



# Annual Report

## Research Activity 2021

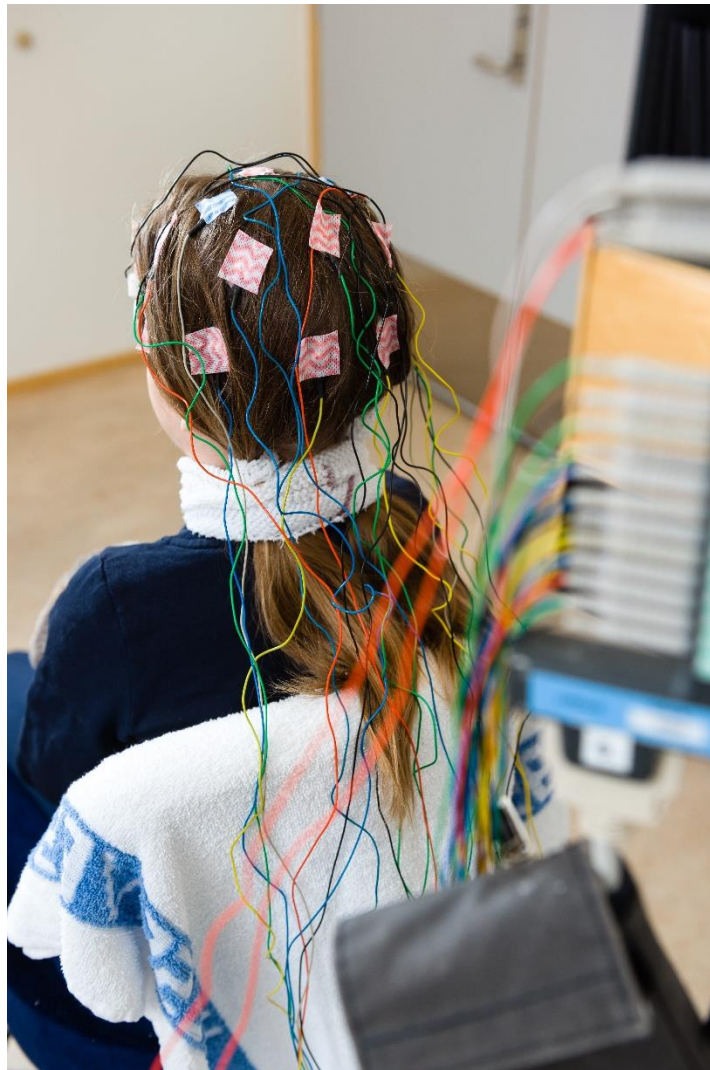


Foto: Morten Skoglund, UiO

**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 16 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, 2 Associate Professor, several postdoctoral fellowships and PhD students, administrative staff and technical staff.

The Division has an advisory research board which in 2021 consisted of: Professor and Head of Research John-Anker Zwart, Division Director Eva Bjørstad, Professors and Senior Consultants Morten Lossius, Eirik Helseth, Mona Skjelland, Nada Andelic, Bjørnar Hassel and Administrative Manager Agnete Hager.

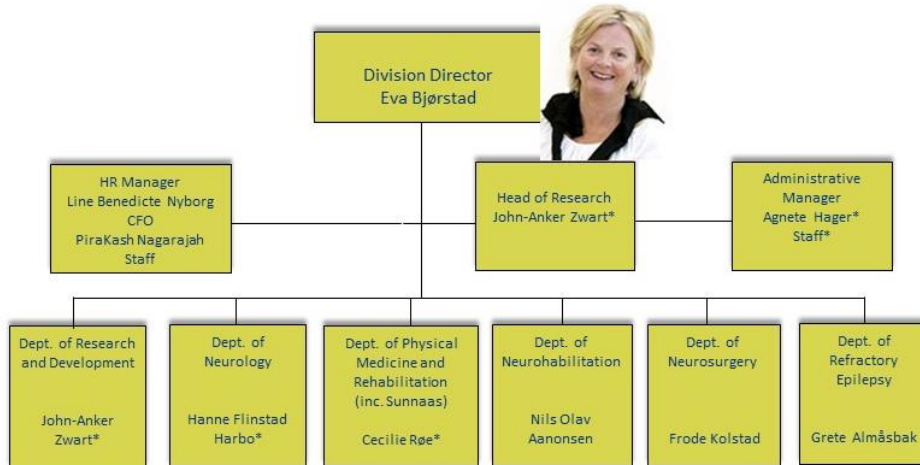
In 2021 there were in total 250 registered peer reviewed publications and 11 PhD dissertations, while Sunnaas Rehabilitation Hospital published 86 registered peer reviewed articles and had 2 PhD dissertation.

*Eva Bjørstad, Division Director*



## Division of Clinical Neuroscience (NVR)

### Organizational Chart



\*UiO employee(s)



## 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, 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, UiO
- Emilie I. Howe, PhD, Postdoc, OUH
- Silje Fure, PhD fellow, UiO
- Elin Western, PhD fellow, UiO
- Ida Maria Borgen Henriksen, PhD fellow, UiO
- Håkon Moksnes, PhD fellow, UiO
- Christoph Schäfer, PhD fellow, UiT
- Cathrine Buaas Tverdal, PhD fellow, UiO
- Lars-Johan Viddal-Valaas, PhD fellow, UiO
- John Bjørneboe, PhD, Researcher, OUH

### 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 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 multicenter 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 Kleffellgård
- 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 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 Kleffellgård, 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
- The effect evaluation of combined cognitive and vocational interventions after mild-to-moderate traumatic brain injury: a randomized controlled trial and qualitative process evaluation.  
Principal Investigator: Nada Andelic, PhD Emile I. Howe and PhD fellow Silje Fure
- The family as a resource for improved patient and family functioning after traumatic brain injury. A randomized controlled trial of a family centered intervention.  
Principal investigator Helene L. Sjøberg, PhD Mari S. Rasmussen

## Other projects

- Center-TBI (Collaborative European NeuroTrauma Effectiveness Research in TBI).  
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 Buaas 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
- Health 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 2021

### PhD thesis

Emilie I. Howe: *“Return to work after traumatic brain injury: A randomised controlled trial, long-term employment probability and predictors of employment status”*, UiO, February 2021

Mari S. Rasmussen: *“It’s a family experience – improving patient and family functioning after traumatic brain injury. A randomized controlled trial of a family-centred intervention”*, UiO, August 2021

**Peer reviewed original research articles: >40** (including Center-TBI-publications)







### Selected publications:

Fure SCR, Howe EI, Andelic N, Brunborg C, Sveen U, Røe C, Rike PO, Olsen A, Spjelkavik Ø, Ugelstad H, Lu J, Ponsford J, Twamley EW, Hellstrøm T, Løvstad M.

*“Cognitive and vocational rehabilitation after mild-to-moderate traumatic brain injury: A randomised controlled trial.”*

Ann Phys Rehabil Med. 2021 Sep;64(5):101538. doi: 10.1016/j.rehab.2021.101538.

Rasmussen MS, Andelic N, Pripp AH, Nordenmark TH, Soberg HL.

*“The effectiveness of a family-centred intervention after traumatic brain injury: A pragmatic randomised controlled trial.”*

Clin Rehabil. 2021 Oct;35(10):1428-1441. doi: 10.1177/02692155211010369.

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. 2021 Nov 2. doi: 10.1097/HTR.0000000000000744.



## 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
- Line Preede, PhD student, UiO
- Elina Schistad, PhD, OUH
- Helene Skaara, MSc, OUH
- Sigrid Skatteboe, PhD, OUH
- Håkon Sveinall, PhD student, 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
- Reliability of Modic changes. Principal investigator Elina Schistad
- Improving functioning and participation among persons with physical disabilities. Principal investigator Cecilie Røe. PhD fellow Line Preede
- Clinical course and prognostic factors for shoulder pain patients in primary and specialized care. Principal investigator Kaia Engebretsen
- 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 2021

### Dissertations:

Martine Enger, OUH, UiO, April 2021:

*"The epidemiology of shoulder injuries in the general population. Clinical diagnosis of acute rotator cuff tears"*

Main supervisor: Jens Ivar Brox

Alexandra Hott, SSHF, UiO, February 2021:

*"Patellofemoral pain. Treatment, outcome measures and prognostic factors"*

Co supervisors: Niels Gunnar Juel and Jens Ivar Brox

Line Preede, OUH, BHSS, UiO, May 2021:

*"Evaluating adapted physical activity-based rehabilitation in people with chronic disabilities"*

Main supervisor: Cecilie Røe

Thy Vanem, OUH, UiO, March 2021:

*"Marfan syndrome in adults – re-investigations in a Norwegian cohort after 10 years"*

Co supervisor: Cecilie Røe

### Peer reviewed original research articles: 33

#### Selected publications:

Aasdahl, Lene; Fimland, Marius Steiro; Røe, Cecilie.

*"The Readiness for Return to Work Scale; Does it Help in Evaluation of Return to Work?"*

Journal of occupational rehabilitation 2021 s. 1-12

NTNU STO OUS UiO

Preede, Line; Soberg, Helene L.; Dalen, Håkon Erlend; Nyquist, Astrid; Jahnsen, Reidun; Saebu, Martin;

Bautz-Holter, Erik; Røe, Cecilie.

*"Rehabilitation goals and effects of goal achievement on outcome following an adapted physical activity-based rehabilitation intervention"*

Patient Preference and Adherence 2021 ;Volum 15. s. 1545-1555

PIHSØ OUS UiO OSLOMET

Schmidt, Malte; Enger, Martine; Pripp, Are Hugo; Nordsletten, Lars; Moosmayer, Stefan; Melhuus, Knut; Brox, Jens Ivar.

*"Interrater reliability of physical examination tests in the acute phase of shoulder injuries"*

BMC Musculoskeletal Disorders 2021 ;Volum 22.(1) s. 1-9

OUS UiO MHH



## 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
- Kathrine C. Haavardsholm, MSc, 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



## 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

### Dissertations 2021

None

## 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
- **Torleiv Svendsen:** *“Tolerability and efficacy of new antiepileptic drugs”* Supervisor: Cecilie Johannessen Landmark. Co-supervisors: Ole Morten Rønning and Morten I. Lossius
- **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





#### Postdoc:

- **Silje Alvestad:** *“Scandinavian multi-registry study of antiepileptic drug teratogenicity: The SCAN-A study”*. Co-workers: Marte Bjørk, Torbjørn Tomsen, Jacob Christensen
- **Kristin Å. Alfstad:** *“Risk factors for psychiatric symptoms and executive problems in youth with epilepsy”*  
Co-workers: Morten I. Lossius, Betty van Roy, Berit Hjelde Hansen, Erik Hessen
- **Kari M. Aaberg:** *«Development in childhood epilepsy»*. Co-workers: Pål Surén, Morten I. Lossius
- **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
- **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

#### 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. Head of Scientific Advisory Board: Morten I. Lossius
- NESREC Nordic Epilepsy Surgery Research Consortium

#### International projects:

- *“EURAP study”. An International Antiepileptic Drugs and Pregnancy Registry”* (International concerted Action on the Teratogenesis of Anti-epileptic Drugs) [EURAP - International Registry of Antiepileptic Drugs and Pregnancy](#), 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, OUH 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, OUH, 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 Nikorona, Danish Epilepsy Centre, Dianalund; responsible in Denmark, Cecilie Johannessen Landmark, project leader
- *“ERAS-Trial (Effect Related to Auto Stimulation): Does additional ECG-triggered stimulation increase the efficacy of Vagus Nerve Stimulation?”* Oliver Henning, Hrisimir Kostov and Tatiana Evsikova, Eylert Brodtkorb, St.Olavs Hospital, NTNU, Lieven Lagae, UZ Leuven University Hospital, Belgium, Anne Sabers, University of Copenhagen, Denmark and Jukka Petola, Tampere University Hospital, Finland
- *“EEG in Nodding Syndrome (Onchocerca volvulus associated epilepsy)”* Oliver Henning, Richard Idro, Makerere University, Kampala, Uganda

#### Expert groups etc.

- Cannabidiol International Expert group (CBD). Cecilie Johannessen Landmark
- Treatment strategies on pediatric epilepsies annual educational course  
[www.epiped-course.com](http://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
- Nordic Expert Group on Epilepsy and Dementia. Erik Sætre

### 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
- Ass. prof. Marte Bjørk, Haukeland University Hospital and UiB
- Marte Syvertsen, MD, Drammen Hospital 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. Kristina Malmgren, Sahlgrenska University Hospital, Sweden
- 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 2021

Peer reviewed original research articles: 24

Other publications: 6

### Selected publications:

Villagrán A, Eldøen G, Duncan R, Aaberg KM, Hofoss D, Lossius MI (2021)

*"Incidence and prevalence of psychogenic nonepileptic seizures in a Norwegian county: A 10-year population-based study"*

Epilepsia, 62 (7), 1528-1535

DOI 10.1111/epi.16949, PubMed 34075579

Kostov KH, Kostov H, Larsson PG, Henning O, Eckmann CAC, Lossius MI, Peltola J (2021)

*"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"*

Epilepsia

DOI 10.1111/epi.17152, PubMed 34935136

Heminghyt E, Herrman H, Skogan AH, Konglund A, Egge A, Lossius M, Dietrichs E, Taubøll E (2021)

*"Cognitive change after DBS in refractory epilepsy: A randomized-controlled trial"*

Acta Neurol Scand, 145 (1), 111-118

DOI 10.1111/ane.13539, PubMed 34658033

### 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



## 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, Oslo university hospital (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
- Sortberg, Angelika, professor, UiO / Consultant OUH
- Sorteberg, Wilhelm, dr.med., OUH
- Stanisic, Milo, dr.med., OUH
- Ringsby, Jon-Olav, 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 2021

Peer reviewed original research articles: 30

Invited lectures at international congresses: >10

### Selected publications (group members in bold):

**Eide, P.K.**, Vinje, V., Pripp, A.H., Mardal, K.A., Ringstad, G., 2021  
*"Sleep deprivation impairs molecular clearance from the human brain"*  
Brain. 144, 863-874.  
*A study that attracted major interest. Altmetric score 1062.*

Schultz, N.H., Sørvoll, I.H., Michelsen, A.E., Munthe, L.A., Lund-Johansen, F., Ahlen, M.T., **Wiedmann, M.**, Aamodt, A.H., Skattør, T.H., Tjønnfjord, G.E., Holme, P.A., 2021.  
*"Thrombosis and Thrombocytopenia after ChAdOx1 nCoV-19 Vaccination"*  
N Engl J Med. 384, 2124-2130.  
*A study that attracted major interest.*

Western, E., Nordenmark, T.H., **Sorteberg, W.**, Sorteberg, A., Karic, T., **Sorteberg, A.**, 2021  
*"(-)-OSU6162 in the treatment of fatigue and other sequelae after aneurysmal subarachnoid hemorrhage: a double-blind, randomized, placebo-controlled study"*  
J Neurosurg. 1-11.  
*A double-blind, randomized, placebo-controlled study of medical treatment of fatigue after SAH*



## Oslo Neurosurgical Neurotrauma Group



Professor Eirik Helseth, MD/PhD, Consultant neurosurgeon, Dept. of Neurosurgery, Oslo University Hospital (eirik.helseth@ous-hf.no) and Professor of Neurosurgery, Faculty of Medicine, University of Oslo (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 2021

- 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
- Subaxial cervical fractures - Christina Teiner Høstmælingen
- 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 2021

### Dissertations 2021

None

**Peer reviewed original research articles:** >25 (including Center TBI-publications)

**Invited lectures at international congresses:** None, Covid 19

### Selected publications:

Rønning P, Helseth E, Skaansar O, Tverdal C, Andelic N, Bhatnagar R, Melberg M, Skaga NO, Aarhus M, Halvorsen S, Helseth R (2021)

*“Impact of Preinjury Antithrombotic Therapy on 30-Day Mortality in Older Patients Hospitalized With Traumatic Brain Injury (TBI)”*

Front Neurol, 12, 650695

DOI 10.3389/fneur.2021.650695, PubMed 34054695

Tverdal C, Andelic N, Helseth E, Brunborg C, Rønning P, Hellstrøm T, Røe C, Aarhus M (2021)

*“In the Aftermath of Acute Hospitalization for Traumatic Brain Injury: Factors Associated with the Direct Pathway into Specialized Rehabilitation”*

J Clin Med, 10 (16)

DOI 10.3390/jcm10163577, PubMed 34441872





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Rizvi SAM, Helseth E, Aarhus M, Harr ME, Mirzamohammadi J, Rønning P, Mejlænder-Evjensvold M, Linnerud H (2021)

*“Favorable prognosis with nonsurgical management of type III acute odontoid fractures: a consecutive series of 212 patients”*

Spine J, 21 (7), 1149-1158

DOI 10.1016/j.spinee.2021.02.003, PubMed 33577924



## Vilhelm Magnus Laboratory for Neurosurgical Research



### Group Leader

Iver A. Langmoen, MD/PhD, Professor, Dept of Neurosurgery, UiO  
(i.a.langmoen@medisin.uio.no) /Dept. of Neurosurgery, OUH (UXLAIV@ous-hf.no)

### Group Members:

- Cecilie J Sandberg, MSc, PhD, Lab manager/HR/Daily activities, OUH
- Einar O. Vik-Mo, MD, PhD, Deputy group leader, OUH
- Skarphedinn Haldorsson, MSc, PhD, Post Doc
- Luna Kutiti Djirackor, MD, PhD, Post Doc
- Erlend Skaga, MD, PhD, Research fellow, UiO
- Marit Brynjufsen, MSc, PhD-student, UiO
- Elise Solli, MSc, PhD-student, NTNU
- Emily Palmero, BSc, OUH
- Richard Nagymihaly, MSc, PhD
- Zanina Grieg, MSc, OUH (leave of absence)
- Birthe Mikkelsen, BSc, OUH (leave of absence)

### Research profile and aims

After showing that the human brain contains stem cells which can differentiate into functional neurons, and that malignant brain tumors harbor cancer stem cells that are essential to tumor growth and progression, the Vilhelm Magnus Laboratory (VML) has focused purely on translational research, mainly on glioblastoma (GBM), the most frequent and deadly brain cancer (median survival in unselected series < 1 year).

This resulted in the first clinical protocol targeting stem cells in a solid tumor - an autologous vaccine against GBM stem cells, as well as 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.

#### Aims:

- To characterize cell types and cellular mechanisms in GBMs with special attention to GBM stem cells (GSCs)
- To develop therapeutic strategies against GBM targeting GCSs

### Ongoing projects

Fifteen years ago we showed, 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;128:2189-99, Westerlund et al Exp Cell Res. 2003; 289:378-83, Moe et al Neurosurgery 2005;56:1182-8).



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;63:1022-33), 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;63:1022-33; Vik-Mo et al, Neuro Oncol, 2010 Dec;12:1220-30, Vik-Mo et al, Exp Cell Res, 2011 Apr 15;317:1049-59, Joel et al, Dev Dyn, 2013;242:1078-93, Sandberg et al, Exp Cell Res, 2013 15;319:2230-43, Fayzullin et al Exp Cell Res. 2016 10;349:199-213, Mughal et al, Neoplasia. 2018;20:643-6569).



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

#### **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;62:1499-509). One out of four of the patients are still alive.

The responders have a median survival of 7 years and are still recurrence free. 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 is in the process of regulatory approval.

**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.

**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
- Steinar Aamdal/Paal Brunsvig, OUH
- Gustav Gaudernack, Targovax
- Kyrre Emblem, OUH
- Ola Myklebust, OUH
- Petter Brandal, OUH
- Else Marit Inderberg, OUH
- Elsa Lundanes, UiO
- Steven Wilson, UiO

### International

- Krister Wennerberg, Markus Perola, Finnish Institute for Molecular Medicine, Finland
- 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, 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 2021

### Peer reviewed original research articles:

Skaga E et al.

*“Real-world validity of randomized controlled phase III trials in newly diagnosed glioblastoma: to whom do the results of the trials apply?”*

Neurooncol Adv. 2021 Feb 26;3(1):vdab008.

Djirackor L et al.

*“Intraoperative DNA methylation classification of brain tumors impacts neurosurgical strategy”*

Neurooncol Adv. 2021 Oct 10;3(1):vdab149.



## 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
- Drug effect prediction through machine learning in EEG

### 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 Nuclus Subthalamicus and CSF in patients with Parkinson disease



- Predictors of VNS stimulation
- New treatment in chronic subdural haematomas
- 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
- European SEEG collaboration (EBRAINS->HIP)
- Resting state fMRI for epileptic focus localization

### 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

### Funding

- AED effect prediction by EEG supported by Eisai
- More national and international funding through collaborators

### Scientific production of the research group in 2021

Peer reviewed original research articles: 8

Invited lectures at international congresses: 0 lectures





**Selected publications:**

*“Early spectral EEG in preterm infants correlates with neurocognitive outcomes in late childhood”*

Nordvik, T., Schumacher, E.M., Larsson, P.G. et al.. *Pediatr Res* (2022)

<https://doi.org/10.1038/s41390-021-01915-7>

*“Seizure Outcome After Ipsitemporal Reoperation in Pharmacoresistant Temporal Lobe Epilepsy Patients With Hippocampal Sclerosis and Nonspecific Pathology”*

J Ivanović, MD, KÅ Alfstad, MD, PhD, PB Marthinsen, MD, KB Olsen, MD, PG Larsson, MD, PhD, AH Pripp, PhD, M Stanišić, MD, DrMedSci

*Neurosurgery Open*, Volume 2, Issue 1, March 2021, okab001,

<https://doi.org/10.1093/neuopn/okab001>

*“Cognition in adult patients with newly diagnosed non-lesional temporal lobe epilepsy”*

AB Bjørke;Y Østby;S G Grahl;P G Larsson;KB Olsen;MCJ Nævra;GA Ringstad;AB;L Gjerstad;E Taubøll;K Heuser

*Epilepsy & behavior* : EB. , 2021, Vol.116, p.107771

<https://doi.org/10.1016/j.yebeh.2021.107771>



## Movement, muscle and neurodegeneration



### Group Leader

Mathias Toft, MD/PhD, Professor and Head of Section, 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)
- Silje Bjerknes, MD
- Vidar Gundersen, Prof MD PhD
- Nadja Anette Myrvik Kvernmo, MD
- Inger Marie Skogseid, MD PhD
- Mathias Toft, Prof MD, PhD (PI Molecular studies of PD)
- Zafar Iqbal, PhD
- Kaja Nordengen, MD, PhD
- Siri Egenæs, BSc
- Gezime Seferi, BSc
- Sofie Lysholm Lian, MD
- Victoria Berge-Seidl, MD
- Chiara Cappelletti, MSc
- Natasha Demic, MD
- Sandra Pilar Henriksen, MSc
- Lasse Pihlstrøm, MD, PhD (PI Huntington and neurodegenerative genomics)
- Manuela Tan, PhD
- Maren Stolp Andersen, MD
- Jon Anders Tunold, MD
- Ingeborg Haugesag Lie, MD
- Marleen van Walsem, PhD
- Kristin Ørstavik, MD PhD (PI Rare neuromuscular disorders)
- Trine Haug Popperud, MD PhD
- Magnhild Rasmussen, MD PhD
- Sean Wallace, MD, PhD
- Ellen Annexstad, MD
- Marianne Nordstrøm, Registered dietitian, PhD
- Sean Wallace, MD, PhD
- Aristomo Andries, MD, MSc
- Hanne Ludt Fossmo, MSc
- Gro Solbakken, MSc
- Angelina Maniaol, MD, PhD (PI Myasthenia and ALS)
- Marion Boldingh, MD, PhD

### Research profile and aims

The Movement, muscle and neurodegeneration group was founded in 2019, bringing together researchers studying a spectrum of chronic neurological disorders causing impaired motor function. Our areas of interest range across disorders affecting the planning and calibration of movements in the basal



ganglia (Parkinson's disease, Huntington's disease, dystonia and tremor), diseases affecting the upper and lower motor neurons (amyotrophic lateral sclerosis and spinal muscular atrophy) and neuromuscular disorders (myasthenic syndromes and primary myopathies).

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, muscle and neurodegeneration group is a thematically overarching research group organized into five subgroups focused on specific diseases and methodologies:

- [Clinical studies of movement disorders](#)
- [Molecular studies of Parkinson's disease](#)
- [Huntington's disease and neurodegenerative genomics](#)
- [Rare Neuromuscular Disorders](#)
- [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. Patients with Huntington's disease are included in international registries. Laboratory research is focusing on genetic and genomic studies of Parkinson's disease, and epigenetic studies of Parkinson's disease and Dementia with Lewy bodies. Furthermore, several projects are examining the role of inflammation in neurodegeneration.

The Rare Neuromuscular Disorders Project 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. The research is mainly clinical research related to myotonic dystrophy, Charcot-Marie Tooth, spinal muscular atrophy and Duchennes muscular dystrophy.

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
- Dept. of Cardiology, OUH
- Prof. Jan Frich, Dept. of Health Management and Health Economics, UiO

### International

- IPDGC (international Parkinson Disease Genetics 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. Henry Houlden, University College London, UK







- Prof. S.O. Kolseth, Dept. of Nutrition, Inst. of Basic Medical Sciences, UiO
- Sunnaas Rehabilitation Hospital
- Prof. Jens Volkmann, University of Würzburg, Germany

## Funding

Among others:

- The Research Council of Norway
- South-Eastern Norway Regional Health Authority
- DAM (Norwegian ExtraFoundation for Health and Rehabilitation)
- Michael J. Fox Foundation
- The Norwegian Health Association
- Sophies Minde Foundation

## Scientific production of the research group in 2021

### PhD dissertation: 1

Margrete Langmyhr; *“Investigating the molecular genetics of sporadic Parkinson’s disease”*

### Peer reviewed original research articles: 22

#### Selected publications:

Andersen MS, Bandres-Ciga S, Reynolds RH, Hardy J, Ryten M, Krohn L, Gan-Or Z, Holtman IR, Pihlstrøm L, International Parkinson's Disease Genomics Consortium (2021)

*“Heritability Enrichment Implicates Microglia in Parkinson's Disease Pathogenesis”*

Ann Neurol, 89 (5), 942-951

DOI 10.1002/ana.26032, PubMed 33502028

Bjerknes S, Toft M, Brandt R, Rygvold TW, Konglund A, Dietrichs E, Andersson S, Skogseid IM (2021)  
*“Subthalamic Nucleus Stimulation in Parkinson's Disease: 5-Year Extension Study of a Randomized Trial”*

Mov Disord Clin Pract, 9 (1), 48-59

DOI 10.1002/mdc3.13348, PubMed 35005065

Solbakken G, Løseth S, Froholdt A, Eikeland TD, Nærland T, Frich JC, Dietrichs E, Ørstavik K (2021)  
*“Pain in adult myotonic dystrophy type 1: relation to function and gender”*

BMC Neurol, 21 (1), 101

DOI 10.1186/s12883-021-02124-9, PubMed 33663406



## 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)

- **Clinical stroke research group, Ullevål**  
Group leader Else Charlotte Sandset, MD, PhD, senior researcher
- **Stroke, Headache and Covid research group, Rikshospitalet**  
Group leader Anne Hege Aamodt, MD, PhD, senior researcher

### Group Members (all groups)

- Rajiv Advani, MD, PhD
- Helge Fagerheim Bugge MD, PhD-student
- Brian Enriquez, MD, PhD-student
- Mona Guterud, paramedics, PhD-student
- Guri Hagberg MD, PhD
- Charlotta Hamre, PhD-student
- Gisle Berg Helland, PhD-student
- Maren Ranhoff Hov, MD, PhD, postdoc
- Jørgen Ibsen, MD, PhD-student
- Hege Ihle-Hansen, MD, PhD
- Bjørn Jamtli, PhD-student
- Mirza Jusufovic, MD, PhD
- Kristian Lundsgaard Kraglund, MD, PhD
- Karianne Larsen, MD, PhD-student
- Christian Lund, MD, PhD
- Ragnhild Munthe-Kaas, MD, PhD-student
- Terje Nome, MD, PhD-student
- Lasse Ormel, MD, PhD
- Barbara Ratajczak-Tretel, MD, PhD-student
- Stephen Ryan, MD, PhD-student
- David Russell, Professor emeritus
- Therese Schørlien, MD, PhD-student
- Karolina Skagen, MD, PhD, postdoc
- Thor Skattør, MD, PhD-student
- Kristine Stø, MD, PhD-student
- Jesper Sørmark, MD
- Mahtab Zamani, MD, PhD-student
- Anna Tancinova, MD, PhD-student
- Lars Tveit, MD, PhD-student
- Georgios Vlachos, MD, PhD-student



## Research profile and aims

The main goal is to conduct high-quality cerebrovascular research, leading to new knowledge and improved treatment of stroke patients. The main research areas are:

- **Acute stroke, inflammation and cerebrovascular monitoring.** The aim of this group is to study the role of inflammation and gut microbiota in cerebrovascular diseases and to study pre- and intracerebral circulation and the impact of cerebral monitoring.
- **Pre-hospital and acute stroke.** The focus of this group is to improve and implement prehospital diagnostics and treatment of acute stroke patients.
- **Acute stroke treatment and atrial fibrillation. AI (Artificial intelligence) in stroke diagnostics.** The scientific research interest is acute stroke treatment, diagnostic workup in acute ischemic stroke and the relation between stroke and atrial fibrillation.
- **Stroke and cognition.** This group aims to quantify and measure levels of cognitive impairment after stroke and to identify biological and clinical markers associated with prognosis for cognitive disorders following incident stroke.

## Ongoing projects

- Acute cerebral thrombi: mapping the immuno-thrombotic content -developing clinical tools for identifying the embolic source.
- Advanced ultrasound methods in the assessment of carotid plaque instability
- MIST: Microbiota in Stroke Trial. The Gut and Oral bacteria in atherosclerosis and ischemic stroke
- BRIDGE study: Bridging pregnancy and fetal microchimerism with long-term maternal cardiovascular and neurovascular health.
- Optimizing cerebral monitoring in acute ischemic stroke and subarachnoid hemorrhage. Improving hemodynamic diagnostics using transcranial ultrasound in a neurocritical care cohort.
- Nor-CARRAD: Norwegian prospective ultrasound study of carotid radiation-induced lesions in neck cancer patients.
- Para-NASPP (Norwegian Acute Stroke Prehospital Project); Diagnostics and triage of acute stroke by the National Institute of Stroke Scale (NIHSS) by paramedics.
- Treat-NASPP; Prehospital advanced diagnostics and treatment of acute stroke.
- The rural CT-study. A case-control study with pre-hospital treatment with intravenous thrombolysis in acute stroke at "Sjukestugu Ål".
- OSCAR: The Oslo Acute Revascularization Study.
- NOR-FIB: The Nordic atrial fibrillation and Stroke Study, a prospective observational study of the occurrence of AF in patients with cryptogenic stroke / TIA.
- 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.
- The Moyamoya Task Force: Multi-disciplinary translational project for improving patient care in Norway and unraveling the mysteries of Moyamoya.
- NorCOAST; The Norwegian Cognitive impairment after Stroke study. A descriptive cohort study recruiting patients from five Norwegian hospitals.
- Hidden impairment after stroke.





- ACE 1950; The ACE 1950 Study is a prospective, population-based, cohort study of the cardio- and cerebrovascular health of all men and women born in 1950 in Akershus County, Norway.

## Most important national and international collaborators

### National

- Research Institute of Internal Medicine, OUH, Prof. Bente Halvorsen
- Norwegian Air Ambulance Foundation (NLA)
- Dept of Ophthalmology, OUH, Prof. Morten C Moe
- Dept of Transplantation Medicine, OUH, Prof. Johannes Hov
- Division of Obstetrics and Gynaecology, OUH, Prof. Annetine Staff
- Østfold Hospital, Depts. of Cardiology and Neurology
- National Hospital of Epilepsy (SSE)
- Dep of Clinical and Molecular Medicine, NTNU, Prof. Terje Espevik
- Institute of Basic Medical Science, Dept of biostatistics, UiO

### International

- University of Calgary, Canada, Prof. Mayank Goyal
- The George Institute for Global Health, China and Australia, Professors Craig S. Anderson and Philip M. Bath
- Nottingham University, UK
- University Hospital Bern, Switzerland, Prof. Urs Fischer
- Greater Manchester Comprehensive Stroke Center, UK, Prof. Craig Smith
- University of Maastricht, Netherlands, Prof. Erik Biessen

### Funding

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

## Scientific production of the research group in 2021

**PhD dissertation:** Charlotta Hamre; "*Mobility after minor stroke – a one-year follow-up study*"

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





### Selected publications:

*“Carotid Atherosclerosis and Longitudinal Changes of MRI Visual Rating Measures in Stroke Survivors: A Seven-Year Follow-Up Study”*

Ihle-Hansen H, Ihle-Hansen H, Fure B, Thommessen B, Helland GB, Øksengård AR, Beyer MK, Sandset EC, Wyller TB, Hagberg G.

J Stroke Cerebrovasc Dis. 2021 Oct;30(10):106010. doi: 10.1016/j.jstrokecerebrovasdis.2021.106010

*“Vaccine Induced Immune Thrombotic Thrombocytopenia Causing a Severe Form of Cerebral Venous Thrombosis With High Fatality Rate: A Case Series”*

Wiedmann M, Skattør T, Stray-Pedersen A, Romundstad L, Antal EA, Marthinsen PB, Sørvoll IH, Leiknes Ernsten S, Lund CG, Holme PA, Johansen TO, Brunborg C, Aamodt AH, Schultz NH, Skagen K, Skjelland M.

Front Neurol. 2021 Jul 30;12:721146. doi: 10.3389/fneur.2021.721146.

*“Thrombosis and Thrombocytopenia after ChAdOx1 nCoV-19 Vaccination”*

Schultz NH, Sørvoll IH, Michelsen AE, Munthe LA, Lund-Johansen F, Ahlen MT, Wiedmann M, Aamodt AH, Skattør TH, Tjønnfjord GE, Holme PA.

N Engl J Med. 2021 Jun 3;384(22):2124-2130. doi: 10.1056/NEJMoa2104882.



## ERGO - Epilepsy Research Group of Oslo



### Group Leader of ERGO and Clinical Epilepsy Research

Erik Taubøll, Professor, Dept. of Neurology, 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
- Kjell Heuser, Senior Consultant, **Group leader**; TLE/translation
- Sigrid Svalheim, Section Head. **Project Leader**; side effects of AED
- Dag Aurlien, Consultant, Stavanger. **Project Leader**; epilepsy and cardiology
- Agnes Balint Bjørke, MD, PhD fellow; TLE
- Toni Berger, MD, PhD fellow ; Marie Curie programme, EU
- Alba Gonzalez; MD, PhD fellow; Epilepsy and cardiology
- Monika Mochol, PhD fellow; side effects of AED
- Helle Hermann, PhD fellow; deep brain stimulation for epilepsy
- Line Sveberg, Consultant; Women and epilepsy/autoimmune epilepsy
- Ketil Berg Olsen, 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

### Associated 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 sub groups:

- Research group for Clinical Epilepsy Research
- Research Group for Translational Epilepsy Research

Research within ERGO is currently focusing on five main areas:

1) Epilepsy-Translational Research. This focuses on research on epileptogenesis, glial cells and genetic and clinical studies. The project 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.



Recently, we have also started epigenetic studies investigating changes in DNA methylation and gene expression during epileptogenesis. (See publications Berger T et al, PloS-One 2019, Berger T et al, Frontiers in Neurology 2020 and phd-thesis, Toni Berger 2022).

2) "Gender issues", endocrinology and long-term effects of AEDs. The 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 AEDs on hormones, immunology, haematology and bone health. The effects of epilepsy and antiepileptic drugs on inflammation parameters are now studied both clinically and using a zebra-fish model (see i.e. Mochol M et al, Seizure 2020; Mochol et al, Epilepsy Res 2021).

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 research is ongoing (see i.e. González A, et al, Epilepsy Res 2020; González et al, Case Rep Neurol 2022).

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 especially focus on possible predictors for outcome and study in more detail treatment of the super refractory cases (for 2020, see: Habhab SF et al, Epilepsy Behav 2020; Roberg et al, JAMA Neurology 2022).

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.

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 AED 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 AEDs, 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.

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, OUS. Studying possible mechanisms involved in epileptogenesis may open new treatment strategies to prevent epilepsy, i.e. after stroke and brain injuries.

One PhD degree was completed within this research area with dissertation in February 2022.





- **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 AEDs**

Patients starting treatment with the AEDs 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 AEDs on gene expression related to immune genes in zebra-fish have also recently been finished in collaboration with NMBU (Norwegian University of Life Sciences), and a study on the effect of AEDs on markers for inflammation in humans with epilepsy is performed together with collaborators in OUH.

- **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 are also studying the impact of several years of active epilepsy on cardiac function

- **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.

- **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 2022.

- **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.







## 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 (GLIALAB), UiO, group leader Rune Enger
- Prof Erik Ropstad, NMBU (Norwegian University of Life Sciences)
- Prof Pål Aukrust, Research Institute of Internal Medicine, OUH
- Institute of Basic Medical Science, UiO, Prof Farrukh Chaudry

### 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

## Scientific production of the research group in 2021

**Peer-reviewed original research articles: 6**

**Abstracts: 1**

**International reviews: 2**

**National publications: 4**

**Speaker at international congresses: 7**

2 at International Educational Virtual Forum, Neurology update in Kazakhstan 2021. 5 at 1<sup>st</sup> Nordic Status Epilepticus Meeting, Oslo.

**Arranged international congresses: 1**

1<sup>st</sup> Nordic Status Epilepticus Meeting, Oslo, May 2021

### Selected publications:

Bjørke AB, Østby Y, Grahl SG, Larsson PG, Olsen KB, Johansen Nævra MC, Ringstad GA, Bjørnerud A, Gjerstad L, Taubøll E, Heuser K.

*"Cognition in adult patients with newly diagnosed non-lesional temporal lobe epilepsy"*  
Epilepsy Behav. 2021;116:107771. doi: 10.1016/j.yebeh.2021.107771.

Mochol M, Whatmore P, Taubøll E, Landmark CJ, Ropstad E, Svalheim S, Fraser TWK.

*"Lamotrigine effects on immune gene expression in larval zebrafish"*  
Epilepsy Res. 2021;178:106823. doi: 10.1016/j.epilepsyres.2021.106823.





Heuser K, Enger R.

*“Astrocytic Ca<sup>2+</sup> Signaling in Epilepsy”*

Front Cell Neurosci. 2021;15:695380. doi: 10.3389/fncel.2021.695380.

Taubøll E, Isojärvi JIT, Herzog AG.

*“The interactions between reproductive hormones and epilepsy”*

Handb Clin Neurol. 2021;182:155-174. doi: 10.1016/B978-0-12-819973-2.00011-3.

### Funding

- The South-Eastern Norway Regional Health Authority, 1 PhD
- EU grant, 722053, Marie S Curie programme, 1 PhD
- Internal, OUH, 2 PhD (klin stip, D-still)
- Østfold Hospital Trust (0,5) PhD



## Multiple Sclerosis (MS)



### 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
- 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
- Steffan D. Bos-Haugen, MSc/PhD, researcher, Dept of Neurology and Dept of Medical Genetics, UiO
- Daniel Rinker, MSc/PhD, post doc, Dept of Neurology, OUH
- Pål Berg-Hansen, MD/PhD, Consultant, Dept of Neurology, OUH
- Gro Owren Nygaard, MD/PhD, Consultant, Dept of Neurology, OUH
- Sigrid Aune de Rodez Benavent, MD/PhD, Dept of Ophthalmology, OUH
- Anna M. Eriksson, MSc/PhD fellow, Dept of Neurology, UiO
- Ina S. Brorson, MSc/PhD fellow until June 2021/post doc, Dept of Neurology, OUH/UiO
- Einar August Høgestøl, MD/PhD, Resident, Dept of Neurology, OUH, Associate Professor Dept of Psychology, UiO
- Cecilia Smith Simonsen, MD/PhD fellow, Drammen Hospital/OUH
- Heidi Øyen Flemmen, MD/PhD fellow, Consultant, Skien Hospital/OUH
- Synne Brune, MD/PhD fellow, Resident, Dept of Neurology, OUH
- Line Broch, MD, PhD fellow, Consultant, Drammen hospital/OUH
- Chiara Cappelletti, MSc/PhD fellow, OsloMet
- Marte Wendel-Haga, MD/PhD, Consultant Kysthospitalet and Dept of Neurology, OUH
- Lars L. Skattebøl, MD/PhD fellow, Resident, Dept of Neurology, OUH, UiO
- Mathias H. Øverås, MD/PhD fellow, Resident, Dept of Neurology, OUH, UiO
- Marie Strømstad, MSc, Research Assistant, OUH
- Martine Mesel Isom, MSc, Research Assistant, OUH
- Synne Johannesen, Study nurse, FOU Department, OUH
- Marton König, MD/PhD, Resident, Dept of Neurology, OUH
- Ingeborg H. Lie, MD, Resident, Dept of Neurology, OUH

### Associated Group Members

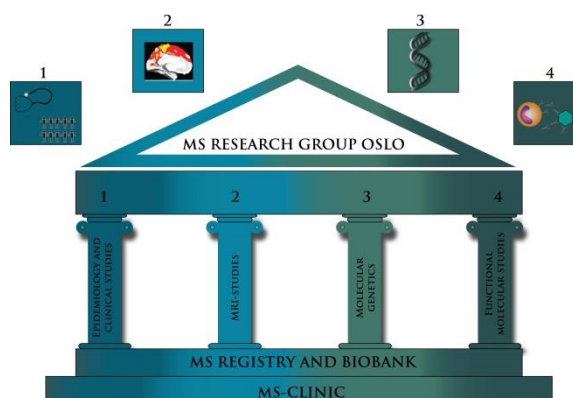
- Stine Marit Moen, MD/PhD, Head of research and development, MS Centre Hakadal
- Piotr Sowa, MD/PhD, Consultant, Division of Radiology and Nuclear Medicine, OUH
- Rigmor Lundby, MD/PhD, Consultant, Division of Radiology and Nuclear Medicine, OUH
- Mona K Beyer, MD/PhD, Professor, Division of Radiology and Nuclear Medicine UiO/OUH

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

- Silje Espevik, medical student (Brean, Celius)
- Anniken K. Jørgensen, medical student (Celius)
- Matthias Rasmussen Fuglestad, psychology student (Landrø, Høgestøl)
- Jacob Ring, psychology student (Landrø, Høgestøl)

## 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

- Tone Berge, researcher: Vitamin D responsive regulation of susceptibility genes for autoimmune diseases. In collaboration with Professor Lisa Barcellos at the University of California
- Steffan Daniel Bos, researcher: Identification of molecular mechanisms and biomarkers of Multiple Sclerosis (MS-biomarkers) – RNA sequencing of CD4+ and CD8+ T cells as potential biomarkers of MS phenotypes
- Anna M. Eriksson, PhD fellow: Identification of molecular mechanisms and biomarkers of Multiple Sclerosis (MS-biomarkers) – molecular characterization of DEXI and other MS susceptibility genes. Supervisor: Tone Berge, Co-supervisors: Hanne F. Harbo and Steffan D. Bos
- Ina S. Brorson, Postdoc: Defining and characterizing molecular pathways in multiple sclerosis and single cell analysis of MS patients' PBMCs
- Daniel Rinker, Postdoc: Integrating genetic and MRI data in multiple sclerosis
- Cecilia Smith Simonsen, PhD fellow: Predictors for disease susceptibility and disease progression in Multiple sclerosis, Supervisor: Elisabeth Gulowsen Celius, Co supervisors: Stine Marit Moen
- 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
- 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
- Chiara Cappelletti, PhD fellow: Novel molecular mechanisms for severe brain disorders – a study using complex data analyses. Supervisor: Tone Berge, Co supervisor: Mathias Toft
- Lars L Skattebøl, PhD fellow: Advanced MRI in the clinical study NOR-MS. Supervisors Gro Nygaard, Einar A. Høgestøl, Hanne F Harbo
- Anna M. Eriksson, Martine M Isom, Tone Berge: CLEC16A and other candidate genes
- Ina S. Brorson and Steffan Bos: Single cell analysis of peripheral immune cells from MS patients



- Synne Brune, Einar A. Høgestøl, Hanne F. Harbo, Sigrid A. de Rodez Benavent, Tone Berge: Neurofilament analysis in MS research and clinical practice. (Biogen Idec)
  - Mathias Øverås MD/PhD fellow: NOR-MS Supervisor: Gro O Nygaard, co-supervisors: Hanne F. Harbo, Tone Berge
  - Hanne F. Harbo, Steffan D. Bos, Pål Berg-Hansen, Mona Beyer, Synne Brune: BorrSci study, lead from Kristiansand (South-Eastern Norway Multi- Regional Health Authority grant)
  - 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, Dan Rinker, Elisabeth Celius, Piotr Sowa, Mona K Beyer: MAGNIMS collaboration on various MRI projects
  - Einar A. Høgestøl, Hanne F. Harbo, Dan Rinker, Elisabeth Celius, Piotr Sowa, Mona K Beyer: NORMENT 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, Stine Marit Moen/MS Centre Hakadal and SINTEF: Digital oppfølging og støtte for personer med multipel sklerose (MS-DOS)
  - Elisabeth G. Celius: Lemtrada PASS, international observational study. EGC national investigator
  - 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
  - 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, Marton König, Hanne F. Harbo: OVERLORD-MS





## 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
- Stine Marit Moen, MS Centre Hakadal
- Benedicte A. Lie, Dept. of Medical Genetics, OUH /UiO
- Lars Westlye, Dept. of Psychology, UiO and NORMENT, OUH
- Anne Spurkland, Institute of Basic Medical Sciences, UiO
- Emilia Kerty, Dept. of Neurology, OUH/UiO
- Liv Drolsum, Dept. of Ophthalmology, OUH/UiO
- Ole A. Andreassen, Lars T. Westlye, Tobias Kaufman, Torbjørn Elvsåshagen, Dag Alnæs, NORMENT, OUH/UiO
- Trygve Holmøy, Dept. of Neurology, Akershus University Hospital
- Nils Inge Landrø and Bruno Laeng, Dept. of Psychology, UiO
- Ole Landsverk, Dept of Pathology, KLM, OUH
- Øivind Torkildsen, Stig Wergeland and Jan Aarseth, Haukeland University Hospital
- Frode Berven, Dept. of Biomedicine, University of Bergen
- Åslaug Lorentzen, Dep. of Neurology, Sørlandet Sykehus
- Peyman Mirtaheri, Dept of Mechanical, Electronics and Chemical Engineering, OsloMet
- Mathias Toft, Dept of Neurology, UiO/OUH
- Heidi Ormstad, Universitet Sør-Øst/OsloMet
- Kristina Gervin and Kaja Selmer, FoU dept, Div of Clinical Neuroscience, OUH
- Frederic Meyer and Trine Seeberg, SINTEF
- Ragnhild Halvorsrud, SINTEF

### International

- Ingrid Kockum, on behalf of the MultipleMS consortium
- Mara Rocca, on behalf of the MAGNIMS consortium
- An Goris, on behalf of the International MS Genetics Consortium
- Pablo Villoslada, Hospital Clinic of Barcelona, Spain, on behalf of the Sys4MS consortium
- Lisa Barcellos, University of California, Berkeley, US
- Stephen Sawcer, University of Cambridge, UK
- Jorge Oksenberg, University of California, San Francisco, US
- Sergio E. Baranzini, University of California, San Francisco, US
- Nordic MS genetics consortium (Hillert, Olsson, Kockum, Oturai, Sørensen, Saareala)
- Pierre Antoine Gourraud, Hôpital St-Jacques - CHU de Nantes, France
- Tobias Granberg, Fredrick Piehl, Karolinska Institute, Stockholm, Sweden
- Kaj Blennow and Henrik Zetterberg, Sahlgrenska University Hospital, Gothenburg, Sweden
- Paul Lillrank, Aalto University, Finland
- Hanneke Hulst, Leiden University, Netherlands
- Maja Jagodic, Karolinska Institutet, Stockholm, Sweden





## 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
- Dam Foundation
- 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
- The Peder Saether Foundation
- Oslo MS foundation
- OsloMet

## Scientific production of the research group in 2021

**Peer reviewed original research articles:** 16 (9 with group members as first author)

### PhD theses:

Ina S. Brorsson: *"Genome-wide DNA methylation and gene expression profiling of multiple sclerosis CD4+ and CD8+ T cells"* 09.06.2021

### Selected publications:

König M, Lorentzen ÅR, Torgauten HM, Tran TT, Schikora-Rustad S, Vaage EB, Mygland Å, Wergeland S, Aarseth J, Aaberge IAS, Torkildsen Ø, Holmøy T, Berge T, Myhr KM, Harbo HF, Andersen JT, Munthe LA, Sjøraas A, Celius EG, Vaage JT, Lund-Johansen F, Nygaard GO

*"Humoral immunity to SARS-CoV-2 mRNA vaccination in multiple sclerosis: the relevance of time since last rituximab infusion and first experience from sporadic revaccinations"*

J Neurol Neurosurg Psychiatry. 2021 Oct 20: jnnp-2021-327612. Doi: 10.1136/jnnp-2021-327612. Online ahead of print. PMID: 34670844

Flemmen HØ, Simonsen CS, Broch L, Brunborg C, Berg-Hansen P, Moen SM, Kersten H, Celius EG  
*"Maternal education has significant influence on progression in multiple sclerosis"*

Mult Scler Relat Disord. 2021 Aug;53:103052. doi: 0.1016/j.msard.2021.103052. Epub 2021 May 30. PMID: 34111658

Simonsen CS, Flemmen HØ, Broch L, Brunborg C, Berg-Hansen P, Moen SM, Celius EG

*"The course of multiple sclerosis rewritten: a Norwegian population-based study on disease demographics and progression"*

J Neurol. 2021 Apr;268(4):1330-1341. doi: 10.1007/s00415-020-10279-7. Epub 2020 Oct 22. PMID: 33090270

### Other publications (abstracts excluded):





Regular updates on our home page regarding Covid-19

**Invited lectures at international congresses:**

German Neurological society: MS Therapie unter Pandemiebedingungen (Celius)

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

**Om**

[Oppgi sted](#)

Oslo University Hospital (OUH) Multiple Sclerosis (MS) Research Group. Our official Facebook information-page. Keep track on our ongoing research and other interesting MS activities

Multiple Sclerosis (MS) research group at Oslo University Hospital (OUH) - University of Oslo (UiO) aims to identify characteristics and susceptibility factors of MS, 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. The MS research group is a member of the Neuroscience Research Unit (NRU). **Se mindre**

814 personer liker dette

863 følgere

<http://ous-research.no/ms/>





## NEMU – Neurological and musculoskeletal pain and genetics



### Group Leader

John-Anker Zwart, Professor, Dept. of Neurology, Head of Research, Division of Clinical Neuroscience, UiO (j.a.zwart@medisin.uio.no) / OUH (uxzwjo@ous-hf.no)

### Group Members (including associated members)

#### Microneurography and mechanisms

- Ellen Jørum, Professor, UiO/OUH
- Lars Kristian Lunden, PhD fellow, OUH
- Dagrun Sagafos, PhD fellow, OUH
- Inge Petter Kleggetveit, MD/Postdoctoral fellow, OUH

#### Clinical trials

- Kjersti Storheim, PhD/ Professor, OUH/OsloMet
- Lars Christian Haugli Bråten, MD/Postdoctoral fellow, OUH
- Elisabeth Gjefsen, MD/PhD fellow, OUH
- Margreth Grotle, Professor, OUH/OsloMet
- Ida Løchting, Msc/Postdoctoral fellow, OUH
- Eira Ebbs, Msc/PhD fellow/research coordinator, OUH
- Astrid Lunestad, User representative
- Ingrid Fjeldheim Bånerud, Msc/Administrative, OUH
- Håvard Furunes, MD/PhD fellow, Innlandet Hospital Trust
- Mads Peder Rolfsen, PhD fellow, OUH
- Amy Martinsen, PhD fellow/Research coordinator, OUH
- Marianne Mørk, Msc/PhD fellow, OUH
- Gøril Brevik Melbye, Msc/Phd fellow, OUH
- Christer Mjåset, PhD fellow, OUH
- Monica Wigemyr, Msc/Research coordinator, OUH
- Iris Fortes Corona, MSc / Administrative, OUH
- Fiona Aanesen, MSc / Research coordinator, OUH

#### Population genetics

- Bendik Winsvold, MD/ Senior researcher, OUH
- Amy Martinsen, PhD fellow/Research coordinator, OUH
- Sigrid Børte, MD/Postdoctoral fellow, OUH
- Ingrid Heuch, MD/Senior researcher, OUH
- Linda M. Pedersen, PhD/ Senior researcher, OUH
- Marie Udnesseter Lie, Msc/PhD fellow, OUH
- Synne Øien Stensland, MD/ Senior researcher, OUH
- Espen Saxhaug Kristoffersen, MD/PhD, associate professor, UiO

## Group Members cont.

### Neurogenetics

- Kaja Kristine Selmer, MD/ Senior researcher, OUH
- Kristina Gervin, Senior scientist, Dept. of Research and Innovation, OUH
- Sigrid Pedersen, PhD fellow, Dept. of Complex Epilepsy, OUH
- Fridny Heimisdottir, PhD fellow, Dept. of Complex Epilepsy, OUH
- Inger-Lise Mero, MD, PhD, Dept. of Medical Genetics, OUH
- Emilie Willoch Olstad, PhD fellow, Inst. of Pharmacology, UiO
- Mathilde Minet Kinge-Rasmussen, PhD fellow, Dept. of Research and Innovation, OUH
- Ying Sheng, PhD, bioinformatician, Dept. of Medical Genetics, OUH
- Siri Rydning, MD, PhD, Dept. of Neurology, OUH
- Jeanette Koht, MD, PhD, Dept. of Neurology, OUH
- Chantal Tallaksen, MD, Prof. Emeritus, Dept. of Neurology, OUH
- Iselin Wedding, MD, PhD, Dept. of Neurology, OUH
- Magnus D. Vigeland, Mathematician, Dept. of Medical Genetics, OUH
- Tone Berge, PhD/Senior researcher, OUH

### Pain and neuropathies

- Kristian Bernhard Nilsen, MD/ Senior researcher, OUH
- Inge Petter Kleggetveit, MD/Postdoctoral fellow, OUH
- Daniel Gregor Schulze, MD/PhD fellow, OUH
- Marie Udnesseter Lie, Msc/PhD fellow, OUH
- Øystein Dunker, Msc/PhD fellow, OUH
- Sara Maria Allen, Msc, OUH
- Thomas Warvik, Msc, OUH
- Elena Petriu, Msc, OUH
- Maria Dehli Vigeland, Msc/PhD fellow, OUH
- Kristin Ørstavik, MD, Senior researcher, OUH
- Aristomo Andries, MD, OUH
- Ioannis Kitsos, MD/PhD fellow, OUH

### Epidemiology

- Ingrid Heuch, MD/Senior Researcher, OUH
- Synne Øien Stensland, MD/ Senior researcher, OUH
- Linda M. Pedersen, PhD/ Senior researcher, OUH
- Maren Hjelle Guddal, Msc/PhD fellow
- Olaf Fjeld, MD/PhD fellow, OUH
- Vibeke Siewers, Research coordinator, OUH
- Helle Stangeland, PhD fellow, OUH
- Monica Baumann- Larsen, PhD fellow, OUH

## Research profile and aims

The focus of our research group is to generate research based knowledge on pathomechanisms (including molecular mechanisms as e.g. genetics), prevention, treatment and rehabilitation of pain, injuries and diseases in the musculoskeletal and nerve system, including headache and migraine.

Our work is highly interdisciplinary, including experts in clinical medicine, physiotherapy, psychology, physiology, nutrition, mathematics, genetics and molecular biology.

The subgroups of NEMU each have their specific areas and goals, as listed below.

## Subgroups – their ongoing projects and collaboration partners

### Microneurography and mechanisms



Headed by Ellen Jørum

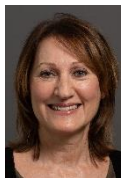
#### Ongoing projects

- Microneurography studies of neuropathic pain
- Complex regional pain syndrome: clinical features and possible mechanisms
- Pain mechanisms and genetic causes of insensitivity to pain

#### Collaboration

- Heidelberg University – Medical Faculty Mannheim

### Clinical trials



Headed by Kjersti Storheim

#### Ongoing projects

- 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
- Epigenetic and molecular biomarkers in chronic low back pain and Modic changes. A case-control study



- Lumbar disc prosthesis versus multidisciplinary rehabilitation in chronic back pain and localized degenerative disc. Long term follow-up of a randomized multicentre trial
- The NORwegian Degenerative spinal STENosis-trial (the NORDSTEN-study)
- Spinal surgery in Norway. Trends, costs and regional differences
- 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
- Cross cultural validation of outcome measurement tool and evaluation of treatment options for patients with plantar fasciopathy
- People with intellectual disabilities and vulnerabilities for harmful sexual behavior and abuse
- The MI-NAV project: Can Motivational Interviewing facilitate Return-to-Work in sicklisted people with musculoskeletal disorders? A randomised trial within NAV (hosted at OsloMet)
- Applying Artificial Intelligence in Developing Personalized and Sustainable Healthcare for Spinal Disorders (AID-Spine)
- Illness perceptions and coping with chronic illness
- Ingenting om oss uten oss. Et behovsidentifiserende og inkluderende prosjekt for personer med muskel-/ skjelett sykdommer og plager – basert på prinsipper fra The James Lind Alliance

### Most important national and international collaborators

#### National

- University Hospital of North Norway (UNN)
- The Arctic University of Norway (UiT)
- Vestre Viken Hospital Trust, Drammen
- St.Olav's University Hospital
- Østfold Hospital Trust, Kalnes
- Haukeland University Hospital, Bergen
- University of Bergen (UiB)
- Stavanger University Hospital
- Norwegian University of Science and Technology (NTNU)
- OsloMet
- Norwegian Institute of Public Health (FHI)
- Diakonhjemmet Hospital
- Norwegian Centre for Violence and Traumatic Stress Studies, Oslo
- The Norwegian Back Pain Association
- The Norwegian Council for Musculoskeletal Health, Dept. of Pharmacy (through The PharmaTox Strategic Research Initiative and UiO:RealArt – a convergence environment)

#### International

- Keele University, UK
- Karolinska Institutet, Sweden
- Sahlgrenska Academy, Sweden
- Linköping University, Sweden
- University of Southern Denmark, Denmark
- University of Oulu, Finland
- Ontario Tech University, Canada
- University of Sydney, Australia
- Monash University, Australia
- Erasmus MC, Rotterdam, the Netherlands
- Vrije Unieversiteit, Amsterdam, the Netherlands
- The low-back pain consortium
- the Disc 4All consortium



## Population genetics



Headed by Bendik Winsvold

### Ongoing projects

- HUNT All-In Neuropsychiatry
- Decipher mechanisms and improve the treatment of chronic pain through large-scale genetic analysis (DecipherPain)
- Genetic aspects of chronic low back pain and its comorbidities
- Environmental and genetic causes of migraine in children and adolescents
- Genetic and environmental causes of migraine, a large-scale family-based analysis
- Headache biomarkers
- Familial Hemiplegic Migraine in Norway

### Most important national and international collaborators

#### National

- KG Jebsen Center for Genetic Epidemiology, NTNU (Prof. Kristian Hveem)
- Norwegian Institute of Public Health (FHI) (Christopher Nielsen, Per Magnus)
- University Hospital of North Norway (Tore Solberg)

#### International

- Broad Institute of MIT and Harvard, USA (Prof Aarno Palotie, Prof Karestan Koenen)
- University of Michigan, USA (Prof. Cristen Willer)
- Yale School of Medicine, USA (Prof. Guido Falcone)
- King's College London, UK (Dr. Frances Williams)
- University College London (UCL), UK (Prof. Henry Houlden)
- Leiden University Medical Center (LUMC), The Netherlands (Prof. Arn van den Maagdenberg)
- Institute for Molecular Medicine Finland (FIMM), Finland (Prof. Maija Wessman, Matti Pirinen)
- Queensland University of Technology (Prof. Dale Nyholt), Australia
- Karolinska Institutet, Sweden (Prof. Andrea Belin)
- Danish Headache Center (Prof. Jes Olesen, Rigmor Jensen, Thomas Folkman Hansen), Denmark
- Université de Bordeaux, France (Prof. Stephanie Debette)
- The low-back pain consortium
- the Disc4All consortium

### Consortium participations

- International Consortium for Cluster Headache Genetics (CCG)
- International Headache Genetics Consortium (IHGC) ([www.headachegenetics.org](http://www.headachegenetics.org))
- Genetics of Osteoarthritis (GO) ([www.genetics-osteoarthritis.com](http://www.genetics-osteoarthritis.com))
- GWAS & Sequencing Consortium of Alcohol and Nicotine use (GSCAN) ([gscan.sph.umich.edu](http://gscan.sph.umich.edu))
- CHARGE consortium ([www.chargeconsortium.com](http://www.chargeconsortium.com))
- Social Science Genetic Association Consortium (SSGAC) ([www.thessgac.org](http://www.thessgac.org))
- Psychiatric Genetics Consortium (PGC) ([www.med.unc.edu/pgc](http://www.med.unc.edu/pgc))

## Nerogenetics



Headed by Kaja Selmer

### Ongoing projects

- 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
- Epigenetics of epilepsy development
- 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
- TeraEpi: Teratogenicity of anti-seizure medication: the roles of epigenetics and folic acid supplements
- 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 (Haukeland University Hospital)
- Complex epilepsy research group (OUH)
- National Centre for Rare Epilepsy-Related Disorders (OUH)
- Epilepsy research group in Oslo; ERGO (OUH)
- Dept. of Microbiology (OUH)
- Depts. of neurology (NTNU, OUH)
- NERVOUS1, neuropediatric research group (OUH)
- 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

## Pain and neuropathies



Headed by Kristian Bernhard Nilsen

### Ongoing projects

- Exploring the genetics of neuropathic pain
- Clinical and neurophysiological aspects of peripheral neuropathies
- Polyneuropathy in childhood cancer survivors
- Motor neurons – can they be counted?
- Digital gold mining in hospital data : Extrapolating neurophysiological reference values from historical records
- Sleep, inflammation and pain – cohort studies from Norway
- Prognostic factors for development of chronic pain after hospitalization for acute low back pain and/or sciatica
- Puccini: A randomized, placebo-controlled, double-blind, parallel-group, multicenter combined Phase
- 2a/2b study to assess the efficacy and safety of BAY 1817080 in patients with diabetic neuropathic pain
- Neuroscience registry and biobank

### Most important national and international collaborators

#### National

- Stavanger University Hospital
- Haukeland University Hospital, Bergen
- St. Olav's University Hospital, Trondheim
- University Hospital of North Norway
- Diakonhjemmet Hospital
- The National Institute of Occupational Health in Norway; STAMI

#### International

- University of Oxford, UK
- University of Sydney, Australia
- McGill University, Canada
- Heidelberg University – Medical Faculty Mannheim, Germany
- Aarhus University Hospital, Denmark
- David Geffen School of Medicine at UCLA - Los Angeles, USA

## Epidemiology



Headed by Ingrid Heuch and Synne Øien Stensland

### Ongoing projects

Adults (Heuch):

- The Acute Low-Back Pain Study. Clinical, neurophysiological and genetic risk factors
- Risk factors for anterior cruciate ligament injuries in Norwegian adolescents and young adults: (the ACL/HUNT studies)
- RygGen
- Risk factors for development of chronic pain after hospitalization for acute low back pain and/or sciatica (RUKSAR)
- Childbirth, hormonal factors and low back pain - a prospective epidemiological survey

Children and adolescents (Stensland):

- Physical activity and sport participation during adolescence and musculoskeletal complaints in adulthood. A population based cohort study (PI: Storheim)
- Killing pain? Use of analgesic, sedative and anxiolytic medication and the development of psychiatric illness in adolescents ('Vold og helseplager hos ungdom') (PI: Stensland)

### Most important national and international collaborators

#### National

- HUNT Research Centre/NTNU
- Norwegian University of Science and Technology; NTNU
- Norwegian Institute of Public Health; FHI
- OsloMet
- St. Olav's University Hospital, Trondheim
- The Change factory (Forandringsfabrikken)
- University of Bergen; UiB

#### International

- Keele University, UK

## Scientific production of the research group in 2021

### Dissertations

Maren Hjelle Guddal; *"Physical activity and sport participation in adolescence. Health implications related to musculoskeletal pain, mental health and obesity. The HUNT Study"*

Olaf Randall Fjeld; *"Symptomatic lumbar disc herniation treated in hospitals: Prognosis of unfavourable surgical events and persistent leg-pain"*





## Peer reviewed original research articles: 68

### Selected publications:

Austevoll IM, Hermansen E, Fagerland MW, Storheim K, Brox JI, Solberg T, Rekeland F, Franssen E, Weber C, Brisby H, Grundnes O, Algaard KRH, Böker T, Banitalebi H, Indrekvam K, Hellum C; NORDSTEN-DS Investigators.

*"Decompression with or without Fusion in Degenerative Lumbar Spondylolisthesis"*

N Engl J Med. 2021 Aug 5;385(6):526-538. doi: 10.1056/NEJMoa2100990. PMID: 34347953.

Fjær R, Marciniak K, Sundnes O, Hjorthaug H, Sheng Y, Hammarström C, Sitek JC, Vigeland MD, Backe PH, Øye AM, Fosse JH, Stav-Noraas TE, Uchiyama Y, Matsumoto N, Comi A, Pevsner J, Haraldsen G, Selmer KK.

*"A novel somatic mutation in GNB2 provides new insights to the pathogenesis of Sturge-Weber syndrome"*

Hum Mol Genet. 2021 Oct 13;30(21):1919-1931. doi: 10.1093/hmg/ddab144. PMID: 34124757; PMCID: PMC8522634.

Harder AVE\*, Winsvold BS\*, Noordam R\*, Vijfhuizen LS, Børte S, Kogelman LJA, de Boer I, Tronvik E, Rosendaal FR, Willems van Dijk K, O'Connor E, Fourier C, Thomas LF, Kristoffersen ES; Cluster Headache Genetics Working Group, Fronczek R, Pozo-Rosich P, Jensen RH, Ferrari MD, Hansen TF, Zwart JA, Terwindt GM, van den Maagdenberg AMJM.

*"Genetic Susceptibility Loci in Genomewide Association Study of Cluster Headache"*

Ann Neurol. 2021 Aug;90(2):203-216. doi: 10.1002/ana.26146. Epub 2021 Jul 14. PMID: 34180076

### Funding

- South-Eastern Norway Regional Health Authority
- The Research Council of Norway
- The DAM Foundation
- The Norwegian Fund for Post-Graduate Training in Physiotherapy
- Sophies Minde Research Fund
- KLINBEFORSK
- Novo Nordic Foundation
- National Advisory Unit on Rare Disorders
- Norwegian Childhood Cancer Society
- The Norwegian Medical Association
- UiO
- OsloMet
- OUH



## Brain plasticity and neuropsychiatry



### Group Leader

Torbjørn Elvsåshagen; M.D., 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; M.D., Ph.D.; Diakonhjemmet Hospital
- Britta Bürker; M.D., Ph.D.; OUH/UiO
- Guro Dunvoll; M.Sc., Ph.D. research fellow; OUH/UiO/OsloMet
- Torfinn Hynnekleiv; M.D.; OUH and Innlandet Hospital Trust
- Katalin Juhasz; M.D.; Akershus University Hospital
- Eva A. Malt; M.D., Ph.D.; Assoc. professor; Inst. of Clinical Medicine, UiO
- Ulrik F. Malt; M.D., Ph.D.; Professor emeritus; Inst. of Clinical Medicine, UiO
- Kåre Osnes; M.D., Ph.D.; Diakonhjemmet Hospital
- Torunn Søyseth; M.Sc.; OUH
- Mathias Valstad; M.Sc., Ph.D. research fellow; OUH/UiO
- Nathalia Zak; M.D., Ph.D.; OUH

### Associated Group Members

- Stein Andersson; Ph.D., Professor; Dept. of Psychology, UiO
- Atle Bjørnerud; Ph.D., Professor; OUH
- Birgitte Boye; M.D., Ph.D., Professor; Inst. of Basic Medical Sciences, UiO
- Torgeir Moberget; Ph.D., Postdoc; OUH
- Kristian Bernhard Nilsen; M.D., Ph.D., section leader; OUH
- Elena Kondratskaya; M.Sc., Ph.D.; OUH
- Nina Bang; M.Sc., Ph.D. research fellow; Norwegian University of Science and Technology

### 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:

1. To examine whether structural and functional brain plasticity are core characteristics of the human sleep-wake cycle
2. To increase our understanding of how novel schizophrenia- and bipolar disorder-associated genetic variants affect synaptic function and plasticity
3. 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. Lars Gullestad, Dept. of Cardiovascular Medicine, OUH/UiO
- Prof. Hilde Nilsen, Dept. of Molecular Biology (EpiGen), UiO
- Prof. Gaute Einevoll, NMBU/UiO

### 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

## 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 2021:

South-Eastern Norway Regional Health Authority: *“MenThalBrain: The thalamus and brainstem nuclei in severe mental illnesses”*; ~3.5MNOK; PI: Elvsåshagen, T.

South-Eastern Norway Regional Health Authority: *“The neurobiology of violence: towards EEG- and MRI-based biomarkers”*; ~3.7MNOK; PI: Bang, N.

## Scientific production of the research group in 2021

Peer reviewed original research articles: 55

### Selected publications:

Valstad, M., et al. “Evidence for Reduced Long-Term Potentiation-Like Visual Cortical Plasticity in Schizophrenia and Bipolar Disorder”  
Schizophr Bull. 2021 Oct 21;47(6):1751-1760. doi: 10.1093/schbul/sbab049.

Elvsåshagen, T., et al. “The genetic architecture of the human thalamus and its overlap with ten common brain disorders”  
Nat Communications, 2021. 12(1): p. 2909.

Mullins, N., et al. “Genome-wide association study of more than 40,000 bipolar disorder cases provides new insights into the underlying biology”  
Nat Genetics, 2021. **53**(6): p. 817-829.



## 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., coordinator, OUH
- Lina Plataniti, project manager, OUH
- Chatrine Faye, recruitment officer, OUH
- Christoffer Hatlestad, cand.psychol., PhD-candidate, OUH
- Reidar Jessen, cand.psychol., PhD-candidate, OUH
- Thomas Tveitstøl, Phd-candidate, OUH
- Mats Tveter, Phd-candidate, OUH
- Ana Perez, cand.psychol, PhD-candidate, OUH
- Slawomir Wojniusz, PhD, physiotherapist, senior researcher, OUH/OsloMet
- Stefan Sütterlin, PhD, psychology, OUH/HiØF
- Patrick Riss , PhD, chemist, senior researcher, OUH/UiO
- Syed Nuruddin, PhD, VetMD, senior researcher, OUH/UiO

### 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 centered 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 brain network models with artificial intelligence methods to identify crucial features of the aging brain's functional integrity.

We are an international group of researchers which comes from a variety of different educational backgrounds, including medicine, psychology, physiotherapy, nursing and biological science. Our multidisciplinary approach to brain-behavior relations allows us to conduct research across various systems and cognitive levels; from molecules to cells to cognitive systems to behaviors. As part of our effort for international collaboration, the Cognitive Health Research Group applied and won the Human Brain Project Voucher call for harmonization between the Virtual Brain Cloud and AI-Mind. This will ensure a strength of the European collaboration between the AI-Mind project, and the EBRAINS infrastructure in the Human Brain Project.

Our broad research methods portfolio includes: Electrophysiological (EEG) source reconstruction and network modelling; event-related potential (ERP) techniques; positron emission tomography (PET) and radiochemistry; neuropsychological assessment; in-depth qualitative interview



techniques; and physiotherapeutical interventions. Another new focus area includes artificial intelligence system with the use of deep learning techniques.

## Ongoing projects

- AI-Mind – Intelligent digital tools for screening of brain connectivity and dementia risk estimation in people affected by mild cognitive impairment
- HumanBrainProject Voucher – Harmonization between Virtual Brain Cloud and AI-Mind
- Novel risk factor assay for Alzheimer’s disease – Multi-parametric quantification of HPG/HPTaxis dysfunction (AIRDEM)
- Effectiveness of somatocognitive therapy for the treatment of provoked localized vestibulodynia (the Pro-LoVe study)
- Gender dysphoria in adolescents – a qualitative study
- Gender dysphoria: Worldwide exacerbation, prevalence, and the impact of GnRH treatment on brain development – an investigation in a human and animal model (CONOS)

## Most important national and international collaborators

### National

- Erik Taubøll, OUH
- Mona-Elisabeth Revheim, OUH
- Per Magnus, FHI
- Thor Audun Saga, NMS
- Uta Sailer, UiO
- Mathias Toft, OUH
- Randi Borgen, OUH
- Beate Rygge, Digital Life Norway
- Klas Pettersen, NORA
- Jan Bjaali, UiO, EBRAINS
- Siv Fjellkårstad, HelseDir
- Bobby Ray Sannerud, DNV
- Tormod Flatby, Ahus
- Eirik Næs Ulseth, PubGene AS
- Anne-Kristin Solbakk, UiO
- Erik Stänicke, UiO
- Reidun Torp, UiO
- Marte Roa Syvertsen, Vestre Viken

### International

- Fernando Maestu, Madrid, Spain
- Ricardo Bruña, Madrid, Spain
- Ernesto Pereda, Tenerife, 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
- Walter Bockting, New York, USA
- Neil Evans, Glasgow, UK
- Jane Robinson, Glasgow, UK

## Scientific production of the research group in 2021

Peer reviewed original research articles: 14





### Selected publications:

Hatlestad-Hall C, Bruña R, Erichsen A, Andersson V, Syvertsen MR, Skogan AH, Renvall H, Marra C, Maestú F, Heuser K, Taubøll E, Solbakk AK, Haraldsen IH (2021)  
*"The organization of functional neurocognitive networks in focal epilepsy correlates with domain-specific cognitive performance"*  
J Neurosci Res, 99 (10), 2669-2687  
DOI 10.1002/jnr.24896, PubMed 34173259

Hatlestad-Hall C, Bruña R, Syvertsen MR, Erichsen A, Andersson V, Vecchio F, Miraglia F, Rossini PM, Renvall H, Taubøll E, Maestú F, Haraldsen IH (2021)  
*"Source-level EEG and graph theory reveal widespread functional network alterations in focal epilepsy"*  
Clin Neurophysiol, 132 (7), 1663-1676  
DOI 10.1016/j.clinph.2021.04.008, PubMed 34044189

Jessen RS, Haraldsen IRH, Stänicke E (2021)  
*"Navigating in the dark: Meta-synthesis of subjective experiences of gender dysphoria amongst transgender and gender non-conforming youth"*  
Soc Sci Med, 281, 114094  
DOI 10.1016/j.socscimed.2021.114094, PubMed 34116421

### Funding

- Horizon 2020: H2020-SC1-BHC-06-2020
- The Research Council of Norway
- South-Eastern Norway Regional Health Authority



## 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
- Daniel Dahlberg, MD, OUH
- Marleen van Walsem, PhD, OUH
- Emilie Kildal, Stud psychol, UiO

### Research profile and aims

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 Oslo University Hospital, and Oslo Metropolitan University (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

- Cecilie Morland, OsloMet/Inst. of Pharmacy, UiO
- Frode Strisland, SINTEF – Smart sensor systems, Oslo
- Oslo Municipality and the burroughs of Nordstrand, Østensjø and Vestre Aker
- Erik Taubøll, Dept. of Neurology, UiO
- Torgeir Bruun Wyller, Leiv Otto Watne and Nenad Bogdanovic, Dept. of Geriatrics, OUH
- Espen Mariussen and Øyvind Voie, Norwegian Defence Research Establishment, Kjeller
- Frode Rise, Inst. of Chemistry, UiO
- Farrukh Chaudry and 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 2021

### Peer reviewed original research articles: 8

#### Selected publications:

Kildal E, Stadskleiv K, Boysen ES, Øderud T, Dahl IL, Seeberg TM, Guldal S, Strisland F, Morland C, Hassel B. *“Increased heart rate functions as a signal of acute distress in non-communicating persons with intellectual disability”*

Sci Rep. 2021 Mar 19;11(1):6479. doi: 10.1038/s41598-021-86023-6.

Rogne AG, Müller EG, Udnaes E, Sigurdardottir S, Raudeberg R, Connelly JP, Revheim ME, Hassel B, Dahlberg D.

*“β-Amyloid may accumulate in the human brain after focal bacterial infection: An 18 F-flutemetamol positron emission tomography study”*

Eur J Neurol. 2021 Mar;28(3):877-883. doi: 10.1111/ene.14622.

Schjelderup J, Hope S, Vatshelle C, van Karnebeek CDM.

*“Treatment experience in two adults with creatinfe transporter deficiency”*

Mol Genet Metab Rep. 2021 Feb 22;27:100731. doi: 10.1016/j.ymgmr.2021.100731.

### Funding

- The Research Council of Norway
- Rebergs legat



## Specialized medical rehabilitation – Sunnaas Rehabilitation Hospital



### 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
- Grethe Månnum, MD/PhD, Ass. Professor, Sunnaas/UiO
- Ingeborg Lidal, MD/PhD, Sunnaas
- Kristin Knudsen-Baas, MD/PhD, Sunnaas
- Emil Kostovski, MD/PhD, Sunnaas
- Svend Rand-Hendriksen, MD/PhD, Sunnaas
- Tor Haugstad, MD/PhD, Sunnaas
- Marianne Løvstad, PSYCH/PhD, Professor, Sunnaas/UiO
- Anne-Kristine Schanke, PSYCH/PhD, Professor emeritus, 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
- Arve I. Opheim, PT/PhD, Sunnaas/Region Västra Götaland
- Vivien Jørgensen, PT/PhD, Sunnaas
- Ellen Høy, PT/PhD, Sunnaas
- Anne Lannem, PT/PhD, Sunnaas
- Matthijs Wouda, PT/PhD, Sunnaas
- Linda Rennie, PT/PhD, Sunnaas
- Anne-Stine Bergquist Røberg, RN/PhD, Sunnaas
- Edel Jannecke Svendsen, RN/PhD, Sunnaas
- Ellen Berg, Cand Scient/PhD, Sunnaas/OsloMet
- Melanie Kirmess, ST/PhD, Ass. Professor, Sunnaas/UiO
- 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: Hege Prag Øra, Thy Thy Vanem, Svein Otto Fredwall, Ingebjørg Irgens, Erlend Solberg Dørum, Kristine Marie M. Vege, Jelena Simic
- PSYCH: Daniel Løke, Knut Kolskår, Dani Beck, Ingvil Laberg Holthe
- RN: Anne Geard
- PT: Wiebke Höfers, Pia Wedege, Emelie Butler Forslund, Ann Marie Hestetun-Mandrup
- SW: Jannike K. Vikan
- ST: Maribeth C. Rivelsrud, Silje Merete Hansen
- OT: Anne-Marthe Sanders
- 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 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 2021

### Dissertations:

Hege Prag Øra, UiO

*“Telerehabilitation for post-stroke aphasia. Technical features, feasibility, acceptability and effects on language outcomes of augmented speech and language therapy by videoconference”*

Thy Thy Vanem, UiO

*“Marfan syndrome in adults – re-investigations in a Norwegian cohort after 10 years”*



Peer reviewed original research articles: 86

**Selected publications:**

*“50 Years and older - born with spina bifida: participation, health issues and physical function”*

Lidal IB, Lundberg Larsen K, Hoff M.

Disabil Rehabil. 2021 Jan;43(2):241-250. doi: 10.1080/09638288.2019.1621953. Epub 2019 Jun 10. PMID: 31180731

*“Neuropsychological Impairment, Brain Injury Symptoms, and Health-Related Quality of Life After Pediatric TBI in Oslo”*

Holthe IL, Dahl HM, Rohrer-Baumgartner N, Eichler S, Elseth MF, Holthe Ø, Berntsen T, Yeates KO, Andelic N, Løvstad M.

Front Neurol. 2022 Jan 28;12:719915. doi: 10.3389/fneur.2021.719915. eCollection 2021. PMID: 35153967

*“Organisation of services and systems of care in paediatric spinal cord injury rehabilitation in seven countries: a survey with a descriptive cross-sectional design”*

Höfers W, Jørgensen V, Sällström S, Vege KM, Strøm M, New PW, Bushnik T, Zakharova O, Krasovsky T, Guttman D, Ghatasha A, Genlin L, Yang C, Yu-Xi Q, Wahman K, Sunnerhagen KS, Ertzgaard P, Sukhov R, Augutis M, Stanghelle JK, Roaldsen KS.

Spinal Cord. 2022 Apr;60(4):339-347. doi: 10.1038/s41393-021-00726-1. Epub 2021 Nov 20. PMID: 34802054



## Publication list NVR research groups 2021

Includes ordinary journal articles and reviews only

Abé C, Ching CRK, Liberg B, Lebedev AV, Agartz I, Akudjedu TN, Alda M, Alnæs D, Alonso-Lana S, Benedetti F, Berk M, Bøen E, Bonnin CDM, Breuer F, Brosch K, Brouwer RM, Canales-Rodríguez EJ, Cannon DM, Chye Y, Dahl A, Dandash O, Dannlowski U, Dohm K, Elvsåshagen T, Fisch L et al. (2021)

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

Biol Psychiatry, 91 (6), 582-592

DOI [10.1016/j.biopsych.2021.09.008](https://doi.org/10.1016/j.biopsych.2021.09.008), PubMed [34809987](https://pubmed.ncbi.nlm.nih.gov/34809987/)

Advani R, Strømsnes TA, Stjernstrøm E, Lugg ST (2021)

Multiple simultaneous embolic cerebral infarctions 11 months after COVID-19

Thromb J, 19 (1), 57

DOI [10.1186/s12959-021-00304-8](https://doi.org/10.1186/s12959-021-00304-8), PubMed [34407847](https://pubmed.ncbi.nlm.nih.gov/34407847/)

Alfradique-Dunham I, Al-Ouran R, von Coelln R, Blauwendraat C, Hill E, Luo L, Stillwell A, Young E, Kaw A, Tan M, Liao C, Hernandez D, Pihlstrom L, Grosset D, Shulman LM, Liu Z, Rouleau GA, Nalls M, Singleton AB, Morris H, Jankovic J, Shulman JM (2021)

Genome-Wide Association Study Meta-Analysis for Parkinson Disease Motor Subtypes

Neurol Genet, 7 (2), e557

DOI [10.1212/NXG.0000000000000557](https://doi.org/10.1212/NXG.0000000000000557), PubMed [33987465](https://pubmed.ncbi.nlm.nih.gov/33987465/)

Andelic N, Røe C, Tenovuo O, Azouvi P, Dawes H, Majdan M, Ranta J, Howe EI, Wiegers EJA, Tverdal C, Borgen I, Forslund MV, Kleffelgaard I, Dahl HM, Jacob L, Cogné M, Lu J, von Steinbuechel N, Zeldovich M (2021)

Unmet Rehabilitation Needs after Traumatic Brain Injury across Europe: Results from the CENTER-TBI Study

J Clin Med, 10 (5)

DOI [10.3390/jcm10051035](https://doi.org/10.3390/jcm10051035), PubMed [33802336](https://pubmed.ncbi.nlm.nih.gov/33802336/)

Andersen MS, Bandres-Ciga S, Reynolds RH, Hardy J, Ryten M, Krohn L, Gan-Or Z, Holtman IR, Pihlstrøm L, International Parkinson's Disease Genomics Consortium (2021)

Heritability Enrichment Implicates Microglia in Parkinson's Disease Pathogenesis

Ann Neurol, 89 (5), 942-951

DOI [10.1002/ana.26032](https://doi.org/10.1002/ana.26032), PubMed [33502028](https://pubmed.ncbi.nlm.nih.gov/33502028/)

Andersson H, Jablonski GE, Nordahl SHG, Nordfalk K, Helseth E, Martens C, Røysland K, Goplen FK (2021)

The Risk of Benign Paroxysmal Positional Vertigo After Head Trauma

Laryngoscope, 132 (2), 443-448

DOI [10.1002/lary.29851](https://doi.org/10.1002/lary.29851), PubMed [34487348](https://pubmed.ncbi.nlm.nih.gov/34487348/)

Andreassen S, Lindland EMS, Solheim AM, Beyer MK, Ljøstad U, Mygland Å, Lorentzen ÅR, Reiso H, Harbo HF, Løhaugen GCC, Eikeland R (2021)

Cognitive function, fatigue and Fazekas score in patients with acute neuroborreliosis

Ticks Tick Borne Dis, 12 (3), 101678

DOI [10.1016/j.ttbdis.2021.101678](https://doi.org/10.1016/j.ttbdis.2021.101678), PubMed [33529985](https://pubmed.ncbi.nlm.nih.gov/33529985/)



Andreou D, Steen NE, Jørgensen KN, Smelror RE, Wedervang-Resell K, Nerland S, Westlye LT, Nærland T, Myhre AM, Joa I, Reitan SMK, Vaaler A, Morken G, Bøen E, Elvsåshagen T, Boye B, Malt UF, Aukrust P, Skrede S, Kroken RA, Johnsen E, Djurovic S, Andreassen OA, Ueland T, Agartz I (2021)

Lower circulating neuron-specific enolase concentrations in adults and adolescents with severe mental illness  
Psychol Med, 1-10 (in press)

DOI [10.1017/S0033291721003056](https://doi.org/10.1017/S0033291721003056), PubMed [35387700](https://pubmed.ncbi.nlm.nih.gov/35387700/)

Arnold M, Sandset EC, Aguiar de Sousa D, Demchuk AM (2021)

Transitioning From Mentee to Mentor: How and When to Start Developing the Skills Needed to Support Others?  
Stroke, 52 (12), e848-e851

DOI [10.1161/STROKEAHA.121.035918](https://doi.org/10.1161/STROKEAHA.121.035918), PubMed [34749505](https://pubmed.ncbi.nlm.nih.gov/34749505/)

Aukrust CG, Kamalo PD, Prince RJ, Sundby J, Mula C, Manda-Taylor L (2021)

Improving competencies and skills across clinical contexts of care: a qualitative study on Malawian nurses' experiences in an institutional health and training programme

Nurs Open, 8 (6), 3170-3180

DOI [10.1002/nop2.1030](https://doi.org/10.1002/nop2.1030), PubMed [34355870](https://pubmed.ncbi.nlm.nih.gov/34355870/)

Austevoll IM, Hermansen E, Fagerland MW, Storheim K, Brox JI, Solberg T, Rekeland F, Franssen E, Weber C, Brisby H, Grundnes O, Algaard KRH, Böker T, Banitalebi H, Indrekvam K, Hellum C, NORDSTEN-DS Investigators (2021)

Decompression with or without Fusion in Degenerative Lumbar Spondylolisthesis

N Engl J Med, 385 (6), 526-538

DOI [10.1056/NEJMoa2100990](https://doi.org/10.1056/NEJMoa2100990), PubMed [34347953](https://pubmed.ncbi.nlm.nih.gov/34347953/)

Baumgartner T, Carreño M, Rocamora R, Bisulli F, Boni A, Brázdil M, Horak O, Craiu D, Pereira C, Guerrini R, San Antonio-Arce V, Schulze-Bonhage A, Zuberi SM, Hallböök T, Kalviainen R, Lagae L, Nguyen S, Quintas S, Franco A, Cross JH, Walker M, Arzimanoglou A, Rheims S, Granata T, Canafoglia L et al. (2021)

A survey of the European Reference Network EpiCARE on clinical practice for selected rare epilepsies  
Epilepsia Open, 6 (1), 160-170

DOI [10.1002/epi4.12459](https://doi.org/10.1002/epi4.12459), PubMed [33681659](https://pubmed.ncbi.nlm.nih.gov/33681659/)

Berge-Seidl V, Pihlstrøm L, Toft M (2021)

Integrative analysis identifies bHLH transcription factors as contributors to Parkinson's disease risk mechanisms  
Sci Rep, 11 (1), 3502

DOI [10.1038/s41598-021-83087-2](https://doi.org/10.1038/s41598-021-83087-2), PubMed [33568722](https://pubmed.ncbi.nlm.nih.gov/33568722/)

Birkenaes V, Elvsashagen T, Westlye LT, Hoegh MC, Haram M, Werner MCF, Quintana DS, Lunding SH, Martin-Ruiz C, Agartz I, Djurovic S, Steen NE, Andreassen OA, Aas M (2021)

Telomeres are shorter and associated with number of suicide attempts in affective disorders

J. Affect. Disord., 295, 1032-1039

DOI [10.1016/j.jad.2021.08.135](https://doi.org/10.1016/j.jad.2021.08.135)

Bjerknes S, Toft M, Brandt R, Rygvold TW, Konglund A, Dietrichs E, Andersson S, Skogseid IM (2021)

Subthalamic Nucleus Stimulation in Parkinson's Disease: 5-Year Extension Study of a Randomized Trial  
Mov Disord Clin Pract, 9 (1), 48-59

DOI [10.1002/mdc3.13348](https://doi.org/10.1002/mdc3.13348), PubMed [35005065](https://pubmed.ncbi.nlm.nih.gov/35005065/)





Bjørke AB, Østby Y, Grahl SG, Larsson PG, Olsen KB, Johansen Nævra MC, Ringstad GA, Bjørnerud A, Gjerstad L, Taubøll E, Heuser K (2021)

Cognition in adult patients with newly diagnosed non-lesional temporal lobe epilepsy

Epilepsy Behav, 116, 107771

DOI [10.1016/j.yebeh.2021.107771](https://doi.org/10.1016/j.yebeh.2021.107771), PubMed [33545650](https://pubmed.ncbi.nlm.nih.gov/33545650/)

Bjørnstad DM, Åbjørsbråten KS, Hennestad E, Cunen C, Hermansen GH, Bojarskaite L, Pettersen KH, Vervaeke K, Enger R (2021)

Begonia-A Two-Photon Imaging Analysis Pipeline for Astrocytic Ca<sup>2+</sup> Signals

Front Cell Neurosci, 15, 681066

DOI [10.3389/fncel.2021.681066](https://doi.org/10.3389/fncel.2021.681066), PubMed [34093134](https://pubmed.ncbi.nlm.nih.gov/34093134/)

Blauwendraat C, Iwaki H, Makarious MB, Bandres-Ciga S, Leonard HL, Grenn FP, Lake J, Krohn L, Tan M, Kim JJ, Gibbs JR, Hernandez DG, Ruskey JA, Pihlstrøm L, Toft M, van Hilten JJ, Marinus J, Schulte C, Brockmann K, Sharma M, Siitonen A, Majamaa K, Eerola-Rautio J, Tienari PJ, Grosset DG et al. (2021)

Investigation of Autosomal Genetic Sex Differences in Parkinson's Disease

Ann Neurol, 90 (1), 35-42

DOI [10.1002/ana.26090](https://doi.org/10.1002/ana.26090), PubMed [33901317](https://pubmed.ncbi.nlm.nih.gov/33901317/)

Boer CG, Hatzikotoulas K, Southam L, Stefánsdóttir L, Zhang Y, Coutinho de Almeida R, Wu TT, Zheng J, Hartley A, Teder-Laving M, Skogholt AH, Terao C, Zengini E, Alexiadis G, Barysenka A, Bjornsdottir G, Gabrielsen ME, Gilly A, Ingvarsson T, Johnsen MB, Jonsson H, Kloppenburg M, Luetge A, Lund SH, Mägi R et al. (2021)

Deciphering osteoarthritis genetics across 826,690 individuals from 9 populations

Cell, 184 (18), 4784-4818.e17

DOI [10.1016/j.cell.2021.07.038](https://doi.org/10.1016/j.cell.2021.07.038), PubMed [34450027](https://pubmed.ncbi.nlm.nih.gov/34450027/)

Boer CG, Hatzikotoulas K, Southam L, Stefánsdóttir L, Zhang Y, Coutinho de Almeida R, Wu TT, Zheng J, Hartley A, Teder-Laving M, Skogholt AH, Terao C, Zengini E, Alexiadis G, Barysenka A, Bjornsdottir G, Gabrielsen ME, Gilly A, Ingvarsson T, Johnsen MB, Jonsson H, Kloppenburg M, Luetge A, Lund SH, Mägi R et al. (2021)

Deciphering osteoarthritis genetics across 826,690 individuals from 9 populations

Cell, 184 (24), 6003-6005

DOI [10.1016/j.cell.2021.11.003](https://doi.org/10.1016/j.cell.2021.11.003), PubMed [34822786](https://pubmed.ncbi.nlm.nih.gov/34822786/)

Borgen IMH, Kleffelgård I, Hauger SL, Forslund MV, Sjøberg HL, Andelic N, Sveen U, Winter L, Løvstad M, Røe C (2021)

Patient-Reported Problem Areas in Chronic Traumatic Brain Injury

J Head Trauma Rehabil (in press)

DOI [10.1097/HTR.0000000000000744](https://doi.org/10.1097/HTR.0000000000000744), PubMed [34743086](https://pubmed.ncbi.nlm.nih.gov/34743086/)

Borgen IMH, Røe C, Brunborg C, Tenovuo O, Azouvi P, Dawes H, Majdan M, Ranta J, Rusnak M, Wiegers EJA, Tverdal C, Jacob L, Cogné M, von Steinbuechel N, Andelic N, CENTER-TBI participants investigators (2021)

Care transitions in the first 6 months following traumatic brain injury: Lessons from the CENTER-TBI study

Ann Phys Rehabil Med, 64 (6), 101458

DOI [10.1016/j.rehab.2020.10.009](https://doi.org/10.1016/j.rehab.2020.10.009), PubMed [33246186](https://pubmed.ncbi.nlm.nih.gov/33246186/)

Broch L, Simonsen CS, Flemmen HØ, Berg-Hansen P, Skardhamar Å, Ormstad H, Celius EG (2021)

High prevalence of fatigue in contemporary patients with multiple sclerosis

Mult Scler J Exp Transl Clin, 7 (1), 2055217321999826

DOI [10.1177/2055217321999826](https://doi.org/10.1177/2055217321999826), PubMed [33796331](https://pubmed.ncbi.nlm.nih.gov/33796331/)





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Precision treatment with nicotine in autosomal dominant sleep-related hypermotor epilepsy (ADSHE): An observational study of clinical outcome and serum cotinine levels in 17 patients  
Epilepsy Res, 178, 106792  
DOI [10.1016/j.epilepsyres.2021.106792](https://doi.org/10.1016/j.epilepsyres.2021.106792), PubMed [34763266](https://pubmed.ncbi.nlm.nih.gov/34763266/)

Brolin K, Bandres-Ciga S, Leonard H, Makarious MB, Blauwendraat C, Mata IF, Foo JN, Pihlstrøm L, Swanberg M, Gan-Or Z, Tan MM, International Parkinson's Disease Genomics Consortium (2021)  
RIC3 variants are not associated with Parkinson's disease in large European, Latin American, or East Asian cohorts  
Neurobiol Aging, 109, 264-268  
DOI [10.1016/j.neurobiolaging.2021.08.009](https://doi.org/10.1016/j.neurobiolaging.2021.08.009), PubMed [34538707](https://pubmed.ncbi.nlm.nih.gov/34538707/)

Buades-Rotger M, Solbakk AK, Liebrand M, Endestad T, Funderud I, Siegwandt P, Enter D, Roelofs K, Krämer UM (2021)  
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