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# Annual Report

## Research Activity 2022



**Division of Clinical Neuroscience**

**University of Oslo  
Oslo University Hospital  
Sunnaas Rehabilitation Hospital**





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## Oslo University Hospital, Sunnaas Rehabilitation Hospital and the University of Oslo

Oslo University Hospital (OUH) is Norway's largest hospital with over 24 000 employees and a budget of 23 billion NOK. The Hospital has a local function for parts of Oslo's population. It has a regional function for the inhabitants in the South-Eastern Norway Regional Health Authority, as well as a large number of national functions. The Hospital is responsible for a large part of the medical research and education of health personnel in Norway.

Sunnaas Rehabilitation Hospital offers multidisciplinary rehabilitation to patients with complex functional impairment following illness or injury. The Hospital also holds national responsibilities for rare congenital disorders and locked-in syndrome.

The University of Oslo (UiO) is Norway's largest research and educational institution with 28 000 students and 7 000 employees. Professional breadth and internationally recognized research environments make UiO an important contributor to society. The Faculty of Medicine was established in 1814 and works for progressive education, research and dissemination for the patients' and society's best interests.

### Division of Clinical Neuroscience

The Division of Clinical Neuroscience encompasses the disciplines of neurology, neurosurgery, physical medicine and rehabilitation, neuro habilitation and complex epilepsy. The proximity to patients and their medical issues are the cornerstones for the research conducted at our hospitals, and the research aims at improving patient care. High ethical standards ensure the confidentiality and our goal is to continuously improve diagnostics, treatment and management for all our patients.

### Research activity

The Division's research activity is organized into 27 different research groups covering a broad range of basic, clinical and epidemiological research, with an overall aim to improve patient care with emphasis on diagnostic, therapeutic and preventive measures. Most group leaders have a combined position at the hospital and the University of Oslo. In total, the Division has 17 Professors, 1 Associate Professor, several postdoctoral fellowships and PhD students, administrative staff and technical staff.

The Division has an advisory research board which in 2022 consisted of: Professor and Head of Research John Anker Zwart, Division Director Eva Bjørstad, Professors and Senior Consultants Morten Lossius, Eirik Helseth, Lasse Pihlstrøm, Torgeir Hellstrøm, Bjørnar Hassel, Kaja Selmer, Cathrine Buas Tverdal and Administrative Manager Agnete Hager.

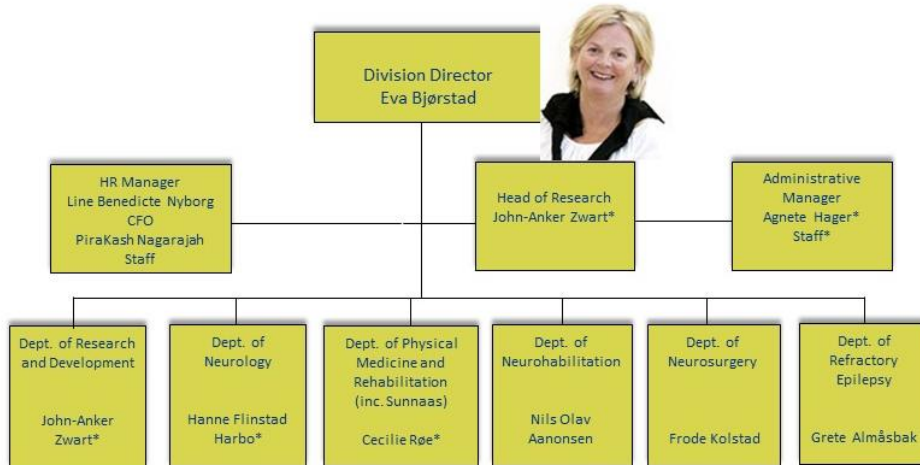
In 2022 there were in total 255 registered peer reviewed publications and 16 PhD dissertations, while Sunnaas Rehabilitation Hospital published 75 registered peer reviewed articles and had 4 PhD dissertations.

*Eva Bjørstad, Division Director*



## Division of Clinical Neuroscience (NVR)

### Organizational Chart



\*UiO employee(s)



## Department of Physical Medicine and Rehabilitation

The Department of Physical Medicine and Rehabilitation has a large outpatient clinic for painful musculoskeletal disorders and carries out early rehabilitation after traumatic brain injuries and other conditions in need of both specialized rehabilitation and hospital care.

The department has a multidisciplinary staff with clinical, educational and research responsibilities. The two research groups: "Painful musculoskeletal conditions" and "Rehabilitation after trauma" conduct clinical interdisciplinary research, aiming to improve treatments programs services and outcome in close collaboration with the users and their organizations is in focus.

The research groups are included in the network of Center for habilitation and rehabilitation services research (CHARM).

The "Rehabilitation after trauma" group has close collaboration with the rehabilitation research group at Sunnaas Hospital and constitute the Oslo Traumatic Brain Injury Outcome and Rehabilitation Research Network (OBIOR).

The Department of Physical Medicine and Rehabilitation is headed by Professor Cecilie Røe.



## Rehabilitation after trauma



### Group Leader

Nada Andelic, MD/PhD, Professor, Dept. of Nursing Science, UiO  
(nada.andelic@medisin.uio.no) / OUH (nadand@ous-hf.no)

### Group members

- Cecilie Røe, Professor, UiO
- Erik Bautz-Holter, Professor emeritus, UiO
- Helene Lundgaard Sjøberg, Professor, OsloMet
- Unni Sveen, Professor emeritus, OsloMet
- Tonje Haug Nordenmark, Associate Professor, UiO
- Marit V. Forslund, PhD, Postdoc, OUH
- Tanja Karic, PhD, Researcher, OUH
- Torgeir Hellstrøm, PhD, Researcher, OUH
- Ingerid Kleffeltgård, PhD, Postdoc, OUH
- Mari S. Rasmussen, PhD, Postdoc, OUH
- Emilie I. Howe, PhD, Postdoc, OUH
- Silje Fure, PhD, OUH
- Elin Western, PhD, OUH
- Ida Maria Borgen Henriksen, PhD/postdoc, OUH/UiO
- Håkon Moksnes, PhD fellow, UiO
- Christoph Schäfer, PhD fellow, UiT
- Cathrine Buaas Tverdal, PhD, UiO
- Lars-Johan Viddal-Valaas, PhD fellow, UiO
- John Bjørneboe, PhD, Researcher, OUH
- Benedikte Madsen, PhD fellow, UiO
- Camilla Guren Hovset PhD fellow, UiO

### Research profile and aims

The research group generates knowledge about the mechanisms and consequences of trauma, patient care, trends and challenges in treatment and rehabilitation including the patients' healthcare needs.

The main research focus is traumatic injuries including traumatic brain injury (TBIs), multiple trauma and aneurysmal subarachnoid hemorrhage (aSAH). The research conducted by this group is multidisciplinary, where collaboration between genetics, intensive care medicine, neurosurgery, neuroradiology, neuropsychology and rehabilitation professionals has been established over the last 17 years.

By combining the perspectives and methods of basal, clinical and health care service research, we may provide unique knowledge on the consequences of injuries, how to organize effective patient care and improve the functional outcomes after injuries.





### The main aims of the research group for 2020-2025 are:

- To better understand the mechanisms, course and consequences of TBI, multiple traumas and aSAH by using translational research strategy
- To develop (and implement) cost-effective rehabilitation interventions to target TBI-related challenges in the short- and long-term after injury
- To improve collaboration and knowledge transfer between primary and secondary health care services to ensure seamless rehabilitation for trauma patients
- To strengthen existing and initiate new national and international research collaborations

### Main ongoing projects

- Traumatic brain injury; needs and treatment options in the chronic phase. A randomized controlled community-based intervention.  
Principal investigator: Cecilie Røe, PhD fellow Ida M. Borgen Henriksen, postdocs: Marit V. Forslund, Solveig L. Hauger, Ingerid Kleffegård
- OSU6162 in the treatment of fatigue and other neuropsychological sequelae after aneurysmal subarachnoidal hemorrhage - a double-blind, randomised, placebo-controlled study.  
Principal investigators Angelika Sorteberg and Tonje Haug Nordenmark. PhD fellow Elin Western
- Rehabilitation needs, service provision and cost after trauma. In collaboration with the National Trauma Register, University Hospital of North Norway, and CHARM.  
Principal investigator Nada Andelic, PhD fellows Håkon Moksnes and Christoph Schäfer, Postdoc Mari S. Rasmussen
- Sub-threshold training in patients with persistent post-concussion symptoms after mild TBI – a randomized controlled study.  
Principal investigator: Ingerid Kleffegård, PhD fellow Lars-Johan Viddal Valaas
- Changes in physical, cognitive and emotional functions 5 and 10 years after aneurysmal subarachnoid hemorrhage.  
Principal investigators: Tonje Haug Nordenmark and Tanja Karic
- Exploring the role of personality characteristics in symptom-burden, return to work and health related quality of life during the first year after mild-to-moderate traumatic brain injury.  
Principal investigators: Emilie I. Howe, PhD fellow Benedikte Madsen
- Traumatic Brain Injury – Rehabilitation and user satisfaction.  
Principal investigators: Marit V. Forslund, PhD fellow Camilla Guren Hovset
- Trauma Rehabilitation: User experiences and Unmet Needs.  
Principal investigator: postdoc Emilie I Howe

### Other projects

- Center-TBI (Collaborative European NeuroTrauma Effectiveness Research in TBI) is in publication phases.  
Principal investigator at the OUH site Nada Andelic
- Development of persistent fatigue after moderate-to-severe TBI. In collaboration with Sunnaas Rehabilitation Hospital.  
Principal investigator Marianne Løvstad, PhD fellow Daniel Løke
- Acute treatment of traumatic brain injury at Oslo University Hospital. Profile of patient population, hospital resource use and hospital discharge. In collaboration with Dept. of Neurosurgery.





Principal investigators Mads Århus and Eirik Helseth, PhD fellow Cathrine Tverdal

- Pediatric traumatic brain injury: A prospective study investigating incidence, outcomes and unmet treatments needs 2 years post-injury. In collaboration with Children Dept.  
Principal investigators Trond Diseth and Mia Myhre, PhD fellow Hilde M. Dahl

## Most important national and international collaborators

### National

- Oslo Traumatic Brain Injury Outcome and Rehabilitation Research Network (OBIOR- research network)
- Hospitals in the South-East Region, including Sunnaas Rehab. Hospital
- OsloMet
- Work Research Institute (AFI)
- Norwegian Labor and Welfare Administration, Oslo
- NAV, Dept. of vocational rehabilitation
- Universities of Oslo, Bergen, Trondheim and Tromsø
- Helsam/Charm, UiO

### International

- Karolinska, Uppsala, Umeå and Salgrenska University Hospitals, Sweden
- Copenhagen University Hospital and Hammel Rehabilitation and Research Centre, Denmark
- Virginia Commonwealth University, Richmond, US
- BioCruces Health Research Institute, Spain
- University of California, San Diego, CA, USA
- University of Gottingen, Germany
- Hannover Medical School, Germany
- CENTER-TBI collaborators across the European hospitals/universities (particularly Finland, UK, France, Slovakia and Germany)

## Funding

- Norwegian Research Council
- Heath Authority South-East Region
- Dam Foundation (Stiftelsen Dam)
- Norwegian Fund for Post-Graduate Training in Physiotherapy (Fysiofondet)
- European Union's Seventh Framework Programme for Research and Development
- University of Oslo
- Oslo University Hospital

## Scientific production of the research group in 2022

### PhD thesis

Silje Fure: *“Combined cognitive and vocational rehabilitation after mild-to-moderate traumatic brain injury: A randomized controlled trial”*, UiO, 11.05.22.

Ida M. Borgen: *“A Goal-Oriented Randomized Controlled Intervention in the Chronic Phase of Traumatic Brain Injury – Feasibility, Patient-Reported Problem Areas, and Goal Attainment”*, UiO, 13.05.22.

Elin Western: *“Fatigue after aneurysmal subarachnoid hemorrhage: A study of risk factors, clinical presentation and treatment with (-)-OSU6162”*, UiO, 31.05.22.





Peer reviewed original research articles: >45 (including Center-TBI-publications)

**Selected publications:**

Howe EI, Andelic N, Fure SCR, Røe C, Sjøberg HL, Hellstrøm T, Spjelkavik Ø, Enehaug H, Lu J, Ugelstad H, Løvstad M, Aas E.

*“Cost-effectiveness analysis of combined cognitive and vocational rehabilitation in patients with mild-to-moderate TBI: results from a randomized controlled trial”*

BMC Health Serv Res. 2022 Feb 12;22(1):185. doi: 10.1186/s12913-022-07585-3.

Maas AIR, Menon DK, Manley GT, Abrams M, Åkerlund C, Andelic N, Aries M, Bashford T, Bell MJ, Bodien YG, Brett BL, Büki A, Chesnut RM, Citerio G, Clark D, Clasby B, Cooper DJ, Czeiter E, Czosnyka M, Dams-O'Connor K, De Keyser V, Diaz-Arrastia R, Ercole A, van Essen TA, Falvey É, Ferguson AR, Figaji A, Fitzgerald M, Foreman B, Gantner D, Gao G, Giacino J, Gravesteyn B, Guiza F, Gupta D, Gurnell M, Haagsma JA, Hammond FM, Hawryluk G, Hutchinson P, van der Jagt M, Jain S, Jain S, Jiang JY, Kent H, Kolias A, Kompanje EJO, Lecky F, Lingsma HF, Maegele M, Majdan M, Markowitz A, McCrea M, Meyfroidt G, Mikolić A, Mondello S, Mukherjee P, Nelson D, Nelson LD, Newcombe V, Okonkwo D, Orešič M, Peul W, Pisciă D, Polinder S, Ponsford J, Puybasset L, Raj R, Robba C, Røe C, Rosand J, Schueler P, Sharp DJ, Smielewski P, Stein MB, von Steinbüchel N, Stewart W, Steyerberg EW, Stocchetti N, Temkin N, Tenovuo O, Theadom A, Thomas I, Espin AT, Turgeon AF, Unterberg A, Van Praag D, van Veen E, Verheyden J, Vyvere TV, Wang KKW, Wiegers EJA, Williams WH, Wilson L, Wisniewski SR, Younsi A, Yue JK, Yuh EL, Zeiler FA, Zeldovich M, Zemek R; InTBIR Participants and Investigators

*“Traumatic brain injury: progress and challenges in prevention, clinical care, and research”*

Lancet Neurol. 2022 Nov;21(11):1004-1060. doi: 10.1016/S1474-4422(22)00309-X. Epub 2022 Sep 29.

Borgen IMH, Kleffegård I, Hauger SL, Forslund MV, Sjøberg HL, Andelic N, Sveen U, Winter L, Løvstad M, Røe C.

*“Patient-Reported Problem Areas in Chronic Traumatic Brain Injury”*

J Head Trauma Rehabil. 2022 Sep-Oct 01;37(5):E336-E345. doi: 10.1097/HTR.0000000000000744.

Epub 2021 Nov 2.



## Painful musculoskeletal disorders



### Group Leader

Cecilie Røe, Professor, Head of Dept of Physical Medicine and Rehabilitation,  
UiO (cecilie.roe@medisin.uio.no)/ OUH (cecilie.roe@ous-hf.no)

### Group Members

- Erik Bautz-Holter, Professor emeritus, UiO
- Siri Bjorland, PhD, OUH
- Jens Ivar Brox, Professor, UiO
- John Bjørneboe, PhD, OUH
- Kaia Beck Engebretsen, PT, PhD, OUH
- Marte Heide, PhD student, UiO
- Marianne Bakke Johnsen, PhD, UiO
- Niels-Gunnar Juel, MD, Dr. Philos, OUH
- Synnøve Kvalheim, PhD, OUH
- Kjersti Myhre, PhD, OUH
- Marianne Mørk, PhD student, OUH
- Elina Schistad, PhD, OUH
- Helene Skaara, MSc, OUH
- Sigrid Skatteboe, PhD, OUH
- Håkon Sveinall, PhD student, OUH
- Thy Vanem, PhD, OUH
- Mirad Taso, PhD student, OUH
- Thy Vanem, PhD student, OUH

### Research profile and aims

The research unit generates knowledge regarding diagnostics, treatment and rehabilitation of painful musculoskeletal conditions. The main focus is on neck, back and shoulder conditions. The research is multidisciplinary, and collaboration with basal, clinical and health care service milieus established. Based on the framework of the International Classification of Functioning, Disability and Health (ICF) and the biopsychosocial model, interaction between the genetic and other basal disease mechanisms with psychosocial, personal and environmental factors are studied regarding the course of pain, functioning and participation. Furthermore, developing and evaluating treatment models in prospective and randomized studies, aiming to improve functioning and return to work are focus areas.

The main aims are:

- To understand the mechanisms, course and consequences of painful musculoskeletal conditions.
- To develop and evaluate treatment models for painful musculoskeletal conditions.



## Ongoing projects

- A randomized controlled study of surgical versus non-surgical treatment for cervical radiculopathy. Principal investigator Jens Ivar Brox, PhD fellow Mirad Taso
- The effectiveness of radial extracorporeal shockwave therapy, standardized exercise program or usual care for patients with plantar fasciopathy. PhD fellows Marianne Mørk and Marte Heide
- Antibiotic treatment in patients with chronic low back pain and Modic Changes: randomized trial. Conducted by FORMI. Principal investigator in the research group Jens Ivar Brox and Elina Schistad
- Development of a minimum reporting set for rehabilitation services. Principal investigator Cecilie Røe
- The Norwegian Tennis Elbow (Note) study. Principal investigator Marianne Bakke Johnsen, PhD fellow Håkon Sveinall

## Most important national and international collaborators

### National

- Dept. of Orthopaedics, OUH
- Research Unit for Musculoskeletal Health, FORMI, OUH
- Institute of Health and Society, UiO
- Dept. of Physical medicine and Rehabilitation, St Olavs Hospital
- Dept. of Physical medicine and Rehabilitation, University Hospital of North Norway
- Dept. of Physical medicine and Rehabilitation, Haukeland University Hospital

### International

- Christoph Gutenbrunner, Hannover Medical School, Department of Rehabilitation Medicine, Hannover, Germany
- Tuomas Lähdeoja, Helsinki University Central Hospital, Finland
- Juan Lu, Paul Perrin, Virginia Commonwealth University, US

## Funding

- The Research Council of Norway
- South-Eastern Norway Regional Health Authority
- Sofies Minde Ortopedi
- Oslo University Hospital





## Scientific production of the research group in 2022

Peer reviewed original research articles: 18

### Selected publications:

Torstein Dalen-Lorentsen, Thor Einar Andersen, Christian Thorbjørnsen, Michael Brown, David Tovi, Anders Braastad, Tom Gerald Lindinger, Christian Williams, Eirik Moen, Benjamin Clarsen, and John Bjørneboe

*"Injury characteristics in Norwegian male professional football: A comparison between a regular season and a season in the pandemic"*

Front. Sports Act. Living, 21 October 2022 Sec. Injury Prevention and Rehabilitation

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Røe, Cecilie; Bautz-Holter, Erik; Andelic, Nada; Sjøberg, Helene L.; Nugraha, Boya; Gutenbrunner, Christoph; boekel, andrea; Kirkevold, Marit; Engen, Grace; Lu, Juan

*"Organization of Rehabilitation Services in Randomized Controlled Trials: Which Factors Influence Functional Outcome? A Systematic Review"*

Archives of Rehabilitation Research and Clinical Translation 2022

UiO OSLOMET OUS

Taso, Mirad; Sommernes, Jon Håvard; Bjorland, Siri; Zwart, John Anker Henrik; Engebretsen, Kaia Beck; Sundseth, Jarle Østberg; Pripp, Are Hugo; Kolstad, Frode; Brox, Jens Ivar

*"What is success of treatment? Expected outcome scores in cervical radiculopathy patients were much higher than the previously reported cut-off values for success"*

European spine journal 2022

UiO OUS



## Department of Refractory Epilepsy - National Centre for Epilepsy

The National Centre for Epilepsy at OUS is the only tertiary epilepsy centre in Norway and offers highly specialized work-up and treatment for complex and refractory epilepsy. The Centre is a full member of the ERN EpiCare and has members in several committees and the Executive Committee.

The Centre provides comprehensive care and has national responsibilities for complex epilepsy, rare epilepsy, pre-surgical work-up, epilepsy surgery and post-surgical work-up in collaboration with the Department of neurosurgery, OUS, psychogenic non-epileptic seizures (PNES) and dietary treatment.

The research group at the centre includes MDs, PhDs, epilepsy nurses, pharmacist, psychologists, and clinical nutritionists. The focus is on genotype/phenotyping of epilepsies, characterization of different epilepsy syndromes, clinical pharmacology of antiseizure medication, diagnostic and treatment options; EEG, epilepsy surgery, VNS, diets, psychosocial issues, cognition and PNES.

All patients are included in the hospital quality registry, also used for research purposes, consent provided.

The department of Refractory Epilepsy is headed by Grete Almåsbak.



## Complex epilepsy



### Group Leader

Morten I. Lossius, Consultant neurologist, National Centre for Epilepsy (NCE), OUH ([mortenl@ous-hf.no](mailto:mortenl@ous-hf.no)) and Professor, UiO ([morten.lossius@medisin.uio.no](mailto:morten.lossius@medisin.uio.no))

### Group Members

- Marit Bjørnvold, MD/PhD, NCE
- Cecilie Johannessen Landmark, MSc/PhD, NCE and OsloMet
- Kristin Alfstad, MD/PhD, NCE
- Karl Otto Nakken, MD/PhD, NCE
- Magnhild Kverneland, MSc/PhD, NCE
- Kari Modalsli Aaberg, MD/PhD, NCE
- Hilde Karterud, Cand.san/PhD, NCE
- Oliver Henning, MD, Dr. Philos., NCE
- Erik Sætre, MD/PhD, NCE
- Annette Holth Skogan, Clin. Neuro. Psych/PhD, NCE
- Lisa E. Hauger, Clin. Psych./PhD, NCE
- Silje Alvestad, MD/PhD, NCE

### PhD candidates

- Torleiv Svendsen, MD, NCE and UiO
- Antonia Villagran, MD, NCE and UiO
- Eli B. Kyte, Clin. Neuro. Psych, NCE and UiO
- Sigrid Pedersen, MSc, NCE
- Rune Markhus, MD, NCE
- Ellen Molteberg, MD, NCE and UiO
- Konstantin H. Kostov, MD, NCE and UiO
- Gernot Hlauschek, MD, NCE and UiO
- Merete Tschamper, MSc, NCE and UiO
- Truls Vikin, MD, NCE
- Fridny Heimisdottir, MD, NCE

### Associated group members

- Anette Huuse Farnen, MD/PhD, Innlandet Hospital Trust and UiO
- Marte Syvertsen, MD/PhD, Vestre Viken Hospital Trust and UiO
- Kaja Kristine Selmer, MD/PhD, OUH and UiO
- Ine Cockerell, MSc, OUH and UiO
- Margrete Larsen Burns, MD, PhD, Dept. of Pharmacology, NCE, OUS



## Research profile and aims

Clinical research in patients with difficult-to-treat epilepsy, with particular focus on:

- Characterization of epilepsy syndromes (genotype/phenotype)
- Clinical pharmacology of antiseizure medications
- Diagnostic and treatment options; EEG, pharmacotherapy, surgery, VNS, ketogenic diets
- Psychosocial, psychiatric and neurocognitive aspects
- Psychogenic non-epileptic seizures

### Dissertation 2022

Thorleiv Svendsen:

*“Real-world experience of four new antiseizure medications in difficult –to-treat epilepsy. Efficacy, tolerability and the importance of pharmacokinetic variability”*

UiO, 14 June 2022. Supervisor: Cecilie Johannessen Landmark, co-supervisor: Morten I. Lossius

## Ongoing projects

### PhD candidates in the UiO PhD program:

- **Antonia Villagran:** *“Psychiatric comorbidity in patients with psychogenic non-epileptic seizures (PNES)”* Supervisor: Morten I. Lossius. Co-supervisor: Roderick Duncan
- **Sigrid Pedersen:** *“Epilepsy in Children: The Impact of the Gut Microbiota and Epigenetics in Successful Treatment of Epilepsy”* Supervisor: Kaja K. Selmer. Co-supervisors: Knut Rudi, Per Ole Iversen and Benedicte Alexandra Lie
- **Ellen Molteberg:** *“Long term effects of modified Atkins diet in therapy-resistant epilepsy”* Supervisor: Erik Taubøll. Co-supervisors: Per Medbøe Thorsby and Karl O. Nakken
- **Eli B. Kyte:** *“Impact of epilepsy surgery on cognition, psychiatry and quality of life at the commencement of aging”* Supervisor: Kristin Å. Alfstad. Co-supervisors: Morten I. Lossius and Annette H. Skogan
- **Merete Tschamper:** *“Childhood epilepsy and parental health literacy”* Supervisor: Marie Hamilton Larsen. Co-supervisors: Astrid K. Wahl and Rita Jakobsen
- **Konstantin H. Kostov:** *“Clinical outcomes and determinants of effectiveness of vagus nerve stimulation in a large national refractory epilepsy population”* Supervisor: Morten I. Lossius, Co-supervisor: Jukka Peltola
- **Gernot Hlauschek:** *“Identifying novel imaging and clinical biomarkers of epileptogenesis poststroke”* Supervisor: Morten I. Lossius, Co-supervisors: Patrick Kwan and Meng Law
- **Truls Vikin:** *“Epilepsy in children-how are they doing?”* Supervisor: Kari M. Aaberg, Co-supervisors: Pål Surén and Morten I. Lossius



- **Fridny Heimisdottir:** *“Genetic mosaicism in focal epilepsy. Creating a platform for precision medicine in mosaic disorders”*. Supervisor: Kaja K. Selmer, Co-supervisors: Kristin Å. Alfstad, Inger-Lise Mero

#### Postdoc:

- **Silje Alvestad:** *“Scandinavian multi-registry study of antiepileptic drug teratogenicity: The SCAN-A study”*. Co-workers: Marte Bjørk, Torbjørn Tomsen, Jacob Christensen
- **Kari M. Aaberg:** *«Development in childhood epilepsy»*. Co-workers: Pål Surén, Morten I. Lossius

#### Other projects:

- **Kristin Å. Alfstad:** *“Risk factors for psychiatric symptoms and executive problems in youth with epilepsy”*  
Co-worker: Morten I. Lossius
- **EpilepsiNett:** *«Kan vi tette gapet? Sosioøkonomiske forskjeller og helseulikhet hos unge med epilepsi. Et EpilepsiNett prosjekt med data fra registre, kliniske kohorter og brukerstyrt oppfølging»*  
Kristin Å. Alfstad, Kari M. Aaberg, Marte Bjørk, Marte Roa Syversen, Eline Dahl-Hansen, Maryam Shirzadi, Jeanette Koht
- **Magnhild Kverneland:** *“Who should be treated with ketogenic diet for epilepsy”*  
Co-worker: Kaja K. Selmer
- **Erik Sætre:** *“Mortality in Epilepsy”*  
Co-worker: Michael Abdelnoor

#### PhD-candidates not yet in the UiO PhD program:

- **Kathrine C. Haavardsholm:** *“Long term effect of ketogenic diet in children with epilepsy”*  
Supervisor: Anette Ramm –Pettersen, Co-supervisor: Kaja K. Selmer

#### PhD-candidates in the UiO PhD program, associated to the group:

- **Ine Cockerell:** *“Treatment and follow-up in patients with tuberous sclerosis”*  
Supervisor: Terje Nærland. Co-supervisors: Cecilie J. Landmark, Caroline Lund and Ketil Heimdal

#### National network

- EpilepsiNett: National Network for Evidence-based Epilepsy Care  
Chairperson: Marte Syversen. Management team: Morten I. Lossius, Nils Erik Gilhus, Marte Bjørk, Kristin Å. Alfstad, Jørn Mandla Sibeko

#### International networks

- EpiCARE; European Reference Network (ERN) on rare and complex epilepsies. Lead of working group 18 and executive committee member: Morten I. Lossius





### Interntional projects

- “EURAP study”. An International Antiepileptic Drugs and Pregnancy Registry” (International concerted Action on the Teratogenesis of Anti-epileptic Drugs) (<https://eurapinternational.org/>)  
**Silje Alvestad** and **Siri Myklebust**, national coordinators
- “Computer based identification of morphometric abnormalities in MRI images in patients before and after operation in the temporal lobe.” **Kristin Å. Alfstad, Morten I. Lossius**, Jugoslav Ivanovic, Pål Bache Marthinsen, Oslo University Hospital and Lars Pinborg, Copenhagen University Hospital, Denmark
- “Detection and classification of seizures with wearable sensors-new technology in the diagnosis of epilepsy”. **Kristin Å. Alfstad, Antonia Villagran, Rune Markhus** and Kristina Malmgren, University of Gothenburg and Sahlgrenska University Hospital, Sweden
- “Ultra-long subcutaneous EEG monitoring: reliability, safety and impact on clinical management in uncontrolled epilepsies.” **Kristin Å. Alfstad, Oliver Henning, Margrete Halvorsen Bø**, Arild Egge, Oslo University hospital, Guido Rubboli, University of Copenhagen, Danish Epilepsy Centre, Dianalund, Denmark and Sándor Benizky, Aarhus University Hospital and Danish Epilepsy Centre, Dianalund, Denmark.
- “Nordic prospective observational study of outcomes after rare epilepsy surgery procedures”. **Fridny Heimisdottir, Kristin Å. Alfstad** and Tove Hallbook, University of Gothenburg and Sahlgrenska Hospital, Sweden
- “Children with refractory epilepsy and use of the newest antiepileptic drugs”. Scandinavian project between the National Centre for Epilepsy in Norway and Danish Epilepsy Centre, Dianalund, Denmark; **Margrete Larsen Burns**, Marina Nikorova, Danish Epilepsy Centre, Dianalund; responsible in Denmark, **Cecilie Johannessen Landmark**, project leader
- “Nordic Delphi Consensus on VNS guidelines”  
An international multicenter project. The aim of the project is to find Consensus for mutual clinical VNS guidelines in the Nordics for drug resistant epilepsy patients  
**Oliver Henning**, project leader, **Hrisimir Kostov**, Thorsten Gerstner, Stein-Helge Tingvoll, Susanne Ingebrigtsen, Atle Lillebø, Omar Hikmat (Norway), Dragan Marsanovic, Kern Olofsson, Anne Sabbers, Ioannis Tsiropoulos, Noemi Becser Andersen (Denmark)  
Liisa Metsähonkala, Reina Roivainen, Salla Lamouso, Jukka Peltola (Finland), Sintia Kolbjer, Lisa Gordon, Helena Gauffin, Johan Lundgren, Elinor Ben-Menachem, Fredrik Asztely, (Sweden).
- “EEG in Nodding Syndrome (Onchocerca volvulus associated epilepsy).” **Oliver Henning**, Richard Idro, Makarere University, Kampala, Uganda

### Expert groups etc.

- Cannabidiol International Expert group (CBD). **Cecilie Johannessen Landmark**
- Treatment strategies on pediatric epilepsies annual educational course  
[https:// www.epiped-course.com](https://www.epiped-course.com) (EpiPed.) **Cecilie Johannessen Landmark**





- Epilepsy Education Task Force, Botanical Medicines Task Force and Pediatric treatment task force, all initiated by the International League Against Epilepsy (EpiED) **Cecilie Johannessen Landmark**
- Eilat Educational course: Pharmacological treatment of epilepsy **Cecilie Johannessen Landmark**  
<https://www.ilae.org/congresses/10th-eilat-educational-course-pharmacological-treatment-of-epilepsy>
- Annual course Baltic sea summer school for epilepsy: **Oliver Henning** and **Cecilie Johannessen Landmark**  
<https://www.ilae.org/congresses/ilae-sponsored-meetings-and-courses/baltic-sea-summer-school-on-epilepsy-bssse>
- Nordic Expert Group on Epilepsy and Dementia. **Erik Sætre**
- Nor-EpiNet Nordic network for precision medicine, steering group members **Kaja Selmer** and **Cecilie Johannessen Landmark**
- Commission on Epidemiology, International League Against Epilepsy. **Kari Modalsli Aaberg**

## Most important national and international collaborators

### National

- Prof. Eylert Brodtkorb, St. Olavs Hospital and NTNU, Trondheim
- Prof. Erik Taubøll, OUH and UiO
- Prof. Jeanette Koht, Viken Hospital Trust and UiO
- Prof. Nils Erik Gilhus, Haukeland University Hospital and UiB
- Ass. prof. Marte Bjørk, Haukeland University Hospital and UiB
- Marte Syvertsen, MD, PhD, Viken Hospital Trust and UiO

### International

- Prof. Torbjörn Tomson, Karolinska Institutet, Stockholm, Sweden
- PhD Jacob Christensen, University of Århus, Denmark
- Prof. Marina Nikorona, Danish Epilepsy Centre, Dianalund, Denmark
- Prof. Anne Sabers, University of Copenhagen, Denmark
- Lars Pinborg, Copenhagen University Hospital, Denmark
- Prof. Richard Chin, Muir Maxwell Epilepsy Centre and University of Edinburgh
- MD Roderick Duncan, MD, DB Medical Research Centre, Christchurch, New Zealand
- Prof. Christoph Helmstaedter, Bonn University Hospital, Germany
- Prof. Lieven Lagae, UZ Leuven University Hospital, Belgium
- MD, PhD Richard Idro, Mulago National Referral Hospital, Kampala, Uganda
- Prof. Sándor Beniczky, Danish Epilepsy Centre, Dianalund, University of Århus, Denmark
- Prof. Guido Rubboli, Danish Epilepsy Centre, Dianalund, University of Copenhagen, Denmark
- Ass. Prof. Rikke Steensbjerre Møller, University of Southern Denmark, Denmark
- Prof. Jukka Peltola, Tampere University Hospital, Finland





## Scientific production of the research group in 2022

**Peer reviewed original research articles: 22**

**Other publications: 7**

### Selected publications:

Molteberg E, Taubøll E, Kverneland M, Iversen PO, Selmer KK, Nakken KO, Hofoss D, Thorsby PM (2022)  
“Substantial early changes in bone and calcium metabolism among adult pharmacoresistant epilepsy patients on a modified Atkins diet”  
Epilepsia, 63 (4), 880-891  
DOI [10.1111/epi.17169](https://doi.org/10.1111/epi.17169), PubMed [35092022](https://pubmed.ncbi.nlm.nih.gov/35092022/)

Alvestad S, Husebye ESN, Christensen J, Dreier JW, Sun Y, Igland J, Leinonen MK, Gissler M, Gilhus NE, Tomson T, Bjørk M (2022)  
“Folic Acid and Risk of Preterm Birth, Preeclampsia, and Fetal Growth Restriction Among Women With Epilepsy: A Prospective Cohort Study”  
Neurology, 99 (6), e605-e615  
DOI [10.1212/WNL.0000000000200669](https://doi.org/10.1212/WNL.0000000000200669), PubMed [35577577](https://pubmed.ncbi.nlm.nih.gov/35577577/)

Pedersen S, Kverneland M, Nakken KO, Rudi K, Iversen PO, Gervin K, Selmer KK (2022)  
“Genome-wide decrease in DNA methylation in adults with epilepsy treated with modified ketogenic diet: A prospective study”  
Epilepsia, 63 (9), 2413-2426  
DOI [10.1111/epi.17351](https://doi.org/10.1111/epi.17351), PubMed [35762681](https://pubmed.ncbi.nlm.nih.gov/35762681/)

### Funding

- South-Eastern Norway Regional Health Authority: 1 PhD, 1 postdoc 6 years
- Norwegian Foundation for Health and Rehabilitation (Stiftelsen Dam): 4 PhDs
- NordForsk: 1 postdoc

#### Other financial support:

- Norwegian chapter of ILAE
- Norwegian Epilepsy Society
- National National Advisory Unit on Rare Diseases
- Novo Nordisk Foundation



## Department of Neurosurgery

The department of Neurosurgery treats adults and children with traumatic brain injury, spontaneous intracranial hemorrhages, intracranial tumors, hydrocephalus, epilepsy, congenital malformations in the central nervous system, degenerative brain diseases, degenerative spinal disease, intraspinal tumors and cervical spine injuries.

The department has regional responsibility for neurosurgery in Helse Sør-Øst with 3.1 million people, and national functions in craniofacial surgery, epilepsy surgery, and surgery for cerebral vascular malformations. In addition, the department has multi-regional functions for pediatric neurosurgery and Parkinson's surgery.

The department of Neurosurgery is headed by Professor Eirik Helseth.



## Neurovascular–Cerebrospinal Fluid Research Group



### Group Leader

Per Kristian Eide, Professor, Dept of Neurosurgery, UiO (p.k.eide@medisin.uio.no)/  
Head of Section, Dept of Neurosurgery, OUH (peide@ous-hf.no)

### Group Members

- Aukrust, Camilla Grøver, PhD fellow UiO
- Dahlberg, Daniel, PhD, OUH
- Eide, Per Kristian, group leader
- Fric, Radek, PhD, OUH
- Lashkarivand, Aslan, PhD fellow, UiO
- Langvatn, Erlend, Consultant, OUH
- Quesada, Cesar Luis Vera, PhD fellow, UiO
- Slettebø, Haldor, Senior Consultant, OUH
- Sorteberg, Angelika, professor, UiO / Consultant OUH
- Sorteberg, Wilhelm, dr.med., OUH
- Stanisic, Milo, dr.med., OUH
- Romundstad, Luis, Consultant, OUH
- Rønning, Pål Andre, PhD, consultant, OUH
- Valnes, Lars-Magnus, PhD, Postdoc, OUH
- Wiedmann, Markus, PhD, Consultant, OUH

### Research profile and aims

The Neurovascular & Cerebrospinal Fluid Research Group (Division of Clinical Neuroscience, University of Oslo and Oslo University Hospital) teams up with a multidisciplinary group of neurosurgeons and neuroscientists, mathematicians, PhD candidates, Postdocs and students, to provide a broad collaboration with a common vision; to challenge, discover and improve our current understanding and treatment of complex neurovascular and cerebrospinal fluid (CSF) disorders. We address the close interaction between the cerebral vasculature and the CSF, which we consider to have major impact on cerebral metabolism and metabolic failure. The group has a translational perspective with a strong clinical basis.

From the clinical perspective, the following diseases and disease states are targeted:

- Intracranial aneurysms and subarachnoid hemorrhage, including neuro-intensive surveillance and outcome. Cerebral hemodynamics and cerebral revascularization. Pathophysiology and treatment of chronic subdural hematomas.
- Cerebrospinal fluid diseases and role of cerebrospinal fluid in metabolic function of central nervous system, particularly in neurodegeneration and dementia, CSF disturbances, vascular disease and cerebral bleeds, inflammatory disease and neuro-oncology.
- Neuro-inflammatory conditions, particularly related to neurosurgical diseases.
- Brain Monitoring. Neurosurgical pathophysiology, intracranial pressure and arterial blood pressure dynamics.



## Ongoing projects

- **Cerebrospinal fluid**  
Efflux pathways. Glymphatic function. Meningeal lymphatic function. Imaging of CSF flow and CSF tracer transport, and CSF molecular clearance function. Pathophysiology of CNS diseases with CSF disturbance: Hydrocephalus. Normal pressure hydrocephalus. Idiopathic intracranial hypertension. Spontaneous intracranial hypotension. Idiopathic CSF obstruction from cysts. Chiari malformation.
- **Neurovascular**  
Subarachnoid hemorrhage: Bleeding risks. Complications (Vasospasms. Hydrocephalus. Fatigue). Rehabilitation. Outcome. Vascular compression syndromes. Trigeminal neuralgia.
- **Neuro-inflammation**  
Cerebral abscesses: Pathophysiology. Subdural hematoma: pathophysiology and role of neuroinflammation.
- **Brain monitoring**  
Invasive and non-invasive intracranial pressure (ICP).

## Most important national and international collaborators

### National

- Simula Research Laboratory, UiO
- Dept of Physical Medicine and Rehabilitation, OUH
- Dept of Radiology, OUH
- The Intervention Centre, OUH
- Dept of Informatics, UiO
- Dept of Mathematics, UiO
- Dept of Neurology, OUH
- Division of Emergencies and Critical Care, OUH
- Sunnaas Rehabilitation Hospital
- Institute of Basic Medical Sciences, UiO

### International

- University of Gothenburg, Sweden
- University of Kupio, Finland
- University of Copenhagen, Denmark

## Funding

- South-Eastern Norway Regional Health Authority
- European Union







## Scientific production of the research group in 2022

Peer reviewed original research articles: 27

Invited lectures at international congresses: >10

Selected publications (group members in bold):

**Aukrust CG**, Paulsen AH, Uche EO, Kamalo PD, Sandven I, Fjeld HE, Strømme H, **Eide PK**

*“Aetiology and diagnostics of paediatric hydrocephalus across Africa: a systematic review and meta-analysis”*

Lancet Glob Health 2022, 10:e1793-e1806

**Lashkarivand A**, **Eide PK**

*“Brain Sagging Dementia-Diagnosis, Treatment, and Outcome: A Review”*

Neurology 2022, 98:798-805

**Ringstad G**, **Eide PK**

*“Molecular trans-dural efflux to skull bone marrow in humans with CSF disorders”*

Brain 2022, 145:1464-1472



## Oslo Neurosurgical Neurotrauma Group



Professor Eirik Helseth, MD/PhD, Consultant neurosurgeon, Dept. of Neurosurgery, OUH (eirik.helseth@ous-hf.no) and Professor of Neurosurgery, Faculty of Medicine, UiO (eirik.helseth@medisin.uio.no)

### Group Members

- Mads Aarhus, MD/PhD, OUH
- Hege Linnerud, MD/PhD, OUH
- Jon-Terje Ramm-Pettersen, MD/PhD, OUH
- Pål Rønning, MD/PhD, OUH
- Tor Brommeland, MD/PhD, OUH
- Ali Rizvi, MD/PhD fellow, OUH
- Christina Teisner Høstmælingen, MD, OUH
- Cathrine Buaas Tverdal, registrar and PhD fellow, OUH
- Dag Ferner Netteland, MD/PhD fellow
- Annette Robertsen, MD/PhD fellow
- Ingar Næss, medical student, PhD fellow, UiO
- Pål Galteland, MD/PhD fellow
- Mats Døving, MD/PhD fellow

### Research profile and aims

Main focus on surgical complications and outcome after surgery for:

- Neurotrauma
- Traumatic brain injury
- Cervical spine injury
- Bicycle related injuries

### Ongoing projects 2022

- Cervical trauma – Epidemiology and Surgical management
- Traumatic Brain Injury – Epidemiology and management
- CenterTBI – European study
- Transocular ultrasound for ICP measurement – with SINTEF/Nisonic
- GLOBAL NEUROTRAUMA OUTCOMES STUDY (GNOS)



### PhD projects

- Odontoid fractures – Ali Rizvi
- Transocular ultrasound for ICP measurement - Dag Ferner Netteland
- Traumatic brain injury – Cathrine Buaas Tverdal
- Traumatic brain injury and etichs – Annette Robertsen
- Bicycle accidents – Pål Galteland
- Bicycle accidents – Ingar Næss
- Bicycle accidents – Mats Døving

### “Forskerlinje” projects

- Bicycle accidents – Ingar Næss

### Funding

South-Eastern Norway Regional Health Authority

## Scientific production of the research group in 2022

### Dissertations 2022

Ali Rizvi: *“Management of acute odontoid fractures”*

Annette Robertsen: *“Treatment-limiting decisions in severe traumatic brain injured patients”*

Cathrine Buaas Tverdal: *“Acute management of traumatic brain injury at Oslo University Hospital”*

**Peer reviewed original research articles:** >30 (including Center TBI-publications)

**Invited lectures at international congresses:** 4

### Selected publications:

Stray AV, Siverts H, Melhuus K, Enger M, Galteland P, Næss I, Helseth E, Ramm-Pettersen J (2022)  
*“Characteristics of Electric Scooter and Bicycle Injuries After Introduction of Electric Scooter Rentals in Oslo, Norway”*

JAMA Netw Open, 5 (8), e2226701

DOI 10.1001/jamanetworkopen.2022.26701, PubMed 35969397





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Utheim NC, Helseth E, Stroem M, Rydning P, Mejlænder-Evjensvold M, Glott T, Hoestmaelingen CT, Aarhus M, Roenning PA, Linnerud H (2022)

*“Epidemiology of traumatic cervical spinal fractures in a general Norwegian population”*

Inj Epidemiol, 9 (1), 10

DOI 10.1186/s40621-022-00374-w, PubMed 35321752

Sødal HF, Storvig G, Tverdal C, Robinson HS, Helseth E, Taubøll E (2022)

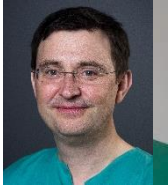
*“Early post-traumatic seizures in hospitalized patients with traumatic brain injury”*

Acta Neurol Scand, 146 (5), 485-491

DOI 10.1111/ane.13670, PubMed 35833266



## Vilhelm Magnus Laboratory for Neurosurgical Research



### Group Leader

Einar O. Vik-Mo, MD/PhD, Professor, Dept of Neurosurgery, UiO /Dept. of Neurosurgery, OUH (UXVIEB@ous-hf.no)

### Group Members

- Cecilie Sandberg, MSc/PhD, unit leader
- Iver A. Langmoen, dr. med, professor emeritus
- Skarphedinn Halldorsson, MSc/PhD, post.doc
- Luna Djirackor, MD/PhD, post.doc
- Awais Mughal, MD/PhD, research fellow
- Erlend Skaga, MD/PhD, research fellow
- Emily Palmero, BSc
- Zanina Grieg, MSc
- Marit Brynjulvsen, MSc, PhD-student
- Eduardo Mendoza, MD, PhD-student
- Evy-Marie Thorkildsen, MSc
- Richard Nagymihaly, MSc/PhD

### Associated researchers from other departments

- Henning Leske, neuropathologist, Dept. of Pathology
- Tale Torjussen, pediatric neurologist/oncologist, Dept. of Pediatrics

### Research profile and aims

The Vilhelm Magnus laboratory focuses on translational research to understand underlying mechanisms in neurosurgical diseases and improve diagnostics and treatment for these.

In recent years, the focus has been on molecular and cell biology methods, combined with animal models, to better understand brain cancer.

Two clinical intervention studies, originating from the laboratory, are ongoing. These studies seek to improve the prognosis for patients with glioblastoma (GBM), the most frequent and deadly brain cancer (median survival in unselected series < 1 year) (Skaga et al., Neurooncol Adv. 2021). From 2008-2015 we performed the first clinical protocol targeting stem cells in a solid tumor - an autologous vaccine against GBM stem cells. Evolving from this first study, we are now since 2018 conducting a randomized study evaluating this immunotherapy approach (DEN-STEM). In addition, we are exploring an individualized systems medicine strategy, in which we test > 500 drugs against tumor stem cells from individual patients. The latter is also the first study of its kind in any type of solid tumor.

The Vilhelm Magnus Laboratory is a section within the Department of Neurosurgery.

### Ongoing projects

Almost two decades ago the Vilhelm Magnus Laboratory demonstrated, for the first time, that stem cells from the adult human brain can differentiate into functional neurons, and that it is possible to generate a

small nervous system with numerous neurons that fire action potentials and communicate via synapses, from a single stem cell, harvested from the adult human brain (Moe et al Brain, 2005, Westerlund et al Exp Cell Res. 2003, Moe et al Neurosurgery 2005).

Simultaneously we started to grow cells from GBMs. A population of cells from these tumors turned out to have stem cell-like properties. Through extensive comparisons between GSCs and normal stem cells from the adult brain (Varghese et al Neurosurgery 2008), we identified genes and pathways which are dysregulated in GSCs and provided the first clinical dataset that support the cancer stem cell hypothesis in glioblastoma (Sandberg et al, Exp Cell Res, 2013).

We further showed that a GBM can only be transferred from one animal to another by transplantation of cells from the GSC subpopulation, in keeping with other results indicating that it is this subpopulation that is responsible for recurrence, growth and drug resistance. We have, therefore, characterized GSCs quite extensively (Varghese et al Neurosurgery. 2008, Vik-Mo et al, Neuro Oncol, 2010, Vik-Mo et al, Exp Cell Res, 2011, Joel et al, Dev Dyn, 2013, Sandberg et al, Exp Cell Res, 2013, Fayzullin et al Exp Cell Res. 2016, Mughal et al, Neoplasia 2018).



*VML members Elise Solli, Einar Vik-Mo, Cecilie J Sandberg, Marit Brynjulvsen, Luna Djirackor, Iver Langmoen, Emily Palmero and Skarphedinn Halldorsson.*

#### **Development of a stem cell-based vaccine in patients with brain cancer:**

We developed the first clinical protocol which targeted stem cells in a solid tumor by transducing dendritic cells from patients with mRNA from their own GBM stem cells. This significantly improved clinical outcome (Vik-Mo et al, Cancer Immunol Immunother. 2013). Two out of the 21 treated patients are still alive more than ten years after their diagnosis of GBM.

A randomized trial of the vaccine was certified by all required authorities and started in the spring of 2018. This study is currently including patients. Our intention in the current study is also to clarify why some patients respond and others do not; by in-depth studies of individual tumors and treatment responses.

**Individualized systems medicine strategy to target GSCs in patients with recurrent glioblastoma:** In collaboration with our partners at the Finnish Institute for Molecular Medicine, we are combining the novel technical possibilities of high-throughput screening and deep sequencing with our established know-how on patient specific tumor stem cell cultures. Exploring a panel of 525 drugs established in clinical use, as well as drugs in early-phase development, at five different concentrations, we have screened stem cells from individual tumors for drug sensitivity. The approach has been coined Individualized Systems Medicine. This study has shown that GBMs from individual patients are very

heterogenous with respect to drug sensitivity (Skaga et al. 2019).

A clinical early phase trial for feasibility evaluation of this strategy has been formally approved and will start patient inclusion in 2023.

**Coordinated undermining of survival paths with nine repurposed drugs (CUSP9) and temozolomide in patient derived GBM samples:**

A major barrier to effective treatment in glioblastoma is the simultaneous activity of multiple survival and growth-promoting mechanisms. A conceptually new treatment approach has emerged focusing on coordinated blockade of the native survival paths of GBMs. The coordinated blockade is undertaken by 9 clinically well-known and repurposed drugs concomitant with the cytotoxic and standard of care, temozolomide, in a drug cocktail termed CUSP9. We have evaluated the in vitro efficacy of CUSP9 in patient derived GBM samples using clinical relative drug concentrations across several different experimental cell assays. The coordinated approach has demonstrated a broad efficacy among several patient samples and experimental cell assays, and as the drugs have well-known safety profiles the results are intriguing for translation to patient treatment (Skaga et al. 2019).

**Characterization of invasive GCSs at the single cell level:**

Glioblastomas are characterized by diffusely infiltrative growth. To investigate the invasive properties of glioblastoma cells we film cells while they invade into rodent brain slices or 3D-biomatrixes using time-lapse microscopy. We have identified subpopulations of cells with different invasive potentials. These cells display specific movement patterns and morphology (Fayzullin et al. 2019). We are now developing this strategy further to encompass functional characteristics combined with time-laps microscopy.

**Molecular targeting of cancer stem cells in glioblastoma:**

By performing a systematic comparison of gene expression in adult human neural stem cells and GSCs, we have identified differentially expressed genes that may have the potential as new and specific targets for treatment of glioblastoma. Our results from exploring several of these genes and pathways in-depth, suggest a functional role for the Wnt signaling pathway (Kierulf-Vieira KS et al.2020), PBK and NAT12/NAA30 in GBM. As a strategy to more efficiently and directly identify targets that are likely to trigger a therapeutic response, we are currently focusing on genetic high throughput loss-of function screening as tools to identify both individual and shared target hits in patient derived GSC cell cultures.

**The molecular basis for tissue stiffness in glioblastoma:**

Magnetic resonance imaging elastography is a novel imaging modality with the potential to preoperatively identify surgical risk by evaluating tumor stiffness. Through a collaboration with Dept. of Diagnostic Physics, we are further exploring the molecular basis for MRI heterogeneity in glioblastoma (Fløgstad Svensson et al., 2022).

**A molecular pipeline for individualized treatment in pediatric brain cancers:**

Brain cancer is the most common cancer in children. We are exploring the use of rapid molecular characterization using Nanopore technology combined with stem cell biology and high throughput drug-screening to develop better individualized treatment strategies. In our recent publication, we demonstrate how this method can lead to sensitive, robust, and rapid intraoperative molecular classification of brain tumors (Djirackor et al. 2022). The project was highlighted as the first main hall lecture on the "London Calling Conference 2021".



## Most important national and international collaborators

### National

- Gunnar Kvalheim/Dag Josefsen, OUH
- Jon A. Kyte, OUH
- Kyrre Emblem, OUH
- Petter Brandal, OUH
- Else Marit Inderberg, OUH
- Steven Wilson, UiO

### International

- Krister Wennerberg, Copenhagen University, Denmark
- Aki Laakso, Emilia Gaal-Paavola, Töölö Hospital, Helsinki, Finland
- Rainer Glass, LMU, München, Germany
- Krishna Bhat and Frederick Lang, MD Anderson Cancer Center, Houston, USA
- Winston Hide, Harvard University, MA, USA
- Phillipp Euskirchen and David Capper, Charité Universitätsmedizin, Berlin, Germany

## Funding

- Norwegian Cancer Society
- Barnekreftforeningen
- The Norwegian Research Council
- South-Eastern Regional Health Authorities
- OUH, Dept. of Neurosurgery

## Scientific production of the research group in 2022

### Peer reviewed original research articles:

Skaga E, Kuleskiy E, Potdar S, Panagopoulos I, Micci F, Langmoen IA, Sandberg CJ, Vik-Mo EO.

["Functional temozolomide sensitivity testing of patient-specific glioblastoma stem cell cultures is predictive of clinical outcome."](#)

Transl Oncol. 2022 Sep 15;26:101535

doi: 10.1016/j.tranon.2022.101535

Winther RR, Hjermstad MJ, Skovlund E, Aass N, Helseth E, Kaasa S, Yri OE, Vik-Mo EO.

["Surgery for brain metastases-impact of the extent of resection."](#)

Acta Neurochir (Wien). 2022 Oct;164(10):2773-2780

doi: 10.1007/s00701-021-05104-7

Fløgstad Svensson S, Fuster-Garcia E, Latysheva A, Fraser-Green J, Nordhøy W, Isam Darwish O, Thokle Hovden I, Holm S, Vik-Mo EO, Sinkus R, Eeg Emblem K.

["Decreased tissue stiffness in glioblastoma by MR elastography is associated with increased cerebral blood flow."](#)

Eur J Radiol. 2022 Feb;147:110136

doi: 10.1016/j.ejrad.2021.110136





## Functional Neurosurgery Group



### Group Leader

Pål G. Larsson, MD/Dr. philos, Head of Clinical Neurophysiology, Dept. of Neurosurgery, OUH (pall@ous-hf.no)

### Group Members

- Arild Egge, MD/PhD, OUH
- Frode Kolstad, MD/PhD, OUH
- Milo Stanisic, MD, Dr.med., OUH
- Jugoslav Ivanovic, MD/PhD fellow
- Mark Züchner, MD/PhD, OUH
- Ane Konglund, MD/PhD, OUH
- Marianne Nævra, Mphil., OUH
- Ketil Berg Olsen, MD, OUH
- Lars Etholm, MD/PhD, OUH

### Research profile and aims

Main research aim is assessment of brain, medulla and peripheral nerve function and surgical treatment:

- Epilepsy surgery
- Deep brain stimulation
- Other electrical nerve tissue stimulation
- Assessment of brain function through EEG
- Stereotactic intracranial recording (SEEG)
- Function localization through intracranial recordings and stimulations
- Clinical assessment through machine learning

### Ongoing projects

- Cognitive function assessment through SEEG
- Consciousness assessment through EEG
- Dynamics of large-scale cortical networks during general anesthesia
- Changes in brain connectivity during the Wada test
- Epilepsy surgery outcome
- Changes in connectivity in preterm children and prediction of long term outcome
- Adjuvant treatment with Cyclocapron in surgical treatment of CSDH
- ProTLE – follow up study of newly diagnosed temporal lobe epilepsies
- Continues spike wave during sleep (CSWS)
- NORSTIM – prospective study of DBS in STN in Parkinson disease
- DBS in tremor
- DBS in epilepsy
- Microbiota in Nuclius Subthalamicus and CSF in patients with Parkinson disease
- Diagnostics and follow up of fatigue after cerebral abscesses with EEG



- Context-dependent memory maps in the medial temporal lobe
- Epileptic seizures: activity of single neurons as a diagnostic marker
- Recent trends in status epilepticus - with a special focus on outcome prediction and diagnosis
- Predictors of VNS stimulation
- New treatment in chronic subdural hematomas
- Interictal EEG features as biomarkers in presurgical epilepsy work up
- Refractory status epilepticus
- Laser ablation in Epilepsy
- Genetic mapping in Moya Moya
- Accuracy verification of a robotic system on a phantom
- Robot assisted methods in neurosurgery
- European SEEG collaboration (EBRAINS->HIP)
- Resting state fMRI for epileptic focus localization
- Assessment of MEP suction in cerebral surgery
- 7 T MRI assessment in epilepsy surgery
- Motor Cortex Stimulation in patients with spinal cord injury

## Most important national and international collaborators

### National

- Institute of Psychology, UiO
- Institute of Basic Medical Sciences, UiO
- Department of Neurology, OUH
- Department of Anesthesiology, OUH
- Children's Department, UUS, OUH
- National Center for Epilepsy, OUH
- Department of Radiology, OUH
- Research laboratory, DNR, OUH
- Internal Medicine, OUH
- OsloMet
- Department of Engineering Cybernetics, NTNU

### International

- Helene Wills institute, UC Berkeley, US
- Clinical Neurophysiology, Århus, Denmark
- Dianalund Epilepsy Center, Denmark
- Epilog
- Dept of Neuroscience, Helsinki University, Finland
- Human Brain Project (EBRAINS)
- The University of Auckland, New Zealand
- The University of Helsinki, Finland
- Sahlgrenska University Hospital, Gothenburg, Sweden

## Funding

- National and international funding through collaborators

## Scientific production of the research group in 2022

### Dissertations

Mark Züchner: *"Experimental models for spinal cord injury: From basic to translational studies"*

Jugoslav Ivanovic: *"Surgical treatment challenges and postoperative seizure outcomes in patients with temporal lobe epilepsy"*





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**Peer reviewed original research articles: 8**

**Selected publications:**

*“Monitoring the Awake and Anesthetized Unconscious States Using Bispectral Index and Electroencephalographic Connectivity Measures”*

MCJ Nævra, L Romundstad, A Aasheim, PG Larsson  
Clinical EEG and Neuroscience, 15500594221131680 2022

*“Episodic Memory Dysfunction and Effective Connectivity in Adult Patients with Newly Diagnosed Nonlesional Temporal Lobe Epilepsy”*

A Bakhtiari, AB Bjørke, PG Larsson, KB Olsen, MCJ Nævra, E Taubøll, ...  
Frontiers in Neurology 13, 774532-774532 2022

*“Norwegian population-based study of long-term effects, safety, and predictors of response of vagus nerve stimulation treatment in drug-resistant epilepsy: The NORPulse study”*

KH Kostov, H Kostov, PG Larsson, O Henning, CAC Eckmann, MI Lossius, ...  
Epilepsia 63 (2), 414-425 11 2022

**Book chapter**

*“Modern Treatment of Status Epilepticus in Adults”*

K Heuser, KB Olsen, LB Ulvin, L Gjerstad, E Taubøll  
Exon publications, 2022

*“Temporal lobe epilepsy: From etiology to treatment”*

Edited by:

Fernando Cendes, Esper A. Cavalheiro, Luis Concha, Boris Bernhardt,  
Antonio Gambardella, Angelo Labate, Paolo Federico and Samuel Wiebe  
Frontier p. 211-222

Episodic memory dysfunction and effective connectivity.



## Pediatric Neurosurgical Research Group



### Group Leader

Radek Frič, MD PhD (designated group leader), Senior Consultant Neurosurgeon, Dept. of Neurosurgery, OUH (radek.fric@ous-research.no)

### Group Members

- Bernt J. Due-Tønnessen, MD/PhD, OUH
- Angelika Sorteberg, MD/PhD, UiO/OUH
- Jarle Sundseth, MD/PhD, OUH
- Arild Egge, MD/PhD, OUH
- Ulrikke Wiig, MD, OUH
- Jugoslav Ivanovic, MD/PhD, OUH
- Einar Vik-Mo, MD/PhD, UiO/OUH
- Pitt Niehusmann, MD/PhD, OUH
- Monica Cheng Munthe-Kaas, MD/PhD, OUH
- Einar Stensvold, MD/PhD, OUH
- Tale Torjussen, MD/PhD, OUH
- Aina Ulvmoen, MD/PhD, OUH
- Elin Tønne, MD/PhD, OUH
- Ketil Heimdal, MD/PhD, OUH
- Petra Aden, MD/PhD, OUH
- Anita Pühr, PhD, OUH
- Anne-Britt Skarbø, Consultant Neuropsych., OUH
- Birgitte Høydal Jensen, MD, OUH
- Eline Bryne, Med. Student, UiO

Remark: this research group has just been formally founded and exact number of members/affiliated members may be specified in the next annual report.

### Research profile and aims

This research group was formally established early in 2023, in order to promote and coordinate ongoing and future research projects within the field of pediatric neurosurgery at OUH. This includes several areas:

- Pediatric neurooncology - in cooperation with Depts. of Pediatrics and Oncology and Vilhelm Magnus Laboratory
- Cranofacial surgery - in collaboration with the Norwegian National Unit for Cranofacial Surgery
- CSF circulation incl. pediatric hydrocephalus, arachnoidal cysts and Chiari-malformation – in cooperation with Neurovascular & Cerebrospinal Fluid Research Group
- Functional pediatric neurosurgery incl. spasticity and epileptosurgery – in cooperation with Functional Neurosurgical Research Group
- Cerebrovascular neurosurgery incl. arteriovenous malformation, aneurysms, moyamoya disease
- Spinal dysraphism



## Ongoing projects

Outcome after treatment of Chiari malformation type 1 in children (E. Bryne, B. Due-Tønnessen, R. Fric)

AVM in children; intern quality register and long-term outcome study (R. Fric, B. Høydal Jensen, B. Due-Tønnessen)

Pediatric aneurysms (A. Sorteberg, R. Fric, B. Due-Tønnessen)

Long-term outcome after surgical treatment of subependymal giant cell astrocytoma M. Tuft, B. Due-Tønnessen, R. Fric)

Surgical treatment of childhood-onset craniopharyngioma – long-term outcome study (R. Fric, U. Wiig, B. Due-Tønnessen)

### PhD project

Results of craniostylosis surgery (Ulrikke Wiig)

## Group meetings

“Miniseminar om barnenevroonkologi” 15 December 2022, RH; including discussion/promotion of the group foundation

### Funding

South-Eastern Norway Regional Health Authority

## Scientific production of the research group in 2022

### Dissertations 2022

Elin Tønne: *“Craniostylosis in Norway: Epidemiology and genetic causes”*, Sep 2022

### Invited lectures at international congresses:

Frič R. What is the natural history of pediatric AVM (congenital or acquired anomalies)? ESPN Consensus Conference: CNS AVM in children. April 8-9, 2022, Athens, Greece.

Frič R, Due-Tønnessen BJ. Surgical management of malformative hydrocephalus. ESPN Course, Varese, Italy, May 30-June 3, 2022.





Frič R. What are the peculiarities of surgical approaches for brain tumors in children? EANS/ESPN/WFNS Virtual Course “Emergencies in Pediatric Neurosurgery” Part II. What a general neurosurgeon needs to know on brain tumors in children? September 29, 2022.

### Other assignments

EANS Congress, Belgrade, Oktober 16-20, 2022 – R. Fric as a member of Pediatric Section Panel and Individual Members Committees

ESPN Course, Varese, June 2022 – B. Due-Tønnessen and R. Fric as Invited Speakers/Faculty

### Peer reviewed original research articles:

#### Selected publication:

Tønne E, Due-Tønnessen BJ, Vigeland MD, Amundsen SS, Ribarska T, Åsten PM, Sheng Y, Helseth E, Gilfillan GD, Mero IL, Heimdal KR.

*“Whole-exome sequencing in syndromic craniosynostosis increases diagnostic yield and identifies candidate genes in osteogenic signaling pathways”*

Am J Med Genet A 2022 May;188(5):1464.

Lundar T, Due-Tønnessen BJ, Frič R, Brandal P, Due-Tønnessen P.

*“Choroid plexus tumors in children: long-term follow-up of a consecutive single institutional series of 59 patients treated over a period of eight decades (1939-2020)”*

World Neurosurg 2022 Feb 15;158:e810-e819.doi: 10.1016/j.wneu.2021.11.070.

Niehusmann P, Stensvold E, Leske H, Pietsch T, Goschzik T, Gielen GH, Due-Tønnessen B, Frič R, Nilssen Y, Brandal P.

*“Molecular pathological insights reveal a high number of unfavorable risk patients among children treated for medulloblastoma and CNS-PNET in Oslo 2005-2017”*

Pediatr Blood Cancer 2022 May 15;e29736. doi: 10.1002/pbc.29736.



## Department of Neurology

The Department of Neurology is located at Rikshospitalet and Ullevål, and treats patients with diseases of the brain, spinal cord and peripheral nerves, as well as certain muscle diseases.

The department has extensive clinical expertise and research activity, particularly related to movement disorders, epilepsy, stroke/diseases in the brain's blood supply, multiple sclerosis (MS), diseases that affect muscles such as myasthenia gravis and amyotrophic lateral sclerosis (ALS), hereditary neurological diseases, neuropsychiatry and painful conditions affecting the neck, back and peripheral nerves, as well as headache.

The Department of Neurology is headed by Professor Mathias Toft.



## Movement, muscle and neurodegeneration



### Group Leader

Mathias Toft, MD/PhD, Professor and Head of Department, Dept. of Neurology, UiO (mathias.toft@medisin.uio.no) and OUH (mtoft@ous-hf.no)

### Group Members

- Espen Dietrichs, Prof MD PhD (PI Clinical movement disorders)
- Sara Staubo, MD
- Hedda Holm
- Silje Bjercknes, MD
- Vidar Gundersen, MD PhD
- Inger Marie Skogseid, MD PhD (PI Deep brain stimulation and botulinumtoxin)
- Iselin Wedding, MD, PhD
- Nadja Anette Myrvik Kvernmo, MD
- Mathias Toft, Prof MD, PhD (PI Molecular studies of PD)
- Zafar Iqbal, PhD
- Kaja Nordengen, MD, PhD
- Sofie Lysholm Lian, MD
- Daniel Rahmati
- Martine Narum
- Zakariya Abdirab
- Elain Kohle
- Hildegunn Haugan
- Solveig Dalbro, MD
- Chiara Cappelletti, MSc
- Natasha Demic, MD
- Lone Holmen, MSc
- Angelina Maniaol, MD, PhD (PI Myasthenia and ALS)

### Research profile and aims

The Movement disorders and neurodegeneration group brings together researchers studying a spectrum of chronic neurological disorders causing impaired motor function. Our areas of interest range across different movement disorders and neurodegenerative diseases.

In a majority of the conditions we study, the etiology is neurodegenerative, genetic or both.

Our scientific approaches span from translational studies, based largely on laboratory and bioinformatic methodologies, to observational studies and clinical trials recruiting patients from the Department of Neurology.

The Movement disorders and neurodegeneration group is a thematically overarching research group organized into four subgroups focused on specific diseases and methodologies:





- [Clinical studies of movement disorders](#)
- [Molecular studies of Parkinson's disease](#)
- [Deep brain stimulation and botulinumtoxin treatment](#)
- [Myasthenia gravis and amyotrophic lateral sclerosis](#)

## Ongoing projects

We perform clinical studies, including a prospective study of early-stage Parkinson's disease and clinical trials on the efficacy of deep brain stimulation for Parkinson's disease, dystonia, and tremors.

Laboratory research is focusing on genetic, epigenetic and genomic studies. Furthermore, several projects are examining biomarkers in neurodegenerative diseases, with a focus on glial activation and clearance.

The last project group focuses on clinical studies of myasthenia gravis and amyotrophic lateral sclerosis, and participates in national and international projects related to genetic studies, imaging and clinical trials.

## Most important national and international collaborators

### National

- Multiple other groups within UiO and OUH
- The other university hospitals in Norway, incl. NeuroSysmed in Bergen
- Prof. Ole Andreassen, UiO, DemGene – Genetics of Dementia

### International

- AI-MIND Consortium
- COURAGE-PD consortium
- Dr. Owen Ross, Mayo Clinic, USA
- Dr Wilma van der Berg, VuMC University Hospital, Amsterdam, Netherlands
- Prof. Per Odin, Lund University, Sweden
- Prof. Jens Volkmann, University of Würzburg, Germany

## Funding

Among others:

- The Research Council of Norway
- South-Eastern Norway Regional Health Authority
- Michael J. Fox Foundation
- The Norwegian Health Association





## Scientific production of the research group in 2022

Peer reviewed original research articles: 18

### Selected publications:

*“Deep Brain Stimulation for Arm Tremor: A Randomized Trial Comparing Two Targets”*

Kvernmo N, Konglund AE, Reich MM, Roothans J, Pripp AH, Dietrichs E, Volkmann J, Skogseid IM.

Ann Neurol. 2022 May;91(5):585-601.

doi: 10.1002/ana.26317. PMID: 35148020

*“Epigenome-wide association study of human frontal cortex identifies differential methylation in Lewy body pathology”*

Pihlstrøm L, Shireby G, Geut H, Henriksen SP, Rozemuller AJM, Tunold JA, Hannon E, Francis P, Thomas AJ, Love S, Mill J, van de Berg WDJ, Toft M.

Nat Commun. 2022 Aug 22;13(1):4932.

doi: 10.1038/s41467-022-32619-z. PMID: 35995800

*“Distributed genetic architecture across the hippocampal formation implies common neuropathology across brain disorders”*

Bahrami S, Nordengen K, Shadrin AA, Frei O, van der Meer D, Dale AM, Westlye LT, Andreassen OA, Kaufmann T.

Nat Commun. 2022 Jun 15;13(1):3436.

doi: 10.1038/s41467-022-31086-w.PMID: 35705537



## Huntington's disease and neurodegenerative genomics



### Group Leader

Lasse Pihlstrøm, MD/PhD, Senior Researcher and Consultant, Dept. of Neurology, OUH  
(lasse.pihlstrom@medisin.uio.no)

### Group members

- Lasse Pihlstrøm, MD, PhD
- Manuela Tan, PhD – postdoctoral fellow
- Khadeeja Siddique, PhD – postdoctoral fellow
- Maren Stolp Andersen, MD – PhD fellow
- Jon Anders Tunold, MD – PhD fellow
- Ingeborg Haugesag Lie, MD – PhD fellow
- Marleen van Walsem, PhD – psychologist and researcher
- Ellen Hoven Maurtveten, research nurse
- Juni Kristensen Folge, medical student on the research programme

### Research profile and aims

Independent group as of 2022. We study a range of neurodegenerative and movement disorders, combining clinical data collection with advanced genomics and biomarker research. An overarching aim of our work is to elucidate disease mechanisms and pave way for precision medicine in neurodegenerative disorders of both monogenic and complex etiology.

Genome-wide association studies (GWAS) have provided important knowledge about the genetic architecture of brain disorders and highlighted key molecular pathways. We aim to build on the insights from GWAS and advance our understanding further both by deep clinical phenotyping and advanced bioinformatic analyses of large genomic, epigenomic and transcriptomic datasets. In particular, we are interested in neuroinflammation, protein pathology and their intersection with genetic risk profiles.

Group leader Lasse Pihlstrøm is also heading the clinical team for Huntington's disease and is responsible for the follow-up of HD patients in the outpatient clinic at Department of Neurology. Our clinic is currently the only Norwegian site in the global Enroll-HD study. Huntington's disease is a monogenic disorder caused by a mutation in the *HTT* gene, yet the importance of genetic modifier variants elsewhere in the genome is increasingly recognized. We aim to contribute to a deeper understanding of these genetic modifiers, taking advantage of experience and methodologies from genomic studies of complex brain disorders, such as Parkinson's disease.

The ultimate aim of our research is to improve patient care. Observational studies such as PROSPOS and Enroll-HD are designed to facilitate clinical trials through their scientific output, but also by generating databases of well-characterized potential trial participants. Lasse Pihlstrøm is currently local PI of the NOPARK trial in Parkinson's disease. It is also a future aim to offer our Huntington's disease patients participation in clinical trials.



## Ongoing projects

[Prospective study of parkinsonism in Oslo \(PROSPOS\)](#) is a longitudinal observational study tracking natural history, genetics, and biomarkers to understand disease mechanisms and facilitate personalized medicine in Parkinson's disease and atypical parkinsonism, including multiple system atrophy (MSA). This study forms the basis of a number of ongoing PhD projects involving methods such as brain imaging using PET and MRI, studies of cerebrospinal fluid biomarkers, single-cell sequencing analyses and eye-tracking technology.

[Enroll-HD](#) is a global registry for Huntington's disease including both symptomatic and presymptomatic gene carriers as well as family and community controls. Data is collected at annual visits. The study has included more than 20,000 participants worldwide.

[NOPARK](#) is a double-blind randomized controlled trial investigating nicotinamide riboside supplement as a potential disease-modifying treatment in Parkinson's disease. The trial is led from the Haukeland University Hospital and the NeuroSysMed center.

We collaborate extensively with local and international partners and are active members of several international consortia, in particular the [International Parkinson's Disease Genomics Consortium \(IPDGC\)](#), the [Global Parkinson's Genetics Program \(GP2\)](#) and the Genetic Modifiers of Huntington's Disease (GeM-HD) Consortium.

## Most important national and international collaborators

### National

- Close day-to-day collaboration with the Movement, muscle and neurodegeneration group
- Andreas Lossius, Institute of Basic Medical Sciences, UiO
- Haukeland University Hospital, Bergen with NeuroSysMed and Prof. Charalampos Tzoulis
- Marianne Fyhn and Torkel Hafting, Institute of Basic Medical Sciences, UiO
- Prof. Ole Andreassen, UiO, and the DemGene Consortium

### International

- IPDGC (international Parkinson Disease Genetics Consortium)
- GP2 (Global Parkinson's Genetics Program)
- COURAGE-PD consortium
- Genetic Modifiers of Huntington's Disease (GeM-HD) Consortium
- Prof. Owen Ross, Mayo Clinic, USA
- Prof. Wilma van der Berg, Amsterdam University Medical Center, Netherlands
- Prof. Jon Mill, University of Exeter, UK
- Prof. Henry Houlden, University College London, UK





## Funding

Among others:

- South-Eastern Regional Health Authority, Norway
- Michael J. Fox Foundation
- The Norwegian Health Association
- Norwegian Parkinson Research Fund
- University of Oslo

## Scientific production of the research group in 2022

**Peer reviewed original research articles: 12**

### Selected publications:

Pihlstrøm L, Shireby G, Geut H, Henriksen SP, Rozemuller AJM, Tunold JA, Hannon E, Francis P, Thomas AJ, Love S, Mill J, van de Berg WDJ, Toft M (2022)

*"Epigenome-wide association study of human frontal cortex identifies differential methylation in Lewy body pathology"*

Nat Commun, 13 (1), 4932

DOI 10.1038/s41467-022-32619-z, PubMed 35995800

Stolp Andersen M, Tan M, Holtman IR, Hardy J, International Parkinson's Disease Genomics Consortium, Pihlstrøm L (2022)

*"Dissecting the limited genetic overlap of Parkinson's and Alzheimer's disease"*

Ann Clin Transl Neurol, 9 (8), 1289-1295

DOI 10.1002/acn3.51606, PubMed 35684951

van Walsem MR, Frich JC, Gómez Castañeda M, Howe EI, Pihlstrøm L, Andelic N, Aas E (2022)

*"Health related quality of life, service utilization and costs for patients with Huntington's disease in Norway"*

BMC Health Serv Res, 22 (1), 1527

DOI 10.1186/s12913-022-08881-8, PubMed 36517848



## Rare NeuroMuscular Disorders Research Group



### Group Leader

Kristin Ørstavik, MD/PhD, Head of Section for rare neuromuscular disorders,  
Dept. of Neurology, OUH (krorstav@ous-hf.no)

### Group members

- Kristin Ørstavik, MD PhD
- Trine Haug Popperud, MD PhD, PI Clinical studies in adults
- Sean Wallace, MD PhD, PI Clinical studies in children
- Marianne Nordstrøm, Registered dietitian, PhD, group leader ERN-NMD multidisciplinary group
- Hanne Ludt Fossmo, Physiotherapist, PhD-student, research coordinator
- Anna Benterud, MD, PhD-student
- Magnhild Rasmussen, MD PhD

### Associated members

- Ellen Annexstad, MD, PhD-student
- Gro Solbakken, Physiotherapist, PhD
- Jan Frich, MD PhD, Professor UiO
- Marleen Van Walsem, Neuropsychologist PhD





## Research profile and aims

The Rare Neuromuscular Disorders Research Group was founded in 2019 bringing together researchers studying a spectrum of rare neuromuscular disorders causing impaired motor function.

Our areas of interest range across disorders affecting motor neurons (spinal muscular atrophy), muscular junction (myasthenic syndromes), muscle (primary myopathies and muscular dystrophies) and hereditary neuropathies. In a majority of the conditions we study, the etiology is genetic and progressive.

We do observational studies and clinical trials recruiting patients from the Department of Neurology and the National register of neuromuscular disorders. The research group is closely linked to the Section for rare neuromuscular disorders and EMAN at the Department of Neurology at OUH.

## Ongoing projects

The group focuses on juvenile and adult neuromuscular disorders and the main objective is to contribute to early detection and diagnostics of disease, better treatment and multidisciplinary care for the people affected by the rare neuromuscular disorders and their relatives.

### Spinal Muscular Atrophy (SMA) project

Since 2018 OUH have administered Nusinersin (Spinraza) to children with SMA. More recently Zolgensma and Risdiplam has also been available treatments. We are involved in an ongoing Phd project on patients that have received treatment. PI and main supervisor is Sean Wallace.

We also have an ongoing project on the diet of children with SMA. A paper on the subject has been submitted in 2022. PI is Marianne Nordstrøm.

### Hypokalemic periodic paralysis project – In collaboration with Frambu

How are your muscles affected by what you eat and how physically active you are? In order to offer better guidance to people with hypokalemic periodic paralysis, we want to learn from the patients`experiences. In this research project, we therefore want to map the diet and physical activity level of people with hypokalemic periodic paralysis. The aim is to gain more knowledge about how diet and physical activity can affect the frequency, degree and duration of muscle weakness.

The project has already published a review-paper and started the Interviews in 2022. PI is Marianne Nordstrøm.

### Myotonic Dystrophy type 1 projects

- We have finalized a Phd project on “Trunk Muscle Impairments and Pain in Myotonic Dystrophy type 1 Association to CTG size and Function”. Gro Solbakken did her dissertation in November 2021. Read a summary on the project here: [Public Defence: Gro Solbakken - UiO](#). Main supervisor was Kristin Ørstavik.
- We have an ongoing Phd project on “Symptoms, Outcome measures and Treatment of arm- and hand function in Myotonic Dystrophy type 1”. PhD student Hanne Ludt Fossmo. Kristin Ørstavik is a co-supervisor. The project consists of three substudies;

-Translation, reliability and validity of the Norwegian version of ABILHAND-NMD and ACTIVLIM for people with Myotonic Dystrophy type 1. Paper submitted 2022





- Symptoms and Outcome Measures for Upper- Limb Function in Myotonic Dystrophy Type 1 (SOUL-DM1). [Symptoms and Outcome Measures for Upper- Limb Function in Myotonic Dystrophy Type 1](#). Data collection ongoing in 2022. PI Kristin Ørstavik

- Technology Assisted Rehabilitation for Upper Limb Function in Myotonic Dystrophy Type 1 (Technorehab). [Technology Assisted Rehabilitation for Upper Limb Function in Myotonic Dystrophy Type 1](#). Data collection ongoing in 2022. PI Hilde Robinson

- We also collaborate on an ongoing Phd project from the Norwegian School of Sport Sciences. The project includes a study called Myotonic Dystrophy Type 1 and Resistance Exercise (STYRK DM1). [Myotonic Dystrophy Type 1 and Resistance Exercise](#). Kristin Ørstavik is a co-supervisor
- We have finished and have recently submitted a paper on DM1 in children and cognitive impairment (2022). PI is Magnhild Rasmussen

### **Duchennes muscular dystrophy project**

We have an ongoing Phd project on Duchenne Muscular Dystrophy under 18y in Norway; [Duchenne Muscular Dystrophy < 18y in Norway: Genotype/Phenotype, Growth, Puberty, Bone Health and Quality of Life](#). Third paper and thesis submitted in 2022. PhD student Ellen Annexstad and Main-supervisor Magnhild Rasmussen.

### **Charcot-Marie Tooth (CMT) project**

Physical activity in people with hereditary polyneuropathies. Identify potential solutions that can be used in a future intervention study to improve quality of life and regular physical activity in people with CMT. In 2022, we have submitted several applications for founding and received 600 000 Nkr from “Stiftelsen Sophies Minde”. A qualitative study will start during 2023. PI and Main supervisor Kristin Ørstavik.

### **Neuromuscular disorders in Heart transplant recipients in Norway – the Heart-Musc Study**

Several rare neuromuscular disorders may cause cardiomyopathy and, in some patients, even be fatal. Since 1983 almost 1100 people have received a heart-transplant (HTX) in Norway. Approximately 40% were diagnosed with cardiomyopathy. This is a collaboration between Department of Cardiology, Department of Medical Genetics and our Research Group. PI and main supervisor Kristin Ørstavik. In this PhD study we are planning 3 work-packages:

- WP1. We will go through the medical records of all HTX, patients diseased or alive (after consent) and register if they had neuromuscular symptoms or findings, if there was a positive family history of cardiomyopathy/NMD and to what extent genetic testing was performed and the results.
- WP2. In alive patients with unknown genetic cause of cardiomyopathy, an updated genetic testing will be offered both to those, who were previously tested and in those to date untested.
- WP3. In patients with genetic findings and/or medical records indicating an hereditary NMD, clinical testing as well as supplementary work-up will be performed.

In 2022 we have started on WP1, going through the medical records of diseased HTX-patients.

### **AMC project in collaboration with National Center for Rare Disorders (TRS), Sunnaas Hospital**

In this project, we are planning to go through all registered patients with AMC in Norway to explore both genetically and clinically if they have a rare NMD that might explain their arthrogryposis. This project is mainly localized at TRS, but Kristin Ørstavik will be involved and function as a Co-supervisor in a planned PhD.







In 2022 several applications have been submitted and a scoping review was performed mainly by our collaborators at Sunnaas.

### **Health Literacy in patients with rare Neuromuscular disorders and their relatives**

A project involving several Center for rare disorders and with PI at Frambu.

In 2022 we have received funding for a PhD student and have worked on a Review paper that is planned submitted in 2023.

## **Most important national and international collaborators**

### **National**

- Dept of cardiology, OUH
- Prof S.O. Kolseth, Dept of Nutrition, Inst. of Basic Medical Sciences, UiO
- Multiple other groups within UiO and OUH
- The National Neuromuscular Center
- Frambu competence center
- TRS
- The other university hospitals in Norway
- Vestre Viken Hospital
- Neuromuscular Association Norway (FFM)

### **International**

- ERN-NMD (European reference Network)
- Muskelsvindfonden ved Ulla Werluf and Charlotte Handberg, Århus, Denmark
- Rigshospitalet Copenhagen, Denmark
- Sahlgrenska ved Mar Tullinius, Gothenburg, Sweden
- Bjarne Udd, Finland

## **Funding**

Among others:

- National Advisory Unit on Rare Disorders (NKSD)
- Research fund of the Neuromuscular Association Norway (FFM)
- Sophie and Leif Torps fund to research on myotonic dystrophy (UNIFOR)
- Sophies Minde Foundation
- South-Eastern Norway Regional Health Authority
- DAM (Norwegian Extra Foundation for Health and Rehabilitation)
- The Norwegian Health Association

## **Scientific production of the research group in 2022**

**Peer reviewed original research articles: 4**





**Selected publications:**

*“Novel mutations in the HADHB - gene causing a mild phenotype of mitochondrial trifunctional protein (MTP) deficiency”*

Ørstavik K, Arntzen KA, Mathiesen P, Backe PH, Tangeraas T, Rasmussen M, Kristensen E, Van Ghelue M, Jonsrud C, Blikrud YT.

JIMD Rep. 2022 Mar 1;63(3):193-198. 35433169

*“Functional ability and physical activity in hereditary neuromuscular diseases”*

Andries A, Van Walseem MR, Ørstavik K, Frich J.

J Neuromuscul Dis. 2022;9(3):437-446 10.3233/JND-210677 35180128

*“A woman in her fifties with chronic muscle weakness”*

Rustad C...H L Fossmo .....K Ørstavik.

Tidsskr Nor Laegeforen. 2022 Jan 7;142 (1) 10.4045/tidsskr.21.0038 35026081



## Cerebrovascular diseases



### Group Leader

Mona Skjelland, Professor II and Consultant, Dept. of Neurology, OUH  
(moskje@ous-hf.no) and UiO (m.e.skjelland@medisin.uio.no)

### Group Members

- Karolina Skagen MD, PhD, senior researcher
- Lars Tveit MD, PhD-student
- Christian Lund, MD, PhD, senior researcher
- Therese Schørlien, MD, PhD-student
- Kristine Stø, MD PhD-student
- Mahtab Zamani, MD, PhD-student
- Markus Wiedmann, MD, PhD, senior researcher
- Brian Enriquez, MD PhD-student
- Maria Skytjoti, MD PhD, senior researcher
- Vigdis Bjerkeli, Chief engineer, researcher
- Camilla Thorsen, study nurse
- Terje Nome, MD, PhD-student

### Research profile and aims

The main goal is to conduct high-quality cerebrovascular research, including translational and clinical studies, leading to new knowledge and improved treatment of stroke patients.

### Ongoing projects

- Advanced ultrasound methods in the assessment of carotid plaque instability
- The MIST study (Microbiota in Stroke); The Gut and Oral bacteria, Atherosclerosis and Ischemic Stroke Study
- Improving cerebral haemodynamic diagnostics using transcranial ultrasound in a neurocritical care cohort
- The BRIDGE study: Bridging pregnancy and fetal microchimerism with future female maternal cardiovascular and neurovascular health
- Inflammation in atherosclerosis and ischemic stroke; a biomarker study
- NORwegian prospective ultrasound study of CARotid RADiation-induced lesions in head and neck cancer patients (NOR-CARRAD)
- The StrokeOmics study: Multi-Omics for Precision Medicine in Acute Ischemic Stroke
- Cardiovascular risk in ketogenic diet, assessed by advanced ultrasound of carotid arteries
- Pre- and intracerebral vasculopathies in ischemic stroke, a register study

### Investigator-led studies:

- Group members are participating in RCTs, observational and industry funded trials (ACST-2, STROKECLOSE, ESCAPE-NEXT, The OCCLUSION-AF Trial)



## Most important national and international collaborators

### National

- Research Institute of Internal Medicine, OUH, Prof. Bente Halvorsen
- Dept of Transplantation Medicine, OUH, Prof. Johannes Hov
- Division of Obstetrics and Gynaecology, OUH, Prof. Annetine Staff
- Dept of Immunology, Proteomics Core Facility UiO, Prof. Tuula Nyman
- Dept of Clinical and Molecular Medicine, NTNU, Prof. Terje Espevik

### International

- Greater Manchester Comprehensive Stroke Center, UK, Prof. Craig Smith
- University of Maastricht, Netherlands, Prof. Erik Biessen
- University of Calgary, Canada, Prof. Michel Hill
- Clinical Research Faculty, University of Manchester, Prof. Ben Parker

## Funding

- South-Eastern Norway Regional Health Authority
- The Research Council of Norway
- The Foundation Dam

## Scientific production of the research group in 2022

Peer reviewed original research articles: 10

### Selected publications:

*“Fecal level of butyric acid, a microbiome-derived metabolite, is increased in patients with severe carotid atherosclerosis”*

Kristine Stø, Jørgen Valeur, Thor Ueland, Gunn Helen Malmstrøm, Vigdis Bjerkeli, Marius Trøseid, Johannes R Hov, Kristian Holm, Beate Vestad, Bente Halvorsen, Mona Skjelland<sup>4</sup>, Karolina R Skagen.  
Sci Rep. 2022 Dec 26;12(1):22378. PMID: 36572703, doi: 10.1038/s41598-022-26759-x.

*“Vaccine associated benign headache and cutaneous hemorrhage after ChAdOx1 nCoV-19 vaccine: A cohort study”*

Schultz NH, Søråas AVL, Sørvoll IH, Akkøk ÇA, Vetlesen A, Bhamra JS, Ahlen MT, Holme PA, Aamodt AH, Skagen K, Skattør TH, Skjelland M, Wiedmann MK.  
J Stroke Cerebrovasc Dis. 2023 Jan;32(1):106860. doi: 10.1016/j.jstrokecerebrovasdis.2022.106860. Epub 2022 Nov 17. PMID: 36403363

*“Markers of extracellular matrix remodeling and systemic inflammation in patients with heritable thoracic aortic diseases”*

Seim BE, Holt MF, Ratajska A, Michelsen A, Ringseth MM, Halvorsen BE, Skjelland M, Kvitting JP, Lundblad R, Krohg-Sørensen K, Osnes LTN, Aukrust P, Paus B, Ueland T.  
Front Cardiovasc Med. 2022 Dec 20;9:1073069. doi: 10.3389/fcvm.2022.1073069. eCollection 2022. PMID: 36606286



## Oslo Stroke Clinical Research Group



### Group Leader

Else Charlotte Sandset, Consultant Neurologist, OUH (else@sandset.net)

Senior Researcher, The Norwegian Air Ambulance Foundation

### Group members

- Maren Ranhoff Hov, MD, PhD
- Rajiv Advani, MD, PhD
- Hege Ihle-Hansen, MD, PhD
- Guri Hagberg MD, PhD
- Kristian Lundsgaard Kraglund, MD, PhD
- Lasse Ormel, MD, PhD
- Helge Fagerheim Bugge MD, PhD-student
- Mona Guterud, paramedic, PhD-student
- Gisle Berg Helland, PhD-student
- Karianne Larsen, MD, PhD-student
- Georgios Vlachos, MD, PhD-student
- Helle Eilertsen, MD, PhD-student
- Lars Alteheld, MD

### Affiliated members

- Håkon Ihle-Hansen (Vestre Viken)
- Jørgen Ibsen, MD, PhD-student (Vestre Viken)
- Dag Ferner Netteland (NK)
- Bjørn Jamtli (PRE)
- Camilla Hardeland (PRE)
- Espen Saxhaug Kristoffersen (AHUS)
- Karoline Skogen (KRN)
- TILL Schellhorn (KRN)

### Study nurses/coordinators

- Maren Hauge
- Ane Vervik
- Mia Dagsvik

### Research profile and aims

The aim of the research group is to improve care in all points of the stroke treatment chains. All projects should have direct implications for clinical practice.



## Funding

- South-Eastern Norway Regional Health Authority
- The Research Council of Norway
- The Foundation Dam
- SNLA, Norwegian Air Ambulance Foundation

## Scientific production of the research group in 2022

**Peer reviewed original research articles: more than 40**

**Lectures at national and international conferences: more than 20**

### Selected publications:

*“Streamlining Acute Stroke Care by Introducing National Institutes of Health Stroke Scale in the Emergency Medical Services: A Prospective Cohort Study”*

Larsen K, Ranhoff Hov, M et al.

Stroke. 2022.

*“Tenecteplase versus alteplase for the management of acute ischaemic stroke in Norway (NOR-TEST 2, part A): a phase 3, randomised, open-label, blinded endpoint, non-inferiority trial”*

Kvistad CE, Næss H, Helleberg BH, Idicula T, Hagberg G, Nordby LM, Jenssen KN, Tobro H, Rørholt DM, Kaur K, Eltoft A, Evensen K, Haasz J, Singaravel G, Fromm A, Thomassen L.

Lancet Neurol. 2022 Jun;21(6):511-519. doi: 10.1016/S1474-4422(22)00124-7. Epub 2022 May 4. PMID: 35525250 Clinical Trial.

*“Tenecteplase for acute ischaemic stroke”*

Sandset EC, Tsvigoulis G.

Lancet. 2022 Jun 28:S0140-6736(22)01107-2. doi: 10.1016/S0140-6736(22)01107-2. Epub ahead of print. PMID: 35779556.



## Headache and Stroke



### Group Leader

Anne Hege Aamodt, MD/PhD, FEAN, FESO

Senior Consultant and Researcher, Dept of Neurology, OUH

and NorHEAD, NTNU (a.h.aamodt@medisin.uio.no / anhaam@oushf.no /  
anne.hege.aamodt@ntnu.no)

### Group members

- Marion Bolding, MD, PhD, postdoc
- Brian Enriquez, MD, PhD student
- Gisle Berg Helland, PhD student
- Terje Nome, MD, Dr. Philos student
- Barbara Ratajczak-Tretel, MD, PhD student
- Stephen Ryan, MD, PhD student
- Thor Skattør, MD, PhD student
- Jesper Sørmark, MD
- Anna Tancinova, MD, PhD student
- Maria Argren, MD, PhD student
- Peter M. Andel, MD, PhD student
- Linn Heitmann, MD, PhD student
- Jon André Totland, MD, PhD student
- Siv Pigniatello, MD, PhD student
- Ansar Roy, research nurse
- Christina Kefaloykos, research nurse
- Helle Skalleberg, research nurse
- Cecilia Dunne, medical student
- Marcus Boateng, medical student

### Research profile and aims

The main goal is to conduct high-quality cerebrovascular and headache research, leading to new knowledge and improved treatment of stroke and headache patients. Since the start of the Covid pandemic we are also doing clinical trials in Covid.

The main research areas are:

- Reperfusion treatment in acute ischemic stroke
- Atrial fibrillation in cryptogenic stroke, the role of inflammation
- AI (Artificial intelligence) in stroke diagnostics
- Visual impairment in acute stroke
- Moyamoya angiopathy
- Headache treatment including migraine
- Neurological complications after covid infection and covid vaccines



## Ongoing projects

- OSCAR: The Oslo Acute Reperfusion Study
- NOR-FIB 1: The Nordic Atrial Fibrillation and Stroke Study, a prospective observational study of the occurrence of AF in patients with cryptogenic stroke / TIA
- NOR-FIB 2: The Norwegian Atrial Fibrillation and Stroke Study, a prospective observational study of the brain health in AF
- Ten-CRAOS: A randomized controlled trial with tenecteplase in central retinal artery occlusion
- StrokeVIS: Oslo Stroke Study of Visual Impairment after Stroke
- AI-STROKE: Optimizing Acute Ischemic Stroke Diagnostics Using Artificial Intelligence
- NorMoyamoya: The Moyamoya Task Force: Multi-disciplinary translational project for improving patient care in Norway and unraveling the mysteries of Moyamoya
- NeuroCOVID: The Norwegian Study of Nervous System Manifestations and Sequelae After COVID-19  
NeuroCOVID
- CovaxHEAD: Persistent severe headache after Covid vaccine

## Most important national and international collaborators

### National

- Dept of Neurology, Haukeland University Hospital, Prof. Øivind Torkildsen, Marte Bjørk
- Dept of Behavioural Medicine, Institute of Basic Medical Sciences, UiO, Prof. Birgitte Boye
- Dept of Radiology and Nuclear Medicine, Computational Radiology and Artificial Intelligence, Prof. Atle Bjørnerud
- Dept of Clinical Medicine, The Arctic University of Norway, Prof. Agnethe Eltoft

### International

- Prof. Peter Vanacker, Antwerp University Hospital, Belgium
- Karolinska University Hospital, Sweden, Prof. Michael Mazya, Prof. Niaz Ahmed
- Christian-Doppler- Klinik Salzburg, Austria, Prof. Slaven Pikija
- St. Vincent's Hospital Melbourne, Australia, Prof. Lauren Sanders
- National Hospital for Neurology and Neurosurgery, University College London Hospital, UK, Prof. Manjit Matharu
- Besta Neurological Institute, Milan, Italy, Prof. Anna Bersano
- Universitätsklinikum Hamburg-Eppendorf, Germany, Prof. Götz Thomalla
- Utrecht University, the Netherlands, Prof. Bart van der Worp
- Dept of Clinical Neurological Sciences, Schulich School of Medicine and Dentistry, University of Western Ontario, Canada, Prof. Vladimir Hachinski







## Funding

- Klinbeforsk
- South-Eastern Norway Regional Health Authority
- The Research Council of Norway
- The Foundation Dam
- Odd Fellow
- EU grants

## Scientific production of the research group in 2022

Peer reviewed original research articles: 8

### Selected publications:

Ratajczak-Tretel B, Tancin Lambert A, Al-Ani R, Arntzen K, Bakkejord GK, Bekkeseth HMO, Bjerkeli V, Eldøen G, Gulsvik AK<sup>8</sup>, Halvorsen BE, Høie GA, Ihle-Hansen H, Ihle-Hansen H, Ingebrigtsen S, Johansen H, Kremer C, Krogeth SB, Kruuse C, Kurz M, Nakstad I, Novotny V, Næss H, Qazi R, Rezaj MK, Rørholt DM, Steffensen LH, Sørmark J, Tobro H, Truelsen TC, Wassvik L, Ægidius KL, Atar DA, Aamodt AH  
*“Atrial fibrillation in cryptogenic stroke and TIA patients in The Nordic Atrial Fibrillation and Stroke (NOR-FIB) Study: Main results”*  
European Stroke Journal 2022;0(0). doi:10.1177/23969873221123122. IF 4.75.

Mishra A, Malik R, Hachiya T, et al. Aamodt AH in HUNT All-in Stroke, GIGASTROKE consortium  
*“Stroke genetics informs drug discovery and risk prediction across ancestries”*  
Nature. 2022 Sep 30:1–15. doi: 10.1038/s41586-022-05165-3. PMID: 36180795; PMCID: PMC9524349.  
IF 69.504

Avan A, Hachinski, V, Aamodt AH  
*“Brain Health Learn and Act Group. Brain health: key to health, productivity, and wellbeing”*  
Alzheimers Dement 2022 Jul;18(7):1396-1407.. doi: 10.1002/alz.12478. 21.566 2022 Jul;18(7):1396-1407. doi: 10.1002/alz.12478. Epub 2021 Sep 27. IF 21.566



## ERGO - Epilepsy Research Group of Oslo



### Team Leader for ERGO and Group Leader for Clinical Epilepsy Research

Erik Taubøll, Professor, Dept. of Neurology, OUH and UiO  
(erik.tauboll@medisin.uio.no) /OUH (erik.tauboll@ous-hf.no)



### Group Leader for Translational Epilepsy Research

Kjell Heuser, Senior Consultant, Dept. of Neurology, OUH  
(kheuser@ous-hf.no)

### Group Members

- Erik Taubøll, Senior Consultant, Professor. **Team leader ERGO and Group leader for Clinical Epilepsy Research**
- Kjell Heuser, Senior Consultant, **Group leader**; translational epilepsy research
- Sigrid Svalheim, Senior consultant. **Project Leader**; side effects of ASMs
- Dag Aurlien, Consultant, Stavanger. **Project Leader**; epilepsy and cardiology
- Agnes Balint Bjørke, MD, PhD fellow; TLE
- Toni Berger, MD, PhD, specialty registrar, postdoc
- Alba Gonzalez; MD, PhD fellow; Epilepsy and cardiology
- Monika Mochol, MD, PhD fellow; side effects of ASMs
- Helle Hermann, MD, PhD fellow; deep brain stimulation for epilepsy
- Line Sveberg, Consultant; Women and epilepsy/autoimmune epilepsy
- Ketil Berg Olsen, MD, Senior Consultant; Status epilepticus
- Line Bedos Ulvin, MD, PhD fellow; Status epilepticus
- Hild F. Sødal, MD, PhD fellow; posttraumatic epilepsy project
- Ylva Østby, Neuropsychologist, TLE project
- Maren Ranhoff Hov, MD, PhD, MD PhD, Dep Neurology and Norwegian Air Ambulance Foundation
- Ingrid Hustad, MD, PhD fellow, Norwegian Air Ambulance Foundation

### Associate Group Members

- Cecilie Nome, Phd candidate, TLE/translation, Letten Research Center
- Rune Enger, Head of Letten Research Center, Institute of Basic Medical Science, UiO
- Cecilie Bugge Bakketun, Phd candidate, Glia/epileptogenesis, Letten Research Center
- Bjørnar Hassel, Department of Neurohabilitation, UiO/OUH
- Leif Gjerstad, MD/PhD Prof. emeritus, OUH/UiO
- Pål Gunnar Larsson, Department of Neurosurgery, OUH



## Research profile and aims

ERGO has been active in epilepsy research for about 25 years and consists of two groups:

- Research group for Clinical Epilepsy Research. Group leader Erik Taubøll
- Research Group for Translational Epilepsy Research. Group leader Kjell Heuser

The many research projects are closely linked and are therefore referred to collectively.

### Research within ERGO is currently focusing on six main areas:

1) Epilepsy-Translational Research. This focuses on research on epileptogenesis, glial cells and genetic and clinical studies. Group leader is Kjell Heuser. The initial studies are basic research, using several *in vivo* epilepsy models. In addition, larger patient trials are used, in which the clinical, radiological (MRI), and neuropsychological development of TLE is monitored over time.

We have also performed epigenetic studies investigating changes in DNA methylation and gene expression during epileptogenesis.

2) Gender issues, endocrinology and long-term effects of ASMs. The project leader is Sigrid Svalheim. "Gender issues" have been an important area of research for the group over many years, with many PhD theses. The current major focus is studying the long-term side-effects of ASMs on hormones, immunology, haematology and bone health. The effects of epilepsy and antiepileptic drugs on inflammation parameters have now been studied both clinically and using a zebra-fish model.

3) Epilepsy and cardiology / SUDEP (sudden unexpected death in epilepsy patients). The project leader is Dag Aurlen, who is presently based at Stavanger University Hospital. The project is a collaborative venture between Oslo University Hospital (OUS) and Stavanger University Hospital. Both clinical and basic animal studies are now close to an end.

4) Status epilepticus (SE). OUH has a large population of patients who has experienced SE and epidemiological studies have recently been performed regarding underlying causes, treatment, outcome etc. We will now together with colleagues from Denmark (Odense university, prof CP Beier) especially focus on possible predictors for outcome and study in more detail treatment of the super refractory cases.

5) Traumatic brain injury and posttraumatic epilepsy. Studies to investigate possible predictors for posttraumatic epilepsy have recently been started, in collaboration with colleagues in Italy and USA. Primarily, factors of relevance to inflammation will be the focus of our studies.

6) The Prehospital Seizure Control trial – (PreCtrl). Mapping of prehospital seizure management in the ambulance service of Oslo, Norway. In collaboration with Dep. of Prehospital services, Oslo University Hospital and The Norwegian Air Ambulance Foundation. This project will start up during Spring 2023. Project leader is Maren Ranhoff Hov and PhD student is Ingrid Hustad.

In addition to these five main areas of research, the group also has interests in deep brain stimulation (DBS) in epilepsy and ketogenic diets.





## Ongoing projects

- **Can the brain's glial cells be a point of attack for novel ASM treatments?**

This is a major project in which, among other approaches, a mouse model is being used to investigate how epilepsy arises and evolves over time. The main question is how glia cells behave during the development and worsening of epilepsy, and whether these changes can be affected by various drugs such as ASMs, anti-inflammatory drugs, drugs that affect intracellular cell signalling etc. Within this project the group has hosted a Special Issue in *Frontiers of Neurology* in 2020 with Kjell Heuser as editor. See also Berger et al, *PLoS One* 23019, *Frontiers in Neurol*, 2020; 2022.

In extension to this study, we are now also investigating possible epigenetic changes taking place during epileptogenesis. This is done in collaboration with Dr. Kaja K. Selmer and her group in Research Group for Neurogenetics, Division of Clinical Neuroscience, OUH. Studying possible mechanisms involved in epileptogenesis may open new treatment strategies to prevent epilepsy, i.e. after stroke and brain injuries.

One PhD degree; A translational view on epileptogenesis, was completed within the field in 2022; Toni Berger.

- **Is epilepsy a progressive disease?**

This long-term study focuses on changes in the clinical, radiological and neuropsychological picture in patients with temporal lobe epilepsy (Pro-TLE). Comprehensive investigations are conducted on patients with newly diagnosed temporal lobe epilepsy at various time points over a 10-year period. Two papers were recently published: Bjørke AB et al, *Epilepsy & Behav* 2021 and Bjørke AB et al, *Front Neurol* 2022.

- **Long-term effects of ASMs**

Patients starting treatment with the ASMs levetiracetam and lamotrigine will be followed prospectively for 2-years in terms of immunological, hormonal, and haematological adverse reactions, and possible changes in bone health. The data will be collected through interviews, questionnaires, blood tests, and bone density measurements. This project is supported with a 50 % PhD student from Østfold Hospital Trust.

As part of this project, studies on the effect of ASMs on gene expression related to immune genes in zebra-fish have also recently been finished in collaboration with NMBU (Norwegian University of Life Sciences) (Mochol M et al *Epilepsy Res* 2021), and a study on the effect of ASMs on markers for inflammation in humans with epilepsy is performed together with collaborators in OUH (See Mochol M et al, *Acta Neurol Scand* 2023 (in press).

- **Epilepsy and cardiology**

It has become increasingly clear that several epilepsies are channelopathies, as are many cardiac arrhythmias, and are associated with many of the same channels and ions. The relationship between epilepsy and cardiac arrhythmias like the long QT syndrome (LQTS) is studied. This is also of central importance for understanding sudden unexpected death in epilepsy (SUDEP). We have also studied the impact of several years of active epilepsy on cardiac function. Studies will be finished in 2023. (see i.e. González A, et al, *Epilepsy Res* 2020; González et al, *Case Rep Neurol* 2022).

- **National registration of refractory status epilepticus**

We are collating national experiences on how patients with this condition are treated in Norway and how this can be improved. As there are only a few such patients at each centre, joint exchange





of experiences is essential. Collection of data commenced in 2015. A national reference group for SE has been established.

Recently, an international collaboration with prof. Christoph Patrick Beier and his group in Odense, Denmark has been started focusing on prognosis of status epilepticus.

(see also: Ulvin LB et al, 2018/2019, Habhab SF et al, *Epilepsy Behav* 2020; Roberg L et al, *JAMA Neurology* 2022, Heuser K et al, *Exon Publ* 2022).

- **Deep brain stimulation (DBS) in epilepsy**

In this study, patients with hard-to-treat epilepsy are treated with DBS using a blinded study design. The clinical work is now completed and most results published. A phd thesis will be submitted for evaluation within 2023.

- **Traumatic brain injury and posttraumatic epilepsy**

A project to study the possible predictive value of different parameters, especially related to inflammation, measured immediately after traumatic brain injuries on the frequency of posttraumatic epilepsy was started in 2021. This is an international collaborative work with groups from US and Europe and with financial support from the US Department of Defence.

- **The Prehospital Seizure Control trial – (PreCtrl)**

ERGO is one of several collaborators in this study that will start in 2023. The intention is to describe the prehospital and initial inhospital pathways and treatment of patients with seizures, to standardize national EMS guidelines and improve time to control in seizure management for better prognosis for the patients. We also plan to implement a new model for standardizing competence, communication and treatment for prehospital seizure assessment – the PreCTRL model.

The other collaborators are: The Norwegian Air Ambulance Foundation, Faculty of Health Science, Oslo Metropolitan University, and Department of Prehospital services, OUH.

## Most important national and international collaborators

### National

- Dept. of Cardiology, OUH, Prof Kristina Hermann Haugaa
- Kaja Selmer's research group, Div. of Clinical Neuroscience, OUH
- National Centre for Epilepsy
- Stavanger University Hospital
- Østfold Hospital Trust
- Institute of Basic Medical Science, Glia cells research group, UiO, Rune Enger
- Prof Pål Aukrust, Research Institute of Internal Medicine, OUH
- Dr Olav B Smeland and coworkers
- NORMENT, OUH
- Maren Ranhoff Hov, Norwegian Air Ambulance Foundation

### International

- Institute of Cellular Neurosciences, Medical Faculty, University of Bonn, Germany (Prof. C. Steinhäuser)
- Pavel Klein, the CURE programme for post-traumatic epilepsy research, Washington, USA
- Annamaria Vezzani, Department of Neuroscience, IRCCS – Mario Negri Institute for Pharmacological Research, Milan, Italy
- Prof Christoph Patrick Beier, Odense University Hospital, University of Southern Denmark, Denmark





## Scientific production of the research group in 2022

**Ph.D. dissertation:** 1. Toni Berger. A translational view on epileptogenesis. UiO, 2022.

**Peer-reviewed original research articles:** 7

**Abstracts, national/international:** 6/3

**International reviews:** 2

**National publications:** 0

**Speaker at international congresses:** 4.

E. Taubøll. Reproductive disorders in women with epilepsy: The role of anti-seizure medications. 18th international Iranian congress of epilepsy, February 23-25, 2022.

E. Taubøll. Catamenial epilepsy; definition, prevalence, pathophysiology and treatment. BIOJUME Paris Meeting, 11-12.09.2022, Hôtel Hor Europe, Paris.

Hild F Sødal. Early post-traumatic seizures in hospitalized patients with traumatic brain injury. EAN, Vienna, June 2022.

Hild F Sødal. Posttraumatic epilepsy study – the Norwegian experience. CURE network meeting, 2022.

### Selected publications

Berger TC, Taubøll E, Heuser K. The potential role of DNA methylation as preventive treatment target of epileptogenesis. *Front Cell Neurosci.* 2022 Jul 22;16:931356.

Bakhtiari A, Bjørke AB, Larsson PG, Berg Olsen K, Johansen Nævra MC, Heuser K, Taubøll E, Østby Y. Episodic Memory Dysfunction and Effective Connectivity in Adult Patients With Newly Diagnosed Non-Lesional Temporal Lobe Epilepsy. *Front Neurol.* 2022 Feb 10;13:774532.

Sødal HF, Storvig G, Tverdal C, Robinson HS, Helseth E, Taubøll E. Early post-traumatic seizures in hospitalized patients with traumatic brain injury. *Acta Neurol Scand.* 2022 Jul 14. doi: 10.1111/ane.13670.

### Funding

- The South-Eastern Norway Regional Health Authority, 1 PhD
- Internal, OUH, 2 PhD (1 klin stip, 1 D-still)
- Østfold Hospital Trust (0,5) PhD
- Norwegian Air Ambulance Foundation, 1 PhD (collaboration ; NAAF and ERGO)



## Multiple Sclerosis (MS) – Clinical and epidemiological MS-studies



### Group Leader

Elisabeth Gulowsen Celius, Professor and Consultant of Neurology (MD/PhD),  
Department of Neurology, OUH and Institute of Clinical Medicine, UiO  
(e.g.celius@medisin.uio.no/ uxelgu@ous-hf.no)

### Group members

- Elisabeth Gulowsen Celius, MD/PhD, Professor, Dept of Neurology, OUH/UiO
- Pål Berg-Hansen, MD/PhD, Consultant, Dept of Neurology, OUH
- Cecilia Smith Simonsen, MD/PhD, Dept of Neurology, Drammen Hospital
- Heidi Øyen Flemmen, MD/PhD fellow, Consultant, Skien Hospital/OUH
- Line Broch, MD, PhD fellow, Consultant, Drammen Hospital/OUH
- Binyam Bungudo, PhD, Postdoc, University of Oslo
- Kamilla Brekke, MD, PhD fellow, Sykehuset Vestfold / UiO
- Marte Wendel-Haga, MD/PhD, Consultant Kysthospitalet and Dept of Neurology, OUH

### Associated Group Members

- Piotr Sowa, MD/PhD, Consultant, Division of Radiology and Nuclear Medicine, OUH

**We are working closely together with all the members of the other MS subgroups.**

This year we have had one student connected to our subgroup, writing student thesis:

- Anniken K. Jørgensen, medical student (Celius)

### Research profile and aims

Multiple Sclerosis (MS) research group at the Department of Neurology, OUH and UiO, aims to identify characteristics and susceptibility factors of MS, and to contribute to a better understanding of the disease and development of better treatments. We perform genetic, immunological, clinical, epidemiological, environmental, MRI and translational studies of MS in collaboration with national and international research partners and networks.

### Ongoing projects

- The BOTV-project. Epidemiology in Buskerud, Oslo, Telemark and Vestfold.
- Heidi Øyen Flemmen, PhD fellow: Socioeconomic factors as predictors for disease susceptibility and disease progression in Multiple sclerosis, Supervisor: Elisabeth Gulowsen Celius, Co supervisor: Pål Berg-Hansen
- Line Broch, PhD fellow: Fatigue in Multiple Sclerosis. Supervisor: Elisabeth Gulowsen Celius, Co-supervisor: Heidi Ormstad



- Kamilla Brekke, PhD-fellow: Multiple sclerosis and aging – a real world, population-based cohort study. Supervisor: Cecilia Smith Simonsen, Elisabeth G. Celius, Brit A Blaauw
- Hanne F. Harbo, Steffan D. Bos, Pål Berg-Hansen, Tone Berge, Elisabeth G Celius Mona Beyer, Einar A. Høgestøl, Synne Brune, Goran Petrovski, Dragana Drobnjak Nes, Sigrid Aune de Rodez Benavent: MultipleMS - partner in EU Horizon 2020-project (Harbo Oslo PI)
- Einar A. Høgestøl, Hanne F. Harbo, Dan Rinker, Elisabeth Celius, Piotr Sowa, Mona K Beyer: MAGNIMS collaboration on various MRI projects
- Elisabeth G. Celius, Pål Berg-Hansen, Stine Marit Moen/MS Centre Hakadal and SINTEF: AutoActive: Tools and Methods for Autonomous Analysis of Human Activities from Wearable Device Sensor Data (SINTEF PI)
- Elisabeth G. Celius: Lemtrada PASS, international observational study (Sanofi). EGC national investigator
- Elisabeth G. Celius: CLAD Cross, an international study on switch to cladribine (Merck). EGC member of steering group and national investigator.
- Elisabeth G. Celius, Pål Berg-Hansen, Åshild Skardhamar, Lars Skattebøl, Elisabeth Gjfsen and Synne Brune: HERCULES – an international trial of tolebrutinib (Sanofi). EGC PI.
- Elisabeth G. Celius, Stine Marit Moen/MS Centre Hakadal, Tone Berge and OsloMet: Use of functional near-infrared spectroscopy analyses for studies of neuroplasticity in MS patients – a pilot study
- Elisabeth G. Celius, Paul Lillrank, Aalto University and Ragnhild Halvorsrud, SINTEF: PATHWAY: A toolkit for managing and communicating patient pathways
- Gro O. Nygaard, Hanne F Harbo and Oslo MS Research Group: NOR-MS. Norwegian multicenter study of cladribine and rituximab (NOR-MS)
- Gro O. Nygaard, Marton König, Elisabeth Gulowsen Celius, Hanne F Harbo, Ingeborg Aaberge (FHI), Audun Aase (FHI), Åslaug R Lorentzen (SSHF), Lars L Skattebøl: Vaccine responses in MS patients
- GLIMPSE: A comparative study of cladribine with other high-efficacy treatments using real-world data. Stig Wergeland, Elisabeth G. Celius, Jan Hillert, Melinda Magyari, Tim Spelman

## Most important national and international collaborators

### National

- Mona Beyer, Rigmor Lundby, Piotr Sowa, Atle Bjørnerud and Tuva Hope, Div. of Radiology and Nuclear Med., OUH
- Øivind Torkildsen, Stig Wergeland and Jan Aarseth, Haukeland University Hospital
- Peyman Mirtaheri, Dept of Mechanical, Electronics and Chemical Engineering, OsloMet
- Heidi Ormstad, Universitet Sør-Øst/OsloMet

### International

- Ingrid Kockum, on behalf of the MultipleMS consortium
- Mara Rocca and Rosa Cortese, on behalf of the MAGNIMS consortium
- An Goris, on behalf of the International MS Genetics Consortium
- Stephen Sawcer, University of Cambridge, UK
- Sergio E. Baranzini, University of California, San Francisco, US
- Nordic MS genetics consortium (Hillert, Olsson,







- Kristina Gervin and Kaja Selmer, FoU dept, Div of Clinical Neuroscience, OUH
- Frederic Meyer and Trine Seeberg, SINTEF
- Ragnhild Halvorsrud, SINTEF
- Kockum, Oturai, Sørensen, Saareala)
- Tobias Granberg, Fredrick Piehl, Karolinska Institute, Stockholm, Sweden
- Paul Lillrank, Aalto University, Finland

### Funding

- The Research Council of Norway
- University of Oslo
- South-Eastern Norway Regional Health Authority grant
- Vestre Viken Hospital
- Telemark Hospital
- Odd Fellow Foundation
- Oslo MS foundation

## Scientific production of the research group in 2022

**Peer reviewed original research articles:** 16

### PhD theses:

Cecilia Smith Simonsen: *"The Contemporary Multiple Sclerosis Patient"*

Supervisor: Elisabeth Gulowsen Celius, Co supervisor: Stine Marit Moen. March 2022.

### Selected publications:

Flemmen HØ, Simonsen CS, Broch L, Brunborg C, Berg-Hansen P, Moen SM, Kersten H, Celius EG  
*"The influence of socioeconomic factors on access to disease modifying treatment in a Norwegian multiple sclerosis cohort"*

Mult Scler Relat Disord. 2022 May;61:103759. doi: 10.1016/j.msard.2022.103759. Epub 2022 Mar 24. PMID: 35358792

Broch L, Flemmen HØ, Simonsen CS, Berg-Hansen P, Ormstad H, Brunborg C, Celius EG  
*"Fatigue in multiple sclerosis is associated with socioeconomic factors"*

Mult Scler Relat Disord. 2022 Aug;64:103955. doi: 10.1016/j.msard.2022.103955. Epub 2022 Jun 9. PMID: 35753177

Simonsen CS, Flemmen HØ, Broch L, Brekke K, Brunborg C, Berg-Hansen P, Celius EG  
*"Rebaseline no evidence of disease activity (NEDA-3) as a predictor of long-term disease course in a Norwegian multiple sclerosis population"*

Front Neurol. 2022 Nov 14;13:1034056. doi: 10.3389/fneur.2022.1034056. eCollection 2022. PMID: 36452173





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**Other publications (abstracts excluded):**

Regular updates on our home page

Medisinbloggen, UiO on MS

Helse Sør-Øst Research Report 2021 on socioeconomic factors and MS (PhD-project Heidi Øyen Flemmen)

**Invited lectures at international congresses:**

ECTRIMS Congress 27.10.22, Amsterdam: Pregnancy and Breast Feeding in Multiple sclerosis.

Elisabeth G. Celius

ECTRIMS Congress 28.10.22, Amsterdam: Switching between high-efficacy therapies. Meet the Expert session. Elisabeth G. Celius

MS medical Forum, International webinar 22.6.22: MS and pregnancy. Elisabeth G. Celius

MS Masters Forum: Treatment of Multiple Sclerosis. Elisabeth G. Celius, Milan, November 2022

**Social Media;** Facebook: «Multippel Sklerose Forskningsgruppen Oslo»



## Multiple sclerosis (MS) - Therapeutic trials and vaccine studies



### Group Leader

Gro Owren Nygaard, Researcher and Consultant of Neurology (MD/PhD),  
Department of Neurology, OUH and UiO (g.o.nygaard@medisin.uio.no /  
uxgryg@ous-hf.no)

### Group members

- Einar August Høgestøl, MD/PhD, Researcher and Resident, Dept of Neurology, OUH, Associate Professor Dept of Psychology, UiO
- Lars L. Skattebøl, MD/PhD fellow, Resident, Dept of Neurology, OUH, UiO
- Mathias H. Øverås, MD/PhD fellow, Resident, Dept of Neurology, OUH, UiO
- Synne Johannesen, Study nurse, Dept of Neurology, OUH
- Marton König, MD/PhD, Postdoc and Consultant, OUH
- Tilde Harridsleff Rasmussen, MD/PhD fellow, Dept of Neurology, OUH, UiO
- Piotr Sowa, MD/PhD, Consultant, Division of Radiology and Nuclear Medicine, OUH
- Rigmor Lundby, MD/PhD, Consultant, Division of Radiology and Nuclear Medicine, OUH
- Marte Wendel-Haga, MD/PhD, Consultant Kysthospitalet and Dept of Neurology, OUH

### Associated Group Members\*

- Mona K Beyer, MD/PhD, Professor, Division of Radiology and Nuclear Medicine UiO/OUH
- Elisabeth Gulowsen Celius, MD/PhD, Professor, Dept of Neurology, OUH/UiO
- Hanne Flinstad Harbo, MD/PhD/MHA, Professor and Head of Dept of Neurology, OUH/UiO
- Tone Berge, MSc/PhD, Head of Section – Neuroscience Research Uni, FOU dept, OUH, Professor, OsloMet

\*There is considerable overlap between the different MS research groups and most participants are members of more than one group

### Research profile and aims

Therapeutic trials and vaccine studies in multiple sclerosis (MS) research group at the Department of Neurology, OUH and UiO, aims to perform clinical studies in close collaboration with basic scientists. This translational focus is maintained in all ongoing studies. We aim to contribute to better treatment of persons with MS and to a better understanding of the underlying mechanisms of the disease. We perform clinical, immunological, MRI and genetic studies of MS in collaboration with national and international research partners and networks.

### Ongoing projects

- NOR-MS: a national multicenter non-inferiority study of two highly efficient MS therapies (cladribine and rituximab)
- NevroVAX: a national study of immune responses to vaccines in persons with MS



- OVERLORD MS: local PI and responsible for the primary endpoint of the national multicenter non-inferiority study of two highly efficient MS therapies (ocrelizumab and rituximab), lead from Haukeland University Hospital
- HMAS for MS ved OUS: a prospective study of persons with MS treated with stem cell therapy at OUH

### Most important national and international collaborators

#### National

- Fridtjof Lund-Johansen, Ludvig Munthe, Jon Torgils Waage, Dept of Immunology, OUH
- Siri Mjåland, Asia Wolf, FHI
- Trygve Bergeland, Kappa biosciences
- Nils Bolstad, Johanna Gehin, Åge Brustad, Dept of Medical Biochemistry, OUH
- Mona Beyer, Rigmor Lundby, Piotr Sowa, Atle Bjørnerud, Wibeke Nordhøy, Frode Tuvnes, Div. of Radiology and Nuclear Med., OUH
- Trygve Holmøy, Dept of Neurology, Akershus University Hospital
- Øivind Torkildsen, Stig Wergeland and Jan Aarseth, Haukeland University Hospital
- Åslaug Lorentzen, Stine Schikora-Rustad, Ingvild Leknes, Åse Mygland, Dept of Neurology, Sørlandet Sykehus
- Clinicians from collaborating hospitals in Tromsø, Trondheim, Stavanger, Skien, Drammen, Tønsberg, Lillehammer and Fredrikstad
- Lars Westlye and Esten, Dept of Psychology, UiO and NORMENT, OUH
- Mathias Toft, Dept of Neurology, UiO/OUH
- John Anker Zwart, FOU, OUH/UiO

#### International

- Pablo Villoslada, Hospital Clinic of Barcelona, Spain on behalf of the Sys4MS consortium
- Stephen Sawcer, University of Cambridge, UK
- Tobias Granberg, Fredrick Piehl, Karolinska Institute, Stockholm, Sweden
- Kaj Blennow and Henrik Zetterberg, Sahlgrenska University Hospital, Gothenburg, Sweden
- 





## Funding

- South-Eastern Norway Regional Health Authority (NOR-MS, Nevrovax post doc)
- The Research Council of Norway (NOR-MS)
- University of Oslo (research position)
- Dam Foundation (Nevrovax PhD)
- Odd Fellow Foundation (NOR-MS, Nevrovax)
- Oslo MS foundation (NOR-MS)
- CEPI (Nevrovax)
- Kappa (Nevrovax)

## Scientific production of the research group in 2022

Peer reviewed original research articles: 4

### Selected publications:

König M, Torgauten HM, Tran TT, Holmøy T, Vaage JT, Lund-Johansen F, Nygaard GO (2022)  
*“Immunogenicity and Safety of a Third SARS-CoV-2 Vaccine Dose in Patients With Multiple Sclerosis and Weak Immune Response After COVID-19 Vaccination”*

JAMA Neurol, 79 (3), 307-309

DOI 10.1001/jamaneurol.2021.5109, PubMed 35072702

Nygaard GO, Torgauten H, Skattebøl L, Høgestøl EA, Sowa P, Myhr KM, Torkildsen Ø, Celius EG (2022)  
*“Risk of fingolimod rebound after switching to cladribine or rituximab in multiple sclerosis”*

Mult Scler Relat Disord, 62, 103812

DOI 10.1016/j.msard.2022.103812, PubMed 35462167

Riise J, Meyer S, Blaas I, Chopra A, Tran TT, Delic-Sarac M, Hestdalen ML, Brodin E, Rustad EH, Dai KZ, Vaage JT, Nissen-Meyer LSH, Sund F, Wader KF, Bjornevik AT, Meyer PA, Nygaard GO, König M, Smeland S, Lund-Johansen F, Olweus J, Kolstad A (2022)

*“Rituximab-treated patients with lymphoma develop strong CD8 T-cell responses following COVID-19 vaccination”*

Br J Haematol, 197 (6), 697-708

DOI 10.1111/bjh.18149, PubMed 35254660

**Social Media;** Facebook: «Multipel Sklerose Forskningsgruppen Oslo»



## Multiple Sclerosis (MS) – Imaging studies



### Group Leaders

Einar August Høgestøl, Associate Professor and Resident in Neurology, MD/PhD, Psychological Dept., UiO ([einaan@uio.no](mailto:einaan@uio.no)) and Dept. of Neurology, OUH ([eiaand@ous-hf.no](mailto:eiaand@ous-hf.no))



Hanne Flinstad Harbo, Professor and Consultant of Neurology (MD/PhD/MHA), UiO ([h.f.harbo@medisin.uio.no](mailto:h.f.harbo@medisin.uio.no)) and Dept. of Neurology, OUH ([uxhahb@ouf-hf.no](mailto:uxhahb@ouf-hf.no))

### Group members

- Gro Owren Nygaard, MD/PhD, Consultant, Dept of Neurology, OUH
- Synne Brune, MD/PhD fellow, Resident, Dept of Neurology, OUH
- Lars L. Skattebøl, MD/PhD fellow, Resident, Dept of Neurology, OUH, UiO
- Gisle Berg Helland, MD/PhD fellow, Department of Neurology, OUH
- Bettina Újhelyi, MSc student, Erasmus scholarship, University of Trento, Italy
- Marie Strømstad, MSc, Research Assistant, OUH

### Associated Group Members

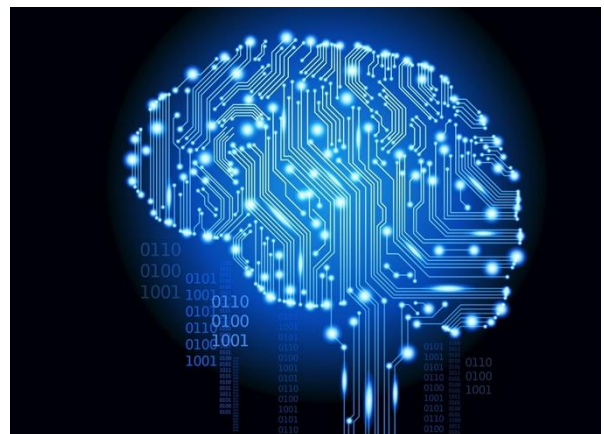
- Piotr Sowa, MD/PhD, Consultant, Division of Radiology and Nuclear Medicine, OUH
- Rigmor Lundby, MD/PhD, Consultant, Division of Radiology and Nuclear Medicine, OUH
- Mona K Beyer, MD/PhD, Professor, Division of Radiology and Nuclear Medicine UiO/OUH

This year we have had two students connected to our group, writing student theses:

- Matthias Rasmussen Fuglestad, Psychology MSc student, UiO (Landrø, Høgestøl)
- Jacob Ring, Psychology MSc student, UiO (Landrø, Høgestøl)

## Research profile and aims

The research group “Imaging studies of MS” at OUH and UiO, aims to integrate imaging studies in our ongoing translational projects. We aim to investigate new advanced imaging methods to exploit the vast data incorporated in the MRI scans that our study participants undergo. We have our own MRI lab at Domus Medica 4 at Gaustad for advanced processing of MRI data. Our aim is to help establish new imaging biomarkers for improved precision medicine in MS care.





## Ongoing projects

We have several ongoing projects where we collaborate extensively with local and international partners. We are furthermore active associated members of the Magnetic Resonance Imaging in MS Consortium (<https://www.magnims.eu>), International MS Genetics Consortium ([International Multiple Sclerosis Genetics Consortium – MSGC](#)) and partners and work package leader (Harbo) in Multiple MS ([Home - MultipleMS](#)), an EU Horizon 2020 project.

In the **MultipleMS** ([Home - MultipleMS](#)), Prof. Hanne F. Harbo is PI and work package leader. The consortium has more than 20 academic partners and aims at develop novel personalized medicine approaches for MS patients. We are working actively in the MRI working group to be a part of the ongoing and future imaging work related to this project.

**NOR-MS** (<https://www.ous-research.no/nor-ms>): an ongoing national randomized controlled trail to compare the effect of the off-label drug rituximab against cladribine for use in relapsing remitting MS patients.

**OVERLORD-MS** (<https://helse-bergen.no/kliniske-studier/okrelizumab-versus-rituksimab-som-behandling-for-tidlig-attakvis-multippel-sklerose-overlord-ms>): an ongoing national randomized controlled trail to compare the use of two anti-CD20 drugs (ocrelizumab and rituximab) for newly diagnosed patients with MS. We are the MRI reading center and running the advanced MRI analyses in this project.

**MAGNIMS Consortium** (<https://www.magnims.eu>): We are leading a project investigating multishell diffusion weighted imaging in MS in normal appearing white matter and in lesions. In addition, we are contributing to several ongoing and previous projects.

- Synne Brune: PhD fellow: MRI and Neurofilament as biomarkers in Multiple sclerosis. Supervisor: Hanne F Harbo, Co supervisors: Mona K Beyer and Pål Berg-Hansen
- Lars L Skattebøl, PhD fellow: Advanced MRI in the clinical study NOR-MS. Supervisors Gro Nygaard, Einar A. Høgestøl, Hanne F Harbo
- Hanne F. Harbo, Steffan D. Bos, Pål Berg-Hansen, Tone Berge, Elisabeth G Celius Mona Beyer, Einar A. Høgestøl, Synne Brune, Goran Petrovski, Dragana Drobnjak Nes, Sigrid Aune de Rodez Benavent: MultipleMS - partner in EU Horizon 2020-project (Harbo Oslo PI)
- Hanne F. Harbo, Einar A. Høgestøl, Sigrid de Rodez Benavent, Steffan Bos, Tone Berge, Synne Brune, Elisabeth G Celius, Mona Beyer: Sys4MS- Biotek 2021/NFR Project. (Harbo Oslo PI)
- Einar A. Høgestøl, Hanne F. Harbo and others: Brain age in MS with Tobias Granberg, Karolinska Institute, Sweden
- Einar A. Høgestøl, Hanne F. Harbo, Elisabeth Celius, Piotr Sowa, Mona K Beyer: MAGNIMS collaboration on various MRI projects
- Einar A. Høgestøl, Hanne F. Harbo, Elisabeth Celius, Piotr Sowa, Mona K Beyer: NORMENT collaboration on various MRI projects
- Gro O. Nygaard, Hanne F Harbo, Einar A. Høgestøl and more: NOR-MS. Norwegian multicenter study of cladribine and rituximab (NOR-MS)





- Gro O. Nygaard, Einar Høgestøl, Lars L Skattebøl, Piotr Sowa, Hanne F Harbo, Kristin Wesnes (St Olavs Hospital): 7T MRI in NOR-MS
- Gro O. Nygaard, Rigmor Lundby, Einar A. Høgestøl, Mathias Øverås, Hanne F. Harbo: OVERLORD-MS

## Most important national and international collaborators

### National

- Mona K. Beyer, Rigmor Lundby, Piotr Sowa, Atle Bjørnerud and Bradley MacIntosh, Div. of Radiology and Nuclear Med., OUH
- Lars Westlye and Nils Inge Landrø, Dept of Psychology, UiO
- Ole A. Andreassen, Lars T. Westlye, Tobias Kaufmann, Torbjørn Elvsåshagen, Ivan Maximov, Dag Alnæs, Esten Leonardsen, NORMENT, OUH/UiO
- Øivind Torkildsen, Stig Wergeland, Kjell-Morten Myhr and Jan Harald Aarseth, Haukeland University Hospital
- Geir Ringstad, Per Kristian Eide and Erik Melin, Div. of Radiology and Nuclear Med., OUH

### International

- Ingrid Kockum, on behalf of the MultipleMS consortium
- Mara Rocca, Christina Einzinger, Frederik Barkhof, on behalf of the MAGNIMS consortium
- Pablo Villoslada, Hospital Clinic of Barcelona, Spain, on behalf of the Sys4MS
- Tobias Granberg, Fredrick Piehl, Karolinska Institute, Stockholm, Sweden
- Hanneke Hulst, Leiden University, Netherlands
- 

## Funding

- South-Eastern Norway Regional Health Authority
- The Research Council of Norway
- University of Oslo
- European Commission: EU Horizon 2020
- European Commission/The Research Council of Norway: Sys4MS - Biotek 2021
- South-Eastern Norway Regional Health Authority grant
- Unrestricted research grants from Novartis, Biogen, Sanofi Genzyme, Merck
- Odd Fellow Foundation, Forsberg and Aulie, Ingrid and Fritz Nilsen, UNIFOR
- Oslo MS Foundation







## Scientific production of the research group in 2022

Peer reviewed original research articles: 7

### Selected publications:

Rise Henning H., Brune Synne, Chien Claudia, Berge Tone, Bos Steffan D., Andorrà Magí, Valdeolivas Irene Pulido, Beyer Mona K., Sowa Piotr, Scheel Michael, Brandt Alexander U., Asseyer Susanna, Blennow Kaj, Pedersen Mads L., Zetterberg, Henrik de Schotten, Michel Thiebaut Cellerino, Maria Uccelli, Antonio Paul Friedemann, Villoslada Pablo, Harbo Hanne F., Westlye Lars T., Høgestøl Einar A  
*“Brain disconnectome mapping derived from white matter lesions and serum neurofilament light levels in multiple sclerosis: A longitudinal multicenter study”*

NeuroImage: Clinical, Volume 35, 2022, 103099, ISSN 2213-1582,

<https://doi.org/10.1016/j.nicl.2022.103099>.

Esten H. Leonardsen, Han Peng, Tobias Kaufmann, Ingrid Agartz, Ole A. Andreassen, Elisabeth Gulowsen Celius, Thomas Espeseth, Hanne F. Harbo, Einar A. Høgestøl, Ann-Marie de Lange, Andre F. Marquand, Didac Vidal-Piñero, James M. Roe, Geir Selbæk, Øystein Sørensen, Stephen M. Smith, Lars T. Westlye, Thomas Wolfers, Yunpeng Wang,

*“Deep neural networks learn general and clinically relevant representations of the ageing brain”*

NeuroImage, Volume 256, 2022, 119210, ISSN 1053-8119,

<https://doi.org/10.1016/j.neuroimage.2022.119210>

Høgestøl EA, Ghezzi S, Nygaard GO, Espeseth T, Sowa P, Beyer MK, Harbo HF, Westlye LT, Hulst HE, Alnæs D.

*“Functional connectivity in multiple sclerosis modelled as connectome stability: A 5-year follow-up study”*

Mult Scler. 2022 Apr;28(4):532-540. doi: 10.1177/13524585211030212. PMID: 34259578; PMCID: PMC8961247.

DOI: <https://doi.org/10.1177/13524585211030212>

### Presentations at international congresses:

EAN, Vienna, 2022: Høgestøl – *“Brain age estimation by machine learning outperforms brain parenchymal fraction as imaging marker in multiple sclerosis”*, Winner EAN Tournament Finals, Basic Science. Skattebøl – *“Brain Age in Multiple Sclerosis: A comparison of traditional machine learning and deep learning models”*, Oral Presentation.

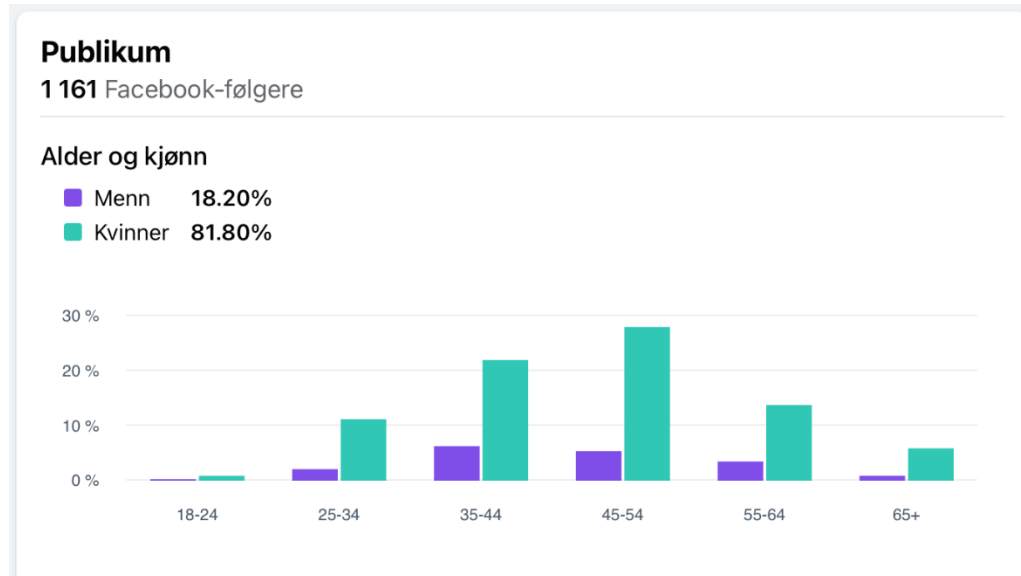
ECTRIMS, Amsterdam, 2022: Høgestøl – *“Cognitive impairment in MS: what can be done?”*, Sanofi seminar with Professor Hulst. Skattebøl: *“Brain Age in Multiple Sclerosis: A comparison between machine learning and deep learning models”*, Oral Presentation

Forskningsdagene, 28/9-2022: Høgestøl - *“Hold hjernen din ung!»* In collaboration with Hjernerådet and NORMENT (Irene Voldsbekk) at Litteraturhuset.





Social Media: Facebook: «Multippel Sklerose Forskningsgruppen Oslo»



## Multiple Sclerosis (MS) – Molecular and immunological studies



### Group Leaders

Tone Berge, Head of Section, Neuroscience Research Unit, Dept. of Research and Innovation, Div. of Clinical Neuroscience, OUH (tone.berge@ous-research.no/ tonebe@ous-hf.no) and Professor, OsloMet



Hanne Flinstad Harbo, Professor and Consultant of Neurology (MD/PhD/MHA), UiO (h.f.harbo@medisin.uio.no) and Dept. of Neurology, OUH (uxhahb@ouf-hf.no)

### Group members

- Chiara Cappelletti (MSc), PhD fellow OsloMet and Engineer OUH
- Synne Brune-Engelbreiten (MD), PhD fellow UiO and Consultant of neurology OUH
- Mathias H. Øverås (MD), PhD fellow UiO, Dept of Neurology, OUH
- Bachelor students, OsloMet; Sophie Alseen, Yngvild Thronsen Bondvik, Solveig Cristina Hernandez Vråle and Patrycja Gabrychowicz
- Daniel Rinker (PhD), post doc OUS and UiO

### Associate members\*

- Gro O. Nygaard (MD, PhD), Researcher and Consultant of Neurology, OUH
- Elisabeth Gulowsen Celius (MD, PhD), Professor UiO, Consultant of Neurology OUH
- Einar August Høgestøl (MD, PhD), Researcher OUH, Associate Professor UiO
- Steffan D. Bos (Msc, PhD), Researcher Cancer Registry of Norway
- Ina S. Brorson (Msc, PhD), Post doc, UiO
- Linda M. Pedersen (Msc, PhD), researcher OUH, Associate Professor OsloMet
- Sandra Pilar Henriksen (Msc), Engineer OUH
- Martine Mesel Isom (Msc), PhD fellow UiO/OUH

\*There is considerable overlap between the different MS research groups and most participants are members of more than one group

### Research profile and aims

The molecular and immunological MS studies research group aims to identify and characterize genes and biological pathways important for MS disease onset, progression and treatment response. By performing molecular studies in selected immune cells, we aim at contributing to understand the biological significance behind MS susceptibility genes identified through global “omics” approaches. Additionally, we aim at identifying novel biomarkers, which in the future will guide the clinicians in the follow-up of people with MS, being an important step towards precision medicine.



## Ongoing projects

- epiNOR-MS: Identification of epigenetic biomarkers for treatment response in Multiple Sclerosis - implications for precision medicine
- An advanced study of Multiple Sclerosis and Parkinson's Disease big-data to identify molecular mechanisms for disease risk
- An advanced study of Multiple Sclerosis and Parkinson's Disease big-data to identify molecular mechanisms for disease risk
- Proteomic approaches to identify dysregulation of T cells in MS
- Neurofilament as an MS disease marker
- Multiple sclerosis and aging – a real world, population-based cohort study
- MultipleMS – an EU project led by Karolinska Institute in Stockholm – aim at developing novel personalized medicine approaches for MS patients, Harbo is work package leader.
- International MS Genetics Consortium, aiming at identifying genomic components increasing the risk for disease onset and progression.

## Most important national and international collaborators

### National

- Mathias Toft, Dept of Neurology, UiO/OUH
- John Anker Zwart, FOU OUH/UiO
- Frode Berven, University of Bergen
- Hans-Christian Aas, Core Facility for Flow cytometry, OUH
- Kristina Gervin, FOU OUH
- Kaja Selmer, FOU OUH
- Cecilia Smith Simonsen, Vestre Viken Hospital, Drammen
- Mona Beyer, Neuroradiology, OUH
- Randi Eikeland, University of Agder and Sørlandet Hospital
- Åslaug Lorentzen, Sørlandet Hospital

### International

- Pablo Villoslada, Hospital Clinic of Barcelona, Spain
- Stephen Sawcer, University of Cambridge, UK
- Kaj Blennow and Henrik Zetterberg, Sahlgrenska University Hospital, Gothenburg, Sweden
- Ingrid Kockum and Maja Jagodic, Karolinska Institute, Stockholm, Sweden
- An Goris, on behalf of the International MS Genetics Consortium
- Lisa Barcellos, University of California, Berkeley, US

## Funding

- South-Eastern Norway Regional Health Authority
- EU horizon 2020, MultipleMS
- University of Oslo
- Oslo University Hospital
- OsloMet
- Odd Fellow Foundation
- Oslo MS foundation
- Halvor Høies fond





## Scientific production of the research group in 2022

Peer reviewed original research articles: 12

### Selected publications:

Brune, S., Høgestøl, E. A., de Rodez Benavent, S. A., Berg-Hansen, P., Beyer, M. K., Leikfoss, I. S., Bos, S. D., Sowa, P., Brunborg, C., Andora, M., Valdeolivas, I. P., Asseyer, S., Brandt, A., Chien, C., Scheel, M., Blennow, K., Zetterberg, H., Kerlero de Rosbo, N., Paul, F., Uccelli, A., Villoslada, P., Berge, T., Harbo, H. F. "Serum neurofilament light chain concentration predicts disease progression in multiple sclerosis" *Mult Scler.* 2022; 28(12):1859-1970. doi: 10.1177/13524585221097296.

Cappelletti C., Eriksson A., Brorson I.S., Leikfoss I.S., Kråbøl O., Høgestøl E.A., Vitelli V., Mjaavatten O., Harbo H.F., Berven F., Bos S.D., Berge T.

"Quantitative proteomics reveals protein dysregulation during T cell activation in multiple sclerosis patients compared to healthy controls"

*Clin Proteomics.* 2022 Jul 5;19(1):23. doi: 10.1186/s12014-022-09361-1.

Brorson, I.S., Eriksson, A.M., Høgestøl, E., Leikfoss, I.S., Harbo, H.F., Berge, T., Vitelli, V., Bos, S.D.

"Global DNA methylation changes in treated and untreated MS patients measured over time"

*J Neuroimmunol.* 2022 Jan 7;364:577808. doi: 10.1016/j.jneuroim.2022.577808.

### Other publications

MultipleMS: WP5 - D5.2: Report all results of immunophenotyping - *Immune Profiling Report*, 21<sup>st</sup> December 2022

Prof. An Goris, Dr Sinéad Moylett; Laboratory of Neuroimmunology, KU Leuven; Prof. Stephanie Humblet-Baron, Julika Neumann; Adaptive Immunology, KU Leuven; Prof. Tone Berge; Neuroscience Research Unit, Oslo University Hospital; Dr Nicolas Ruffin; Neuroscience, Karolinska Institutet

Bachelor thesis (20 ECTS), in Norwegian:

*Molekylære mekanismer ved multippel sklerose.*

Sophie Alseen, Yngvild Throndsen Bondvik

*Nevrovax – immunrespons etter vaksinerings hos personer med multippel sklerose*

Solveig Cristina Hernandez Vråle, Patrycja Gabrychowicz

Social Media;

Facebook: «Multippel Sklerose Forskningsgruppen Oslo»

Twitter: FOU Nevrokliniken @FOU\_Nevroclin



## Brain plasticity and neuropsychiatry



### Group Leader

Torbjørn Elvsåshagen; MD., PhD, Researcher; Department of Neurology, OUH (telvsaha@ous-hf.no) and Norwegian Centre for Mental Disorders Research (NORMENT), UiO (torbjorn.elvsashagen@medisin.uio.no)

### Group Members

- Erlend Bøen; MD., PhD.; Diakonhjemmet Hospital
- Britta Bürker; MD., PhD.; OUH/UiO
- Guro Dunvoll; M.Sc., PhD. research fellow; OUH/UiO/OsloMet
- Torfinn Hynnekleiv; MD.; OUH and Innlandet Hospital Trust
- Katalin Juhasz; MD.; Akershus University Hospital
- Eva A. Malt; MD., PhD.; Assoc. professor; Inst. of Clinical Medicine, UiO
- Ulrik F. Malt; MD., PhD.; Professor emeritus; Inst. of Clinical Medicine, UiO
- Kåre Osnes; MD., PhD.; Diakonhjemmet Hospital
- Torunn Søyseth; M.Sc.; OUH
- Mathias Valstad; M.Sc., PhD. research fellow; OUH/UiO
- Nathalia Zak; MD., PhD.; OUH
- Verónica Mäki-Marttunen; PhD.; OUH
- Astrid Gjerdrum Hornslien

### Associated Group Members

- Stein Andersson; PhD., Professor; Dept of Psychology, UiO
- Atle Bjørnerud; PhD., Professor; OUH
- Birgitte Boye; MD., PhD., Professor; Inst. of Basic Medical Sciences, UiO
- Torgeir Moberget; PhD., Postdoc; OUH
- Elena Kondratskaya; M.Sc., PhD.; OUH
- Nina Bang; M.Sc., PhD. research fellow; NTNU

### Research profile and aims

Our group conducts research in the fields of adult brain plasticity and neuropsychiatry. Plasticity – the capacity for change – is increasingly recognized as an intrinsic property of the adult brain and may play important roles in the etiologies and treatments of neurological and psychiatric illnesses. Neuropsychiatry recognizes that the brain and mind are one, that mental illnesses are disorders of the brain, and that psychiatric symptoms are commonly found in neurological disorders. One important goal of neuropsychiatric research is to bridge the gap between neurology and psychiatry.

Among the main aims of our current research are:

- To examine whether structural and functional brain plasticity are core characteristics of the human sleep-wake cycle
- To increase our understanding of how novel schizophrenia- and bipolar disorder-associated genetic variants affect synaptic function and plasticity
- To examine the role of brainstem and thalamus regions in neuropsychiatric and neurological disorders



## Ongoing projects

- Brainstem and thalamus volumes: genetic architectures and roles in neuropsychiatric and neurological disorders
- Sleep-wake-dependent brain plasticity in health and depression
- Genes, synaptic function, and stem cells in bipolar disorder, schizophrenia, and autism spectrum disorder: from pathophysiology towards personalized medicine
- Brain plasticity and psychobiology in bipolar II disorder and borderline personality disorder
- Studies of genotype-phenotype interactions in the 3q29 microdeletion syndrome
- Neuropsychiatry and coping in heart and lung transplantation
- Non-invasive human LTP-like plasticity – examining robustness, functional significance and clinical utility of a novel biomarker

## Most important national and international collaborators

### National

- Prof. Ole A. Andreassen, NORMENT, UiO/OUH
- Prof. Erik Jönsson, NORMENT, UiO
- Prof. Srdjan Djurovic, NORMENT, UiO
- Ass. prof. Lars T. Westlye and Dr. Tobias Kaufmann, NORMENT, UiO
- Prof. Bjørn Bjorvatn, Norwegian Competence Center for Sleep Disorders, Bergen
- Dr. Stine Knudsen, C. of Exp. For Neurodevelopmental Disorders and Hypersomnias, OUH
- Prof. Gaute Einevoll, NMBU/UiO
- Prof. Gulowsen Celius, Prof. Harbo, Ass. Prof. Høgestøl, dr. Gro Nygaard; MS groups, OUH
- Dr. Marte Wendel-Haga, Vestfold Hospital Trust, Kysthospitalet
- Dr. Sigrid Svalheim and Dr. Line Sveberg, OUH

### International

- ENIGMA groups (Enhancing NeuroImaging Genetics through Meta-Analysis)
- EURONET-SOMA: European Research Network on somatoform disorders; group leader: Prof. Bernd Löwe, Uni Hamburg-Eppendorf, Abt. Für Psychotherapie und Psychosomatische Medizin, Germany
- Ass. prof. Mirjana Maletic-Savatic, Baylor College of Medicine, Houston, USA
- Director Marta Bianciardi, Martinos Center for Biomedical Imaging/Harvard Medical School, USA
- Ass. Prof. David L. Perez, Harvard Medical School, USA

## Funding

- South-Eastern Norway Regional Health Authority
- Norwegian Competence Center for Sleep Disorders
- Oslo University Hospital
- Throne-Holst Foundation
- Ebbe Frøland Foundation





### Research grants in 2022:

South-Eastern Norway Regional Health Authority: *“FuNDamenThal: The Thalamus in Functional Neurological Disorder”*; ~3.6MNOK; PI: Elvsåshagen, T.

## Scientific production of the research group in 2022

Peer reviewed original research articles: 46

### Selected publications:

Voldsbekk I, et al.

*“Evidence for widespread alterations in cortical microstructure after 32 h of sleep deprivation”*

Transl Psychiatry, 2022. 12(1): p. 161.

Brouwer, R.M., et al.

*“Genetic variants associated with longitudinal changes in brain structure across the lifespan”*

Nat Neurosci, 2022. 25(4): p. 421-432.

Abé, C., et al.

*“Longitudinal Structural Brain Changes in Bipolar Disorder: A Multicenter Neuroimaging Study of 1232 Individuals by the ENIGMA Bipolar Disorder Working Group”*

Biol Psychiatry, 2022. 91(6): p. 582-592.





## Cognitive Health Research group (CoHR)



### Group Leader

Ira Ronit Hebold Haraldsen, MD/PhD, OUH (iharaldse@ous-hf.no)

### Group Members

- Vebjørn Anderson, BSc, stud.med., ass. coordinator, OUH
- Lina Plataniti, project manager, OUH
- Catherine Faye, recruitment officer, OUH
- Lone Holmen, technician, OUH
- Christoffer Hatlestad, cand.psychol., Post-doc, OUH
- Thomas Tveitstøl, Phd-candidate, OUH
- Mats Tveter, Phd-candidate, OUH
- Ana Perez, cand. psychol., PhD-candidate, OUH
- Ramesh Upreti, Phd-candidate, OUH
- Rabindra Khadka, PhD-candidate, OUH
- Annette Bondi, researcher, OUH

### Research profile and aims

Our aims include contribution to development of novel and innovative methods for early detection, prevention, diagnostics and treatment of neurological diseases associated with cognitive health issues. Another branch of our research is concerned with environmental and biological factors in gender development, and qualitative research into subjective experiences of adolescence gender dysphoria.

Currently, our focus is primarily centred on development of accessible and next generation AI-models in identifying and estimate dementia in people at risk. Also, the group focus on the development of functional biomarkers of neurodegeneration with the EEG-based functional brain network models with deep learning (DL) and classic machine learning (ML) artificial intelligence methods to identify crucial features of the normal and pathological aging and its changing brain's functional integrity. Furthermore, our group wishes to innovate different predictive algorithms for the prediction of dementia and other neurodevelopmental diseases.

We are an international group of researchers coming from a variety of diverse educational backgrounds, including medicine, psychology, artificial intelligence, mathematics, physics, robotics, and biological science. Our multidisciplinary approach to the brain-behaviour relation unravelling efforts allows us to conduct research across various systems and cognitive levels; from molecules to cells to cognitive systems to behaviours.

Our broad research method portfolio includes: Electrophysiological (EEG) source reconstruction and network modelling; event-related potential (ERP) techniques; positron emission tomography (PET) and radiochemistry; neuropsychological assessment; mathematical algorithm development. Also new focus area includes prediction of health economic models when it comes to introducing DL artificial intelligence-based tools in supportive medical decision making.



## Ongoing projects

- eBRAIN-Health - Digital twins for disease modelling
- eBrain Health Data Cloud – a federated European platform for sensitive data
- AI-Mind – Intelligent digital tools for screening of brain connectivity and dementia risk estimation in people affected by mild cognitive impairment
- GnRH treatment on brain development – an investigation in a human and animal model (CONOS)

## Most important national and international collaborators

### National

- Erik Taubøll, UiO/OUH
- Per Magnus, FHI
- Uta Sailer, UiO
- Mathias Toft, UiO/OUH
- Randi Borgen, OUH
- Beate Rygge, Digital Life Norway
- Klas Pettersen, NORA
- Jan Bjaali, UiO, EBRAINS
- Siv Fjellkårstad, HelseDir
- Harry Hallock, DNV
- Erik Christensen, Prediagnosics
- Tormod Flatby, Ahus
- Anne-Kristin Solbakk, UiO
- Ainar Drews, UiO
- Gard Thomassen, UiO
- Marte Roa Syvertsen, Vestre Viken

### International

- Fernando Maestu, Madrid, Spain
- Paolo Rossini, Rome, Italy
- Camillo Mara, Rome, Italy
- Hanna Renwall, Helsinki, Finland
- Americo Cicchetti, Rome, Italy
- Tim Govers, Radbooud, The Netherlands
- Jeanette Müller, Zurich, Switzerland
- Petra Ritter, Berlin, Germany
- Laura Hughes, Cambridge, UK
- James Rowe, Cambridge, UK
- Hanna Renvall, Helsinki, Finland
- Victor Jirsa, Marseilles, France
- Huifang Wang, Marseilles, France
- Karolina Jarawka, Roche
- Stéphane Epelbaum, Eli Lilly Europe, France
- Andreas Keller, Saarland University, Germany

## Scientific production of the research group in 2022

Peer reviewed original research articles: **18** (indexed in Publika)

### Selected publications:

Hatlestad-Hall C, Rygvold TW, Andersson S (2022)

*“BIDS-structured resting-state electroencephalography (EEG) data extracted from an experimental paradigm”*

Data Brief, 45, 108647

DOI 10.1016/j.dib.2022.108647, PubMed 36425964





Rygvoid TW, Hatlestad-Hall C, Elvsåshagen T, Moberget T, Andersson S (2022)  
*“Long-Term Potentiation-Like Visual Synaptic Plasticity Is Negatively Associated With Self-Reported Symptoms of Depression and Stress in Healthy Adults”*  
Front Hum Neurosci, 16, 867675  
DOI 10.3389/fnhum.2022.867675, PubMed 35601905

Rygvoid TW, Hatlestad-Hall C, Elvsåshagen T, Moberget T, Andersson S (2022)  
*“Long term potentiation-like neural plasticity and performance-based memory function”*  
Neurobiol Learn Mem, 196, 107696  
DOI 10.1016/j.nlm.2022.107696, PubMed 36368635

### Funding

- EU Horizon: HORIZON-INFRA-2021-TECH-01-01
- Horizon 2020: H2020-SC1-BHC-06-2020
- HumanBrainProject: eBrain HealthDataCloud



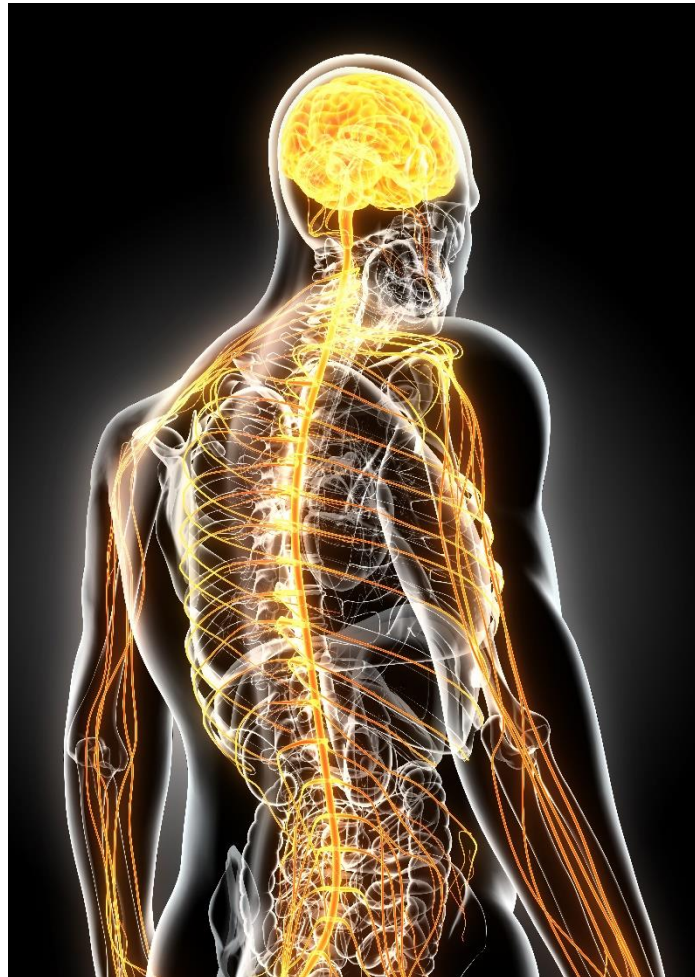
## Department of Research and Innovation

The overarching goal of the Department of Research and Innovation is to help facilitate high quality research across the departments at the Division of Clinical Neuroscience.

There are four sections; the neuroscience research lab, the neuroscience registry and biobank, the research unit for musculoskeletal health (FORMI), which also encompasses patient and public involvement in research and the clinical trial unit which facilitates industry-sponsored clinical trials.

Each unit in the department constitutes a research group.

The Department of Research and Innovation is headed by Professor John Anker Zwart.



## Musculoskeletal health



### Group Leader

Kjersti Storheim, MD/PhD, Professor OsloMet, Head of Section for Research and Communication Unit for Musculoskeletal Health; FORMI, OUH  
(uxskje@ous-hf.no)

### Group members

- Lars Christian Haugli Bråten, MD/Postdoctoral fellow, OUH
- Elisabeth Gjefsen, MD/PhD fellow, OUH
- Margreth Grotle, Professor, OUH/OsloMet
- Ida Løchting, PhD/Postdoctoral fellow, OUH and OsloMet
- Eira Ebbs, Msc/PhD fellow/research coordinator, OUH
- Astrid Lunestad, User representative
- Ingrid Fjeldheim Bånerud, Msc/Administrative, OUH
- Mads Peder Rolfsen, MD/PhD fellow, OUH
- Amy Martinsen, Msc/PhD fellow/Research coordinator, OUH
- Marianne Mørk, Msc/PhD fellow, OUH
- Gøril Brevik Melbye, Msc/Phd fellow, OUH
- Christer Mjåset, MD/PhD fellow, OUH
- Iris Fortes Corona, MSc/Administrative, OUH
- Fiona Aanesen, MSc / Research coordinator, OUH
- Ingrid Heuch, MD/Senior Researcher, OUH
- Synne Øien Stensland, MD/ Senior researcher, OUH and NKVTS
- Maren Hjelle Guddal, PhD fellow, OUH
- Olaf Fjeld, MD/PhD fellow, OUH
- Vibeke Siewers, Research coordinator, OUH
- Helle Stangeland, PhD fellow, NKVTS
- Monica Baumann- Larsen, MD/PhD fellow, OUH
- Ørjan Nesse Vigdal, Msc/PhD fellow, OsloMet
- Maria Dehli Vigeland, PhD fellow, OUH
- John Anker Zwart, Professor, OUH/UiO
- Sverre M Mjølnes, PhD fellow, AHUS
- Christian Hellum, MD/PhD, OUH

### Research profile and aims

The focus of our research group is to generate research-based knowledge which improve the health and care of people who have or are at risk of, musculoskeletal health conditions. Our musculoskeletal health research priorities include clinical trials evaluating effect of treatment for people with musculoskeletal conditions, population health and prevention, registry studies, health literacy and coping, user involvement in research and dissemination. Our research group is multidisciplinary and incorporate a wide range of different methods from epidemiology and randomised placebo-controlled trials to laboratory science and genetics.

## Ongoing projects

### Clinical trials

- BackToBasic; TNF alfa blocker treatment of chronic low-back pain with Modic changes, a randomized double blind multicenter placebo-controlled trial
- The AIM-study (Antibiotics In Modic changes); antibiotic treatment of chronic low-back pain with Modic changes, a randomised double blind multicenter placebo controlled trial
- The NORwegian Degenerative spinal STENosis-trial (the NORDSTEN-study)
- The MI-NAV project: Can Motivational Interviewing facilitate Return-to-Work in sicklisted people with musculoskeletal disorders? A randomised trial within NAV
- The Lumbar Interbody Fusion vs. Multidisciplinary Rehabilitation (LIFEHAB) trial
- Epigenetic and molecular biomarkers in chronic low back pain and Modic changes. A case-control study

### Epidemiology and registry studies

- Childbirth, hormonal factors and low back pain - a prospective epidemiological survey
- Risk factors for anterior cruciate ligament injuries in Norwegian adolescents and young adults: (the ACL/HUNT studies)
- Spinal surgery in Norway. Trends, costs and regional differences
- The Acute Low-Back Pain Study. Clinical, neurophysiological and genetic risk factors
- Back Pain in Elderly (BACE). A prospective cohort study of older people visiting primary care with a new episode of back pain
- Neck surgery in Norway
- Physical activity and sport participation during adolescence and musculoskeletal complaints in adulthood. A population-based cohort study
- Killing pain? Use of analgesic, sedative and anxiolytic medication and the development of psychiatric illness in adolescents ('Vold og helseplager hos ungdom')
- Risk factors for development of chronic pain after hospitalization for acute low back pain and/or sciatica (RUKSAR)

### Mixed methods

- Cross cultural validation of outcome measurement tool and evaluation of treatment options for patients with plantar fasciopathy
- Illness perceptions and coping with chronic illness
- People with intellectual disabilities and vulnerabilities for harmful sexual behavior and abuse
- Applying Artificial Intelligence in Developing Personalized and Sustainable Healthcare for Spinal Disorders (AID-Spine)
- Nothing About Us Without Us: Research Priorities from Patients with musculoskeletal diseases - A James Lind Alliance project for Public and Patient Involvement (PPI)



## Most important national and international collaborators

### National

- UiO and OUH: Div. of Orthopaedic surgery; Christian Hellum, Mads P Rolfsen, Dept of Clinical Neurophysiology; Kristian Bernhard Nilsen, Dept of Physical Med. and Rehab.; Jens Ivar Brox, Elina Skirstad, Dept of Clinical Microbiology; Karianne Gammelsrud, Dept of Medical Genetics; Benedicte A Lie, Norw. Center for Violence and Traumatic Stress Studies; Grete Dyb, Helene Aakvaag
- UiB and Haukeland University Hospital: Ansgar Espeland, Ivar Austevoll, Per M Kristoffersen, Kari Indrekvam, Frode Rekeland, Magnhild Dagestad, Jan Sture Skouen, Thomas E Kadar, Jörg Assmus
- NTNU and St. Olav Hospital: Gunn Hege Marchand, Øystein P Nygaard
- UiS and Stavanger University Hospital: Clemens Weber, Eric Franssen
- The Arctic University of Norway and University Hospital of North Norway: Tore Solberg, Gunnstein Bakland
- OsloMet: Britt Elin Øiestad, Anne Therese Tveter, Tarjei Rysstad, Alexander Tingulstad, Rikke M Killingmo, Henriette Jahre, Bjørnar Berg, Per Solvang, Kaja Smedbråten
- Norwegian Institute of Public Health: Andrew Garratt, Karin Magnusson, Svetlana Skurtveit
- REMEDY, Diakonhjemmet Hospital: collaborators in WP7
- Østfold Hospital Trust: Anne J Haugen, Lars Grøvle
- Møre and Romsdal Hospital Trust, Ålesund: Erland Hermansen, Jørn Aarøen
- Akershus University Hospital: Oliver Grundnes
- Ryggforeningen i Norge: Thor Einar Holmgard, Inger Ljøstad
- Rådet for muskelskjeletthelse

### International

- Sahlgrenska Academy, Sweden; Helena Brisby
- Linköping University, Sweden; Allan Abbott
- University of Southern Denmark, Denmark; Jan Hartvigsen, Stine Clausen
- University of Oulu, Finland; Jaro Karppinen
- University of Sydney, Australia; Chris Maher
- Monash University, Australia; Rachel Buchbinder
- Erasmus MC, Rotterdam, the Netherlands; Bart Koes, Alessandro Chiarotto
- Vrije Universiteit, Amsterdam, the Netherlands; Raymond Ostelo, Mauritz van Tulder
- The Disc 4All consortium





## Funding

- South-Eastern Norway Regional Health Authority
- The Research Council of Norway
- Foundation Dam
- Sophies Minde Foundation
- OUH

## Scientific production of the research group in 2022

Peer reviewed original research articles: 21

### Selected publications:

Vigdal ØN, Storheim K, Killingmo RM, Småstuen MC, Grotle M

*“The one-year clinical course of back-related disability and the prognostic value of comorbidity among older adults with back pain in primary care”*

Pain. 2022 Sep 8. doi: 10.1097

Hermansen E, Austevoll IM, Hellum C, Storheim K, Myklebust TÅ, Aaen J, Banitalebi H, Anvar M, Rekeland F, Brox JI, Franssen E, Weber C, Solberg TK, Furunes H, Grundnes O, Brisby H, Indrekvam K  
*“Comparison of 3 Different Minimally Invasive Surgical Techniques for Lumbar Spinal Stenosis: A Randomized Clinical Trial”*

JAMA Netw Open. 2022 Mar 1;5(3):e224291

Kristoffersen PM, Vetti N, Grøvle L, Brox JI, Haugli Bråten LC, Grotle M, Julsrud Haugen A, Rolfsen MP, Froholdt A, Skouen JS, Lutro O, Marchand GH, Anke A, Zwart JA, Storheim K, Assmus J, Espeland A.

*“Amoxicillin Did Not Reduce Modic Change Edema in Patients With Chronic Low Back Pain: Subgroup Analyses of a Randomised Trial (the AIM Study)”*

Spine (Phila Pa 1976). 2023 Feb 1;48(3):147-154





## Headache and pain



### Group Leader

Bendik Slagsvold Winsvold, MD/PhD, Senior Researcher and Consultant Neurology,  
OUH (uxwinb@ous-hf.no)

### Group members

- Amy Martinsen, PhD fellow/Research coordinator, OUH
- Helene Engstrand Lier, PhD fellow, OUH
- Marie Bengtson Agren, PhD fellow, OUH
- Sigrid Børte, PhD, OUH
- John Anker Zwart, MD/PhD, OUH/UiO
- Espen Saxhaug Kristoffersen, MD/PhD, Associate professor, UiO

### Research profile and aims

Our research group works to improve the understanding and treatment of headache and pain disorders. Specific focus areas are headache and pain genomics, epidemiology and clinical treatment trials. Our work is highly interdisciplinary, and are based on collaboration between experts in clinical medicine, physiotherapy, mathematics, genetics and molecular biology.

### Ongoing projects

- Norwegian Centre for Headache Research – NorHEAD ([www.ntnu.edu/norhead](http://www.ntnu.edu/norhead))
- HUNT All-In Neuropsychiatry
- Decipher mechanisms and improve the treatment of chronic pain through large-scale genetic analysis (DecipherPain)
- Environmental and genetic causes of migraine in children and adolescents
- Headache biomarkers
- Genetic and environmental causes of migraine, a large-scale family-based analysis
- Genetic aspects of chronic low back pain and its comorbidities
- Familial Hemiplegic Migraine in Norway
- Translating molecular insights into improved treatment for headache disorders



## Most important national and international collaborators

### National

- UiO and OUH: Psychosis Research Center; Prof. Ole Andreassen, Dept of Clinical Neurophysiology; Kristian Bernhard Nilsen, Norw. Center for Violence and Traumatic Stress Studies; Prof. Grete Dyb
- NTNU and St. Olav's Hospital: NorHEAD: Erling A Tronvik; K.G. Jepsen Center of Genetic Epidemiology: Prof. Kristian Hveem;
- Dept of Public Health: Prof. Egil A. Fors, Prof. Paul Jarle Mork, Prof. Johan Håkon Bjørngaard
- UiO, Bergen: Marte Helene Bjørk
- Norwegian Institute of Public Health: Prof. Christopher Nielsen
- University Hospital of North Norway: Dept of Neurosurgery; Tore Solberg

### International

- Leiden University Medical Center, Dpt's of Human Genetics and Neurology, the Netherlands; Prof. Arn van den Maagdenberg, Gisela Terwindt
- Karolinska Institute, Dept. of Neuroscience, Sweden; Prof. Andrea Belin
- University of Michigan, Dept. of Computational Medicine, USA, Prof. Cristen Willer
- Broad Institute of MIT and Harvard, the Stanley Center, USA; Prof Aarno Palotie, Prof Karestan Koenen
- King's College London, Institute of Neurology, UK; Prof Henry Houlden, Manjit Matharu
- Institute for Molecular Medicine Finland; Prof. Maija Wessman, Matti Pirinen
- Queensland University of Technology, Australia; Prof. Dale Nyholt
- Danish Headache Center, Denmark; Thomas Folkman Hansen
- Vall d'Hebron University Hospital and Quirón Hospital, Dept of Neurology, Spain; Dr. Patricia Pozo Rosich
- Mc Gill University, Canada; Prof. Luda Diatchenko
- Université de Bordeaux, France; Prof. Stephanie Debette

### Consortium participations

- CCG - International Consortium for Cluster Headache Genetics ([www.clusterheadachegenetics.org](http://www.clusterheadachegenetics.org))
- IHGC - International Headache Genetics Consortium ([www.headachegenetics.org](http://www.headachegenetics.org))
- GO - Genetics of Osteoarthritis ([www.genetics-osteoarthritis.com](http://www.genetics-osteoarthritis.com))
- GSCAN - GWAS & Sequencing Consortium of Alcohol and Nicotine use ([gscan.sph.umich.edu](http://gscan.sph.umich.edu))
- CHARGE consortium ([www.chargeconsortium.com](http://www.chargeconsortium.com))
- SSGAC - Social Science Genetic Association Consortium ([www.thessgac.org](http://www.thessgac.org))
- PGC - Psychiatric Genetics Consortium; PTSD Workgroup ([www.med.unc.edu/pgc](http://www.med.unc.edu/pgc))
- PGC - Psychiatric Genetics Consortium; Alzheimer's disease Workgroup ([www.med.unc.edu/pgc](http://www.med.unc.edu/pgc))
- PGC - Psychiatric Genetics Consortium; Bipolar Disorder Workgroup ([www.med.unc.edu/pgc](http://www.med.unc.edu/pgc))
- PGC - Psychiatric Genetics Consortium; OCD & Tourette Workgroup ([www.med.unc.edu/pgc](http://www.med.unc.edu/pgc))
- PGC - Psychiatric Genetics Consortium; ADHD Workgroup ([www.med.unc.edu/pgc](http://www.med.unc.edu/pgc))
- PGC - Psychiatric Genetics Consortium; Major depressive disorder Workgroup ([www.med.unc.edu/pgc](http://www.med.unc.edu/pgc))
- PGC - Psychiatric Genetics Consortium; Anxiety Workgroup ([www.med.unc.edu/pgc](http://www.med.unc.edu/pgc))
- PGC - Psychiatric Genetics Consortium; Alzheimer's Disease Workgroup ([www.med.unc.edu/pgc](http://www.med.unc.edu/pgc))
- PGC - Psychiatric Genetics Consortium; ADHD Workgroup ([www.med.unc.edu/pgc](http://www.med.unc.edu/pgc))



## Ongoing clinical trials

- Interventional, randomized, double-blind, parallel-group, placebo-controlled study of add-on eptinezumab treatment to brief educational intervention for the preventive treatment of migraine in patients with dual diagnosis of migraine and medication overuse headache. EudraCT Number 2021-003049-40. Role: Local PI. Sponsor institution: H. Lundbeck A/S
- CandMig 3 Study - Candesartan for migraine prevention: A multicentre, binational, triple blind, placebo controlled, parallel group study of two doses of candesartan (8 and 16 mg). EudraCT Number 2019-003386-18. Role: Local PI. Sponsor institution: St. Olav's Hospital, Trondheim
- MiBlock Study - Botulinum toxin type A blockade of the sphenopalatine ganglion in treatment-refractory chronic migraine: A randomized, placebo-controlled, triple-blind (blinded statistician), multicentre, parallel group proof-of-concept, phase 3 study. EudraCT Number 2018-004053-24. Role: Sub-PI. Sponsor institution: St. Olav's Hospital and NTNU, Trondheim
- AIM Study - Efficacy of antibiotic treatment in patients with chronic low back pain and Modic changes: A double blind, randomised, placebo controlled, multicentre trial Role: Sub-PI. Sponsor institution: OUH

### Funding

- South-Eastern Norway Regional Health Authority
- The Research Council of Norway
- OUH

## Scientific production of the research group in 2022

**Peer reviewed original research articles: 12**

### Selected publications:

Hautakangas H, Winsvold BS, Ruotsalainen SE, Bjornsdottir G, Harder AVE, Kogelman LJA, Thomas LF, Noordam R et.al.

*"Genome-wide analysis of 102,084 migraine cases identifies 123 risk loci and subtype-specific risk alleles"*

Nat Genet 2022

Mishra A, Malik R, Hachiya T, Jürgenson T, Namba S, Posner DC, Kamanu FK, Koido M, Le Grand Q, Shi M, He Y, Georgakis MK, Caro I, Krebs K, Liaw YC, Vaura FC, Lin K, Winsvold BS et.al.

*"Stroke genetics informs drug discovery and risk prediction across ancestries"*

Nature 2022

Saunders GRB, Wang X, Chen F, Jang SK, Liu M, Wang C, Gao S, Jiang Y, Khunsriraksakul C, Otto JM, Addison C, Akiyama M, Albert CM, Aliev F, Alonso A, Arnett DK, Ashley-Koch AE et.al

*"Genetic diversity fuels gene discovery for tobacco and alcohol use"*

Nature 2022 612(7941), 720-724.

## Neurogenetics research group



### Group Leader

Kaja Selmer, MD/PhD, Scientist, OUH (k.k.selmer@medisin.uio.no)

### Group members

- Kristina Gervin, Senior scientist, OUH
- Sigrid Pedersen, PhD fellow, OUH
- Fridny Heimisdottir, PhD fellow, OUH
- Amrinder Singh, Post-doc, OUH
- Inger-Lise Mero, MD, PhD, OUH
- Emilie Willoch Olstad, PhD fellow, UiO
- Mathilde Minet Kinge-Rasmussen, MD, PhD fellow, OUH
- Ying Sheng, PhD, Bioinformatician, OUH
- Siri Lynne Rydning, MD, PhD, OUH
- Jeanette Koht, MD, PhD, OUH
- Chantal Tallaksen, MD, Prof. Emeritus, UiO/OUH
- Iselin Wedding, MD, PhD, OUH
- Magnus D. Vigeland, Mathematician, OUH

### Research profile and aims

The aim of the group is to identify and characterize the underlying causes, biomarkers and predictors of neurological disease, with a focus on epilepsy, movement disorders, and musculoskeletal disease and pain. With the access to detailed clinical and molecular data from clinical trials and large population databases, we aim to translate our results into knowledge enabling personalized treatment for the patients.

### Ongoing projects

- TeraEpi: Teratogenicity of anti-seizure medication: the roles of epigenetics and folic acid supplements
- Epilepsy in Children: The Impact of the Gut Microbiota and Epigenetics in Successful Dietary Treatment
- FORCE: Focal Refractory Childhood Epilepsy - A study of surgical treatment in Norway – aetiology and prognostic factors
- Pharmacokinetic interactions between ketogenic diet and anti-epileptic drugs in children
- Dietary treatment of adult patients with epilepsy
- BIOJUME: Biology of Juvenile Myoclonic Epilepsy. Genetics and epigenetics of juvenile myoclonic epilepsy
- Clinical and molecular characterization of hereditary ataxia and hereditary spastic paraplegia
- Translational pharmaco-omics: A system biology approach to identify underlying mechanisms of variation treatment response in neurological disease



- PharmaTOX: The PharmaTox Strategic Research Initiative aims to generate novel insight on effects of pharmaceuticals on human neurotoxicity and neurodevelopment
- NorEpiNet: Nordic network for personalized treatment of epilepsy
- ReMeDy: Center for Rheumatic and Musculoskeletal Diseases

## Most important national and international collaborators

### National

- Bergen epilepsy research group; BERG
- Complex epilepsy research group
- National Centre for Rare Epilepsy-Related Disorders
- Epilepsi research group in Oslo; ERGO
- Dept. of Microbiology, OUH/UiO
- NervOUS1, neuropediatric research group
- National Advisory Unit on Rare Disorders, OUH
- Patient organizations: Norsk epilepsiforbund; Norsk forening for arvelig spastisk paraparese og ataksi; Rådet for muskelskjeletthelse
- Diakonhjemmet Hospital

### International

- Bristol University, UK
- Filadelfia epilepsy hospital, Denmark
- University College London, UCL, UK
- The BIOJUME consortium
- The SPATAX network

## Funding

- The Research Council of Norway
- Novo Nordic Foundation
- DAM Foundation
- The National Advisory Unit on Rare Disorders
- Barnestifelsen, OUH
- Norsk Epilepsiselskap
- Epilepsiforbundet
- South-Eastern Norway Regional Health Authority

## Scientific production of the research group in 2022

Peer reviewed original research articles: 14

### Selected publications:

Olstad EW, Nordeng HME, Gervin K.

*“Prenatal medication exposure and epigenetic outcomes: a systematic literature review and recommendations for prenatal pharmacoepigenetic studies”*

Epigenetics. 2022 Apr;17(4):357-380. doi: 10.1080/15592294.2021.1903376. Epub 2021 Apr 29. PMID: 33926354; PMCID: PMC8993058.





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Pedersen S, Kverneland M, Nakken KO, Rudi K, Iversen PO, Gervin K, Selmer KK

*“Genome-wide decrease in DNA methylation in adults with epilepsy treated with modified ketogenic diet: A prospective study”*

Epilepsia. 2022 Sep;63(9):2413-2426. doi: 10.1111/epi.17351. Epub 2022 Jul 10. PMID: 35762681; PMCID: PMC9796519.

Herrenbrueck I, Mero IL, Rummel J, Chebib M, Møller RS, Ahring PK

*“Gain-of-function and loss-of-function GABRB3 variants lead to distinct clinical phenotypes in patients with developmental and epileptic encephalopathies”*

Nat Commun. 2022 Apr 5;13(1):1822. doi: 10.1038/s41467-022-29280-x. PMID: 35383156; PMCID: PMC8983652.



## Research group for applied neurophysiology



### Group Leader

Kristian Bernhard Nilsen, MD/PhD, Consultant Clinical  
Neurophysiologist, OUH (kristian.bernhard.nilsen@ous-hf.no)

### Group members

- Inge Petter Kleggetveit, MD/Postdoctoral fellow, OUH
- Daniel Gregor Schulze, MD/PhD fellow, OUH
- Line Bedos Ulvin, MD/Phd fellow, OUH
- Marie Udneseter Lie, Msc/PhD fellow, OUH
- Øystein Dunker, Msc/PhD fellow, OUH
- Sara Maria Allen, Msc, OUH
- Jørn Klepp Thorgersen, Msc, OUH
- Elena Petriu, Msc, OUH
- John Anker Zwart, MD, professor in Neurology

### Research profile and aims

Our ambition is to better patient care through increased understanding of the nervous system. We will take the lead within method development and application of new methods in clinical neurophysiology.

We are currently involved in both basic research, clinical trials and innovation projects at Department of Neurology and Department of Research and Innovation, both in the Neuroscience Clinic at OUH/UiO.

We write about neuroscience in our research blog - Nevroglimt (in Norwegian)

### Ongoing projects

-with group leader as PI

- Neurological home hospital (innovation project)
- Exploring the genetics of neuropathic pain
- Clinical and neurophysiological aspects of peripheral neuropathies
- Motor neurons – can they be counted?
- Digital gold mining in hospital data: Extrapolating neurophysiological reference values from historical records



## Most important national and international collaborators

### National

- Stavanger University Hospital;  
Marie Bu Kvaløy
- Haukeland University Hospital, Bergen;  
Tom Eichele
- NTNU/St. Olav's University Hospital,  
Trondheim;  
Petter Moe Omland
- University Hospital of North Norway;  
Sissel Løseth
- Diakonhjemmet Hospital;  
Hilde Berner Hammer, Ulf Sundin
- The National Institute of Occupational  
Health in Norway; STAMI;  
Dagfinn Matre

### International

- University of Oxford, UK;  
David Bennett
- Aarhus University Hospital, Denmark;  
Hatice Tankisi
- David Geffen School of Medicine at UCLA - Los  
Angeles, USA;  
Joe Jabre
- Leiden University Medical Center;  
Martijn Tannemaat

## Funding

- South-Eastern Norway Regional Health Authority
- The Research Council of Norway
- The Norwegian Childhood Cancer Society
- The Norwegian Medical Association
- Kvanes legat

## Scientific production of the research group in 2022

Peer reviewed original research articles: 11

### Selected publications:

Andries A, Ørstavik K, Rueegg CS, Eng S, Edvardsen E, Allen SM, Torsvik IK, Raastad T, Ruud E, Nilsen KB. «*Polyneuropathy in Adolescent Childhood Cancer Survivors: The PACCS Study*»

Pediatr Neurol. 2022 Nov 25;140:9-17. doi: 10.1016/j.pediatrneurol.2022.11.012. Epub ahead of print. PMID: 36586183.

Dunker Ø, Grotle M, Bu Kvaløy M, Uglem M, Løseth S, Hjelland IE, Kleggetveit IP, Allen SM, Dehli Vigeland M, Munk Killingmo R, Sand T, Nilsen KB.

«*Accuracy of neuropathic pain measurements in patients with symptoms of polyneuropathy: validation of painDETECT, Self-Completed Leeds Assessment of Neuropathic Symptoms and Signs, and Douleur Neuropathique 4*»

Pain. 2022 Oct 10.







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Dunker Ø, Nilsen KB, Olsen SE, Åsvold BO, Bjørgaas MRR, Sand T.

*“Which combined nerve conduction study scores are best suited for polyneuropathy in diabetic patients?”*

Muscle Nerve. 2022 Feb;65(2):171-179. doi: 10.1002/mus.27445. Epub 2021 Nov 5. PMID: 34687224.



## Department of Neurohabilitation

The Department of Neurohabilitation with multidisciplinary staff, including consultants in neurology and psychiatry, psychologists with specialities in clinical neuropsychology and habilitation psychology, physiotherapists, nutritionists and case workers with various professional backgrounds.

The department provides care to a wide variety of patient groups with complex disabilities, including intellectual disabilities and other acquired and congenital disorders, also including rare conditions, genetic conditions and neurological conditions.

The Department of Neurohabilitation is headed by Nils Olav Aanonsen.



## Intellectual disability and neurohabilitation



### Group Leader

Bjørnar Hassel, Professor, Dept. of Neurohabilitation, OUH  
(bjornar.hassel@ous-hf.no) and UiO (bjornar.hassel@medisin.uio.no)

### Group Members

- Nils Olav Aanonsen, MD, OUH
- Sigrun Hope, MD, PhD, OUH
- Anne Katrin T. Holmøy, MD, OUH
- Kathrine Haggag, MD, OUH
- Jutta Rummel, MD, OUH
- Alma Sikiric, MD, OUH
- Gøril Svae, OUH
- Daniel Dahlberg, MD, OUH
- Marleen van Walsem, PhD, OUH
- Emilie Kildal, Cand psychol, UiO

The aim of the neurohabilitation research group is 1) to conduct research that will lead to improvement of the quality of life of persons with developmental disabilities, 2) to investigate mechanisms behind brain dysfunction and damage that leads to developmental disability.

In collaboration with the municipality of Oslo, various departments at OUH and OsloMet, we investigate the use of sensors for autonomic responses as a means of communication for developmentally disabled persons who are unable to express their needs.

To investigate mechanisms that underlie some forms of developmental disability we use clinical and preclinical approaches to elucidate mechanisms of toxicity of certain metabolites and microbes.

### Ongoing projects

- Wearable sensors for autonomic responses as a means of communication for persons with developmental disability who lack the ability to express themselves
- Mechanisms of seizure generation and cell death during brain abscess formation, a preventable cause of developmental disability
- Mechanisms of cell death and seizure generation during formation of cystic brain tumors
- The effects on brain cells of propionic acid, a metabolite that causes cerebral dysfunction in an inborn error of metabolism
- The metabolism of glyceraldehyde, a cause of neurodegeneration through formation of advanced glycation end products
- Barriers to proper handling of persons with intellectual disability and harmful sexual behavior



## Most important national and international collaborators

### National

- Emilie Kildal, Terje Nærland, Ole Andreassen, KG Jebsens Center, UiO/OUH
- Cecilie Morland, OsloMet/Inst. of Pharmacy, UiO
- Mona-Elisabeth Revheim, Ebba Gløersen Müller, James Patrick Connelly, Div. of Radiology and Nuclear Medicine, OUH
- Bente Halvorsen, Research Institute of Internal Medicine, OUH
- Oslo Municipality/burroughs of Nordstrand, Østensjø and Vestre Aker
- Bærum municipality/Emma Hjorts Hjem
- Pål Gunnar Larsson, Ketil Olsen, Dept. of Neurosurgery, OUH
- Erik Taubøll, Dept. of Neurology, UiO
- Leiv Otto Watne, Dept. of Geriatrics, Ahus
- Espen Mariussen and Øyvind Voie, Norwegian Defence Research Establishment, Kjeller
- Frode Rise, Inst. of Chemistry, UiO
- Farrukh Chaudry, Niels Christian Danbolt, Dept. of Anatomy, UiO

### International

- Farshid Amirabdollahian, University of Hertfordshire, UK
- Sergio Guillen, Mysphera, TSB Real time location systems, Valencia, Spain
- Jordi Rovirasimon, Parc Sanitari Sant Joan de Deu, Barcelona, Spain
- Raymond Dingleline, Emory University, Atlanta, GA, USA

## Scientific production of the research group in 2022

Peer reviewed original research articles: 4

### Selected publications:

Hassel B, Niehusmann P, Halvorsen B, Dahlberg D.

*“Pro-inflammatory cytokines in cystic glioblastoma: A quantitative study with a comparison with bacterial brain abscesses. With an MRI investigation of displacement and destruction of the brain tissue surrounding a glioblastoma”*

Front Oncol. 2022;12:846674. doi: 10.3389/fonc.2022.846674.

Rogne A, Hassel B.

*“Improvement of attention deficit/hyperactivity disorder (ADHD) in three adult men during testosterone treatment: a case series”*

J Med Case Rep. 2022;16(1):425. doi: 10.1186/s13256-022-03651-w.

Dahlberg D, Rummel J, Distante S, De Souza GA, Stensland ME, Mariussen E, Rootwelt H, Voie Ø, Hassel B.

*“Glioblastoma microenvironment contains multiple hormonal and non-hormonal growth-stimulating factors”*

Fluids Barriers CNS. 2022 Jun 4;19(1):45. doi: 10.1186/s12987-022-00333-z.

### Funding

- The Research Council of Norway
- Rebergs legat





## Sunnaas Rehabilitation Hospital

The hospital's full continuum of care focuses on community re-entry, which for many people means returning to home, work or a supported, community living environment. The hospital also holds national responsibilities for rare congenital disorders and locked-in syndrome.

Our areas of expertise includes spinal cord injuries, severe multitrauma, traumatic brain injuries, stroke, cognitive challenges, pain, severe burn injuries, neurological illnesses and are congenital disorders.



## Specialized medical rehabilitation



### Group Leader

Frank Becker, MD/PhD, Associate Professor, Dept. of Physical Medicine and Rehabilitation, UiO/Sunnaas Rehabilitation Hospital (frank.becker@sunnaas.no)

### Group Members

- Anne Catrine Trægde Martinsen, Professor, Director of Research, Sunnaas/OsloMet
- Ingeborg Lidal, MD/PhD, Sunnaas
- Heg Prag Øra, MD/PhD, Sunnaas
- Kristin Knudsen-Baas, MD/PhD, Sunnaas
- Claudia Nyberg, MD/PhD, Sunnaas
- Ariane Kwiet, MD/PhD, Sunnaas
- Lena Lande Wekre, MD/PhD, Sunnaas
- Marianne Løvstad, PSYCH/PhD, Professor, Sunnaas/UiO
- Per Ola Rike, PSYCH/PhD, Sunnaas
- Sveinung Tornås, PSYCH/PhD, Sunnaas
- Solveig Hauger, PSYCH/PhD, Sunnaas
- Nina Marit Rohrer-Baumgartner, PSYCH/PhD, Sunnaas
- Vegard Strøm, Cand. Scient/PhD, Sunnaas/Norwegian School of Sport Sciences
- Birgitta Langhammer, PT/PhD, Professor, Sunnaas/OsloMet
- Kirsti Skavberg Roaldsen, PT/PhD, Ass. Professor, Sunnaas/ OsloMet/ Karolinska Institute
- Charlotta Hamre, PT/PhD, Sunnaas
- Arve I. Opheim, PT/PhD, Sunnaas/Region Västra Götaland
- Vivien Jørgensen, PT/PhD, Sunnaas
- Ellen Høyner, PT/PhD, Sunnaas
- Anne Lannem, PT/PhD, Sunnaas
- Matthijs Wouda, PT/PhD, Sunnaas
- Linda Rennie, PT/PhD, Sunnaas
- Edel Jannecke Svendsen, RN/PhD, Sunnaas
- Ellen Berg, Cand Scient/PhD, Sunnaas/OsloMet
- Gry Velvin, SW/PhD, Sunnaas

### Guest professors:

- Fin Biering-Sørensen, MD/PhD, Professor, Copenhagen University
- Katharina Sunnerhagen, MD/PhD, Professor, Gothenburg University
- Lena Hartelius, ST/PhD, Professor, Gothenburg University
- Jennie Ponsford, PSYCH/PhD, Professor, Monash University, Melbourne
- Claire Glenton, Dr. philos, Norwegian Institute of Public Health

### PhD fellows:

- MD: Svein Otto Fredwall, Vesna Miloshevskaja Jakimovska, Ingebjørg Irgens, Erlend Solberg Dørum, Kristine Marie M. Vege, Jelena Simic, Helle Walseth Nilsen
- PSYCH: Daniel Løke, Mari Sælid Messel, Knut Kolskår, Dani Beck, Ingvil Laberg Holthe, Anja Schanke, Martin Matre, Line Sophie Eide
- RN: Anne Geard
- PT: Wiebke Höfers, Pia Wedege, Emelie Butler Forslund, Ann Marie Hestetun-Mandrup
- SW: Jannike K. Vikan
- SLT: Maribeth C. Rivelsrud, Silje Merete Hansen
- OT: Anne-Marthe Sanders, Truls Johansen
- DIET: Hanne Bjørg Slettahjell

### Research profile and aims

The overall research aim for our group is to improve everyday living of people with physical and/or mental impairments. Within the setting of specialized rehabilitation, especially neurorehabilitation, we are interested in all aspects of body functions, activities and participation that injury or disease may affect. Our research activities comprise both subacute and chronic stages, and are organized in four groups:

- Acquired Brain injuries
- Spinal cord injuries
- Movement dysfunctions
- Rare disorders

### Ongoing projects

A large number of studies are ongoing, mainly within the following areas:

- Specialized rehabilitation interventions for patients with acquired neurological injuries, such as stroke, spinal cord injury or traumatic brain injury
- Telerehabilitation
- Rehabilitation technology, e.g. gaming, exoskeletons, virtual reality
- Rehabilitation of acquired injuries in children and adolescents
- Movement disorders, spasticity, gait analysis
- Rare disorders as e.g. Marfan's syndrome, achondroplasia



## Most important national and international collaborators

### National

- Oslo University Hospital
- OsloMet
- Norwegian Sport High School
- Haukeland University Hospital
- St. Olav Hospital
- University Hospital of North Norway
- Beitostølen Health Sport Center
- Hospitals in the South-Eastern Norway Health Region

### International

- Karolinska Institute, Stockholm, Sweden
- Gothenburg University, Sweden
- Copenhagen University, Denmark
- Monash University, Melbourne, Australia
- China Rehabilitation and Research Center, China
- Rusk Institute of Rehabilitation, NY, USA
- Policlinic no2, Petrozavodsk, Karelia, Russia
- Sheba Medical Center, Tel Aviv, Israel
- Bethlehem Arab Society for Rehabilitation, Palestine
- El Wafa Hospital, Gaza, Palestine
- Sahlgrenska University Hospital, Högsbo, Sweden
- Bayi 81 Rehabilitation Center, Sichuan, China
- Schweizer Paraplegiker-Forschung AG, Switzerland

## Funding

### Main sources:

- The Norwegian Research Council
- South-Eastern Norway Regional Health Authorities
- DAM – Norwegian ExtraFoundation for Health and Rehabilitation
- Sunnaas Rehabilitation Hospital
- Birgit og Rolf Sunnaas Minnefond

## Scientific production of the research group in 2022

### Dissertations:

*“Biopsychosocial Mechanisms in Fatigue – Exploration of Factors Associated with the Occurrence and Maintenance of Fatigue in the General Population and Patients with Traumatic Brain Injury”*

Daniel Løke

*“The Norwegian Adult Achondroplasia Study: A population-based study of medical complications, physical functioning, cardiovascular risk factors, and body composition in adults with achondroplasia”*

Svein Otto Fredwall

*“Spatiotemporal correlates of cognitive control: proactive and reactive control of response inhibition and associations with resting state activity”*

Mari Sælid Messel

*“Spinal cord injury in North Macedonia with a community dwelling comparison to Norway”*

Vesna Miloshevska Jakimovska







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**Peer reviewed original research articles: 75**

**Selected publications:**

*“Physical Health Conditions in Persons with Spinal Cord Injury Across 21 Countries Worldwide”*

Strøm V, Månnum G, Arora M, Joseph C, Kyriakides A, Le Fort M, Osterthun R, Perrouin-Verbe B, Postma K, Middleton J.

J Rehabil Med. 2022 Jun 29;54:jrm00302. doi: 10.2340/jrm.v54.2040.

*“Videoconferencing in Pressure Injury: Randomized Controlled Telemedicine Trial in Patients With Spinal Cord Injury”*

Irgens I, Midelfart-Hoff J, Jelnes R, Alexander M, Stanghelle JK, Thoresen M, Rekand T.

JMIR Form Res. 2022 Apr 19;6(4):e27692. doi: 10.2196/27692.

*“Implementing the exoskeleton Ekso GT™ for gait rehabilitation in a stroke unit - feasibility, functional benefits and patient experiences”*

Høyer E, Opheim A, Jørgensen V.

Disabil Rehabil Assist Technol. 2022 May;17(4):473-479. doi: 10.1080/17483107.2020.1800110.



## Publication list NVR research groups 2022

Includes ordinary journal articles and reviews only

Absalom NL, Liao VWY, Johannesen KMH, Gardella E, Jacobs J, Lesca G, Gokce-Samar Z, Arzimanoglou A, Zeidler S, Striano P, Meyer P, Benkel-Herrenbrueck I, Mero IL, Rummel J, Chebib M, Møller RS, Ahring PK (2022)

Gain-of-function and loss-of-function GABRB3 variants lead to distinct clinical phenotypes in patients with developmental and epileptic encephalopathies

Nat Commun, 13 (1), 1822

DOI [10.1038/s41467-022-29280-x](https://doi.org/10.1038/s41467-022-29280-x), PubMed [35383156](https://pubmed.ncbi.nlm.nih.gov/35383156/)

Advani R, Sandset EC (2022)

Insights into a personalized management of blood pressure in acute stroke

Curr Opin Neurol, 35 (1), 39-44

DOI [10.1097/WCO.0000000000001016](https://doi.org/10.1097/WCO.0000000000001016), PubMed [34845148](https://pubmed.ncbi.nlm.nih.gov/34845148/)

Ahring PK, Liao VWY, Gardella E, Johannesen KM, Krey I, Selmer KK, Stadheim BF, Davis H, Peinhardt C, Koko M, Coorg RK, Syrbe S, Bertsche A, Santiago-Sim T, Diemer T, Fenger CD, Platzer K, Eichler EE, Lerche H, Lemke JR, Chebib M, Møller RS (2022)

Gain-of-function variants in GABRD reveal a novel pathway for neurodevelopmental disorders and epilepsy

Brain, 145 (4), 1299-1309

DOI [10.1093/brain/awab391](https://doi.org/10.1093/brain/awab391), PubMed [34633442](https://pubmed.ncbi.nlm.nih.gov/34633442/)

Alvestad S, Husebye ESN, Christensen J, Dreier JW, Sun Y, Igland J, Leinonen MK, Gissler M, Gilhus NE, Tomson T, Bjørk M (2022)

Folic Acid and Risk of Preterm Birth, Preeclampsia, and Fetal Growth Restriction Among Women With Epilepsy: A Prospective Cohort Study

Neurology, 99 (6), e605-e615

DOI [10.1212/WNL.0000000000200669](https://doi.org/10.1212/WNL.0000000000200669), PubMed [35577577](https://pubmed.ncbi.nlm.nih.gov/35577577/)

Andreassen S, Lindland EMS, Beyer MK, Solheim AM, Ljøstad U, Mygland Å, Lorentzen ÅR, Reiso H, Bjuland KJ, Pripp AH, Harbo HF, Løhaugen GCC, Eikeland R (2022)

Assessment of cognitive function, structural brain changes and fatigue 6 months after treatment of neuroborreliosis

J Neurol, 270 (3), 1430-1438

DOI [10.1007/s00415-022-11463-7](https://doi.org/10.1007/s00415-022-11463-7), PubMed [36380166](https://pubmed.ncbi.nlm.nih.gov/36380166/)

Andreassen S, Solheim AM, Ljøstad U, Mygland Å, Lorentzen ÅR, Reiso H, Beyer MK, Harbo HF, Løhaugen GCC, Eikeland R (2022)

Cognitive function in patients with neuroborreliosis: A prospective cohort study from the acute phase to 12 months post treatment

Brain Behav, 12 (6), e2608

DOI [10.1002/brb3.2608](https://doi.org/10.1002/brb3.2608), PubMed [35593485](https://pubmed.ncbi.nlm.nih.gov/35593485/)

Andries A, Van Walsem MR, Ørstavik K, Frich JC (2022)

Functional Ability and Physical Activity in Hereditary Neuromuscular Diseases

J Neuromuscul Dis, 9 (3), 437-446

DOI [10.3233/JND-210677](https://doi.org/10.3233/JND-210677), PubMed [35180128](https://pubmed.ncbi.nlm.nih.gov/35180128/)

Andries A, Ørstavik K, Rueegg CS, Eng S, Edvardsen E, Allen SM, Torsvik IK, Raastad T, Ruud E, Nilsen KB (2022)

Polyneuropathy in Adolescent Childhood Cancer Survivors: The PACCS Study

Pediatr Neurol, 140, 9-17

DOI [10.1016/j.pediatrneurol.2022.11.012](https://doi.org/10.1016/j.pediatrneurol.2022.11.012), PubMed [36586183](https://pubmed.ncbi.nlm.nih.gov/36586183/)



Aukrust CG, McNicholas R, Winkler AS, Johnson W, Pattisapu J, White C, Veerappan VR, Negida A, Park KB (2022)  
Comprehensive and equitable approaches to the management of neurological conditions in low-and middle-income countries-A call to action  
Brain Spine, 2, 101701  
DOI [10.1016/j.bas.2022.101701](https://doi.org/10.1016/j.bas.2022.101701), PubMed [36605388](https://pubmed.ncbi.nlm.nih.gov/36605388/)

Aukrust CG, Parikh K, Smart LR, Mdala I, Fjeld HE, Lubuulwa J, Makene AM, Härtl R, Winkler AS (2022)  
Pediatric Hydrocephalus in Northwest Tanzania: A Descriptive Cross-Sectional Study of Clinical Characteristics and Early Surgical Outcomes from the Bugando Medical Centre  
World Neurosurg, 161, e339-e346  
DOI [10.1016/j.wneu.2022.02.003](https://doi.org/10.1016/j.wneu.2022.02.003), PubMed [35134579](https://pubmed.ncbi.nlm.nih.gov/35134579/)

Aukrust CG, Paulsen AH, Uche EO, Kamalo PD, Sandven I, Fjeld HE, Strømme H, Eide PK (2022)  
Aetiology and diagnostics of paediatric hydrocephalus across Africa: a systematic review and meta-analysis  
Lancet Glob Health, 10 (12), e1793-e1806  
DOI [10.1016/S2214-109X\(22\)00430-2](https://doi.org/10.1016/S2214-109X(22)00430-2), PubMed [36400085](https://pubmed.ncbi.nlm.nih.gov/36400085/)

Bahrami S, Hindley G, Winsvold BS, O'Connell KS, Frei O, Shadrin A, Cheng W, Bettella F, Røddevand L, Odegaard KJ, Fan CC, Pirinen MJ, Hautakangas HM, HUNT All-In Headache, Dale AM, Djurovic S, Smeland OB, Andreassen OA (2022)  
Dissecting the shared genetic basis of migraine and mental disorders using novel statistical tools  
Brain, 145 (1), 142-153  
DOI [10.1093/brain/awab267](https://doi.org/10.1093/brain/awab267), PubMed [34273149](https://pubmed.ncbi.nlm.nih.gov/34273149/)

Bahrami S, Nordengen K, Shadrin AA, Frei O, van der Meer D, Dale AM, Westlye LT, Andreassen OA, Kaufmann T (2022)  
Distributed genetic architecture across the hippocampal formation implies common neuropathology across brain disorders  
Nat Commun, 13 (1), 3436  
DOI [10.1038/s41467-022-31086-w](https://doi.org/10.1038/s41467-022-31086-w), PubMed [35705537](https://pubmed.ncbi.nlm.nih.gov/35705537/)

Bakhtiari A, Bjørke AB, Larsson PG, Olsen KB, Nævra MCJ, Taubøll E, Heuser K, Østby Y (2022)  
Episodic Memory Dysfunction and Effective Connectivity in Adult Patients With Newly Diagnosed Nonlesional Temporal Lobe Epilepsy  
Front Neurol, 13, 774532  
DOI [10.3389/fneur.2022.774532](https://doi.org/10.3389/fneur.2022.774532), PubMed [35222242](https://pubmed.ncbi.nlm.nih.gov/35222242/)

Bakke I, Lund CG, Carlsson M, Salvesen R, Normann B (2022)  
Barriers to and facilitators for making emergency calls - a qualitative interview study of stroke patients and witnesses  
J Stroke Cerebrovasc Dis, 31 (10), 106734  
DOI [10.1016/j.jstrokecerebrovasdis.2022.106734](https://doi.org/10.1016/j.jstrokecerebrovasdis.2022.106734), PubMed [36037678](https://pubmed.ncbi.nlm.nih.gov/36037678/)

Banitalebi H, Espeland A, Anvar M, Hermansen E, Hellum C, Brox JI, Myklebust TÅ, Indrekvam K, Brisby H, Weber C, Aaen J, Austevoll IM, Grundnes O, Negård A (2022)  
Reliability of preoperative MRI findings in patients with lumbar spinal stenosis  
BMC Musculoskelet Disord, 23 (1), 51  
DOI [10.1186/s12891-021-04949-4](https://doi.org/10.1186/s12891-021-04949-4), PubMed [35033042](https://pubmed.ncbi.nlm.nih.gov/35033042/)

Banitalebi H, Aaen J, Storheim K, Negård A, Myklebust TÅ, Grotle M, Hellum C, Espeland A, Anvar M, Indrekvam K, Weber C, Brox JI, Brisby H, Hermansen E (2022)  
A novel MRI index for paraspinal muscle fatty infiltration: reliability and relation to pain and disability in lumbar spinal stenosis: results from a multicentre study  
Eur Radiol Exp, 6 (1), 38  
DOI [10.1186/s41747-022-00284-y](https://doi.org/10.1186/s41747-022-00284-y), PubMed [35854201](https://pubmed.ncbi.nlm.nih.gov/35854201/)



- Bardan I, Fagerli KM, Sexton J, Kvien TK, Bakland G, Mielnik P, Hu Y, Lien G, Flatø B, Molberg Ø, Kristianslund EK, Aga AB (2022)  
Treatment Response to Tumor Necrosis Factor Inhibitors and Methotrexate Monotherapy in Adults With Juvenile Idiopathic Arthritis: Data From NOR-DMARD  
J Rheumatol, 50 (4), 538-547  
DOI [10.3899/jrheum.220645](https://doi.org/10.3899/jrheum.220645), PubMed [36379571](https://pubmed.ncbi.nlm.nih.gov/36379571/)
- Bath PM, Song L, Silva GS, Mistry E, Petersen N, Tsvigoulis G, Mazighi M, Bang OY, Sandset EC (2022)  
Blood Pressure Management for Ischemic Stroke in the First 24 Hours  
Stroke, 53 (4), 1074-1084  
DOI [10.1161/STROKEAHA.121.036143](https://doi.org/10.1161/STROKEAHA.121.036143), PubMed [35291822](https://pubmed.ncbi.nlm.nih.gov/35291822/)
- Beghi E, Helbok R, Ozturk S, Karadas O, Lisnic V, Grosu O, Kovács T, Dobronyi L, Bereczki D, Cotelli MS, Turla M, Davidescu EI, Popescu BO, Valzania F, Cavallieri F, Ulmer H, Maia LF, Amodt AH, Armon C, Brola W, Victoria G, Riahi A, Krehan I, von Oertzen T, Azab MA et al. (2022)  
Short- and long-term outcome and predictors in an international cohort of patients with neuro-COVID-19  
Eur J Neurol, 29 (6), 1663-1684  
DOI [10.1111/ene.15293](https://doi.org/10.1111/ene.15293), PubMed [35194889](https://pubmed.ncbi.nlm.nih.gov/35194889/)
- Beghi E, Moro E, Davidescu EI, Popescu BO, Grosu O, Valzania F, Cotelli MS, Kiteva-Trenchevska G, Zakharova M, Kovács T, Armon C, Brola W, Yasuda CL, Maia LF, Lovrencic-Huzjan A, de Seabra MML, Avalos-Pavon R, Aamodt AH, Meoni S, Gryb V, Ozturk S, Karadas O, Krehan I, Leone MA, Lolich M et al. (2022)  
Comparative features and outcomes of major neurological complications of COVID-19  
Eur J Neurol, 30 (2), 413-433  
DOI [10.1111/ene.15617](https://doi.org/10.1111/ene.15617), PubMed [36314485](https://pubmed.ncbi.nlm.nih.gov/36314485/)
- Berg-Hansen P, Moen SM, Austeng A, Gonzales V, Klyve TD, Negård H, Seeberg TM, Celius EG, Meyer F (2022)  
Sensor-based gait analyses of the six-minute walk test identify qualitative improvement in gait parameters of people with multiple sclerosis after rehabilitation  
J Neurol, 269 (7), 3723-3734  
DOI [10.1007/s00415-022-10998-z](https://doi.org/10.1007/s00415-022-10998-z), PubMed [35166925](https://pubmed.ncbi.nlm.nih.gov/35166925/)
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The potential role of DNA methylation as preventive treatment target of epileptogenesis  
Front Cell Neurosci, 16, 931356  
DOI [10.3389/fncel.2022.931356](https://doi.org/10.3389/fncel.2022.931356), PubMed [35936496](https://pubmed.ncbi.nlm.nih.gov/35936496/)
- Bialer M, Johannessen SI, Koepp MJ, Levy RH, Perucca E, Perucca P, Tomson T, White HS (2022)  
Progress report on new antiepileptic drugs: A summary of the Sixteenth Eilat Conference on New Antiepileptic Drugs and Devices (EILAT XVI): I. Drugs in preclinical and early clinical development  
Epilepsia, 63 (11), 2865-2882  
DOI [10.1111/epi.17373](https://doi.org/10.1111/epi.17373), PubMed [35946083](https://pubmed.ncbi.nlm.nih.gov/35946083/)
- Bialer M, Johannessen SI, Koepp MJ, Levy RH, Perucca E, Perucca P, Tomson T, White HS (2022)  
Progress report on new antiepileptic drugs: A summary of the Sixteenth Eilat Conference on New Antiepileptic Drugs and Devices (EILAT XVI): II. Drugs in more advanced clinical development  
Epilepsia, 63 (11), 2883-2910  
DOI [10.1111/epi.17376](https://doi.org/10.1111/epi.17376), PubMed [35950617](https://pubmed.ncbi.nlm.nih.gov/35950617/)
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Association of Prenatal Exposure to Antiseizure Medication With Risk of Autism and Intellectual Disability  
JAMA Neurol, 79 (7), 672-681  
DOI [10.1001/jamaneurol.2022.1269](https://doi.org/10.1001/jamaneurol.2022.1269), PubMed [35639399](https://pubmed.ncbi.nlm.nih.gov/35639399/)



Bjørneboe J, Heen A, Borud E, Bahr R, Clarsen B, Norheim AJ (2022)  
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