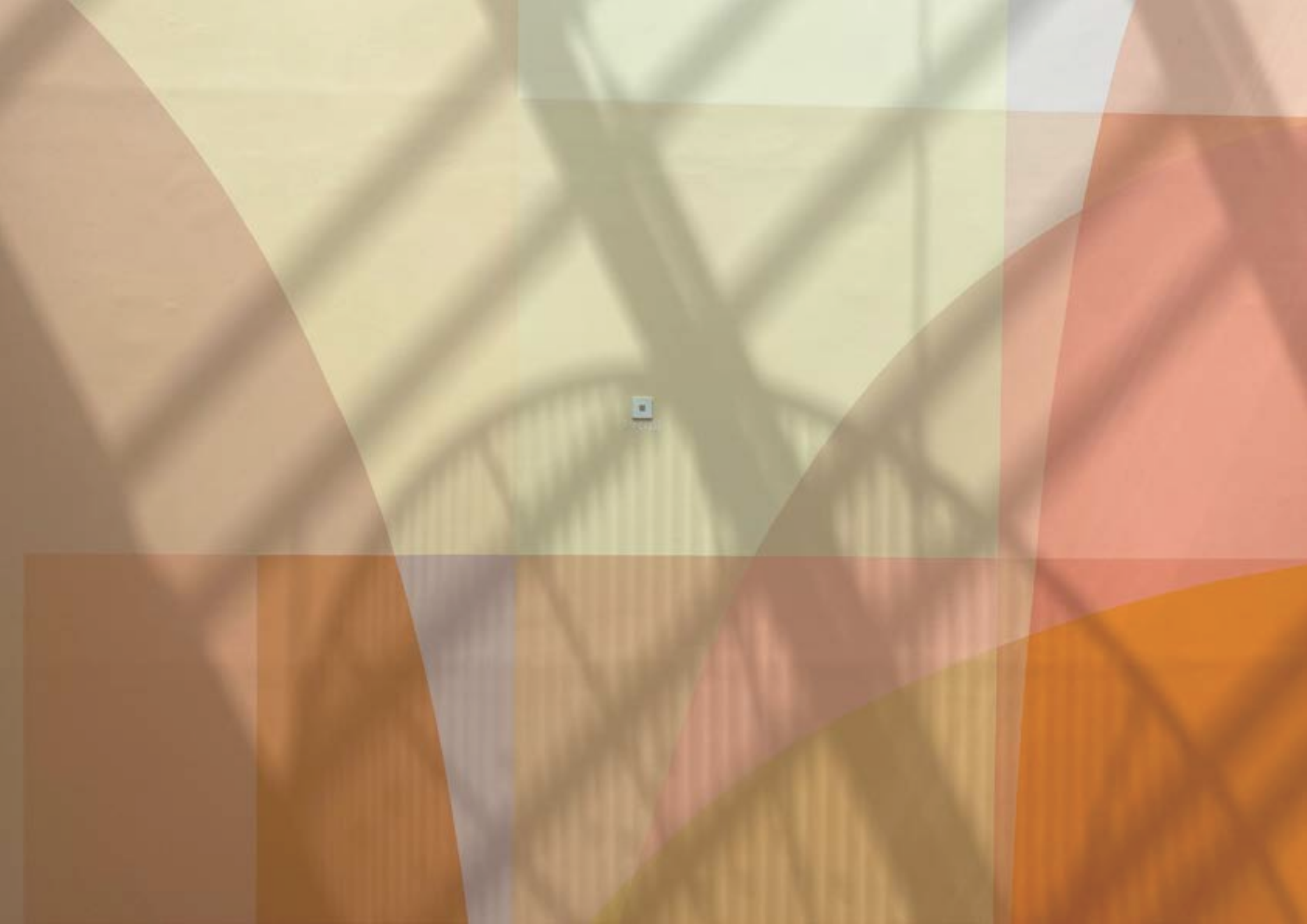
CLINICAL & RESEARCH

2025 Report

EAR NOSE AND THROAT - HEAD AND NECK SURGERY AND AUDIOLOGY

Rigshospitalet



Content

Reflecting on the year 2025

- by Mads Klokker, Chief Surgeon

Every year brings its own highlights and areas of focus. In 2025, the Department once again experienced several significant achievements that deserve recognition. Above all, as Head of Department, I am immensely proud of the many dedicated and highly skilled colleagues who make up our team. I do not believe we have ever been as professional, committed and energetic in our focus on patient care as we are today. This dedication was recognised through the regional "Patient Award Price (Længdespringerprisen), presented to the Department that has maintained the highest patient satisfaction ratings over the longest period.

Alongside our daily clinical activities and the treatment of patients within our specialty, the Department continues to place a strong emphasis on innovation, new ways of thinking and research.

In 2025, this resulted in more scientific publications and PhD candidates than ever before. Much of this success has been achieved through our close partnership with the Technical University of Denmark (DTU), where we now collaborate with three separate departments on a range of research and development projects. Together with one of these departments, we reached another important milestone at the end of the year with the establishment of an additional Clinical Professorship, held by the newly appointed Professor and Consultant, Tobias Todsen.

Preparedness and contingency planning are areas that will continue to receive particular attention within the Department. The ongoing conflict between Russia and Ukraine has highlighted the importance of ensuring that the healthcare system is prepared for potential emergencies. In accordance with the principles of sector responsibility set out by the Danish National Operational Staff (NOST), departments must be capable of maintaining essential functions independently in the event of a crisis. This remains a key focus area for us.

Furthermore, the emergence of new weapon technologies has unfortunately led to new patterns of injury. We must anticipate that fascial as well as head and neck trauma in future armed conflicts may increase three- to fourfold compared with previous wartime experiences, largely due to the widespread use of drones in modern warfare.

From a political perspective, the continued focus on hearing aids and age-related hearing loss has resulted in additional funding being allocated to the

Department to help reduce waiting times.

MADS KLOKKER

Head of Dept. of Otorhinolaryngology Head & Neck Surgery Audiology Rigshospitalet, Copenhagen University Hospital

Head of Military Aviation Medicine and Copenhagen Hearing & Balance Center.

MD and associate professor in Otorhinolaryngology, Copenhagen University

Affiliated Danish Armed Forces Health Services

60+ peer-reviewed scientific publications

30+ years in otorhinolaryngology

"I do not believe we have ever been as professional, committed and energetic in our focus on patient care as we are today. This dedication was recognised through the regional "Patient Satisfaction Award" (Længdespringer Pris)

Patient organisations such as the Danish Associations for the Hard of Hearing (Høreforeningen) and DaneAge Association (Ældre Sagen) have welcomed this development, not least because growing evidence suggests a potential association between hearing loss and reduced cognitive function.

The strategic focus on hearing disorder has also led to the merger of the Capital Region of Denmark's two ENT and Audiology departments, effective from the beginning of 2026. A larger, unified department offers opportunities for greater efficiency and more consistent treatment pathways, although organisational change can understandably create uncertainty among staff. I am particularly grateful that Senior Consultant Thomas Hjuler agreed to support in the transition period by serving on secondment to the Department of ENT and Audiology at North Zealand Hospital. We now look ahead to a new era shaped by evolving

regional priorities, including initiatives such as "Activity Reduction" and the "Outpatient Clinic of the Future".

I hope that readers of the 2025 Annual Report will be inspired to engage further with our department and to explore opportunities for future collaboration with our exceptional team.

Warm regards,

Mads Klokker
Chief Surgeon

Reflecting on the year 2025

- by Tine Bloch Jensen, Chief Nurse

2025 has been a remarkable year for the Department of Otorhinolaryngology, Head and Neck Surgery and Audiology. Throughout the year, we have continued to strengthen our commitment to excellent patient care, research, education, and professional development while navigating the increasing complexity of modern healthcare.

At the heart of our department is a strong interdisciplinary culture. Physicians, nurses, physio-therapists, occupational therapists, dietitians, audiologists, secretaries, and many other healthcare professionals work together with a shared purpose: to improve the lives of our patients and their families. Through collaboration, mutual respect, and professional expertise, we create seamless patient pathways and deliver high-quality, individualized care.

One of the most significant achievements of 2025 was receiving the Patient Satisfaction Award from the Capital Region of Denmark (so called Længdespringerprisen). This recognition is particularly meaningful because it reflects the experiences and voices of the patients and families we serve. It is a tribute to the professionalism, compassion, and dedication demonstrated by our staff every day and a powerful reminder that our greatest success is measured by the difference we make in the lives of others.

The year has also been marked by important progress in nursing research and development. Guided by our Nursing Research and Development Strategy 2024-2029, we have strengthened research partnerships, expanded educational opportunities, advanced innovative initiatives such as virtual reality, and further integrated research, education, and clinical practice. These efforts contribute directly to evidence-based, person-centred care and improved patient outcomes.

Investing in our colleagues remains a strategic priority. Through specialist education, post-graduate programmes, clinical supervision, and active involvement in research and quality improvement initiatives, we continue to strengthen both individual competencies and our collective capacity for innovation and excellence.

Reducing health inequalities has remained another key priority. Through initiatives supporting the Danish Healthcare Reform, including specialist nursing services that bring advanced care closer to patients' homes, we continue to improve continuity of care and ensure equitable access to high-quality treatment. At

> What makes me most proud, however, is not only what we have achieved, but how we have achieved it

the same time, new national and international collaborations have strengthened opportunities for scientific exchange, innovation, and shared learning.

What makes me most proud, however, is not only what we have achieved, but how we have achieved it. Throughout the year, I have witnessed colleagues across all professional groups supporting one another, sharing knowledge, and continually striving to improve care for patients and families. This culture of trust, professionalism, and shared responsibility remains our greatest strength and the foundation for our continued development.

As healthcare continues to evolve, our ambition remains clear. We will continue to strengthen interdisciplinary collaboration, advance research and innovation, and ensure that the highest standards of clinical practice remain firmly centred on the needs of patients and families.

Finally, I would like to express my sincere gratitude to all colleagues for your dedication, professionalism, curiosity, and compassion. The achievements presented in this report are the result of your collective efforts and commitment. Together, you continue to make our department a place recognised not only for clinical excellence, but also for the humanity with which care is delivered every day.

Warm regards,

Tine Bloch Jensen
Chief Nurse

ENT nursing care
LinkedIn

TINE BLOCH JENSEN

Head Nurse of Dept. of Otorhinolaryngology Head & Neck Surgery Audiology Rigshospitalet, Copenhagen University Hospital

Master in Business Coaching

Leadership in Research – Executive Programme, Region Hovedstaden

Diploma in Health Sector Organisation, Leadership and Economics, University of Southern Denmark

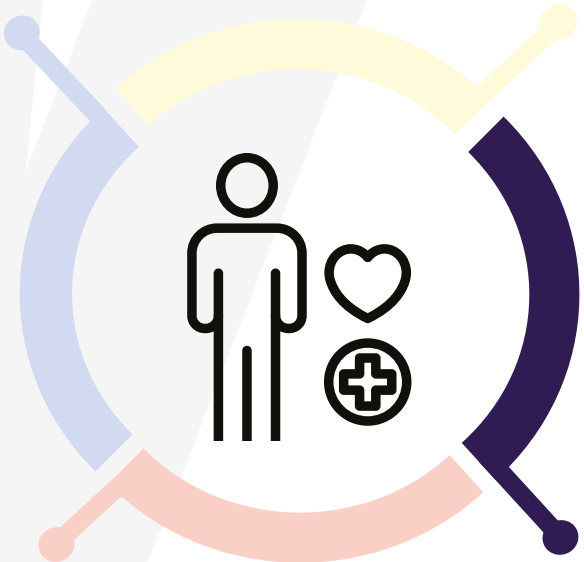
25 years in otorhinolaryngology

Ear, Nose and Throat in focus

The Otorhinolaryngology and Audiology (ENT) specialty focuses on the diagnosis, treatment, and surgical management of conditions affecting the ear, nose, throat, and related structures of the head and neck. As a surgical and audiology Department, we provide advanced care for patients of all ages, addressing hearing impairments, balance disorders, audiology-related needs, airway challenges, and head and neck pathologies.

Nose

- Airway management
- Sinus disorders
- Global Airways
- Smelling rehabilitation



Throat

- Head & Neck disorders
- Cancer
- Guided robotic optic surgery
- Ultrasound diagnostics
- Stemcell research
- Palliative rehabilitation

Ear

- Ear diseases
- Hearing disorders
- Vestibular disorder
- Audiological rehabilitation
- Otopathology laboratory

Education

- Evidence based education
- Hands-on traning
- Virtual Reality training

ENT in numbers

In this dashboard we highlight a selection of key statistics showcasing our performance and progress. These numbers represent the impact of our collective work, offering a snapshot of our milestones and the trajectory we are on.

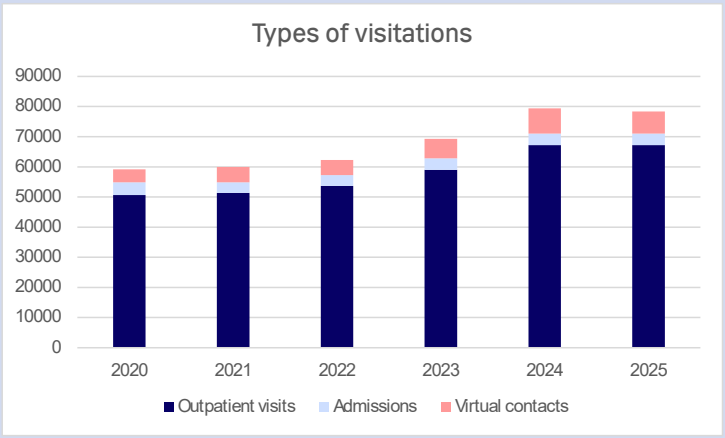
4927
Surgeries

1217
Day Surgeries

67239
Unique Outpatients Visits

4.45
Patient Satisfaction Score
(increasing scale 1-5)

Source: Internal



Source: Internal

1.34
Average admission days

FACT

Our Dept. in Greenland

24
Weeks in Greenland

Together with other hospital departments in Denmark we are in a long-term collaboration with the Greenlandic Self-Government, aiming to strengthen the delivery of comprehensive ENT services. On the reverse Denmark incorporates learnings from Greenland's expertise in delivering healthcare in remote settings and a holistic approach to health.

Source: Internal

Head and Neck Cancer

11

Types of cancer

85 seperate DRG-codes

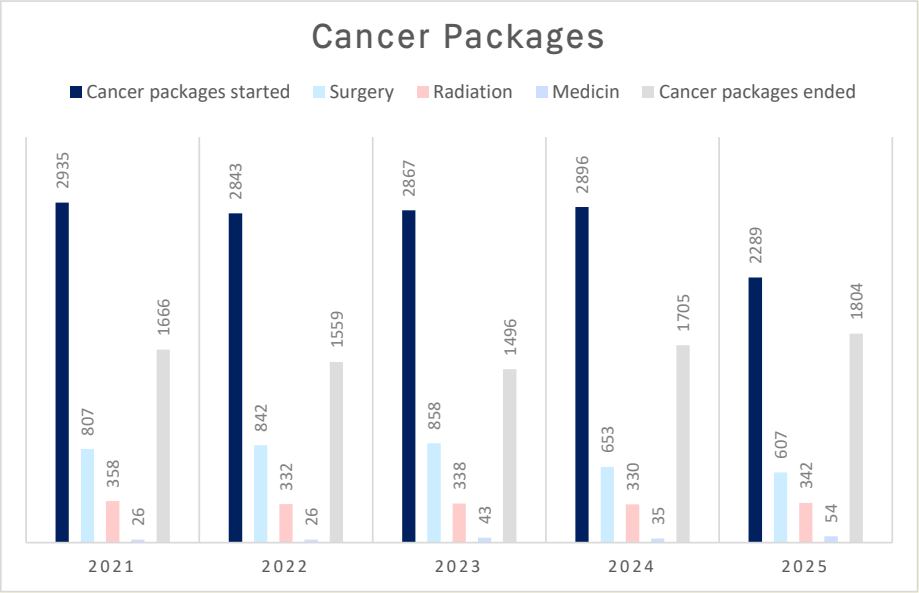
1881

Unique patients with cancer

Source: Internal

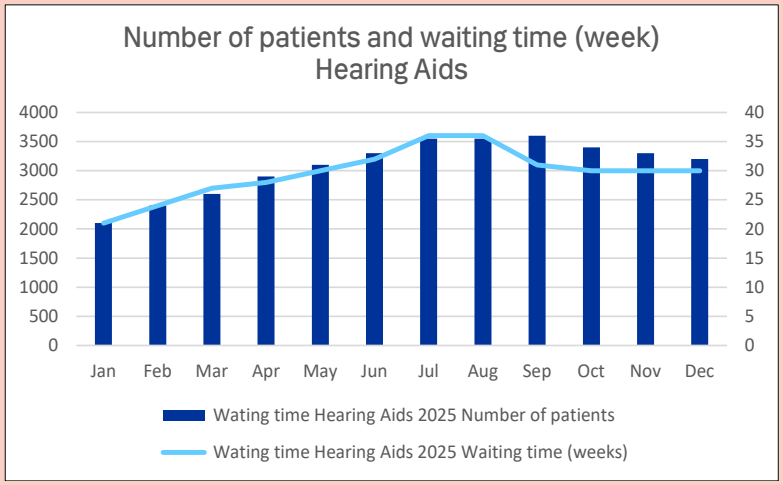
Top 5 most common cancer diagnoses

- Oral cavity cancer
- Oropharyngeal cancer
- Thyroid cancer
- Tonsil cancer
- Metastasis in lymph nodes in the neck



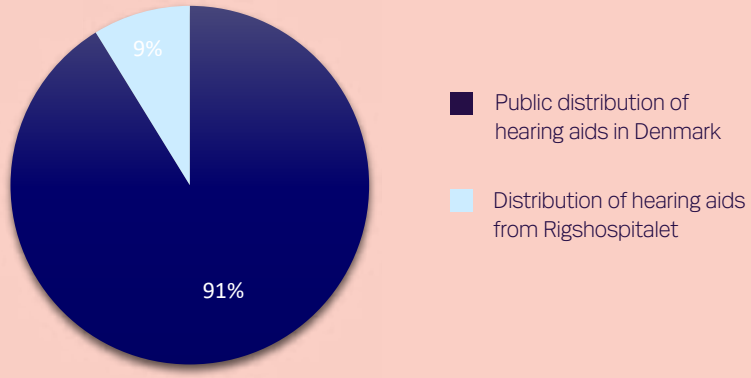
Source: Internal

Hearing Aids



Source: Internal

Distribution of hearing aids in Denmark

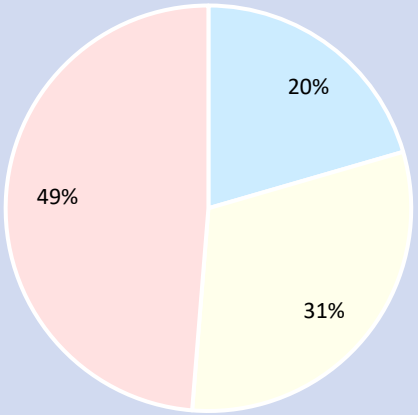


Source: AMGROS

Research

>65 mill. DKK raised for research

Ongoing PhDs



39 publications in progress

- 19 focus on Ear
- 8 focus on Nose
- 12 focus on Head and Neck

148 publications in 2025

Source: PURE (Publication and Research platform)

Patient Satisfaction Award - Længdespringerprisen 2025

We are immensely proud to have received the Region's Patient Satisfaction Award "Længdespringerprisen", a recognition that underscores our Department's ability to deliver consistently high patient satisfaction over time.

This award is especially meaningful given the challenges we face as a clinic with a progressively high volume of visiting patients, maintaining such outstanding results requires not only dedication but also exceptional adaptability and team spirit.

Some of our success is rooted in being agile where the team members are committed to continuous improvement, embracing new methods and approaches to meet the evolving needs of our patients. The strong sense of camaraderie and shared purpose across our teams at both Rigshospitalet and Bispebjerg Hospital has been instrumental in achieving and sustaining these results.

Central to our approach is the seamless coordination of patient pathways, innovative out-reach, and a culture that values patient feedback as a cornerstone of progress. From cross-disciplinary collaboration to home-based rehabilitation and shared clinician-patient decision-making, every initiative is designed to ensure that our patients receive the highest quality of care. Our holistic approach, combining medical expertise with psychological support, physiotherapy, and a child-friendly environment, reflects our commitment to creating trust and delivering excellence.

This award is a celebration of our entire team's hard work, adaptability, and unwavering team spirit. Above all, it is a tribute to our patients, who inspire us every day to be the best we can be.

FACT

PATIENT SATISFACTION AWARD -LÆNGDESPRINGERPRISEN

The purpose of the Patient Satisfaction Award is to spread knowledge about the work that is done to ensure high patient satisfaction, so that other departments can learn and be inspired by this.

In order to be able to nominate a department for the Patient Satisfaction Award, the department had to show that they have initiated efforts to increase patient satisfaction, and that the efforts can be seen reflected in the results of the National Survey of Patient Experiences (LUP), the results of which have been stably high over a longer period

Research, Collaboration and Education

2025 was another year in which research, innovation and education left a clear mark on our Department. Across head and neck surgery, rhinology and our other subspecialties, we continue to work to develop new knowledge that can improve patient care, strengthen international collaboration and educate the next generation of medical doctors and researchers.

Research in Head and Neck Cancer

One of the foundations of the Department's strong international position is the Eastern Denmark Head and Neck Cancer Databases. For more than two decades, detailed clinical data on patients with sinonasal, oral, laryngeal or oropharyngeal cancer, the latter including cancer of the tonsils and root of the tongue, has been systematically collected. The oropharyngeal database currently includes more than 3,500 patients, all HPV tested and is among the most comprehensive of its kind internationally. The many registrations make it possible to follow patient courses over long periods and examine correlations between disease characteristics, treatment and prognosis. Together with biological analyses and modern data processing, the database constitutes a unique research tool aiming personalized medicine that has been crucial for the Department's international collaborations and scientific impact.

One of the year's most exciting research projects was conducted under the auspices of DAHANCA; here, our Department, together with national partners, was in randomised trial comparing robotic surgery and traditional radiotherapy and chemotherapy treating oropharyngeal cancer. Quality of life and functional outcome being the endpoints. Analysis of the extensive data is well underway. The results are eagerly awaited also internationally.

In line with Rigshospitalet's Nordic collaboration within NUHA (Nordic University Hospital Alliance), we have established a Nordic research partnership initially focusing on oropharyngeal cancer. Together with research groups in Sweden, Norway, Finland, and Iceland, data from nearly 10,000 patients has now been compiled. This offers a unique opportunity to employ modern analytical methods, including machine learning and advanced data modeling, to identify patterns that will allow us to optimize the treatment of the individual patient.

Developing less invasive patient care pathways is another key theme. Research into HPV-related cancer focuses, among other things, on the potential to detect post treatment disease activity via blood tests. The aim is for patients to be closely monitored in their local communities in the future, eliminating the need for frequent hospital visits, while simultaneously enabling earlier and more accurate detection of recurrences for the benefit of our patients.

In the realm of surgical innovation, 2025 has been marked by new technological progresses. Our Clinical Academic Group project, entitled Image Guided Cancer Surgery, is based on a collaboration with DTU, KU, Sund and Fluoguide. The aim is to perform a more accurate and precise robotic surgery due enabling the cancer cells to "light up". In parallel with this the use of advanced ultrasound during surgery may also allow the surgeons to better delineate tumors in real time, thereby also optimizing the balance between radical cancer surgery and the preservation of healthy tissue. The latter is led by our newly inaugurated DTU professor, Tobias Todsen, and both technologies have the potential to improve surgical precision also lowering treatment morbidity.

However, research does not stop at cancer treatment itself. For a number of years, the Department has represented the cutting edge in stem cell-based treatment of radiation damage to the salivary glands. Dry mouth is the most burdensome late effects of radiation therapy on head and neck cancer patients, and ongoing studies are now investigating how repeated stem cell injections into the salivary glands can further improve patients' quality of life.

Research in Smell

At the same time, new research areas are being developed within the sense of smell. Loss of smell is the most troublesome burden among patients suffering of chronic rhinosinusitis with polyps (nasal polyps). The severe cases are now offered biologics, and our Department was the first to introduce this game changer in Denmark. As requested by The Danish Medicines Counsil all patients having biologics are enrolled in protocols, which will and has led to several PhD projects to the benefit of the patients. As a spin off we work together with top international smell centers addressing how advanced functional MRI scanning can be used to objectively measure the brain's processing of odor impressions. The perspectives extend far beyond the ENT specialty, as impaired sense of

smell is also among the earliest signs of several neurodegenerative diseases – this was also demonstrated in a common PhD project, led by Oskar Hoffmann McWilliam, with our colleges at the Department of Neurology.

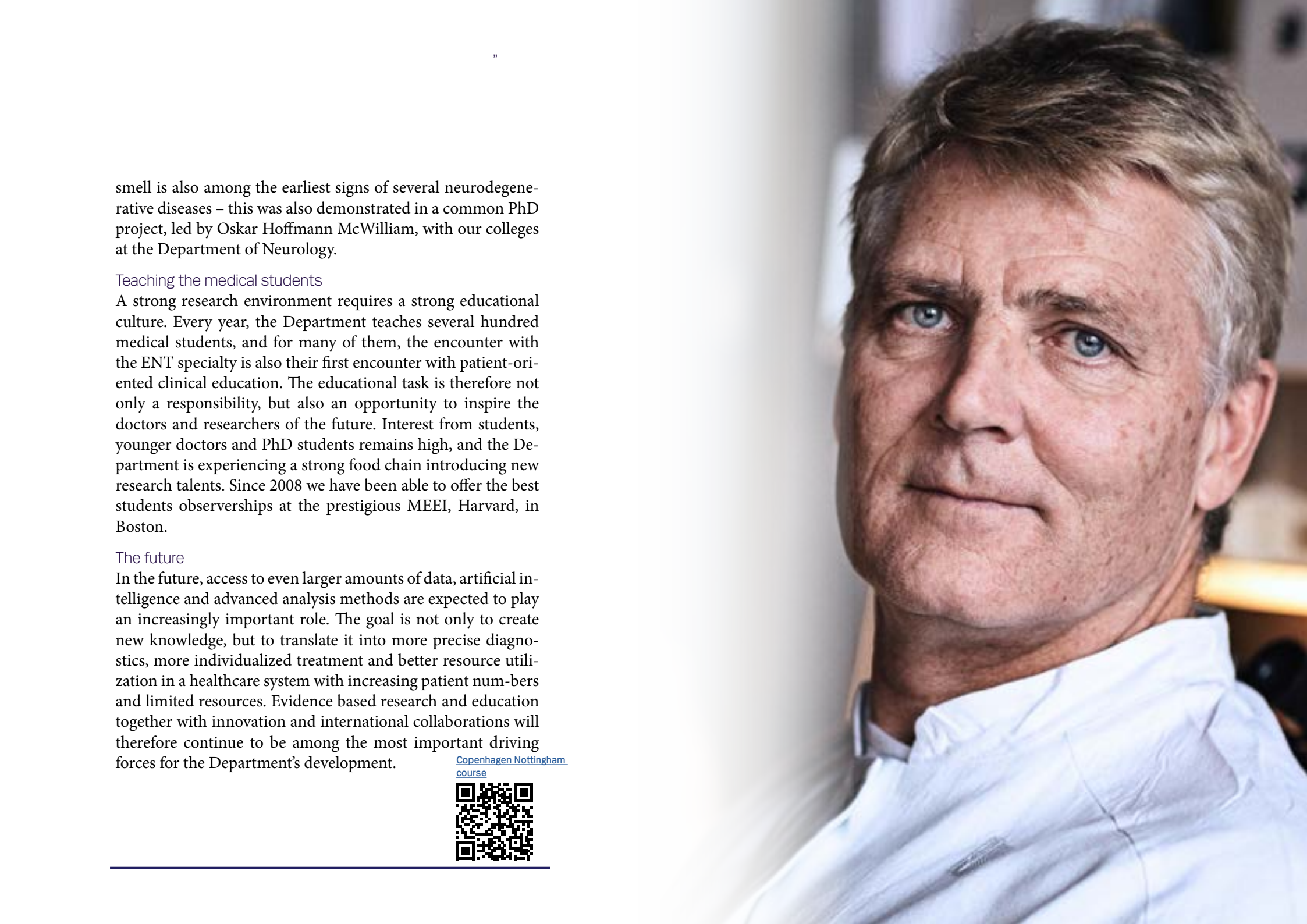
Teaching the medical students

A strong research environment requires a strong educational culture. Every year, the Department teaches several hundred medical students, and for many of them, the encounter with the ENT specialty is also their first encounter with patient-oriented clinical education. The educational task is therefore not only a responsibility, but also an opportunity to inspire the doctors and researchers of the future. Interest from students, younger doctors and PhD students remains high, and the Department is experiencing a strong food chain introducing new research talents. Since 2008 we have been able to offer the best students observerships at the prestigious MEEI, Harvard, in Boston.

The future

In the future, access to even larger amounts of data, artificial intelligence and advanced analysis methods are expected to play an increasingly important role. The goal is not only to create new knowledge, but to translate it into more precise diagnostics, more individualized treatment and better resource utilization in a healthcare system with increasing patient num-bers and limited resources. Evidence based research and education together with innovation and international collaborations will therefore continue to be among the most important driving forces for the Department's development.

Copenhagen Nottingham course



Building bridges across the healthcare chain

Chain responsibility is a core principle of the Danish healthcare system, ensuring that patients receive coordinated and seamless care across all levels of treatment. As healthcare faces growing patient numbers, increasingly complex care pathways, from general practice and local hospitals to highly specialised university hospitals, and rapid technological development, stronger collaboration across institutions, from has become essential.

The Technical University Hospital (TUH) partnership supports this ambition by bringing together clinicians, engineers, data scientists, and innovators to develop solutions that address real clinical needs. The goal is not only to develop new technologies, but to ensure that innovation addresses real clinical needs and ultimately improves outcomes for patients.

In 2025, a significant milestone was reached for the TUH partnership when Tobias Todsen was appointed as the first head and neck surgeon to hold a clinical professorship at DTU. Affiliated with DTU Compute, his appointment represents more than a personal achievement, it embodies the vision behind TUH's unique collaboration between hospitals and engineering research environments.

For Tobias Todsen, whose clinical work focuses on head and neck cancer surgery, the professorship provides a direct link between challenges observed in the operating theatre and the technological expertise available at DTU. Through collaborations involving artificial intelligence, advanced imaging, robotics, and digital health technologies, clinical questions can be transformed into solutions that support earlier diagnosis, more precise treatment, and better follow-up care.

The collaboration led to the first TUH MedTech Innovation Workshop, where delegates were given a comprehensive overview of the tools required to initiate medical device and digital health innovation collaborations. The workshop was based on tools from Johns Hopkins Center for Bioengineering Innovation and Design, and with a vast input from external faculty members.

As the first head and neck surgeon appointed at DTU, he serves as a visible example of how TUH's "brickless" university hospital model can bridge traditional boundaries and accelerate the development of healthcare solutions that benefit patients throughout their entire treatment journey.

About TUH


OHROME

Creating Capacity Through Day Surgery

Clinical Lead ”Day Surgery” / Eva Kirkegaard Kiær

One of the most significant improvements in 2025 has been the continued expansion of our “day surgery services”, creating additional surgical capacity and helping reduce waiting times for patients requiring treatment within ear, nose, and throat surgery.

Many patients suitable for surgery can now undergo the procedure as day surgery and return home on the same day after a period of observation. For many patients, this is not only more convenient but also preferred since recovery in familiar surroundings is desired.

Benefits

With the additional surgical capacity created through day surgery, more patients can now complete their entire treatment pathway within the public healthcare system. Previously, a considerable number of patients would have been referred to private providers for treatment. This is an optimization on several parameters.

We perform a broad spectrum of procedures including functional nasal surgery to improve breathing, removal or reduction of tonsils, vocal cord surgery, parathyroid surgery, and procedures involving the ear canal, eardrum, and middle ear. These surgical procedures normally take between 30 minutes and two hours.

When considering day surgery, a careful patient selection is essential. Patients with severe heart disease, significant obesity, sleep apnea or other serious medical conditions often require overnight observation and are therefore treated through other pathways. Similarly, children under the age of seven years do not currently undergo surgery in the day surgery setting.

Challenges

The expansion of surgical capacity has had consequences throughout the organization. Because day surgery allows a high number of patients to move through the operating theatres each day, the Department has had to increase its capacity for outpatient assessments and preoperative consultations. Considerable effort has therefore been invested in restructuring outpatient services to ensure that patients can be assessed, prepared, and scheduled efficiently.

Alongside these organizational changes, the Department has placed strong emphasis on expectation management. Every patient is thoroughly informed about the available surgical options, the anticipated results, and the potential risks associated with the procedures and the postoperative management.

Collaboration

The development of day surgery has relied on a close collaboration with the department of Anaesthesiology and the Head of the Day Surgery Unit. This teamwork has been crucial to establish safe and effective patient pathways. In addition, the modern sedation techniques are significantly gentler when compared to previous methods, and in combination with less invasive surgical procedures, fewer patients now experience nausea and general discomfort following surgery. Patient involvement and feedback are also playing a growing role in postoperative care, including the introduction of digital tools such as pain-monitoring applications.

As a public hospital, we also highly value our collaboration with private healthcare providers. Their support in managing waiting lists and accommodating periods of increased demand for less specialised treatments helps ensure that patients receive timely, high-quality care. This partnership allows us to focus our resources on delivering highly specialised services while maintaining an efficient and patient-centred healthcare system.

Looking ahead

The public demand for certain procedures continues to rise. The Department has observed a growing number of referrals for functional nasal surgery, reflecting a broader trend seen over the past two decades. Increased use of over-the-counter nasal decongestant sprays, together with factors such as allergies and a growing public focus on breathing and airway functioning following the COVID-19 pandemic, may all contribute to this development.

Looking ahead, we expect day surgery to play an even greater role in the years to come. This is based on both the continued development of less invasive surgical techniques but also a need to streamline patient pathways based on a growing elderly population adding to the gen-eral pressure on the Danish healthcare system. However, in the continued development we work hard to secure that our day surgery initiative maintains at the highest standard of care.

What is Otology, Audiology and Balance Disorders treatment?

From Eardrum to Auditory Nerve

Clinical Lead ”Otology Surgery” / Søren Foghsgaard

Ear surgery spans a very broad and highly specialized area, from treatment of diseases of the external ear to advanced surgery of the inner ear and auditory nerve. At Otology Unit, we work with the entire spectrum of otological disorders, and our activity includes both common procedures and some of the most complex ear surgical treatments in Denmark.

Surgery begins all the way out in the external ear, where we treat skin cancer, benign tumors and diseases of the ear canal, among other things. Further into the middle ear, we perform many operations for eardrum perforations, one of the most common ear surgical problems. These procedures are important both for the patients' hearing and quality of life, but also as part of the training of new ear surgeons who must learn microsurgical techniques. The combination of high specialication, long training periods and increasing patient volume places great demands on planning and surgical capacity. Middle ear surgery also includes the treatment of cholesteatomas, colloquially often called “bone-eater disease”. Cholesteatomas are a serious chronic ear disease that can destroy bone tissue and cause significant damage if not detected and treated in time. In addition, we perform reconstruction of the middle ear bones and stapes surgery for otosclerosis, an operation that can provide a significant improvement in hearing for many patients.

Further inside the ear, we perform cochlear implant operations (CI), which have become an increasingly important area in recent years. Cochlear implant technology has developed significantly, and more patients are now benefiting from the treatment. Older patients with severe hearing loss are increasingly being referred, because the results are often better than traditional hearing aids for significant hearing loss. At the same time, we are seeing new indications, including patients with single-sided deafness, where the treatment can have a major effect on both hearing and quality of life.

We also provide highly specialized surgical treatment of vestibular schwannomas (acoustic neuromas) and perform all schwannoma surgeries in Denmark. These surgeries are performed in close collaboration with neurosurgical and radiological specialists and require considerable experience and advanced surgical expertise. The procedures require great precision, as the surgery is performed close to both the auditory nerve, the balance organ and the brainstem, where the goal is to remove the tumour while preserving neurological function and quality of life.

> Despite the challenges, the ambition remains the same: to offer highly specialized treatment at an international level

Children make up a significant part of the patient group in the Otology Unit. Many children are followed for long periods, especially after cochlear implant surgeries, where both surgical treatment and subsequent rehabilitation require close follow-up over many years. Several patients remain affiliated with the Department for large parts of their lives, and collaboration with audiologists, paediatricians and other specialists is therefore central.

At the same time, the area of balance disorders plays a growing role. Although there is not yet an established surgical treatment for this, we see many patients with vestibular disorders in our outpatient services. There is international research into so called vestibular implants, which can potentially restore balance function in the same way that cochlear implants can restore hearing, but the technology is still in the research stage.

New techniques

Innovation and technological development are generally taking on more importance in the otological specialty. For example, new imaging diagnostic methods have improved the possibilities for diagnosing and planning treatment. Diffusion-weighted MRI scans make it possible to identify cholesteatomas much earlier and more precisely, while advanced CT scanning provides a better understanding of diseases such as otosclerosis and other middle ear disorders. This strengthens both the decision-making basis and the surgical planning.

New surgical techniques are also being worked on. Endoscopic ear surgery is gradually finding its way into the clinic and makes it possible to see anatomical areas that were previously difficult to visualize with a microscope alone. At the same time, the possibilities for robot-assisted surgery are being investigated, especially when inserting cochlear implant electrodes, where very slow and precise insertion can potentially protect the delicate structures of the inner ear better.
However, technological development also places new demands on both the clinic and patients. For many patients, it is no longer just the surgery that is decisive, but also the subsequent integration of the technology into everyday life. Connectivity, software and user-friendliness are taking on more importance, especially for patients with implants and advanced hearing technology solutions.

Collaboration

Collaboration with other specialties is an important part of the work at Otology Unit. We work closely with the radiology department, neurologists, rheumatologists, infectious disease physicians and neurosurgeons on complex patients. In addition, we collaborate with, among others, the Danish Statens Serum Institut on rare infectious conditions and with paediatric departments on the treatment of the youngest patients.

Challenges

The year has also been marked by significant capacity challenges. Limited surgical capacity and increasing waiting lists have created great pressure on both staff and patients. Therefore, the issue of patient selection and prioritization is increasingly becoming a part of everyday clinical practice. The need is increasing within cochlear implant surgery, and the work to de-velop more efficient patient processes, including increased use of day surgery and telephone consultations, has therefore been intensified. Despite the challenges, the ambition remains the same: to offer highly specialized treatment at an international level while ensuring that patients with both common and complex ear disorders receive the best possible treatment.

Otosurgical Research

2025, otosurgical research has focused on improving treatment of patients with ear diseases. The research combines clinical studies with experimental surgery and has among other subjects been concentrated on the treatment of acute mastoiditis in children and new perspectives for cochlear implant-related treatment.

An important area of research has been the treatment of acute mastoiditis in children, a serious infection of the bone behind the ear, which was previously often treated with mastoidectomy, where parts of the bone behind the ear are surgically removed. After the introduction of new internal guidelines in 2016, this treatment has in many cases been replaced by more conservative procedures, such as needle aspiration or incision behind the ear. Results showed that 94 percent recovered without need for further treatment, while only a few patients required repeated treatment or later mastoidectomy. Complications were rare, and the length of hospital stay was generally shorter compared to traditional surgical treatment. The research also showed that the incidence of mastoiditis decreased during the Covid-19 pandemic, while the bacterial pattern was largely unchanged compared to previous studies.

In parallel, the Department has developed a new minimally invasive surgical method to inject cells or medicinal substances directly into the cochlear modiolus/auditory nerve. The aim is to improve the outcomes for selected patients with cochlear implants, especially patients with impaired function of the auditory nerve itself. In the study, the cochlear modiolus of ten human cadavers were injected through the ear canal and middle ear via a 0.5 mm drill opening in the cochlea. Small glass and metal spheres the size of cells were used as a model for future cell treatment. Using micro-CT scanning and histological analyses, the researchers were able to document high precision and minimal leakage, as 89–97 percent of the spheres were located in the modiolus. The results point to significant potential for future local treatment with stem cells and targeted medicine with the aim of restoring or improving hearing in patients with severe hearing loss.

FACT

COCHLEAR IMPLANT

A cochlear implant (CI) is an advanced hearing implant for people with severe hearing loss or deafness. The implant converts sound into electrical signals that stimulate the auditory nerve directly via an electrode in the inner ear

MICRO-CT

Micro-CT is a high-resolution X-ray scanning technique that makes it possible to examine very small anatomical structures in detail, including in the inner ear. The method is used in research to create three-dimensional images with high precision

RESEARCHERS

Per Cayé-Thomasen, Jumana Reda, Charlotte Navntoft, Peter Erfurt, Peter Baumhoff, Andrej Kral

FACT

LOW-DOSE CONE BEAM

(CBCT) is a 3D medical imaging method that uses a cone-shaped X-ray beam and reduced radiation settings. It provides clear pictures of bones and teeth while lowering the radiation risk to the patient

Next-Generation Otosurgical Navigation and Simultation

In 2025, the Temporal Bone Imaging and Simulation Group and Otopathology Lab at the Copenhagen Hearing and Balance Center's focuses on combining advanced imaging with virtual and physical simulation to improve surgical precision, training, and ultimately patient outcomes.

A major milestone came in May 2025, when Innovation Fund Denmark awarded DKK 15.4 million to the Grand Solutions project COVION – Computer Vision for Otosurgical Navigation, led by Assoc. Prof. Steven Andersen. The project aims to develop patient-specific surgical planning and mixed-reality navigation that can support surgeons before and during complex ear surgery by combining advanced imaging, computer vision, and surgical simulation

In several projects including COVION, the team is further advancing high-resolution, low-dose cone-beam CT scans (CBCT) that can be performed immediately during the patient's outpatient visit at the Department. Our group is investigating new scan protocols, automated image analysis, and diagnostic applications that may support faster and more precise decision-making in mid-dle ear and inner ear disease. In January 2025, the team published their proof-of-concept work on dynamic CBCT – a new modality that allows determining the mobility of the ossicle through changing the pressure on the tympanic membrane during the scan.

The group also continued to expand the Visible Ear Simulator, one of the world's most advanced virtual reality simulators for temporal bone surgery. The simulator software is provided free online and is used worldwide for training of temporal bone procedures including mas-toidectomy and cochlear implantation. The latest update of the Visible Ear Simulator includes validated automated performance assessment and export of temporal bone models for 3D-printing. Ongoing work funded by the Novo Nordisk Foundation allows the team to investigate how patient-specific 3D-printed models can support learning as well as intraoperative perfor-mance in collaboration with Massachusetts Eye and Ear Infirmary, Harvard Medical School, Boston, USA.

Otopathology Laboratory

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Independent Research Fund Denmark
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Copenhagen Imaging
BHS Technologies
MCI – The Entrepreneurial School (Austria)
Massachusetts Eye and Ear, Harvard Medical School (USA)
Poznan University of Technology (Poland)
Technical University of Denmark (DTU)

Vestibular Research

RESEARCHERS & TEAM

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Understanding balance disorders and motion sickness requires both advanced technology and carefully designed experimental methods. During the year, we focused on establishing the infrastructure needed for a dedicated research laboratory capable of investigating how balance is affected, how motion sickness develops, and how these responses can be meas-ured objectively. This work represents an important step towards developing new approaches for diagnosing, monitoring, and ultimately improving the management of vestibular disorders.

From Artificial Intelligence to Advanced Motion Testing

A major achievement was the establishment of AI-assisted eye movement analysis, creating the foundation for more efficient and objective assessment of vestibular function. At the same time, we developed and implemented a system capable of inducing visually triggered motion sickness under controlled laboratory conditions. This platform will be presented in first quarter of 2026.

To investigate motion sickness, we had to develop a solution to induce it. Such a patient testing platform device we brought into operation based on Off-Vertical Axis Rotation (OVAR), enabling controlled induction of motion sickness through vestibular stimulation. To support these studies, we acquired, installed, and commissioned a biosignal recording system, allowing physiological responses to be measured alongside participants' symptoms. Following ethical approval, recruitment and data collection began for studies investigating both OVAR-induced and visually induced motion sickness.

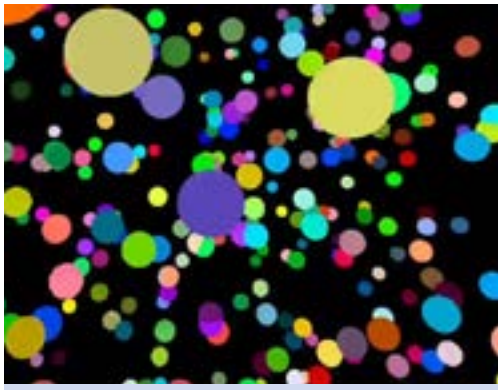
Building Smarter Tools for Balance Assessment

Alongside the experimental platforms, we initiated new research into digital assessment of balance. Using a single-camera vision system, we began exploring whether simple balance exercises can be recorded and analysed in a reliable and accessible manner. This work has the potential to support future clinical assessment using readily available technology.

Investing in Expertise for Future Discoveries

Developing these capabilities require investment not only in infrastructure but also in interdis-ciplinary expertise. Being part of the PhD programme at DTU, our researchers completed extensive engineering coursework while contributing their clinical perspective to an engineering environment. This two-way exchange strengthened the collaboration between clinicians and engineers, ensuring that technological developments remained closely aligned with real clinical challenges and patient needs.

Together, these developments have established the foundations of an independent research laboratory dedicated to inducing, measuring, and understanding motion sickness and balance disorders. The new infrastructure and interdisciplinary collaborations now provide a strong platform for future studies exploring both the mechanisms underlying vestibular disorders and potential interventions to improve patient care.



Moving view in VR goggles while stimulating Visually Induced Motion Sickness (VIMS)

Photo: Stine Fiig

Audiology: The Hearing Brain

Clinical Leads ”Audiology” / Jesper Yde & Cecilia Fernandez Samar

Audiology is the science of hearing, and our task is to diagnose, treat, and rehabilitate individuals with hearing loss and tinnitus. Our mission is to ensure that everyone, regardless of age or background, can fully participate in society through optimal hearing. We work with everything from advanced technology, such as hearing aids and cochlear implants, to personal counselling and support for patients and their families.

Our patients range from newborns with congenital hearing loss to elderly individuals with age-related hearing difficulties. Hearing loss is a cronic disability that needs lifelong ongoing treatment. Each year, we treat thousands of patients, with the largest group being adults with age-related hearing loss. But our work is not defined by volume alone.

The youngest patients, children, require special attention, as assessing their hearing and ensuring they receive the right support to develop on par with their peers can be challenging. For them, it is not just about hearing but about becoming part of a hearing society where they can thrive and fully participate.

Challenges

One of the greatest challenges in audiology is ensuring that hearing aids and other hearing solutions are not only provided but also properly fitted and followed up. Many patients experi-ence that hearing aids do not function optimally unless there are ongoing adjustment and support. It is not enough to simply dispense a hearing aid; it requires a lifelong effort to ensure that patients receive the best possible treatment.

Technology in audiology is constantly evolving. Streaming functions in hearing aids have already made a significant difference for many patients, and new solutions like AI-driven hearing aids promise to further revolutionise the field. However, despite these advancements, many hearing aids are still not being used to their fullest potential. A key challenge is in fact that we hear with the brain, it is called the hearing sense. The hearing brain must be continuously trained and used to receive the most optimal hearing experience. The training can lead to hearing aid adjustments to match the patient’s changing needs. There remain further challenges in integrating these technologies into clinical practice so that they truly benefit patients.

Another challenge is the increasing demand for hearing treatment, especially in light of demographic changes. We are living longer, and more people are experiencing hearing loss. At the same time, there is growing awareness that hearing is an important part of overall health. This places greater demands on our Department, but it also presents an opportunity to raise awareness of our work and its significance. We see that more patients today are well-informed and have higher expectations for their treatment. This is a positive development, but it also requires us to continuously evolve and adapt our services.

Collaborations

We collaborate with medical specialties, research institutions, and patient organisations to maximise the impact of our work. Together, we develop innovative methods and technologies, leveraging our clinical expertise and patient recruitment to advance treatment outcomes. We see growing interest in genetic research and stem cell treatments, which may one day open doors to entirely new forms of treatment.

Denmark's thriving hearing and sound industry provides a strong foundation for advancing hearing health

But for now, the most important thing is to ensure that the solutions we have today are used optimally.

A key area of growing interest is the brain's central role in hearing. While it has long been understood that we hear with the brain, there is now increased recognition of how untreated hearing loss can significantly impact cognition and overall quality of life. Studies demonstrate that untreated hearing loss may lead to social isolation and even elevate the risk of dementia. For this reason, raising awareness and educating the public about the critical importance of early intervention remains a cornerstone of our mission.

We want to be a Department that not only treats hearing loss but also raises awareness of how good hearing can profoundly improve quality of life. While hearing loss is not always perceived as a life-threatening condition, its impact on cognitive health, social interaction, and overall well-being is immense. Denmark's thriving hearing and sound industry provides a strong foundation for advancing hearing health, and we are proud to contribute to this ecosystem. Through collaboration, innovation, and a patient-centred approach, we will continue to be a key player in audiology, both in Denmark and internationally.

CHBC LinkedIn

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Audiology Research: Can Deaf People really Hear?

Over the past few years, we have established a strong research environment at the Copenhagen Hearing and Balance Center through collaborations with primary care, DTU Hearing Health, and Aalborg University's Multisensory Lab. Our research has helped advance a broader understanding of hearing as a process involving both the ear and the brain.

We have previously conducted long-term follow-up on children with cochlear implants (CI). The results show a markedly positive development, with many children developing language and vocabulary at the same level as their peers and participating actively in regular educational environments. The research thus contributes to a new understanding of how modern hearing treatment can support throughout childhood and between hearing and hearing-impaired young people.

In addition, we work with registry research within hearing loss after cancer treatment as well as interna-tional multicenter studies on hearing and language development, where we investigate how children with hearing impairment develop across different health systems and cultural contexts.

An important focus area is the development of digital and innovative solutions for rehabilitation and dissemination. Through apps and digital learning tools, we work to make knowledge about hearing and the role of the brain more accessible to children, young people, families and professionals. Our research is characterized by a high degree of patient involvement and co-creative design.

The Hearing Deaf

The most pressing is the lack of updated prevalence data. Today, there is a new group of patients who are diagnostically classified as deaf, but who are functionally hearing through modern treatment, for example with a CI. We still lack knowledge about where this group is in the education system, in the labor market and in society in general.

Today, we have more than 4,000 deaf people in Denmark, many of whom are functionally hearing with the help of a CI. However, society's resource distribution still largely reflects the understanding of deafness from earlier times. There is a lack of updated evidence on how this new CI-treated patient group performs in the long term. Prevalence research is therefore crucial for both treatment quality, government services and a fairer distribution of resources to ensure equality in health for the entire group of people with severe hearing loss.

Innovation for the Kingdom

Innovation and technological development are becoming particularly relevant in light of the new healthcare reform, where more treatment is being moved out of hospitals and closer to the patients' everyday lives. Within speech and language pathology, this development is particularly relevant because our patients live with a lifelong need for treatment. Tele-health/Remote Care is therefore becoming an increasingly important part of our work, among others in Greenland, the Faroe Islands and Bornholm, where we offer specialized advice and AVT courses without extensive travel. Experience shows that digital solutions can strengthen coherence in treatment.

Challenge

Raising research to operational level is one of our biggest challenges today. Through research, we have developed a number of innovative apps and digital solutions with high patient involvement and documented effects, but when the research projects are completed, there is often a lack of structures and funding for maintenance and implementation in clinical practice. This creates a challenge in a healthcare system where digitalization is also prioritized politically as a central part of future treatment options.

Civil Society

An important part of our work is also about communication and cooperation with civil society. Through our collaboration with DaneAge Association (Ældre Sagen), we work to increase understanding of hearing, the role of the brain and modern treatment options for older people with hearing loss. Here, we experience a great need for knowledge about, among other things, CI and the options that exist today for people with severe hearing loss. The work has made clear how important communication and available knowledge are for both patients, relatives and society in general.

DTU Hearing Systems

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Towards Precision Audiology - DTU

Hearing loss is far more complex than what can be captured by a conventional audiogram. Individuals with similar hearing thresholds often experience very different listening difficulties, respond differently to hearing rehabilitation, and follow different clinical trajectories. This recognition increasingly shapes our research strategy.

Throughout 2025, the audiology research programme, conducted in close collaboration between our Copenhagen Hearing and Balance Center (CHBC) and the Technical University of Denmark (DTU), has continued its transition towards Precision Audiology. By integrating clinical expertise with engineering, neuroscience, computational modelling and advanced diagnostics, we seek to better understand the individual patient rather than the hearing loss alone.

Understanding the Individual Patient

A major research activity during 2025 was the Link Project, a collaborative initiative between CHBC, DTU, and the Danish Dementia Research Centre at Rigshospitalet. During the year, the project successfully completed clinical data collection, establishing one of the most comprehensively characterised cohorts examining the relationship between hearing loss and cognition.

The study combines comprehensive audiological assessments, detailed cognitive evaluations, and validated patient-reported outcome measures, including the Danish versions of the Hearing Handicap Inventory (HHI) and the Social Participation Restrictions Questionnaire (SPaRQ). The implementation and validation of these instruments have strengthened our

ability to characterise the functional and social consequences of hearing loss and to assess outcomes that extend beyond traditional audiological measures.

Preliminary analyses indicate that conventional audiological measures alone may not adequately explain cognitive status in older adults. To address this challenge, advanced computational phenotyping approaches are being applied to identify physiological hearing profiles and their relationship to cognitive health. These approaches support the development of more individualised diagnostic strategies and contribute to our growing understanding of healthy ageing.

Listening in the Real World

A second major research focus during 2025 has been the study of hearing under conditions that more closely resemble everyday communication. While conventional hearing assessments provide important clinical information, they do not fully capture the listening challenges experienced by patients in complex acoustic environments.

This ambition is exemplified by the continued development of the Spatial Hearing Laboratory. Following technical optimisation and calibration, the laboratory has matured into a unique research platform capable of recreating realistic acoustic environments. The facility enables evaluation of hearing performance under conditions that closely resemble situations encountered in daily life

The Spatial Hearing Laboratory supports a broad range of activities, including the development of conversational speech materials with greater ecological validity and novel localisation tests designed to provide efficient and clinically meaningful assessments of spatial hearing.

Our hearing aid and cochlear implant research continues to expand across both adult and paediatric populations. Current projects investigate bimodal hearing, localisation performance, advanced binaural signal processing, hearing performance in noisy and reverberant environments, and outcomes following cochlear implantation in children with single-sided deafness. These studies aim to improve patient selection and support more individualised rehabilitation pathways.

We have also been investigating real-world device benefit using ecological momentary assessment, collecting real-time reports of listening experiences through brief smartphone-based questionnaires. These studies examine hearing experiences and perceived benefit across different device settings and incorporate openended responses to explore how artificial intelligence may support clinicians and patients in optimising device fitting and rehabilitation in everyday listening environments that matter most to each patient.

Translating Research into Clinical Care

Throughout 2025, we continued evaluating diagnostic tools capable of identifying hearing difficulties that cannot be explained by hearing thresholds alone. Longitudinal studies have demonstrated how hearing-aid experience influences speech perception over time, while both behavioural and electrophysiological versions of the Audible Contrast Threshold (ACT) test have been investigated as measures of suprathreshold hearing deficits.

We also continued developing objective measures of auditory function for populations in which conventional behavioural testing may be limited. Research using functional near-infrared spectroscopy (fNIRS) is exploring how cortical responses to sound can be measured in children with hearing impairment. An important aspect of this work has been evaluating the test-retest reliability and reproducibility of auditory-evoked fNIRS responses, as robust and consistent measurements within individual patients are essential for future clinical application.

Another important step towards precision diagnostics was achieved through research establishing detailed reference data for electrocochleographic and auditory brainstem responses in normal-hearing adults and demonstrating how computational modelling can link physiological measurements across different levels of the auditory pathway. This work provides an important foundation for future diagnostic tools aimed at identifying specific sites of auditory dysfunction and supports the broader transition from symptom-based assessment towards mechanism-based audiological diagnosis.

Building the Future of Audiology

These activities are enabled by the close integration of clinicians, engineers, audiologists, neuroscientists, and data scientists. Over more than a decade, the collaboration between CHBC and DTU has developed into a highly interdisciplinary research environment that facilitates translation between laboratory research and clinical implementation.

As the field moves towards increasingly individualised diagnosis and treatment, this partnership provides a strong foundation for developing the next generation of audiological assessment tools and rehabilitation strategies. By combining clinical insight with advances in engineering, computational modelling, and neuroscience, we continue working towards a future in which hearing care can be tailored to the needs and physiology of each individual patient.

What is Rhinolog, Sleep Surgery and Global Airways treatment?

From Everyday Nasal Surgery to Advanced Skull Base Procedures

Clinical Lead ”Rhino Surgery” / Jacob Danquart

At its core, rhinological surgery focuses on restoring breathing function and subsequential improving quality of life by increased air humidification, air filtering and taste sensation. Many patients seek treatment because nasal obstruction affects their breathing, sleep, physical activity, and overall well-being. Others require treatment for chronic sinus disease, recurrent infections, or structural abnormalities that compromise normal airflow through the nose.

The Department’s work ranges from relatively minor endoscopic procedures to some of the most advanced interventions in modern rhinology. These include surgery for tumours located near the skull base and treatment of severe infections that can spread into areas beneath the brain.

Sleep apnea surgery remains another important area of activity. Patients suffering from sleep-related breathing disorders often experience significant health consequences, including poor sleep quality, daytime fatigue, and increased risk of cardiovascular disease. These conditions may involve surgery on the soft palate, pharynx, or other upper airway structures and can require a variety of treatment approaches.

A key element of the diagnostic pathway to sleep apnea surgery is Drug-Induced Sleep Endoscopy (DISE), which allows clinicians to evaluate airway collapse during sedation and tailor treatment to the individual patient. This personalised approach helps ensure that surgical interventions are directed towards the anatomical structures responsible for airway obstruction.

The Department also maintains a strong focus on what is known as the “Global Airways” concept, recognising the close relationship between diseases of the upper and lower airways. This field combines surgical expertise with medical management and places particular emphasis on inflammatory and chronic conditions affecting the nose. Through this integrated perspective, clinicians work closely with colleagues from respiratory medicine and other specialties to optimise treatment for patients with airway disease.

Activities

Clinical activity during the year also reflected changing patterns of disease. The Department observed a continuous increasing number of patients requiring treatment for complications related to cocaine use. These patients often present with severe damage to the nasal structures and can require complex reconstructive management. In contrast, treatment volumes related to allergy and smoking-associated conditions remained largely unchanged compared with previous years.

Educational activities continued as planned during the year, including the Advanced Skull Base Course, which remains an important platform for knowledge sharing and professional development among specialists working in this highly complex field.

Challenges

Despite strong clinical and academic activity, waiting times for rhinological treatment remain a challenge. Growing awareness of the importance of healthy breathing has increased demand for assessment and treatment, also by otherwise healthy individuals also highlighting the need to train new surgeons. Developing surgical expertise requires continuity throughout the patient journey, from initial consultation to postoperative follow-up, ensuring both high-quality patient care and effective training of the next generation of clinicians.

Healthcare regulation presents another challenge. Modern healthcare systems place significant emphasis on performance targets, standardised pathways,

and measurable outcomes. While these frameworks support transparency and accountability, they can also create administrative complexity.

Collaboration

Collaboration remains essential to achieving this goal. Rhinology intersects with numerous other specialties, including paediatrics, plastic surgery, dentistry, neurosurgery, infectious diseases, and clinical microbiology. One of the most important examples is the weekly multidisciplinary discussion "Skull Base Conference", where rhinologists and neurosurgeons and other disciplines meet to discuss complex patient cases and determine the most appropriate treatment strategies.

Finally, 2025 contained also an organisational transition with the appointment of a new clinical leader for our Rhinology Surgical team. While no major treatment innovations accompanied these changes, leadership transitions inevitably require a period of adaptation. Maintaining productivity, quality, and continuity of care during such periods is itself an important achievement.

Skullbase course

Research in Global Airways and Smell

The Department's rhinology research is anchored in two complementary leadership functions. As Chair Professor of Otorhinolaryngology Christian von Buchwald provides the strategic academic leadership of the discipline, while Professor Vibeke Backer leads the clinical research programme, focusing on translational and patient-oriented research. Together, these activities span the full spectrum from basic mechanisms to clinical implementation.

Global airway out-patient clinic

Chronic rhinosinusitis with nasal polyps (CRSwNP) is a common inflammatory airway disease associated with substantial impairment in quality of life, such as loss of smell and taste and daytime tiredness. The disease frequently coexists with asthma and allergic rhinitis, atopic dermatitis, and exacerbated respiratory disease.

Standard treatment includes nasal saline irrigation, intranasal corticosteroids and, for patients with more severe disease, endoscopic sinus surgery (ESS). Despite these interventions, many patients experience recurrent nasal polyps, persistent symptoms, and repeated need for systemic corticosteroids or revision surgery, making long-term disease control a major clinical challenge.

Introduction of biologic therapy may transform the management of severe chronic rhinosinusitis with nasal polyps (CRSwNP), and our Department was the first in Denmark to implement this treatment in clinical research.

Global Airways and DACESS LinkedIn

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Clinical research

Since optimal integration of biologic therapy and surgery remains unclear. To address this unmet need, our Department completed a prospective study comparing three treatment strategies in patients with severe CRSwNP: 1. peri-operative anti-IL-5 biologic therapy combined with ESS, 2. biologic therapy alone, and 3. ESS alone.

The first six-month analyses were published, demonstrating significant improvements in disease-specific quality of life (SNOT-22), nasal polyp score, olfactory function, and asthma control in both biologic-treated groups. Among patients with extensive nasal polyposis, combined surgery and biologic therapy resulted in greater clinical improvement than biologic therapy alone. Twelve-month follow-up analyses, including all three treatment groups, are ongoing and will be reported in 2027.

In 2025, one PhD projects on upper and lower airway outcomes following biologic treatment and ESS were successfully completed.

These findings have also expanded our research into olfactory dysfunction, one of the more burdensome symptoms experienced by patients with CRSwNP. Through collaborations with leading international smell research centres, we are investigating how advanced functional MRI can objectively characterise the brain's processing of odour stimuli. The perspectives extend beyond rhinology, as impaired olfaction is among the earliest clinical manifestations of several neurodegenerative diseases. This was further highlighted through a collaborative PhD project with the Department of Neurology.

Nursing and allied health research

In 2025, two Master's-level nurses completed PhD theses. One PhD project investigated adherence to intranasal corticosteroid therapy in patients with severe CRSwNP eligible for biologic treatment. The work also evaluated the long-term adverse effects of systemic corticosteroid treatment and health-related quality of life, demonstrating considerable treatment-related morbidity, poor quality of life, and low adherence to topical therapy.

A second PhD project investigated persistent olfactory dysfunction following long COVID. The research showed that many patients experienced persistent smell loss despite olfactory training, frequently accompanied by qualitative smell and taste disorders.

In autumn 2025, a new PhD project was initiated focusing on the genetics of CRSwNP using the Danish Twin Registry, the impact of lifestyle factors, and the influence of environmental pollution on severe and recurrent disease through linkage with national health registries.

The Danish Global Airway Registry

Our Department established and coordinates the Danish Global Airway Registry. The nationwide registry currently includes 536 patients receiving biologic therapy for CRSwNP, of whom 225 have been enrolled at Rigshospitalet. Patients have been followed prospectively for 6–36 months using standardized clinical assessments. Most patients have experienced substantial benefit from biologic treatment, including reduced sino-nasal symptoms and improved asthma control.

In accordance with recommendations from the Danish Medicines Council, all patients receiving biologic treatment are enrolled in prospective research protocols, creating a unique clinical research platform and strengthened evidence-based patient care.

All participants have provided written informed consent for inclusion in the registry, national and international research collaborations, collection of biological samples, establishment of a biobank, and electronic seasonal questionnaires administered before and after the pollen season. The registry has been approved by the Danish Research Ethics Committee and operates under a data protection agreement.

The registry provides an important platform for national and international real-world evidence studies. One major collaboration is the international INVENT Registry, which combines anonymized data from Denmark, Belgium, the Netherlands, and Italy, with additional European countries expected to join.

What is Head and Neck Cancer, Stem cells, Ultrasound, Prognostication?

From Complex Surgery to Personalised Care

Clinical Lead "Head & Neck Surgery" / Jacob Melchiors

Head and neck surgery is one of the most complex surgical specialties within healthcare. The specialty encompasses the surgical treatment of diseases affecting the oral cavity, pharynx, larynx, salivary glands, thyroid gland and upper oesophagus. Within our Department, the treatment of patients with head and neck cancer constitutes a significant part of our work, both clinically, organisationally and in terms of resource allocation.

The Department treats patients with both benign and malignant diseases. However, as a highly specialised tertiary referral centre, we differ from other hospitals in the region by providing advanced head and neck cancer surgery. As a result, patient pathways are often more complex, prolonged and resource-intensive.

While patients undergoing surgery for benign thyroid or salivary gland lesions can often be discharged on the same day or the following day, patients with advanced head and neck cancer typically require longer hospital stays as well as extensive surgery, rehabilitation and multidisciplinary care.

Multidisciplinary Collaboration in Complex Patient Pathways

A substantial part of head and neck cancer care takes place outside the operating theatre. Patient pathways require close collaboration between surgeons, oncologists, radiologists, pathologists and specialist nurses, and the department invests considerable resources in multidisciplinary team meetings and shared decision-making.

At the same time, national cancer pathway targets place significant demands on prioritisation and coordination. Ensuring rapid treatment for cancer patients frequently affects capacity for other patient groups, making careful planning and resource management an increasingly important part of daily clinical practice.

Individualised Treatment Rather Than Standardised Solutions

Head and neck cancer can rarely be managed using a one-size-fits-all approach. Every tumour and every patient is different, requiring individual assessment and tailored treatment planning.

In 2025, the Department strengthened this approach through weekly specialist conferences where complex cases are reviewed by experienced consultants and senior surgeons. The aim is to ensure the best possible treatment decisions through professional discussion, shared expertise and collective reflection.

Creating Value from the Patient's Perspective

In recent years, the focus has shifted from simply determining whether a tumour can be removed to considering what treatment means for the patient's life afterwards.

In head and neck surgery, treatment may affect a patient's ability to speak, eat, swallow and participate in social life. Consequently, patient preferences, quality of life and individual treatment goals play an increasingly important role in clinical decision-making. The objective is not only to prolong life, but also to ensure that treatment provides meaningful benefit for the individual patient.

Moving Forward

The department is also seeing a growing incidence of HPV-related cancers of the oropharynx and base of tongue. These patients often present with very small primary tumours that can be difficult to identify, despite the presence of obvious lymph node metastases in the neck. Diagnosis frequently requires advanced imaging, repeated investigations and, in some cases, robotic surgery to locate the hidden primary tumour.

Both ultrasound and robotic surgery are playing an increasingly important role in this work. Rigshospitalet is among the few centres where ENT surgeons perform advanced ultrasound diagnostics themselves as an integrated part of the diagnostic pathway. The combination of highly specialised ultrasound, rapid pathology diagnostics and robotic surgery enables more precise and less invasive treatment.

The surgical robot is used primarily for HPV-related oropharyngeal cancer, where treatment is gradually shifting from primary radiotherapy towards carefully selected surgical approaches. This development is taking place cautiously and in close collaboration with oncologists and radiologists. New treatment strategies are introduced gradually and on an evidence-based foundation to ensure patient safety and optimal outcomes.

Within thyroid surgery, the Department is also engaged in research projects that challenge traditional treatment paradigms. Increasing numbers of small thyroid nodules are detected incidentally through imaging and ultrasound examinations, and not all necessarily require surgery. Current studies are therefore investigating whether selected patients can be managed through active surveillance or treated with radiofrequency ablation rather than surgery. At the same time, advances in artificial intelligence and image analysis are expected to improve future assessment of which lesions truly require intervention.

The year 2025 was also characterised by organisational innovation. The Department continues to optimise cancer diagnostics and create more flexible patient pathways. Experience has shown that patients with a low suspicion of cancer do not necessarily require the same level of resources as those with a high suspicion of serious disease. New fast-track models are therefore being explored, allowing resources to be allocated more appropriately according to individual patient needs.

These developments take place against a broader discussion about the future of healthcare. Operating theatre capacity, equitable access to care and the balance between highly specialised surgery and routine procedures remain significant challenges. As more benign surgical procedures are moved away from tertiary centres, the remaining patient population becomes increasingly complex and resource-intensive, while also making surgical training more challenging. This places substantial demands on organisation, workforce development and retention of specialised staff.

The Department therefore sees a growing need for stronger collaboration across the future super-region, both clinically, organisationally and in research. Our ambition remains to advance the treatment of patients with head and neck cancer through clinical excellence, multi-disciplinary collaboration and an ever-deeper understanding of what creates genuine value for patients.

East Danish Head and Neck cancer LinkedIn

FACT

HPV-RELATED HEAD AND NECK CANCER

HPV-positive oropharyngeal cancer cases have risen sharply in recent decades and now account for a significant proportion of head and neck cancers globally. Common symptoms include persistent sore throat, difficulty swallowing, and unexplained lumps in the neck. HPV DNA testing complements biopsy and imaging in diagnosis.

Treatment typically involves a combination of surgery, radiotherapy, and occasionally chemotherapy. HPV-positive cases often respond better to treatment than HPV-negative cases. However, approximately 20-30% of patients experience recurrence after initial treatment. Early detection of recurrence through ctDNA and HPV-DNA monitoring has shown promising results in improving outcomes

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Stem cells, HPV, Epidemiology and Care during crisis

In 2025, our research in head and neck cancer has focused on four key areas: regenerative stem cell therapy, HPV-related cancer, epidemiology, and the impact of COVID-19 on cancer care. Together, these efforts aim to improve treatment outcomes, strengthen diagnostic precision, and deepen our understanding of how head and neck cancers develop and affect patients over time.

Findings

One of the year's most important achievements has been within our MESRIX research programme, which explores the use of stem cell therapy to help patients recover from long-term side effects of radiation treatment. Many people treated for head and neck cancer experience permanent damage to their salivary glands, leading to severe dry mouth that can affect eating, speaking, sleeping, and overall quality of life.

In 2025, we published long-term results from a clinical study showing that stem cell (mesenchymal stromal cells) treatment is both safe and effective in improving saliva production in these patients. The findings provide strong evidence that regenerative medicine can help re-store some of the functions lost during cancer treatment. We have also helped prepare the next phase of the research, which will investigate how the treatment works at a biological level and why some patients benefit more than others.

Another major focus has been cancers caused by the human papillomavirus (HPV), a virus that is now responsible for a growing number of throat cancers worldwide. Our research has examined how these cancers develop, how they are diagnosed, and how information about HPV is communicated to the public. We have studied patients with less common forms of HPV-related cancer and investigated how different biological markers can influence a patient's outlook and treatment pathway. There is a need for greater awareness among patients and health care professionals along with public information about the HPV-related throat cancer, which is also shown in research that we contributed to.

Trends and outlook

In addition to studying individual patients, we have looked at broader trends in cancer across Denmark. A nationwide study examined how the occurrence of head and neck cancer and patient survival have changed over the past 40 years. This work provides valuable knowledge about how the disease has evolved and helps guide future healthcare planning and research priorities.

Finally, we investigated how the COVID-19 pandemic affected cancer care. Through two studies, we explored whether the pandemic caused delays in diagnosis and treatment and whether it influenced outcomes for patients with throat cancer. These findings contribute to a better understanding of how healthcare systems can maintain high-quality cancer care during future crises.

Together, our research in 2025 reflects a commitment to improving both survival and quality of life for people affected by head and neck cancer by combining innovative treatments with a deeper understanding of the disease.

Improving Prognostication and Personalised Treatment in Head and Neck Cancer

RESEARCHERS

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In 2025, our research focused on two closely connected areas: prognostication and personalized treatment in head and neck cancer. Head and neck cancer is a complex disease, and patients with seemingly similar tumors can experience very different treatment outcomes. Our research focuses on understanding these differences and developing better tools to predict disease progression, guide treatment decisions, and improve patient care.

Traditionally, doctors have relied on factors such as the location, stage, and grade of a tumor to assess prognosis and determine treatment strategies. While these clinical parameters remain important, they provide only part of the picture. As cancer treatment becomes increasingly personalized and more treatment options become available, there is a growing need for more precise prognostic tools.

A major focus of our research is tumor heterogeneity, the biological differences that exist both within a single tumor and between tumors in different patients. These variations can influence how a cancer develops, how it responds to treatment, and ultimately how patients fare.

Through several prospective clinical studies, we have investigated the use of advanced molecular imaging techniques, the safety of radiotherapy dose escalation, and the relationship between imaging findings and the underlying biology of tumors.

Our results have demonstrated substantial variation in PD-L1 expression within tumors, raising important questions about treatment decisions based on a single biopsy sample. We also identified clinically relevant genomic differences within tumors in approximately one-third of patients, highlighting the need for more personalized treatment approaches. These studies remain among the few to directly compare imaging-derived measures of tumor heterogeneity with biological heterogeneity and detailed pathological assessments.

In parallel, our retrospective studies have focused on improving prognostication. This work led to the development and validation of a prognostic model for patients with oropharyngeal cancer, enabling the identification of patients at increased risk of developing metastases and supporting the selection of candidates for clinical trials investigating new systemic therapies.

Together, these research activities have strengthened our understanding of prognostication and tumor heterogeneity in head and neck squamous cell carcinoma and translated new knowledge into clinically relevant tools.

They have also laid the foundation for the ongoing PET Follow study, a prospective clinical trial evaluating the use of post-treatment PET/CT scans to guide follow-up care and surgical decision-making. More than 500 patients have already been enrolled, and the study is expected to provide important evidence for optimizing the management of patients with head and neck cancer after treatment.

FACT

PET SCAN

Positron Emission Tomography scan is a medical imaging test that uses a safe, radioactive tracer to show how the organs and tissues are working at a cellular level

FACT

TORS

Transoral robotic surgery (TORS) is a minimally invasive technique that enables surgeons to remove tumours of the throat through the mouth using robotic instruments, helping to preserve healthy tissue and function.

Head and Neck Ultrasound course

RESEARCHERS

Tobias Todsen, Amalie Posselt, Nina Sannino-Greve, Kasper Daugaard Larsen, Daniel Lauritzen, Ahmed Ehsan Al-Khafaf, Jacob Nielsen, Fatemeh Makouei, Maria Stangalini, Zakir Hussain Shahoo, Amanda Muff Baunsgaard Nielsen, Villads Aagaard Brixen, Hans Christian Tvedskov, Joachim Bugge Thestrup Kjelde, Rikke Harmsen

Precision Diagnostics and Surgical Treatment through Ultrasound and AI

In 2025, our research focused on advancing technologies to improve the diagnosis, treatment, and management of diseases in the head and neck region. By combining clinical expertise, emerging imaging technologies, and artificial intelligence, we aim to make diagnostics more precise and surgical treatment less invasive.

AI

A key area of our work has been exploring how clinicians and artificial intelligence can work together to improve diagnostic accuracy. In a clinical trial, we investigated human-AI interaction in the ultrasound diagnoses of thyroid nodules. The results demonstrated how physicians had a substantial impact on the AI's diagnostic accuracy, highlighting the importance of exploring human-AI collaboration in clinical practice before implementing new technologies in patient treatment. A way to overcome the operator variance in ultrasound AI diagnostics is to use three-dimensional (3D) ultrasound volume. We investigated how 3D ultrasound can improve the evaluation of thyroid diseases. By providing more comprehensive anatomical information than conventional two-dimensional imaging, 3D ultrasound may strengthen diagnostic accuracy and support more informed treatment decisions.

Transoral Ultrasound

We have also continued to develop and validate transoral ultrasound as a novel imaging technique for patients with oropharyngeal cancer. During the year, we published results demonstrating that surgeon-performed transoral ultrasound can improve the detection and staging of cancers located deep within the throat, enabling more accurate treatment planning and personalized patient care.

Building on this work, we also explored the use of intraoperative 3D ultrasound during cancer surgery. One of the fundamental challenges in cancer surgery is removing the entire tumor together with an adequate safety margin while preserving as much healthy tissue as possible. If too little tissue is removed, patients may require additional surgery or further treatment. Conversely, removing excessive amounts of healthy tissue can impair function and quality of life.

In a pilot study involving patients undergoing transoral robotic surgery (TORS) for oropharyngeal cancer, we assessed the feasibility of using intraoperative 3D ultrasound for real-time evaluation of tumor margins.

Previous non-randomized studies have shown promising results of more expensive spinal needles to improve diagnostic adequacy in aspiration biopsy in the evaluation of the thyroid nodules. Therefore, we conducted a multicenter randomized controlled trial to compare these results with conventional ultrasound guided fine-needle aspiration biopsy (FNAB). We concluded that no significant improvement was found. This is important information is an example of our ambition to be cost efficient whilst not reduce our patient care.

Beyond cancer and imaging research, we have continued to investigate the role of the throat in respiratory viral infections. Our studies on SARS-CoV-2 and influenza demonstrated the importance of upper airway sampling sites and highlighted the previously underrecognised role of the throat during the early stages of viral infection. These findings improve our understanding of respiratory disease transmission and may contribute to more effective diagnostic strategies in future outbreaks.

Together, these projects illustrate our ambition to transform ultrasound from a diagnostic tool into a comprehensive platform for precision diagnostics, image-guided treatment, and personalised patient care in head and neck disease.

Annual Overview of PhD Defenses

At our Department, we take immense pride in witnessing our researchers crossing the finish line each year, concluding three years of intense research and writing. Often, this journey is undertaken alongside the demanding life of a clinician. At a university hospital, education and research are core pillars, complementing patient care. This year, we are proud to celebrate six remarkable defenses

Mesenchymal stem cells for radiation induced hyposalivation and xerostomia in previous head and neck cancer patients (MESRIX-III)

PhD Defense: Amanda Louise Fenger Carlander, 2025

The PhD thesis explored patient characteristics and prognosis in HPV-positive oropharyngeal cancer, and the potential of mesenchymal stem cell therapy to alleviate treatment-related side effects. Supervised by Professor Christian von Buchwald, co-supervisors Christian Grønhøj, Jens Kastrup, and Mads Klokker. The assessment committee, chaired by Professor Ulrik Niels Lassen, and opponents Professor Antti Mäkitie (University of Helsinki) and Professor Katarina Le Blanc (Karolinska Institutet).

New applications and test modalities for the Audible Contrast Threshold (ACT)

PhD Defense: Lisbeth Birkelund Simonsen

Lisbeth defended her PhD at DTU and the Interacoustics Research Unit (IRU), with collaboration with Rigshospitalet.Her research focused on the final development of the clinically viable Audible Contrast Threshold (ACT) test for measuring spectro-temporal modulation detection, and an objective electrophysiological version, E-ACT, for infants, young children and individuals unable to actively participate in behavioural testing. Supervisors, partners and assesment group: Søren Laugesen, Abigail Anne Kressner,Torsten Dau, Jaime Undurraga, David Harbo Jordel, Sinnet Greve Bjerge Kristensen, Kevin J Munro, Debi Vickers and Jens Hjortkjær.

From Silence to Sound: How Cochlear Implants are Improving Hearing in Denmark

- Investigating Speech Recognition, Patient-Reported Outcome, Tnnitus, Hearing Presavation, and Spatial Hearing

PhD Defense: Kasper Dyre Rasmussen, 2025

The PhD defence focused on cochlear implantation (CI) and was based on four peer-reviewed publications addressing speech understanding and quality of life, tinnitus, preservation of residual hearing, and sound localisation in CI patients. The defence was assessed by Professor Saku Sinkkonen, Professor Jesper Hvass Schmidt and Ramon Gordon Jensen, who chaired the assessment committee. Kasper was supervised by Per Caye-Thomasen, Michael Bille and Niels West.

Optimising CRSwNP Management

- A six month randomisedControlled Trial of Mepolizumab with or without FESS

PhD Defense: Anne-Sophie Homøe, 2025

The PhD defense addresses the treatment of chronic rhinosinusitis with nasal polyps and indicates that the combination of surgery and biological therapy can enhance and potentially accelerate the treatment effect. It represents an important contribution to a rapidly evolving field.

Surgeon-Performed Ultrasound of Oropharyngeal Cancers

PhD Defense: Martin Garset-Zamani, 2025

The research explored whether surgeon-performed ultrasound can complement or potentially reduce reliance on conventional imaging such as CT, MRI and PET-CT/MRI in the assessment and treatment of oropharyngeal cancer. The thesis also evaluated the use of ex vivo 3D ultrasound of surgical specimens, generating several novel findings. The assessment committee comprised Professor Preben Homøe, Associate Professor Merry Sebelik (Atlanta, USA) and Associate Professor Tejs Klug. Congratulations to Martin and his supervisors, Professor Christian von Buchwald, Associate Professor Rikke Norling and primary supervisor Professor Tobias Todsen.

Specific Training According to BaLance Evaluation (STABLE)

PhD Defense: Kasper Søndergaard, 2025

Physiotherapist Kasper Søndergaard defended his PhD on fall prevention and balance training in older adults. Based on three scientific papers, the thesis investigated the Specific Training According to BaLance Evaluation (STABLE) approach. The studies found that all STABLE measures, except the Cognitive Timed Up and Go, can be used to guide exercise prescription.

Ongoing PhDs

EAR

Adam Omari “Patient-specific 3D-printed models for improving temporal bone and middle ear surgery”

Anders Nøhr “Gamification and certification in the Visible Ear Simulator”

Asher Lou Isenberg “GUT-BALANCE: Investigating the Gut-Brain axis in Motion Sickness”

Beatriz Tomás da Costa ”Assesing Hearing Performance of Teenagers with Hearing Aids and Cochlear Implants using functional Near-Infared Spectroscopy (fNIRS)”

Beauty Hariz “Outcome of Children who are deaf and hard of hearing with cochlear implant in the Middle East”

Bilal Akram “Clinical cone-beam CT in the diagnosis and surgical treatment of otosclerosis”

Camelia Nabi Saber “Multicenter Study for Enhancing Auditory Brainstem Implant Performance in Neurofibromatosis type 2 Patients”

Colin Barbier “Characterising the effect of compression and reverberation on spatial hearing”

Elisa Skovgaard Jensen “Audio-vestibular function in neuroinfections”

Francesco Ganis “Localisation and emotional detection in speech signals of children with CI”

Jeppe Hjembæk-Brandt ”Surgical visualization and work-related musculoskeletal pain in microsurgeons ”

Line Husted Baungaard “Adult Cochlear Implantation and Hearing Rehabilitation: Outcomes, Patient Perspectives and Rehabilitation Practices”

Lone Jantzen “Auditory late effect in CCS”

Louie Rogalla “Automating diagnostics in BPPV”

Mats Daniel Rekswinkel “Investigating an objective and clinically oriented measurement paradigm based on cortical responses to assess speech discrimination”

Nete Rudbeck Kamper “TeenHear - timely and relevant audiology for adolescents with hearing loss”

Pernilla Kjær Andersen ”Clinical evidence for more ecologically valid assessments of hearing”

Peter Trier Mikkelsen “Advancing virtual reality temporal bone simulation for patient-specific simulation and mixed reality perioperative guidance”

Quirin Mühlberger “Individualization of binaural processing in hearing aid and cochlear implant users”

Signe Wischmann “Gamification in audtory rehabilitation”

NOSE

Christian Korsgaard Pedersen “Biological treatment of severe nasal polyposis in Denmark”

Christiane Holbæk Haase “Adherence to local steroid in Global Airways – importance of double disease and the relationship between steroid intake and the impact on the endocrine axis, bone density, and bone structure”

Ditte Gertz Mogensen ”Post-COVID-19 Olfactory Dysfunction: Patient Characteristics, Impact on Quality of Life, and the Effect of Olfactory Training”

Elizabeth Stevens ” Tapering of Biologics in CRSwNP”

Jens Even Tidemandsen “Change in physical activity, lung function, airway inflammation and airway hyperresponsiveness after treatment with mepolizumab and FESS surgery compared with mepolizumab alone in patients with CRSwNP– 6 months follow-up of a randomized controlled trial”

Mads Guldager “Mastering endoscopic sinus surgery”

Marie Høxbro ”Optimization of treatment in patients with CRSwNP with FESS only. New appendix FESS only (without mepolizumab)”

Simon Hedeager Høj ”Chronic Rhinosinusitis Beyond the Airways: From Disease Origins to Clinical Phenotypes”

HEAD AND NECK

Amalie Hartvig Pall Posselt ”Novel ultrasound techniques to improve diagnostic work up in the outpatient clinic”

Amanda Øster Andersen “Optical molecular imaging in head and neck surgery”

Benedicte Bitsch Lauritzen ”Circulating HPV-DNA in head and neck cancer: a national study”

Carl Frederik Haugaard “Wireless electroporation in HNSCC”

Daniel Julius Lauritzen “Improving treatment Outcomes in Oral Cancer Surgeries with intraoperative Surgeon-performed ultrasound”

Ditte V. Mogensen ” Mucosal melanoma in the head and neck region - comprehensive investigations on mutational landscape and tumor microenvironment to improve treatment outcomes”

Hannes Sjölander ”Advanced robotic surgery and optical imaging in the treatment of head and neck cancer”

Jakob Myllerup Jensen ” Diagnostic value of circulating HPV DNA in patients with HPV-positive oropharyngeal squamous cell carcinoma (HPV-OPSCC)”

Joachim Hansen ”Intraglandular treatment with mesenchymal stem cells in patients with xerostomia dut to Sjögrens syndrome”

Kasper Daugaard Larsen “Improving the diagnostic work up of thyroid nodules: Exploring new biopsy techniques and Proteome profiling”

Nina Buhl Sannino-Greve ”Advancing Diagnostic and Surgical Outcomes in Oropharyngeal Cancer: The Role of Ultrasound in Optimizing Patient Care”

Signe Buhl Gram “Heterogeneity in Head and Neck Squamous Cell Carcinoma – impact on treatment and follow-up”

Publications 2025

THESIS

PhD Thesis

Effect of mepolizumab and FESS surgery compared with mepolizumab alone in patients with CRSwNP and signs of Type-2 inflammation – 6 months follow-up of a randomized controlled trial
Anne-Sophie Homøe

Mesenchymal stem cells for radiation induced hyposalivation and xerostomia in previous head and neck cancer patients (MERIX-III)
Amanda Louise Fenger Carlander

Advances in Cochlear Implantation in Denmark: Investigating Speech Recognition, Tinnitus, Patient-Reported Outcomes, Hearing Preservation, and Spatial Hearing
Kasper Rasmussen

Specific Training According to BaLance Evaluation (STABLE)
Kasper Søndergaard

New applications and test modalities for the Audible Contrast Threshold (ACT) test
Lisbeth Birkelund Simonsen

Transoral ultrasound to improve diagnostic work-up of oropharyngeal cancer
Martin Garset-Zamani

EAR

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