campus Ahus researchers have improved clinical care for large patient groups, both locally, nationally, and internationally.

For diagnostics, researchers from Ahus/ Campus Ahus have a leading role across several disciplines, and especially for testing and implementing biomarkers for cardiovascular disease and neurological disease. For these large patient groups, researcher at Ahus have contributed to the implementation of new diagnostic tests at Ahus and across the world (see "Impact Cases"). Ahus/ Campus Ahus was also among the first hospitals in Norway to start high-throughput gene sequencing for molecular characterization (InPred Ahus) which is prerequisite for enrolling patients into precision medicine clinical trials in Norway. This work was performed in collaboration between the research laboratory EpiGen and the diagnostic laboratory in the hospital, with EpiGen introducing front-line technology for later transfer to the diagnostic laboratory and use in daily clinical routine.

Clinical interventional trials have been a specific area of focus for Ahus since 2015. During this period, Ahus has strategically and purposefully invested in strengthening the infrastructure for initiating, conducting, and concluding clinical interventional trials. For industry-initiated clinical interventional trials, the goal is to offer patients safer and better treatments and to develop improved and more tailored treatments for individual patients. Ahus have also encouraged and supported researcher-initiated (academic) clinical interventional trials. Through clinical interventional trials, Ahus can contribute to a sustainable healthcare service in Norway, which is continuously evolving. Accordingly, Ahus will further strengthen the competence and capacity to conduct clinical interventional trials, both for better patient' treatment and to improve research. It is particularly important to increase the number of clinical interventional trials in areas in need of more evidence-based medicine, which include surgical specialties, psychiatry and substance abuse, and pediatrics and adolescence medicine. As reported in the "Impact Case" from the Division of Orthopedics, there are areas of surgical research at Ahus/ Campus Ahus that are advanced and have strategically built-up competence and capacity to perform interventional clinical trials. Ahus/ Campus Ahus will continue to support capacity for clinical interventional trials across the hospital and recently the Division of pediatrics and adolescence medicine received funding for 2-year part-time position for a consultant as "Medical lead" to spearhead development of both industry-sponsored and researcher-initiated clinical interventional trials in pediatrics and adolescence medicine.

Innovation is an important and integral part of our feature research activity. We have established an innovation network at Ahus - see chapter 4.2 - Research innovation and commercialization. There are several research projects that have progressed into an innovation venture and where the research is important for future patient treatment - see **Table 10**. By having built an infrastructure for clinical interventional trials at Ahus/ Campus Ahus, we also contribute to innovation in Norway and across the world by enabling industry-partners to use the patient cohorts of Ahus, which represent >10% of the Norwegian population, to test and refine new products in diagnostics and therapeutics.

b) Reflect on how research at the unit contributes towards the quality of relevant education programme at your institutions or beyond.

Research is important to strengthen and further develop expertise in the clinical divisions. Most associate professors and professors have responsibilities for both clinic care, research, and education. By having multifaceted responsibilities these academic leaders at Ahus/Campus Ahus add their expertise to patient care, stimulates the professional environment, and can use their knowledge from research also to advance education at Ahus/Campus Ahus. As a large teaching hospital, most clinical disciplines have academic positions and therefore benefit from the interaction between Ahus and UiO providing integration between clinical care, research, and education. Ahus has an Education Strategy and Action Plan to support this advancement in education.

c) Describe the different opportunities for students on relevant educational programmes to become involved in research activities at the administrative unit, and the extent to which students use those opportunities.

The Faculty of Medicine, UiO, has an established research program for medical students. The aim of the program is to provide research-interested medical students with training in research, and that provides a basis for a further PhD study. These students also get an added perspective to the medical studies and have an advantage in regards to further PhD courses, e.g. can take their doctorate ten years earlier than the average - The Medical Student Research Program - Faculty of Medicine (uio.no).

Ahus also collaborates with OsloMet and many employees take their master's degrees in subjects such as anesthesiology, intensive care, etc. OsloMet has funding from the Ministry of Education and Science and a few years ago announced "bridge-building positions PhD" related to health subjects, where the fellows have 40% clinical duties and 60% allocated time for research.

5. Relevance to society

Reflect on the administrative unit's contribution towards the Norwegian Long-term plan for research and higher education, societal challenges more widely, and the UN Sustainable Development Goals.

Ahus has four statutory responsibilities: patient treatment, education, research, and transfer of knowledge to patient and relatives. Research at Ahus is important to improve clinical care for patients at Norway's largest acute hospital (catchment area for Ahus >600,000 inhabitants, which is >10% of the Norwegian population). Research at Ahus has also improved care for patients regionally, nationally, and internationally. With Ahus being a major teaching hospital in Norway, Ahus contributes to the education of all categories of health care professionals in Norway. Hence, Ahus/Campus Ahus is a major contributor to fulfilling the aims of "Good health and well-being", "education", and "no poverty" and "reduced inequalities" in the UN Sustainable Development Goals. Ahus/Campus Ahus also has established policies for gender and cultural equality, is a major workplace in the region with labour contracts according to Norwegian legislation, works closely with the worker unions to have well-regulated working conditions, and adheres to strategies to reduce energy consumption and reduce waste, which relate to the UN Sustainable Development Goals for "no poverty" and "zero hunger", "climate action", and "reduced inequalities". Ahus also has close partnerships with industry partners and has built infrastructure to perform clinical interventional trials and provide large-scale biospecimen collection, which are relevant for Norway to achieve "Economic growth" and "Industry, innovation and infrastructure", as defined in the UN Sustainable Development Goals.

Research, education, and innovation at Ahus are also in line with the Norwegian Long-term plan for research and higher education. Ahus contributes to the education of all categories of health care professionals in Norway by collaborating closely with several universities, especially UiO for medical students and Oslo Metropolitan University for all other categories of health personnel. Ahus has a nationally leading data warehouse and large-scale biorepositories, which will be important contributions to building Life Science industry in Norway and to increase the use of health data for better clinical care. Ahus has strategically built infrastructure and competence to perform clinical interventional trials and to collaborate with industry partners, and clinical studies and collaboration with industry are focus areas in the Long-term plan for research and higher education. Pertinent to this point, Ahus has included "Clinical interventional trials" and "Collaboration with industry" as ToRs for this evaluation. The Strategic plan for Ahus 2040 also identifies Mental health as a key priority and Ahus has made important discoveries related to female health, which are also highlighted in the Long-term plan for research and higher education. Several research groups at Ahus are leading in biomarker development and testing, and Ahus was among the first hospitals in Norway to introduce gene sequencing for inclusion into clinical cancer studies, which demonstrate the potential and contribution by Ahus/ Campus Ahus to the development of precision medicine in Norway. Accordingly, Ahus/ Campus Ahus makes, and will continue to make, important contributions to execute the Norwegian Long-term plan for research and higher education.

To maintain a world-leading universal health system is prioritized across political groups in Norway and have widespread support in the population. As the catchment area of Ahus represents >10% of the Norwegian population, improvements in research, education, and innovation at Ahus will benefit large patient groups and help Norway maintain a world-leading universal health system. Increasing research output from Ahus also helps improve health-related research in general in Norway and to build Life Science industry, which are all considered prioritized areas for the Norwegian society towards year 2040.

5.1 Impact cases

Impact cases have been selected by the administrative unit to support the Terms of References and Ahus and Campus Ahus' self-defined focus areas:

- The conduct of Clinical Trials, both investigator-initiated and industry-initiated
- Innovation projects, either conducted in collaboration with industry, or funded by national and international bodies

Impact cases from Ahus/Campus Ahus:

1. Cardiac biomarkers
2. Cardio-oncology
3. Investigator-initiated prospective randomized controlled trials in orthopedic trauma surgery
4. Dementia Disease Initiation: Predictors for dementia, biomarkers and novel drug candidates
5. The NAD^+-mitophagy pathway in human ageing and its broad clinical applications