



SELF-ASSESSMENT REPORT

DEPARTMENT OF CLINICAL MEDICINE 2014-2016

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SUMMARY

This self-assessment report is part of a research assessment undertaken at all departments at the University of Copenhagen. The process was initiated by the Rector's Office. In the self-assessment report, the Department of Clinical Medicine (IKM, Institut for Klinisk Medicin) will present an overall picture of our researchers' research activity for the first time. We will describe the frameworks for the research environments and illustrate the research activity for the whole department as well as for the individual specialities at the department.

IKM is the largest department at the University of Copenhagen, and is an integrated part of the Faculty of Health and Medical Sciences (SUND). The Department is led by the Head of Department with reference to the Dean. An academic staff of approximately 700, including 200 clinical professors, and more than 700 PhD students generate high-impact research, publishing approximately 2,400 original international peer-reviewed papers per year with an average impact factor of 5.2-5.7.

The research is based on a high degree of international and interdisciplinary collaboration, and covers a wide range of topics, spanning from basic research to randomised clinical trials produced by 34 specialities. The field-weighted citation impact for publications from IKM is more than double of the world average, and among the highest at the University of Copenhagen¹.

The vast majority of the academic and educational staff have their academic position at the University but are employed as clinicians at hospitals owned by the Capital Region of Denmark or Region Zealand. These shared positions ensure that medical students receive top quality, practice-based, discussion-oriented, and feedback-driven clinical education, highly relevant for the health system. The shared positions between the University and clinical hospital departments also ensure up-to-date health research, embedded in clinical practice and supported by the basic sciences at SUND.

1. SUND Health Report 2016 4th edition – appendix 2.

The gender distribution among our staff is 35% women and 65% men, and the average age is 54 years. Among Clinical Research Associate Professorships (KFL positions), the gender distribution is 47% women and 53% men, and among PhD students working in the majority of specialities, there is a female predominance. This points to implementing a more gender-balanced structure in the future. Further, since 2015 the University of Copenhagen has had an action plan, 'Career, Gender and Quality – Equal Opportunities in Research and Leadership', with search committees for recruitment.

The present self-assessment shows that most specialities have strong research profiles, whereas some specialities need resources to reach a higher scientific level. We will engage in possible actions to help improve the science produced by these weak research environments. Such actions could involve strategic initiatives with support from Copenhagen University Hospital (KUH), including searching for external key researchers who could contribute to strengthening science at departments. The overall SWOT analysis highlights the main

findings from all the different specialities. A selection of the important findings show that our strengths are a strong academic tradition and a high level of research. Our weaknesses are lack of career paths and that our staff's clinical work increasingly infringes on time for research. We have opportunities to extend networks and the threats indicate lack of funding/reduction of budgets, increasing administrative work on IT systems and problems with access to data.

In summary, IKM is a strong department with a large and high-impact scientific production, with research-based teaching of medical students, and with major contributions to the scientific education of PhD students. Our vision is to be the leading educational and research institution at international level within the clinical field, and new strategic work together with the Dean's Office and Copenhagen University Hospital (KUH) will further develop this vision in the near future.

INTRODUCTION TO THE DEPARTMENT

The Department of Clinical Medicine (IKM, Institut for Klinisk Medicin) is an integrated part of the Faculty of Health and Medical Sciences (SUND) at the University of Copenhagen. The Department is led by the Head of Department with reference to the Dean. We employ approximately 700 staff, of whom more than 200 are professors, and we oversee a budget of DKK 115 million (~115 million EUR). The majority of the academic and educational staff have their academic position at the University, but are employed as clinicians at hospitals owned by the Capital Region of Denmark or Region Zealand. This ensures that medical students receive international top quality, feedback-driven and practice-based clinical education that is of immediate relevance to the health system. It also secures highly relevant health research embedded in clinical practice, supported by the basic sciences at SUND. The

FACTS IKM

- In total approx. 700 employees
- Approx. 200 professors
- Approx. 750 PhD students
- 34 specialities
- 19 locations (hospitals)
- 108 hospital departments
- Gender distribution – IKM staff: female 35%, male 65%
- Gender PhD students: female 66%, male 34%
- Mean age 54 years

research produced by the academic staff is characterized by both its excellence with respect to publication impact as well as the broad range of scientific areas covered. In this report, we describe the ways in which the research base is currently secured and paths that can be taken to strengthen it further.

IKM is one of 11 departments at SUND at the University of Copenhagen, and it is the largest department at the University in terms of personnel. IKM was founded on 1 November 2012 after a merger between the five previous clinical departments: the Department of Surgery and Internal Medicine, the Department of Orthopaedics and Internal Medicine, the Department of Diagnostic Sciences, the Department of Gynaecology, Obstetrics and Paediatrics and the Department of Neurology, Psychiatry and Sensory Sciences. Our department covers most medical specialities (see next chapter)². The department administration is situated in the Panum Building in Copenhagen, whereas the academic staff is located at the various hospitals in the Capital Region of Denmark and Region Zealand.

Through teaching, research and knowledge dissemination, IKM contributes to undergraduate and postgraduate education in Eastern Denmark in particular, as well as postgraduate research-based development of the medical specialities in Denmark. Our vision is to be the leading educational and research institution at international level within the clinical field. Our current strategy was developed in 2013³.

2. Occupational Medicine, General Medicine and Social Medicine are located at the Department of Public Health, University of Copenhagen. Forensic Medicine is located at the Department of Forensic Medicine, University of Copenhagen.

3. See Appendix 3.

In the near future, we will develop a new strategy for IKM in close collaboration with the Dean's Office and Copenhagen University Hospital (KUH) and aligned with the strategy of the University of Copenhagen (which will be finished by the end of 2017).

KUH is the organizational frame for the university-based collaboration between SUND at the University of Copenhagen and the health services in the Capital Region of Denmark and Region Zealand. According to the Danish Health Act, the Danish regions are obliged to guarantee research in all the mentioned health services. As part of KUH, the hospitals in the Capital Region of Denmark and Region Zealand are also obliged to conduct research at a certain level; with a plan for research and teaching and a plan for professorships. Furthermore, many hospital departments are obliged to do research as part of their national and regional speciality function or as highly specialized departments according to the national plan and demands from the Danish Health Authority for these functions. As described in the so-called professor agreement⁴, there is a signed bilateral agreement between university and hospital management that our professors should devote 50% of their working hours to university-related work (such as research, teaching, assessments and exams) and 50% to clinical work.

With this agreement, the professors have a guarantee that they will have time allocated to research and the hospital is guaranteed highly qualified employees for patient care. Our staff is expected to produce original research that gives value to patients and society, and that supports the teaching of our students. Despite the fact that we are a clinical department, the research performed by IKM staff covers a full spectrum, from basic research, animal experiments, registry studies and translational research, to randomised clinical trials. All funding for the research performed by the staff at the department is administrated at the hospitals.

FACTS BIBLIOMETRIC DATA

- Number of international original peer-review publications 2014-16: 7,125 (i.e. 2,375 publications per year)
- Mean impact factor: 5.3
- Number of publications in the most prestigious general medical journals in 2016: 13

We have employees at at least 19 different locations in the Capital Region of Denmark and Region Zealand. The psychiatric hospitals in both regions are organized separately from the somatic hospitals.

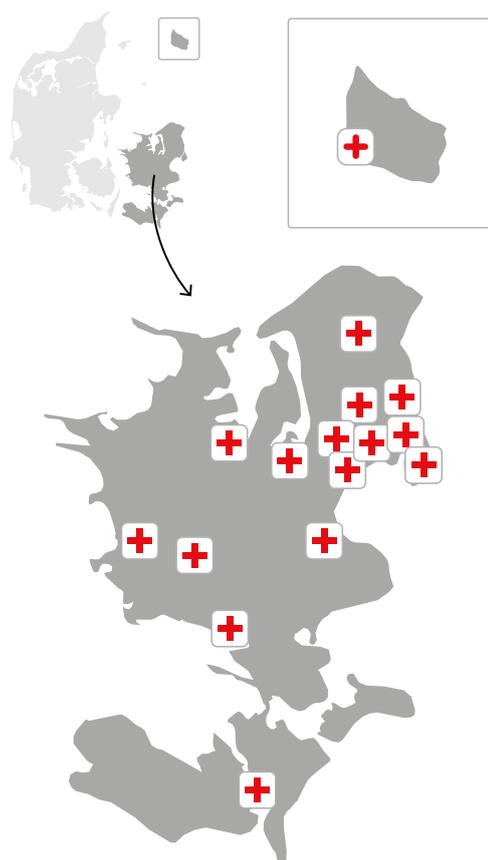


Figure 1. The figure shows where IKM contributes to undergraduate and postgraduate education in the Capital Region of Denmark and Region Zealand, comprising the Eastern part of Denmark.

4. See Appendix 4.

GOVERNANCE AND ORGANIZATION

IKM is the largest department in terms of personnel at the University of Copenhagen. We have academic staff at all the hospitals in the Capital Region of Denmark and Region Zealand. The Department is organized according to the matrix structure shown in the organisation diagram below.

The Department Management has overall responsibility for the Department's teaching and administration and for facilitating research within the specialities. The members are:

Head of Department: Clinical Professor Jesper Hastrup Svendsen
Deputy Head of Department: Clinical Research Associate Professor Ruth Frikke-Schmidt
Deputy Head of Department: Clinical Professor Peter Bytzer
Head of Administration: Eve Frisenborg

The Department Management meets every week and communicates on a daily basis to deal with

current matters within teaching and recruitment as well as to plan upcoming meetings within the department boards, councils and committees. Once a month, the Department Management meets with the Head of Studies of Medicine to discuss matters in relation to the curriculum and issues discussed in the Board of Studies. These meetings have high priority. This meeting structure secures close interaction between the members of the Department Management regarding updates and knowledge transfer about on-going matters and gives the management opportunities to act when governance challenges can be foreseen. The Head of Department is in close contact with the Dean, with approximately two meetings per month, supplemented by frequent telephone meetings. Similarly, the Head of Department is in close contact with the Vice-Dean for Research, especially in matters concerning professorship recruitments and job interviews. Furthermore, the Head of Department is a member of the Management Team at SUND⁵, who meet weekly, and of the top 80

5. Deans, Vice-Deans, Faculty Director and Department Heads.

Title	Appointment Conditions
Clinical professor/professor	50% research and teaching and 50% clinical work. Clinical position is usually as a consultant at a hospital.
Clinical research associate professor	50% research and teaching and 50% clinical work. Clinical position as a staff specialist or consultant at a hospital. Must be a medical specialist and have an academic degree.
Clinical associate professor	Main function is teaching of undergraduate students. Clinical position as a staff specialist or consultant at a hospital. Must be a medical specialist and have an academic degree.
Postgraduate clinical associate professor	Postgraduate education within the speciality. Clinical position as a staff specialist or consultant at a hospital or general practitioner. Must be a medical specialist.
External lecturer	Teaching of students. Clinical position other than medical doctor at a hospital or doctor not employed at a hospital.
Affiliate professor/affiliate associate professor	Recruited from an international university with an unsalaried affiliation to the University of Copenhagen.
Emeritus/emerita professor	Retired clinical professor with an unsalaried affiliation.

Table 1: Employment categories among the staff of IKM with dual appointments at SUND, University of Copenhagen and the hospitals in the Capital Region of Denmark or Region Zealand.

university management forum, which meets biannually⁶. In addition, the Head of Department is a member of several research-related fora in the Capital Region of Denmark (such as FIRU 2.0⁷), Copenhagen Health Science Partners, and at Rigshospitalet (Forum for Research and Innovation). The Head of Department also attends regular meetings (once a month) with research leaders from Region Zealand.

Overall responsibility for IKM's budget lies with the Head of Department. The Head of

Department and the Head of Administration meet at least quarterly with the Dean's Office to adjust the budget to support future activities.

Table 1 shows the various employment categories among our staff and their appointment conditions.

The clinical professors have their academic position at the University of Copenhagen and they are therefore appointed and employed by the University according to the Ministerial

6. Rector, University Director, Administrative Directors, Deans, Vice-Deans, Faculty Directors and Department Heads.

7. Forum for Forskning, Innovation og Regional Udvikling.

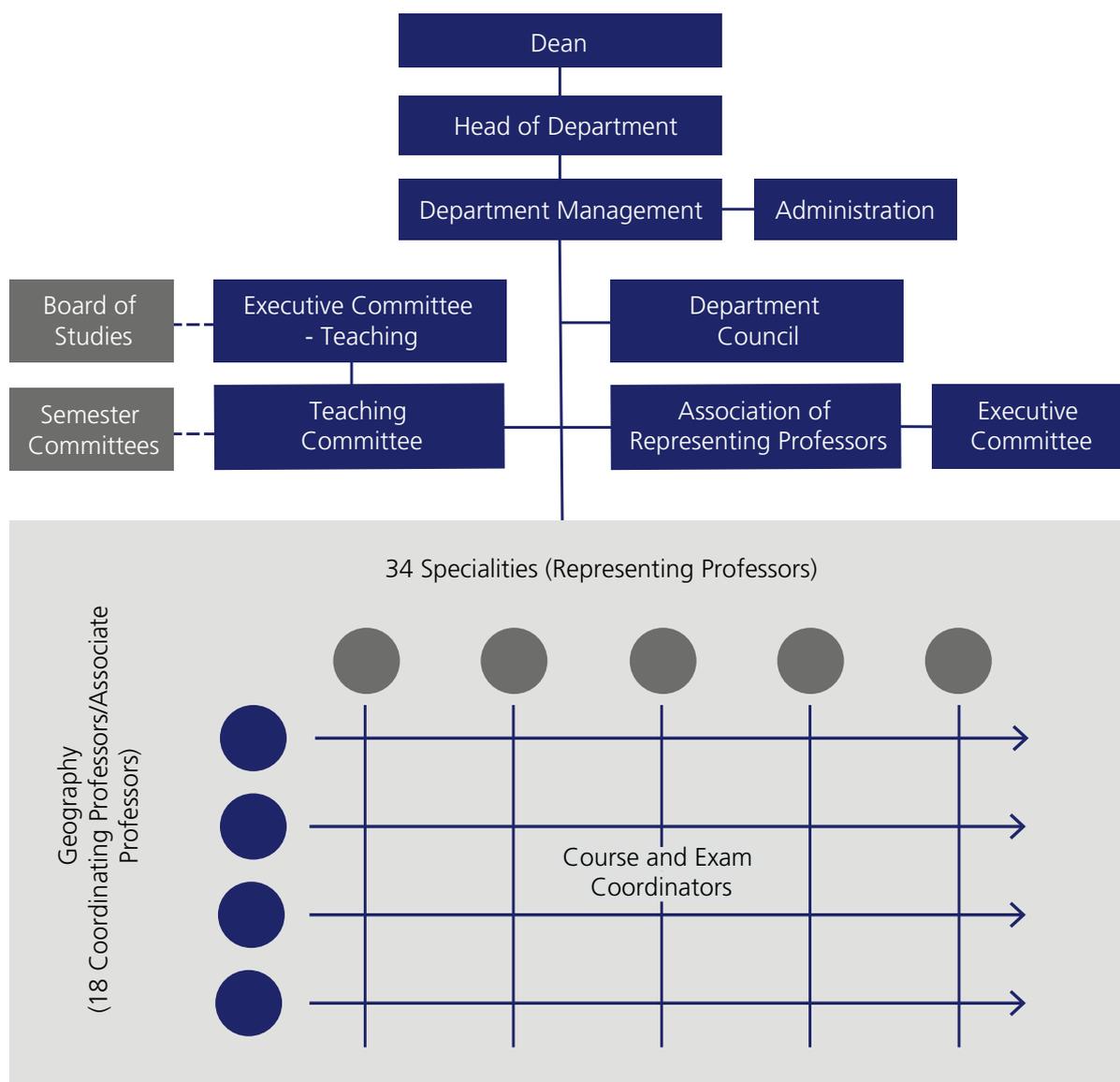


Figure 2. Organization diagram of IKM

The Head of Department and the Department Management refer to the Dean. The Department Council and the various committees refer to the Head of Department. The diagram includes the matrix model with specialties (horizontal axis) and geographies/hospitals (vertical axis).

Order on the Appointment of Academic Staff at Universities⁸.

Their practical working conditions are determined by the board of Copenhagen University Hospital (KUH)⁹ which, as described

previously, is the organizational framework for the university-based collaboration between SUND at the University of Copenhagen and the health services in the Capital Region of Denmark and Region Zealand.

8. <http://healthsciences.ku.dk/research/doctoral-degree-ku/guidelines/ministerialorderondoctorddegrees.pdf>

9. See Appendix 4.

The main axes in the matrix are the geographical structure (vertical) and the specialities (horizontal). Each geography (i.e. hospital/centre at Rigshospitalet) has a coordinating professor and each speciality has a representing professor.

The coordinating professors are SUND's link to the hospital management and vice versa. They are appointed¹⁰ by the Dean on the basis of a recommendation from the Head of Department and the hospital management. The coordinating professors handle all IKM-related matters at their hospital/centre, including annual group appraisal interviews with the clinical professors and clinical research associate professors at their hospital/centre. The Head of Department conducts annual group appraisal interviews with the coordinating professors. The Department Management meet with the coordinating professors twice a year, usually in March and October.

Each of the 34 specialities has a representing professor, who typically is a tenured professor. Representing professors are appointed by the Head of Department on the basis of a recommendation from the clinical research associate professors and the clinical professors in the speciality. The representing professors are responsible for matters related to both teaching and research for their speciality across all hospitals/centres. All representing professors are members of the Association of Representing Professors, who meet with the Department Management twice a year, usually in March and October.

Coordinating professors cover the geographical knowledge of the research and teaching at their hospital/centre, including discussions with IKM and hospital management. The representing professors provide the expert knowledge on the specific speciality concerning both research and teaching relevant to the position. Both the

coordinating professors and the representing professors play an important role in the recruitment of clinical professors and clinical associate professors to IKM, with an expert evaluation of the specific position.

The members of the Department Council¹¹ are elected. The Council is composed of academic staff representatives from all hospitals/centres, an administrative staff representative and a number of student representatives. The different members (academic staff, administrative staff and students) are elected for a 1-3-year period within their individual election group (A: full-time academic staff, B: part-time academic staff, C: administrative staff, D: students).

The Head of Department is ex-officio chair of the Department Council. The deputy chair is elected from among the remaining members.

The Teaching Committee¹² (one of the Deputy Heads of Department and Course and Exam Coordinators) is responsible for teaching and exams performed by IKM staff and meets biannually. The Executive Committee – Teaching¹³ (one of the Deputy Heads of Department, the Head of Studies and selected members from the Teaching Committee) also meets biannually. The members of the committees are appointed by the Head of Department from among the staff in the specialities relevant for the specific course or exam.

Each year in January, IKM hosts a symposium for all staff and collaborators from the University and from outside the University. The symposium includes an academic agenda with focus on research and teaching. The meeting is concluded with a dinner and networking.

10. In this chapter, the term "appointed" is used in relation to a function, not in relation to recruitment to a salaried job.

11. Institutråd.

12. Undervisningsudvalg.

13. Forretningsudvalg for undervisningsudvalg.

SELF-ASSESSMENT PROCESS

This self-assessment report is part of a research assessment undertaken at all departments at the University of Copenhagen. The process was initiated by the Rector's Office. The self-assessment report has been drawn up by the Department Management (the Head of Department and Deputy Heads of Department) supported by the department administration.

The representing professors from all 34 specialities have contributed with information about their respective speciality. The material was submitted as a template, providing us with:

- Description of the speciality
- SWOT analysis for the speciality
- Three selected CV résumés from a broad range of researchers within their speciality. The representing professors have chosen the CV's within their speciality.
- Prizes/awards granted to researchers in the speciality

The material submitted from the representing professors was supplemented by information about the number of employees, types of employment, age and gender distribution. This supplementary information was obtained by the department administration.

In order to ensure a high and comparable quality of the process, the template was submitted after a presentation of the template content and a discussion of the evaluation process at a meeting with all representing professors on 22 March 2017.

The coordinating professors have contributed through discussions about the evaluation

process ensuring perspectives on the research at IKM from the hospitals/geographies.

The Capital Region of Denmark and Region Zealand have provided us with a list of publications written by academic staff from IKM for 2014, 2015 and 2016. Moreover, we received information about our researchers' collaboration with private and public institutions in 2016 from the Capital Region of Denmark. The information is based on signed contracts with the institutions. For 2016, we assessed IKM research collaborations with other research institutions by reading author affiliations on 50% of the publications and then categorising the collaborations into: a) within the University of Copenhagen, b) with other Danish research institutions, c) with Scandinavian research institutions, d) with European institutions and e) with other international institutions.

Our data is based on publications with authorship by IKM staff from 2014-2016. The data on funding and innovation was supplied to us from the units for Research and Innovation at the Capital Region and Region Zealand.

The key figures on our staff used throughout the report in the main sections and in the speciality chapters are from February 2017.

A draft version of this report has been through a hearing process with the coordinating professors, the representing professors and representatives from the two regions. In addition, the draft has been commented on by the Head of Studies and the administrative team in Research & Innovation at SUND.

RESOURCES AND CAPACITY

BUDGETARY ASPECTS

We employ approximately 700 academic staff, of whom more than 200 are professors, and we oversee a budget of DKK 115 million (~EUR 15 million) (table 2). The table shows that the basic funding (government funding) has been reduced

by about DKK 3 million during the last 3 years, whereas there has been a considerable increase in external funding of about DKK 7 million. On the expenditure side, there has been an increase in salaries of almost DKK 5 million, primarily reflecting the increase in our academic staff.

Financial Breakdown (million DKK)	2014	2015	2016
Funding			
Basic	87.8	85.3	84.7
External	23.2	28.3	30.3
Principal Expenditure Items			
Academic staff	67.8	70.8	73.2
Administrative staff	3.2	3.1	3.5
Reimbursement to the regions for medical training	31.3	30.1	30.5
Operational costs	8.6	6.4	4.7

Table 2: Financial breakdown of IKM 2014-2016.

RECRUITMENT AND CAREER PATHS AT IKM

SUND appoints academic staff on all levels, from external lecturers to professors. We continuously have a high number of PhD students and clinical associate professors (figure 3).

Between 2014 and 2016, the total number of professors at IKM increased from 163 to 196, corresponding to a 41% increase in fixed-term professors (92 in 2014 and 130 in 2016) and a 7% decrease in tenured professors (71 in 2014 and 66 in 2016).

Academic Staff at Department of Clinical Medicine, Feb 2017

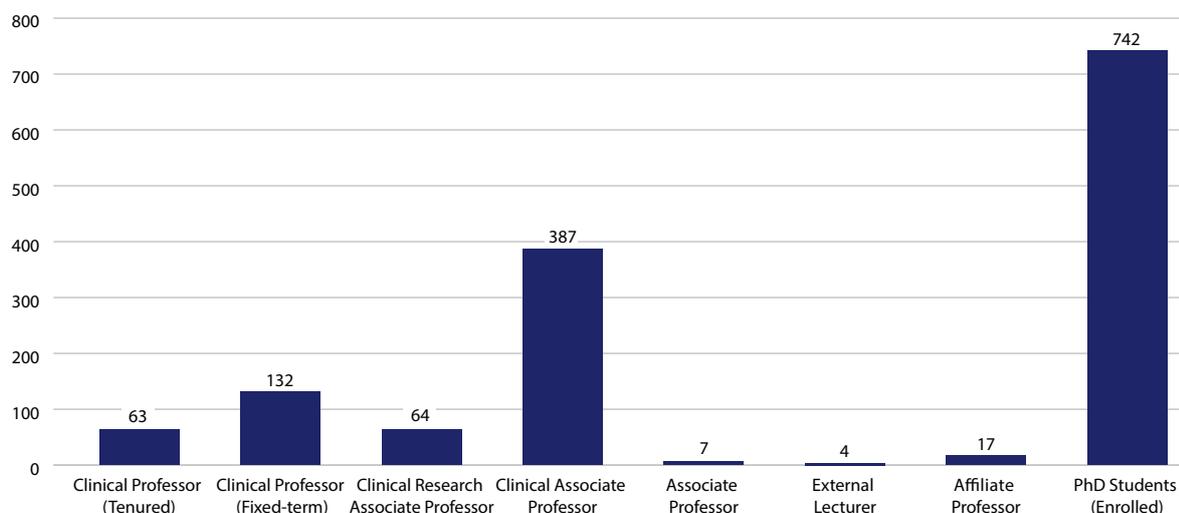


Figure 3. The different categories of employment types and the number of employees in each category, based on contract data from February 2017.

Overall, there are fewer women (35%) than men (65%) among the staff (table 3). Among clinical research associate professors the female:male ratio is more balanced (47% vs. 53%). Our

tenured professors have a mean age of 61 and our clinical research associate professors have a mean age of 51 years.

	Men		Women		Total	
	Number	Mean age	Number	Mean age	Number	Mean age
Clinical professor (tenured)	48	62	14	60	62	61
Clinical professor (fixed-term)	96	58	37	57	133	58
Clinical research associate professor	34	51	30	51	64	51
Clinical associate professor	240	53	147	53	387	53
Associate professor	2	43	5	51	7	49
External lecturer	2	36	2	54	4	45
Affiliate professor	16	57	0	0	16	57
Total	438	55	235	54	673	54

Table 3. Age and gender distribution among the different categories of employees at IKM. "Associate Professor": Lektor.

Table 3 shows the age and gender distribution of our staff distributed for different categories of employees divided into age groups.

Figure 4 shows the number of employees for three different categories of positions (tenured

professor, clinical professor and clinical research associate professor) for all our specialities. The figure shows the broad variation in number of employees, ranging from two persons in small specialities such as Plastic Surgery, Thoracic Surgery and Vascular Surgery to 30 in Neurology.

Age and gender distribution of Academic Staff at Department of Clinical Medicine

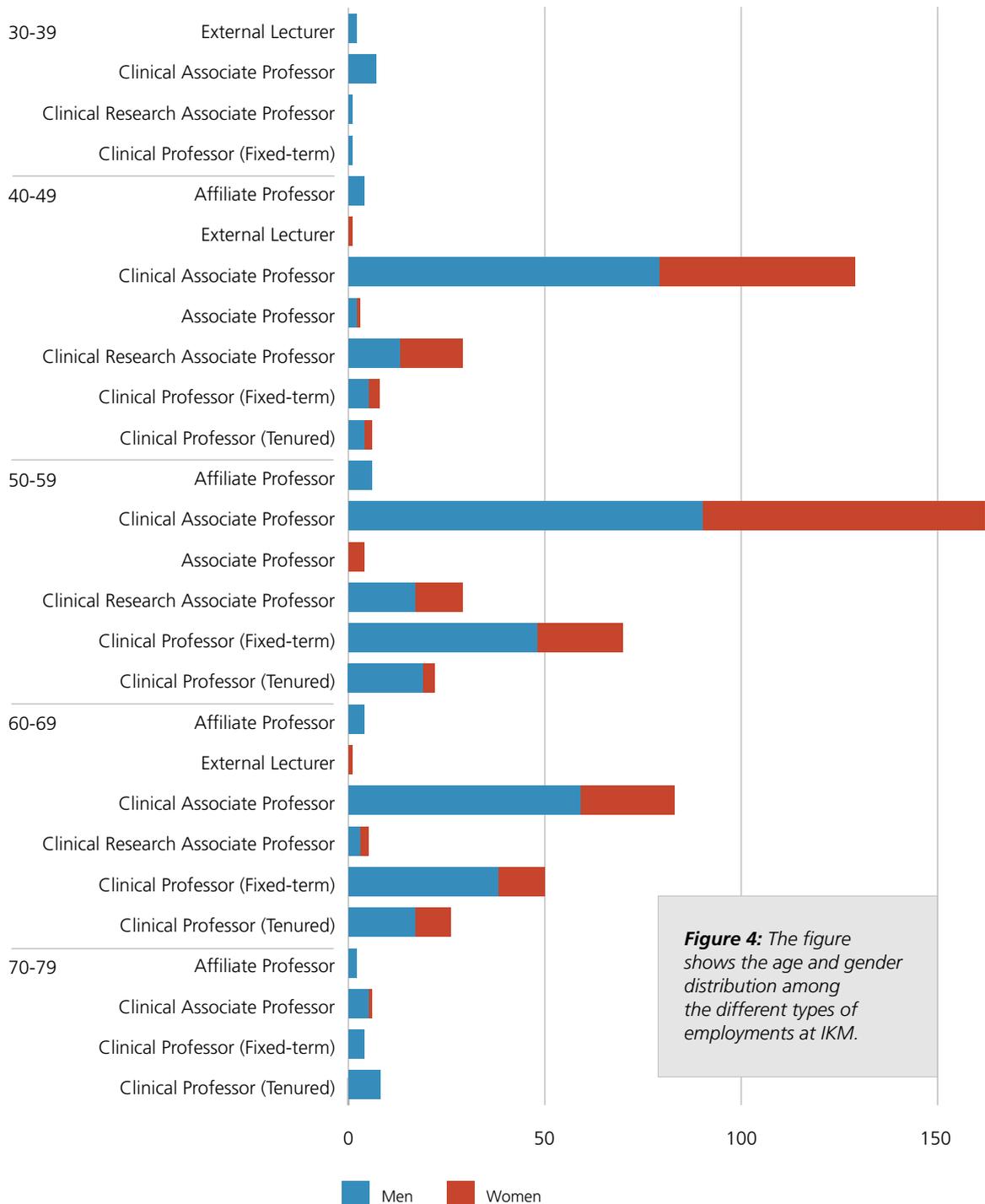


Figure 4: The figure shows the age and gender distribution among the different types of employments at IKM.

Academic Staff at Department of Clinical Medicine, Feb 2017

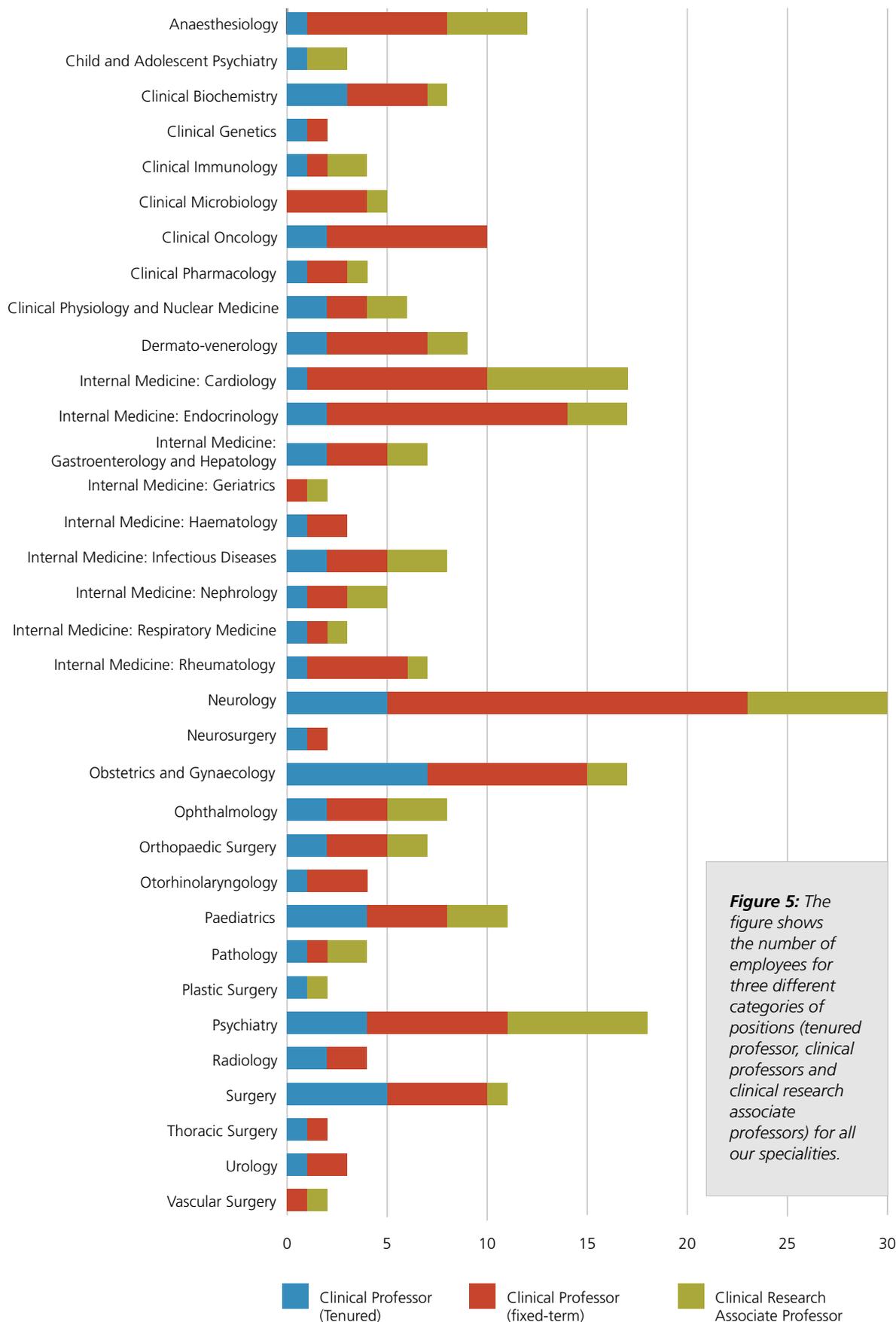


Figure 5: The figure shows the number of employees for three different categories of positions (tenured professor, clinical professors and clinical research associate professors) for all our specialities.

'CAREER, GENDER AND QUALITY – EQUAL OPPORTUNITIES IN RESEARCH AND LEADERSHIP'

In 2015, the University of Copenhagen implemented its action plan, 'Career, Gender and Quality – Equal Opportunities in Research and Leadership'¹⁴. According to this action plan, specific rules for SUND specify that search committees are obligatory for all advertised faculty positions, i.e. that IKM must appoint a search committee for recruitment of all clinical professors and clinical research associate professors. The Head of Department is responsible for setting up the search committees. During the recruitment process, the search committees should actively search for potential candidates, both nationally and internationally. The search committees submit their work on a template. This includes information on the candidates they have contacted and must focus on recruiting the most qualified candidates and ensuring a gender balance, if possible. If only one gender is represented among applicants (or only one applicant), SUND has to apply for a dispensation from the Rector of the University to proceed with the assessment process. The establishment of search committees has increased the number of applicants for faculty positions. The search committees' work could probably be improved further by establishing a formalised collaboration among the universities in the Nordic countries and more interaction with national and international specialist societies.

Due to the double affiliation, applicants must submit separate applications to the university (the professorship) and the hospital (the consultancy/senior researcher position). These two parts are assessed separately, and applicants must be found qualified for both positions. The assessment committees for professorships have three members, of whom the chairman is a clinical professor from IKM. In addition to the chairman, the assessment committee has two external members (not from the University

of Copenhagen), typically one national and one international professor. The committee is appointed with focus on representation of both genders.

In general, all applications proceed to the assessment. The assessment committee decides whether candidates are qualified or not, and can furthermore state the individual candidate's level of qualification (i.e. very qualified vs. qualified). This level of qualification must only be in relation to the job advertisement and not the other candidates. After the assessment has been finalised, the hospital and IKM recommend applicants for interview to the Dean. The appointment committee typically consists of the Vice-Dean for research, the head of IKM, the head of studies, the head of the hospital department, the chief executive of the hospital, the chairperson of the assessment committee, the coordinating professor and the representing professor for the speciality. At the interview, the appointment committee decides on which applicant to appoint. During the interview, applicants describe their reasons for applying for the position, visions for the speciality and the proposed research and teaching plan. The appointment committee discuss pros and cons for the various applicants and tries to reach a consensus on which candidate will be the best for the position. In this final decision, the applicant's track record in research, teaching and the evaluation of the research plan are major factors. However, the applicant's clinical profile is also ranked as highly important among competences for the professorship.

In many specialities, research competences, and specifically a PhD degree, are necessary to obtain attractive positions (specialist training¹⁵) leading to a specialist qualification. Unfortunately, a large proportion of clinicians stop doing research once they have obtained their PhD degree. After the PhD degree has been obtained, the current options for a university connection for clinicians are limited because they are typically not

14. See <http://ikm.ku.dk/english/research/>

15. Hoveduddannelsesstillingen.

medical specialists yet, and this is a requirement for our current university positions. In addition, these young scientists would often have difficulties in competition with older colleagues due to their limited additional scientific skills, teaching portfolio and clinical competences. Currently, clinicians rarely do postdocs or other types of full-time research after their PhD degree. Part-time employments in research for clinicians are sparse, but very attractive. These part-time employments depend on external funding and acceptance from the head of the hospital department, but the positions are typically without a university affiliation. Some of these barriers for early university affiliation are expected to be overcome with the proposed new academic position as a clinical assistant professor (see below).

In general, the clinical training of physicians includes well-defined career paths leading to specialist level and consultant employment. Such career paths are less well defined in the university part of academic careers for clinical employees. In an ideal world, the university-related career path for clinicians would include: PhD, postdoc, (clinical assistant professor), clinical associate professor/clinical research associate professor (KFL positions) and finally clinical professor. Most clinical tenured professors are appointed with a previous university appointment. However, the majority of fixed-term clinical professors are appointed without a previous IKM appointment. This obvious weakness is expected to be curtailed in the future due to the establishment of the clinical assistant professor position (see below).

There is a lack of university appointment possibilities between the PhD level and the associate professor level. Currently the university and the regions are collaborating on establishing a new academic position – the clinical assistant professor¹⁶. This position should be linked to the clinical specialist training programme, where the standard five-year programme would be prolonged by one year to allow for 20%

research time, to be distributed in agreement with the hospital department. Young specialists who did not enter the programme during their specialist training should be able to get dispensation to enter the programme later in their career.

This initiative is highly appreciated among our staff, and is anticipated to recruit the best young clinicians for research and thus strengthen clinical research in general. The barriers for such a new position category would be financial (i.e. funding of the additional one year of the training programme) and societal considerations (i.e. the candidates will be one year older when they reach specialist level). Due to a relative lack of specialist doctors in some specialities and parts of Denmark, an additional research year will give a shorter specialist work-life and hence contribute to a reduced number of specialist doctors. However, the benefits from an earlier and structured connection to the university out-balance the described challenges.

Professorships

Typically a hospital or a hospital department contacts IKM with a proposal to establish a new externally financed fixed-term professorship. The establishment of an externally financed fixed-term professorship requires that the representing and coordinating professors have approved the academic content of the position and that the hospital/hospital department has approved the financing. The initialisation document must be signed by the hospital director, the Regional Head of Research and the head of IKM before the advertisement for the professorship is put into process by the Dean.

A tenured professorship is a very attractive position because it is a permanent employment and represents the leading academic position within the speciality. For the strongest specialities, these positions have a high number of applicants, including international applicants. However, in other specialities there has only been one applicant.

16. Klinisk adjunkt.

In rare cases, a professor can be “called for” a position¹⁷, indicating that the position is not advertised before the appointment. This praxis is primarily used when a strong candidate is wanted for a given position for strategic reasons.

Overall, it is the impression in IKM that the total number of applicants for a given position has increased after the introduction of the search committees, as has the number of international applicants. Despite the increasing number of international applicants, we have not been very successful in hiring international staff members. A large proportion of international applicants get second thoughts due to family reasons, or they use an appointment at University of

Copenhagen to promote the establishment of a professorship at their home university. Financial aspects (i.e. funding for the professorship honorarium and the half-time secretary) and willingness of the hospital head of department to pay the full consultancy salary and only get 50% clinical value are major obstacles for the establishment of professorships. Often, the local candidate has established the funding for the professorship, but since it has to be an open process, the hospital department has to take the financial risk of announcing a new consultancy position, as it is not certain that the local candidate will be offered the position. Alternative recruitment strategies could potentially be implemented – such as appointment without advertisement of the

2014-2016		Clinical professorships (tenured)	Clinical professorships (fixed-term)
Positions filled by	Male	7	35
	Female	4	9
Total		11	44
Number of applicants	Male	25	41
	Female	5	5
Total		30	46
Positions filled by internal IKM candidate		11	13
Positions filled by Danish candidate		11	39
Positions filled by international candidate		0	5
Positions filled by Danish candidate from same hospital		7	37
Positions filled without advertisement		1	3

Table 4. Data from professorships advertised in 2014-2016.

17. Clause 7 in the Appointment Order.

position¹⁸ to hire the local candidate that already has funding. In addition, 'calling'¹⁹ or appointment with reappointment for up to one year²⁰ could be considered. However, we have prioritized that professorships should in general be advertised and filled in an open process. The clinical part of the job means that language is a potential barrier when hiring international candidates.

The data in table 4 shows that the relative number of applicants for tenured professorships is higher (2.7 applicants per position), whereas it is lower for the fixed-term professorships (1.0 applicant per position). All tenured professorships were filled with a Danish candidate, and all appointed candidates had an existing employment at IKM. For fixed-term professorships, we are doing better concerning international recruitment, since 11% (5 of 44 positions) were filled with an international candidate, whereas only 30% (13 of 44 positions) had an existing IKM employment. With respect to the tenured professorships, there is a high tendency for recruitment from outside the local hospital (8 of 11 positions), whereas for the fixed-term professorships, a local applicant is likely to be appointed (35 of 44 positions). In the present context, international is defined as recruitment from an international institution abroad and not by citizenship of the applicant (i.e. we have employees from other countries who have worked in Denmark for many years prior to an application, and these are considered Danish). It should be noted that the period 2014-2016 covers the period in which the search committees were launched.

Clinical research associate professors (KFL positions)

KFL positions are fixed-term (usually five years) with a 50% research and 50% clinical work distribution. In 2013, SUND and the Capital

Region of Denmark launched a plan to establish clinical research associate professorships at all hospitals in the region, with a gradually increasing number to a total of 50 positions. The positions were allocated to the respective hospitals according to a regional allocation key. At each advertisement round, all applications are rated by the group of coordinating professors in the Capital Region of Denmark. This evaluation process has received positive feedback from the research environments and the hospitals. The geographical distribution of these attractive positions has been defined by a wish to support research environments in all hospitals; not only at the strongest hospitals. The flipside of the evaluation process is that only internal applicants can be recruited, and unfortunately this eliminates applicants from other regions and is an obstacle to internationalisation. Before an application can be submitted, the head of the hospital department has to accept that a given applicant can apply. Therefore, the head of the hospital department is actually a potential gate-keeper for an application, and this may seem reasonable since he/she has to approve and finance that the applicant can use 50% of the time on research. Accordingly, the hospital department has the largest financial burden related to these positions. The Capital Region of Denmark currently has 49 clinical research associate professors. Region Zealand currently has 15 clinical research associate professors, and a number of positions are planned over the coming years. For strategic reasons, a limited number of these KFL positions could be allocated to support weaker research environments by appointments without advertisement²¹, however this approach would interfere with the principle of free competition. Similar positions with 50:50 distribution of clinical work:research (shared positions)²² exist at some of the larger hospitals financed by the hospitals but without a university affiliation.

18. Clause 8 in the Appointment Order.

19. Clause 7 in the Appointment Order.

20. Clause 9 in the Appointment Order.

21. Clause 8 in the Appointment Order.

22. Delestillinger.

Clinical associate professors

These positions are primarily based on the need for teaching of students. The requirements for the applicants are: medical specialist degree (board certified), an academic degree (PhD or DMSc²³), active researcher (at least one peer-reviewed publication within the last three years) and documented teaching qualifications.

PhD students

The Graduate School of Health and Medical Sciences has approximately 1600 PhD students enrolled, more than 700 of these are associated with IKM via their principal supervisor. The gender ratio is 34% men and 66% women. This ratio is the opposite of the gender ratio for IKM staff, which is 35% women and 65% men. A total of 12% (88 of 742) of our PhD students are international students, which is lower than the 26% overall at the Graduate School²⁴. This lower proportion is probably related to the language requirement that comes with a position as a PhD student working with patients in a clinical environment. Furthermore, only a minority of the PhD positions are advertised at the University's Job Portal or even internationally, as most of the clinical PhD students are recruited and employed from the hospitals. Most PhD candidates are recruited locally by a senior researcher, who takes on the position as principal supervisor for the project. The candidate has usually shown promise as a future researcher during smaller scientific projects, such as a Bachelor or a Master's thesis. This process ensures, on the one hand, a fruitful relationship with someone who is already introduced to the scientific field, but, on the other hand, may exclude even more talented candidates from applying. A more open process with advertised positions as PhD candidates might increase the talent mass but will require a different funding structure, which ensures more complete funding

FACTS PHD STUDENTS

- PhD students with IKM supervisors: 742
- Gender distribution: 34% men and 66% women
- Employee/PhD student ratio 1.1 (range across specialities: 0.2-2.1)
- 1/3 of PhD students has had a change of research environment in or outside of Denmark

in advance, at least for the candidate's salary. The production of PhDs in medicine has increased over the recent years and is at a level comparable to our neighbouring countries (Germany, Sweden, Norway). A recent national analysis of PhD production in medicine concluded that the PhD education is of significant value, both for the candidates and for the recruiting authorities²⁵.

All 34 specialities have PhD students enrolled. However, the number of students per speciality varies between 1 and 69, partly reflecting the variation in the number of potential supervisors in each speciality (figure 6). In specialities such as anaesthesiology, surgery, internal medicine: respiratory medicine and internal medicine: haematology, there is an approximately balanced gender ratio among PhD students, whereas in most other specialities there is a female predominance.

The majority of PhD students are externally funded, since SUND in general does not offer PhD scholarships. PhD supervision and course activity will be described in a later section.

23. Abbreviation for Doctor of Medical Sciences, which is the highest obtainable academic degree in Denmark (above the PhD degree). The degree is typically based on 5-8 original research papers and the original research must have given a significant contribution to science. In contrast to the PhD degree, the DMSc degree is not an education programme (i.e. no requirement of formal courses) but merely a degree. See <http://healthsciences.ku.dk/research/doctoral-degree-ku/guidelines/ministerialorderondoctoraldegrees.pdf>.

24. Based on nationality.

25. <http://ufm.dk/publikationer/2017/undersogelse-af-den-laegevidenskabelige-ph-d-uddannelse>

Figure 6: Number and gender of PhD students

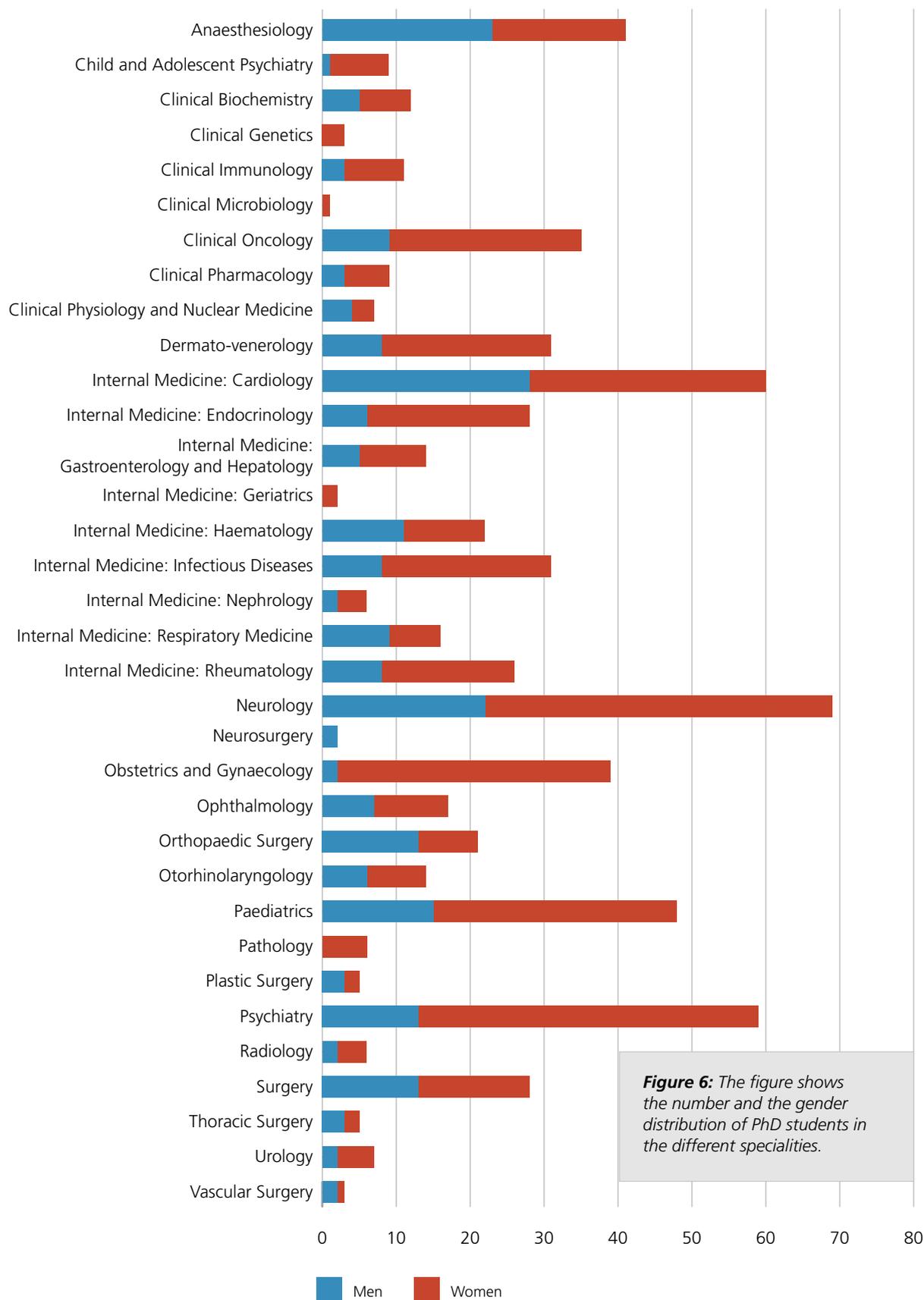


Figure 6: The figure shows the number and the gender distribution of PhD students in the different specialities.

SPECIALITIES AT THE DEPARTMENT

On the following pages the individual 34 specialities of IKM are described in more details according to the template handed out for this purpose.

Anaesthesiology	Neurology
Child and Adolescent Psychiatry	Neurosurgery
Clinical Biochemistry	Obstetrics and Gynaecology
Clinical Genetics	Ophthalmology
Clinical Immunology	Orthopaedic Surgery
Clinical Microbiology	Otorhinolaryngology
Clinical Oncology	Paediatrics
Clinical Pharmacology	Pathology
Clinical Physiology and Nuclear Medicine	Plastic Surgery
Dermato-venerology	Psychiatry
Internal Medicine: Cardiology	Radiology
Internal Medicine: Endocrinology	Surgery
Internal Medicine: Gastroenterology and Hepatology	Thoracic Surgery
Internal Medicine: Geriatrics	Urology
Internal Medicine: Haematology	Vascular Surgery
Internal Medicine: Infectious Diseases	
Internal Medicine: Nephrology	
Internal Medicine: Respiratory Medicine	
Internal Medicine: Rheumatology	

ANAESTHESIOLOGY

REPRESENTING PROFESSOR: LARS RASMUSSEN

DESCRIPTION OF THE SPECIALITY

The speciality consists of four pillars:

- Perioperative management of the surgical patient (clinical anaesthesia)
- Intensive care medicine
- Pain treatment
- Critical emergency medicine

In addition, anaesthesiologists are involved in special units such as the hyperbaric unit, the poison information service, medical simulation and the centre for evidence based medicine. The research topics within these areas are summarized below.

In clinical anaesthesia, numerous interventions are used but the evidence is rather limited and adverse effects are a concern. Strategies for managing the airway is therefore an important topic with focus on prediction of difficulties, optimal choice of airway devices and airway pharmacology. Ventilation during anaesthesia can be done in numerous ways, and oxygen fraction seems to have an impact on postoperative cardiovascular and pulmonary complications. Clinical studies are therefore conducted to assess ventilation and other aspects of perioperative care. Critical incidents and non-technical skills are studied in the medical simulation centre.

In paediatric anaesthesia, there are ongoing investigations in pharmacokinetics, safety and efficacy for well-known drugs.

In the early phase after surgery, studies are assessing the use of clonidine vs pethidine to patients with uncontrolled peri and postoperative shivering, as well as possible benefits of adjuvants in regional anaesthesia. Fast-track rehabilitation programmes have been introduced for surgical patients with optimization and standardization of fluid therapy, transfusion, and nutrition. Current

studies are carried out to examine pathways in emergency surgery, the impact of analgesia and perioperative hemodynamic optimization.

In late recovery, cognitive dysfunction is a significant problem, especially for elderly surgical patients, and several studies are elucidating the pathophysiology, incidence and risk factors.

Intensive care medicine: Some of the most challenging patients are those undergoing emergency abdominal surgery and those with sepsis. Several studies are conducted to optimize management of these patients. In trauma and critical illness, studies are carried out to improve neuromonitoring and the assessment of brain injury pathophysiology.

Interventions for intensive care unit-acquired delirium are also assessed, such as antipsychotics.

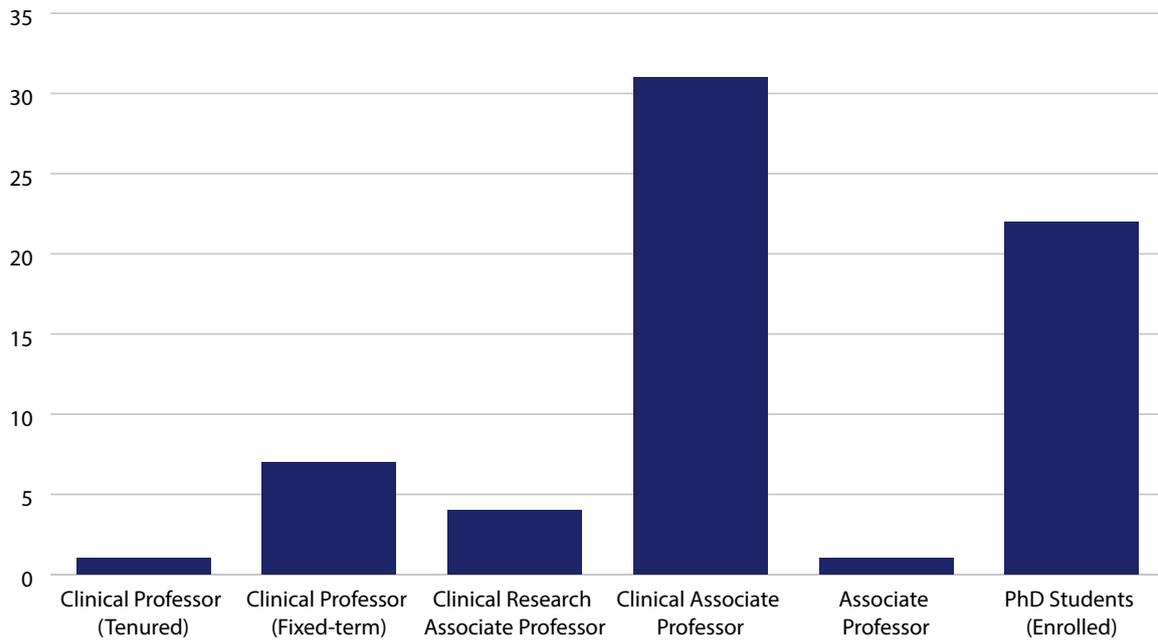
Follow up after intensive care treatment has now been initiated, addressing cognitive, physical and mental status.

Pain treatment and pathophysiology: A research programme has been designed to create an evidence-based foundation for which and how many analgesics, which can be combined within multimodal or balanced postoperative analgesia, including gabapentin or pregabalin and procedure-specific issues. In children, drug formulations and pain-relieving nasal spray are assessed.

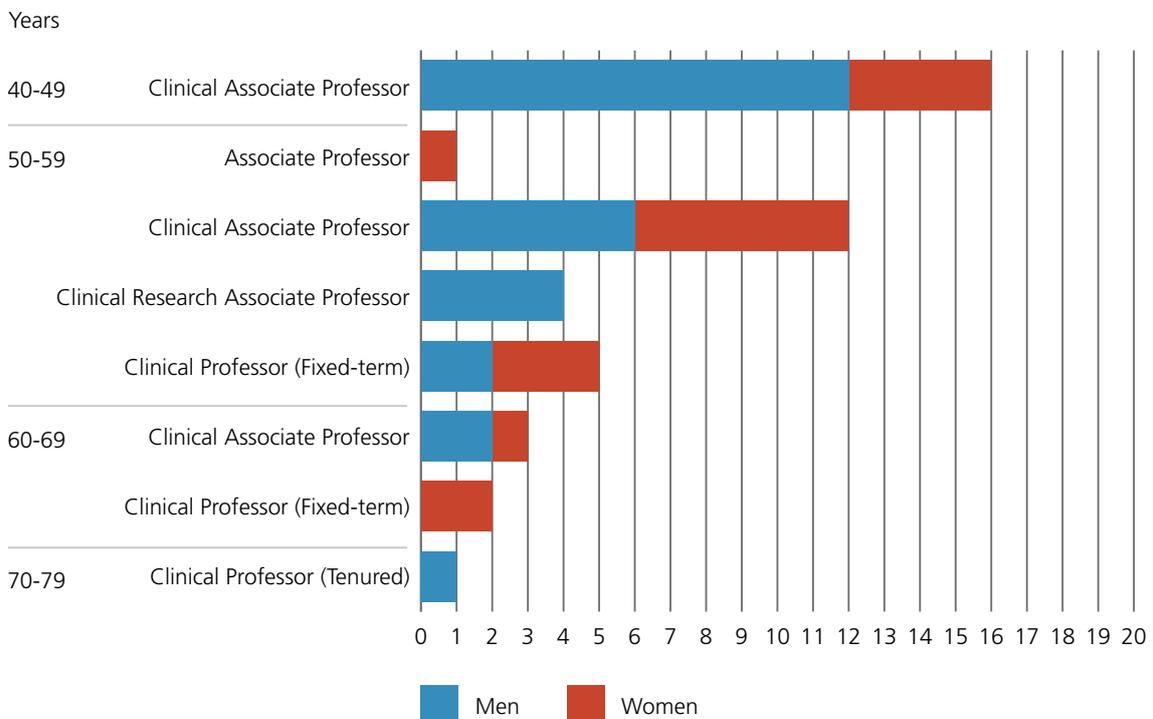
Prehospital and emergency medicine: Research topics in this field include toxicology in acute poisoning, resuscitation, management of the airway and cervical spine in trauma patients, critical bleeding and coagulopathy and replacement of blood loss.

Others: Research in research methodology and hyperbaric medicine with focus on necrotizing soft tissue infections, carbon monoxide poisoning, cyanide poisoning, stroke and diabetic foot ulcers.

Academic Staff in Anaesthesiology – Headcount



Academic Staff in Anaesthesiology – Age and gender distribution





Scientific Production

Anaesthesiology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	142	4.5	146	5.3	166	3.8
Review papers - International	1	6.1				
Letters - International	2	48.6	3	5.0	2	2.1
Original scientific research papers - Danish	7	0.1	3	0.1	4	0.1
Total	152	4.9	152	5.2	172	3.8

3 most prominent publications from 2016

1. Jæger P, Grevstad U, Koscielniak-Nielsen ZJ, Sauter AR, Sørensen JK, Dahl JB. Does dexamethasone have a perineural mechanism of action? A paired, blinded, randomized, controlled study in healthy volunteers. *Br J Anaesth* 2016;117:635-41.
 2. Rygård SL, Holst LB, Wetterslev J, Winkel P, Johansson PI, Wernerman J, Guttormsen AB, Karlsson S, Perner A, TRISS Trial Group, Scandinavian Critical Care Trials Group. Long-term outcomes in patients with septic shock transfused at a lower versus a higher haemoglobin threshold: the TRISS randomised, multicentre clinical trial. *Intensive Care Med* 2016;42:1685-94.
 3. Hjortrup PB, Haase N, Bundgaard H, Thomsen SL, Winding R, Pettilä V, Aaen A, Lodahl D, Berthelsen RE, Christensen H, Madsen MB, Winkel P, Wetterslev J, Perner A, CLASSIC Trial Group, Scandinavian Critical Care Trials Group. Restricting volumes of resuscitation fluid in adults with septic shock after initial management: the CLASSIC randomised, parallel-group, multicentre feasibility trial. *Intensive Care Med* 2016;42:1695-1705.
-

CHILD AND ADOLESCENT PSYCHIATRY

REPRESENTING ASSOCIATE PROFESSOR: ANNE KATRINE PAGSBERG

DESCRIPTION OF THE SPECIALITY

We aim to improve child and adolescent mental health by developing more effective identification, prevention and treatment approaches based on the multi-disciplinary and collaborative scientific study of causal processes underlying the development of disorder using cutting edge methods and testing contemporary theories. This approach requires a strong connection between research and evidence based assessment and treatment for the benefit of patients and their families.

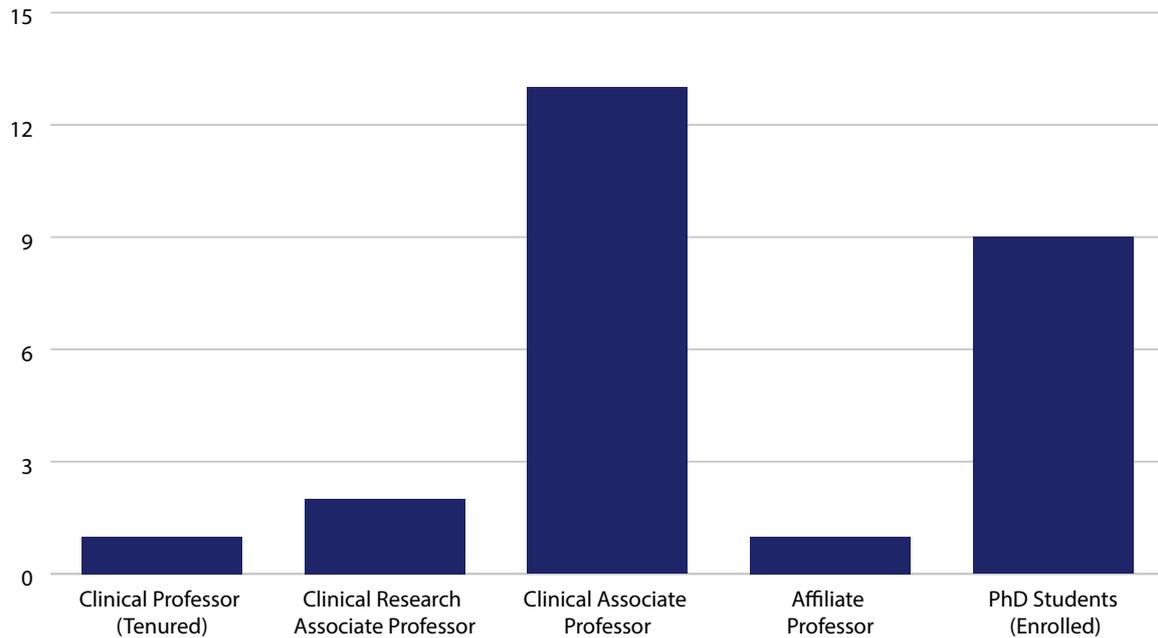
One of the main goals is to offer an increasing number of children and adolescent seen and treated in our services participation in research projects and thereby help to generating new evidence for the future.

The existing research environment in child and adolescent psychiatry is able to create research in close collaboration with other groups, which can focus on current questions in the field and tackle challenges and obstacles such as recruitment of representative samples.

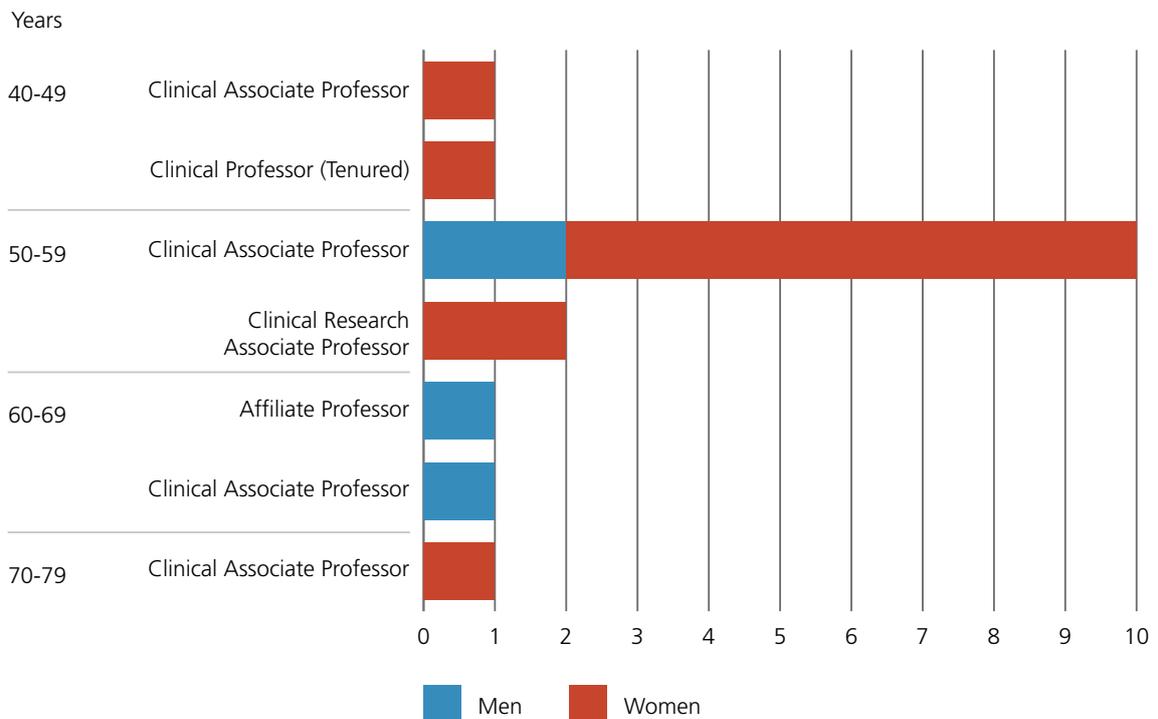
We primarily focus on three main areas of research:

- Epidemiology: studies that explore protective factors, risk factors and processes related to the development of mental health problems and disorders in children and adolescents.
- Dimensionel neuropsychiatry: studies that measure clinical, neuropsychological and neurobiological dimensions closer to the underlying biology than the relatively distal clinical syndromes in populations at risk or in populations with manifest mental disorders.
- Interventions: studies that focus on preventive strategies that target important areas of function in children with specific vulnerabilities, as well as programmes offering treatment to individual children showing signs of mental health problems, however without filling criteria for a diagnosis. Moreover, studies of effectiveness and of adverse effects in several clinical treatment approaches.

Academic Staff in Child and Adolescent Psychiatry – Headcount



Academic Staff in Child and Adolescent Psychiatry – Age and gender distribution



STRENGTHS

- Collegial, ambitious and hardworking researchers with team-based working atmosphere
- Talented senior researchers have become leaders of own independent projects
- Strong synergies and areas of common focus across projects
- Strong, facilitative, open-minded and results-focused leadership with research leadership training
- Good infrastructure and administrative support.
- High quality PhD students
- Significant multidisciplinary collaborations with other groups within the University and other universities in Denmark
- Monopoly on child psychiatry research in the capital region
- An unusually good relationship with adult psychiatry

WEAKNESSES

- Too diversified and losing focus responding to external pressure/priorities (threat) given small group
- Too small to cover required fields.
- Lack intermediate level researchers (i.e. postdocs)
- Lack of statistical support and IT support
- Little integration into European research networks
- Lack of implementation of common/standardised assessment protocols within clinics
- Insufficient external funding. Lack of strategic approach to grants
- Just one professor – too many committees etc. (opportunity delegation)
- Not as independent financially as could be

SWOT

OPPORTUNITIES

- Building specific relationships to establish national and international networks
- Very good funding sources
- External visitors to guide and stimulate the groups.
- Good quality studies that can be published in high impact journals
- Available high quality PhD students who could become postdocs
- Management support for developing a strategic cooperation between researchers and clinicians.
- Opportunity to increase collaboration with imaging and psychology
- Recruitment of patients from private practice.
- National registries as recruitment source and the basis for longitudinal studies
- To increase the number of international collaborations
- Create a more distinctive theme for research (i.e. branding)

THREATS

- The potential pressures due to need for undertaking outreach/education in clinics that will distract from other core tasks with very few senior researchers and a huge clinic with 620 employees
- Change of internal financial strategy
- Inappropriate centralised planning of research priorities
- The lack of research specific IT support
- Long waiting time for approval of use and storage of data

Scientific Production

Child and Adolescent Psychiatry	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	14	3.7	21	4.2	19	4.2
Original scientific research papers - Danish	2	0.1			2	0.1
Total	16	3.2	21	4.2	21	3.8

3 most prominent publications from 2016

1. Burton BK, Hjorthøj C, Jepsen JR, Thorup A, Nordentoft M, Plessen KJ. Research review: Do motor deficits during development represent an endophenotype for schizophrenia? A meta-analysis. *J Child Psychol Psychiatry* 2016;57:446-56.
2. Meier SM, Mattheisen M, Mors O, Schendel DE, Mortensen PB, Plessen KJ. Mortality Among persons with obsessive-compulsive disorder in Denmark. *JAMA Psychiatry* 2016;73:268-74.
3. Rimvall MK, Clemmensen L, Munkholm A, Rask CU, Larsen JT, Skovgaard AM, Simons CJP, van Os J, Jeppesen P. Introducing the white noise task in childhood: associations between speech illusions and psychosis vulnerability. *Psychol Med* 2016;46:2731-40.

CLINICAL BIOCHEMISTRY

REPRESENTING PROFESSOR: BØRGE NORDESTGAARD

DESCRIPTION OF THE SPECIALITY

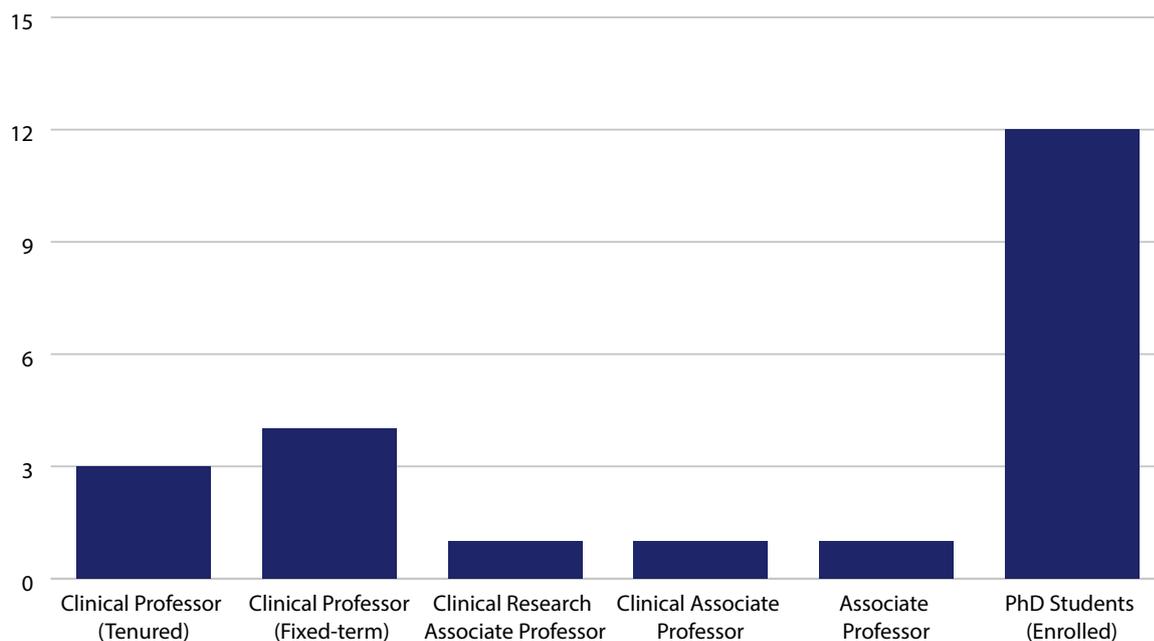
Clinical Biochemistry has research areas within all major groups of diseases, including cardiovascular disease, cancer, lung disease, infectious disease, gastrointestinal disease, neurological disease, endocrinology, gynaecology and obstetrics, etc.

Types of studies include human studies like epidemiology, Mendelian randomization studies, and randomized intervention trials, animal studies including transgenic models, cell studies and in vitro work. Research questions include understanding of disease pathogenesis,

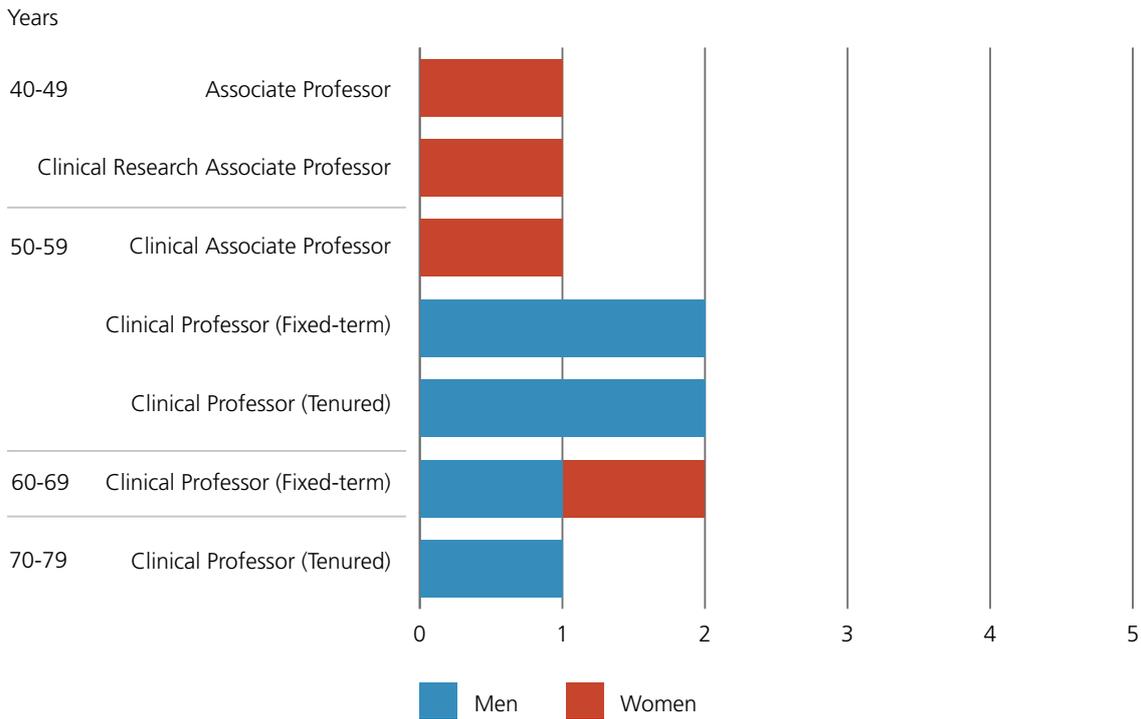
improved diagnostic tests, improved disease prevention and improved disease treatment.

In other words, as Clinical Biochemistry provides diagnostic tests to all medical specialities, the research within Clinical Biochemistry also covers the majority of medical fields and research methods. This also results in widespread collaboration with medical doctors and other researchers in essentially all medical fields as well as in all areas of basic research of relevance for human health and disease, nationally as well as internationally.

Academic Staff in Clinical Biochemistry – Headcount



Academic Staff in Clinical Biochemistry – Age and gender distribution



STRENGTHS

- Long research tradition
- Quality at high international level
- Both human and animal studies
- Routine production, teaching and research symbiosis

WEAKNESSES

- Relatively few researchers
- Many employees without research insight
- More and more focus on huge routine production

SWOT

OPPORTUNITIES

- Access to large-scale analyses of biochemistry and DNA analyses
- Extensive laboratory experience
- Extensive experience with large databases

THREATS

- Domination by routine production
- Difficult to recruit medical doctors into speciality
- 4-5-6 years rule for starting specialization for medical doctors
- Medical students have less access to research leave

Scientific Production

Clinical Biochemistry	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	92	10.4	110	8.7	142	8.0
Review papers - International	3				2	18.5
Original scientific research papers - Danish	3	0.1			1	0.1
Total	98	10.1	110	8.7	145	8.1

3 most prominent publications from 2016

1. Afzal S, Tybjærg-Hansen A, Jensen GB, Nordestgaard BG. Change in body mass index associated with lowest mortality in Denmark, 1976-2013. *JAMA* 2016;315:1989-96.
 2. Näslund-Koch C, Nordestgaard BG, Bojesen SE. Increased risk for other cancers in addition to breast cancer for CHEK2*1100delC heterozygotes estimated from the Copenhagen general population study. *J Clin Oncol* 2016;34:1208-16.
 3. Langsted A, Kamstrup PR, Benn M, Tybjærg-Hansen A, Nordestgaard BG. High lipoprotein(a) as a possible cause of clinical familial hypercholesterolaemia: a prospective cohort study. *Lancet Diabetes Endocrinol* 2016;4:577-87.
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CLINICAL GENETICS

REPRESENTING PROFESSOR: LISBETH TRANEBJÆRG

DESCRIPTION OF THE SPECIALITY

Research is carried out comprising clinical, basic and molecular research within a wide spectrum of genetic disorders. The aims are to identify new genes and genetic mechanisms and to characterize the spectrum of genetic causes in Denmark for a better correlation between underlying mutations and the associated phenotypes, in order to improve genetic counselling and for applying and developing advanced therapies.

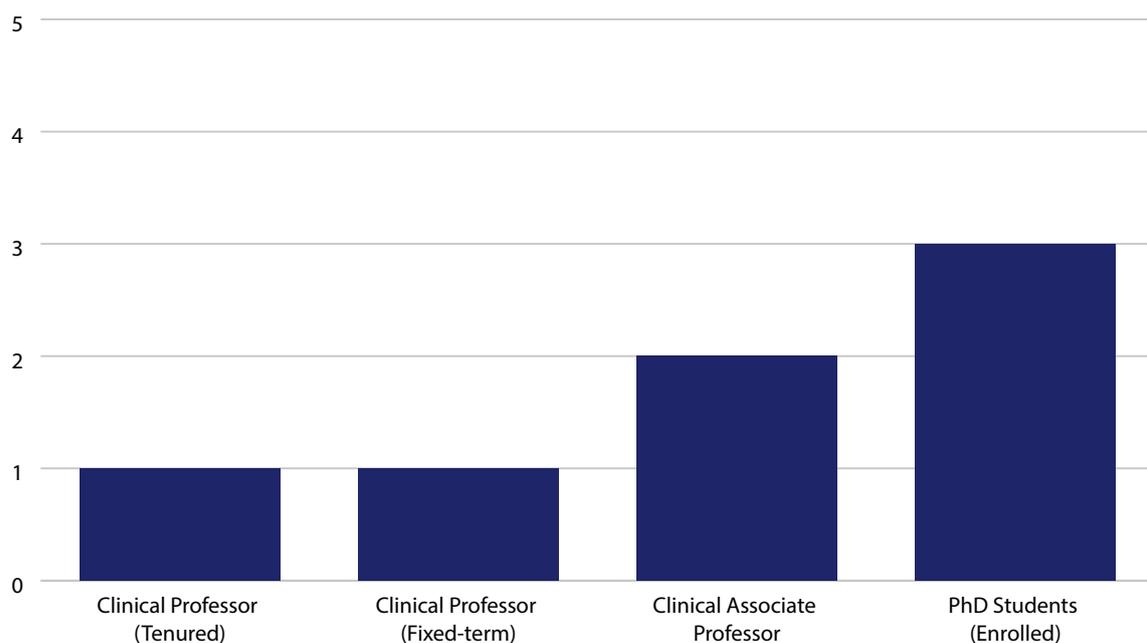
Examples of disorders include (but are not limited to):

- Cancer syndromes, somatic mutations and haematological malignancies
- Hereditary hearing impairment, visual impairment and deafblindness
- Imprinting disorders/epigenetics

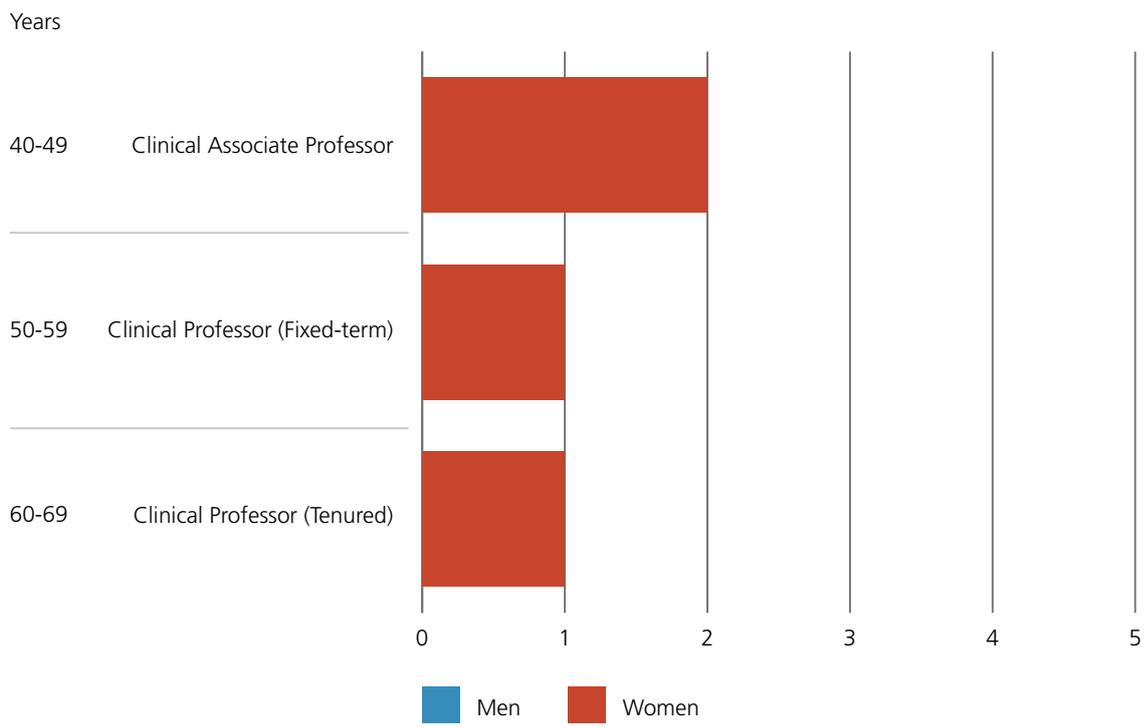
- Inborn errors of metabolism, including neonatal screening
- Neurodevelopmental and neuropsychiatric disorders, including intellectual disability and autism.
- Mitochondrial disorders
- Molecular genetics and cytogenetic, applying next generation sequencing methods on an increasing number of unresolved patient cases from all the above clinical disciplines and functional studies.

In all areas of research, researchers work in a number of extensive national, Nordic and international networks and collaborative groups.

Academic Staff in Clinical Genetics – Headcount



Academic Staff in Clinical Genetics – Age and gender distribution



STRENGTHS

- Access to a large number of patients within all research areas
- Established extensive collaborative international networks
- Broadness in research interest, both in clinical and basic research, among university affiliated researchers

WEAKNESSES

- Few tenured researchers with dedicated time to do research
- Several highly competent researchers are not affiliated with the University
- Lack of funding of research in rare disorders and small research groups

SWOT

OPPORTUNITIES

- Current advanced sequencing technologies opening the opportunities for major discoveries
- Closer collaboration between clinical and basic researchers, taking advantage of utilizing the large number of patients and advanced methods available
- High political expectations towards individualized precision medicine might open to improved funding of genomic research

THREATS

- Lack of centralized management of research
- Dual affiliation with hospital often leads to under prioritization of research
- National competition and lack of nationwide research projects

Scientific Production

Clinical Genetics	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	17	4.6	25	7.8	25	4.4
Original scientific research papers - Danish	8	0.1				
Total	25	2.8	25	7.8	25	4.4

3 most prominent publications from 2016

1. Tingaud-Sequeira A, Raldúa D, Lavie J, Mathieu G, Bordier M, Knoll-Gellida A, Rambeau P, Coupry I, André M, Malm E, Möller C, Andreasson S, Rendtorff ND, Tranebjærg L, Koenig M, Lacombe D, Goizet C, Babin PJ. Functional validation of ABHD12 mutations in the neurodegenerative disease PHARC. *Neurobiol Dis* 2016;98:36-51.
2. Bertelsen B, Stefánsson H, Riff Jensen L, Melchior L, Debes NMM, Groth C, Skov L, Werge T, Karagiannidis I, Tarnok Z, Barta C, Nagy P, Farkas L, Brøndum-Nielsen K, Rizzo R, Gulisano M, Rujescu D, Kiemeny LA, Tosato S, Nawaz MS, Ingason A, Unnsteinsdottir U, Steinberg S, Ludvigsson P, Stefansson K, Kuss AW, Paschou P, Cath D, Hoekstra PJ, Müller-Vahl K, Stuhmann M, Silaharoglu A, Pfundt R, Tümer Z. Association of AADAC deletion and Gilles de la Tourette syndrome in a large European cohort. *Biol Psychiatry* 2016;79:383-91.
3. Ng YS, Alston CL, Diodato D, Morris AA, Ulrick N, Kmoch S, Houštěk J, Martinelli D, Haghghi A, Atiq M, Gamero MA, Garcia-Martinez E, Kratochvílová H, Santra S, Brown RM, Brown GK, Ragge N, Monavari A, Pysden K, Ravn K, Casey JP, Khan A, Chakrapani A, Vassallo G, Simons C, McKeever K, O'Sullivan S, Childs AM, Østergaard E, Vanderver A, Goldstein A, Vogt J, Taylor RW, McFarland R. The clinical, biochemical and genetic features associated with RMND1-related mitochondrial disease. *J Med Genet* 2016;53:768-75.

CLINICAL IMMUNOLOGY

REPRESENTING PROFESSOR: PETER GARRED

DESCRIPTION OF THE SPECIALITY

The research in Clinical Immunology is focused on basic and translational studies to understand the genetic and functional mechanisms of immunological diseases. Our research ranges from patient-focused clinical research to molecular biological studies of immunological processes and testing of new technological equipment for diagnostics and treatment.

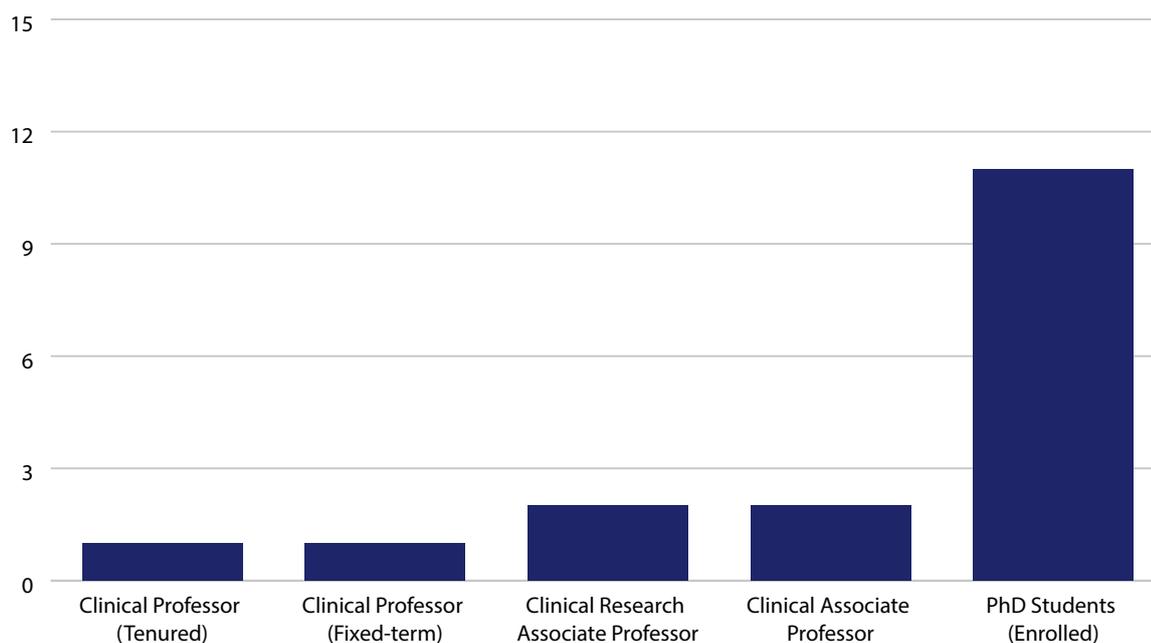
We perform epidemiological studies on biological material from large population and patient cohorts to unravel biomarkers that may be used to assess predisposition and outcome of disease. These studies are complemented by cell biology oriented research, gene expression and protein profiling to shed light on molecular

processes involved in the pathophysiology of immune diseases.

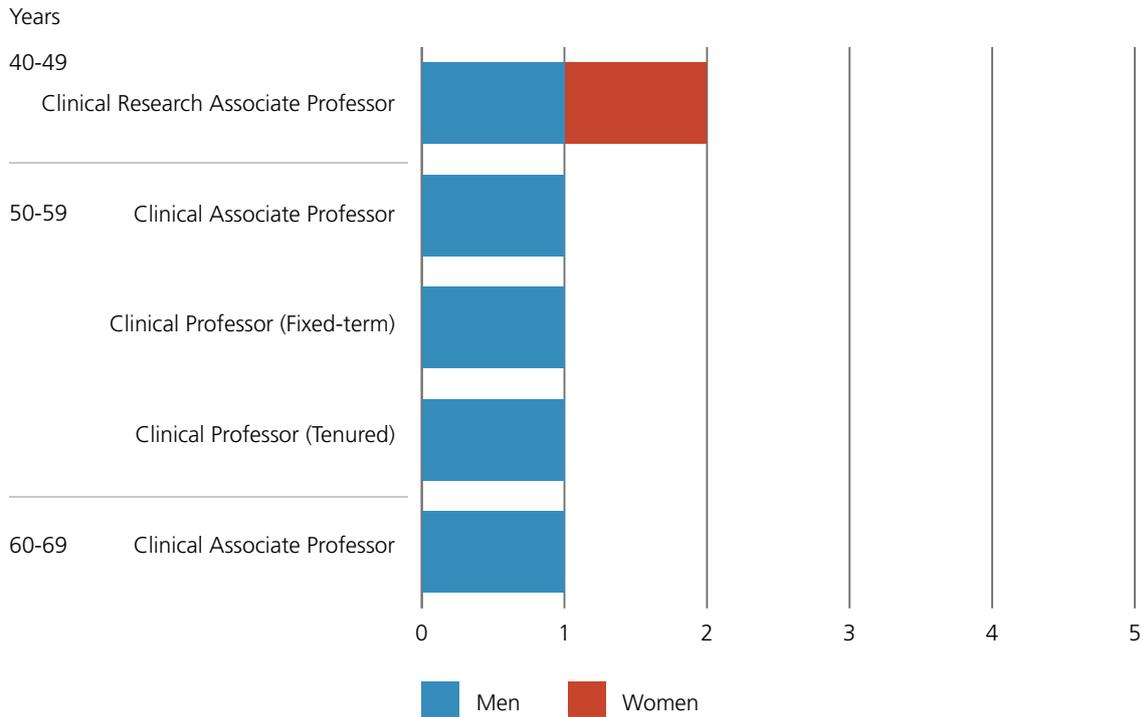
More specifically we focus our research on

- The structure and function of innate immunity with special focus on the complement system
- The role of cytokines and cytokine autoantibodies
- Foetomaternal immunology
- Blood donor health with special focus on iron metabolism
- Immune mechanisms contributing to acute critical illness and the interplay between haemostatic and immunological platelet function
- Genetic predisposition to immune diseases

Academic Staff in Clinical Immunology – Headcount



Academic Staff in Clinical Immunology – Age and gender distribution



STRENGTHS

- Availability and knowhow about advanced laboratory and diagnostic equipment
- Strong track record for translational research
- Interdisciplinarity

WEAKNESSES

- Limited access to patients and limited knowledge about clinical 'problems'
- Hampered that laboratories are spread at different locations
- No overall golden goal or strategy

SWOT

OPPORTUNITIES

- Collaboration
- New areas of research can easily be implemented
- Combining clinical work with research

THREATS

- Reduced access to advanced diagnostic equipment (common laboratories)
- Small groups, which cannot compete for funding

Scientific Production

Clinical Immunology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	46	4.5	69	4.1	54	4.1
Letters - International			2			
Original scientific research papers - Danish			1	0.1		
Total	46	4.5	72	4.0	54	4.1

3 most prominent publications from 2016

1. Vasan SK, Rostgaard K, Majeed A, Ullum H, Titlestad KE, Pedersen OB, Erikstrup C, Nielsen KR, Melbye M, Nyren O, Hjalgrim H, Edgren G. ABO Blood Group and Risk of Thromboembolic and Arterial Disease: A study of 1.5 million blood donors. *Circulation* 2016;133:1449-57.
 2. Edgren G, Hjalgrim H, Rostgaard K, Lambert P, Wikman A, Norda R, Titlestad KE, Erikstrup C, Ullum H, Melbye M, Busch MP, Nyren O. Transmission of neurodegenerative disorders through blood transfusion: A cohort study. *Ann Intern Med* 2016;165:316-24.
 3. Garred P, Genster N, Pilely K, Bayarri-Olmos R, Rosbjerg A, Ma YJ, Skjoedt MO. A journey through the lectin pathway of complement-MBL and beyond. *Immunol Rev* 2016; 274:74-97.
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CLINICAL MICROBIOLOGY

REPRESENTING PROFESSOR: HENRIK WESTH

DESCRIPTION OF THE SPECIALITY

At Rigshospitalet: two clinical professors

Helle Krogh Johansen, Clinical Professor of Clinical Microbiology with special focus on persistent airway infections. We focus on translational biomedical research using the bacterial lung infections in cystic fibrosis (CF) patients as our model system. Our research is directly addressing the globally increasing problem of antibiotic resistance. We have genome sequenced +750 *P. aeruginosa* isolates and our research platform is now used for diagnostic purposes in the routine laboratory. At present, we are transferring our genome knowledge from *P. aeruginosa* to other Gram-negative bacteria in CF such as *Achromobacter* and *Burkholderia*. Funding is from private foundations, the Capital Region of Denmark and Rigshospitalet.

Maiken Cavling Arendrup, Clinical Professor of Microbiology with special focus on medical mycology. The mycology research covers epidemiology and management of fungal infections, new and optimized diagnostics and mechanisms and drivers of emerging resistance, echinocandin resistance in *C. glabrata* and azole resistance in *A. fumigatus*, in particular. We evaluate efficacy and spectrum of new antifungal compounds with a national surveillance of fungal bloodstream infections and >5000 bloodstream fungal isolates stored and our role as EUCAST¹ development laboratory and the newly established collaboration between the Department of Clinical Microbiology at Rigshospitalet, the University of Copenhagen and the Statens Serum Institut knowhow and access to classical and new technology.

At Hvidovre Hospital: one clinical professor and a clinical research associate professor

Henrik Westh, clinical professor of Clinical Microbiology with special focus on MRSA epidemiology and evolution. We have built up an MRSA Knowledge Centre and a Next Generation Sequencing (NGS) Centre currently with major focus on MRSA and VRE. Funding is primarily from the Capital Region, and research is easily spun off from the huge datasets generated. We have sequenced more than 9,000 bacterial genomes and have implemented viral NGS and shotgun metagenomics. Funding is primarily from the Capital Region and private foundations.

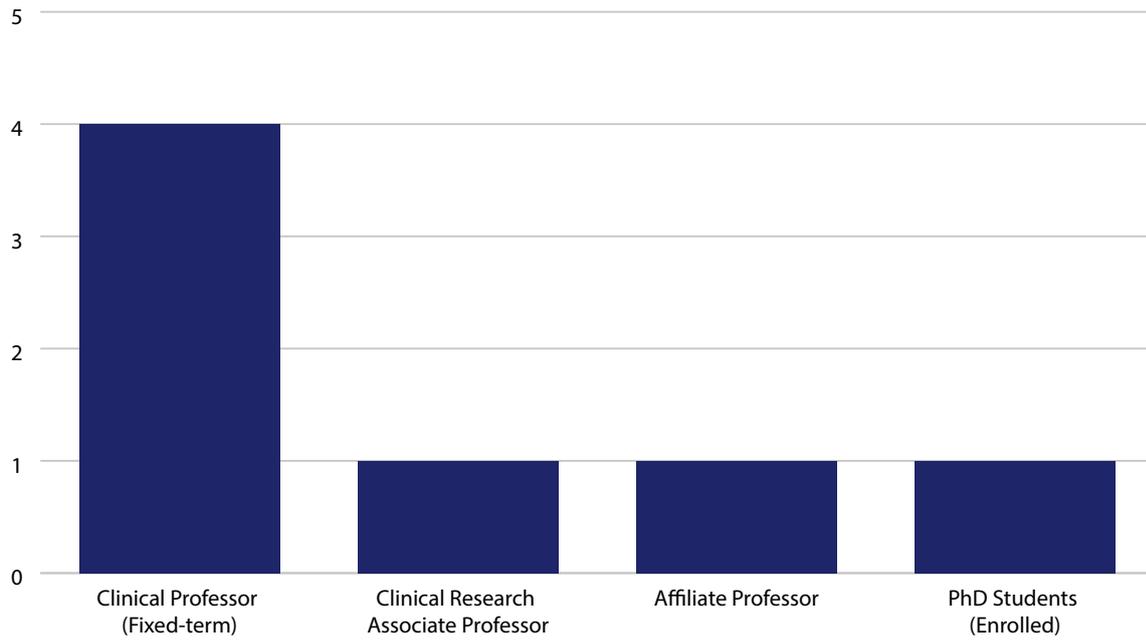
Kristian Schønning, Clinical Research Associate Professor of Clinical Microbiology. Current research areas include development and evaluation of diagnostic molecular assays, viral and bacterial pathogen typing with emphasis on antibiotic and antiviral resistance. The focus of the research is translational with the implementation of developed methods in diagnostic routine or application in clinical studies. Using NGS, we have sequenced 150 hepatitis C virus (HCV) genomes and the method is being used to study resistance associated HCV variants in virological failure and kinetic response direct-acting antiviral therapy.

At Slagelse Hospital

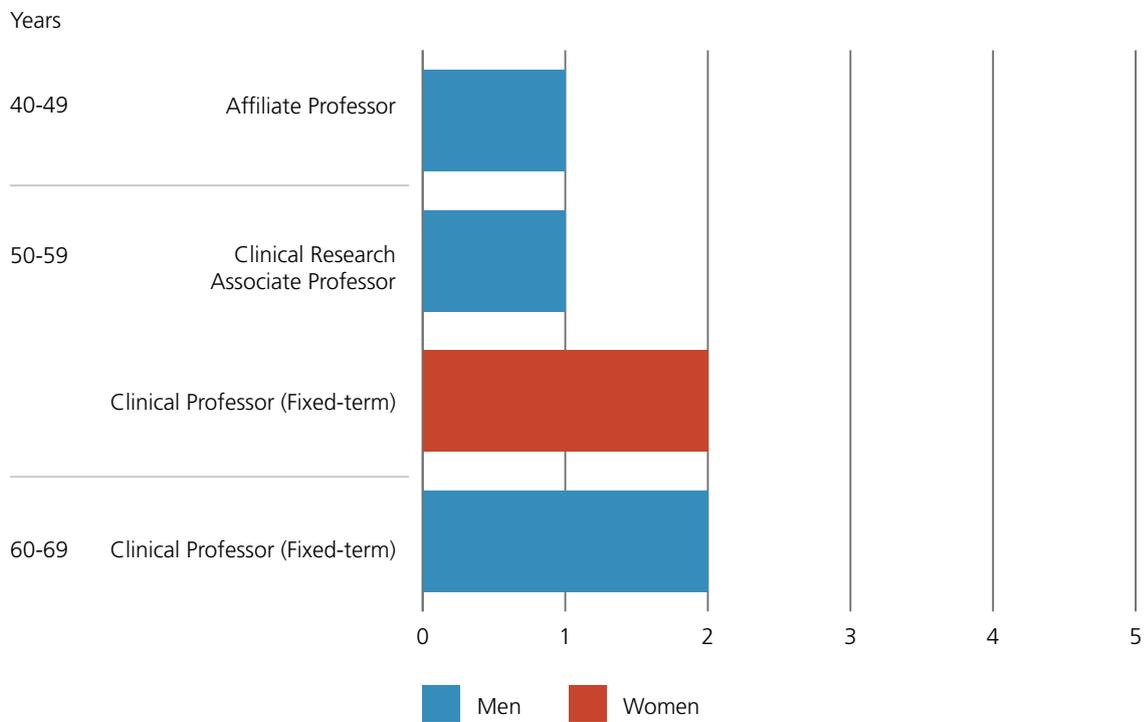
Jens Jørgen Christensen, Clinical Professor of Clinical Microbiology with special focus on applications of molecular methods. Special focus is on bacterial aetiologies of infective endocarditis and taxonomy/identification of bacteria, especially non-hemolytic streptococci

1. European Committee on Antimicrobial Susceptibility Testing.

Academic Staff in Clinical Microbiology – Headcount



Academic Staff in Clinical Microbiology – Age and gender distribution



and related genera. Whole genome sequencing applied on mitis group streptococci (*S. mitis*, *S. oralis*, *S. gordonii*, *S. sanguinis*) and aerococci (*A. urinae*, *A. sanguinicola*) and data have been/ are subjected to comprehensive bioinformatic examinations with focus on virulence factors.

The use of molecular methods rapidly increases for all specimen categories examined in the hospital department, extending the molecular competences generally. Funding is from Region Zealand and private foundations.

STRENGTHS

- Large departments with medical doctors, molecular biologists, engineers and bioinformaticians interacting on research
- All information from samples in common database and all samples from Region Zealand analysed in four laboratories. Easily combined with metadata records
- Strong collaborations with other Danish universities, Statens Serum Institut and international research groups

WEAKNESSES

- Research collaboration between clinical microbiology departments should be even better
- Lack of part-time research positions after PhD and few senior positions
- One laboratory does not have professor affiliation to University of Copenhagen

SWOT

OPPORTUNITIES

- Next generation sequencing capacity is built up in close collaboration between microbiology departments
- In-house analysis of more than 99.9% of all patient samples
- Well established international research collaborations

THREATS

- Hospital owners are looking to centralize what they see as common platforms (NGS equipment) into very few centres
- Recruitment of next generation of professors hampered by lack of research programmes and postdoc positions for younger researcher
- Lack of bioinformaticians that understand biology and genomes

Scientific Production

Clinical Microbiology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	24	4.6	27	5.2	27	5.4
Review papers - International					1	1.1
Letters - International	1		1			
Original scientific research papers - Danish	2	0.1			1	
Total	27	4.2	28	5.2	29	5.3

3 most prominent publications from 2016

1. Davies B, Turner KM, Frølund M, Ward H, May MT, Rasmussen S, Benfield T, Westh H, Danish Chlamydia Study Group. Risk of reproductive complications following chlamydia testing: a population-based retrospective cohort study in Denmark. *Lancet Infect Dis* 2016;16:1057-64.
 2. Sommer LM, Alanin MC, Marvig RL, Nielsen KG, Høiby N, von Buchwald C, Molin S, Johansen HK. Bacterial evolution in PCD and CF patients follows the same mutational steps. *Sci Rep* 2016;6:28732.
 3. Jensen RH, Hagen F, Astvad KM, Tyron A, Meis JF, Arendrup MC. Azole-resistant *Aspergillus fumigatus* in Denmark: a laboratory-based study on resistance mechanisms and genotypes. *Clin Microbiol Infect* 2016;22:570.e1-9.
-

CLINICAL ONCOLOGY

REPRESENTING PROFESSOR: DORTE NIELSEN

DESCRIPTION OF THE SPECIALITY

The hospital departments of Oncology at Rigshospitalet, Herlev and Gentofte Hospital and Zealand University Hospital are responsible for an extensive clinical cancer research comprising phase I, II and III trials in solid tumours.

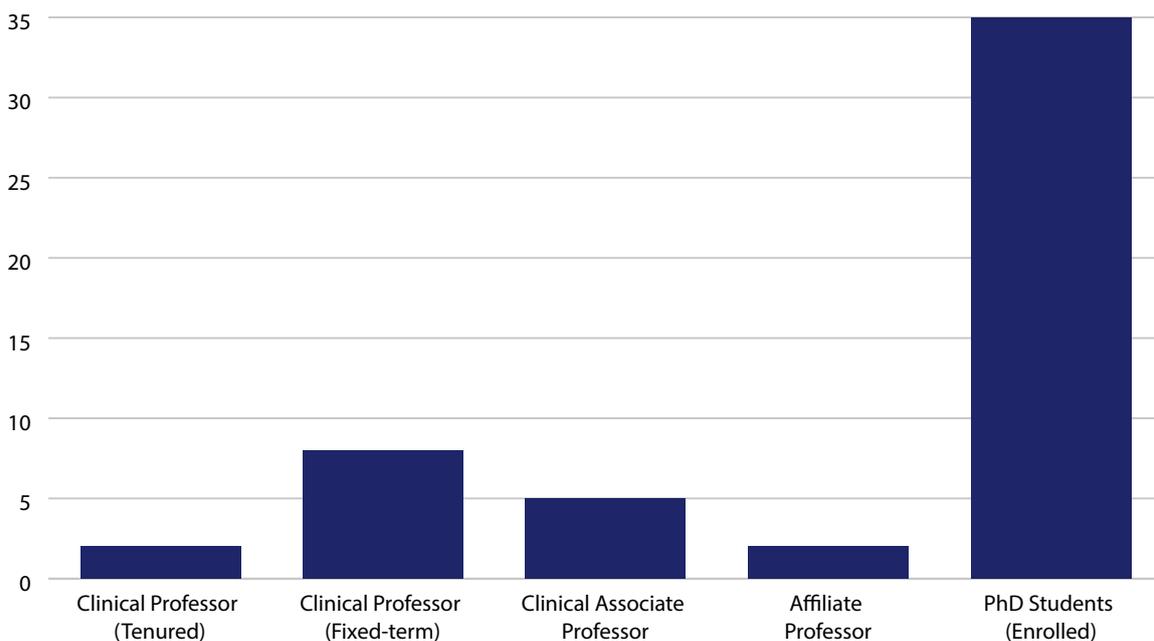
In total, the research units occupying research nurses, data managers and technicians run >100 ongoing clinical trials. The Phase One Unit, Rigshospitalet and Unit for Experimental Cancer Treatment, Herlev and Gentofte Hospital carries out a number of phase I trials, including first-in-human and early phase II trials. In addition, research laboratories responsible for both clinically related translational research and animal testing are attached to the hospital

departments. The main focus is translating basic scientific findings into clinical applications for treatment of cancer.

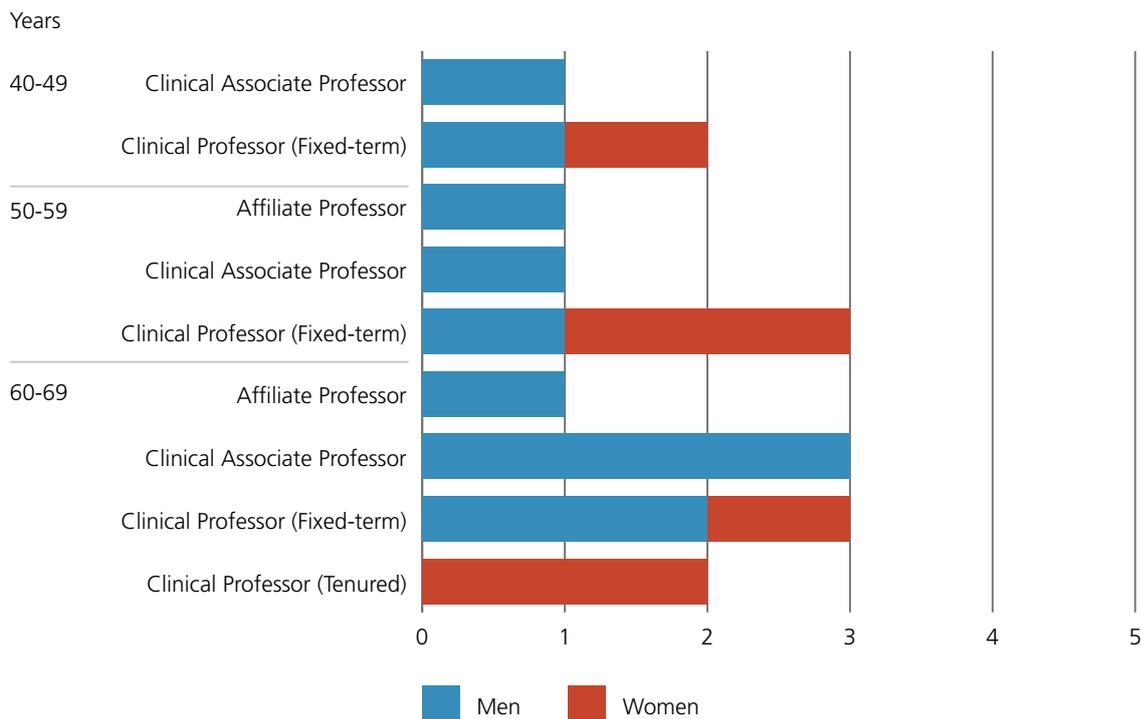
Our research interests are translational research, personalised medicine, preclinical and clinical immunotherapy, radiotherapy, gene therapy, clinical trials, palliative medicine and rehabilitation.

Networks: The hospital departments of oncology affiliated to the University of Copenhagen participate in a number of research assignments at regional, national and international levels.

Academic Staff in Clinical Oncology – Headcount



Academic Staff in Clinical Oncology – Age and gender distribution



STRENGTHS

- Long tradition for clinical research (> 25 years), large research units (> 25 employees at Rigshospitalet and Herlev-Gentofte Hospital, respectively)
- Established Multidisciplinary Cancer Groups within all tumour types
- National and international collaboration
- Danish Cancer Biobank
- Danish Cancer Registry

WEAKNESSES

- Few applicants for positions as physicians in the area
- Limited lectures for students (not an independent subject like e.g. cardiology)
- "Kræftpakkeforløb" = Limited time for evaluation and start of treatment given short time for screening and inclusion into clinical trials

SWOT

OPPORTUNITIES

- Establishment of new networks: NEXT, DCCC (Danish Comprehensive Cancer), NECT (Nordic Phase 1 Collaboration)
- Planned establishment of national research centre financed by Danish Cancer Society and the Danish regions: e.g. Center for Immunotherapy, Center for Long Term Side Effects

THREATS

- Increased demand for routine work
- A decreased number of clinical trials
- 15% of budget must be allocated to the region – we previously used our 'overhead' to finance investigator initiated trials

Scientific Production

Clinical Oncology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	102	6.3	120	5.7	120	5.5
Review papers - International			1			
Letters - International					1	2.7
Original scientific research papers - Danish	3	0.1	2	0.1	2	0.1
Total	105	6.1	123	5.7	123	5.3

3 most prominent publications from 2016

1. Mirza MR, Monk BJ, Herrstedt J, Oza AM, Mahner S, Redondo A, Fabbro M, Ledermann JA, Lorusso D, Vergote I, Ben-Baruch NE, Marth C, Mądry R, Christensen RD, Berek JS, Dørum A, Tinker AV, du Bois A, González-Martín A, Follana P, Benigno B, Rosenberg P, Gilbert L, Rimel BJ, Buscema J, Balser JP, Agarwal S, Matulonis UA, ENGOT-OV16/NOVA Investigators. Niraparib maintenance therapy in platinum-sensitive, recurrent ovarian cancer. *N Engl J Med* 2016;375:2154-64.
2. Rasmussen JH, Håkansson K, Vogelius IR, Aznar MC, Fischer BM, Friberg J, Loft A, Kristensen CA, Bentzen SM, Specht L. Phase I trial of 18F-Fludeoxyglucose based radiation dose painting with concomitant cisplatin in head and neck cancer. *Radiother Oncol* 2016;120:76-80.
3. Bentzen AK, Marquard AM, Lyngaa R, Saini SK, Ramskov S, Donia M, Such L, Furness AJ, McGranahan N, Rosenthal R, Straten PT, Szallasi Z, Svane IM, Swanton C7, Quezada SA, Jakobsen SN, Eklund AC, Hadrup SR. Large-scale detection of antigen-specific T cells using peptide-MHC-I multimers labeled with DNA barcodes. *Nat Biotechnol* 2016;34:1037-45.

CLINICAL PHARMACOLOGY

REPRESENTING PROFESSOR: HENRIK ENGHUSEN POULSEN

DESCRIPTION OF THE SPECIALITY

All IKM staff members in the clinical pharmacology group are scientifically active and presently there are seven active PhD studies initiated by the group members, plus a larger number of PhD students where the group members are co-supervisors.

The relatively small number of staff members has a constant and high number of international peer reviewed publications.

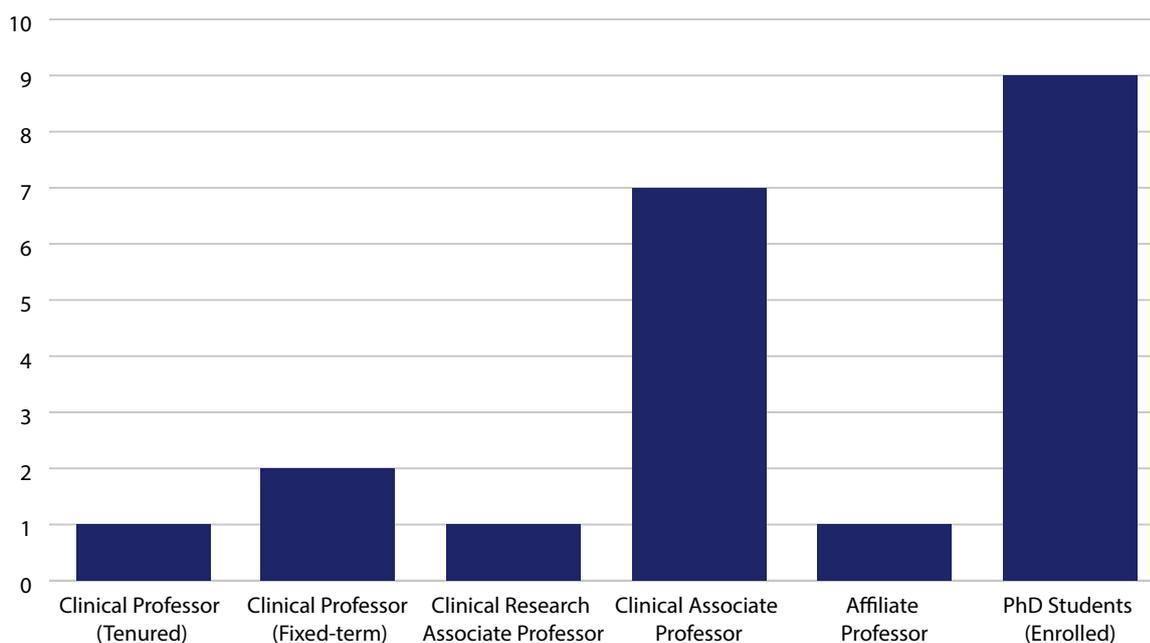
The research areas are wide ranging reflecting the broad spectrum of problems that clinical pharmacology face:

- Basic research on migraine
- Basic mechanisms in type 2 diabetes
- Novel drugs in type 2 diabetes

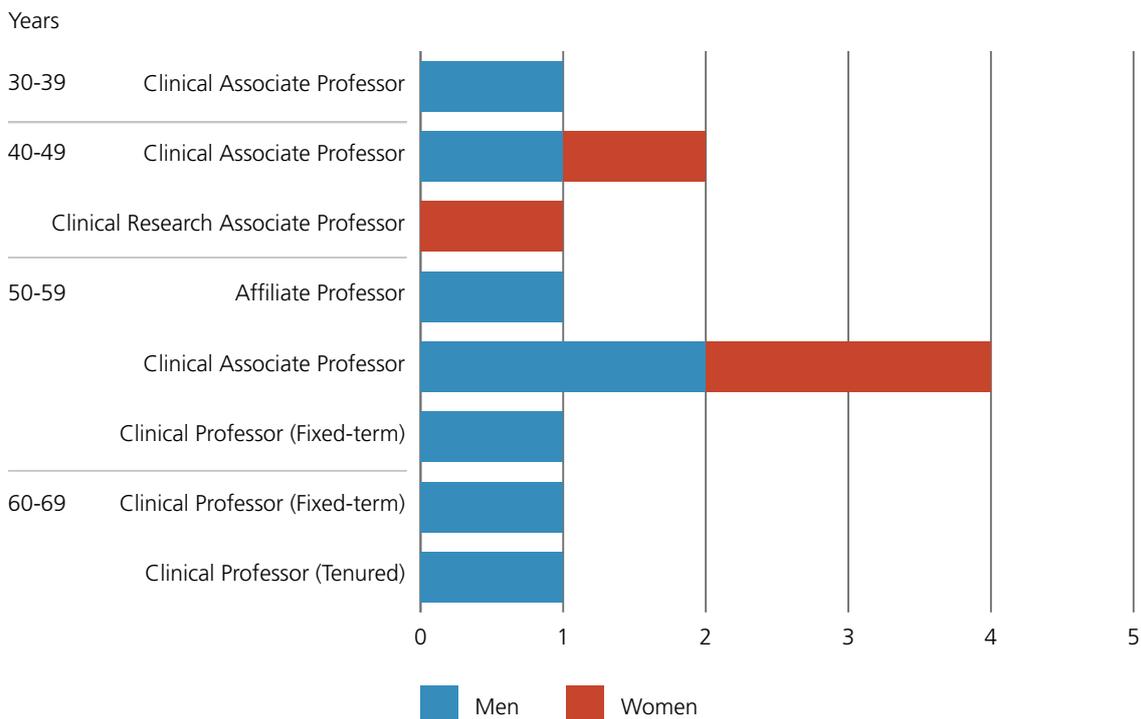
- Special problems in medications to children.
- Pharmacogenetics and pharmacodynamics of psychiatric drugs
- Safety of medications in pregnancy (epidemiological surveys of malformations)
- A number of areas in pharmacoepidemiology
- Studies using data-mining of patients records and in-hospital medications
- A number of nationwide toxicological aspects of drugs

The number of research partners is large and include partners in The Capital Region of Denmark, Region Zealand, other regions in Denmark and international partners.

Academic Staff in Clinical Pharmacology – Headcount



Academic Staff in Clinical Pharmacology – Age and gender distribution



STRENGTHS

- All staff members scientifically active
- High scientific activity
- Broad age range of the staff members

WEAKNESSES

- New speciality and relatively new organization structure
- Geographic separation on several locations
- Dilemma between production demands and science

SWOT

OPPORTUNITIES

- Many collaborators and opportunities for collaboration
- Organisation interest in medicine and public health issues
- Embedded phase I/II trial unit with useful facilities

THREATS

- Budgets cuts
- Broad range of topics with limited collaboration within the department
- General decline in science funding, difficulties in recruiting young MDs and students, because of the "fremdriftsreform" (limitation in time for research including sabbatical for research projects)

Scientific Production

Clinical Pharmacology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	47	3.8	44	3.9	55	3.5
Review papers - International			2		2	3.1
Letters - International			1			
Original scientific research papers - Danish	2	0.1	3	0.1		
Total	49	3.7	50	3.6	57	3.5

3 most prominent publications from 2016

1. Christensen M, Lundh A. Medication review in hospitalised patients to reduce morbidity and mortality. *Cochrane Database Syst Rev* 2016;2.
 2. Rasmussen ST, Andersen JT, Nielsen TK, Cejvanovic V, Petersen KM, Henriksen T, Weimann A, Lykkesfeldt J, Poulsen HE. Simvastatin and oxidative stress in humans: A randomized, double-blinded, placebo-controlled clinical trial. *Redox Biol* 2016;9:32-8.
 3. Penninga EI, Graudal N, Ladekarl MB, Jürgens G. Adverse events associated with flumazenil treatment for the management of suspected benzodiazepine intoxication--A systematic review with meta-analyses of randomised trials. *Basic Clin Pharmacol Toxicol* 2016;118:37-44.
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CLINICAL PHYSIOLOGY AND NUCLEAR MEDICINE

REPRESENTING PROFESSOR: SØREN MØLLER

DESCRIPTION OF THE SPECIALITY

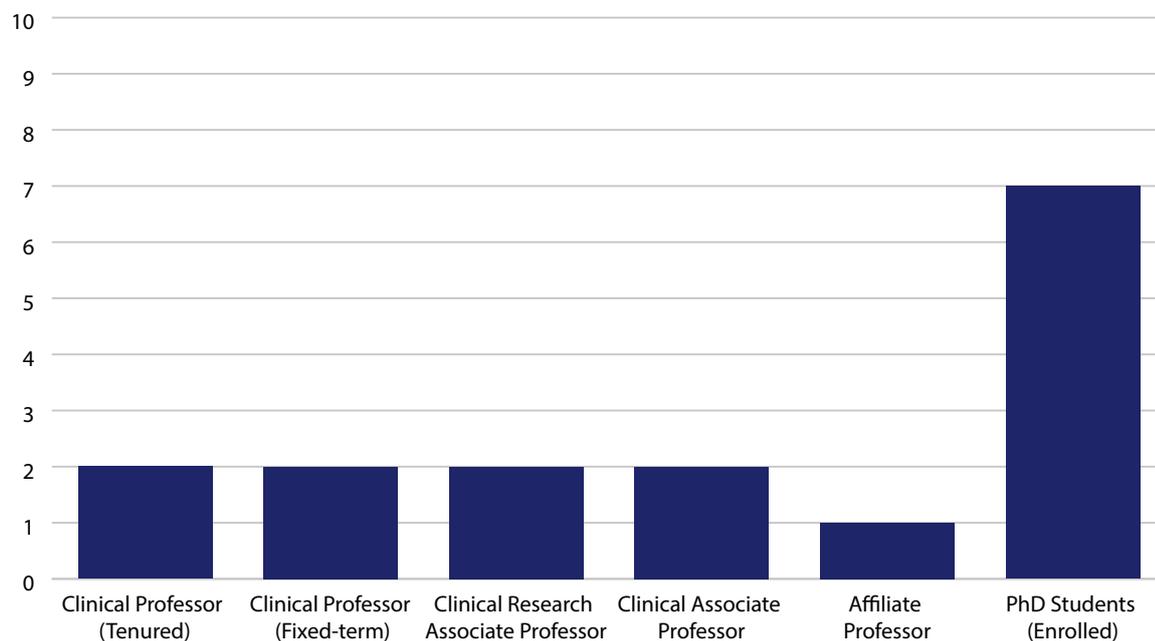
The speciality of Clinical Physiology and Nuclear Medicine (CPNM) offers relevant, patient friendly and contemporary studies of high quality. CPNM initiates and conducts scientific research at the highest international standard in cooperation with other hospital departments and research institutions nationally and internationally.

Main focus research areas are within the fields of pathophysiology of most organ systems using a broad spectrum of classical physiologic methods for functional and diagnostic imaging in addition to measurement of hemodynamics, pressure, flow, and clearance using tracer kinetic principles. Imaging techniques include gamma-camera scintigraphy and multimodal techniques such as single photon emission computerized tomography (SPECT/CT), positron emission tomography (PET/CT), magnetic resonance

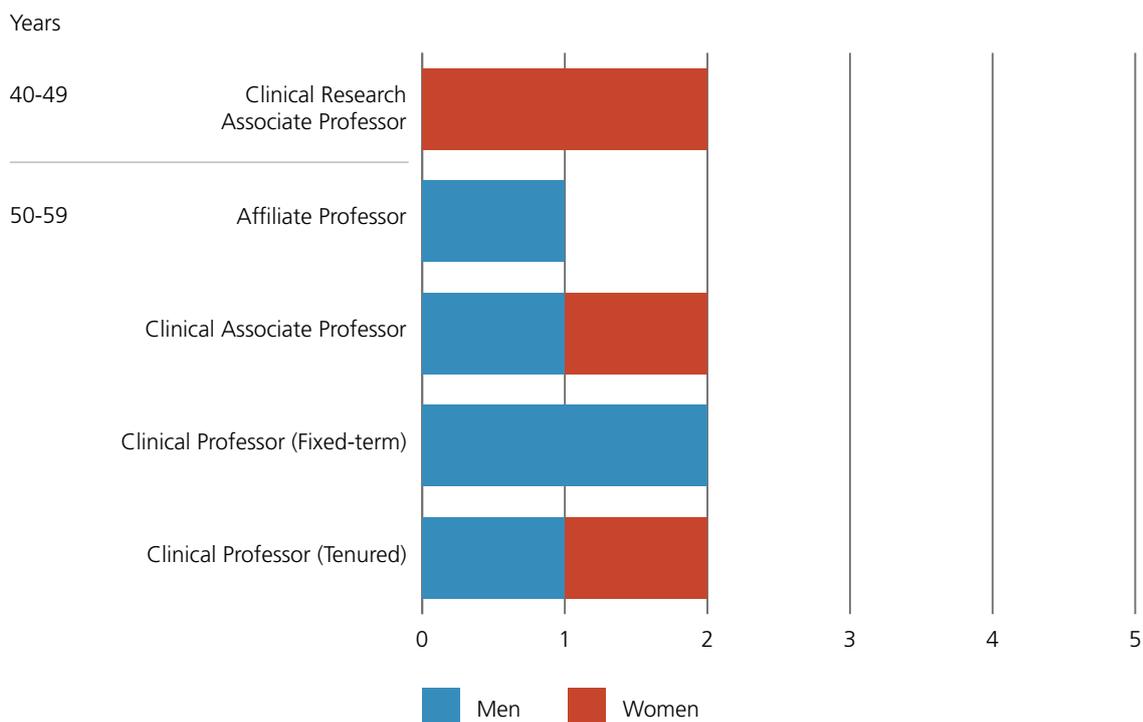
imaging (MRI and PET/MRI) and Doppler/ultrasound modalities. Treatments of benign and malignant diseases with radioactive isotopes represent another cornerstone of CPNM. The departments of CPNM cooperate with a number of leading national and international institutions and universities in Europe and abroad.

During the last decade, high priority research programmes of CPNM have been within oncology with molecular imaging techniques, neurology with brain imaging, cardiovascular physiology, gastro-hepatology and lung physiology, among others. The continued research in these fields provides new important insight into the pathophysiological mechanisms of these entities for the benefit of the individual patients and our understanding and treatment of the disease processes.

Academic Staff in Clinical Physiology and Nuclear Medicine – Headcount



Academic Staff in Clinical Physiology and Nuclear Medicine – Age and gender distribution



STRENGTHS

- Clinical Physiology and Nuclear Medicine (CPNM) is an interdisciplinary, innovative speciality with extensive collaboration with many clinical disciplines
- CPNM has a long tradition for high-level scientific research with great impact on basic physiology and development of new clinical procedures
- Specialists in CPNM consider research as an integrated part of the professional identity and daily work
- CPNM has the ability to attract highly research-minded young medical doctors and technical staff
- Researchers within CPNM have access to and expertise in many advanced state-of the art imaging modalities available. CPNM has a long tradition and large experience in developing new techniques and diagnostic modalities

WEAKNESSES

- Routine and research activities within CPNM are highly dependent on referrals from the clinical departments and interests of the cooperating partners
- CPNM is less visible than clinical departments since patients are not directly associated with the department
- The economy of the departments are directly related to activity, but activity related to different aspects of research are not reimbursed and rarely funded

SWOT

OPPORTUNITIES

- CPNM participates increasingly in multidisciplinary teams and cooperation across various research areas and specialties
- CPNM is highly involved in the increasingly growing developments in oncology
- CPNM participates in the development of new and often costly targeted treatment, e.g. immunotherapy, where treatment strategies may be improved by a 'companion' imaging diagnostic method/tracer
- CPNM plays a pivotal role in the introduction and evaluation of new radiotracers for diagnosis, prognostication, treatments prediction and prognostication in previously uncovered areas, e.g. neuro-inflammation, multiple sclerosis and bacterial species-labelling

THREATS

- Organizational changes and production-focused management driven by financial motives have suppressed research activities and initiatives. Production is prioritized instead of quality in every patient investigation
- Employer-initiated and dictated research strategies (CSHP) are unrelated to local research tradition, skills, interests and possibilities
- Increasing bureaucracy suppress activities in all aspects of research: Legal (data collection, storage and analysis), financial (application for an management of funding) and clinical (RIS/PACS, SP etc.)
- Employer-dictated administration of researchers financial funding. This type of control is meaningless, devastating and not compatible with active research and is extremely demotivating
- Rigid educational structures hampers young researchers to stay for longer periods for research

Scientific Production

Clinical Physiology and Nuclear Medicine	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	61	4.2	58	4.7	38	5.2
Review papers - International			3	1.9	4	2.7
Letters - International			2	13.1	1	1.5
Original scientific research papers - Danish	1	0.1	3	0.1		
Total	62	4.1	66	4.6	43	4.8

3 most prominent publications from 2016

1. Lauritsen J, Kier MG, Bandak M, Mortensen MS, Thomsen FB, Mortensen J, Daugaard G. Pulmonary function in patients with germ cell cancer treated with Bleomycin, Etoposide and Cisplatin. *J Clin Oncol* 2016;34:1492-9.
2. Trebicka J, von Heydebrand M, Lehmann J, Tofteng F, Busk T, Jensen HL, Rohde J, Reiberger T, Mortensen C, Schierwagen R, Klein S, Møller S, Bendtsen F, Krag A; Assessment of response to beta-blockers by expression of β Arr2 and RhoA/ROCK2 in antrum mucosa in cirrhotic patients. *J Hepatol* 2016;64:1265-73.
3. Arnglim N, Schytz HW, Britze J, Amin FM, Vestergaard MB, Hougaard A, Wolfram F, de Koning PJ, Olsen KS, Secher NH, Larsson HB, Olesen J, Ashina M. Migraine induced by hypoxia: an MRI spectroscopy and angiography study. *Brain* 2016;139:723-37.

DERMATO- VENEROLOGY

REPRESENTING PROFESSOR: LONE SKOV

DESCRIPTION OF THE SPECIALITY

The dermato-venerology and allergology section at IKM, University of Copenhagen consists of three clinical hospital departments: Department of Skin and Allergy, Herlev and Gentofte Hospital, Department of Dermato-Venerology, Bispebjerg Hospital and Department of Dermatology, Zealand University Hospital. The hospital departments have a long internationally acknowledged academic tradition doing clinical and translational but also basic research with a high impact on the field of dermatology.

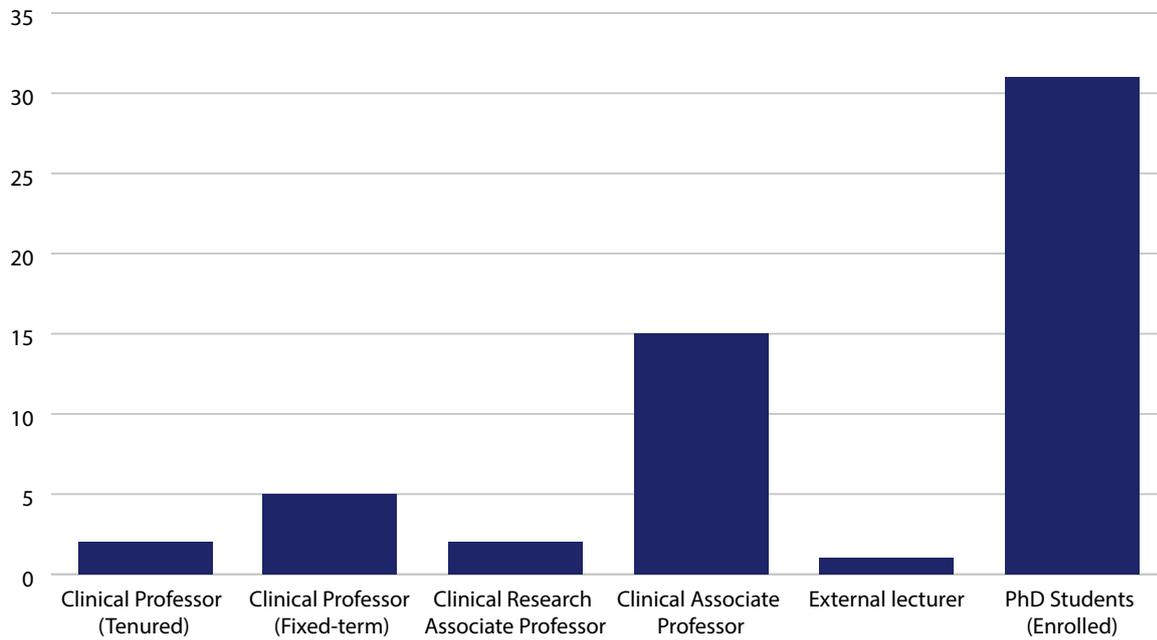
The main areas of research are:

- Atopic dermatitis
- Skin barrier
- Basic mechanisms including immunology and molecular biology
- Connective tissue disorders
- Drug allergy
- Genetic diseases
- Hidradenitis suppurativa
- Skin cancer incl. melanoma

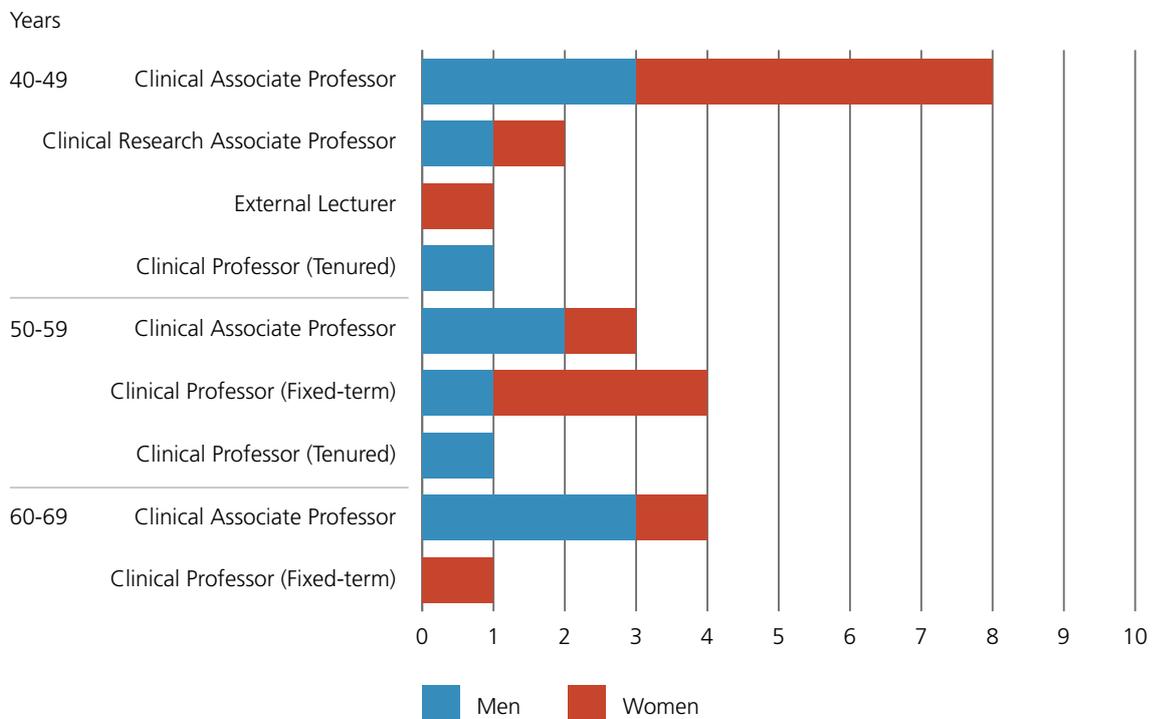
- Imaging
- Contact dermatitis/eczema
- Prurigo
- Cutaneous infections
- Quality of life
- Outcome measures
- Light and laser
- Psoriasis and other inflammatory skin diseases
- Occupational skin diseases
- Wounds
- Tattoos
- Type 1 allergy/IgE
- Urticaria
- Sexually transmitted diseases

Overall, our goal is translational and multidisciplinary research integrating dermatology and allergology broadly with other fields of the medical sciences providing rapid implementation of research into patient care and teaching.

Academic Staff in Dermato-venerology – Headcount



Academic Staff in Dermato-venerology – Age and gender distribution



STRENGTHS

- Well established, internationally acknowledged academic traditions with a high impact on the field of dermatology
- A clinical approach anchored in basic science providing opportunities for translational medicine
- Strong registries

WEAKNESSES

- Shortage of post-doctoral positions
- Unresolved future structure of the dermatovenerology and allergy in the capital region
- Difficult to get large research grants for dermatological research

SWOT

OPPORTUNITIES

- Academic and clinical track record present an attractive profile for international collaboration
- Flexibility due to limited size and non-bureaucratic approaches
- Dermatology has an interface with many other specialties. Skin diseases can be used as models of general pathological processes

THREATS

- Increasing bureaucracy in research and political prioritization
- Single-minded clinical productivity focus by the hospital organisations
- Time consuming IT systems

Scientific Production

Dermato-venerology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	107	5.1	146	5.0	160	4.4
Review papers - International	3		10		11	2.5
Letters - International	2				7	3.9
Original scientific research papers - Danish	3	0.1	6	0.1	8	0.1
Total	115	4.9	162	4.7	186	4.1

3 most prominent publications from 2016

1. Kimball AB, Okun MM, Williams DA, Gottlieb AB, Papp KA, Zouboulis CC, Armstrong AW, Kerdel F, Gold MH, Forman SB, Korman NJ, Giamarellos-Bourboulis EJ, Crowley JJ, Lynde C, Reguiat Z, Prens EP, Alwawi E, Mostafa NM, Pinsky B, Sundaram M, Gu Y, Carlson DM, Jemec GB. Two phase 3 trials of adalimumab for hidradenitis suppurativa. *N Engl J Med* 2016;375:422-34.
 2. Andersen YM, Egeberg A, Gislason GH, Hansen PR, Skov L, Thyssen JP. Risk of myocardial infarction, ischemic stroke, and cardiovascular death in patients with atopic dermatitis. *J Allergy Clin Immunol* 2016;138:310-2.e3.
 3. Clausen ML, Slotved HC, Krogfelt KA, Agner T. Tape stripping technique for stratum corneum protein analysis. *Sci Rep* 2016;6:19918.
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INTERNAL MEDICINE: INFECTIOUS DISEASES

REPRESENTING PROFESSOR: JENS LUNDGREN

DESCRIPTION OF THE SPECIALITY

HIV: pathogenesis, pathophysiology, antiretroviral treatment (strategic use, extent of benefit and harm), transmission risk factors and prevention (ART and PrEP) including infectious (viral hepatitis, tuberculosis, invasive bacterial infections and cancers) and non-infectious comorbidities (in particular atherosclerosis and cardiovascular disease, liver fibrosis and liver disease, chronic kidney disease and non-infectious cancers). HIV-induced vulnerability is being studied by use of HIV-negative matched controls.

Viral hepatitis: focus on hepatitis C virus (pathophysiology and antiviral treatment (choice of drug, extent of benefit and harm)).

Key affected populations: epidemiology of HIV, viral hepatitis and tuberculosis in men-having-sex-with-men and injecting drug users.

Tuberculosis: host response and immunity, vaccine development, epidemiology of factors for poor outcome in treated tuberculosis.

Malaria: In collaboration with Department of Immunology and Microbiology, University of

Copenhagen, an established research activity re vaccine development.

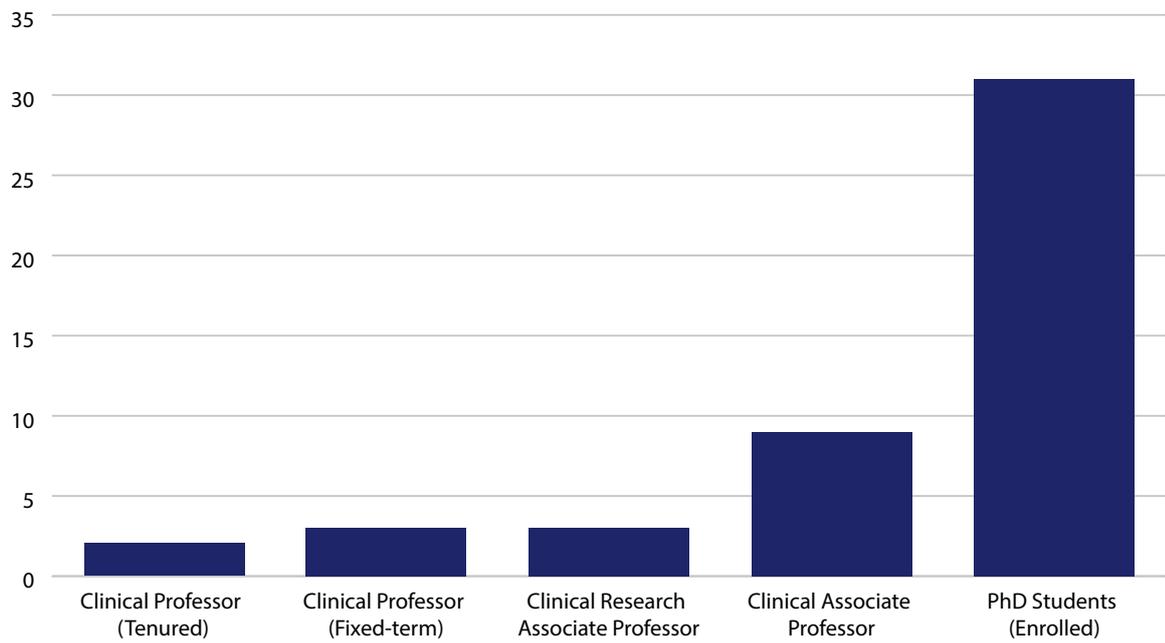
Bacterial infections: host genetic susceptibility, duration of antibacterial therapy for invasive staphylococci infections and pneumonia, faecal transplantation vs bacterial installation for Clostridium difficile infection.

Population-level research using national registry data: wide profile of infections.

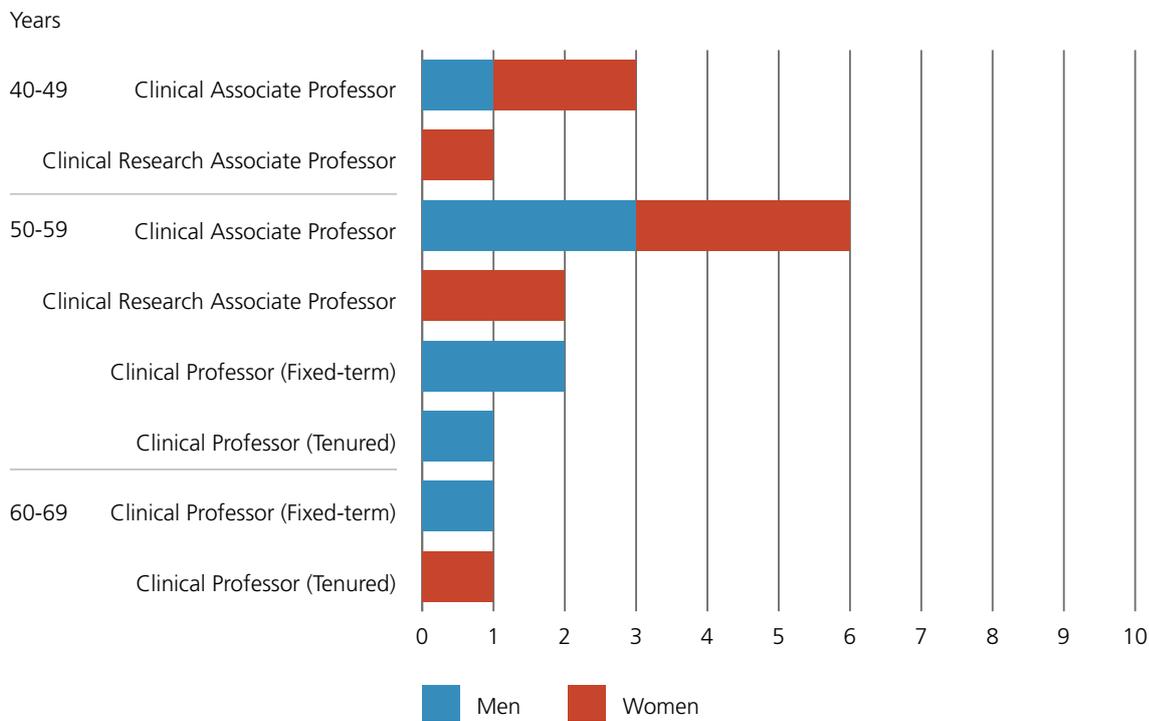
Infectious and inflammatory-related disease pathogenesis among wide profile of patients with iatrogenically induced immune dysfunction (including transplant recipients, patients undergoing treatment of cancer, treated patients with autoimmune disease): including the contribution of the microbiome, host genetic variates and type of treatment provided – use of imaging to further define clinical phenotyping. Discovery of infectious and inflammatory disease causing host genetic variates.

Translational research aimed at understanding how physical activity impact health with specific focus on inflammation and metabolism.

Academic Staff in Internal Medicine: Infectious Diseases – Headcount



Academic Staff in Internal Medicine: Infectious Diseases – Age and gender distribution



STRENGTHS

- High and consistent research productivity and involvement in PhD training
- Decades of international competitive research outputs related to viral infections including HIV and viral hepatitis
- Comprehensive ability to perform population based research
- Extensive international network coordinated from Copenhagen
- Collaboration with Statens Serum Institut in relation to tuberculosis
- Collaboration with the comprehensive global health research efforts at University of Copenhagen related to infections of the tropics incl. malaria
- Collaboration with other specialities pertaining to infectious complications to patients in their primary care (autoimmune disease, transplant recipients, cancer)
- Basic and translational research within infections, immunity, inflammation, host genetics, and metabolism

WEAKNESSES

- Relatively weak research profile in relation to commonly occurring infections such as pneumonia, sexually transmitted bacterial infections, urinary tract infections and gastroenteritis
- Research activities remain fragmented to some extent – synergies for research are not fully exploited

SWOT

OPPORTUNITIES

- Novel omics technologies and how these interact with infections and immunity is an obvious new research direction for the speciality to embrace
- Substantial recent investment made by domestic and international funding bodies (Danish National Research Foundation, European Commission, National Institutes of Health)
- Emerging research activities in relation to neuroinfections, bone infections, duration of antibiotic therapy for systemic infections, and infectious complications to iatrogenic immune dysfunction
- Shared-care structures for infectious diseases with institutions providing primary care for key affected populations (injecting drugs, high-risk sexual activity)
- Many talented younger scientists and hence a pipeline to continued research

THREATS

- The administrative hurdles (legal approvals, overhead, controllers involved with research budget) continue to expand and will negatively impact on the ability to conduct clinical research if not controlled/reversed
- The new IT structure within the Capital Region is still not able to export data for research purposes
- Foundations supporting clinical research are reducing their funding portfolio

Scientific Production

Internal Medicine: Infectious Diseases	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	147	5.8	100	8.8	118	6.7
Review papers - International	1		2	3.4	2	4.3
Letters - International			1	4.5	1	3.8
Original scientific research papers - Danish	6	0.1	3	0.1	3	0.1
Review papers - Danish			1	0.1		
Letters - Danish					1	0.1
Total	154	5.6	107	8.3	125	6.5

3 most prominent publications from 2016

1. Podlekareva DN, Efsen AM, Schultze A, Post FA, Skrahina AM, Pantelev A, Furrer H, Miller RF, Losso MH, Toibaro J, Miro JM, Vassilenko A, Girardi E, Bruyand M, Obel N, Lundgren JD, Mocroft A, Kirk O, TB:HIV study group in EuroCoord. Tuberculosis-related mortality in people living with HIV in Europe and Latin America: an international cohort study. *Lancet HIV* 2016;3:e120-31.
2. Rodger AJ, Cambiano V, Bruun T, Vernazza P, Collins S, van Lunzen J, Corbelli GM, Estrada V, Geretti AM, Beloukas A, Asboe D, Viciano P, Gutiérrez F, Clotet B, Pradier C, Gerstoft J, Weber R, Westling K, Wandeler G, Prins JM, Rieger A, Stoeckle M, Kümmerle T, Bini T, Ammassari A, Gilson R, Krznicar I, Ristola M, Zangerle R, Handberg P, Antela A, Allan S, Phillips AN, Lundgren J, PARTNER Study Group. Sexual activity without condoms and risk of HIV transmission in serodifferent couples when the HIV-positive partner is using suppressive antiretroviral therapy. *JAMA* 2016;316:171-81.
3. Okano JT, Robbins D, Palk L, Gerstoft J, Obel N, Blower S. Testing the hypothesis that treatment can eliminate HIV: a nationwide, population-based study of the Danish HIV epidemic in men who have sex with men. *Lancet Infect Dis* 2016;16:789-96.

INTERNAL MEDICINE: CARDIOLOGY

REPRESENTING PROFESSOR: LARS KØBER

DESCRIPTION OF THE SPECIALITY

Research areas covered by cardiology encompass common as well as rare diseases.

Atherosclerotic heart disease is prominent, and research in this area ranges from prevention to treatment of end-stage disease. There is special interest in hypertension (including genetic, basal and clinical research), overweight, dyslipidaemia and diabetes as prevention of cardiovascular disease. In patients with established disease, there is a large area of research in treatment of ischemic heart disease (acute and chronic), and all of the complications as arrhythmias, heart failure (from mild to end-stage) and cardiac arrest.

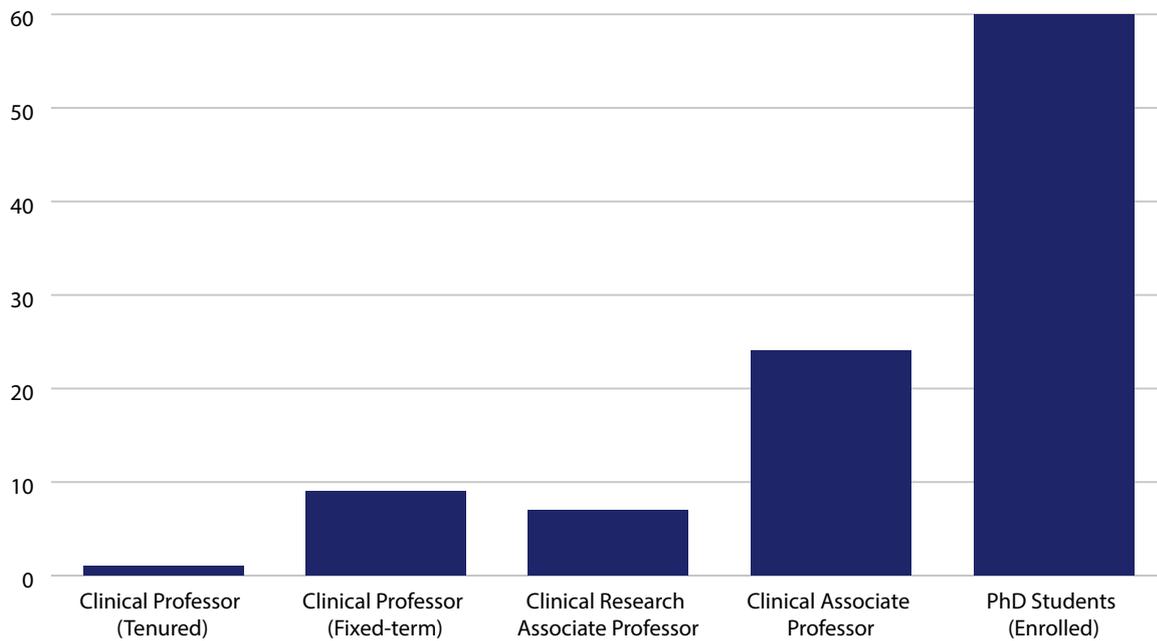
Within all these areas, there is focus on many different aspects such as genetics, biomarkers, pharmacological and non-pharmacological therapy with devices and transplantation. Development of stem cell therapy has been a continuously growing research area with the potential to change management of many heart diseases in the future.

A virtue of SUND is the strong tradition for large-scale clinical trials, which has managed to connect all hospital departments within the region. This collaboration has made it possible to have a translational approach moving rapidly from animal models to trials in humans.

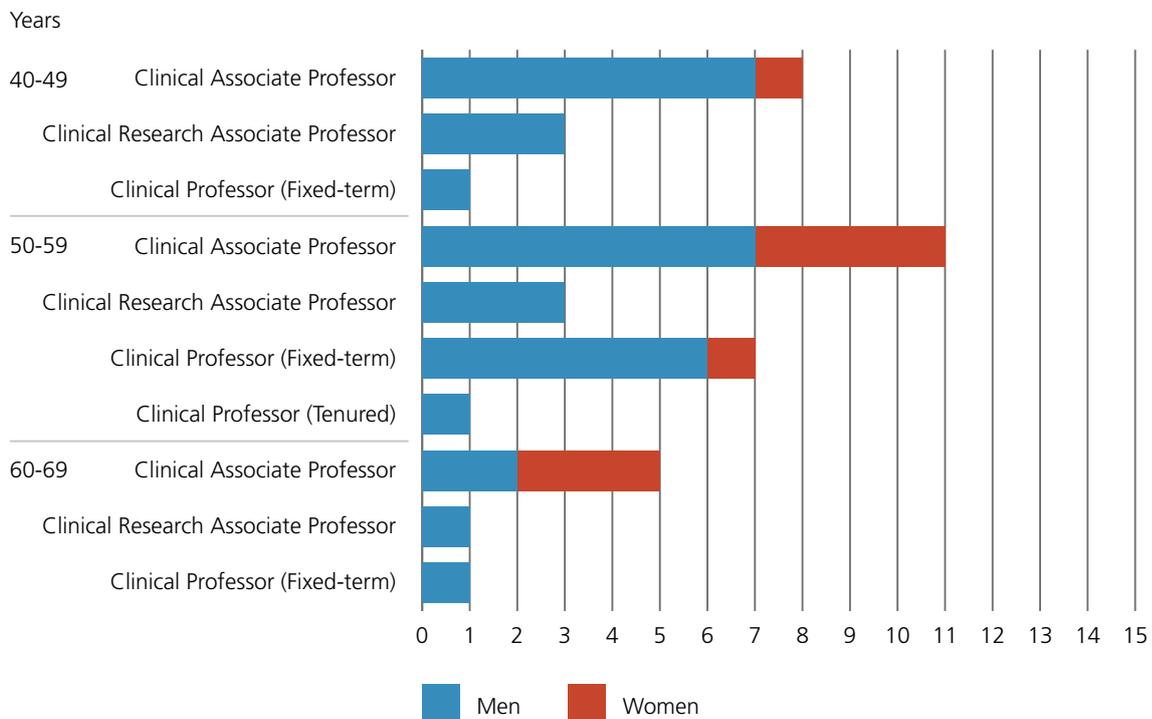
There is a growing research within more rare diseases in congenital heart diseases and other inherited diseases, where national (or international) collaboration often is essential. Together with the thoracic surgeons there is an expanding research in valvular (including endocarditis) diseases, an area that also includes researchers from anaesthesiology and intensive care. Diseases in the pulmonary vasculature and severe lung diseases often requiring transplantation is a smaller, but still important research area.

Helped by the unique Danish registers there is also a strong research tradition within cardiovascular epidemiology and pharmaco-epidemiology, and in this area, we are among the most respected and productive in the world.

Academic Staff in Internal Medicine: Cardiology – Headcount



Academic Staff in Internal Medicine: Cardiology – Age and gender distribution



STRENGTHS

- High degree of collaboration with other institutions in Denmark and internationally
- Very research active faculty
- Growing population of patients with large needs
- Large public interest/appeal
- Utilization of Danish registers
- Structured patient flow with few departments able to collaborate

WEAKNESSES

- Senior researchers are quite similar in age distribution
- Structured university career process for clinicians lack (in contrast to well-structured clinical career process)
- Complex and multifactorial biology behind many diseases and so far less profitable collaboration with basic science
- Possibility for students to have dedicated research time has decreased dramatically

SWOT

OPPORTUNITIES

- Danish Registries
- New technology being developed rapidly
- Multidisciplinary research in many complex diseases
- Collaboration with large populations handling cardiology
- Potential of electronic hospital records to structure data collection
- Linkage between phenotype and genotype in large populations
- Large populations facilitate research on rare diseases including inherited and congenital heart diseases

THREATS

- Legal obstacles to get access to patient data from electronic patient charts
- Obstacles to get permission to perform genetic studies
- Long delay due to administrative handling in ethical committees and legal authorities
- Funding difficult (pharmaceutical industry)
- Transplantation numbers stagnating or declining
- Increasing obstacles for performing clinical research in terms of bureaucracy and recruitment of younger researchers
- Electronic hospital records not supported sufficiently to structure data collection of relevant data, and obstacles for data flow back to the researchers

Scientific Production

Internal Medicine: Cardiology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	208	6.7	247	7.7	284	6.3
Review papers - International					1	3.6
Letters - International	2	7.8	5	16.0	4	29.0
Original scientific research papers - Danish	8	0.1	7	0.1	3	0.1
Total	218	6.5	259	7.7	292	6.6

3 most prominent publications from 2016

1. Køber L, Thune JJ, Nielsen JC, Haarbo J, Videbæk L, Korup E, Jensen G, Hildebrandt P, Steffensen FH, Bruun NE, Eiskjær H, Brandes A, Thøgersen AM, Gustafsson F, Egstrup K, Videbæk R, Hassager C, Svendsen JH, Høfsten DE, Torp-Pedersen C, Pehrson S, DANISH Investigators. Defibrillator implantation in patients with nonischemic systolic heart failure. *N Engl J Med* 2016;375:1221-30.
2. Makkar RR, Fontana G, Søndergaard L. Possible subclinical leaflet thrombosis in bioprosthetic Aortic Valves. *N Engl J Med* 2016;374:1591-2.
3. Kelbæk H, Høfsten DE, Køber L, Helqvist S, Kløvgaard L, Holmvang L, Engstrøm T. Deferred versus conventional stent implantation in patients with ST-segment elevation myocardial infarction (DANAMI 3-DEFER): an open-label, randomised controlled trial. *Lancet* 2016;387:2199-206.

INTERNAL MEDICINE: ENDOCRINOLOGY

REPRESENTING PROFESSOR: JENS FABER

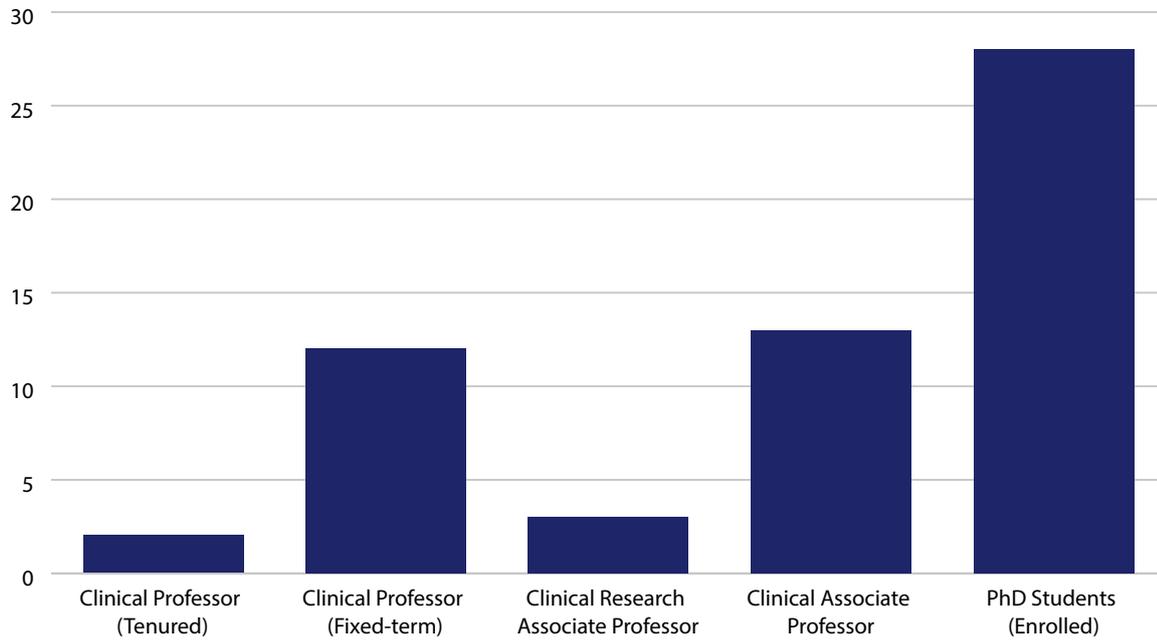
DESCRIPTION OF THE SPECIALITY

Endocrinology calls for collaboration with many other specialities.

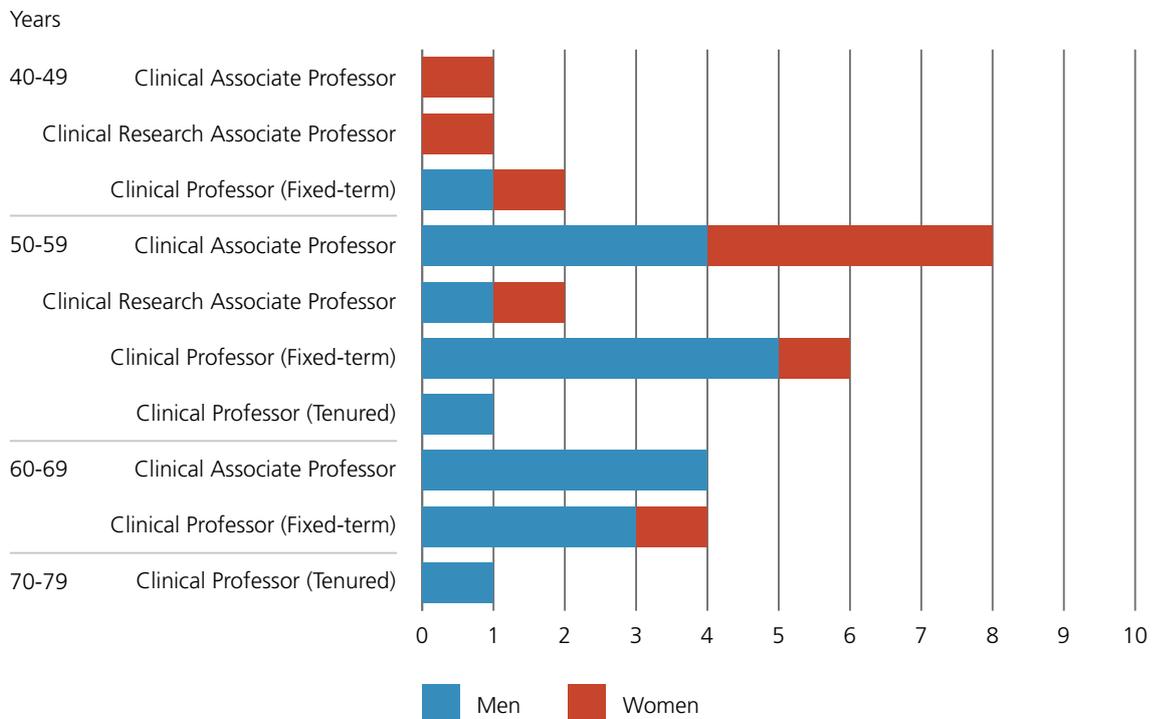
This is conducted in many different sub-specialities and ranges from basic to clinical science:

- Type 1 and 2 diabetes: Prevention and early detection of diabetes, prevention and treatment of late diabetic complications, clinical trials aiming at implementing new treatment modalities including insulin pump technology (development of a closed loop algorithm has been ongoing in co-work with Technical University of Denmark), hypoglycaemia research (consequences, protection, addition of glucagon to insulin in pumps), dementia in diabetes
- Overweight and the consequences of surgery, metabolic changes due to surgery
- Fat metabolism, appetite regulation, consequences of bariatric surgery, including metabolomics, bile acids metabolism and genetic profiling in relation to weight regulation
- Osteoporosis: basic mechanisms, epidemiology and clinical trials
- Thyroid hormones: clinical research in subclinical thyroid disease, the effect on the heart, the effect of national iodine supplementation, QoL studies
- Polycystic Ovary Syndrome (PCOS): the metabolic consequences of the disease and new treatment modalities
- Androgen use and abuse: health consequences
- Heart failure and ischaemic heart disease: Metabolic/endocrine disturbances
- GI peptide research, from basic to clinical application
- Calcium disturbances: basic and clinical research
- Pituitary hormones: effects, treatment modalities
- Adrenal gland hormones: effects, treatment modalities

Academic Staff in Internal Medicine: Endocrinology – Headcount



Academic Staff in Internal Medicine: Endocrinology – Age and gender distribution



STRENGTHS

- Steno Diabetes Center Copenhagen network and funding
- A strong tradition for collaboration between basic science and clinical research
- Collaboration with Technical University of Denmark with regard to technology development
- Register-based research
- Large disease area and strong industry support
- Extensive worldwide collaboration both directly and together with basic science units in Denmark
- Bariatric surgery is centered at Hvidovre Hospital

WEAKNESSES

- Fragmented clinical research
- Career development in clinical research hampered by lack of senior researcher positions with clinic and research
- Lack of access to patient population seen in general practice (i.e. patients with diabetes or patients at risk)
- Large clinical production demand i.e. less time to research

SWOT

OPPORTUNITIES

- Taking more advantage of the link between basic and clinical research
- Thus great opportunity to increase the collaborate with basic science departments at the university
- Focus on prevention and very prevalent diseases (type 2 DM, osteoporosis)
- Epidemiological research due to well preserved national registers
- Expand diabetes metabolism knowledge and expertise to related conditions – basic to clinical

THREATS

- Regulatory barriers for research and regulatory balance between data protection and research
- Declining funding of investigator initiated studies from public sources
- Large clinical production demand
- Steno Diabetes Center Copenhagen: potentially influence on type of (diabetes) research by restriction of allocation of funding

Scientific Production

Internal Medicine: Endocrinology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	128	4.1	166	4.5	164	6.0
Review papers - International	4	12.6	1	3.1	9	6.5
Letters - International			1	5.5	1	5.5
Original scientific research papers - Danish	6	0.1	8	0.1	1	0.1
Review papers - Danish					1	0.1
Total	138	4.1	176	4.2	176	5.9

3 most prominent publications from 2016

1. Svane MS, Jørgensen NB, Bojsen-Møller KN, Dirksen C, Nielsen S, Kristiansen VB, Toräng, Wewer Albrechtsen NJ, Rehfeld JF, Hartmann B, Madsbad S, Holst JJ. Peptide YY and S glucagon-like peptide-1 contribute to decreased food intake after Roux-en-Y gastric bypass surgery. *Int J Obes (Lond)* 2016;40:1699-1706.
2. Abrahamsen B, Eiken P, Prieto-Alhambra D, Eastell R. Risk of hip, subtrochanteric, and femoral shaft fractures among mid and long term users of alendronate: nationwide cohort and nested case-control study. *BMJ* 2016;353:i3365.
3. Marso SP, Bain SC, Consoli A, Eliaschewitz FG, Jódar E, Leiter LA, Lingvay I, Rosenstock J, Seufert J, Warren ML, Woo V, Hansen O, Holst AG, Pettersson J, Vilsbøll T. SUSTAIN-6 Investigators. Semaglutide and cardiovascular outcomes in patients with type 2 diabetes. *N Engl J Med* 2016;375:1834-44.

INTERNAL MEDICINE: GASTROENTEROLOGY AND HEPATOLOGY

REPRESENTING PROFESSOR: FLEMMING BENDTSEN

DESCRIPTION OF THE SPECIALITY

Liver disease: Pathophysiological studies with focus on haemodynamic alterations in cirrhosis and their impact on clinical complications. This has led to collaboration with centres in Germany, London, Barcelona together with being part of EU-funded collaborative studies.

Fatty liver disease: Part of a NOVO challenge program with participating centres from Germany, Belgium and Holland. The research is frontline and involves research of the interplay between adipose tissue, liver tissue and faecal microbiome with focus on cellular function, inflammatory activities and single cell transcriptomics. The research is based on patients undergoing bariatric surgery.

Acute liver failure: Clinical and interventional studies in collaboration with several international centres in Europe and USA as well as animal experiments with special focus on the causes to loss of autoregulation in the brain.

Upper GI disorders: Clinical studies in relation to acid disorders with focus on acid rebound after proton pump inhibitor treatment.

Epidemiological and clinical studies on functional

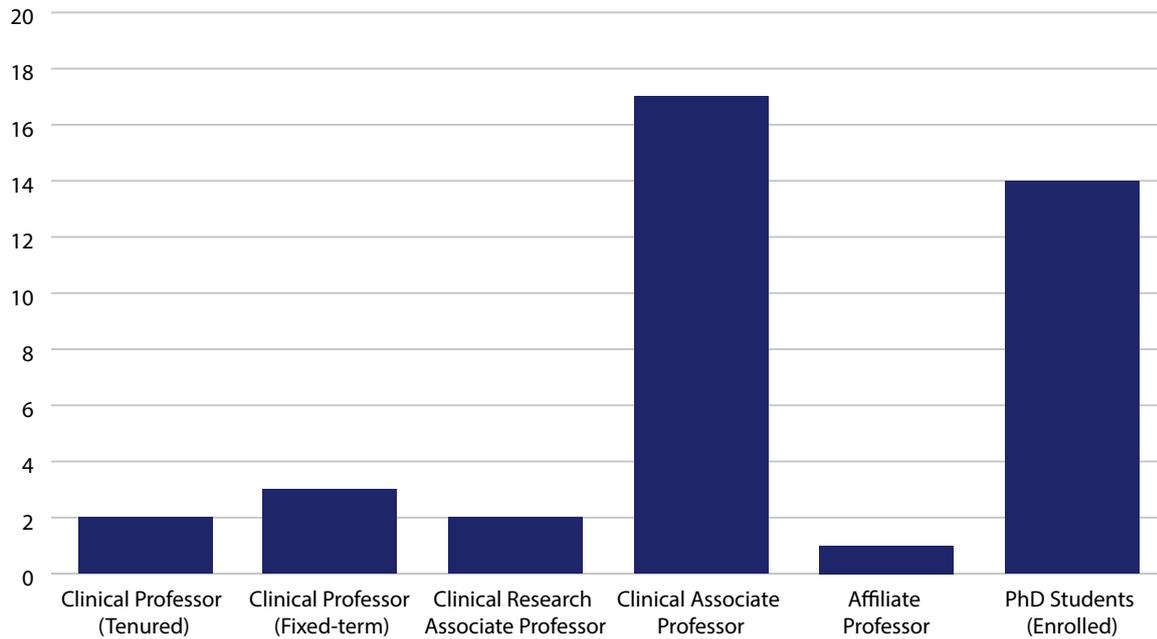
GI disorders with a focus on the relationship between irritable bowel syndrome subtypes and the gut microbiota.

Inflammatory bowel diseases: Clinical studies. Several Nordic investigator initiated studies with large clinical impact. The hospital departments have a long tradition for high impact epidemiological studies, some based on the unique databases in Denmark other population-based. Furthermore, basal studies on the impact of inflammatory bowel disease on cytokines and cellular function in the intestine.

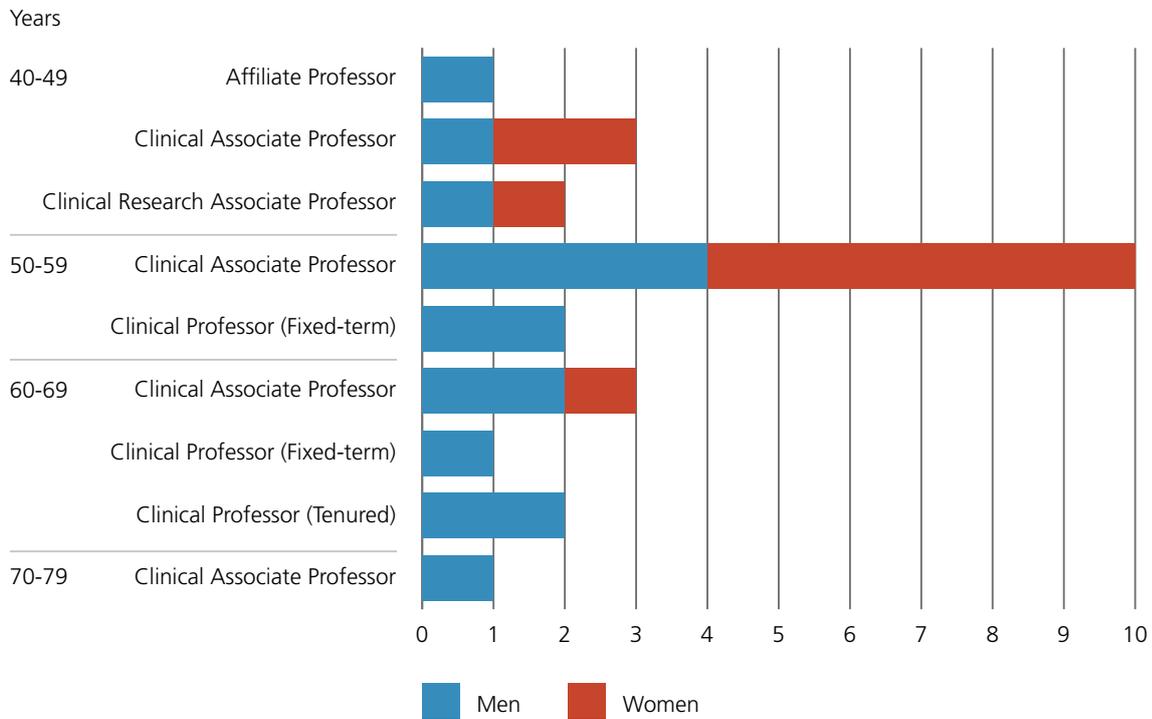
Nutrition and short bowel syndrome: High quality clinical interventional studies with involvement of centres from USA and Europe with the aim to improve nutritional uptake in patients with short bowel syndrome. Furthermore, research within other nutritional and clinical aspects of short bowel syndrome

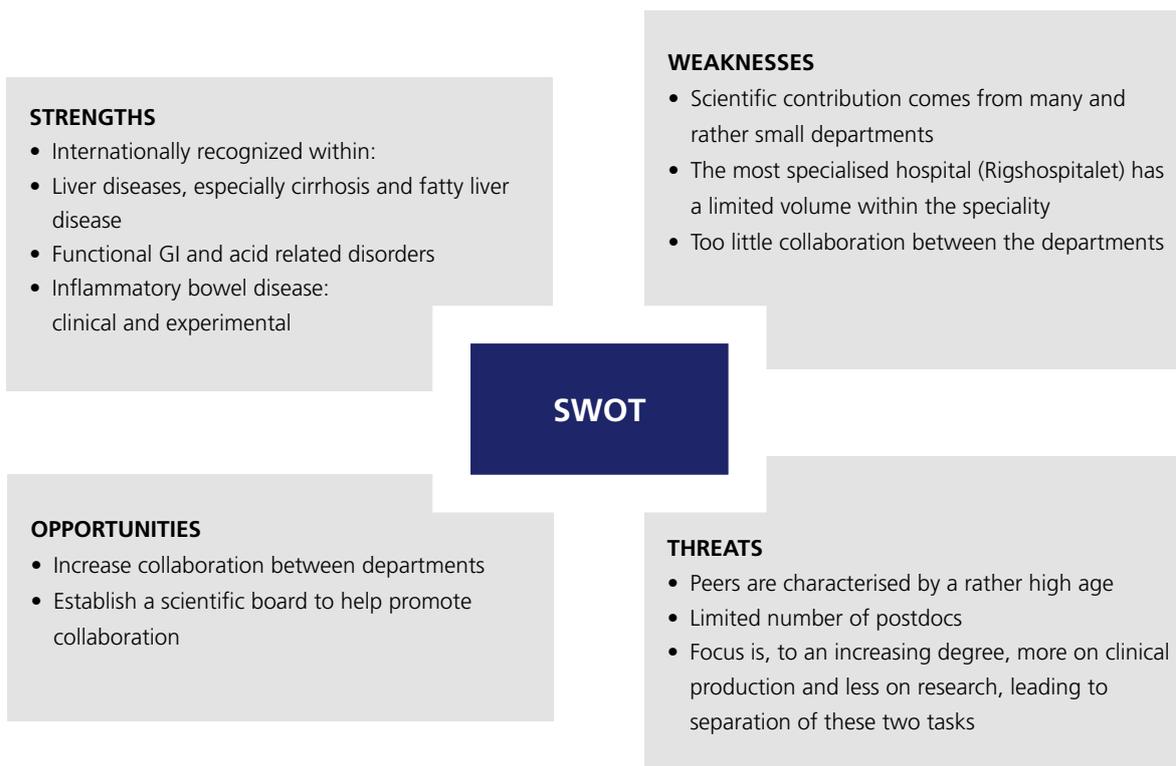
Pancreatitis: Pathophysiological and clinical studies with the aim to improve the understanding of the processes leading to multi-organ failure in severe acute pancreatitis and to improve the outcome.

Academic Staff in Internal Medicine: Gastroenterology and Hepatology – Headcount



Academic Staff in Internal Medicine: Gastroenterology and Hepatology – Age and gender distribution





Scientific Production

Internal Medicine: Gastroenterology and Hepatology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	81	6.1	58	4.5	55	5.0
Review papers - International	1		7	3.1	6	5.4
Letters - International	3	6.3	4	13.1	1	4.4
Original scientific research papers - Danish	3	0.1	4	0.1	4	0.1
Review papers - Danish	1	0.1	1	0.1		
Letters - Danish	3	0.1				
Total	92	5.7	74	4.3	66	4.7

3 most prominent publications from 2016

1. Trebicka J, von Heydebrand M, Lehmann J, Tofteng F, Busk T, Jensen H L, Bendtsen F, Krag A. Assessment of beta-blocker response by expression of beta-Arrestin2 and RhoA/ROCK2 in antrum mucosa in cirrhotic patients. *J Hepatol* 2016;64:1265-73.
 2. Larsen FS, Schmidt LE, Bernsmeier C, Rasmussen A, Isoniemi H, Patel VC, Wendon J. High-volume plasma exchange in patients with acute liver failure: An open randomised controlled trial. *J Hepatol* 2016;64:69-78.
 3. Gluud LL, Vilstrup H, Morgan MY. Non-absorbable disaccharides for hepatic encephalopathy: A Systematic review and meta-analysis. *Hepatology* 2016;64:908-22.
-

INTERNAL MEDICINE: GERIATRICS

REPRESENTING PROFESSOR: PETER SCHWARZ

DESCRIPTION OF THE SPECIALITY

Falls, dizziness and gait instability

Falls is a major geriatric syndrome. The geriatric hospital departments at Herlev and Gentofte Hospital, Rigshospitalet and Nykøbing Falster Hospital systematically collect data on risk factors in clinical databases. These databases have delivered data for several scientific contributions presented at the European Geriatric congresses and the Nordic Gerontology congress in 2016.

Pharmacoepidemiologic research

Pharmacoepidemiologic studies demonstrating the association between various cardiovascular drugs and antipsychotic drugs and risk of falls and fractures have been published during 2015 and 2016.

Frailty and sarcopenia

Frailty and sarcopenia are major geriatric syndromes. A study concerning risk factors for frailty is part of the population study in Lolland and Falster (LOFUS). Data collection is ongoing.

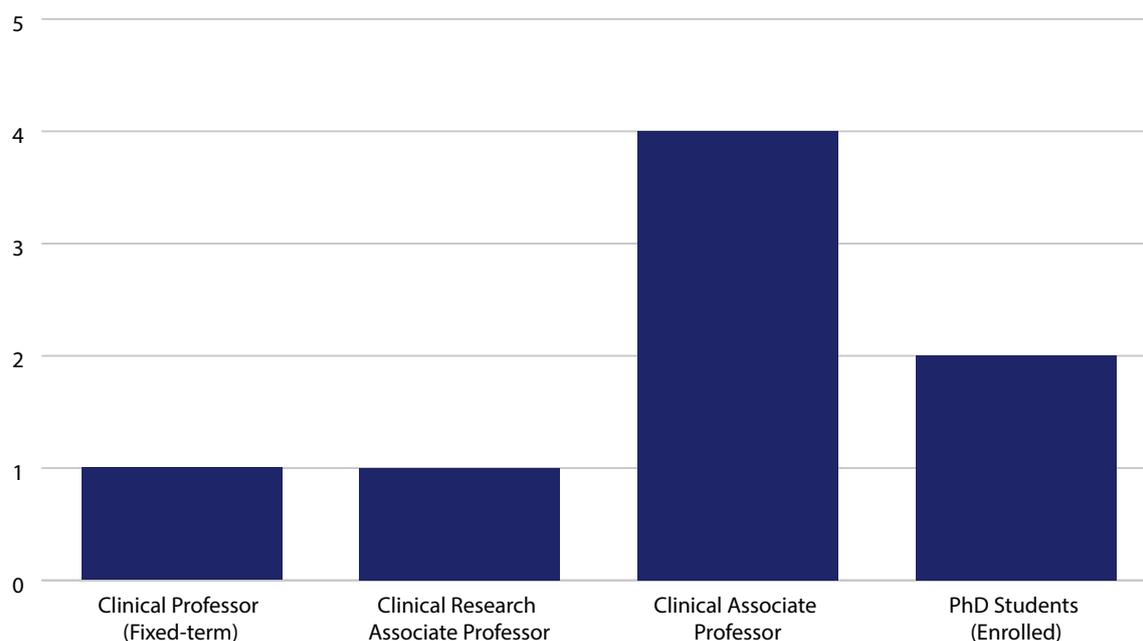
Cancer treatment in elderly patients

An ongoing PhD project at Herlev and Gentofte Hospital is investigating the effect of geriatric assessment in elderly cancer patients.

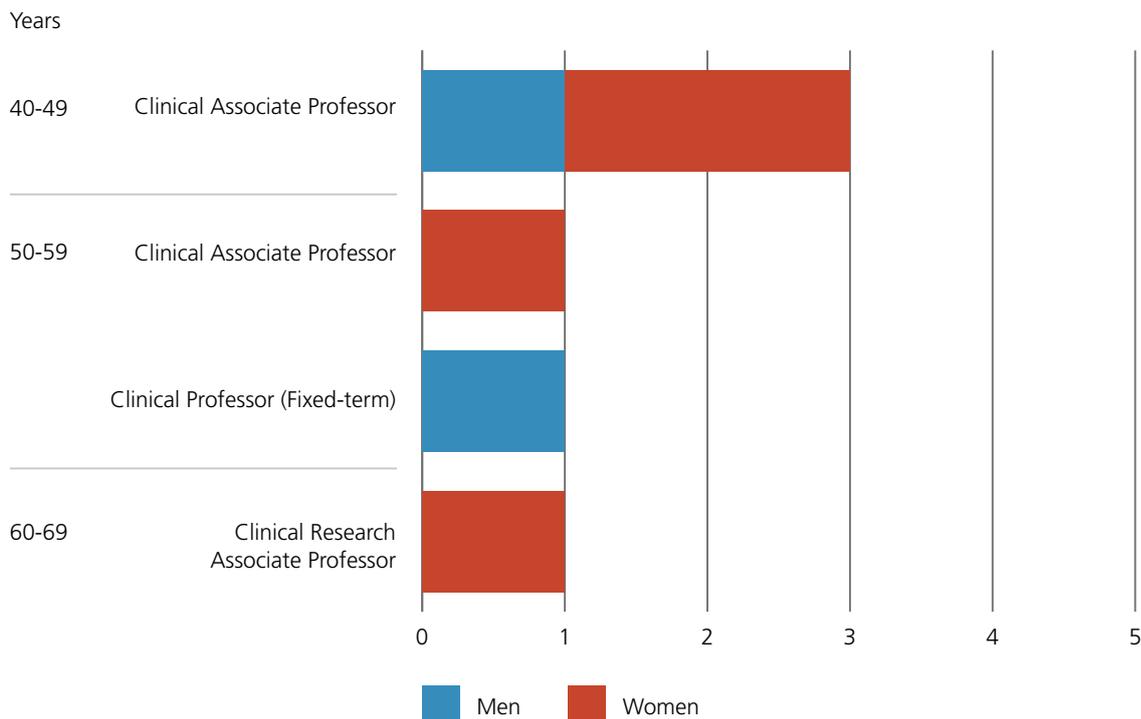
Dementia

Since January 2016, data on diagnostic work up in patients with a suspected diagnosis of dementia have been collected in a national clinical database. The first descriptive study using these data has been submitted for the 2017 Alzheimer's Association International Conference.

Academic Staff in Internal Medicine: Geriatrics – Headcount



Academic Staff in Internal Medicine: Geriatrics – Age and gender distribution



STRENGTHS

- Recruitment for the speciality has been improving over the last years, competition, need for publications in order to get training positions
- Growing political interest due to demography
- Many undeveloped research areas

WEAKNESSES

- Training in geriatric medicine at the University of Copenhagen is minimal and this influences recruitment possibilities
- Small research environment
- A very heterogeneous patient group which makes the traditional RCT design of less use
- Elderly traditionally being a low status research topic

SWOT

OPPORTUNITIES

- Cooperation with patient organisations
- Growing political interest with enhanced possibilities for funding
- Many research questions yet to be answered

THREATS

- Growing efficiency demands in the hospitals
- Not enough qualified tutors
- Only few research environments in geriatric medicine
- Difficulties getting financial funding

Scientific Production

Internal Medicine: Geriatrics	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	49	6.7	52	6.9	49	7.3
Letters - International			1			
Original scientific research papers - Danish	1	0.1				
Review papers - Danish	2	0.1				
Total	52	6.4	53	6.9	49	7.3

3 most prominent publications from 2016

1. Leth-Moller KB, Hansen AH, Torstensson M, Andersen SE, Ødum L, Gisslasson G, Torp-Pedersen C, Holm EA. Antidepressants and the risk of hyponatremia: a Danish register-based population study. *BMJ Open* 2016;6:e011200.
2. Lund CM, Nielsen D, Dehlendorff C, Christiansen AB, Rønholt F, Johansen JS, Vistisen KK. Efficacy and toxicity of adjuvant chemotherapy in elderly patients with colorectal cancer: the ACCORE study. *ESMO open* 2016;1:e000087.
3. Sando A, Schultz M, Eugen-Olsen J, Rasmussen LS, Køber L, Kjølner E, Jensen BN, Ravn L, Lange T, Iversen K. Introduction of a prognostic biomarker to strengthen risk stratification of acutely admitted patients: rationale and design of the TRIAGE III cluster randomized interventional trial. *Scand J Trauma Resusc Emerg Med* 2016;24:100.

INTERNAL MEDICINE: HAEMATOLOGY

REPRESENTING PROFESSOR: KIRSTEN GRØNBÆK

DESCRIPTION OF THE SPECIALITY

The three hospital departments of haematology are all involved in conducting investigator initiated clinical trials and translational research, as well as epidemiology:

Roskilde Department of Haematology: Main focus on chronic myeloproliferative disorders and benign haematology.

Herlev Department of Haematology: Main focus on acute lymphoblastic leukaemia and benign haematology.

Both hospital departments are collaborating with Center for Cancer Immune Therapy (professors associated with Department of Immunology and Microbiology, University of Copenhagen or oncology at IKM).

Rigshospitalet, Department of Haematology: Main focus on acute myeloid leukaemia (AML), myelodysplastic syndrome (MDS) and cytopaenia of unknown significance, chronic lymphocytic leukaemia, Hodgkin's lymphoma and non-Hodgkin's lymphoma (particularly mantle cell lymphoma), multiple myeloma and allogenic bone marrow transplantation.

Translational focus on genetics and epigenetics of haematological cancers.

Finsen laboratory: Main focus on haematological cancer stem cells, but also molecular characterization of myeloid cancers/cancer stem cells in humans.

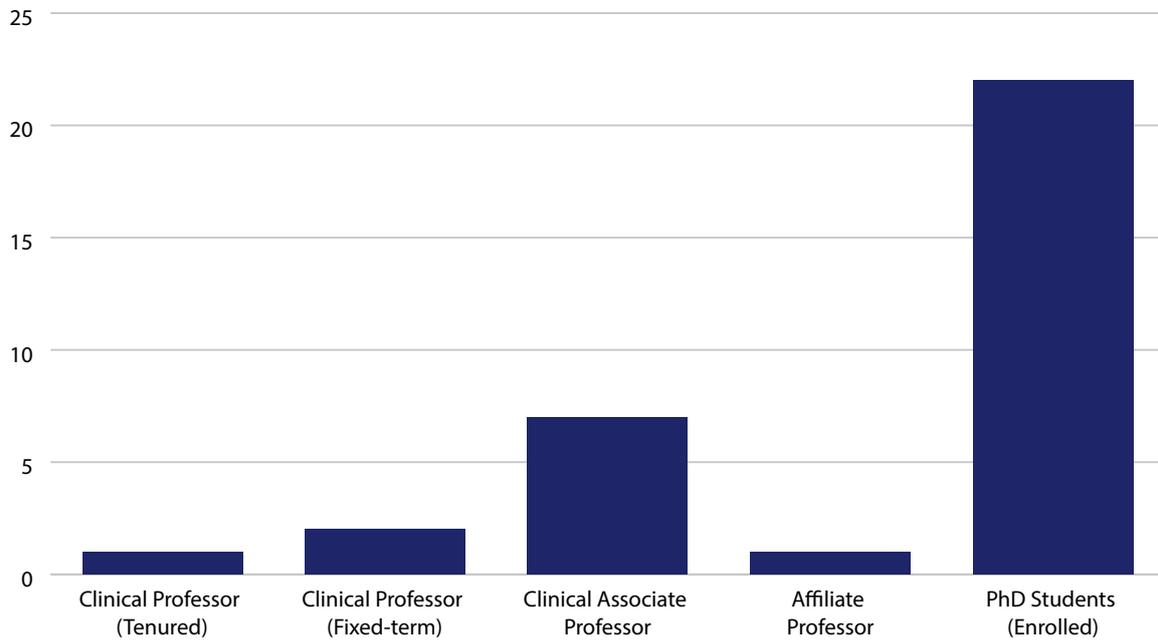
Based on these common interests, the three haematological hospital departments, the Finsen

laboratory and Biotech Research Innovation Centre (BRIC) has been announced as one of the newly established Clinical Academic Groups (CAG), entitled to Efficient Treatment of Leukaemia in translational haematology. This programme will initially focus on cancer stem cells in Acute Myeloid Leukaemia (AML) and Myelodysplastic syndrome (MDS) patients, but as funding is obtained we will broaden this to other haematological cancers with the aims of improving the outcome of treatment for patients with blood cancer.

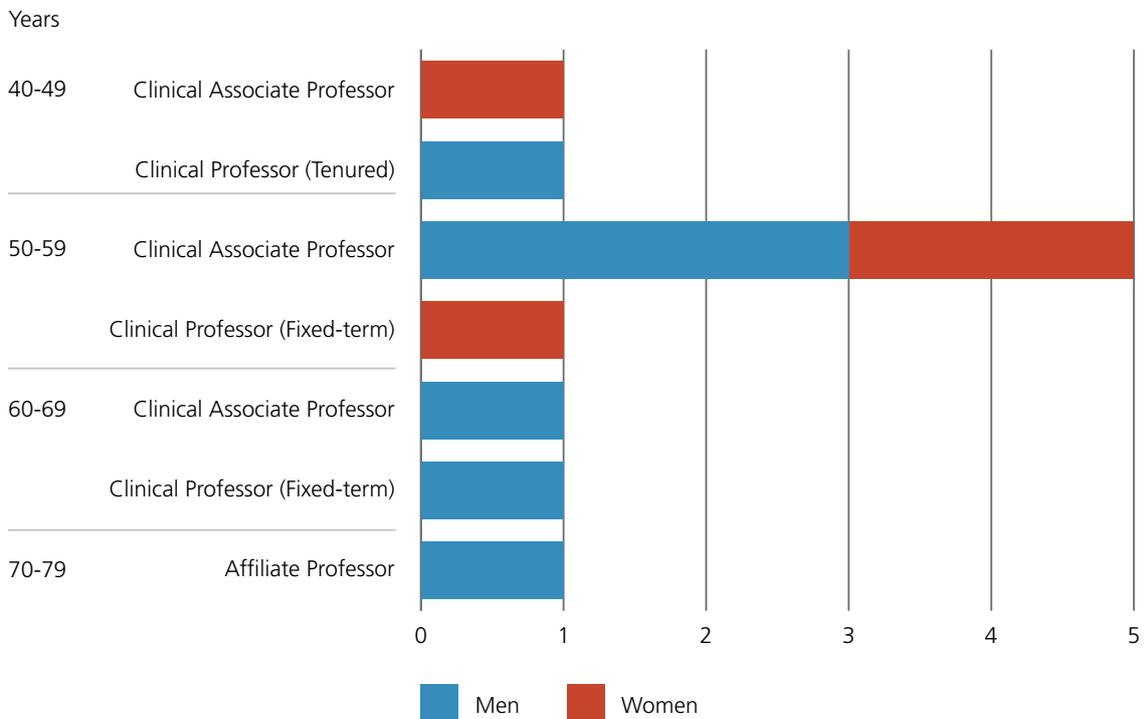
Our overall goals are to:

- Have an immediate impact on how blood cancer patients are treated today by implementing methods for drug screening, and thus testing the sensitivity of patient's MDS and AML stem cells to a wide panel of drugs.
- Improve the understanding of genetic, epigenetic and molecular mechanisms leading to blood cancers by thorough molecular screening of patient samples.
- Suggest new validated targets for the development of anti-cancer therapy and collaborate with biotech to develop new therapies
- Conduction of phase I-II clinical trials based on these findings and thus strengthen both the short- and long-term research and clinical management of blood cancer.

Academic Staff in Internal Medicine: Haematology – Headcount



Academic Staff in Internal Medicine: Haematology – Age and gender distribution



STRENGTHS

- The clinical departments have a longstanding tradition for designing and implementing national and international investigator initiated clinical trials including phase 1-2 studies
- We are systematically conducting high impact translational research in connection to these trials
- The Finsen laboratory have performed outstanding studies of the role of leukemia stem cells in mouse models and are currently expanding these studies to human leukemic stem cells

WEAKNESSES

- We are dealing with rare diseases and are challenged by having few patients of each category at each hospital (Roskilde, Herlev, Rigshospitalet)
- Lack of infrastructure for research cooperation between the three departments
- A tradition of competition instead of cooperation between the three departments
- There is no tenured professor appointed by IKM in clinical haematology

SWOT

OPPORTUNITIES

- To coordinate and integrate research in the three clinical departments and the Finsen laboratory
- To create a clinical academic group in translational haematology that includes all three clinical departments, the Finsen laboratory/ Biotech Research & Innovation Centre (BRIC) and biotech companies
- To attract funding and highly qualified staff in a joint project

THREATS

- Political reluctance to support a united research structure among the four institutions
- Decreased funding and support for research in the clinical departments
- Lack of time for research for clinicians due to a significantly increased practical workload for MDs in the hospitals in general and particularly with the implementation of EPIC

Scientific Production

Internal Medicine: Haematology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	42	6.0	49	7.4	41	6.3
Review papers - International			3			
Letters - International	1	12.1	2		1	3.6
Original scientific research papers - Danish	2	0.1	1	0.1	1	0.1
Total	45	5.9	55	7.2	43	6.0

3 most prominent publications from 2016

1. Pundhir S, Bagger FO, Lauridsen FB, Rapin N, Porse B. Peak-valley-peak pattern of histone modifications delineates active regulatory elements and their directionality. *Nucleic Acids Res* 2016;44:4037-51.
2. Hansen JW, Westman MK, Sjö LD, Saft L, Kristensen LS, Ørskov AD, Treppendahl M, Andersen MK, Grønbaek K. Mutations in idiopathic cytopenia of undetermined significance assist diagnostics and correlate to dysplastic changes. *Am J Hematol* 2016;91:1234-8.
3. Liu M, Ohtani H, Zhou W, Ørskov AD, Charlet J, Zhang YW, Shen H, Baylin SB, Liang G, Grønbaek K, Jones PA. Vitamin C increases viral mimicry induced by 5-aza-2'-deoxycytidine. *Proc Natl Acad Sci U S A* 2016;113:10238-44.

INTERNAL MEDICINE: NEPHROLOGY

REPRESENTING PROFESSOR: BO FELDT-RASMUSSEN

DESCRIPTION OF THE SPECIALITY

Metabolic aspects of chronic kidney disease (CKD). Cause and consequences including diabetes. To a large extent, many patients with CKD without diabetes have glucometabolic disturbances in terms of impaired glucose tolerance or impaired fasting B-glucose. More than 20% of patients in end stage renal disease, i.e. in dialysis or transplanted, have or develop new onset diabetes. Diabetes and prediabetes are contributing to the very high cardiovascular morbidity and mortality in CKD. One of our research groups has a long lasting scientific interest in this complex problem. They study aspects of the metabolic syndrome using various clamp techniques to explore the role of insulin sensitivity, the beta cell function and the incretin hormone axis as well as the effect of new treatments (Incretin based, SGLT2) and the possible pathophysiological basis for their effect on development and progression of diabetic nephropathy and cardiovascular disease. More centres are involved in intervention studies and continuous blood glucose measurement.

Transplantation. At Rigshospitalet we do research on infectious complications in renal transplantation. We also have ongoing projects on renal transplantation in the elderly as well as immunological aspects of renal transplantation and mechanisms of rejection in renal transplantation. Other areas of focus are renal transplantation in immunologically high-risk patients and endocrine complications to renal transplantation. The hospital department continuously participate in international multicentre studies in various fields of renal transplantation.

Calcium-metabolic changes in CKD, including PTH and Klotho. The experimental nephro-endocrine lab at Rigshospitalet has a long lasting scientific interest in basic physiology and pathophysiology related to regulation and interaction of the hormones and ions (calcium, phosphorus, PTH, 1,25(OH)vit D, FGF23, Klotho and BMP-7 and other) involved in the process of ageing and in the disturbances in mineral metabolism, vascular calcification and renal osteodystrophy in uraemia.

Cardiovascular complications including vascular calcifications (Cohort study of 1,000 CKD patients). We are currently establishing a unique cohort of 1,000 patients with varying degrees of chronic kidney dysfunction (The CPH CKD cohort). Medical history, lifestyle parameters, medications and side effects are retrieved from patient interviews, clinical examination and electronic medical records. A biobank with blood and urine samples is currently being generated. Furthermore, CT scanning of the major arterial regions, echocardiography, and ultrasound of the carotid arteries are conducted to assess arterial calcifications, cardiac dysfunction and atherosclerotic plaque burden. Specific goals are to improve early diagnostics and treatment of CVD in CKD and to identify molecular mechanisms that accelerate vascular disease in CKD. The project is based on a strong ongoing collaboration between national and international basic and clinical researchers.

Clinical trials. Investigator initiated multicentre intervention trials of new or old interventions such as intervention with Tolvaptan, magnesium, low phosphate diet and others.

Clinical nephrology. Quality development projects. Optimized treatment of hypertension, dyslipidaemia including intervention on lifestyle focusing on compliance and adherence of the patients. Studies of nutrition and in particular high protein intake.

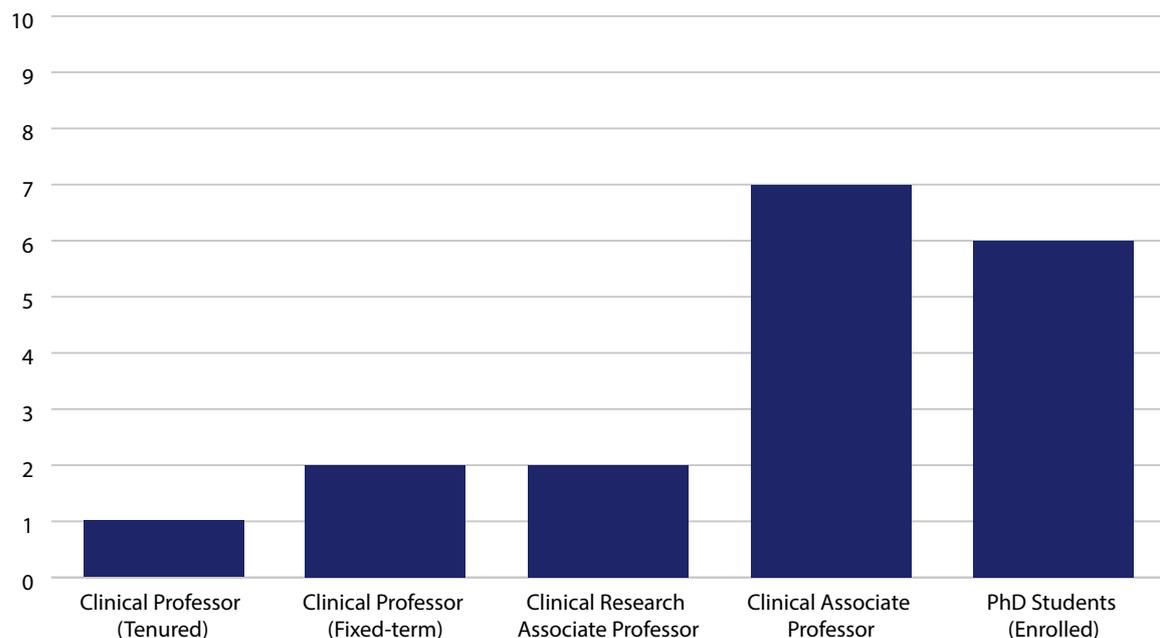
Registry studies. The national registry including all Danish patients with End-stage Renal Disease (ESRD) and in dialysis or transplanted is used in many studies. Endocarditis in ESRD patients, antithrombotic treatment of atrial fibrillation in patients with CKD and numerous other studies.

Vasculitis. Nephrologists at the Rigshospitalet have a long lasting research interest on a high

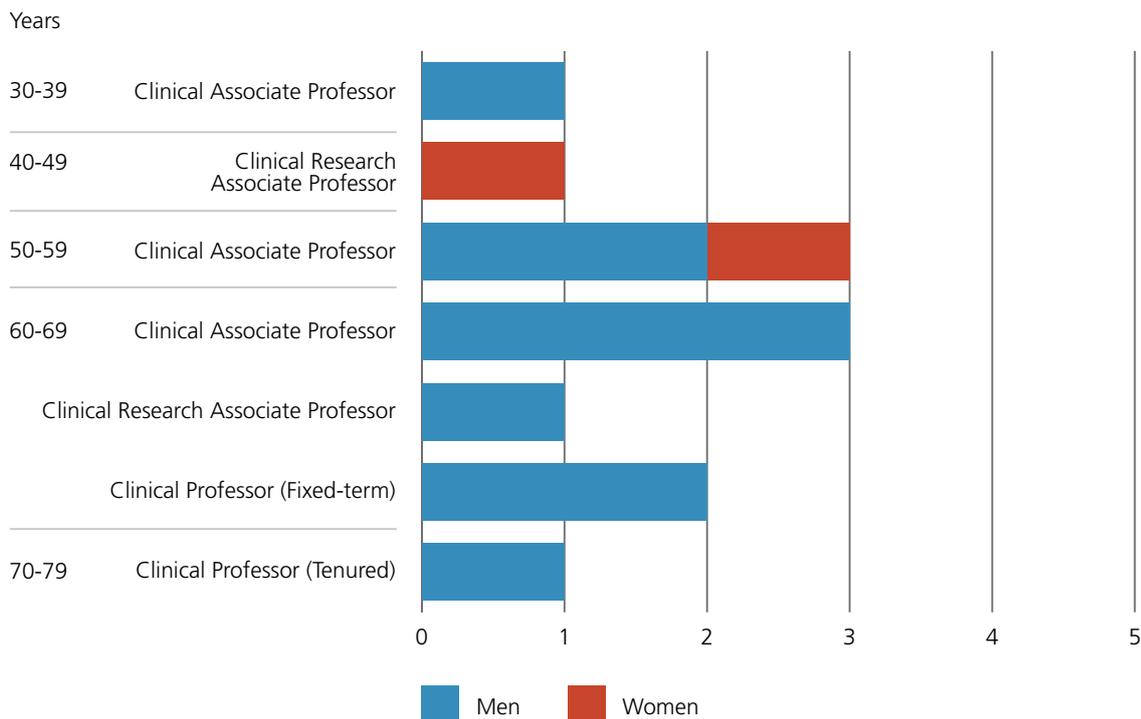
international level of effects of apheresis on acute vasculitis. We take part in the ongoing frontline intervention studies in acute and severe vasculitis such as Pexivas and new trials with Ides in Goodpastures and Advocate phase 3 study on CCX168, an oral C5a receptor inhibitor in AAV.

AKI. Acute Kidney Injury. In collaboration with the Danish Society of Nephrology an app for use in AKI has been developed. There will be research based on the implementation on this. We are also active in research together with the Intensive Care Units regarding AKI.

Academic Staff in Internal Medicine: Nephrology – Headcount



Academic Staff in Internal Medicine: Nephrology – Age and gender distribution



STRENGTHS

- The five centres in the region all report to the National Registry of all Danish patients with end-stage renal disease (ESRD). This is excellent for research purposes
- There are at least five different research labs with focus on different aspects of kidney disease
- At least one center (Rigshospitalet) is strongly associated with the Persimune biobank and database, promoting research in the field

WEAKNESSES

- Administration of funding is laborious and the overhead of funding is increasing
- Students and young doctors have to rush through the different stages of education with difficulties in taking leave for research
- The clinical workload of the senior doctors is increasing leaving only little time for research

SWOT

OPPORTUNITIES

- There is an increasing number of professors, associate professors and doctors with scientific merits and PhD degrees
- There is interest and willingness to collaborate between clinical centres on clinical projects

THREATS

- Major clinical workload in all places and it is getting worse over the past years
- Funding is difficult to obtain and the applications from other specialities are extremely competitive
- Access to clinical databases is difficult and at present highly controversial due to the Danish legislation

Scientific Production

Internal Medicine: Nephrology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	17	3.9	18	4.7	26	4.2
Review papers - International			1		1	4.7
Letters - International	1					
Original scientific research papers - Danish	2	0.1				
Total	20	3.4	19	4.7	27	4.2

3 most prominent publications from 2016

1. Idorn T, Knop FK, Jørgensen MB, Jensen T, Resuli M, Hansen PM, Christensen KB, Holst JJ, Hornum M, Feldt-Rasmussen B. Safety and Efficacy of Liraglutide in Patients With Type 2 Diabetes and End-Stage Renal Disease: An Investigator-Initiated, Placebo-Controlled, Double-Blind, Parallel-Group, Randomized Trial. *Diabetes Care* 2016;39:206-13.
2. Engberg H, Wehberg S, Bistrup C, Heaf J, Sørensen SS, Thiesson HC, Hansen JM, Svensson M, Green A, Marckmann P. Cancer risk and mortality after kidney transplantation: a population-based study on differences between Danish centres using standard immunosuppression with and without glucocorticoids. *Nephrol Dial Transplant* 2016;31:2149-56.
3. Halden TA, Egeland EJ, Åsberg A, Hartmann A, Midtvedt K, Khiabani HZ, Holst JJ, Knop FK, Hornum M, Feldt-Rasmussen B, Jenssen T. GLP-1 restores altered insulin and glucagon secretion in posttransplantation diabetes. *Diabetes Care* 2016;39:617-24.

INTERNAL MEDICINE: RESPIRATORY MEDICINE

REPRESENTING PROFESSOR: VIBEKE BACKER

DESCRIPTION OF THE SPECIALITY

Respiratory medicine has many possibilities as the field includes:

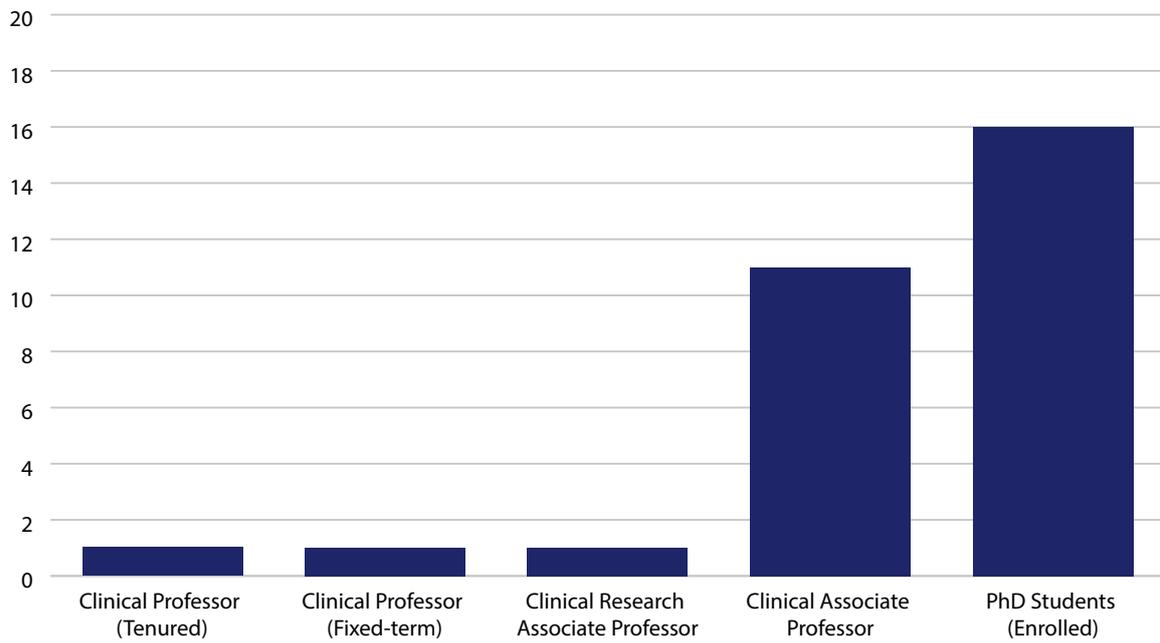
- Immunology with cytokine cell count in sputum, blood and washing fluid from the lungs and use of new biologic drugs
- Allergology with immunotherapy and basic research
- Respiratory physiology with use of a huge number of different lung function measurements
- Acute as well as elective patients

The field covers patients with severe chronic illness such as severe Chronic Obstructive Pulmonary Disease (COPD), severe asthma and severe interstitial lung diseases. Furthermore,

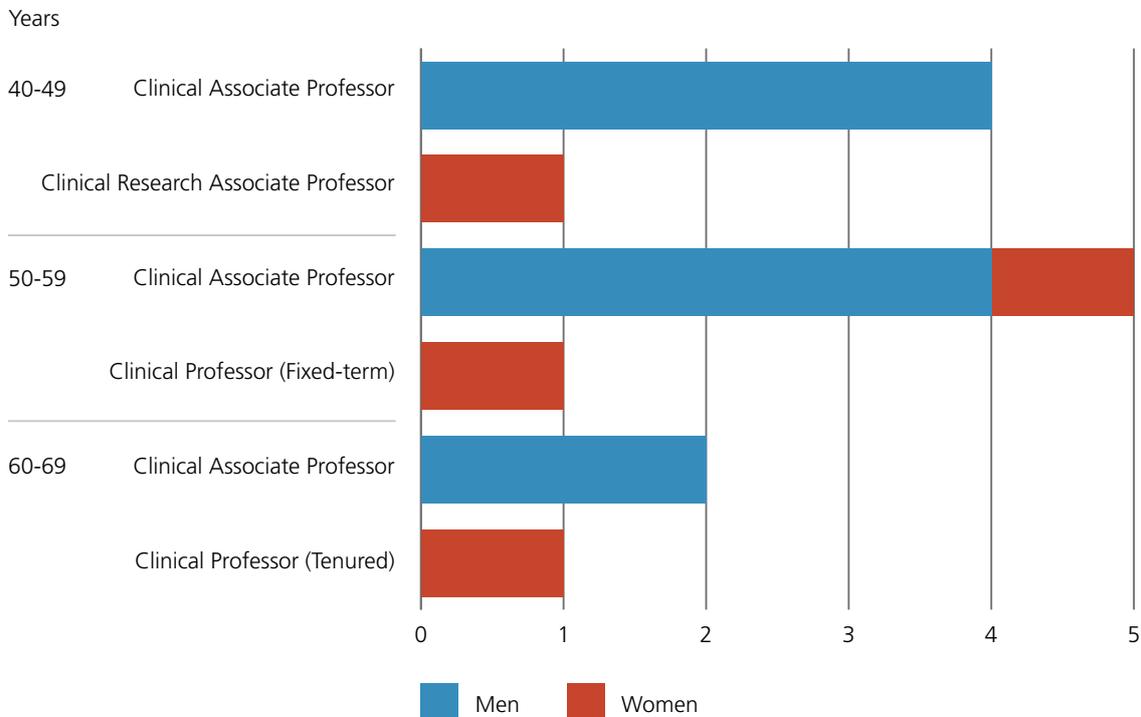
respiratory medicine also has younger patients with pregnancy-related respiratory problems, sports-related respiratory problems and infections such as tuberculosis and bronchiectasis. Lastly, the respiratory field also includes lung cancer diagnostics, which attract physicians with surgical skills as the evaluation of patients with possible cancer includes bronchoscopy, thoracoscopy and different kinds of needle biopsies including use of ultrasound.

In the caretaking of the acute patients with respiratory insufficiency most hospital departments have included the possibility of non-invasive ventilation, judgement of arterial gasses and terminal care.

Academic Staff in Internal Medicine: Respiratory Medicine – Headcount



Academic Staff in Internal Medicine: Respiratory Medicine – Age and gender distribution



STRENGTHS

- Large number of patients
- Broad specialty – covers acute, invasive and highly specialized activities
- Diversity in treatment possibilities
- Large pipeline with new primarily biologic therapies
- Although few academic physicians, those who are in the field have both Nordic and European impact
- More young physicians in training to respiratory medicine have a PhD or obtain one before becoming specialist than 5-10 years ago

WEAKNESSES

- Few senior specialists in academic work
- Few academic physicians are a part of national and international boards of funding
- Many patients with both acute and recurrent admissions - with high number of patients arriving out of office hours
- High morbidity, many hospitalizations - Costly group
- Modest tradition for academic development during the clinical work
- Few in the middle generation of respiratory physicians, including consultants employed in recent years, have an academic degree such as PhD. Few from this generation are continuously publishing papers

SWOT

OPPORTUNITIES

- An increasing number of young physicians are recruited for respiratory medicine
- Fast growing, strong research groups gaining international recognition in interstitial lung disease, asthma and COPD
- Pharmaceutical companies support research in respiratory medicine
- Many available positions for the coming physicians at the hospitals

THREATS

- Little dedicated funding available for respiratory medicine
- Pharmaceutical companies support research in respiratory medicine, directed towards treatment possibilities
- Leaderships mainly focus on clinical work, and not academic work
- Younger physicians are attracted to other specialties than respiratory medicine due to the profile of the speciality, e.g. more are trying to become cardiologists than respiratory physicians

Scientific Production

Internal Medicine: Respiratory Medicine	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	42	3.7	44	3.2	47	9.4
Review papers - International	1	5.6				
Letters - International			1	12.5		
Original scientific research papers - Danish	7	0.1	5	0.1	3	0.1
Total	50	3.1	50	3.1	50	9.0

3 most prominent publications from 2016

1. Sverrild A, Kiilerich P, Brejnrod A, Pedersen R, Porsbjerg C, Bergqvist A, Erjefält JS, Kristiansen K, Backer V. Eosinophilic airway inflammation in asthmatic patients is associated with an altered airway microbiome. *J Allergy Clin Immunol* 2016;29:S0091-6749(16)32475-7.
2. Ali Z, Nilas L, Ulrik CS. Low risk of adverse obstetrical and perinatal outcome in pregnancies complicated by asthma: A case control study. *Respir Med* 2016;120:124-30.
3. Wille MM, Thomsen LH, Petersen J, de Bruijne M, Dirksen A, Pedersen JH, Shaker SB. Visual assessment of early emphysema and interstitial abnormalities on CT is useful in lung cancer risk analysis. *Eur Radiol* 2016;26:487-94.

INTERNAL MEDICINE: RHEUMATOLOGY

REPRESENTING PROFESSOR: MIKKEL ØSTERGAARD

DESCRIPTION OF THE SPECIALITY

The research areas addressed by the speciality of rheumatology are, as the clinical speciality, widespread.

They cover:

- Inflammatory joint diseases (such as rheumatoid arthritis, psoriatic arthritis, spondyloarthritis, gout)
- Systemic autoimmune diseases (such as vasculitis and systemic lupus erythematosus)
- Degenerative diseases (such as osteoarthritis and degenerative spine disease)
- Sports medicine (such as adaptation of connective tissue and skeletal muscle to physical activity, immobilization and ageing)
- Clinical physiotherapy, e.g. inpatient and outpatient rehabilitation in rheumatic diseases and studies of the aetiology of injuries of muscle and tendons)

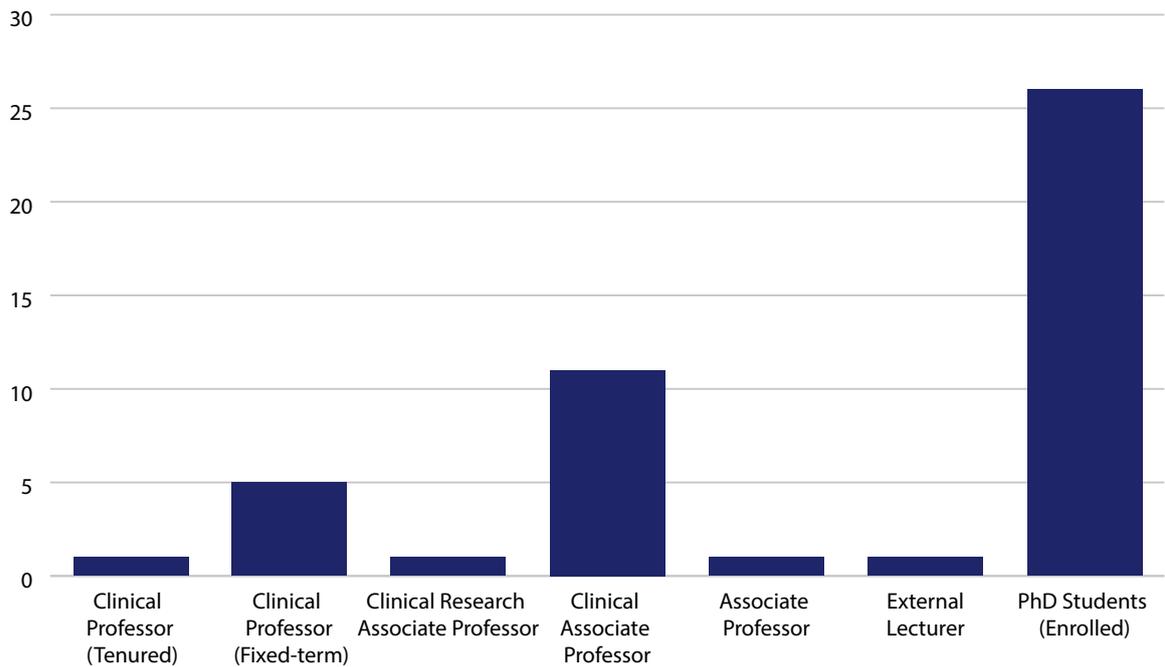
The research is carried out in a broad national and international research collaboration.

Research methodologies include:

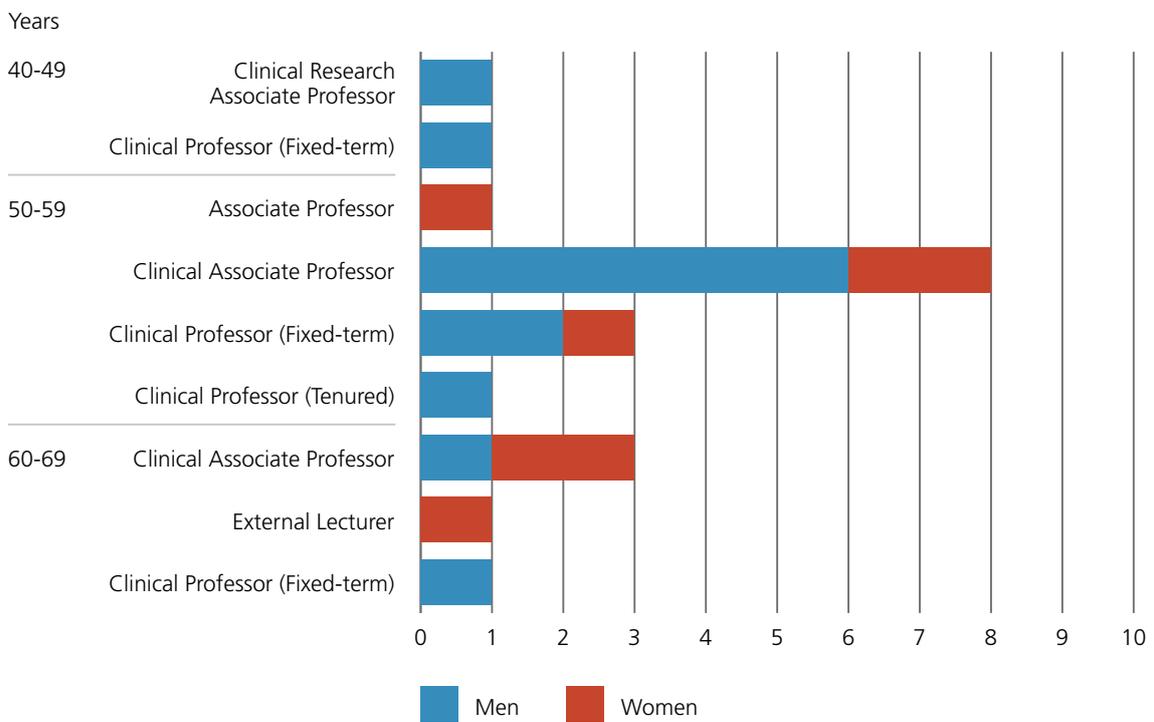
- Investigator initiated RCT's of optimized treatment strategies, e.g. in rheumatoid arthritis, spondyloarthritis and osteoarthritis
- Clinical cohort studies, e.g. in systemic lupus erythematosus, spondyloarthritis and psoriatic arthritis)
- Clinical studies of rehabilitation and the interaction between physiotherapy and pharmacological therapies

- Epidemiological studies, incl. the use of registries such as DANBIO and COPspine, e.g. of treatment efficacy, adverse events, comorbidities and surgery
- Studies of the pathogenesis of autoimmune rheumatic diseases and their comorbidities, e.g. through studies of the innate and adaptive immunity
- Research in diagnostic methods (e.g. ultrasonography, MRI, soluble biomarkers incl. via Danish Rheuma Biobank and diagnostic algorithms)
- Multi-disciplinary research, focusing on the patient perspective in a combination of different research methods (surveys, clinical intervention studies, qualitative methods), e.g. focusing on physical activity and inactivity, sedentary behaviour, smoking and sleep patterns
- Research in outcome measures in clinical trials and practice (e.g. ultrasonography, MRI, soluble biomarkers, incl. via Danish Rheuma Biobank, composite measures, patient-reported outcomes)
- Basic and translational research, e.g. of peptidylarginine deiminase as biomarker and therapeutic target in rheumatoid arthritis
- Sports medicine studies, e.g. of physiological and pathophysiological adaptation of tendon tissue in relation to overuse injury and revealing the mechanisms responsible for age-related loss of muscle mass and altered connective tissue

Academic Staff in Internal Medicine: Rheumatology – Headcount



Academic Staff in Internal Medicine: Rheumatology – Age and gender distribution



STRENGTHS

- Large group, high productivity, good organization (COPECARE: Global Excellence in Health & EULAR Centre of Excellence in Rheumatology)
- Quick implementation of research results in clinical practice
- Different complementing groups (Copenhagen Center for Arthritis Research (COPECARE), Lupus and Vasculitis unit, Institute for Inflammation Research (lab))
- Researchers located in vicinity of clinicians (and most do clinical work)
- Support from head of department
- Comprehensive biobank and database on the larger rheumatological diseases allowing for close monitoring of treatment (DANBIO, COPspine)
- Research in early diagnosis and sensitive monitoring with imaging modalities
- Research in physiological-molecular approach to tissue changes
- Interventional studies on degenerative diseases, such as osteoarthritis

WEAKNESSES

- Research in degenerative spine diseases in general and research in spine surgery in particular (no professor)

SWOT

OPPORTUNITIES

- One department in the Capital Region
- Increased collaboration
- One common organisation
- Better infrastructure (create research facilities/ mutual supporting staff)

THREATS

- One department, split on many addresses
- EPIC (Sundhedsplatformen)
- Reduced research funding in Denmark

Scientific Production

Internal Medicine: Rheumatology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	129	4.2	103	4.3	110	5.1
Review papers - International			1		2	5.5
Letters - International	1	12.4	1	12.4	2	12.4
Original scientific research papers - Danish	2	0.1	1	0.1	3	0.1
Total	132	4.2	106	4.3	117	5.1

3 most prominent publications from 2016

1. Heinemeier KM, Schjerling P, Heinemeier J, Møller MB, Krogsgaard MR, Grum-Schwensen T, Petersen MM, Kjaer M. Radiocarbon dating of adult human articular cartilage shows minimal collagen turnover in both healthy and osteoarthritic tissue. *Sci Transl Med* 2016;8:346-56.
 2. Baker JF, Conaghan PG, Emery P, Baker DG, Østergaard M. Validity of early MRI structural damage end points and potential impact on clinical trial design in rheumatoid arthritis. *Ann Rheum Dis* 2016;75:1114-9.
 3. Dreyer L, Magyari M, Laursen B, Cordtz RL, Sellebjerg F, Loch H. Risk of multiple sclerosis during tumour necrosis factor inhibitor treatment for arthritis: a population-based study from DANBIO and the Danish multiple sclerosis registry. *Ann Rheum Dis* 2016;75:785-6.
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NEUROLOGY

REPRESENTING PROFESSOR: GITTE MOOS KNUDSEN

DESCRIPTION OF THE SPECIALITY

The Neurology speciality covers all research areas within neurology and neurophysiology. Neurology currently employs 20 professors, most of them are specialists in neurology. In 2015, the total external funding was DKK >100 million. Neurology research is conducted at Rigshospitalet and at hospitals in Bispebjerg, Dianalund, Herlev, Hillerød, Hvidovre and Roskilde.

Rigshospitalet constitutes the largest hospital department of neurology and it has the largest research output. Rigshospitalet represents the following research areas, where basic and clinical research goes hand in hand:

- Dementia and other neurodegenerative disorders
- Epilepsy
- Headache/migraine
- Multiple sclerosis/neuroinflammatory disorders
- Neurobiology and neuroimaging
- Neurointensive care
- Neuromuscular disorders

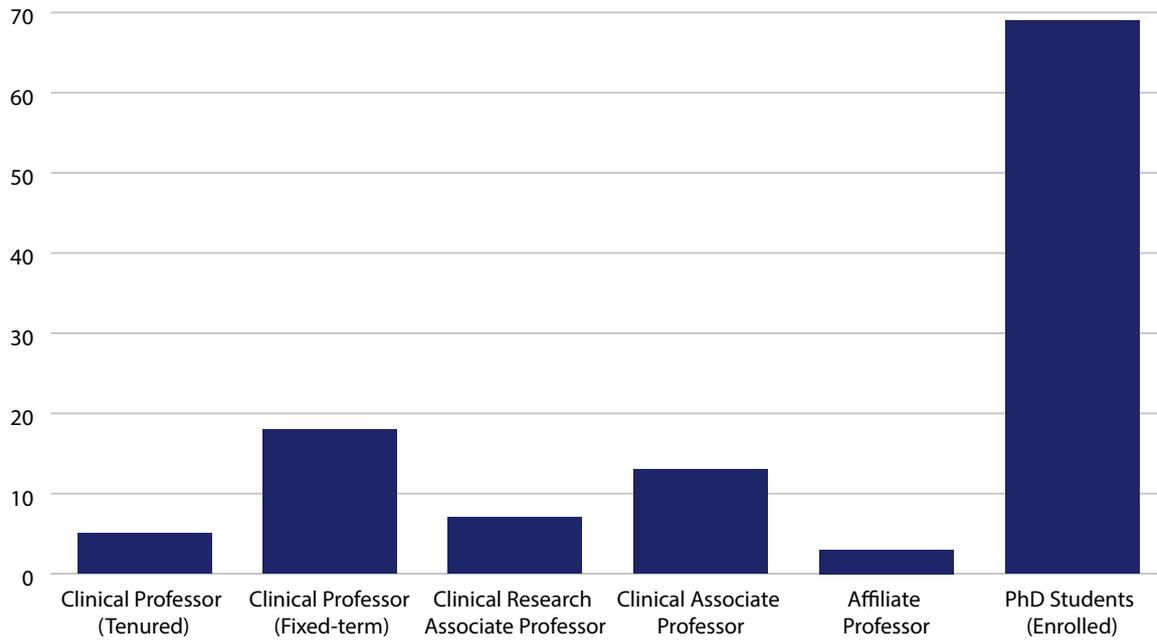
- Neurophysiology
- Sleep disorders
- Stroke/cerebrovascular disorders
- Traumatic brain and spinal cord injuries

For many areas, a close collaboration between scientists at the University of Copenhagen and clinicians exist.

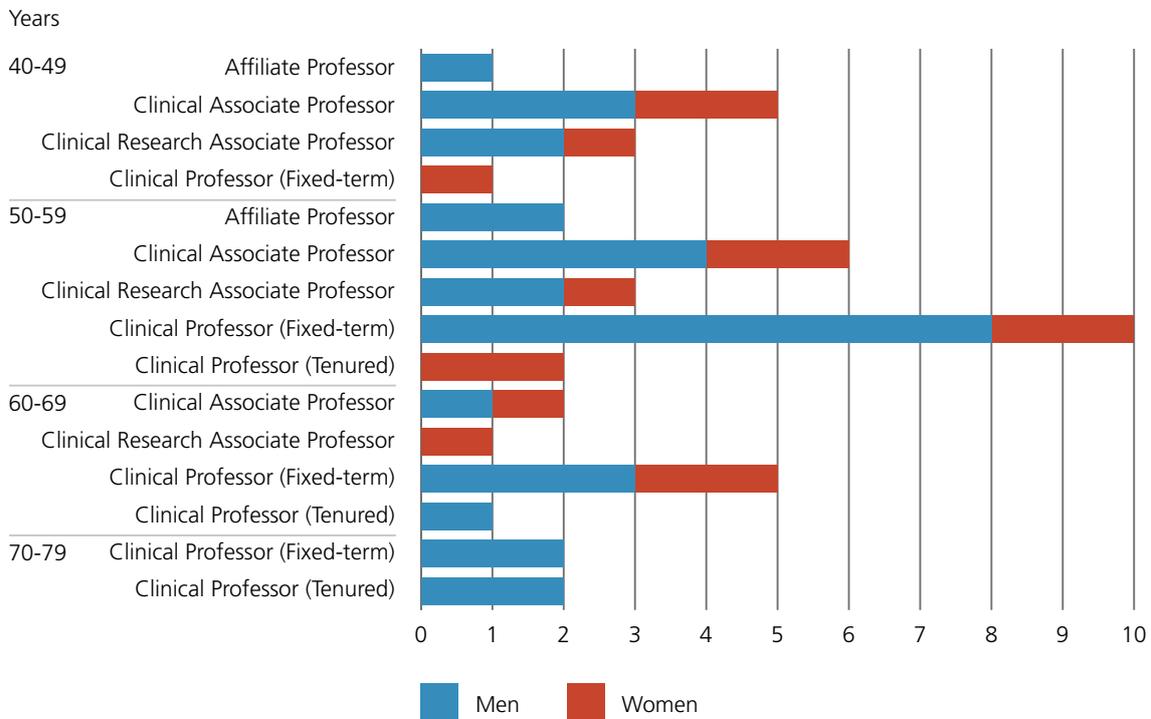
Bispebjerg Hospital focuses particularly on movement disorders, stroke and post-mortem brain tissue examinations; Dianalund Hospital on epilepsy; Herlev and Hillerød hospitals on cerebrovascular disorders. Hvidovre Hospital has a long tradition for excellent work within neuroimaging, although the hospital does not treat patients with brain disorders anymore. Zealand University Hospital, Roskilde has a special focus on dementia and electrophysiological (EEG) recordings.

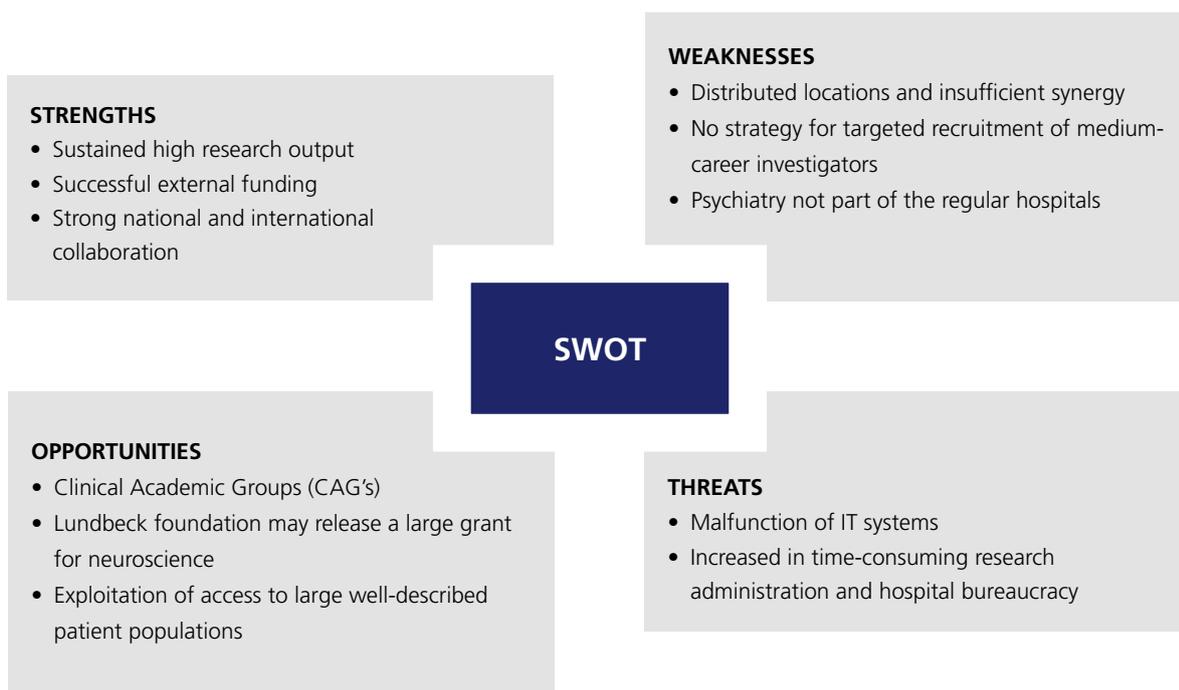
Neurology intimately collaborates with Psychiatry, but also with several other fields within medicine, largely depending upon the subspeciality.

Academic Staff in Neurology – Headcount



Academic Staff in Neurology – Age and gender distribution





Scientific Production

Neurology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	251	5.0	247	6.3	289	5.0
Review papers - International	5	9.2			2	3.6
Letters - International			3	1.6	2	9.4
Original scientific research papers - Danish	12	0.1	5	0.1	7	0.1
Letters - Danish					1	0.1
Total	268	4.8	255	6.1	301	4.9

3 most prominent publications from 2016

1. Gormley P, Anttila V, Winsvold BS, Palta P, Esko T, Pers TH, Farh KH, Cuenca-Leon E, Muona M, Furlotte NA, Kurth T, Ingason A, McMahon G, Ligthart L, Terwindt GM, Kallela M, Freilinger TM, Ran C, Gordon SG, Stam AH, Steinberg S, Borck G, Koironen M, Quaye L, Adams HH, Lehtimäki T, Sarin AP, Wedenoja J, Hinds DA, Buring JE, Schürks M, Ridker PM, Hrafnsdottir MG, Stefansson H, Ring SM, Hottenga JJ, Penninx BW, Färkkilä M, Artto V, Kaunisto M, Vepsäläinen S, Malik R, Heath AC, Madden PA, Martin NG, Montgomery GW, Kurki MI, Kals M, Mägi R, Pärn K, Hämäläinen E, Huang H, Byrnes AE, Franke L, Huang J, Stergiakouli E, Lee PH, Sandor C, Webber C, Cader Z, Muller-Myhsok B, Schreiber S, Meitinger T, Eriksson JG, Salomaa V, Heikkilä K, Loehrer E, Uitterlinden AG, Hofman A, van Duijn CM, Cherkas L, Pedersen LM, Stubhaug A, Nielsen CS, Männikkö M, Mihailov E, Milani L, Göbel H, Esserlind AL, Christensen AF, Hansen TF, Werge T, International Headache Genetics Consortium, Kaprio J, Aromaa AJ, Raitakari O, Ikram MA, Spector T, Järvelin MR, Metspalu A, Kubisch C, Strachan DP, Ferrari MD, Belin AC, Dichgans M, Wessman M, van den Maagdenberg AM, Zwart JA, Boomsma DI, Smith GD, Stefansson K, Eriksson N, Daly MJ, Neale BM, Olesen J, Chasman DI, Nyholt DR, Palotie A. Meta-analysis of 375,000 individuals identifies 38 susceptibility loci for migraine. *Nat Genet* 2016;48:856-66.
2. Løkken N, Hedermann G, Thomsen C, Vissing J. Contractile properties are disrupted in Becker muscular dystrophy, but not in limb girdle type 2I. *Ann Neurol* 2016;80:466-71.
3. Steiner T, Poli S, Griebel M, Hüsing J, Hajda J, Freiburger A, Bendszus M, Bösel J, Christensen H, Dohmen C, Hennerici M, Kollmer J, Stetefeld H, Wartenberg KE, Weimar C, Hacke W, Veltkamp R. Fresh frozen plasma versus prothrombin complex concentrate in patients with intracranial haemorrhage related to vitamin K antagonists (INCH): a randomised trial. *Lancet Neurol* 2016;15:566-73.

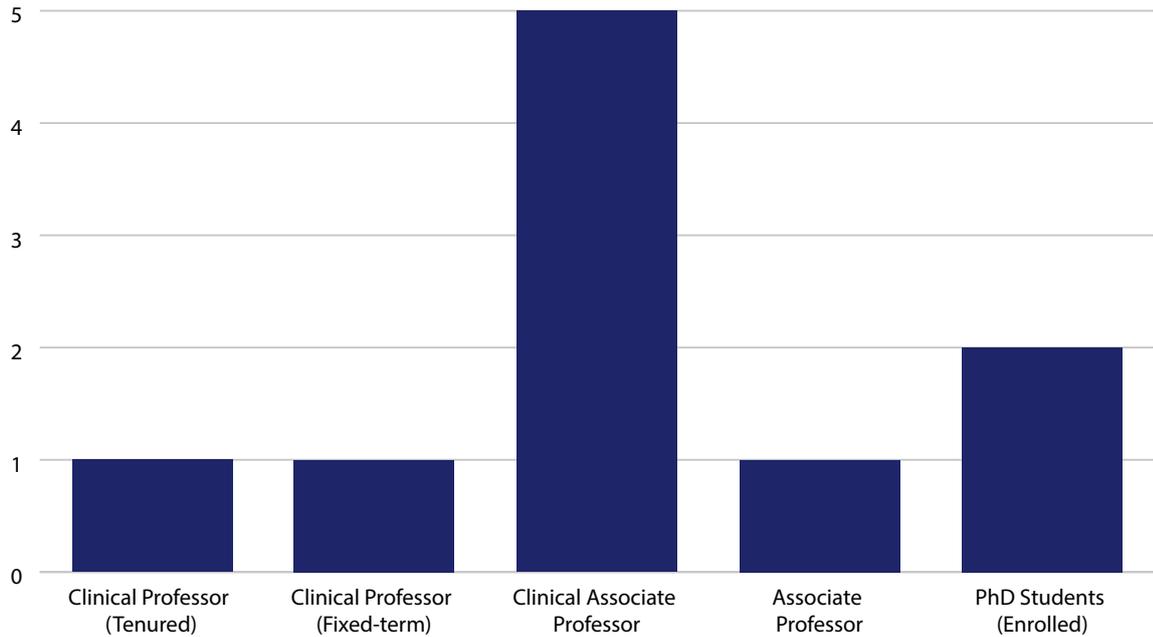
NEUROSURGERY

REPRESENTING PROFESSOR: TIIT MATHIESEN

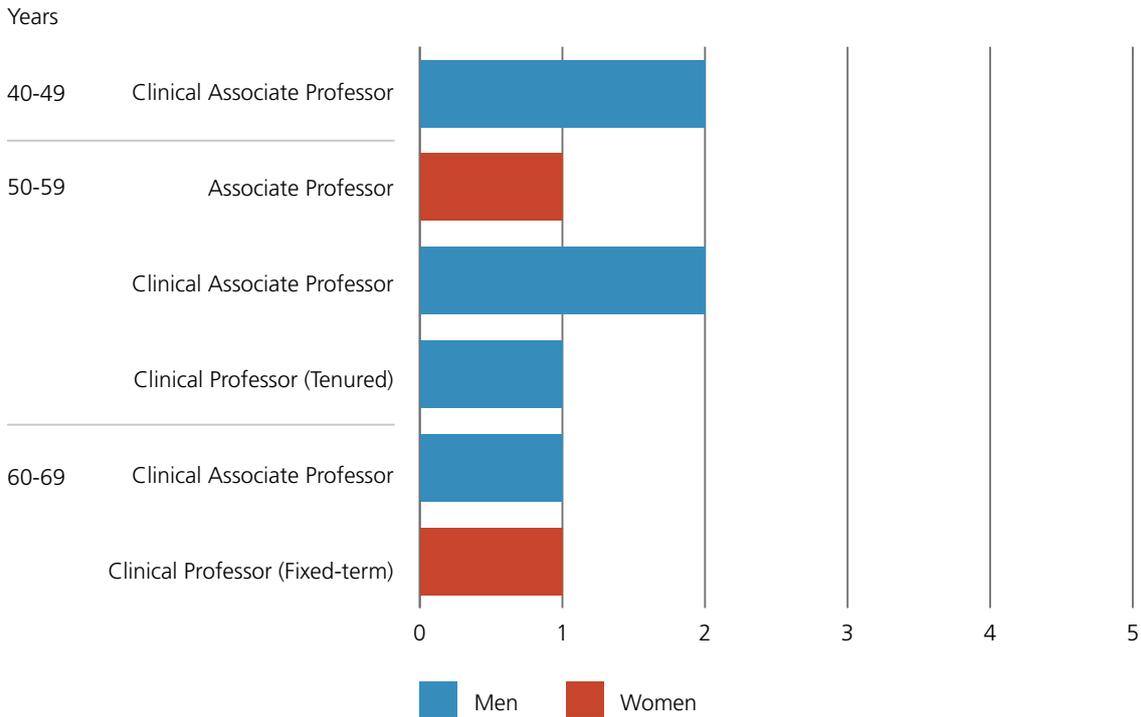
DESCRIPTION OF THE SPECIALITY

- Brain water biomechanics and water transport: Unique multidisciplinary research involving clinical outcome statistics; telemetric methodology; signal analysis and molecular research on brain-water-transport molecules. Clinical and experimental
- Neuro-oncology: Tumour biology as a strongly emerging field. Medical ethics and surgical decision-making. Clinical and in vitro human tissue specimens
- Clinical research in topics of high relevance to neurosurgical management: head trauma, neuro-receptor imaging

Academic Staff in Neurosurgery – Headcount



Academic Staff in Neurosurgery – Age and gender distribution



STRENGTHS

- Unique multidisciplinary research in brain water biomechanics and water transport
- Educational environment
- Many stay in the group after termination of their project
- Collaboration with molecular neurobiology
- Expansion in size and funding

WEAKNESSES

- Relatively small group
- Narrow international collaboration
- One major research line (research in brain water biomechanics and water transport)

SWOT

OPPORTUNITIES

- Research line in neuro-oncology/brain tumour biology is strengthening
- New professor June 1st 2017
- Increasing clinical cohort research in topics of major importance for neurosurgical management

THREATS

- Too rapid expansion
- Competition in tumor biology is very tough

Scientific Production

Neurosurgery	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	8	2.8	15	2.7	12	2.1
Review papers - International					1	2.1
Original scientific research papers - Danish	2	0.1	1	0.1	2	0.1
Total	10	2.3	16	2.4	15	1.8

3 most prominent publications from 2016

1. Rasmussen RD, Gajjar MK, Tuckova L, Jensen KE, Maya-Mendoza A, Holst CB, Møllgaard K, Rasmussen JS, Brennum J, Bartek J Jr, Syrucek M, Sedlakova E, Andersen KK, Frederiksen MH, Bartek J, Hamerlik P. BRCA1-regulated RRM2 expression protects glioblastoma cells from endogenous replication stress and promotes tumorigenicity. *Nat Commun* 2016;7:13398.
2. Andersen-Ranberg NC, Poulsen FR, Bergholt B, Hundsholt T, Fugleholm K. Bilateral chronic subdural hematoma: unilateral or bilateral drainage? *J Neurosurg* 2016;8:1-7.
3. Petersen LG, Petersen JC, Andresen M, Secher NH, Juhler M. Postural influence on intracranial and cerebral perfusion pressure in ambulatory neurosurgical patients. *Am J Physiol Regul Integr Comp Physiol* 2016;310:R100-4.

OBSTETRICS AND GYNAECOLOGY

REPRESENTING PROFESSOR: ØJVIND LIDEGAARD

DESCRIPTION OF THE SPECIALITY

Reproductive medicine. CoNARTaS (Committee of Nordic ART and Safety) is a Nordic collaboration following a cohort of 150,000 children born after assisted conception assessing neonatal morbidity and mortality as compared to spontaneously conceived children. The cohort is now expanded to include 300,000 Nordic ART children born from 1982-2015.

The Repronion is a collaboration between 15 fertility and andrology clinics in Øresund Region, which in 2015 received a EUR 15 million funding from EU/Interreg. 25 PhD studies have been initiated thanks to this donation. We have been in front with ovarian cryopreservation in oncological patients, co-morbidity in polycystic ovary syndrome (PCOS) women and long-term reproductive prognosis in these women. Latest the endometrial receptivity for implantation after in vitro fertilization has become a research focus.

Pharmacoepidemiological research. The short- and long-term influence of hormonal contraception and hormone therapy on the risk of cardiovascular, cancer and psychiatric outcomes have been a focus area of research in the Danish Centre of Human Reproductive Epidemiology (DaHoRs) over two decades.

Foetal medicine. Prenatal diagnosis has been a focus of research in the speciality for decades and has provided empirical results to establish the most modern, cost-effective prenatal diagnosis practice at a national level, securing all Danish citizens a free two-step prenatal screening. The detection rate of foetal chromosome abnormalities in Denmark is consequently the highest worldwide and these data is stored prospectively in a national database.

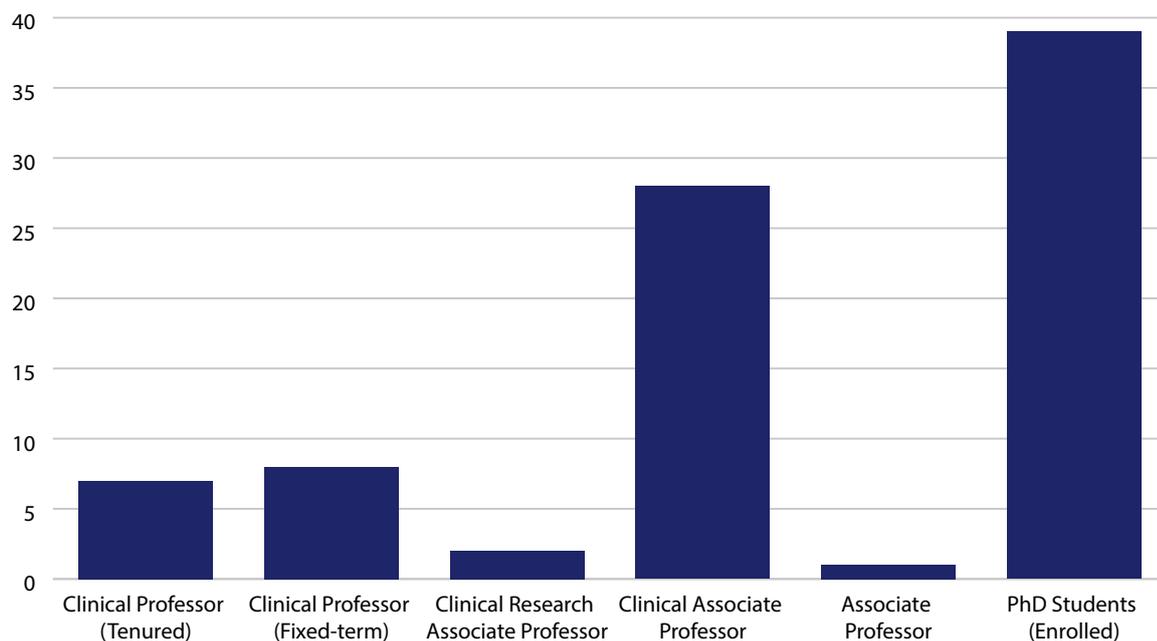
Urogynaecology. In a multidisciplinary co-operation, we are involved in frontline research in advanced urodynamic investigations (reflectometry), urogynaecological cellular therapy and tissue engineering, phase 1 testing of potential new uropharmaca and the development of a new device for non-surgical treatment of urinary incontinence.

Obstetrical research has, through recent years, proved the benefits of a more aggressive induction practice of post-term pregnancies, reducing the risk of stillbirths to the lowest level ever measured worldwide. Research in the fields, e.g. pre-eclampsia, blood type immunization, obstetric training/simulation and physical activity in pregnancy, is ongoing.

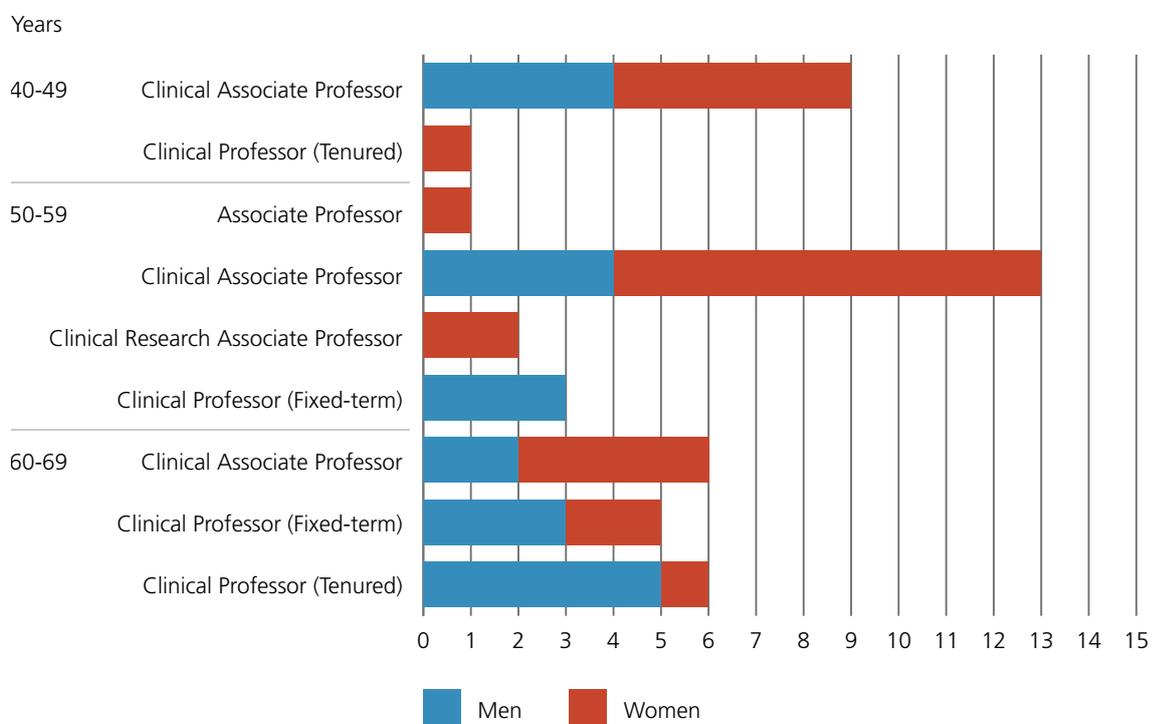
Our frontline research in **diabetes and pregnancy** covers randomized controlled trials, epidemiological studies, clinical research, physiological and epigenetic studies and is targeted optimized treatment of pregnant women with pre-existing diabetes and gestational diabetes. We are also in front in research of long-term consequences for mothers with gestational diabetes and their offspring.

Human papillomavirus (HPV) and gynaecological cancer. A large part of the research is translational and falls within molecular biological epidemiology. Through the establishment of large population-based cohorts with collection of biological samples and information from questionnaires and linkages with nationwide registries, we have obtained results, which have contributed to improved cervical cancer screening strategies, and the development of a vaccine against HPV.

Academic Staff in Obstetrics and Gynaecology – Headcount



Academic Staff in Obstetrics and Gynaecology – Age and gender distribution



Markers of gynaecological cancer detection.

For more than two decades, research has been conducted to improve detection of early ovarian cancer by means of markers or combinations of markers (proteomics) with high sensitivity and specificity for gynaecological cancer detection.

Eight national quality databases monitor and improve clinical practice in areas as gynaecological cancer, urogynaecology, foetal medicine, hysterectomy, hysteroscopic surgeries, deliveries, and early pregnancy besides a long list of scientific contributions.

STRENGTHS

- Unique registry opportunities to assess short long-term outcomes of diseases, surgical interventions or medical treatments at a complete national level
- A unique infrastructure for studies on prenatal screening and its short and long-term consequences for the newborn, for overall population morbidity and for ethical and economical impact for society
- Ideal infrastructure to follow and assess vaccine effects and side effects on a population level with complete follow-up, e.g. HPV-vaccines

WEAKNESSES

- Some bureaucratic barriers to get access to national data
- Hard work and much time used to provide research funding
- Busy clinical work, with limited free time for research for the majority clinicians

SWOT

OPPORTUNITIES

- EU funding
- Too many small scientific groups making it difficult to provide the 'big shot' of funding
- Further elaboration of international scientific networks

THREATS

- Further restrictions in public research funding
- Scientific talents choose clinical work for scientific work due to tight funds
- New data hard- and software actually threatens our complete national recording of discharge diagnoses, surgical procedures, medical treatments and laboratory results

Scientific Production

Obstetrics and Gynaecology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	126	3.3	161	5.1	172	4.4
Review papers - International	2				1	11.2
Letters - International	3	2.2	1	4.7	1	2.8
Original scientific research papers - Danish	7	0.1	12	0.1	9	0.1
Review papers - Danish	3	0.1	2	0.1		
Total	141	3.1	176	4.7	183	4.2

3 most prominent publications from 2016

1. Söderström-Anttila V, Wennerholm UB, Loft A, Pinborg A, Aittomäki K, Romundstad LB, Bergh C. Surrogacy: outcomes for surrogate mothers, children and the resulting families-a systematic review. *Hum Reprod Update*. 2016;22:260-76.
2. Skovlund CW, Mørch LS, Kessing LV, Lidegaard Ø. Association of hormonal contraception with depression. *JAMA Psychiatry* 2016;73:1154-62.
3. Bosch FX, Robles C, Díaz M, Arbyn M, Baussano I, Clavel C, Ronco G, Dillner J, Lehtinen M, Petry KU, Poljak M, Kjaer SK, Meijer CJ, Garland SM, Salmerón J, Castellsagué X, Bruni L, de Sanjosé S, Cuzick J. HPV-FASTER: broadening the scope for prevention of HPV-related cancer. *Nat Rev Clin Oncol* 2016;13:119-32.

OPHTHALMOLOGY

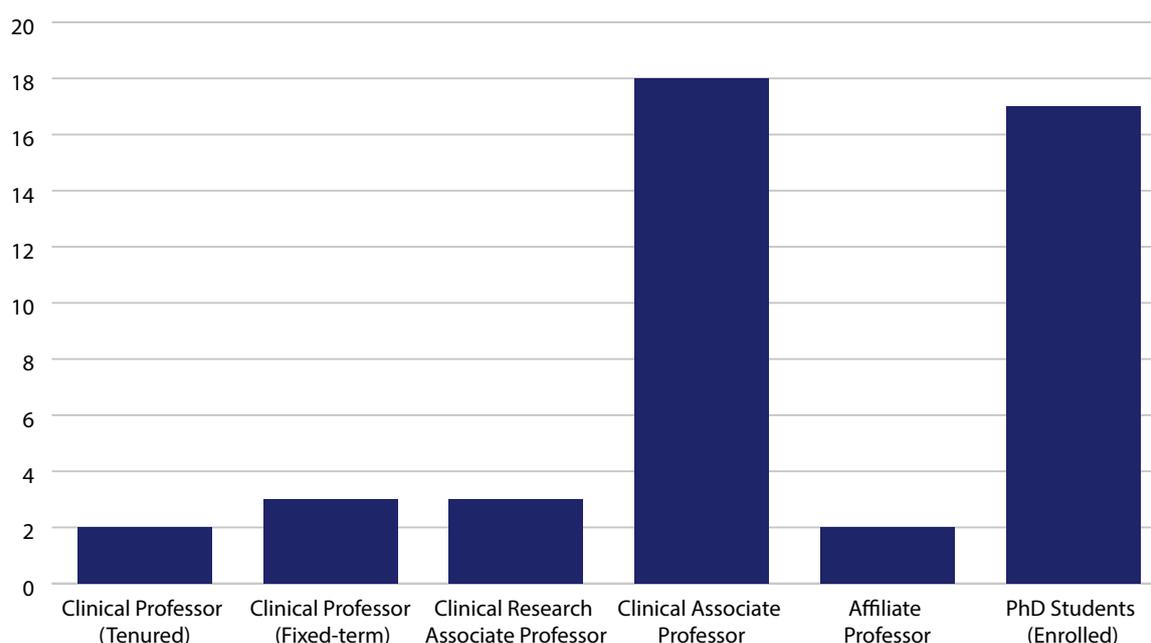
REPRESENTING PROFESSOR: STEFFEN HEEGAARD

DESCRIPTION OF THE SPECIALITY

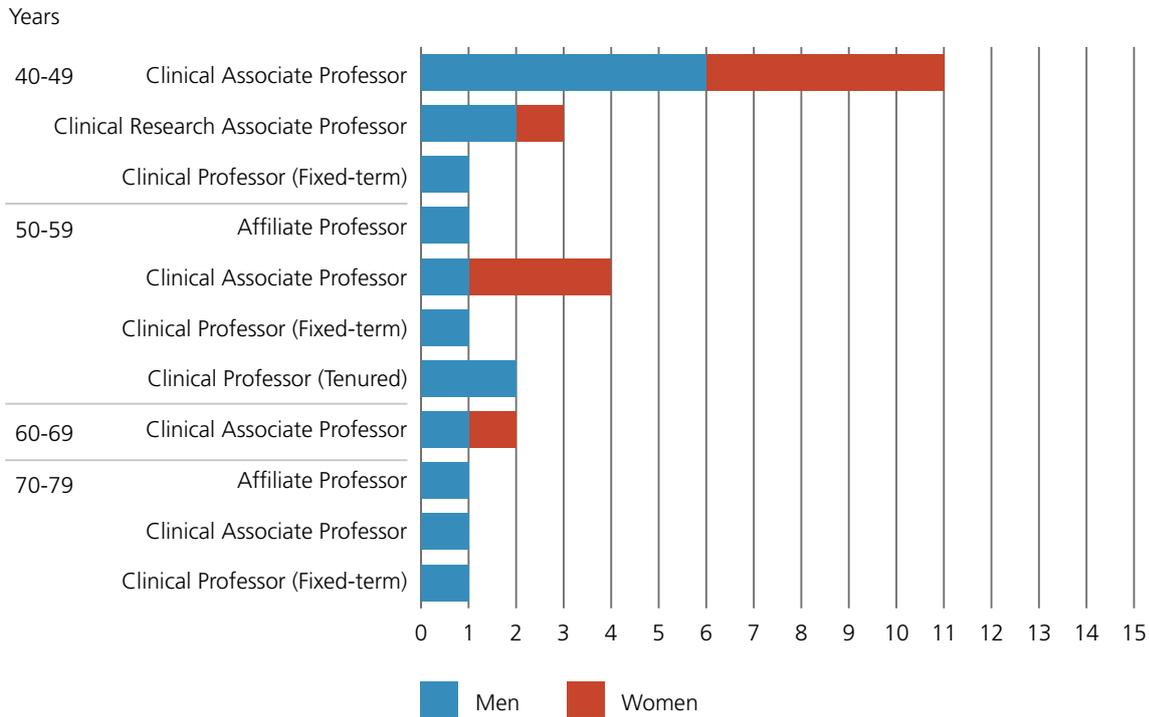
The research areas are the following:

- Clinical research related to patients
- Basic pathophysiological and genetic investigations especially with focus on diabetic retinopathy, neurodegenerative diseases (AMD, retinitis pigmentosa and optic nerve diseases) and oncology
- Drug trials: diabetic retinopathy and neurodegenerative diseases
- Eye pathology where the clinical- and the pathological approaches are combined
- Preclinical animal and cellular translational studies with focus on clinical conditions:

Academic Staff in Ophthalmology – Headcount



Academic Staff in Ophthalmology – Age and gender distribution



STRENGTHS

- Well established research units in close collaboration with the clinic. Both clinical and preclinical (translational) research topics
- Large amount of patients available for the clinical research both pandemic diseases and more specialized genetic diseases with well known genotypes
- Many PhD students. Good possibilities for financing the research

WEAKNESSES

- Few or no postdocs and no with MD PhD degree. No DMSc degrees
- Isolated ophthalmological research
- Strong competition with the busy clinical activity

SWOT

OPPORTUNITIES

- Cellular preclinical studies on specific neurodegenerative ophthalmological disease models
- Gene therapy and stem cell therapy of eye diseases including optic nerve (neurodegenerative diseases) via the vitreous body
- Increasing multidisciplinary clinical activity (genetics, neurology, internal medicine, pediatrics)

THREATS

- The recruitment to ophthalmology is dominated by MD's who want to be full time clinicians
- Ophthalmology is relatively isolated from other specialities

Scientific Production

Ophthalmology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	62	3.3	64	3.6	72	3.3
Review papers - International	2		1		1	7.5
Letters - International	2		3	5.5	2	3.3
Original scientific research papers - Danish	3	0.1	2	0.1		
Total	69	3.1	70	3.6	75	3.4

3 most prominent publications from 2016

1. Stenman L, Persson M, Enlund F, Clasen-Linde E, Stenman G, Heegaard S. Primary orbital precursor T-cell lymphoblastic lymphoma: Report of a unique case. *Mol Clin Oncol* 2016;5:593-5.
2. Kessel L, Andresen J, Tendal B, Erngaard D, Flesner P, Hjortdal J. Toric Intraocular Lenses in the Correction of Astigmatism During Cataract Surgery: A systematic review and meta-analysis. *Ophthalmology* 2016;123:275-86.
3. Rosenberg T, Nørby S, Schwartz M, Saillard J, Magalhães PJ, Leroy D, Kann EC, Duno M. Prevalence and genetics of Leber hereditary optic neuropathy in the Danish population. *Invest Ophthalmol Vis Sci* 2016;57:1370-5.

ORTHOPAEDIC SURGERY

REPRESENTING PROFESSOR: MICHAEL MØRK PETERSEN

DESCRIPTION OF THE SPECIALITY

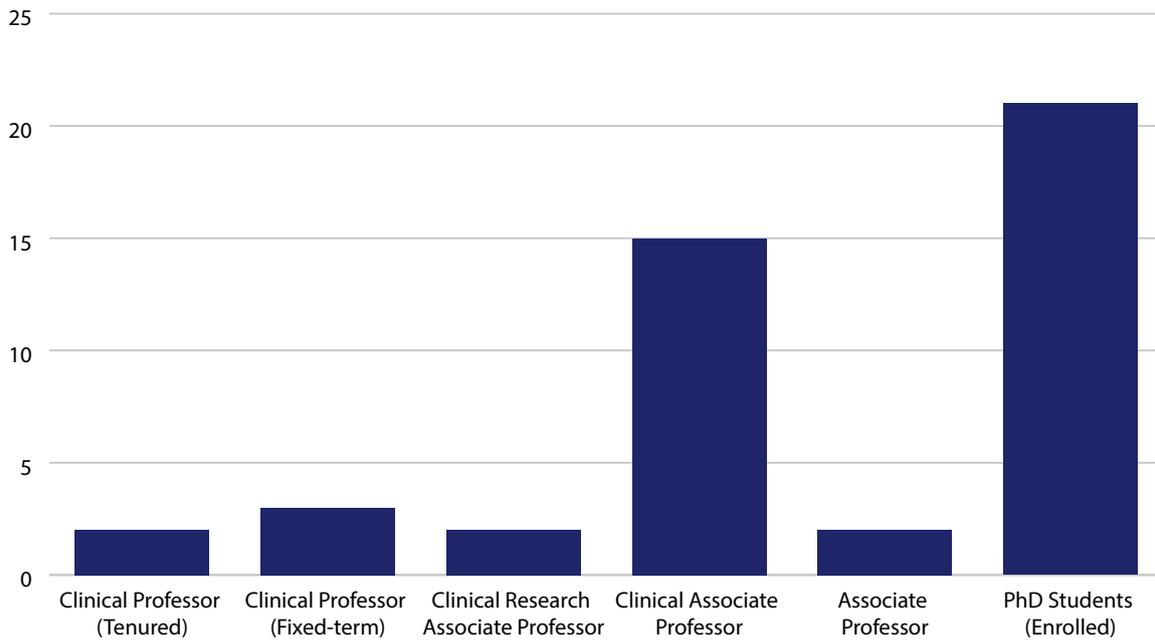
The research focus areas at the various hospital departments of orthopaedic surgery affiliated with the University of Copenhagen vary a lot and reflect the local clinical areas of interest, but major areas are:

- Testing of new developments in knee and hip arthroplasty designs and materials applying special techniques such as RSA radiography and DEXA
- Optimizing treatment strategies in joint replacement surgery (e.g. fast track surgery)
- Various clinical research questions within all areas of orthopaedic surgery are evaluated by means of clinical studies, including RCT's, databases and international multicentre studies

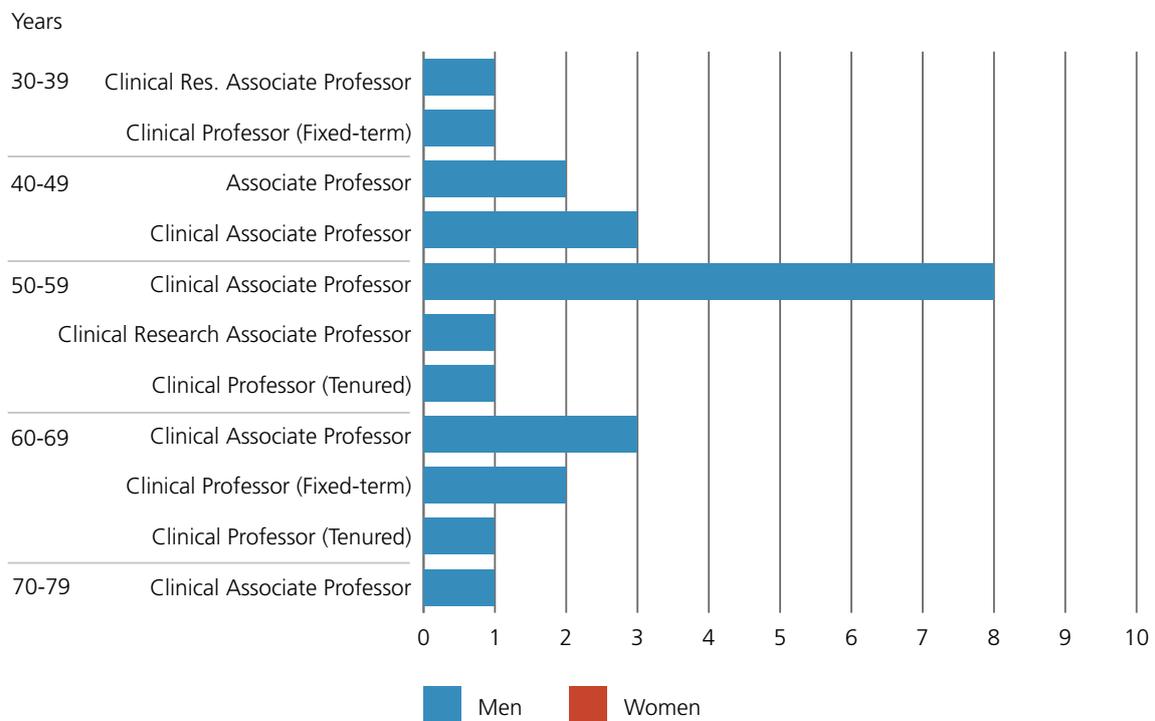
The majority of research projects are conducted within the following areas:

- Hip and knee replacement surgery (Hvidovre Hospital, Rigshospitalet, Herlev and Gentofte Hospital)
- Shoulder and elbow surgery (Herlev and Gentofte Hospital)
- Traumatology (Hvidovre, Rigshospitalet, Herlev and Gentofte Hospital)
- Orthopaedic oncology (Rigshospitalet)
- Hip fractures and fractures in elderly (Bispebjerg Hospital, Hvidovre Hospital, Herlev and Gentofte Hospital)
- Sports traumatology and arthroscopic surgery (Bispebjerg Hospital, Hvidovre Hospital)
- Spinal surgery (Rigshospitalet)
- Paediatric orthopaedics (Hvidovre Hospital, Rigshospitalet)

Academic Staff in Orthopaedic Surgery – Headcount



Academic Staff in Orthopaedic Surgery – Age and gender distribution



STRENGTHS

- The large departments in Copenhagen (Rigshospitalet, Herlev-Gentofte Hospital, Hvidovre Hospital, Bispebjerg Hospital) now have more consultants (clinical professors and clinical research associate professors) with specified research time
- Well-organised research groups have been created in most departments in Copenhagen e.g. Hvidovre Hospital: (SORC-C, CORH), Rigshospitalet (orthopaedic oncology)
- More PhD students working in each department/ research group e.g. Hvidovre Hospital, Rigshospitalet and Herlev-Gentofte Hospital creating a stimulating research environment
- Good opportunities for recruiting patients for clinical studies
- Numerous collaborations with national and international groups

WEAKNESSES

- Dependence on external (including industry) funding
- Lack of organisational visibility
- Much time spent on applying for grants
- Almost no research activities (and publications) in departments outside the Copenhagen area
- Departments outside the Copenhagen area have no consultants with specified research time and no or very few PhD students

SWOT

OPPORTUNITIES

- Regional research meetings could stimulate research collaboration between departments
- More part-time personnel with specified research time could result in a markedly rise of ongoing research activities – especially in hospitals outside the Copenhagen area
- More research groups or departments apply for larger grants together
- Departments or research groups apply for EU funding together with foreign research groups
- New study plan for medical students allowing low cost research personnel
- More technical and administrative assistance to research leaders could free more time for research

THREATS

- Economic – fewer foundations and grants cater to the field
- The risk of political decisions changing the structure of the hospital/department both financially as well as strategically
- More time assigned for administration and documentation resulting in less research time for researchers with full-time or part-time clinical work
- More time spent on various ethical and data security improvement applications
- 15% overhead in the Capital Region of Denmark from January 2016 could lead to decreased external funding

Scientific Production

Orthopaedic Surgery	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	65	3.3	69	3.6	72	3.3
Review papers - International					1	1.9
Letters - International			1		1	5.6
Original scientific research papers - Danish	5	0.6	7	0.1		
Review papers - Danish	1	0.1				
Letters - Danish					1	0.1
Total	71	3.1	77	3.2	75	3.2

3 most prominent publications from 2016

1. Serner A, Weir A, Tol JL, Thorborg K, Roemer F, Guermazi A, Hölmich P. Can standardised clinical examination of athletes with acute groin injuries predict the presence and location of MRI findings? *Br J Sports Med* 2016;50:1541-7.
2. Nielsen CS, Jans Ø, Ørsnes, T, Foss NB, Troelsen A, Husted H. Combined intra-articular and intravenous tranexamic acid reduces blood loss in total knee arthroplasty a randomized, double-blind, placebo-controlled trial. *J Bone Joint Surg Am* 2016;98:835-41.
3. Andersen MR, Winther N, Lind T, Schrøder H, Flivik G, Petersen MM. Monoblock versus modular polyethylene-insert in uncemented total knee arthroplasty – a prospective randomized RSA-study with 2 years of follow-up. *Acta Orthop* 2016;87:607-14.

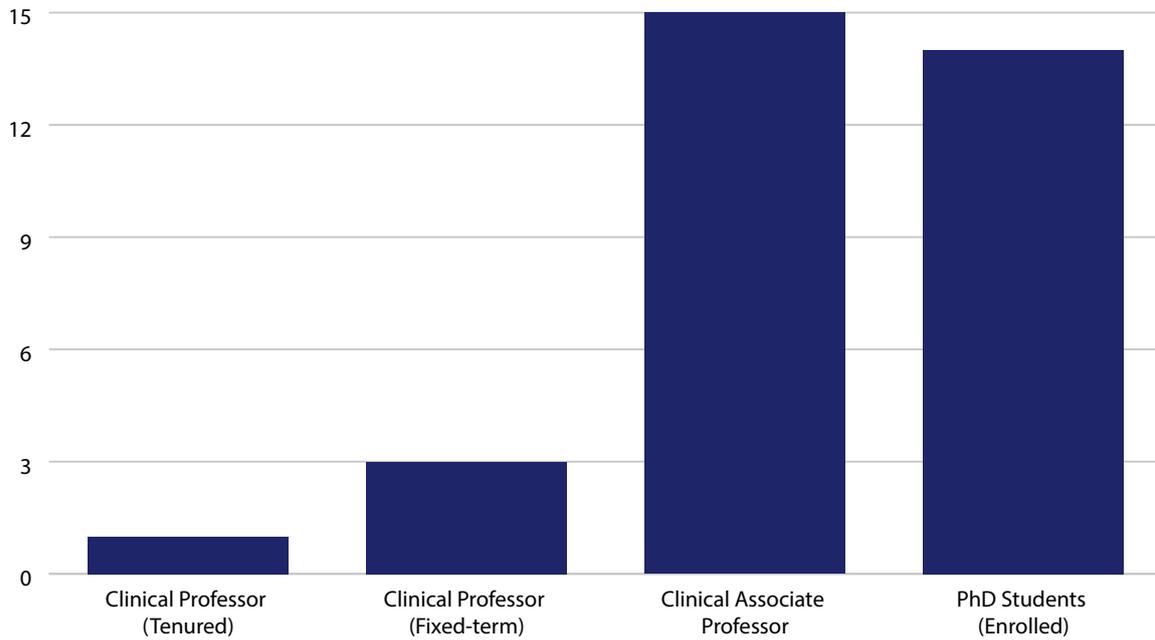
OTORRHINO- LARYNGOLOGY

REPRESENTING PROFESSOR: CHRISTIAN VON BUCHWALD

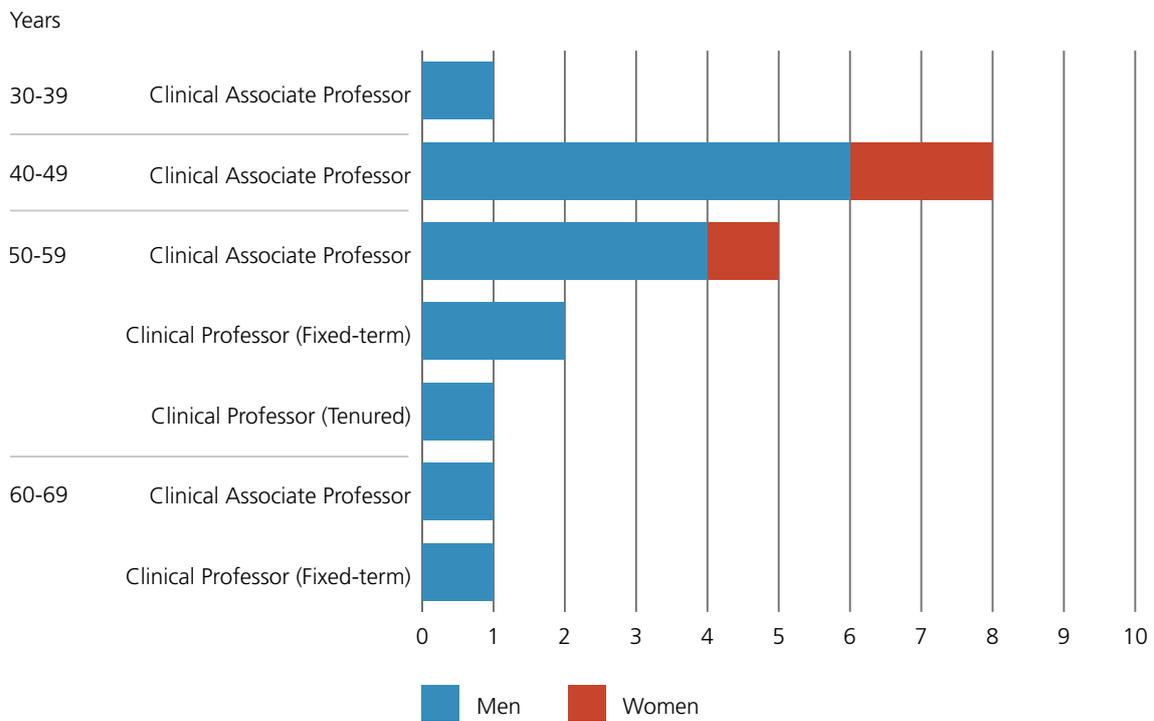
DESCRIPTION OF THE SPECIALITY

- Otopathology with special emphasis on bone dynamics in undecalcified materials and the development of the osteo-dynamic concept of otosclerosis. Moreover, surgical simulation including the initiation and development of the leading Visible Ear Simulator software
- Vestibular Schwannomas, epidemiology, clinic and biomarkers
- Cochlear implant, role and development, speech and hearing
- Head and neck cancer
- Biomarkers for oral carcinoma metastasis and mapping of oral cancer cells
- Optical-guided surgery and nucleotide-based imaging modalities in head and neck cancer.
- Rise of HPV and oropharyngeal cancers, i.e. epidemiology, clinic and genetic profiling of HPV+ and HPV- oropharyngeal cancers, the role of patients of robotic surgery and impact on survival and QoL
- Quality of life after Head and Neck Cancer treatment – Laryngectomized patients
- Salivary gland tumours and cancer
- Head and neck cancer in Greenland
- Sialolithiasis
- Otitis media and biofilm
- The united airways concept i.e. the role of addressing the paranasal sinuses and potential/shown improvement of treatment in patients with nasal polyps/asthma, in COPD and in cystic fibrosis and primary cilia dyskinesia

Academic Staff in Otorhinolaryngology – Headcount



Academic Staff in Otorhinolaryngology – Age and gender distribution



STRENGTHS

- Close association between research and clinic
- High volume of diseases (in public and at our clinic we represent centres of H&N cancer, neuro-otology, otology, audiology, inflammatory lesions (i.e. nasal polyps, CF, PCD - extending to "united airways"-concept)
- Strong profile/ large network (nationally and internationally)
- Free research
- Full time researchers and labs are located in the clinic – and close to the university
- We have initialized - and are continuing focusing on improving – a research feeding chain in close collaboration with the clinic and the university
- In 2012 one professor now three professors (with good support from private foundations)

WEAKNESSES

- Very busy working day in the clinic with limited time to contribute for the clinical associate professors and clinicians to contribute to research
- As a surgical specialty our younger researchers (PhD and postdocs) will lose time and opportunities in regard to surgical training – and thereby an unfair situation in regard to future positions (unless researchers will have a high priority when returning to the clinic)
- We are located on several addresses
- Financial support could be improved in order to reach next level
- Part-time positions with clinic and research are requested
- The organisation or platform on which the research is based is fragile

SWOT

OPPORTUNITIES

- Identification and coordination of our cutting edge research aiming at a clear vision and strategy to reach next level (reaching the 'excellent' donations/foundations)
- Stronger profile and impact of the research in clinic as a natural part of the leading system in the organisation of the clinic
- We have access to and are networking with best researchers outside our specialty as well as to the basic research nationally and internationally

THREATS

- 'Non-equal' conditions/competition between paraclinical and medical specialties vs surgical specialties (i.e. ORL) since surgical competences for an ORL/ENT specialist have to be accomplished in parallel with research
- Strategical research seems to become more dominant (determined by the administrators)
- Increasing overhead and time spend on administration including EPIC
- Research does not count as 'production' by the hospital owners and they demand an increased production

Scientific Production

Otorhinolaryngology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	23	2.7	41	2.4	57	2.9
Review papers - International			1		2	1.1
Letters - International	1		1	4.3		
Original scientific research papers - Danish	8	0.1	3	0.1	3	0.1
Total	32	2.0	46	2.2	62	2.7

3 most prominent publications from 2016

1. Bloch SL, Sørensen MS. The role of connectivity and stochastic osteocyte behavior in the distribution of perilyabyrinthine bone degeneration. A Monte Carlo based simulation study. *Hear Res* 2016;335:1-8.
2. Kørvel-Hanquist A, Koch A, Niclasen J, Dammeye J, Lous J, Olsen SF, Homøe P. Risk factors of early otitis media in the Danish national birth cohort. *PLoS One* 2016;11:e0166465.
3. Carlander AF, Grønhøj Larsen C, Jensen DH, Garnæs E, Kiss K, Andersen L, Olsen CH, Franzmann M, Høgdall E, Kjær SK, Norrild B, Specht L, Andersen E, van Overeem Hansen T, Nielsen FC, von Buchwald C. Continuing rise in oropharyngeal cancer in a high HPV prevalence area: A Danish population-based study from 2011 to 2014. *Eur J Cancer* 2017;70:75-82.

PAEDIATRICS

REPRESENTING PROFESSOR: GORM GREISEN

DESCRIPTION OF THE SPECIALITY

Paediatrics spans age 0-18 years and all organ systems. The common denominator of paediatric research is attention to age, growth and development and the interaction between the child and family and wider society. The most prominent fields of paediatric research at University of Copenhagen are asthma and pulmonology, oncology, the immunological responses to transplantation, growth and sexual development, diabetes, epileptology and brain injury in preterm infants.

Copenhagen Prospective Studies on Asthma in Childhood (COPSAC) is an extra-mural independent research institution with a focus on the origins of chronic inflammatory disorders. The research is based on longitudinal clinical assessment of mother-child cohorts in a translational process involving a very broad range of academics.

Cancer affects 1:350 individuals before 18 years of age. Most patients are treated according to international protocols that embed research questions. Patients are offered participation in research addressing cancer aetiology, tumour

biology, pharmacology, toxicities related to chemotherapy, impact of host genome variants, rehabilitation and long-term follow-up in collaborations on a wide international scale (Japan, the US, Europe). Diagnostics and treatment embed deep geno- and phenotyping, including high-resolution imaging, tumour genetics and biology and therapeutic drug monitoring for several drugs.

Understanding of immune regeneration and inflammatory responses in children treated for malignancies and primary immune deficiencies is considered essential for improvement of outcomes in these patients. Our research has provided evidence that dysregulation of inflammation plays a key role in the pathogenesis of toxic reactions and late effects, and increased knowledge may lead to identification of predictive markers and thereby improved and targeted prophylaxis.

Rare endocrine disorders and male reproductive problems are tackled with a translational focus. 100 physicians, chemists, epidemiologist and molecular biologists are working together at the Department of Growth and Reproduction at Rigshospitalet. Patients with growth and

puberty disorders are managed and included in RCT's, large population based cohorts of healthy children and adolescents are running, and basic research aspects include human ex vivo culture models (foetal testis, foetal adrenal), development of new diagnostic biomarkers and identification of novel genetic and epigenetic markers.

Type 1 diabetes research at the Paediatric Department, Herlev and Gentofte Hospital and University of Copenhagen integrates clinical and basic research with the following specific aims:

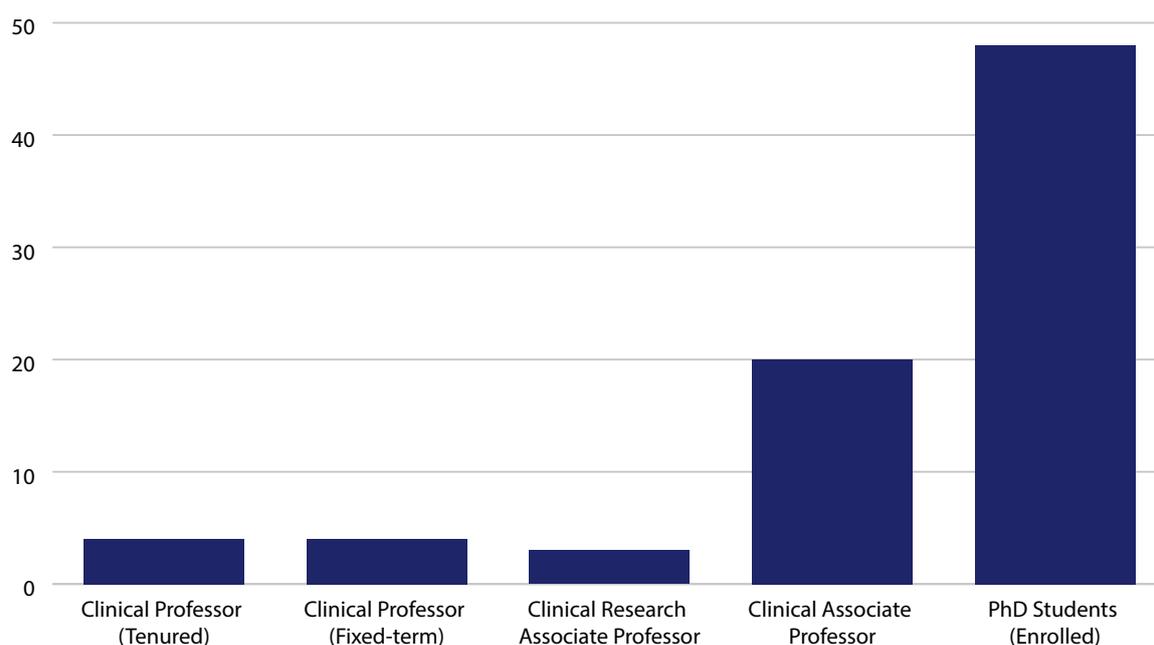
- Understand the pathogenesis to type 1 diabetes
- Development of biomarkers for disease prediction, progression and therapeutic response
- Prolongation of the period with residual beta cell function
- Improvement of the outcome of diabetes treatment
- Understanding and halting of the increasing trend of type 1 diabetes

Epilepsy and cerebral palsy are some of the most frequent severe neuropediatric disorders. A unique cerebral palsy register covering all Danish cases gives opportunity to study the development in birth prevalences, aetiology and consequences of the disease. The results of these surgeries for epilepsia have been studied over the last 20 years, and seizure freedom have been found to be around 60%, now intellectual development is explored.

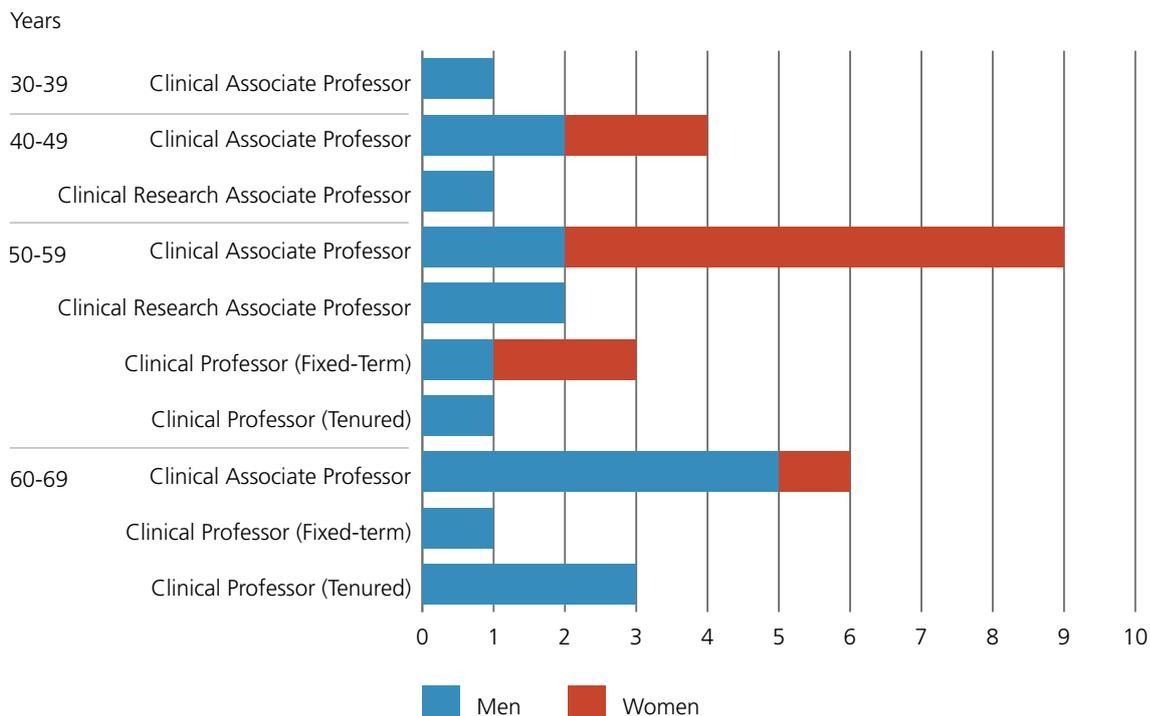
The epidemic of obesity is examined from the foetal as well as the paediatric perspective in large clinical studies combined with large scale biobanking.

Mortality and brain injury in preterm infants are the most important challenges in clinical care. We explore the blood flow to the brain and brain oxygenation, management of cardio-respiratory failure guided by monitoring of cerebral oxygenation, early developmental care and neurodevelopmental deficits and long-term outcomes in terms of education, income, and quality of life.

Academic Staff in Paediatrics – Headcount



Academic Staff in Paediatrics – Age and gender distribution



STRENGTHS

- Medical speciality of high prestige, i.e. recruitment of many young physicians with PhD degrees at entry of clinical specialisation
- Centres of excellence, i.e. focused efforts combining research, teaching and clinical care
- Good organisation of clinical services with reasonably sized units and centralisation of specialised care

WEAKNESSES

- High demands on clinical services
- Loss of research competence by lack of combined clinical service/postdoc positions
- Little coherence among subspecialties and weak 'general paediatrics' trunc

SWOT

OPPORTUNITIES

- A strong growing layer of clinical researchers
- Increased research collaboration among clinical services
- National CPR-number based registries facilitates epidemiology, spanning two generations or more

THREATS

- Organ-specific adult medicine
- Inequalities in visibility and funding among subspecialties
- In-breeding

Scientific Production

Paediatrics	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	119	5.1	135	5.6	158	6.8
Review papers - International	2		1		3	1.0
Letters - International	4		2	12.5	1	3.4
Original scientific research papers - Danish	5	0.1	7	0.1	3	0.1
Letters - Danish			2	0.1		
Total	130	4.9	147	5.3	165	6.5

3 most prominent publications from 2016

1. Bisgaard H, Stokholm J, Chawes BL, Vissing NH, Bjarnadóttir E, Schoos AM, Wolsk HM, Pedersen TM, Vinding Thorsteinsdóttir S, Følsgaard NV, Fink NR, Thorsen J, Pedersen AG, Waage J, Rasmussen MA, Stark KD, Olsen SF, Bønnelykke K. Fish oil-derived fatty acids in pregnancy and wheeze and asthma in offspring. *N Engl J Med* 2016;375:2530-9.
2. Skakkebaek NE, Rajpert-De Meyts E, Buck Louis GM, Toppari J, Andersson AM, Eisenberg ML, Jensen TK, Jørgensen N, Swan SH, Sapra KJ, Ziebe S, Priskorn L, Juul A. Male reproductive disorders and fertility trends: influences of environment and genetic susceptibility. *Physiol Rev* 2016;96:55-97.
3. Schmiegelow K, Attarbaschi A, Barzilai S, Escherich G, Frandsen TL, Halsey C, Hough R, Jeha S, Kato M, Liang DC, Mikkelsen TS, Möricke A, Niinimäki R, Piette C, Putti MC, Raetz E, Silverman LB, Skinner R, Tuckuviene R, van der Sluis I, Zapotocka E, Ponte di Legno toxicity working group. Consensus definitions of 14 severe acute toxic effects for childhood lymphoblastic leukaemia treatment: a Delphi consensus. *Lancet Oncol* 2016;17: 231-9.

PATHOLOGY

REPRESENTING PROFESSOR: ELISABETH RALFKIÆR

DESCRIPTION OF THE SPECIALITY

A main area of research in clinical pathology is cancer of all types and in all organs, e.g. solid and soft tissue tumours, CNS tumours, malignant lymphoma and leukaemia. Most of these investigations rely on elucidating alterations in morphology, phenotype and genotype (DNA/RNA) associated with disease and possibly implicated in prognosis, therapy and pathogenesis. The overall aim is to improve the patient management and the basic understanding of the malignant phenotype.

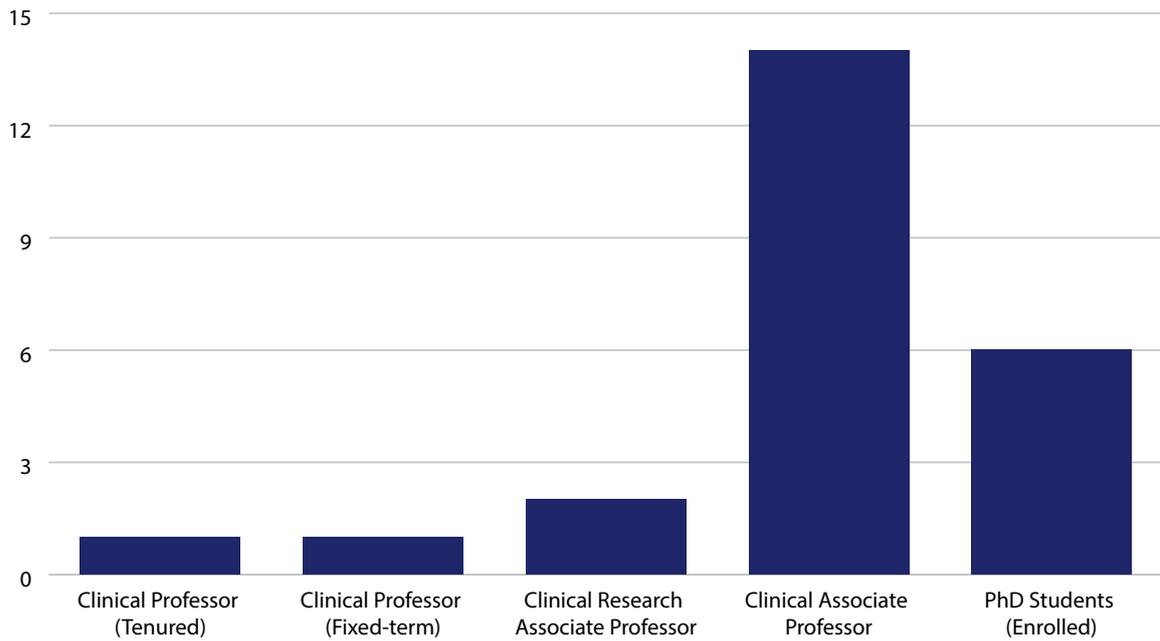
Examples of other areas of research include inflammatory conditions, transplantation pathology, diabetes and neurodegenerative disorders. Several techniques including

morphological assessment, protein expression and DNA/RNA analyses are performed, supplemented in some hospital departments with experimental animal studies.

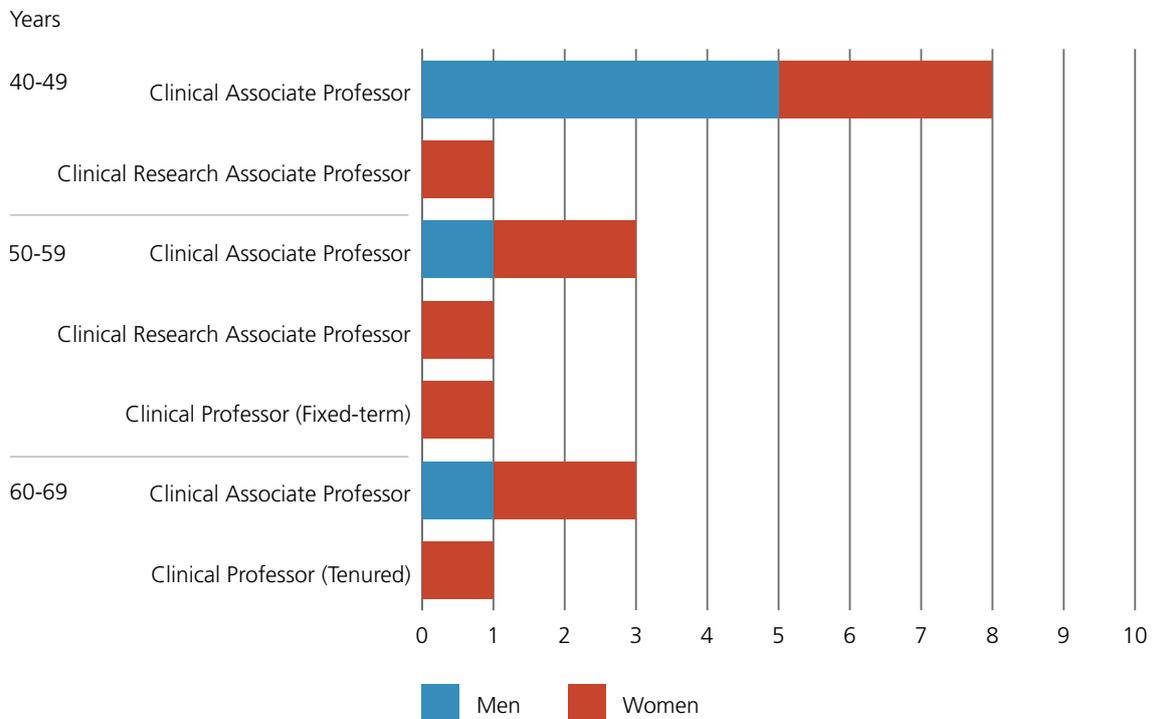
New technical aspects such as digitalization (virtual microscopy and automated image analysis) are also investigated with special reference to their application in research, diagnosis and teaching.

Most of the investigations are conducted in close collaboration with clinical and other para-clinical departments and the departments focusing on basic research at the University of Copenhagen. Pathology also participates in several international study groups.

Academic Staff in Pathology – Headcount



Academic Staff in Pathology – Age and gender distribution



STRENGTHS

- Today pathology departments perform morphological, phenotypic and genomic investigations of lineage, differentiation and proliferation associated biomarkers and of genes, DNA and RNA
- These investigations are used in research (see below) and results are integrated in diagnoses. This gains increasing importance in personalised medicine/targeted therapy
- Pathology departments ensure that samples are representative (e.g. contain malignant cells in the case of cancer diseases) and that conclusions are therefore valid

WEAKNESSES

- Limited time and resources to research due to a large amount of 'routine' obligations (diagnostics, administration etc.)
- Not enough emphasis on research, molecular techniques and advanced computer technology in specialist training
- Very few specific research laboratories exist, and too few non-pathologists (e.g. molecular biologists, IT experts) are generally employed at pathology departments

SWOT

OPPORTUNITIES

- Nationwide access to a vast number of samples from human diseases enabling comprehensive studies of large patient series
- Access to nationwide databases with present and previous specimens and patient information
- Close collaboration with clinical and other diagnostic departments and theoretical departments

THREATS

- Pathology must remain updated respecting novel molecular and digital methods.
- Pathology must be closely integrated in the planned genomic center.
- With centralisation, a general lack of space and money at several departments

Scientific Production

Pathology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	48	5.1	54	5.7	66	5.9
Review papers - International			1	6.6		
Original scientific research papers - Danish	4	0.1	3	0.1		
Total	52	4.7	58	5.4	66	5.9

3 most prominent publications from 2016

1. Mansouri L, Noerenberg D, Young E, Mylonas E, Abdulla M, Frick M, Asmar F, Ljungström V, Schneider M, Yoshida K, Skaftason A, Pandzic T, Gonzalez B, Tasidou A, Waldhueter N, Rivas-Delgado A, Angelopoulou M, Ziepert M, Arends CM, Couronné L, Lenze D, Baldus CD, Bastard C, Okosun J, Fitzgibbon J, Dörken B, Drexler HG, Roos-Weil D, Schmitt CA, Munch-Petersen HD, Zenz T, Hansmann ML, Strefford JC, Enblad G, Bernard OA, Ralfkiaer E, Erlanson M, Korkolopoulou P, Hultdin M, Papadaki T, Grønbæk K, Lopez-Guillermo A, Ogawa S, Küppers R, Stamatopoulos K, Stavroyianni N, Kanellis G, Rosenwald A, Campo E, Amini RM, Ott G, Vassilakopoulos TP, Hummel M, Rosenquist R, Damm F. Frequent NFKBIE deletions are associated with poor outcome in primary mediastinal B-cell lymphoma. *Blood* 2016;128:2666-70.
2. Marcker Espersen ML, Linnemann D, Christensen IJ, Alamili M, Troelsen JT, Høgdall E. SOX9 expression predicts relapse of stage II colon cancer patients. *Hum Pathol* 2016;52:38-46.
3. Nygård S, Vainer B, Nielsen S, Bosman F, Tejpar S, Roth A, Delorenzi M, Brünner N, Budinska E. DNA topoisomerase I gene copy number and mRNA expression assessed as predictive biomarkers for adjuvant irinotecan in stage III colon cancer. *Clin Cancer Res* 2016;22:1621-31.

PLASTIC SURGERY

REPRESENTING ASSOCIATE PROFESSOR: LISBET ROSENKRANTZ HØLMICH

DESCRIPTION OF THE SPECIALITY

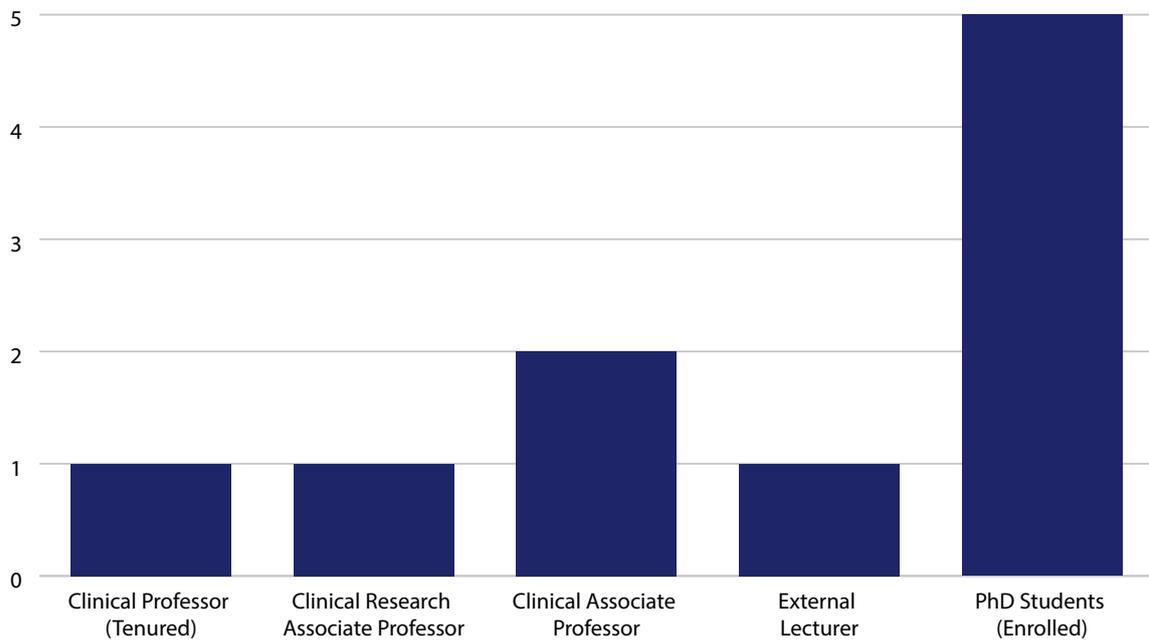
Melanoma: All three hospital departments/hospitals have strong traditions in research in melanoma and also non-melanoma skin cancer; this is both clinical and register-based. Extensive collaboration with other specialities and researchers involved in melanoma, is growing further; both nationally and internationally. Herlev Hospital is strongly involved in the Danish Melanoma Group and this area is one of the main focus areas of the hospital department's research unit.

Microsurgery at Rigshospitalet is one of the largest microsurgical centres in Scandinavia. Research into fast-track surgery applied to microsurgery has been attracting growing international attention in recent years. The microsurgical database is a valuable resource for current and further research.

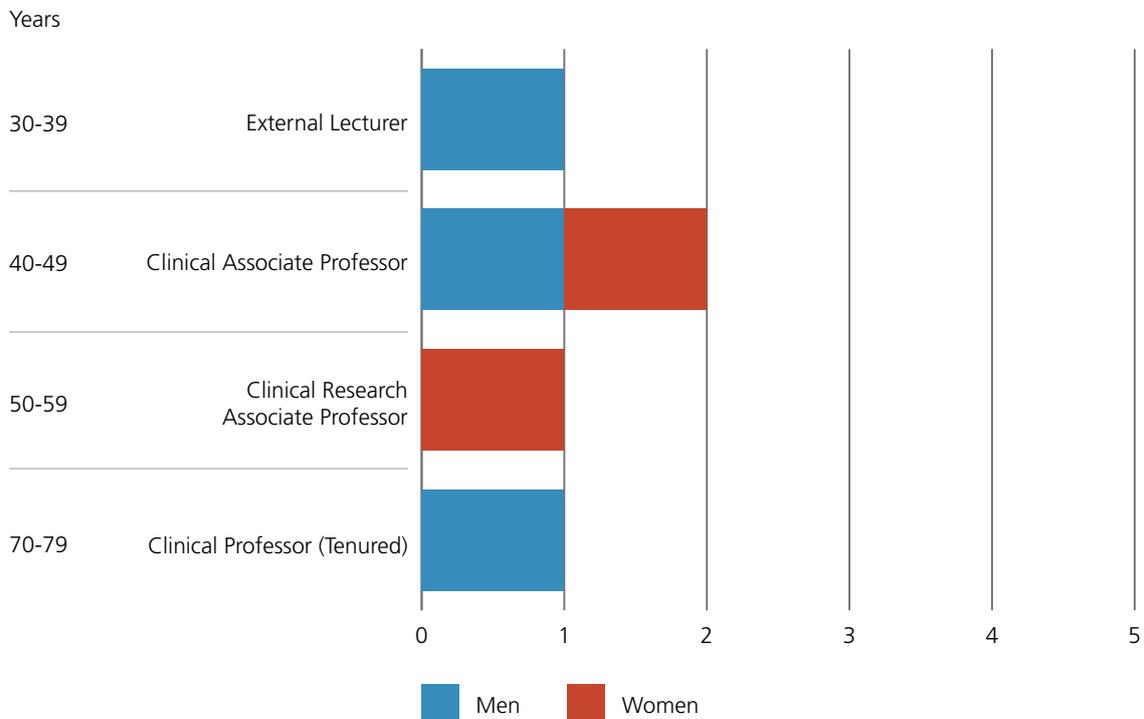
Breast reconstruction, with both breast implants and autologous tissue, is a very important scientific focus area for all hospital departments/hospitals, and collaboration is undertaken with breast surgeons, radiologists, pathologist etc. Lymphoedema, a common morbidity after both skin and breast cancer is another area of both clinical and scientific interest, especially at Herlev and Gentofte Hospital. Research in the massive weight loss patients is also a focus area at Herlev and Gentofte Hospital.

Rigshospitalet is very active in translational clinical adipose stem cell research; both basic laboratory research and applied clinical protocols. Cutting edge scientific discoveries have been provided from this group. Research in burn care is a growing field.

Academic Staff in Plastic Surgery – Headcount



Academic Staff in Plastic Surgery – Age and gender distribution



STRENGTHS

- Expertise in melanoma, breast reconstruction/ microsurgery and in translational clinical research concerning autologous stem cell and fat transplantation in humans
- National and international network with other research groups and active multidisciplinary research activities
- High patient flow in especially melanoma, microsurgery and uniform centralised treatment nationally enables large research projects

WEAKNESSES

- Few active senior researchers in the speciality
- Small speciality
- Heavy clinical burden
- Surgeons need to see patients and perform regular procedures not to lose competences; this takes time off research
- At the moment, only one senior surgeon (person) is employed with a half-time research and teaching and half-time regular clinical obligations

SWOT

OPPORTUNITIES

- Four PhD students at Rigshospitalet and two at Herlev Hospital
- A growing number of young researchers (although few in absolute numbers), who hopefully will continue with postdoc activities
- Formal research units are in function (have been established) in Rigshospitalet and Herlev Hospital and one is being organised at Roskilde Hospital

THREATS

- Heavy clinical burden takes time from research
- Funding is difficult to obtain and applications are very time consuming
- Young colleagues interested in research are employed for short periods of time during their specialist training years, which makes it difficult to engage them in long-term scientific projects
- Specialists do not have curricular need to document research activities, therefore it is difficult to motivate colleagues for the importance of research in daily clinic

Scientific Production

Plastic Surgery	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	4	1.0	10	2.1	12	3.1
Letters - International					1	1.7
Original scientific research papers - Danish	3	0.1	3	0.1	4	0.1
Total	7	0.6	13	1.7	17	2.2

3 most prominent publications from 2016

1. Bonde C, Khorasani H, Elberg J, Kehlet H. Perioperative optimization of autologous breast reconstruction. *Plast Reconstr Surg* 2016;137:411-4.
 2. Meyle KD, Gamborg M, Hölmich LR, Baker JL. Associations between childhood height and morphologically different variants of melanoma in adulthood. *Eur J Cancer* 2016;67:99-105.
 3. Glovinski PV, Herly M, Müller FC, Elberg JJ, Kølle S-FT, Fischer-Nielsen A, Thomsen C, Drzewiecki KT. Avoiding a systematic error in assessing fat graft survival in the breast with repeated magnetic resonance imaging plastic and reconstructive surgery. *Plast Reconstr Surg Glob Open* 2016;4:e1023.
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PSYCHIATRY

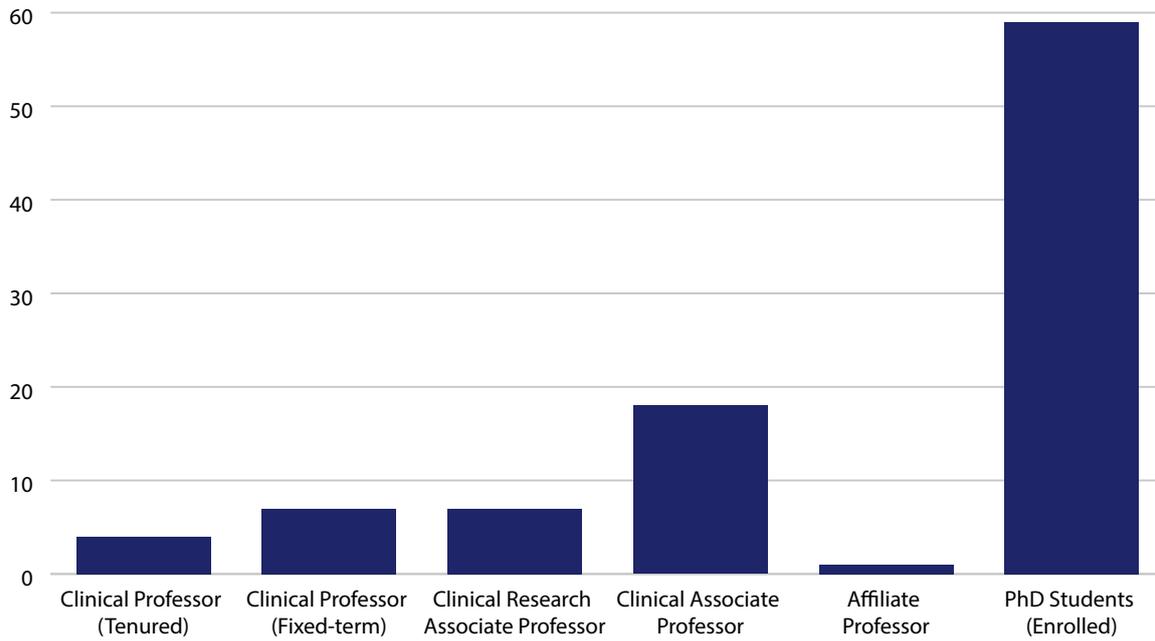
REPRESENTING PROFESSOR: MERETE NORDENTOFT

DESCRIPTION OF THE SPECIALITY

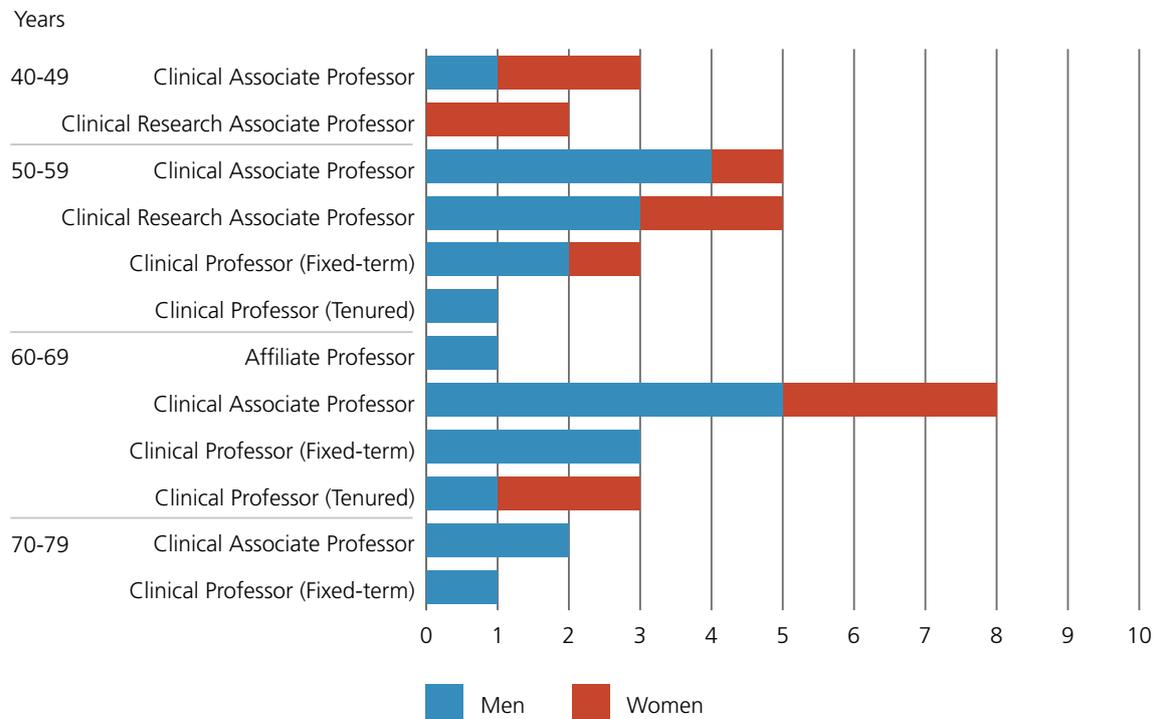
Psychiatric research at SUND at the University of Copenhagen is organized in a network of psychiatric clinical professors and clinical associate professors, senior researchers and PhD students from research environments at the affiliated university departments. We conduct basic psychiatric research with neurobiological, psychophysiological and neurocognitive assessments and thereby expand our understanding of pathogenetic mechanisms.

We conduct high quality register based research that cannot be conducted anywhere else in the world, and we link information from neurobiological and register based research with biological material from national biobanks. Danish psychiatrists have initiated large high quality randomized clinical trials in which pharmacological and psychosocial interventions were tested.

Academic Staff in Psychiatry – Headcount



Academic Staff in Psychiatry – Age and gender distribution



STRENGTHS

- Access to, experience and expertise in epidemiological research utilizing the most complete and comprehensive nationwide registers in the world. Resources have together with the world's largest genotyped cohort with environmental data (100,000 cases with mental disorders and 60,000 controls) been used extensively to conduct world leading epidemiological research on topics of high relevance for psychiatry
- Establishment of some of the world's largest and most well characterized cohorts of drug naïve schizophrenia patients and of patients with first episode psychosis. Have conducted multiple follow-ups and have expertise in deep multimodal phenotyping
- Access to and experience in animal models for psychosis, depression and drug abuse. From 2018 a large lab with animal facilities and extensive possibilities for lab analyses will be ready and available for all psychiatric researchers
- Number of clinical professors and clinical associate research professors has increased rapidly. The strongest research environments are large with 30-60 researchers, facilitating interaction and synergy

WEAKNESSES

- Even though the infrastructure has been strengthened we are short of easy access to senior statisticians
- Capacity for neuroimaging is limited.
- Rather limited possibilities for postdoc positions
- Even though research groups have grown in size, there can still be unexploited possibilities for collaboration and transfer of knowledge between research groups

SWOT

OPPORTUNITIES

- Unique opportunities due to access to unique data resources and strong infrastructure
- Possibilities for attracting world leading scientists as guest professors and collaborators

THREATS

- Risk of an increasing split between psychiatric research and clinical practice, mainly because of the increased production in out and inpatient services and the increasing demands of professionalism in research. Leadership of the psychiatric departments mainly focuses on clinical work
- The increasing level of documentation of safety in research (data surveillance, IT safety, good clinical practice) makes it necessary to set aside specific resources for managing all the necessary documents
- It is a weakness that we have a rather flat pyramid with difficulties for getting funding for postdocs and senior researchers, especially if they are not medical doctors. We sometimes lose expertise in molecular biology, epidemiology, psychology and engineering because of the limited career track

Scientific Production

Psychiatry	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	124	6.4	149	6.2	169	5.6
Review papers - International	3		6		6	3.1
Letters - International			4	20.2	9	7.0
Original scientific research papers - Danish	7	0.1	5	0.1	7	0.1
Total	134	6.1	164	6.1	191	5.5

3 most prominent publications from 2016

1. Benros ME, Trabjerg BB, Meier S, Mattheisen M, Mortensen PB, Mors O, Borglum AD, Hougaard DM, Norgaard-Pedersen B, Nordentoft M, Agerbo E. Influence of polygenic risk scores on the association between infections and schizophrenia. *Biol Psychiatry* 2016;80:609-16.
2. Speyer H, Christian Brix NH, Birk M, Karlsen M, Storch JA, Pedersen K, Hjorthoj C, Pisinger C, Gluud C, Mors O, Krogh J, Nordentoft M. The CHANGE trial: no superiority of lifestyle coaching plus care coordination plus treatment as usual compared to treatment as usual alone in reducing risk of cardiovascular disease in adults with schizophrenia spectrum disorders and abdominal obesity. *World Psychiatry* 2016;15:155-65.
3. Nielsen MO, Rostrup E, Wulff S, Glenthøj B, Ebdrup BH. Striatal reward activity and antipsychotic-associated weight change in patients with schizophrenia undergoing initial treatment. *JAMA Psychiatry* 2016;73:121-8.

RADIOLOGY

REPRESENTING PROFESSOR: MICHAEL BACHMANN NIELSEN

DESCRIPTION OF THE SPECIALITY

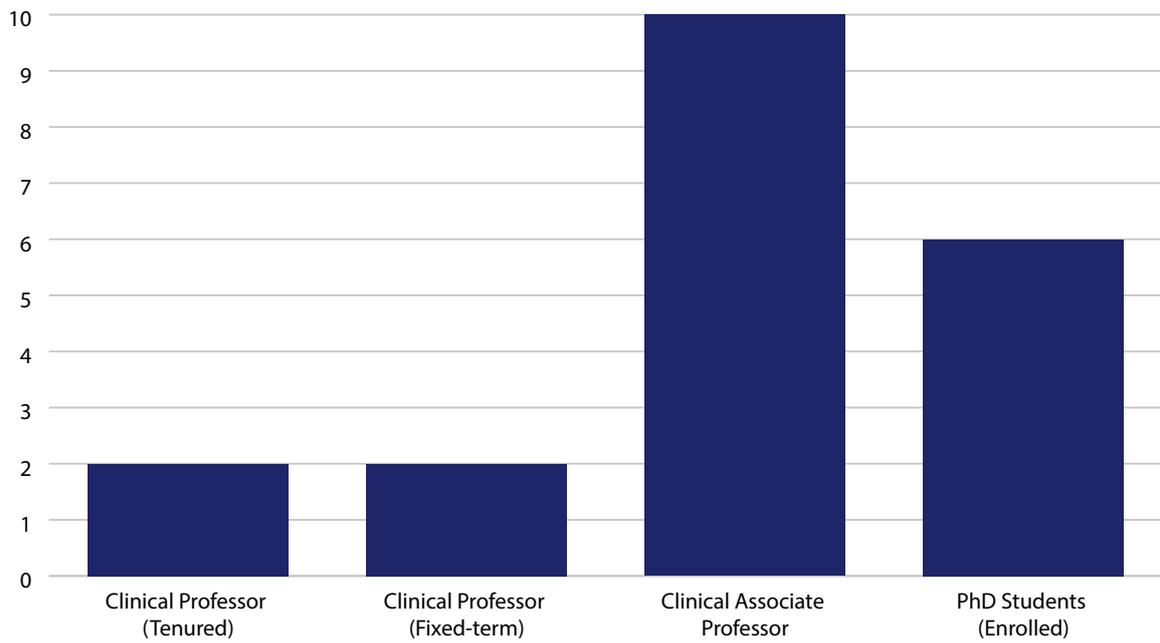
This section mentions the research driven by radiologists. It is often linked to advances in modalities like perfusion CT offering more precise staging and prediction of outcome or new advances in MRI technology, while others are driven by research within a specific medical area like neuroradiology.

Several PhD studies reflect advances in interventional radiology, such as endovascular aortic repair or prostatic embolization in benign hypertropia. On the rise is research in interventional neuroradiology.

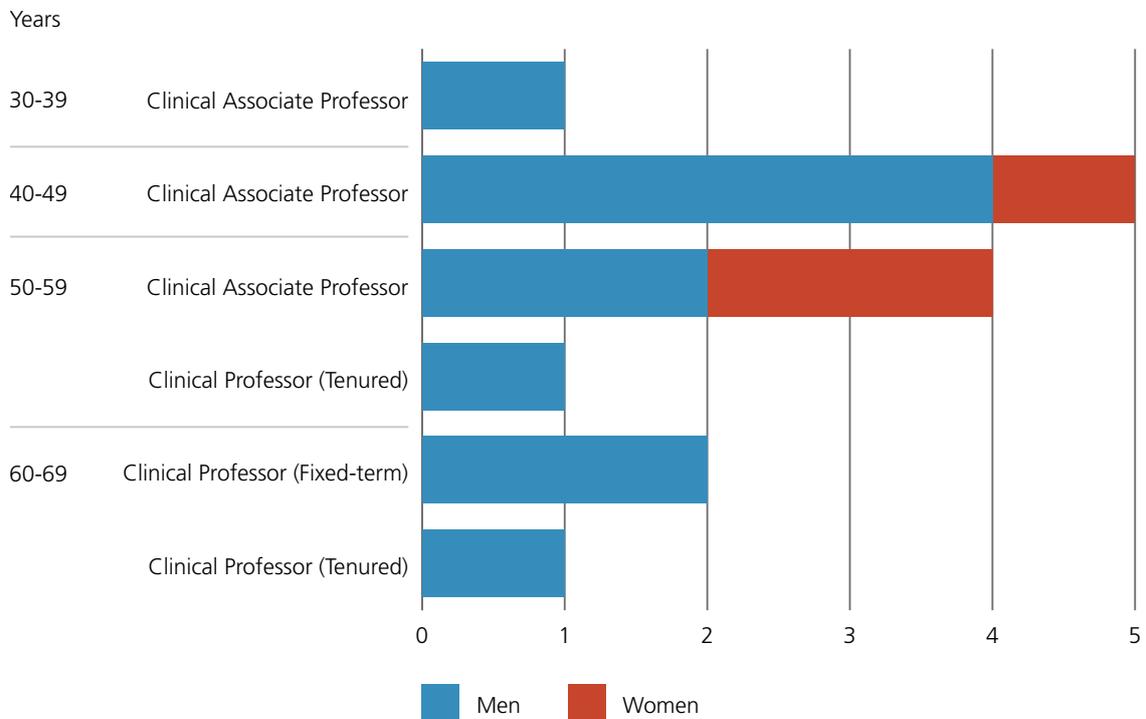
One research group with PhD students and postdocs is focused on ultrasound with a long-standing collaboration with The Technical University of Denmark on clinical testing of advances in new ultrasound technology, especially vector velocity Doppler in flow assessment in peripheral vessels or in the heart.

A combination of the groups above also study simulation training in medical education (ultrasound and interventional radiology). Other research groups are focused on MRI in musculoskeletal imaging or urology, respectively.

Academic Staff in Radiology – Headcount



Academic Staff in Radiology – Age and gender distribution



STRENGTHS

- Contacts with all medical specialities
- Increasing research possibilities reflecting the technology driven modalities in radiology
- Collaborations with the Technical University of Denmark on imaging technology

WEAKNESSES

- Radiology driven research is only present in a few departments in The Capital Region of Denmark and so far limited in Region Zealand
- Low impact factors of radiology journals in the Thomson Reuters ranking in radiology when compared with other specialities
- There is need for a way that young researchers can maintain their university connection after they finish a PhD until they can obtain a position as associate professor

SWOT

OPPORTUNITIES

- Radiology research and patient care are likely to benefit from studies on computer aided detection/diagnosis and big data
- Additional research positions with university connection preferably professorships and if possible with a wider geographic distribution
- Make postdoc research positions reserved for radiology, when competing against other specialties radiologists often come up short

THREATS

- Increasing high workload for the main clinical staff makes it impossible for them to contribute to research, only full-time or part-time researchers can do it
- There is a gap between current professors and the research qualifications of those who are to take over in five to ten years
- Funding is increasingly a problem and co-funding by the hospital may be a problem on several hospitals
- Access to patient data including radiology may be limited by legislative restrictions

Scientific Production

Radiology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	55	3.3	64	3.2	53	2.9
Review papers - International					1	
Letters - International					1	4.4
Original scientific research papers - Danish					2	0.1
Total	55	3.3	64	3.2	57	2.8

3 most prominent publications from 2016

1. Tang SJ, Vilmann AS, Saftoiu A, Wang W, Streba CT, Fink PP, Griswold M, Wu R, Dietrich CF, Jenssen C, Hocke M, Kantowski M, Pohl J, Fockens P, Annema JT, van der Heijden EH, Havre RF, Pham KD, Kunda R, Deprez PH, Mariana J, Vazquez-Sequeiros E, Larghi A, Buscarini E, Fusaroli P, Lahav M, Puri R, Garg PK, Sharma M, Maluf-Filho F, Sahai A, Brugge WR, Lee LS, Aslanian HR, Wang AY, Shami VM, Markowitz A, Siddiqui AA, Mishra G, Scheiman JM, Isenberg G, Siddiqui UD, Shah RJ, Buxbaum J, Watson RR, Willingham FF, Bhutani MS, Levy MJ, Harris C, Wallace MB, Nolsøe CP, Lorentzen T, Bang N, Sørensen SM, Gilja OH, D'Onofrio M, Piscaglia F, Gritzmann N, Radzina M, Sparchez ZA, Sidhu PS, Freeman S, McCowan TC, de Araujo CR Jr, Patel A, Ali MA, Campbell G, Chen E, Vilmann P. EUS needle identification comparison and evaluation study (with videos). *Gastrointest Endosc* 2016;84:424-33.e2.
2. Dencker D, Pedersen F, Engstrøm T, Køber L, Højberg S, Nielsen MB, Schroeder TV, Lönn L. Major femoral vascular access complications after coronary diagnostic and interventional procedures: a Danish register study. *Int J Cardiol* 2016;202:604-8.
3. Christensen AW, Ribbjerg-Madsen S, Christensen R, Dreyer L, Boesen M, Ellegaard K, Bliddal H, Danneskiold-Samsøe B, Amris K. Ultrasound Doppler but not temporal summation of pain predicts DAS28 response in rheumatoid arthritis: a prospective cohort study. *Rheumatology (Oxford)* 2016;55:1091-8.

SURGERY

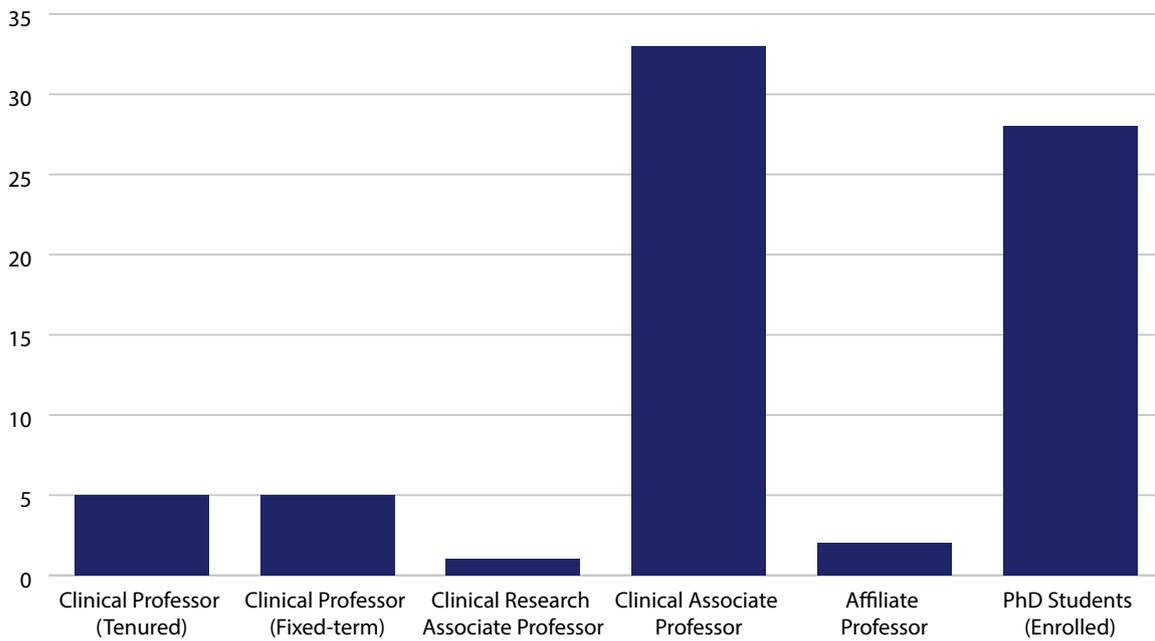
REPRESENTING PROFESSOR: ISMAIL GÖGENUR

DESCRIPTION OF THE SPECIALITY

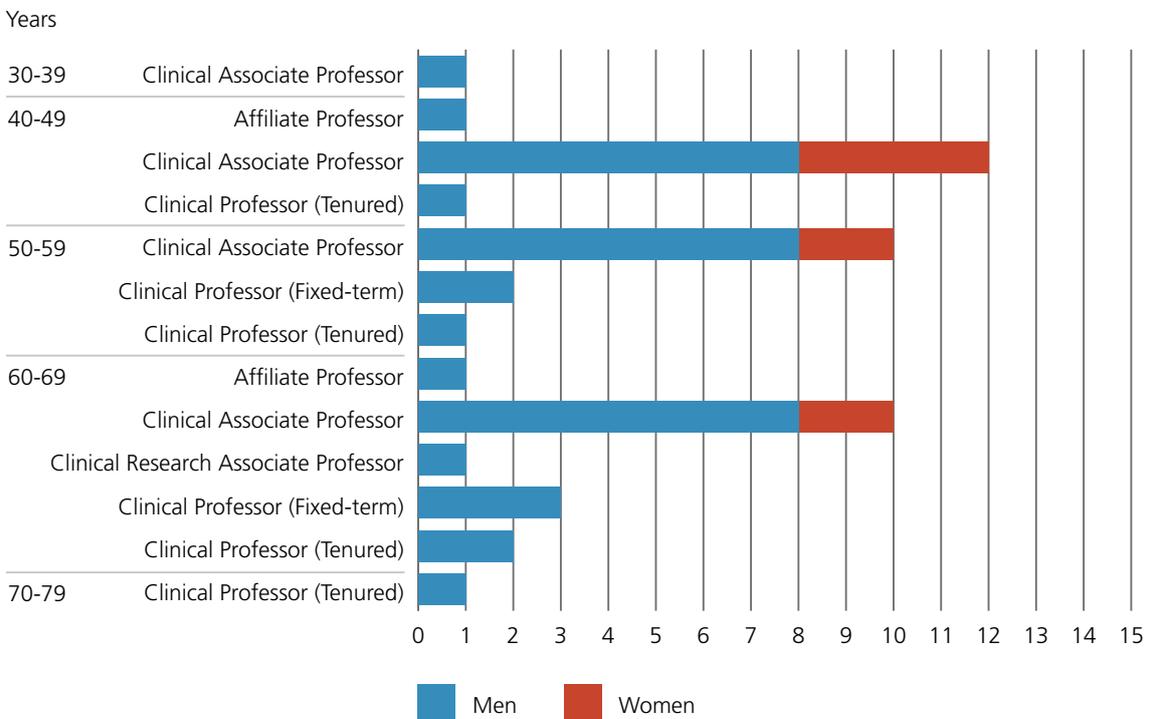
The research areas covered by the speciality include the following major areas:

- Groups focusing on the mechanisms behind perioperative/intraoperative stress response
- Within the last couple of years a major increase is seen in the research of patients undergoing emergency surgery with special emphasis on perioperative interventional bundles.
- A long history of research is seen in registry studies focusing on hernia and within the later years also diverticulitis and benign upper GI diseases.
- Increasing research efforts are seen in robotic surgery both in upper GI and lower GI robotic surgery.
- Translational research within the field of breast cancer and colorectal cancer. There are different groups that focus on molecular biological and pathological factors associated with survival in breast cancer and colorectal cancer.
- An increasing effort is seen in integrating oncological treatments in the immediate perioperative period in both upper and lower GI cancer surgery.
- Finally, there have been substantial research activities within the field of simulation in surgery.

Academic Staff in Surgery – Headcount



Academic Staff in Surgery – Age and gender distribution



STRENGTHS

- Multiple national and regional database studies with international impact
- Long-term experience in high impact research within perioperative medicine and surgical pathophysiology
- Common IT platform in 2017 insuring standardised electronic journals across the speciality

WEAKNESSES

- Several surgical departments have low volume of research
- Number of scientific staff is limited in many of the surgical clinics
- Only few research networks across hospitals

SWOT

OPPORTUNITIES

- Possibility to coordinate large register based studies in the field of surgery
- IT platform that is recently established in 2017 can be used as a common 'case report form across' specialities and hospitals in interventional studies
- Due to short distances between hospitals in the capital region, it is possible to create effective research networks with execution of larger randomised clinical trials

THREATS

- IT platform has notoriously been described as reducing time for research and clinical work.
- Difficult to receive large funding of surgical projects
- Not enough integration of basic research in surgical research leading to a continuous problem with lack of research funding

Scientific Production

Surgery	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	158	3.1	205	4.2	177	3.6
Review papers - International	7	2.7	21	3.0	5	2.5
Letters - International	1	2.5	6	2.2	2	2.1
Original scientific research papers - Danish	36	0.1	18	0.1	8	0.1
Review papers - Danish					1	0.1
Letters - Danish					1	0.1
Total	202	2.4	250	3.8	194	3.3

3 most prominent publications from 2016

1. Kokotovic D, Bisgaard T, Helgstrand F. Long-term recurrence and complications associated with elective incisional hernia repair. *JAMA* 2016;316:1575-82.
2. Shabanzadeh DM, Sørensen LT, Jørgensen T. A Prediction Rule for Risk Stratification of Incidentally Discovered Gallstones: Results From a Large Cohort Study. *Gastroenterology* 2016;150:156-67.
3. Thornell A, Angenete E, Bisgaard T, Bock D, Burcharth J, Heath J, Pommergaard HC, Rosenberg J, Stilling N, Skullman S, Haglund E. Laparoscopic lavage for perforated diverticulitis with purulent peritonitis: a randomized trial. *Ann Intern Med* 2016;164:137-45.

THORACIC SURGERY

REPRESENTING ASSOCIATE PROFESSOR: JESPER HOLST PEDERSEN

DESCRIPTION OF THE SPECIALITY

The speciality of cardio-thoracic surgery takes place in four university hospitals in Denmark, where Rigshospitalet account for approx. half the activity in Denmark. The national Danish activity for lung transplantation and congenital heart surgery is situated at Rigshospitalet. The department is a Scandinavian centre for treatment of mesothelioma.

Patients are referred to Rigshospitalet from The Capital Region of Denmark, Region Zealand, the Faroe Islands and Greenland.

The operative activity is approx. 1,800 cardiac procedures and 1,200 lung procedures annually. All kinds of cardiac and lung surgery procedures are performed at the hospital department.

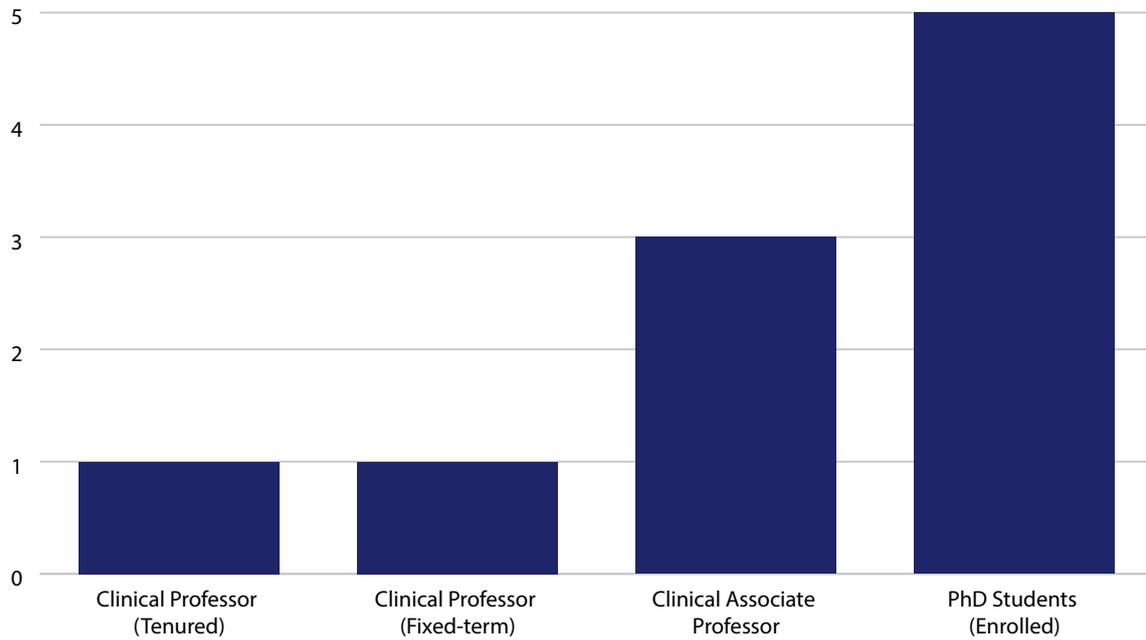
Scientific focus at the hospital department is:

- Heart and lung transplantation
- Ex-vivo-lung-perfusion (back table recondition of marginal lung donors) in collaboration with Lund University and experimental work in the Panum Building
- Heart – assist systems including Heart-Mate 3 and Empella-cardiac support

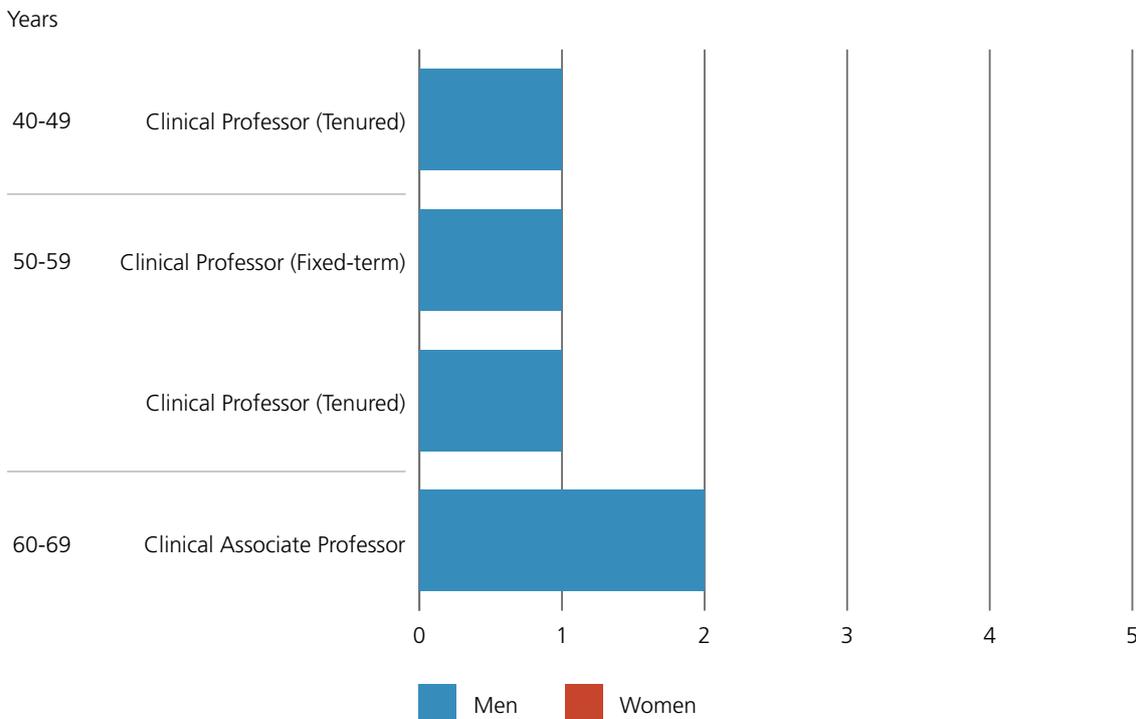
- Thrombosis – and anticoagulation in cardiac surgery
- Long term Freestyle valve procedure
- Aortic dissection/aortic aneurism – treatment and cerebral protection
- Ex-vivo-heart perfusion (OCS system)
- Frailty in cardiac surgery
- Minimal invasive lung surgery (VATS) (international network)
- Multidisciplinary treatment of mesothelioma (Scandinavian Centre)
- Surgical treatment of thymomas, including minimal surgical approach
- Lung cancer screening (international network)
- Rehabilitation after lung cancer treatment
- Lung sparing surgical procedures
- Medical education – Copenhagen Academy for Medical Education and Simulation (CAMES)

In each patient with cardiac- and lung surgery approx. 20,000 data are collected, and is the basis of ongoing production control, retrospective investigations, including data mining.

Academic Staff in Thoracic Surgery – Headcount



Academic Staff in Thoracic Surgery – Age and gender distribution



STRENGTHS

- High volume centre with good surgical results
- High experience with randomized clinical trial, observational studies and animal experimental studies
- International network:
 - Transplantation and lung cancer screening
 - Minimal invasive lung surgery.

WEAKNESSES

- Limited time is scheduled for research and education
- No chair professor for three years and no professor in key research areas.
- Limited financial support

SWOT

OPPORTUNITIES

- We have established a good research network with Scandinavian thoracic centres (Lund, Goteborg and Oslo)
- New head of the clinic

THREATS

- The head of the clinical centre is focusing on production
- New IT system with limited data access
- Very poor physical facilities

Scientific Production

Thoracic Surgery	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	36	4.0	47	3.3	38	3.5
Letters - International	1		1	3.6		
Original scientific research papers - Danish	3	0.1	2	0.1		
Total	40	3.6	50	3.2	38	3.5

3 most prominent publications from 2016

1. Annema JT, Konge L. Endoscopic Ultrasound Training for Pulmonologists. *Chest* 2016;150:984-5.
 2. Lehnert P, Møller CH, Mortensen J, Kjaergaard J, Olsen PS, Carlsen J. Surgical embolectomy compared to thrombolysis in acute pulmonary embolism: morbidity and mortality. *Eur J Cardiothorac Surg* 2016;51:354-61.
 3. Wille M, Dirksen A, Ashraf H, Saghir Z, Bach K, Brodersen J, Clementsen P, Hansen H, Larsen KR, Mortensen J, Rasmussen J, Seersholm N, Skov B, Thomsem L, Tonnesen P, Pedersen JH. Results of the randomized Danish lung cancer screening trial with focus on high-risk profiling. *Am J Respir Crit Care Med* 2016;193:542-51.
-

UROLOGY

REPRESENTING PROFESSOR: JENS SØNKSEN

DESCRIPTION OF THE SPECIALITY

Prostate cancer epidemiology and

pharmaco-epidemiology: Registry-based research aiming at

- Optimizing detection strategies and identifying risk factors for significant prostate cancer in collaboration with Cancer Prevention Institute and Department of Urology, Stanford University, California, USA
- Identifying interaction between prostate cancer and commonly used prescriptions. The main focus on the possible preventive effect of commonly used drugs as statins and anti-diabetics in collaboration with The Danish Cancer Registry

Prostate cancer early localized disease: The Copenhagen Prostate Cancer Center holds information on outcome on both institutional and national level following diagnosis of early prostate cancer. Research on outcome of different treatment strategies and impact of prognostic factors and subsequent interventions is ongoing.

Prostate cancer advanced disease:

Identification of new biomarkers and targets in castration-resistant prostate cancer in collaboration with the Department of Growth and Reproduction, Rigshospitalet, University of Copenhagen.

Prostate cancer treatment: Randomised clinical trials comparing prostate cancer treatments, both surgical and pharmaceutical.

In collaboration with Department of Urology, University of Michigan, USA.

Prostate cancer diagnosis: The use of MRI as a diagnostic tool for prostate cancer. In collaboration with Department of Radiology, Herlev and Gentofte Hospital.

Prostate cancer and exercise: Group-based exercise to improve physical fitness in men with prostate cancer undergoing androgen deprivation therapy. Including qualitative research on patients experiences in relation to exercise.

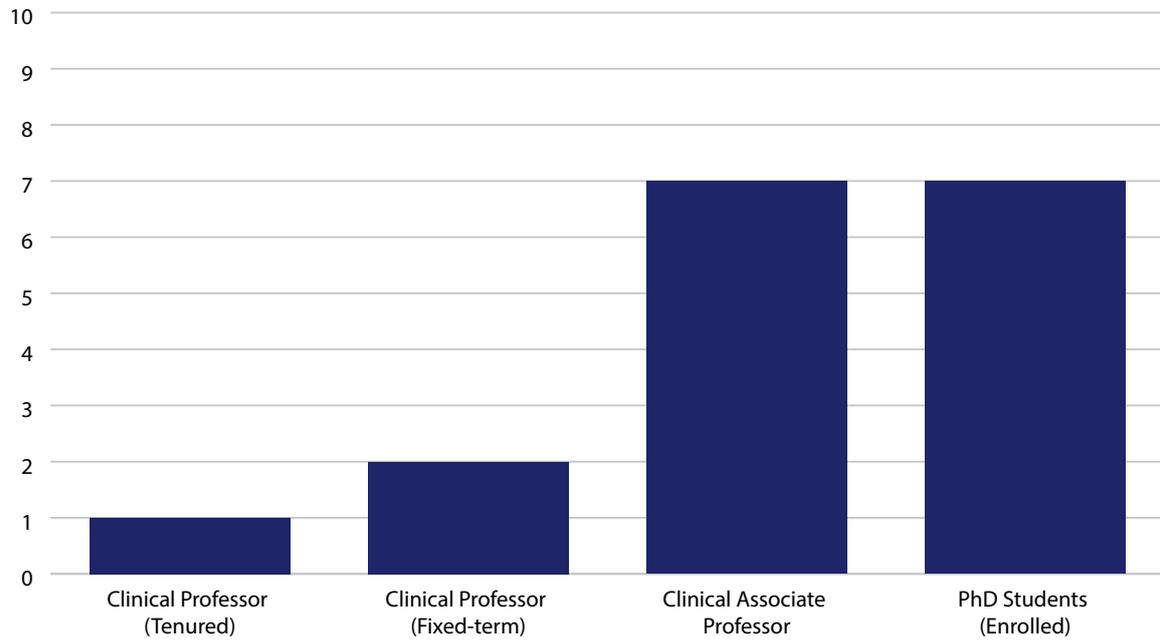
Andrology: Randomised clinical trials within male infertility (surgical techniques). In collaboration with Department of Urology, University of Michigan, USA.

Benign enlargement of prostate: Randomised clinical trials comparing methods for treatment.

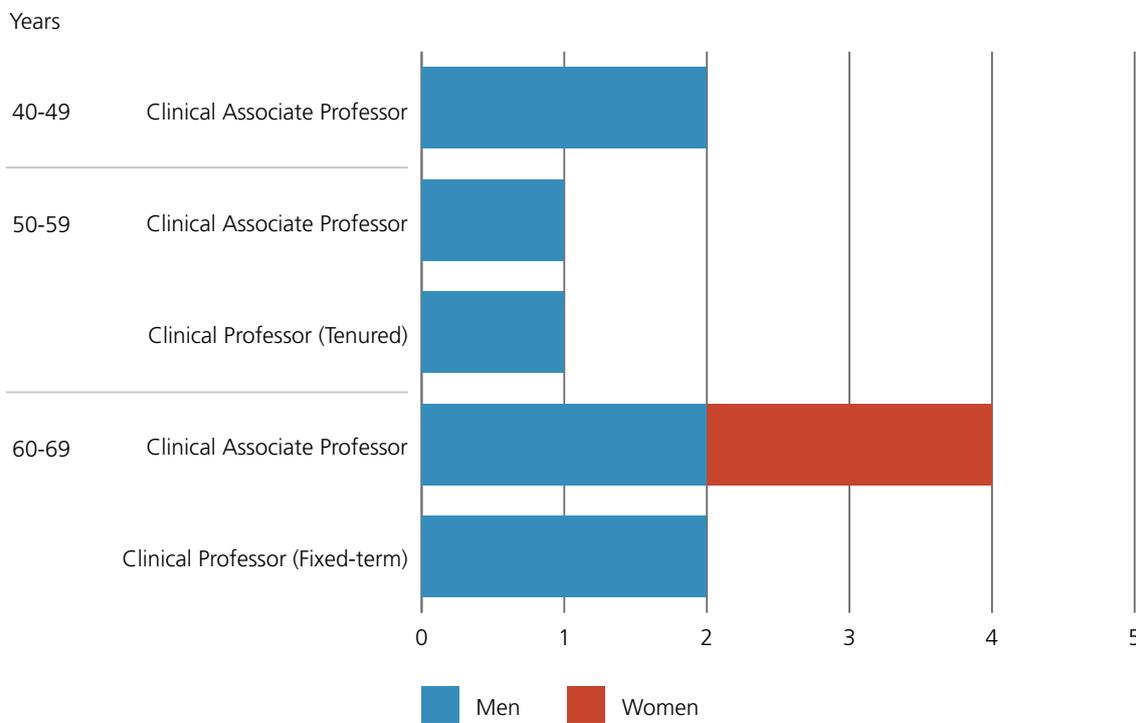
Bladder cancer: The use of optic methods for diagnosis and treatment of bladder cancer.

Renal cancer: Laparoscopic nephrectomy as outpatient procedure and genetic evaluation of renal cell carcinoma predicting biomarkers for renal cell carcinoma. Furthermore, a multicentre study on extended lymph node dissection on upper tract urothelial carcinoma is in progression.

Academic Staff in Urology – Headcount



Academic Staff in Urology – Age and gender distribution



STRENGTHS

- The two regions have a very large volume of patients centralised in only a few departments
- Urology is an internationally well-defined speciality with amongst others diseases, several high prevalence cancer types
- Several small growing and promising research entities creating a synergetic effect
- Well developed and strong industry cooperation and support

WEAKNESSES

- Urology in Denmark relatively weak and historically not visible
- Clinicians extremely busy with patient care not allowing time for research and teaching
- Not yet fully developed cooperation between the three departments in the two regions
- The newly introduced EPIC electronic health care IT system (Sundhedsplatformen) has been very time consuming and extracting data not yet possible

SWOT

OPPORTUNITIES

- Excellent possibilities for strengthening cooperation across specialties, nationally and internationally
- Recent development and funding of the clinical academic group initiative (CAG) between academia and hospitals. Urology involved in the CAG 'Repronion' (Multidisciplinary group in Øresund region in infertility research)
- Professor Jens Sønksen, currently chair of the Danish Urological Association was recently elected as adjunct secretary general of the European Association of Urology and the annual convention will take place in Copenhagen in March 2018. Furthermore, many young researchers hold international positions as well
- Strong international corporations - the dept. of urology at Herlev Hospital has a developing and promising cooperation with Department of Urology at University of Michigan, Ann Arbor and Department of Urology at Rigshospitalet has a developing and promising cooperation with Cancer Prevention Institute and Department of Urology, Stanford University, California, USA

THREATS

- Strong demands for increased clinical production without increased funding
- Controversies with other specialties about borderline clinical/research areas
- Regulatory barriers such as data protection

Scientific Production

Urology	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	26	7.8	23	5.7	32	4.2
Review papers - International	2	2.8	1	6.0	1	6.0
Letters - International	3				1	15.0
Original scientific research papers - Danish	4	0.1	5	0.1	2	0.1
Total	35	6.5	30	4.6	36	4.3

3 most prominent publications from 2016

1. Berg KD, Thomsen FB, Nerstrøm C, Røder MA, Iversen P, Toft BG, Vainer B, Brasso K. The impact of the 2005 international society of urological pathology consensus guidelines on Gleason grading – a matched pair analysis. *BJU Int* 2016;117:883-9.
2. Jensen CF, Ohl DA, Hiner MR, Fode M, Shah T, Smith GD, Sonksen J. Multiple needle-pass percutaneous testicular sperm aspiration as first-line treatment in azoospermic men. *Andrology* 2016;4:257-62.
3. Evans C, Higano CS, Keane T, Andriole G, Saad F, Iversen P, Miller K, Kim C-S, Kimura G, Armstrong AJ, Sternberg CN, Loriot Y, de Bono J, Noonberg SB, Mansbach H, Bhattacharya S, Perabo F, Beer TM, Tombal T. The PREVAIL study: Primary outcomes by site and extent of baseline disease for enzalutamide-treated men with chemotherapy-naïve metastatic castration-resistant prostate cancer. *Eur Urol* 2016;70:675-83.

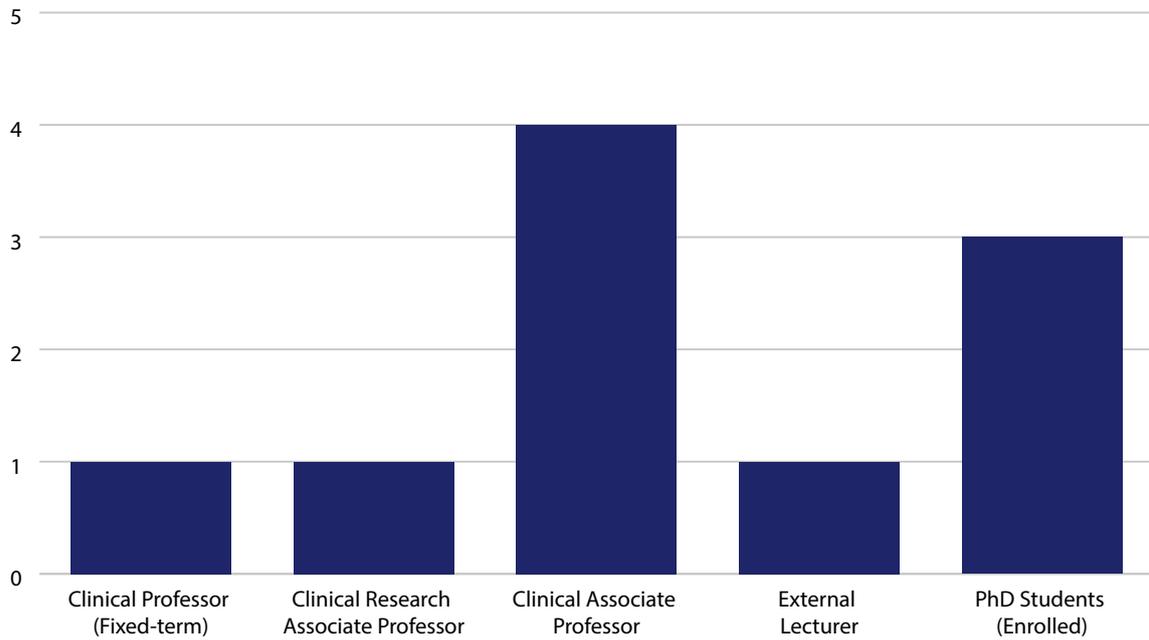
VASCULAR SURGERY

REPRESENTING PROFESSOR: HENRIK SILLESEN

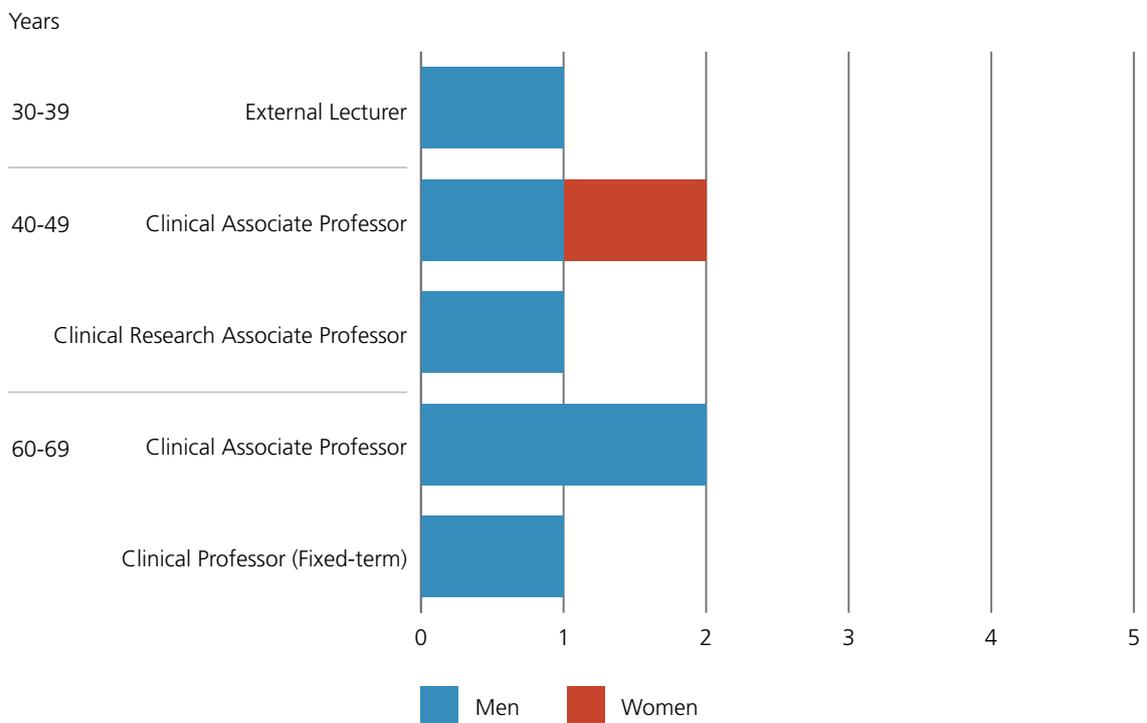
DESCRIPTION OF THE SPECIALITY

- Translational research in vascular disease, relating findings from ultrasound imaging (2D and 3D) and circulating biomarkers to clinical status and outcomes
- Randomized, controlled trials of new medical treatments, e.g. two recent RCT's of anti-inflammatory for prevention of growth of small abdominal aortic aneurysms
- Development of new ultrasound imaging methods, latest 3D quantification of carotid atherosclerosis and aortic aneurysm volume as well as surveillance programs for EVAR cases
- Core-lab function for ultrasound imaging of vascular disease – corelab in three international, multicentre trials from 2011-2016
- Replacement of intra-arterial and CT-angiography by ultrasound based methods
- Investigation of opportunities of ultrasound contrast agents for diagnosis and functional imaging in carotid, aortic aneurysmal and lower limb disease. Patent taken for labelled ultrasound bubbles for diagnosis of vulnerable plaques
- Importance of lifestyle changes in patients with intermittent claudication
- Technical skills training in open- and endovascular surgery

Academic Staff in Vascular Surgery – Headcount



Academic Staff in Vascular Surgery – Age and gender distribution



STRENGTHS

- Well established within clinical research of vascular diseases for decades located in the largest hospital with strong clinical and research relationships to other relevant specialities
- Department and research bridges from atherogenesis and imaging to medical, endovascular and surgical treatment of vascular disease
- Development contract for the past 20 years with the leading manufacturer of ultrasound equipment

WEAKNESSES

- Limited experience in/facilities for basic/animal research within vascular disease
- Only one professor and one part- time postdoc (three professors two years ago) and following, less younger research fellows (PhD students) – only two at present

SWOT

OPPORTUNITIES

- Largest vascular department in Scandinavia/ Northern Europe with a large number of new referrals
- Major change of generations within the coming 1-3 years opening opportunities for younger, more research-oriented consultants
- Internationally well established as research active within vascular disease being it translational, medical, endovascular or surgical treatment

THREATS

- Physical space of department limited at the same time as the number of referrals and treatment increases
- Underproduction of specialists in vascular surgery reducing competition for attractive positions resulting in less general interest to part of research

Scientific Production

Vascular Surgery	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	15	3.8	17	6.2	11	2.8
Original scientific research papers - Danish	2	0.1	2	0.1		
Total	17	3.3	19	5.5	11	2.8

3 most prominent publications from 2016

1. Bredahl KK, Taudorf M, Lönn L, Vogt KC, Sillesen H, Eiberg JP. Contrast enhanced ultrasound can replace computed tomography angiography for surveillance after endovascular aortic aneurysm repair. *Eur J Vasc Endovasc Surg* 2016;52:729-34.
 2. Ghulam QM, Bredahl KK, Gram JB, Lönn L, Goetze JP, Sillesen HH, Eiberg JP. von Willebrand factor and prekallikrein in plasma are associated with thrombus volume in abdominal aortic aneurysms. *Vasc Endovascular Surg* 2016;50:391-7.
 3. Taudorf M, Grønvall J, Schroeder TV, Lönn L. Endovascular aneurysm repair treatment of aortoiliac aneurysms: can iliac branched devices prevent gluteal claudication? *J Vasc Interv Radiol* 2016;27:174-80.
-

THE QUALITY AND INTERNATIONAL IMPACT OF THE RESEARCH

In general, IKM researchers focus their efforts on topics with ambitious potential for publication and impact that benefits the patients. Only a small proportion of the research is published in Danish-language papers. The vast majority of research is original research papers published in peer-reviewed international journals.

IKM researchers have a broad international collaboration network and they are significant contributors to international research.

IKM'S ABILITY TO IDENTIFY NEW SCIENTIFIC CHALLENGES

Both our researchers and the major research journals have sharp focus on novelty in their research and publication strategy. Therefore, the publication level (impact factor - IF) is a

reasonably valid indicator of new scientific areas and important research challenges. However, bibliometric data is unfair to small specialities with a low potential for citations.

Original international research papers comprised 90.1%, 91.7% and 91.3% of all publications in 2014, 2015 and 2016, respectively.

The majority of our clinical professors have five-year fixed-term appointments with a possibility of prolongation. In the establishment of professorships and recruitment for these professorships, the scientific basis for the professorship is thoroughly evaluated by the coordinating professor, the representing professor, the head of IKM, the hospital management and the chief of research of the

2014-2016 Original scientific research papers - international	Clinical Professors (tenured)		Clinical Research Associate Professors (KFL's)	
	Total	Mean	Total	Mean
Co-author	1,095	19	266	16
Last author	597	10	144	8
First author	60	1	14	1

Table 5. Scientific production in the period 2014-2016 for two of the categories of IKM staff: tenured clinical professors and clinical research associate professors, respectively.

region, who provide a guarantee for a specific need for research and development in the described topic within the speciality. Among the documents in an application for professorship or clinical research associate professorship, as well as applications for prolongation of these positions, a specific description of the planned research for the coming five years ("the research plan") is required.

Our tenured professors, who represent the most senior researchers among our staff, have a research production that in 2015 equalled 26% of our total production (numbers for 2016 are not yet available).

Our clinical research associate professors (KFL's) are typically consultants and they are expected to qualify for professorships within a few years if they are given the necessary 50% of their working hours for research. These positions are considered 'mini-professorships', with similar working conditions to professors with 50% clinical work and 50% university work (primarily research), but without funding for a part-time secretary. Among the 65 KFL employees in 2017, 23 were employed in 2013. Out of these 65, five (7.7%) have since been appointed professors. Our KFL staff had a production corresponding to 23% of our total production in 2015²⁶.

Our emeritus professors are senior professors, who have retired from their university and hospital appointments and maintain a connection to IKM without receiving salary. By their emeritus status, they maintain an academic connection to the University.

In the SWOT analyses presented below, a

substantial number of specialities mention the unique Danish registries and genetic/DNA analyses and excellent research collaborations/networks as an opportunity or a strength. The publication analysis from each speciality gives the overall indication that IKM researchers are involved in relevant scientific focus areas and have been published in speciality-relevant high-ranked research journals. A large number of specialities mention complex workflow with ethical committees and data authorities as a threat to research.

In 2014-2016, the mean impact factor for original international research publications was 5.3. Top three among the specialities were Clinical Biochemistry: 8.8; Internal Medicine: Geriatrics: 7.0 and Internal Medicine: Cardiology: 6.9. The three lowest among the specialities were Plastic Surgery: 2.3; Neurosurgery: 2.5 and Otorhinolaryngology: 2.7.

THE LEVEL OF IKM'S SCIENTIFIC PUBLICATIONS

During the three-year period 2014-2016, IKM's academic staff published a total of 7,152 original scientific research papers in international peer-reviewed journals (on average 2,384 publications per year)²⁷. As can be seen from table 6, the number of published papers is increasing over time, whereas the average impact factor for original publications remains relatively stable, ranging from 4.9 to 5.7. The publications from IKM represent approximately 50% of all scientific publications from SUND, University of Copenhagen. The field-weighted citation impact²⁸ for publications from IKM is more than double the world average and among the top third at SUND²⁹. This is quite impressive

26. Based on data from 17 clinical research associate professors (KFL's) employed in 2013 multiplied proportionally to a total of 65 and divided by 3 (average in year 2014, 2015 and 2016). Total number of publications in IKM in 2015 was 2,552.

27. The total number of publications for IKM has been corrected for duplicates, as some publications have authors from more specialities.

28. Share of 10% highly cited publications shows how well SUND's publications are represented among the top 10% highly cited publications in the world (SciVal/Scopus database). Above 10% is above the world average. The indicator is field-weighted. Thus, it takes field differences in citation frequencies into account: A publication is benchmarked with other publications from the same research field defined by SciVal/Scopus and same publication year (Source: SUND Health Report 2016, 2nd Edition).

29. SUND Health Report 2016, 4th Edition – Appendix 2.

IKM	2014		2015		2016	
	No.	Mean Impact Factor	No.	Mean Impact Factor	No.	Mean Impact Factor
Original scientific research papers - International	2,174	5.2	2,341	5.7	2,637	5.3
Review papers - International	24	7.2	54	3.3	118	4.5
Letters - International	52	18.3	38	9.3	43	9.3
Original scientific research papers - Danish	150	0.1	110	0.1	81	0.1
Review papers - Danish	10	0.1	6	0.1	4	0.1
Letters - Danish	1	0.1	3	0.5	4	0.1
Total	2,411	4.9	2,552	5.4	2,887	5.2

Table 6. The total scientific production by IKM staff in the period 2014-2016 described as number of publications and average impact factor broken down by different types of research publications

since our clinical academic staff are not full-time researchers.

During 2016, researchers from IKM published a total of 13 original papers in the world's top five general medical journals: *New England Journal of Medicine* (six papers), *The Lancet* (one paper), *Journal of the American Medical Association* (three papers), *British Medical Journal* (one paper) and *Annals of Internal Medicine* (two papers). Furthermore, a number of papers were published in highly prestigious journals, such as *Nature*, *Nature Genetics*, *Nature Biotechnology*, *Science Translational Medicine*, *Lancet HIV and Lancet Infectious Diseases*.

The spread of publications among the 34 specialities, both measured numerically (figure 8) and on average impact (figure 7), is – at least partly – explained by large differences in the number of academic staff within each speciality. For example, Thoracic Surgery has an academic staff of four, including one professor, compared

to 23 professors in Neurology and a total staff of 48.

With a few exceptions, the number of published papers per speciality increases over time while average impact is maintained (figure 8).

Mean Impact Factor per Speciality 2014-2016

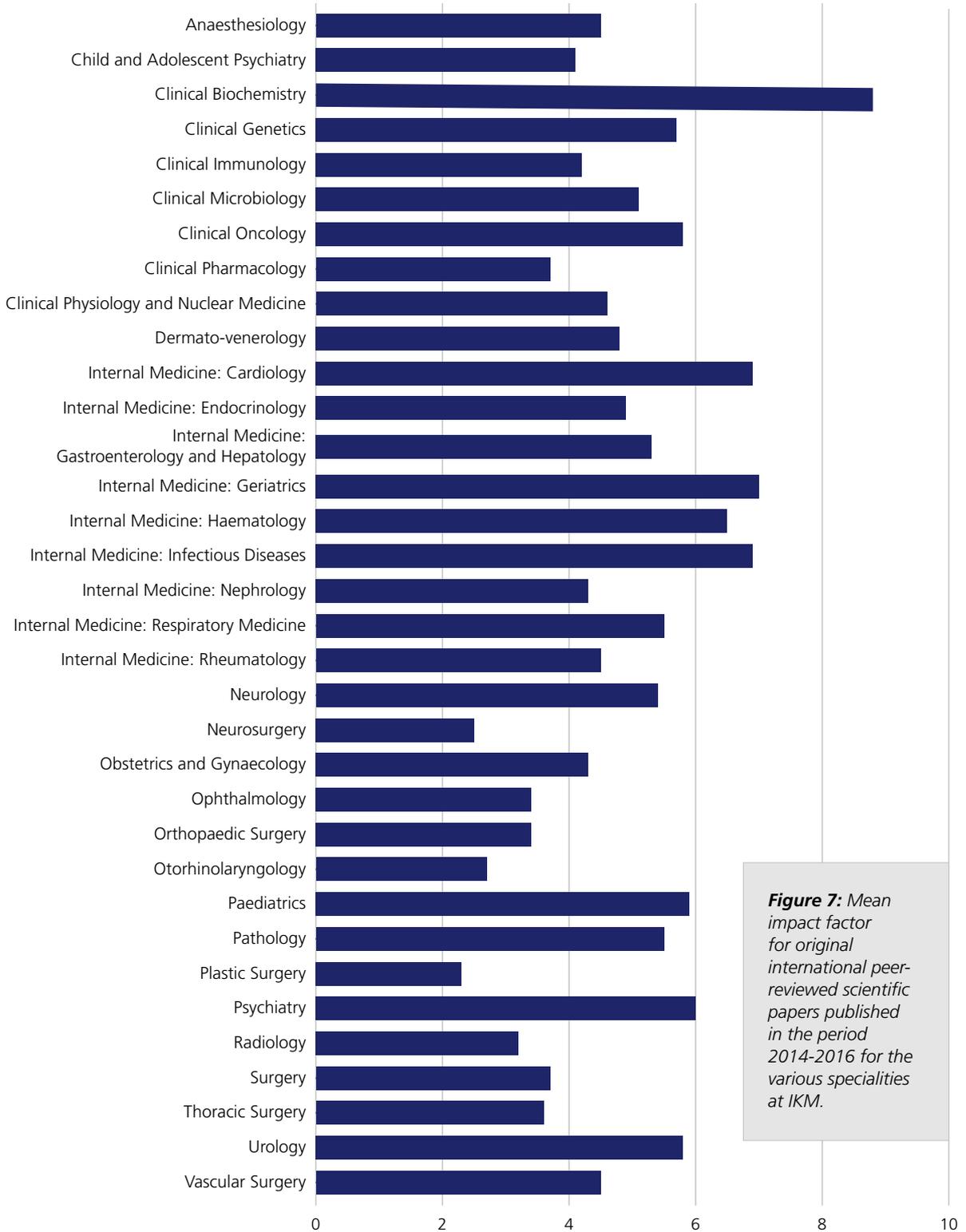
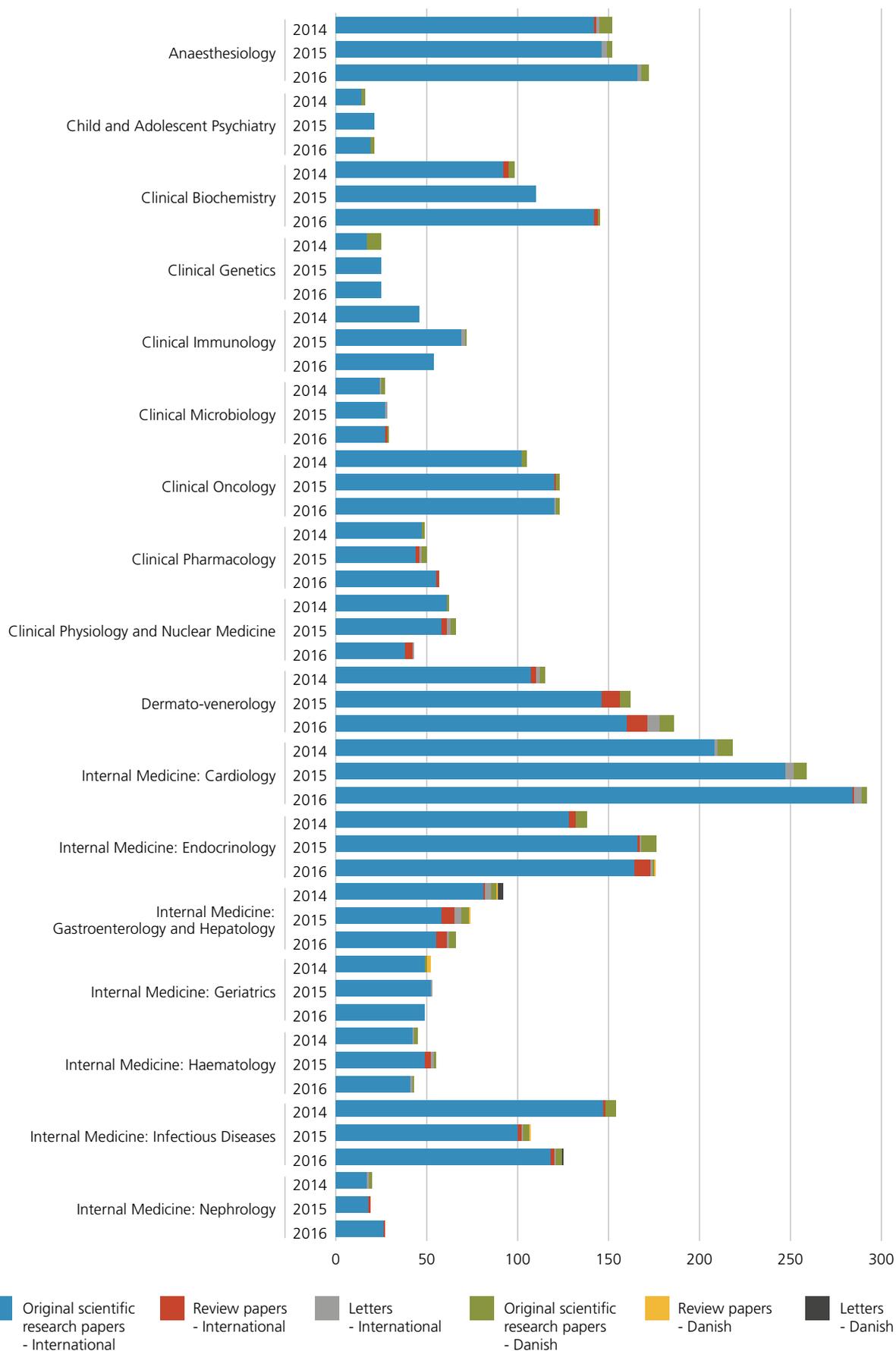
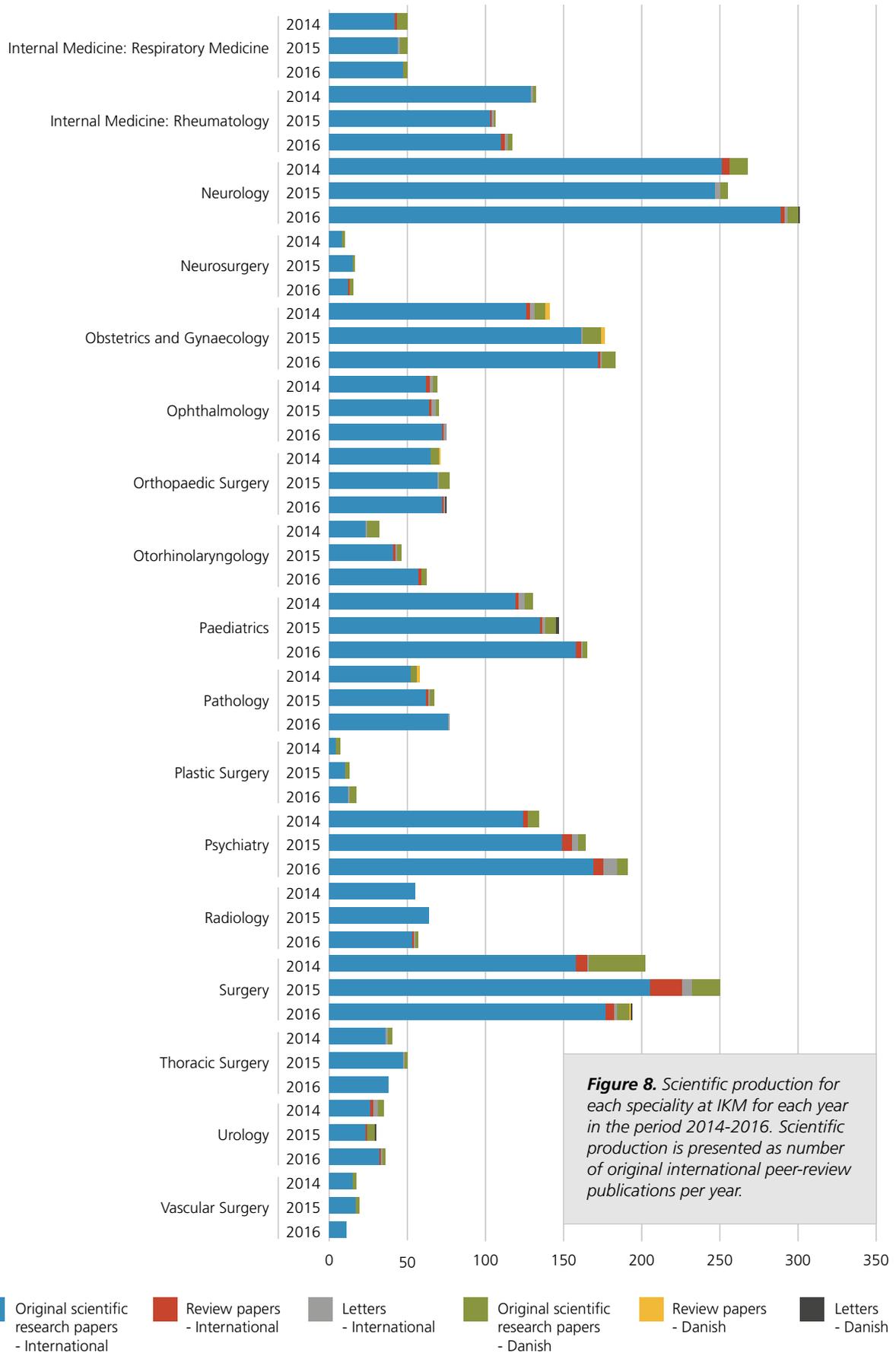


Figure 7: Mean impact factor for original international peer-reviewed scientific papers published in the period 2014-2016 for the various specialities at IKM.

Number of Publications per Speciality per Year





INDIVIDUAL ACHIEVEMENT AWARDS

During the period 2014-2016, a number of professors from IKM were recognized for their outstanding research through international and national prizes and awards. A number of these are highlighted here:

- Clinical Professor Bo Feldt-Rasmussen. Hagedorn Award by the Danish Society of Internal Medicine, 2014
- Clinical Professor Vibeke Backer. Award for Center of Research by the International Olympic Committee, 2014-2018
- Clinical Professor Per Soelberg Sørensen. Monrad Krohn's Prize for the Advancement of Neurological Research by the University of Oslo, 2014
- Clinical Professor Per Hölmich. Honorary Fellow of the Faculty of Sports and Exercise Medicine, Ireland 2014
- Clinical Professor Lars Køber. Kirsten og Freddy Johansen Prize, 2014
- Clinical Professor Christian von Buchwald. Klein's Award by the Medical Society of Copenhagen, 2014
- Clinical Professor Gitte Moos Knudsen. Carlsberg Foundation Research Prize, 2014
- Clinical Professor Jens Lundgren. Excellence in HIV medicine award by the European AIDS Clinical Society, 2015
- Clinical Professor Michael Kjær. Nordic Medical Prize, 2015
- Clinical Professor Flemming Pociot. Johnny Ludvigsson Prize by the Swedish Child Diabetes Foundation, 2015
- Clinical Professor Merete Nordentoft. Kirsten og Freddy Johansen Prize, 2015
- Clinical Professor Peter Rossing. Camillo Golgi prize by the European Association for the Study of Diabetes, 2016
- Clinical Professor Jens Lundgren. Kirsten og Freddy Johansen Prize, 2016
- Clinical Professor Merete Nordentoft. International Richard Jed Wyatt Award, 2016
- Clinical Professor Lars Vedel Kessing. Travelling Professor Award for the Royal Australian and New Zealand College of Psychiatrists, 2016

- Clinical Professor Martin Lauritzen. Niels A. Lassen Prize, 2016

Many other researchers received awards or won article and poster prizes.

PROJECTS CARRIED OUT IN COLLABORATION WITH NON-DANISH RESEARCHERS

IKM's research collaboration was assessed for 2016. Six per cent of IKM publications were authored with collaborators from other Scandinavian countries, 13% of publications represent collaboration with institutions in Europe and 18% represent collaboration with the rest of the world, primarily North America (figure 9). Accordingly, one third of the original research publications represents international collaborations. A substantial proportion of our publications represent collaborations with a high number of authors, which is typical for medical research.

As a part of the PhD programme, a stay in another research group, either nationally or abroad, is mandatory. Our PhD students are encouraged to work in a foreign research institution during their PhD studies for 6-12 months to establish an international network and to learn new research methods to bring back to their own institutions. Among 727 PhD students³⁰ registered at the beginning of 2017, a total of 154 (21%) have had an environment change ranging from two days to 20 months at an international institution during their studies; 70 (10%) had an environment change in Denmark and 8 (1%) went both abroad and to another Danish institution. Two thirds have still yet to take their environment change and it is anticipated that these will be scheduled in the near future. The group of PhD students at any time will clearly include students at different phases in their studies, from those who are in the early phase to others who are in the final phase of their PhD programme. Therefore, the fact that approximately one third of PhD students had a documented environment

30. Data concerning environment change are available for 727 PhD students by the beginning of 2017.

change is considered acceptable. IKM has no systematic records of the evaluation of these environment changes in terms of new academic achievements for the PhD student, or new

cross-disciplinary collaborations. Such records should be organised, in order to get a clear picture of the types of exchanges that are most successful.

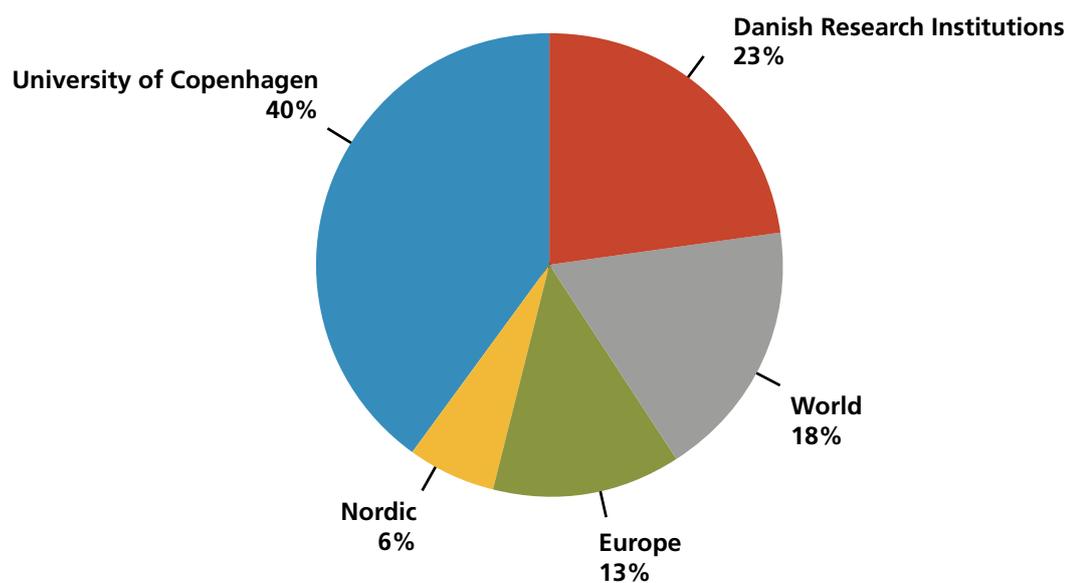


Figure 9. National and international collaboration documented in a sample based on 1689 original international peer-reviewed scientific publications from 2016 published with IKM researchers in the author list.

INTERDISCIPLINARY RESEARCH

We define interdisciplinary research as research with two or more disciplines integrated in a specific research project or collaboration. When IKM staff performs interdisciplinary research, this may be implemented by use of other research methods or with focus on research subjects which are not usually covered by the speciality.

LEVEL OF INTERDISCIPLINARY RESEARCH

A new organisational structure named Copenhagen Health Science Partners (CHSP) has been established to strengthen collaboration between the hospitals of the Capital Region of Denmark and the University of Copenhagen. The initiative was inspired by similar collaborations in the United Kingdom. During the spring of 2017, there was a call for applications to become a Clinical Academic Group (CAG) and 18 applications were evaluated by an international assessment committee. A total of four CAG's had been announced by May 2017 (two from Rigshospitalet, one from Herlev-Gentofte

Hospital and one from Bispebjerg Hospital). The four CAG's announced are the following:

1. Allergy – Clinical Professor Jeanne Duus Johansen (IKM) and Professor Carsten Geisler (Department of Immunology and Microbiology)
2. Precision Diagnostics in Cardiology – Clinical Professor Henning Bundgaard (IKM) and Professor Søren Brunak (Center for Protein Research at SUND)
3. Translational Hematology – Clinical Professor Kirsten Grønbæk (IKM) and Professor Kristian Helin (BRIC)
4. Physical Activity and Sports in Clinical Medicine – Clinical Professor Michael Kjær (IKM) and Professor Flemming Dela (Department of Biomedical Sciences)

The CAG's are led by a CAG leader and a co-leader, one clinical researcher and one basic researcher³¹. The number of CAG's is expected to increase gradually after relevant calls for applications. CHSP is led by a director and has

31. Researchers from other departments at SUND or the University of Copenhagen.

a small supportive staff, which is expected to increase in size. The CAG's will promote interdisciplinary research between clinicians and basic scientists and strengthen research quality. Each CAG will receive basic funding of DKK 1 million to support its infrastructure as well as funding for one PhD student. Collaboration in the CAG's is expected to promote more research funding from larger public and private funds as well as EU funding. CHSP will provide support for the CAG's with larger research applications and communication tasks. The organisational framework of CHSP is expected to enlarge in the coming years, with potential inclusion of other research institutions such as the Technical University of Denmark (DTU), other regions of Denmark and potentially Southern Sweden.

Unfortunately, we have no method to get solid data on the level of interdisciplinary research. However, there are strong traditions to collaborate with bio-statistical scientists and basic scientists from departments focusing on basic research at SUND. Other research partners are bio-informatics scientists, computer scientists, health economists and engineers.

An increasing number of research collaborations are seen with health professional scientists, including nursing researchers and physiotherapists. In the future, we must expect an increasing number of nursing research professorships in particular at IKM, and these researchers could probably benefit from a closer collaboration with traditional medical researchers. At the larger hospitals, an increasing number research groups, particularly nursing research groups, have been established with their own leaderships, PhD students and post docs. These environments are actively publishing and are becoming stronger.

IKM does not have an incentive structure to promote interdisciplinary research collaborations. However, these collaborations are obligatory in many larger national and EU theme grants. Different research communities have different traditions with respect to research methods, authorships etc. which is important to appreciate and clarify in the early phases of collaborations.

ALIGNMENT BETWEEN RESEARCH AND EDUCATIONAL ACTIVITIES

IKM offers a large variety of educational activities, spanning the entire spectrum of the Master's programme in Medicine and three other health programmes (Health Informatics, Health Science and Medicine and Technology). All courses (lectures and clinics at the hospitals) are taught by academic staff (clinical professors or clinical associate professors), which ensures research-based teaching. The hospital-based education (courses and bedside clinics) are divided between approximately 108 different hospital departments at 19 different locations. To help ensure the quality of the educational activities, IKM has appointed a person responsible for education³² from the local academic staff at each hospital department.

Theoretical courses, e.g. in internal medicine and surgery, are taught at 3-4 different locations

at hospitals in the Copenhagen area because of the large number of students at each semester. There is thus the potential that the curriculum may vary depending on differences among the academic staff, who give the lectures. Twice a year, all IKM staff responsible for the individual courses and exams meet to solve any issues.

The revised Master's programme for Medicine, which started two years ago, includes the opportunity to choose a research track (16 weeks) in the 5th semester. This will always be combined with a Master's thesis (25 ECTS) and possibly even with an extended research stay. We believe that this will be an opportunity to recruit young talents into clinical research, but it is likely that clear results from the revised Master's programme will not be available for a few years.

32. Lokal undervisningsansvarlig

2014-2016	Clinical Professors (tenured)		Clinical Research Associate Professors (KFL's)	
	Total	Mean	Total	Mean
Master's Theses Supervision	205	3	66	4
PhD Supervision (completed)	150	3	22	1
PhD Supervision (ongoing)	233	4	38	2

Table 7. Supervision of Master's theses and PhD projects performed by tenured clinical professors and clinical research associate professors. Data is based on information from 17 clinical research associate professors and 59 tenured clinical professors.

RESEARCH-BASED BACHELOR AND MASTER'S ACTIVITIES

Academic staff from IKM act as supervisors for Bachelor and Master's theses for medical students. Approximately 600 theses (mainly Master's theses) are completed per year. A proportion of these theses are eventually published as scientific papers.

PHD SUPERVISION AND COURSE ACTIVITY

At the time of enrolment, the PhD student must have a minimum of two supervisors – one principal supervisor, who must be either clinical professor or clinical associate professor at SUND, and one primary co-supervisor. During the PhD programme, the PhD student must submit three regular assessment reports to the Graduate School. The PhD student may add an external assessor to deliver feed-back on the regular assessments and on the progression of the project.

PhD students must complete courses corresponding to a minimum of 28 ECTS and maximum 35 ECTS credits during their 3-year PhD study³³. Each PhD student associated with IKM has to be connected with one of the graduate programmes in clinical research. The

Graduate School offers six different graduate programmes in clinical research, led by academic staff from SUND (four of these are led by IKM professors): Clinical Research (Head: Professor Vibeke Backer, IKM), Clinical Cancer Research (Head: Professor Inge Marie Svane, IKM), Basic and Clinical Research in Musculoskeletal and Oral Sciences (Head: Professor Michael Kjær, IKM), Psychiatry (Head: Professor Merete Nordentoft, IKM), Medical and Molecular Imaging (Head: Professor Andreas Kjær) and Cardiovascular Research (Head: Associate Professor Morten Schak Nielsen).

Each of the university hospitals/centres that have coordinating professors also have a PhD coordinator, 16 in total³⁴. The PhD coordinators help to facilitate the contact between the PhD students, the departments at SUND and the Graduate School. The PhD coordinators act as advisors on subjects that are related to the non-scientific content of the PhD courses. One of their main tasks is to foster a good academic and social environment for the PhD students and, if necessary, help establish a local environment in which PhD students, who are often working in different departments in the hospital, can meet and support each other. The

33. Please refer to the "Governance and Structure Memo" for further information about the PhD programme at SUND, University of Copenhagen. See also PhD Rules and Regulations at SUND: http://healthsciences.ku.dk/phd/guidelines/PhD_Rules_and_Regulation_June_2017.pdf.

34. Zealand University Hospital, Holbæk Hospital and Nykøbing Falster Hospital share a PhD coordinator.

PhD coordinators meet with the Head of the Graduate School once or twice a year.

PHD STUDENTS

A Danish PhD programme has a duration of three years. PhD students are typically recruited locally among young doctors and research-active medical students known in the local environment. It is not obligatory to advertise for PhD students and therefore clinical PhD students are almost always Danish or from other Scandinavian countries. Gender issues are not dealt with during the recruitment of PhD students. Only staff members with university affiliation can be faculty responsible (main) PhD supervisors. The faculty responsible supervisor has to guarantee the salary for the PhD student as well as the PhD tuition fee (DKK 50,000/year) at the time of enrolment, even though complete funding has not always been obtained at this early time. Increased internationalisation among PhD students could be achieved by obligatory advertisements. However, in projects with patient involvement, ability to speak Danish is essential. In Denmark, the general proportion of international PhD students rose by 19% from 2003 to 2014. Five years after graduation, 41% of the international PhD students from the 2009 graduation cohort remained in Denmark³⁵.

In 2016-2017, the Ministry of Science and Higher Education conducted a major analysis of PhD education in Denmark³⁶, with special focus on the health and medical sciences, in particular the high number of medical doctors doing a PhD³⁷. The uptake of PhD students with a medical background increased by 125%

from 2003 to 2010³⁸. Approx. 90% of Danish PhD students complete their programme, with the completion rate highest for health sciences at 95%. Danish PhD production is on a par with other EU/EEA (European Union/European Economic Area) countries. In 2014, Denmark produced 378 PhD graduates per one million inhabitants, which positions Denmark as number seven among EU/EEA countries.

The conclusion of the analysis was the following³⁹: "The analysis shows that PhD education creates value for the medical profession, and that there is a difference in the competences that medical doctors with a PhD degree use in their everyday worklife compared to medical doctors without a PhD degree. These competences are analysed in relation to 'the seven roles of a medical doctor'⁴⁰ as described by the Danish Medical Association. The largest difference was not surprisingly with respect to academic competencies, where there is a statistically significant difference between medical doctors with and without a PhD degree. Furthermore, there was a tendency towards a PhD degree also having a positive influence on the function of acting as a medical expert in terms of academic and professional development as a doctor. However, the analysis also indicates that this takes place at the expense of clinical experience and patient contact."

Similar increases in the proportion of medical doctors doing PhDs have been observed in Germany, Sweden and Finland⁴¹. The analysis also examined whether the high number

35. Reference: http://healthsciences.ku.dk/phd/guidelines/PhD_Rules_and_Regulation_June_2017.pdf.

36. <http://ufm.dk/publikationer/2017/filer/ph-d-uddannelsens-kvalitet-og-relevans.pdf> (accessed 9 June 2017). An English summary is available on p. 7

37. <http://ufm.dk/publikationer/2017/filer/epinion-undersogelse-af-den-laegevidenskabelige-ph-d-uddannelse.pdf> (accessed 9 June 2017).

38. <http://ufm.dk/publikationer/2017/filer/ph-d-uddannelsens-kvalitet-og-relevans.pdf> (accessed 9 June 2017), p. 10.

39. <http://ufm.dk/publikationer/2017/filer/epinion-undersogelse-af-den-laegevidenskabelige-ph-d-uddannelse.pdf>, p. 4 (accessed 9 June 2017).

40. <https://www.sst.dk/en/news/2013/the-seven-roles-of-physicians> and <https://www.sst.dk/en/news/2013/~/-/media/39D3E216BCBF4A9096B286EE44F03691.ashx>

41. <http://ufm.dk/publikationer/2017/filer/ph-d-uddannelsens-kvalitet-og-relevans.pdf>

of medical doctors doing a PhD (30%) had implications in terms of lower quality in the scientific publications which constituted the foundation of the PhD thesis and the assessment of employers and PhD graduates. Seventy-five percent of international assessors evaluated that Danish PhD's were good or very good compared to international PhD's in the same research topic. From a societal perspective, the Danish PhD programme has been found to be financially sound.

Overall, IKM agrees with the conclusion from the evaluation of the PhD programmes in Denmark, that a PhD degree for medical doctors adds value to the clinical skills and competences PhD's will use in their professional life. Furthermore, the PhD programme is cost-effective from a societal perspective. We should facilitate that our most talented MD's with a PhD degree continue their research activities. This could be achieved by securing early university affiliation.

PRIVATE AND PUBLIC COLLABORATION

STRATEGY FOR COLLABORATION

In The Capital Region of Denmark, 1,050 contracts were signed between academic staff and private partners in 2016. These collaborative efforts cover a wide range of collaborations spanning over clinical trials, PhD programmes, consultancies, EU grants etc.

Current strengths of private-public partnerships are well-organised clinical infrastructures with several highly experienced clinical research units at many of the hospital departments. Weaknesses and threats are that increasing workload on key clinical scientists will limit the possibilities of increasing these types of collaborations further, unless additional funding and investments from both public and private sides are initiated. These investments need to be initiated promptly in order to keep our internationally high position for performing clinical trials. Other countries (i.e. Japan, Korea) invest heavily in infrastructure and life science and are important competitors⁴². We have good opportunities to expand our collaborations with private partners because of the clinical expertise at IKM, because of the high level of quality in infrastructure and disease registries, and because Danish society in general is well regulated. In order to facilitate and attract clinical trials to Denmark, the public-private partnership, National EXperimental Therapy partnership (NEXT) was established in 2014. It has now been suggested to strengthen this effort by a merger with the Clinical Trials Office Denmark (CTOD), and in close dialogue with all stakeholders (regions, ministries, industry, patient organisations)⁴³. This is anticipated to

ensure that Denmark continuously can attract clinical trials, testing of procedures, new techniques, diagnostics, rehabilitation and care. Academic staff at IKM, as well as the four newly established Clinical Academic Groups (CAG's) as described on page 162, are crucial for these activities and will engage actively in this process.

LEVEL OF RESEARCH COLLABORATION

Academic staff at IKM raises substantial funds, and of the more than 1,000 projects described above, a substantial part is private and public research collaborations. At present, five industrial PhD programmes are running. Currently IKM is experiencing increased interest for these kinds of collaborations. In order to stimulate private-public PhD collaborations, sufficient administrative help for contracts and intellectual-property-related issues are important cornerstones. The recent fusion of the two Tech Trans offices at the University of Copenhagen and the Capital Region of Denmark will strengthen commercialisation and facilitate administrative and legislative matters for scientists.

LEVEL OF EDUCATIONAL COLLABORATION

Local meetings or symposia at specific hospitals with invited guest lecturers are commonly organised and emerge from specific research collaborations and research interests. Opportunities for stimulating synergy among the many dynamic clinical scientists at IKM within and across hospitals could include organising a series of symposia with cutting-edge clinical research, co-branding IKM and external sponsors.

42. Life science i verdensklasse – Anbefalinger fra regeringens vækstteam for life science, March 2017.

43. Life science i verdensklasse – Anbefalinger fra regeringens vækstteam for life science, March 2017.

IMPACT AND INNOVATION

STRATEGY FOR PUBLIC ENGAGEMENT

Academic staff at IKM is visible in Danish television, radio, newspapers and magazines. There is great interest in and awareness of health and medical science in today's Danish media landscape.

STRATEGY FOR SOCIETAL IMPACT

Academic staff at the Department continuously works with evidence-based medicine, and works progressively with changing current clinical practice and legislation if needed. It is, however, important to realise that a large proportion of our research has great value for understanding disease mechanisms and clinical issues, despite the fact that it does not always change patient treatment or impact on clinical guidelines.

COMMERCIALISATION AND CONSULTANCY

The two Tech Trans offices at the University of Copenhagen and at the Capital Region of Copenhagen have recently been merged into one section in order to increase opportunities for the commercialisation of scientific inventions and to facilitate the commercialisation process. SUND has strong networks facilitating collaboration between public and private partners and commercialisation: EIT Health (Healthy Living and Active Aging), CHI (Copenhagen Health Innovation), CACHET (Copenhagen Center for Health Technology), CHC (Copenhagen Health Cluster), SUND Vækst-Huset, SUND Innovation HUB, and Health Axis Europe (HAE). These seven networks are well-established and also involve academic staff at IKM.

CONCLUSION AND GENERAL SWOT ANALYSIS

IKM at SUND at the University of Copenhagen is the largest department at the University with an academic staff of almost 700 persons (plus PhD students). The department is unusual since its staff has shared appointments at the hospitals as consultant or staff physicians and at the university. The staff covers 34 medical specialities distributed on 19 locations and the university appointments span from tenured professors, to fixed-term professors, clinical research associate professors and associate professors. The main function of our associate professors is teaching, and due to their research qualifications, the research-based teaching of medical students is secured. The diversity of IKM, with its many specialities, offers great opportunities for collaboration and interdisciplinary research. On the other hand, the fragmentation of IKM over many hospitals may challenge collaboration and communication.

The present research evaluation demonstrates that the majority of the research produced by the staff is in the form of international original research publications and the annual production is around 2,400 publications per year, with an average impact factor of 5.4. The field-weighted citation impact for publications from IKM is more than double the world average and among the top one third at SUND. We are only exceeded by the research centres with full-time researchers, i.e. the Center for Protein Research, the Center for Basic Metabolic Research, the Danish Stem Cell Center, Biotech Research and the Innovation Centre.

Our present report shows that several specialities are extremely productive, although the report also demonstrates that some specialities are performing at a lower level. This could call for

strategic initiatives to facilitate growth in these weakly performing environments.

Among the present PhD students, 66% are women, which will potentially lead to a more balanced gender ratio in the future among the staff, which currently has a male predominance. The PhD students have a mandatory environment change.

A recent collaborative initiative between the University of Copenhagen and the Capital Region of Denmark, called Copenhagen Health Science Partners (CHSP), has recently identified the first four Clinical Academic Groups (CAG's). More CAG's will be announced in the coming years, and CHSP is expected to expand the collaborative partnerships continuously. It is anticipated that CHSP will stimulate a similar growth in research activities as demonstrated by their counterparts in the UK.

IKM is part of a Danish collaboration in which the heads of the clinical departments from all four Danish Universities with a medical school meet on a regular basis and discuss common issues related to financial challenges, research, teaching, curricular, etc. This forum is a highly inspirational network, which stimulates local strategies and development. We suggest that a similar forum for the clinical departments at the major universities in the Nordic countries be established, with regular meetings and collaborations. Such a Nordic forum and its network would facilitate research collaboration, identification of international members in PhD assessment committees, appointment of international members of assessment committees for professorships and exchange of scientists.

STRENGTHS

- Good combination of research and clinical work
- Good organization of clinical services with reasonably sized units and centralization of specialized care
- Access to large numbers of patients and registry data within all research areas
- Collaboration between basic science and clinical research
- Strong collaboration with other universities
- Well-defined infrastructure and administrative support in the department
- Increase/growth in the number of clinical professorships
- High level of research-based teaching

WEAKNESSES

- Lack of well-defined career paths for clinical research positions
- No dedicated time for research for students and young doctors
- Administration of funding is laborious
- Clinical activity related to research is not reimbursed and rarely funded
- The department does not have its own research funds

SWOT

OPPORTUNITIES

- Access to and use of big data
- Recruitment of clinical assistant professors
- Infrastructure – facilitation of a research strategy for the department
- New 5th semester candidate focused on research
- Strengthening of collaboration between hospital and university through Clinical Academic Groups (CAG's)

THREATS

- Basic grants are continuously being reduced
- Difficult to achieve research funding
- Limited access to clinical data due to data protection issues
- Increasing level of documentation of safety in research hampers management

GENERAL SWOT ANALYSIS

Strengths

Many specialities see the close association between clinical work with a high volume of patients and research as a major strength. There is a good organization of clinical services with reasonably sized units and centralization of specialized care.

In many research groups, there is a strong tradition for collaboration between basic science and clinical research. Our researchers have strong collaborations with other universities, both nationally and internationally. The unique

registry opportunities to assess short-term and long-term outcomes of diseases, interventions and treatments at a complete national level is also seen as a major strength. We have established a well-defined infrastructure and administrative support in IKM, empowering the specialities through the representing professors, and facilitating the interaction between the university and the hospitals through the coordinating professors. The increase in the number of clinical professorships over the past years is a major strength. We offer a high level of research-based teaching, spanning the entire spectrum of the Master's programme in Medicine.

Weaknesses

A structured university career process is lacking. This contrasts to the well-structured clinical career process for clinicians and it leads to a deficiency in intermediate level researchers (e.g. post docs). Furthermore, the possibility for students to have dedicated research time has decreased and both students and young doctors have to rush through the different stages of education with difficulties in taking leave for research. Administration of funding is laborious and the overhead of funding is increasing. The economy of the hospital departments is directly related to clinical activity, but activity related to different aspects of research is not reimbursed and rarely funded. IKM does not have any funds dedicated to research.

Opportunities

A prominent opportunity is the potential use of big data from daily routine clinical practice and aligned with disease processes giving rise to an enormous potential for clinical research. The department is expected to benefit from having its own research strategy, and ideally it should have its own supportive infrastructure and funding to support its research. Recent development and funding of the clinical academic group (CAG) initiative between academia and hospitals may provide excellent possibilities to strengthen cooperation across specialities and across borders between basic science and clinicians. The new 5th semester on the Master's part of the medical programme has enabled the student to choose different directions, among which a research perspective can be selected, and this may contribute to recruitment of future PhD students and young researchers. In the near future, we expect a new category among our staff – the clinical assistant professors. These will fill the current gap between the PhD students and the associate professors.

Threats

Many groups fear that it will be increasingly difficult to obtain research funding. Furthermore, the clinical workload will probably increase even further. The lack of research-specific IT support and the fact that the electronic hospital records

do not sufficiently support structured clinical data collection and even set obstacles for data flow back to the researchers will limit clinical research. The administrative hurdles (legal approvals, overhead, increasing administrative workload with research budgets) continue to expand and will negatively affect the ability to conduct clinical research. The increasing level of documentation of safety in research (data surveillance, IT security, good clinical practice) makes it necessary to set aside specific resources for management. Limited access to clinical data (data protection issues) and the legal obstacles to get access to metadata from large databases may hamper clinical and epidemiological research.

In summary, IKM is a large department with strong academic traditions, a high-impact scientific production and major contributions to research-based teaching of medical students and scientific education of PhD students. Our vision is to be an internationally leading institution in education and research within clinical medicine. We will pursue this vision by strengthening our national and international scientific and educational collaborations and by engaging in existing and future innovative partnerships.

TERMINOLOGY

Affiliate associate professor/professor	Adjungeret lektor/professor
Associate professor	Lektor
Association of representing professors	Forsamlingen af ordførende professorer
Board of studies	Studienævn
Clinical assistant professor	Klinisk adjunkt
Clinical associate professor	Klinisk lektor
Clinical professor (tenured)	Lærestolsprofessor
Clinical professor (fixed-term)	Eksternt finansieret klinisk professor
Clinical research associate professor	Klinisk forskningslektor
Coordinating professor	Koordinerende professor
Copenhagen University Hospital	Københavns Universitetshospital (KUH)
Course coordinator	Kursusansvarlig
Department council	Institutråd
Department of Clinical Medicine	Institut for Klinisk Medicin (IKM)
Emeritus/emerita professor	Professor emeritus/emerita
Exam coordinator	Eksamensansvarlig
Executive committee – teaching	Forretningsudvalg for undervisning
External lecturer	Ekstern lektor
Faculty of Health and Medical Sciences (SUND)	Det Sundhedsvidenskabelige Fakultet (SUND)
Head of studies	Studieleder
Postgraduate clinical associate professor	Postgraduat klinisk lektor
Professor agreement	Professoraftale
Representing professor	Ordførende professor
Teaching committee	Undervisningsudvalg
University of Copenhagen	Københavns Universitet

APPENDICES

- Appendix 1: CV résumés for IKM researchers
- Appendix 2: SUND Health Report 4th Edition
- Appendix 3: Strategy for Faculty of Health and Medical Sciences 2013
- Appendix 4: Professor Agreement
- Appendix 5: SUND Innovation Report 2012-2016
- Appendix 6: University Structure and Governance
- Appendix 7: Strategy for the University of Copenhagen 2016

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Photos

Christoffer Regild, Torben Klint, ScanPix, Tomas Bertelsen

Print

Rosendahls

Design

Kliborg Design

September 2017

