

# The Intervention Centre Annual report 2012

Oslo University Hospital and  
Faculty of Clinical Medicine, University of Oslo



## ANNUAL REPORT 2012

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## Safe introduction of new clinical procedures involving medical technology



Medicine is rapidly evolving, and new procedures are constantly introduced. Some of these methods are simple and involve little new technology. Many of the new methods are, however, not so simple, and involve the use of advanced, expensive technology. Some of these methods, like radiology-guided interventions and robot-assisted surgery, involve expensive advanced technology. In many cases, the clinical benefit and cost effectiveness of the new methods have not been documented before the procedures are introduced in daily practice.

The Intervention Centre was established as a toolbox for the clinical departments in their efforts to develop new technology-based procedures for diagnostics and treatment. For more than 15 years, we have worked with clinicians from our own and other hospitals to develop new procedures for treatment in a safe environment.

Before introduction of a new method, a health technology assessment is performed. But often

the scientific evidence is lacking before we start a procedure, then the introduction of the method in our hospital needs to be documented.

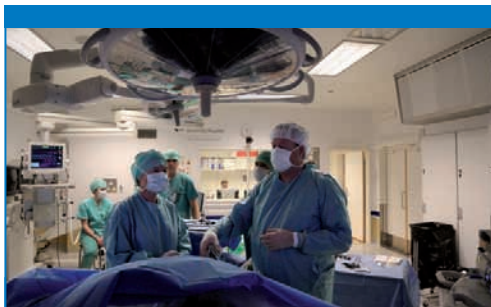
As the Intervention Centre is approved both as an animal facility and operation theatre for patients, the centre can perform the whole chain of studies required for introducing new procedures. The surgeons may start with some animal cases before moving to pilot procedures in patients and eventually randomized, controlled trials.

The randomized trials often include three outcome categories: clinical outcome, patient experienced outcome, and health economy assessment.

In 2012, The Intervention Centre was appointed core facility for introduction of methods. In 2013, we will increase our efforts to support the clinicians in performing health technology assessments and develop procedures in a safe environment, providing evidence for the efficacy of new methods.

**Erik Fosse**  
Head of Department

# Main goals and objectives



## THE CENTRE HAS THE FOLLOWING TASKS:

1. Develop new procedures
2. Develop new treatment strategies
3. Compare new and existing strategies
4. Optimizing and development of advanced imaging techniques
5. Study the social, economic, and organisational consequences of new procedures on health care
6. Administration of radiation protection for all departments in the hospital

## RESEARCH AREAS

- MR guided intervention and surgery
- X-ray, CT, ultrasound, video-guided interventions and surgery
- Robotics and simulators
- Sensor technology, data management and communication technology
- Physics in MR, CT, X-ray, US, PET and nuclear medicine

## FACILITIES

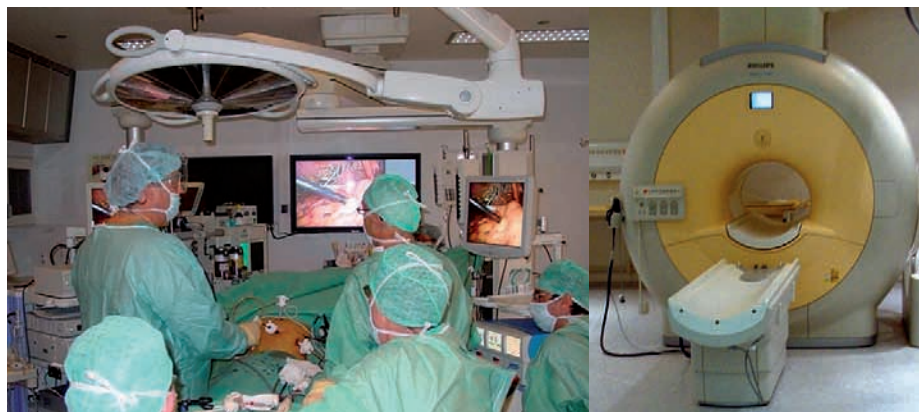
The Centre is part of the general operation room area at Oslo University Hospital, Rikshospitalet. In addition to human procedures, The Intervention Centre has approval for animal trials in the operation theatres and hybrid suites. The staff is experienced in performing animal trials. In three suites advanced imaging equipment is integrated in an operation room environment.

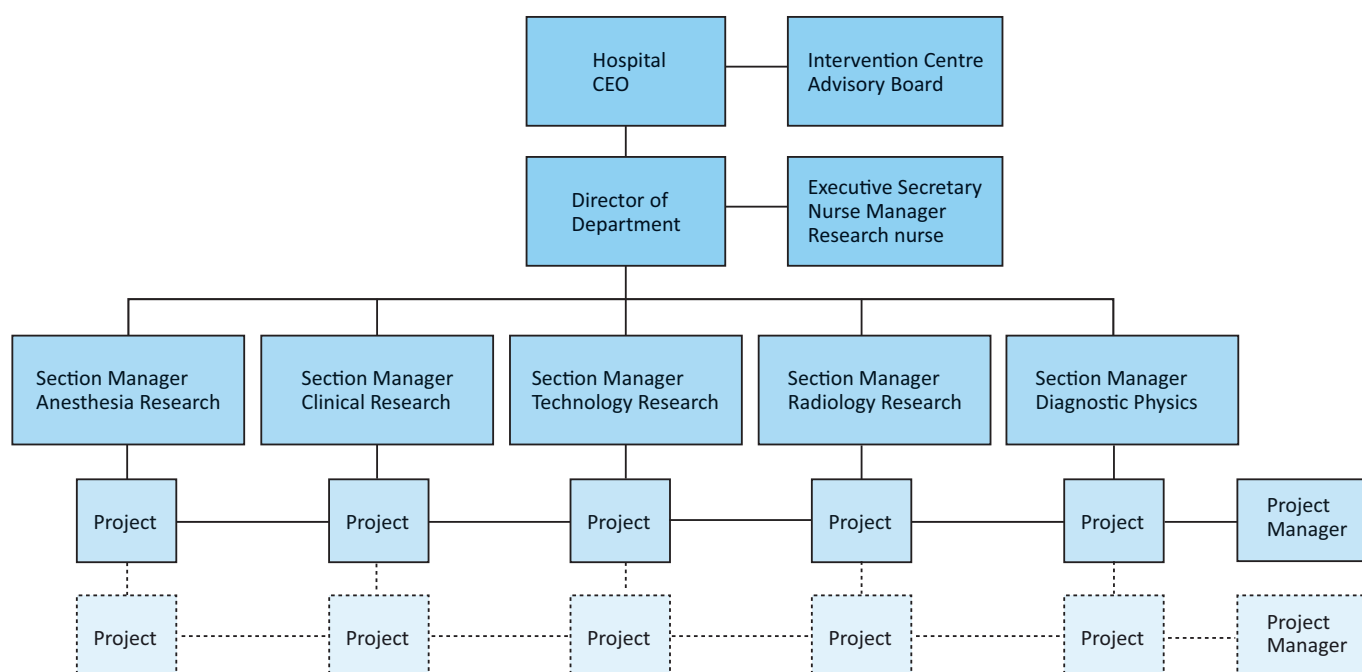
In 2007, all advanced imaging equipment was renewed. In the combined surgical and radiological suite, the conventional angiographic equipment was substituted by a Siemens Zeego system, based on robotic technology and new advances in imaging and functionality. The Intervention Centre is a test site for their Zeego system. The MRI suite was completely rebuilt into a dual room suite where a Philips 3 Tesla MRI was installed in connection to a state-of-the-art Operation theater. The MRI was funded as a joint effort by the Norwegian Research Council, the University of Oslo and Rikshospitalet. In the videoscapy room all systems are equipped with Olympus HD equipment.

## STAFF

The multi-disciplinary staff includes 45 persons (doctors, nurses, radiographers, medical physicists and technologists). Four professors and two associate professors, employed at the Faculty of Medicine and the Faculty of Mathematics and natural sciences of University of Oslo (UiO) and the Department of Electronics and Telecommunication of the Norwegian University of Technology (NTNU), are included among the staff.

The hybrid OR facilities at The Intervention Centre





## ORGANIZATION

The Intervention Centre is organized in The Clinic for diagnostics and intervention in OUS.

In order to facilitate effective management of multi-disciplinary projects, the personnel and equipment at the Centre are allocated to five sections. All projects in the Centre are allocated to one of these sections, and the project manager is reporting to one section manager. The operation rooms are managed by the unit nursing officer, reporting directly to the head of department. In 2005, OUS established a group of

medical physicists specialized in diagnostic radiology, nuclear medicine and intervention. The establishment was supported by both the Southern and the Eastern Norway regional health authorities.

From 1<sup>st</sup> January 2010, the section for diagnostic physics was allocated to the Intervention Centre, providing most of the hospitals in the South-eastern health region of Norway with physic services for daily running of the radiology and nuclear medicine departments and for physics research infrastructure.





# Section of Diagnostic Physics

*Section manager Associate professor Anne Catrine Trægde Martinsen, PhD*

In the Intervention Centre, there are 22 physicists employed on regular basis, of whom 10 are working in the fields of CT, X-ray, intervention and radiation protection, 4 are working in the field of nuclear medicine and PET-CT and 8 are working in the fields of MR-physics. This is the largest department of diagnostic physics in Norway, offering a regional service in the South Eastern Health region of Norway.

In addition to quality assurance and radiation protection, the section is co-responsible for the daily follow-up and management of the PET-CT core facility and the MR core facility in OUS, and are involved in research in topics as MR-physics, CT-physics, mammography, intervention radiology, nuclear medicine including PET-CT, image processing and radiation protection. In addition, comparison studies of different modalities, optimization of radiation protection in pediatrics, interventional radiology and internal dosimetry are also fields of research.

## REGIONAL PHYSICIST SERVICE

In 2005, OUS established a group of physicists specialized in diagnostic radiology, nuclear medicine and intervention, serving most of the hospitals in the south-eastern part of Norway. In 2012, the Intervention Centre offered service to all the hospitals in OUS and to 13 hospitals and radiological institutes at 35 locations outside OUS:

AHUS  
Sykehuset Innlandet  
Sykehuset Østfold  
Telemark  
Lovisenberg  
Diakonhjemmet  
Sunnås  
Martine Hansens hospital  
Volvat  
ALERIS  
Feiringklinikken  
Glittreklinikken  
Helsehuset Kongsberg

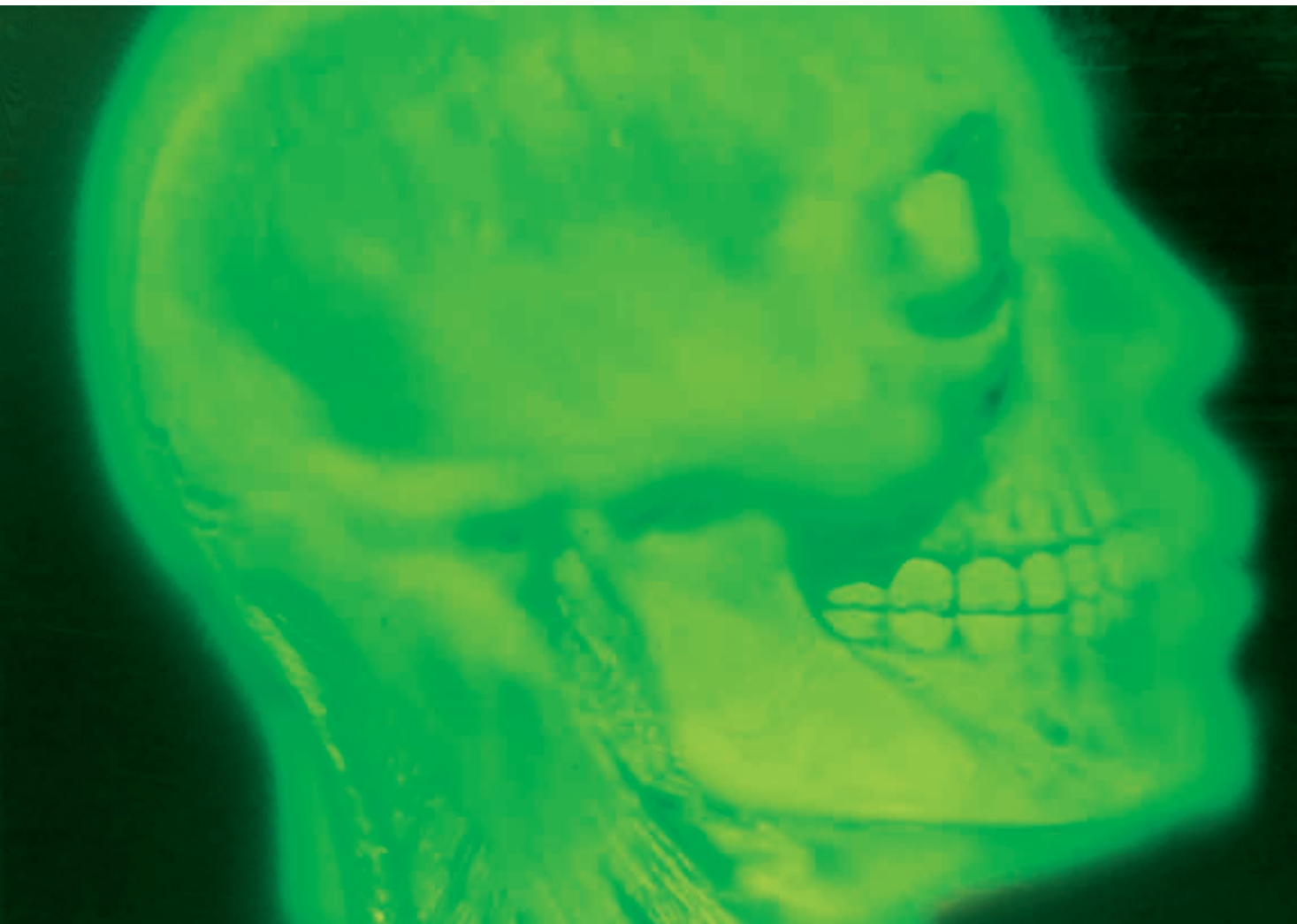
This is a non-profit service; the salary for physicists and traveling costs related to the work done in a hospital

are paid for by the receiving hospital. To the extent that it is feasible each hospital has one contact physicist working together with radiologist and technicians in the radiology department. Multidisciplinary teamwork is one important factor of success. The services offered are:

### System acceptance tests

- Image quality and radiation dose
- Quality assurance tests performed annually
- Multidisciplinary radiation dose versus image quality optimization projects within  
CT  
Trauma  
Neuroradiology  
Intervention  
Pediatrics
- Lectures for surgical personnel using X-ray equipment
- Lectures at the radiological and nuclear medicine departments
- Dose measurements and dose estimates
- Consultancy in purchases of new radiology modalities

The economical benefits of a regional physicist service includes reduced personnel needs due to recirculation of lectures, reports and knowledge between the physicists in the group. Also less measuring equipment is needed in the region due to a centralised pool of equipment. Other regional benefits are the achievement of high competence in CT, X-ray, MR, and nuclear medicine due to the exchange of experience and knowledge from different laboratories and hospitals. Technological problems are solved by experience from previous similar problems in other sites, and development of QA methods and procedures are consolidated in the group of physicists.



## COURSES

The section is responsible for two master courses in physics at the University of Oslo: “FYS 4760 Physics in diagnostic X-ray” and “FYS-KJM 4740/9740 MR-theory and medical diagnostics” and one CT post educating course (“ViCT”) for radiographers at the University college of Oslo.

The section arranged workshops in acceptance testing and quality assurance testing for MR scanners and SPECT/CT, PET/CT and nuclear medicine for Norwegian physicists. Besides, the Section was co-responsible for a Nordic Course in CT colonography in Oslo in 2012 and

in represented in the committees of The annual meeting for Medical physicists (Medfys) and the annual radiological meeting (Vårmøtet i radiologi) in 2012.

## QUALITY ASSURANCE

Methodology for acceptance tests and quality assurance on diagnostic modalities as MR, PET-CT, nuclear medicine, CT, fluoroscopy and X-ray were revised and further developed.

In 2011 QA on 315 modalities, from all vendors at the Norwegian market, were performed.



# Research Groups

MEDICAL PHYSICS RESEARCH | Section Manager Associate professor Anne Catrine Trægde Martinsen

## CT PHYSICS AND TECHNOLOGY

*Leader: Associate professor  
Anne Catrine Trægde Martinsen, PhD*

### RESERACH GROUP MEMBERS

Hilde Kjernlie Andersen, *Medical physicist*  
Krisin Jensen, *Medical physicist*  
Bjørn Helge Østerås, *Medical physicist*  
Kristine Gulliksrud, *Medical physicist*  
Caroline Stokke, *Medical physicist*  
Mogens Aaløkken, *Radiologist*  
Hilde Olerud, *Associate professor/Head of section*  
Dawid Mozejko, *Master-student*  
Antonio Pelegrina, *Master-student*

### RESEARCH PROFILE

The group was established in 2012. Up til now, little research on CT has been performed in Norway. The frequency of CT examinations increases and CT examinations accounted for 80% of the total population radiation exposure from medicine in Norway in 2010. Therefore, development of new techniques to improve image quality and simultaneously reducing the radiation dose to patients is required. The main focus of the group is on development of new imaging methods, clinical implementation and further development of new image reconstruction algorithms and image post processing tools, such as CT perfusion, CT spectral imaging and iterative reconstruction techniques.

### LONG TERM GOALS

The CT physics and technology research group focuses on the development and implementation of advanced image reconstruction and processing techniques with specific focus on improved diagnostics of patients and at the same time reduced radiation dose. Future objectives are on validation of new methodology, such as iterative image reconstruction, spectral imaging, CT organ perfusion, in terms of improved diagnostic outcome and socioeconomic value.

### PROJECTS

**HyPerCept** – Color and Quality in higher dimensions, WP2.1: *Optimizing visual and diagnostic image quality in radiography*

In the study, we will investigate the transfer of knowledge from color imaging in the media industry to the radiography/radiology arena. Our motive is to develop new models, and re-use established models, for predicting the diagnostic quality of images in terms of the sensitivity and specificity of diagnostic imaging protocols.

#### **Optimization of diagnosis image quality and radiation dose of radiological tomography techniques using advanced post processing reconstruction algorithms**

The aim of the study is to introduce new applications in CT tomography and tomography used in mammography screening to improve image quality and potentially lowering radiation doses to the patient.

#### **New method for liver metastasis diagnostics in patients with colorectal cancer (part of the Oslo Comet study)**

The aim of the study is to improve the diagnostics of liver metastasis using new features like CT liver perfusion.

#### **Spectral imaging and iterative reconstruction in CT imaging, image quality and radiation doses**

The aim of the study is to introduce new applications in the clinic using new CT reconstruction techniques to improve image quality and lowering radiation doses to the patient. The study will concentrate on iterative image reconstruction and spectral imaging. Interphantom and interscanner variations for Hounsfield units, homogeneity and low contrast detectability in Catphan 500/600. Quality assurance (QA) phantoms for computed tomography (CT) are commercially available. The aim of the study is to analyze the characteristics of the most commonly used QA phantoms, Catphan 500/504/600 (The Phantom Laboratory, NY) and examine possible interphantom and interscanner variations in HU, homogeneity and low contrast detectability.

#### **Lifetime quality and lifetime cost of CT scanners from all vendors on the Norwegian market**

The aims of the study are: Establishing a complete overview of image quality and radiation dose for CT scanners from all vendors on the Norwegian market, estimate lifetime quality performance and total life time cost for different types of CT scanners from all vendors and evaluate the recommended quality assurance tests and the frequency necessary to ensure safe patient examinations.





### Ultralow dose chest CT

The aim of this study is to compare image quality, radiation dose and laboratory time for chest radiography (CR) with ultra low dose chest CT (ULD-CT) reconstructed with adaptive iterative dose reduction (AIDR 3D).

### Monitoring radiation dose to personell and patients during TAVI procedures

#### PARTNERS

##### **Professor Per Skaane, MD PhD**

Department of Radiology and nuclear medicine  
Oslo University Hospital

##### **Professor Bjørn Edwin, MD PhD**

The Intervention Centre  
Oslo University Hospital

##### **Professor Erik Fosse, MD PhD**

The Intervention Centre  
Oslo University Hospital

##### **Associate professor/Head of section**

##### **Hilde Merethe Olerud, Dr Ing**

Norwegian radiation protection authority

##### **Associate professor Anders Tingberg, PhD**

Department of Medical radiation, Lund University  
Sweden

##### **Associate professor Dag Waaler**

Faculty of Health, Care and Nursing, Health, Technology and Society, Gjøvik University College

##### **Researcher Marius Pedersen**

Norwegian Color Research Laboratory  
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Oslo University Hospital

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Oslo University Hospital

##### **Claudius Reisse, MD**

Department of Radiology and nuclear medicine  
Oslo University Hospital

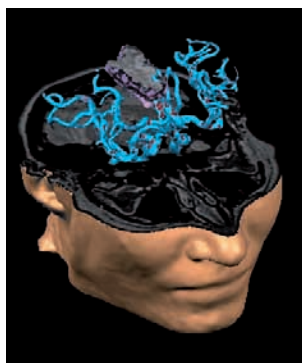
##### **Joanna Kristiansen, MSc**

Department of Radiology and nuclear medicine  
Oslo University Hospital

## MEDICAL PHYSICS RESEARCH

### ADVANCED MR NEURO IMAGING

Group leader: Professor Atle Bjørnerud, PhD, UiO



The main research focus of the Advanced Neuroimaging Group (ANG) is related to functional MRI applied to different neuro-pathological conditions. There is currently a particular focus on MR based imaging for diagnosis, prognosis- and treatment response assessment in patients with primary brain tumors (*gliomas*). A multi-centre study for evaluation of diagnostic

efficacy of MR based perfusion imaging for diagnosis of gliomas is incorporated in the Norwegian Research Council (NRC)-financed project: Evaluation of functional Magnetic Resonance in the Diagnosis of Brain Tumors for Assessment of Clinical Efficacy (EMBRACE). As part of the EMBRACE project a new prospective study is ongoing, which will assess the clinical utility of advanced MR based imaging methods for evaluation of treatment response in high grade gliomas patients.

The ANG is a multi-disciplinary effort and is collaborating closely with many other groups both internally within the OUS and externally with world-class research groups in Europe and the US. The group also has a close link to industry through collaboration/co-development with software companies (*NordicNeuroLab, Bergen, Norway and CorTechs Labs, SanDiego, USA*). The group has filed several patent applications related to novel image processing techniques which have been sub-licensed to our industrial partners. The ANG group members are further involved in a large number of imaging studies ongoing in the Oslo-region. In particular, the group provides MR expertise in several morphometric MR studies where high resolution MRI is used to assess neuro-structural changes related to neurodegenerative disease, Alzheimer's disease and normal aging.

### SOFTWARE DEVELOPMENT – NORDICICE

The ANG has over the last years been central in the development of an extensive software package for advanced image processing in MRI, with special focus on dynamic analysis. The software package, called nordicICE, is now a commercial product sold in more than 20 countries. nordicICE is one of very few medical image analysis software packages for advanced perfusion analysis with full FDA-approval (510K). At Rikshospitalet, nordicICE has been fully integrated into (Sectra) PACS and is now an integral part of routine diag-

nostic MR procedures, including BOLD fMRI, DTI and perfusion analysis. The ANG is currently preparing the nordicICE software package for integration into the next generation Sectra PACS (IDS7) and also focusing on expanding the functionality of the package towards automated tumor segmentation and implementation of advanced statistical methods for computer aided diagnosis (CAD).

### ONGOING PROJECTS

EMBRACE

SAILOR

Magnetic Resonance Imaging:  
A Novel Method for Improved Morphologic  
and Functional Assessment of Breast Tumors

nordicICE integration in PACS

Quantitative MR-perfusion

Automated white matter lesion quantification

### PHD STUDENTS

Paulina Due-Tønnessen

Mentors: Atle Bjørnerud, Kyrre Eeg-Emblem

***Evaluation of functional magnetic resonance in the diagnosis of brain tumors for assessment of clinical efficacy***

Tuva Hope

Mentors: Atle Bjørnerud, Inge Rasmussen, Asta Håberg

***MR based analysis of functional and hemodynamic parameters in brain tumors***

Endre Grøvik

Mentors: Kjell-Inge Gjesdal, Atle Bjørnerud,

Kathinka Kurz, Trygve Storaas

***Magnetic Resonance Imaging: a novel method for improved morphologic and functional assessment of breast tumors***

Arvid Morell (Uppsala)

Mentors: Atle Bjørnerud, Håkan Ahlström

***Quantitative tracer based MRI perfusion – potentials and limitations***

Per Selnes (Akershus University Hospital)

Mentors: Tormod Fladby, Atle Bjørnerud

***Understanding early events in Alzheimer's disease pathogenesis***

### POST DOC

Inge Rasmussen and Kyrre Eeg Emblem

## DOSIMETRY, MODELLING AND VISUALIZATION IN PET-CT

*Group leader: Professor em. Arne Skretting*

The group is heavily involved in PET research and works together with the recently formed PET-CT core facility which serves three PET/CT scanners in OUS. The main activity has been connected to improve the understanding of how image formation affects the quantitative data in the images, physiologically gated studies and image processing to extract novel information from the PET-studies.

### ONGOING PROJECTS

The application of image processing in radiotherapy

Automatic detection of tumor surfaces in FDG-PET for radio therapy planning

Respiration gating by repeated breath-holds during PET data acquisition

Combined ECG and respiration controlled acquisition in PET heart studies

Simulation of image formation and properties by digital intensity diffusion, including small tumours and viable tumour rims around partly necrotic tumours

Investigation into the possibilities of reducing radiation dose and improve image quality in CT diagnostics through the use of advanced image processing

Studies of <sup>64</sup>Cu-labeled porphyrines as a possible radio-pharmaceutical to detect and characterize gliomas and other tumours by PET

Detection of atherosclerotic plaque in the carotid arteries by FDG-PET

Internal radiation dose estimation through serial SPECT and whole body studies in a Phase I clinical study with a new <sup>177</sup>Lu-labelled antibody

Separation of grey and white matter in FDG-studies of the brain by combining MRI, PET system parameter in the image processing

Development of a multilayer phantom for the quality control of DATscan studies in Parkinsons disease

Regional comparisons of the total performance of bone scans utilizing a transmission phantom

### PHD STUDENTS

Karsten Eilertsen

Department of Medical Physics:

***A Beams Eye View on geometric and dosimetric precision in external beam***

Mentor: Professor Arne Skretting,

The Intervention Center, Oslo University Hospital

Kjersti Johnsrud

Department of Radiology and Nuclear Medicine:

***Imaging of Unstable Carotid Artery Plaque***

Mentors: Professor David Russel, Department

of neurology, Oslo University Hospital and

professor Arne Skretting, The Intervention Center,

Oslo University Hospital

Ingerid Skjei Knudtsen:

***The use of FDG-PET in radiation treatment planning and treatment follow-up***

Mentors: Professor Eli Olaug Hole and professor

Eirik Malinen, The faculty of Mathematical and

natural sciences, University in Oslo, and Arne Skretting,

The Intervention Centre, Oslo University Hospital (OUS)

### MR-PHYSICS

***Cardiac MRI: Cardiac dysfunction in adjuvant breast cancer therapy; a MRI study.***

Primary objective: This project is part of the PRADA study which is a collaboration between Akershus University hospital and Oslo University Hospital, Radiumhospitalet.

PhD student: MD Siri Heck, Ahus.

Mentors: MD Pavel Hoffmann, PhD

Department of radiology and nuclear medicine, OUS

Physicist Tryggve Holck Storås, PhD

The Intervention Centre, OUS

***Bowel MRI: MRC and MRI of patients with inflammatory bowel disease***

This project is part of the Inflammatory Bowel South Eastern Norway (IBSEN) study which is a long term follow up study (now 20 years) of patients with inflammatory bowel disease. This is a collaboration between seven hospitals located in the south east of Norway.

PhD student: MD Linda Tøften Bakstad, Ahus.

Mentor: MD Anne Negård PhD, Ahus.

Coworker: Physicist Tryggve Holck Storås, PhD,

The Intervention Centre, Oslo University Hospital





## SECTION FOR ANESTHESIA RESEARCH | Section Manager Per Steinar Halvorsen, MD, PhD

**CLINICAL AND EXPERIMENTAL  
CARDIOVASCULAR MONITORING***Leader: Per Steinar Halvorsen, MD, PhD***RESEARCH SUBJECT**

The research group aims to develop and test new technologies in cardiovascular monitoring and to evaluate hemodynamic response of new and advanced cardiovascular image guided procedures. New technologies developed or investigated for measuring cardiac function and hemodynamic status include implantable 3D accelerometers, miniaturized ultrasound sensors, novel and radar technology. The sensors are tested in both clinical and experimental models in cooperation with many departments at OUS and external institutions.

**ONGOING STUDIES:**

- 1) Detection of regional and global myocardial ischemia in cardiac surgery with implantable sensor systems
- 2) Evaluation of left and right ventricular function by use of implantable sensors
- 3) The effect of therapeutic hypothermia on cardiac function
- 4) The role of therapeutic hypothermia and extra corporeal membrane oxygenation after cardiac arrest
- 5) Evaluation of cardiovascular response during and after trans aortic valve implantation (TAVI)
- 6) New prognostic markers for mortality and morbidity after the TAVI procedure

The research group consists of six senior researchers, six PhD-students and one Post Doc.

**SENIOR RESEARCHERS**

Per Steinar Halvorsen, MD, PhD  
Jan Fredrik Bugge, MD, PhD  
Erik Fosse, MD, PhD  
Helge Skulstad, MD, PhD  
Thor Edvardsen, MD, PhD  
Svend Aakhus, MD, PhD

**POST DOC**

Espen Remme, MSc, PhD

**BIOSENSOR RESEARCH GROUP***Leader: Professor Tor Inge Tønnessen MD, PhD***RESEARCH SUBJECT**

Current monitoring methods are insensitive for detection of severe pathology in organs, and there is a major unmet medical need for real-time monitoring at the organ level for detection of pathology at a time when the organ is salvageable. The biosensor research group focus on developing technology for organ implantable sensors and carry out animal and human studies showing that it is indeed possible to detect serious organ events like insufficient blood supply (ischemia), organ rejection, bowel perforation and infection in organs.

We have developed a miniaturized PCO<sub>2</sub> sensor (IscAlert™) that in real time monitors blood supply in the organ. In animal studies it has detected ischemia immediately in the heart after occlusion of the coronary artery, in the liver after occlusion of the hepatic artery, in the intestine after occlusion portal vein and in a model of hemorrhagic shock PCO<sub>2</sub> sensors detected ischemia in all organs they monitored.

IscAlert™ is CE branded and has FDA approval. We have carried out studies with microdialysis catheters in more than 100 liver transplant patients, the largest study of its kind in the world. It was found that the most serious complication, hepatic artery thrombosis, was detected with 100% sensitivity and 100% specificity in close to real time. Rejection was detected with > 90 % sensitivity and >83% specificity 3 – 7 days earlier than current methods. Also conditions like small bowel perforation and organ infection was detected.

The research group consists of three senior researchers and six PhD-students.

**SENIOR RESEARCHERS**

Tor Inge Tønnessen, MD, PhD  
Gunvald Kvarstein, MD, PhD  
Lars Wælgard, MD, PhD

**PHD CANDIDATES**

Håkon Haugaa, MD  
Søren Pischke, MD  
Gisli Bjørn Bergmann, MD  
Lars Holhjem, MSc  
Runar Strand-Amundsen, MSc  
Faisal Qureshi, Medical student

## COMPLEMENT RESEARCH GROUP

Leader: Professor Tom Eirik Mollnes, MD, PhD

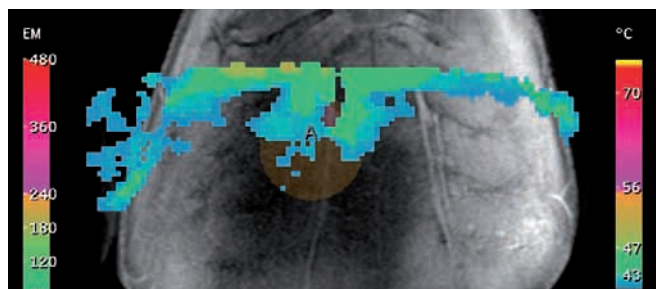
### RESEARCH SUBJECT

#### The role of complement in human disease

Complement is part of the innate immune system protecting the host against invading micro-organisms. Regulatory control mechanisms normally prevent the system from extensive and systemic activation, thereby protecting the host from self damage. Under various disease conditions complement is improperly activated, either locally leading to tissue damage or systemically with risk of serious homeostatic disturbances.

A primary research goal for the Complement Research Group is to elucidate the role of complement as a primary inducer of the inflammatory reaction and thereby form a basis for a future therapeutic approach in complement-mediated disease processes.

For this purpose we have developed novel assays for detection and quantification of complement activation products based on monoclonal antibodies to activation dependent epitopes on a number of complement components; the most important one being the assay for TCC (*the terminal SC5b-9 complement complex*). These assays are used to detect complement activation experimentally and clinically and to evaluate the effect of various complement inhibitors in experimental models. In a novel in vitro human whole blood model where all potential inflammatory mediators are able to interact mutually, we are currently studying the effect of complement inhibition on a number of arms of the inflammatory network. In particular we are focusing on the cross-talk between complement and the Toll-like receptors with emphasis on CD14. The main current projects aim to elucidate the role of complement and CD14 in sepsis, systemic inflammatory response, ischemia-reperfusion injury and transplant rejection. Porcine models for these purposes are established at the Interventional Centre and constitute a major part of the research of the complement group.



## ECONOMIC AND ORGANIZATIONAL CONSEQUENCES OF NEW PROCEDURES AND TREATMENTS

Leader: Professor Erik Fosse, MD, PhD

### GROUP MEMBERS

Bjørn Erik Mørk, PhD OUS/IFI UIO/BI  
Kjersti Wendt, research fellow MSc OUS / Med fak UIO  
Brith Andresen, research fellow MSc OUS / Med fak UIO  
Ivar Sønnebø Kristiansen, professor PhD Inst helseled UIO  
Jasmina Masovic, research fellow MSc IFI UIO  
Olga Mikhailova, research fellow MSc BI  
Margunn Aanestad, professor PhD IFI UIO  
Håkan Håkansson, professor PhD BI  
Per Ingvar Olsen, ass professor PhD BI  
Thomas Hoholm ass professor PhD BI  
Vinod Mishra, consultant PhD OUS

### CHALLENGES

New technology and knowledge has increased the number of treatment options. It also challenges the existing structures in hospital. Catheterbased x-ray guided treatment has allowed cardiologists and radiologists to treat disorders where before open surgery was the only option. The group studies organizational and economical consequences of new methods. This includes changes in hospital organization. Decision making and interaction between the different specialties when new methods are introduced. Cost utility analysis of new methods is also part of the programme.

### GOAL

To establish knowledge of how changes in medical technology and methods challenges the health care system, and provide support to the decision makers in Norwegian Health Care.

### PROJECTS

*"Changes in organisation of vascular surgery in the Health South East region and at Oslo University hospital."* PhD project Kjersti Wendt. Funded byv OUS

*"Economic and patient and close reative experience outcome after percutaneous pulmonary valve replacement in congenital cardiac disease."* PhD project Brith Andresen. Funded by Helse Sør-Øst research funds

*"Fra lokale gjennombrudd i kunnskap til integrasjon i medisinsk praksis (KINT)"* PhD project Jasmina Masovic and Olga Mikhailova and one postdoc, Bjørn Erik Mørk, funded by Norwegian research council VERDIKT programme

## SECTION FOR ANESTHESIA RESEARCH

CARDIOVASCULAR SURGERY AND  
ADVANCED DISTRIBUTED LEARNING*Leader: Jacob Bergsland, MD, PhD*

## GROUP MEMBERS

Jacob Bergsland, MD, PhD, Cardiothoracic Surgeons  
 Karl Øyri, Research Nurse  
 Ilanko Balasingham, Professor, PhD  
 Hugues Fontanelle, PhD  
 Peyman Mirthaheri, Professor at HiO, PhD  
 Samir Delibegovic, Professor at UKC, Tuzla, MD, PhD  
 Zoran Gajic, M.Sc, CEO Exit Centre, Responsible  
 E-Health Initiative, BIH  
 Emir Mujanovic, MD, PhD, Chief of Surgery,  
 BH Heart Centre, BIH

## RESEARCH PROFILE

**The Main Focus of the group is:**

- 1) The Group has several active projects. A large OUS based study focuses on outcomes of patients going through Transcatheter aortic valve implantation. Another project is endovascular aortic interventions. A third project is repair of mitral regurgitation by Mitraclip. These three projects are performed together with the Departments of Thoracic Surgery, Cardiology and Radiology. A development project done together with the University College of Oslo's School of Engineering is developing a new catheterbased instrument for mitral valve repair. The group is participating in many international research constellations focused on implantable sensors and actuators.
- 2) The group has been main partner in international development projects of technological and medical character. Together with partners in Bosnia and Herzegovina an E-Health portal was developed ([www.ezdravlje.org](http://www.ezdravlje.org)). The project was funded by the Ministry of Foreign affairs. A project for advanced simulation training of endoscopic surgery and a corresponding E-learning portal is in progress together with SimSurgery, a company based in Oslo.

## THE GROUPS LONG TERM GOALS

The groups long term goal is to develop and test new minimally invasive methods of cardiovascular therapy, and improving health care by developing sensors and on-line medicine.

## PROJECTS

**Project 1: Transcatheter aortic valve implantation**

Project to develop quality of life, cost and risk/benefit ratios of the new procedure compared to traditional surgery.

**Project 2: Mitraclip**

Evaluation of clinical value of the Mitraclip device.

**Project 3: BIPS**

A project led by SimSurgery Development and validation of advanced distributed learning.

**Project 4: Ultrasponder**

A project to develop an implantable sensor which can be charged and communicate by ultrasound with an outside controlunit. To be used in chronic congestive heart failure.

**Project 5: E-Helse portal in Kosovo**

Planned project for the development of an E-Health Portal for Kosovo, based on the experience from the Health Portal in Bosnia.

**Project 6: HERD**

Higher Education Research and Development for BIH. Project with BUC (Buskerud University College). Cooperation project between the Norwegian partners and Universities in Banja Luka and Tuzla, BIH.

**Project 7: New method for endovascular repair of the Mitral valve**

Project with Oslo University College, Dept of Engineering. Development of a method for chordal replacement.

**Project 8: Video monitoring of cardiovascular status and evaluation of microcirculation of skin and mucous membranes.**

Project with NTNU and Rochester Institute of Technology, NY, USA.



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## COLLABORATIONS

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The group cooperates closely with multiple departments in Oslo University Hospital, other Norwegian Universities in addition to University of Oslo and international academic and corporate organizations.



## SECTION FOR CLINICAL RESEARCH | *Section Manager Bjørn Edwin, professor, MD, PhD*

### IMAGE-GUIDED SURGERY AND MINIMAL INTERVENTION

*Leader: Bjørn Edwin, professor, MD, PhD*

#### RESEARCH GROUP MEMBERS

Trond Buanes, *Prof.*  
Kjersti Flatmark, *MD, PhD*  
Åsmund Avdem Fretland, *MD*  
Marit H. Andersen *MN, PhD*  
Bjørn Atle Bjørnbeth, *Leader, MD, PhD*  
Bård Røsok, *MD, PhD*  
Anne Waage, *MD, PhD*  
Olaug Villanger, *MD, PhD*  
Knut Jørgen Labori, *MD, PhD*  
Dejan Ignjatovic, *MD, PhD*  
Milan Spasojevic, *MD*  
Airazat Kazaryan, *MD, Research fellow*  
Leonid Barkhatov, *MD*  
Karl Øyri, *Research fellow*  
Stig Ronny Kristiansen, *(IT)*  
Erik Næss-Ulseth (*PubGene*)  
Kjell Arne Rein, *MD, PhD*  
Gry Dahle, *MD*  
Cecilie Våpenstad, *MSc*  
Astrid Jones Lie (*PubGene*)  
Sven Petter Haugvik, *MD*  
Ivar P. Gladhaug, *Prof.*

#### ABOUT

Development and assessment of minimal invasive therapy in all surgical fields.

Development and assessment of local ablation in liver malignances, Cryotherapy, Radio frequency ablation and High Intensity focused ultrasound (HIFU).

Development of and assessment of Implants from Bio-medical material, (percutaneous implants for stomas.)

Development and assessment of a 3D map for liver and pancreas used to navigate before and during the navigation.

Development and assessment of a new database plat-form including possibilities to make data from this platform anonymous and use them in public search engine, e.g. PubGen.

Development and assessment of training programs for laparoscopic and single port surgery (LESS).

#### LONG TERM GOALS

Completion of above mentioned research program. Initiate, stimulate and assess more advanced minimal invasive procedures, e.g. Whipple's procedure and advanced liver resections. Assessment of 3D vision to see if 3D will simplify laparoscopic surgery. Assess use of robots in surgery.





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## PROJECTS

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**OsloCoMet-study:**

Oslo randomized laparoscopic vs. open liver resection for colorectal metastases – study.

**Study 1: Surgical stress and Immunosuppression**

To compare stress and immunosuppression following laparoscopic and open liver resection.

**Study 2: Immediate and short term outcomes**

To compare intraoperative and early postoperative outcomes, and immediate oncologic outcomes.

**Study 3: Postoperative pain and quality of life**

- To compare health related quality of life before the procedure, on 2nd postoperative day and in 4, 8, 12 months after the procedure.
- To compare pain on the 2. postoperative day and after 1 month.

**Study 4: Repeat resections**

To define and compare surgical outcomes and major oncologic indexes between sub-groups of repeat resections.

**Studies 5-6: Long term oncologic outcomes**

- To define and compare major oncologic indexes in the 3 and 5 year follow-up period (Study 5)
- To define and compare major oncologic indexes in 10 year follow-up period (study 6)

**Study 7: CoMet Mol**

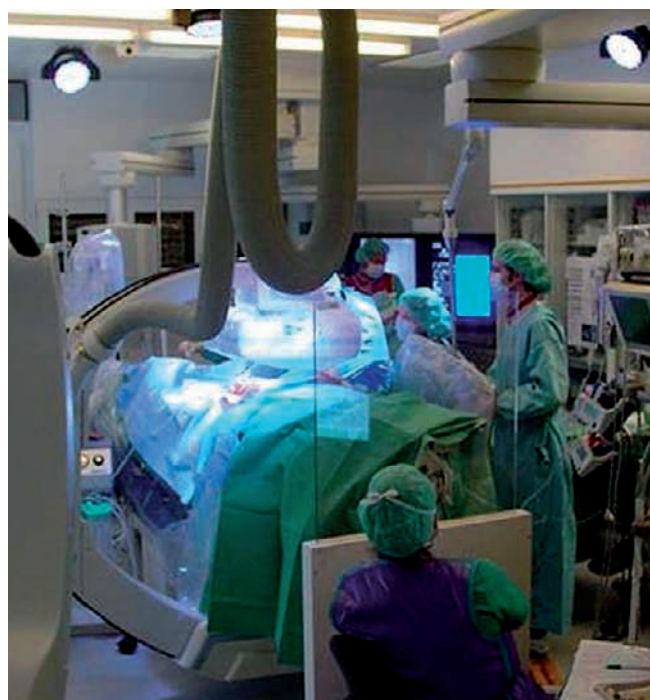
The aim is to perform molecular characterization of biological samples harvested perioperatively (Biobank) and during follow-up and results correlated with clinical end points.

**Study 8: CoMet anti-tumor immunology**

The aim is to evaluate immunological parameters related to anti-tumour immunity and inflammatory factors.

**Study 9: CoMet Imaging**

The aim is to compare CT perfusion to conventional CT and MRI, with respect to the detection of liver metastases from colorectal carcinoma.

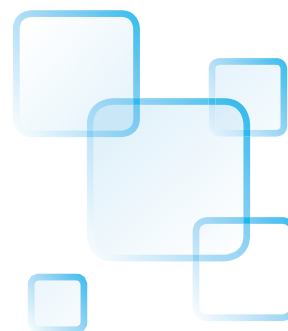
**Project TAVI****Project MitraClip****Project MecMed** (COREMINE/Metajournal)**Project 3D map and navigation** (liver and pancreas)


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## PHD CANDIDATES

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Irina Pavlik Marangos  
 Airazat Kazaryjan  
 Åsmund Avdem Fretland  
 Tom Nordby  
 Kim Ånonsen  
 Milan Spasojevic  
 Sven Petter Haugvik  
 Leonid Barkhatov  
 Mark Shmarvonyan  
 Martin Johansson  
 Rahul P. Kumar  
 Hilde Kjernlie Andersen




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## COLLABORATION

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SimSurgery, Oslo

Nasjonalt kompetansetjeneste for ultralyd og bildeveiledet behandling, Trondheim

Tumorbiologi, Radiumhospitalet, OUS

PubGen, Oslo

A strong cooperation between the different research groups in The Intervention Centre



## SECTION FOR TECHNOLOGY RESEARCH | *Section Manager Ole Jakob Elle, Associate professor, PhD*

### MEDICAL ROBOTICS VISUALISATION AND NAVIGATION

*Associate professor: Ole Jakob Elle, PhD*

#### GROUP MEMBERS

Ole Jakob Elle, *Section Manager*  
 – *Technology Research/Associate. Prof., PhD*  
 Frederic Courivaud, *Senior Researcher, PhD*  
 Espen Remme, *Senior Researcher, PhD*  
 Laura Slaughter, *Senior Researcher/Ass. Prof., PhD*  
 Hugues Fontenelle, *Senior Researcher, PhD*  
 Phuong Nguyen, *Postdoc, PhD*  
 Rafael Palomar, *Researcher/Software developer, MSc*  
 Rahul Kumar, *PhD fellow, MSc*  
 Abubakr El Dirdiri, *PhD fellow, MSc*  
 Dilla Handini, *PhD fellow, MSc*  
 Kim Mathiassen, *PhD fellow, MSc*  
 (also at ROBIN-group at IFI/UIO)  
 Egil Utheim, *Researcher, MSc*  
 Ralf Greisiger, *PhD fellow, MSc*  
 (also at ROBIN-group at IFI/UIO)



#### RESEARCH PROFILE

Most minimally invasive procedures restrict the access and direct vision to the regions which require surgery. Such procedures require intra-operative image modalities such as ultrasound or endoscopic images to be able to monitor the surgery real-time. In many cases this information is not sufficient to perform the procedure accurately and safely. Merging information acquired pre-operatively, mainly from for instance MRI, CT or PET, with intra-operative data can increase the basis for decisions and thereby improve the safety and accuracy of the procedure.

The Medical Robotics, visualization and navigation group develops cutting edge technological solutions which support minimally invasive procedures. The research focus is on image processing methods that are key elements in any software system which supports minimally invasive procedures. In particular, we are focused on developing real-time image-segmentation and – registration methods where segmentation methods finds important anatomical structures such as tumors and vessel structures in images, while registration methods enables fusion of images. Visualization and navigation is required to present the medical images to the surgeon intra-operatively. We are developing visualization systems which use advanced techniques such as augmented reality and volume rendering for this purpose. Robotic surgery which so far primarily has been tele-manipulators like Da Vinci, will in the future in addition to use real-time sensors like force/torque, inertia (accelerometer/gyro) and 3D video be more and more cross-linked with medical image information and move toward automation of surgical procedures. The research group is doing research in all these fields of technology facilitating minimally invasive surgery.

#### LONG TERM GOALS

The research group aims to be nationally and internationally leading research environment in technological solutions for image guided minimally invasive treatment. The group will strive to have competent personnel within the following technological areas:

- Real-time Image-processing  
(*image analysis, segmentation...*)
- Real-time volume visualisation
- Navigation technology
- Robotic technology
- Real-time sensing

- Technology support to Minimally Invasive Treatment in the hybrid OR's in general

The research group want to further extend the national and international research networking by applying research grants as coordinator through NFR and EU-calls as well as participating in consortiums within EU initiatives.

The group will strive towards increasing the number of publications in peer reviewed journals and conferences of high standing.

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## PROJECTS

The section is partly financed through the hospital (permanent staff), but to a larger extent through projects funded by NFR and EU. We are currently participating in 3 EU-projects as well as several NFR-projects and projects financed by Innovasjon Norge.

### IIIOS

*(Integrated Intra-operative Imaging Operating System):* The scope of the IIIOS consortium is to provide technology and training for the integration of ultrasound and biophotonics based imaging guidance with magnetic resonance imaging (MRI), Computed Tomography (CT) and Positron Emission Tomography (PET) to define the specs of an Integrated Interventional Imaging Operating System (IIIOS) aimed at minimal invasive treatment of common life-threatening disorders, e.g., cancer, cardiovascular disease and structural heart defects.

### SCath (Smart Catheterization):

SCAth aims to provide the interventionalist with visual and haptic tools for robust and accurate catheter guidance, which will be developed through novel approaches, by fusing preoperative patient-specific anatomical and mechanical models and intra-operative data streams from in situ sensors.

### I-SUR (Intelligent Surgical Robotics):

This project addresses a very complex problem that can be expressed in a very simple form: is it possible to automate surgery? To explore the feasibility of a solution to this problem, in this project we develop general methods for cognitive surgical robots capable of combining sensing, dexterity and cognitive capabilities to carry out autonomously simple surgical actions, such as puncturing, cutting and suturing.

**MUSIK 2020** (*Multidisciplinary skills for the Biomedical Engineers of 2020*): – Submittet application Nov. 2012 to Marie Curie EU-ITN-actions as Coordinator.

Key to the success of platforms for selecting patients and informing optimal treatment is the development of novel biomedical engineering (BME) based technologies for diagnosis, minimally invasive therapy and monitoring. Musik2020 is a coordinated plan of individual research projects addressing two most significant health issues of our society: cardiovascular disease and cancer. Its main focus is the development of engineering and information technologies for improved management of these diseases, where the multi-disciplinary dialogue and work between clinicians and biomedical engineers is critical.

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## COLLABORATIONS

- University of Dundee
- University of St. Andrews
- Norwegian University of Science and Technology
- University of Homburg, SAAR
- Delft University of Technology
- MR Comp GmbH
- University of Lubeck
- Fakultni Nemocnice u sv. Anny v Brne
- GE Medical Systems
- Katholieke Universiteit Leuven, Leuven, Belgium
- Oslo Universitetssykehus HF, Oslo, Norway
- Zürcher Hochschule für Angewandte Wissenschaften, Winterthur, Switzerland
- Imperial College London, London, United Kingdom
- Institute of Biomechanics, Center of Biomedical Engineering, Graz, Austria
- Endosense SA, Geneva, Switzerland
- Scuola Superiore Sant'Anna, Pisa, Italy
- University of Verona
- Oslo University Hospital
- Tallin University
- San Raffaele Hospital
- Yeditepe University
- ETH Zurich
- King's College London
- University of Oxford
- GE Vingmed
- Cascination
- Sintef Medical Technology
- Sheffield Hallam University
- Universidad de Zaragoza
- Universidad politecnica de Madrid

## SECTION FOR TECHNOLOGY RESEARCH

## WIRELESS SENSOR NETWORKS

*Leader: Ilanko Balasingham, professor, PhD*

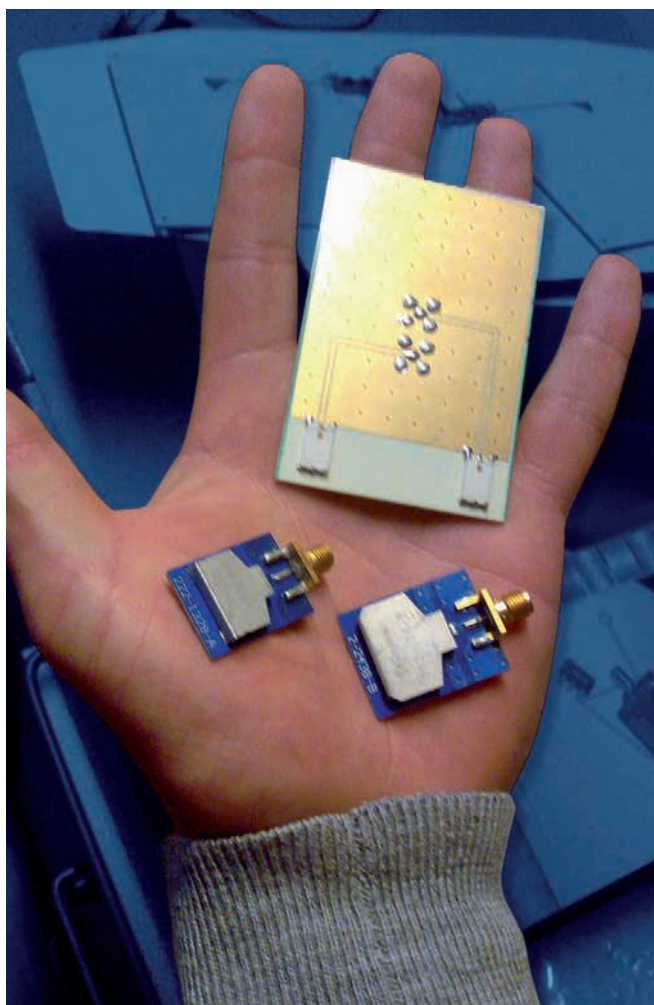
## GROUP MEMBERS

## Senior researchers

Jacob Bergsland, MD, PhD  
Sang-Seon Byun, PhD  
Pål Anders Floor, PhD  
Fei Gao, PhD  
Amir Jabbari, PhD  
Anna Kim  
Rie Komuro, PhD  
Fabio Mesiti, PhD  
Raul Chavez-Santiago, PhD

Junior researchers  
(PhD students)

Nguyen Trung Hieu, MSc  
Fatemeh Kazemeyni, MSc  
Hessam Moussavinik, MSc  
Minh-Long Pham, MSc  
Lars Erik Solberg, MSc  
Babak Moussakhani, MSc  
Kashif Habib Sheikh, MSc  
Stig Støa, MSc  
Mladen Veletic, MSc  
Karl Øyri, MSc



## INTERNATIONAL VISITORS

Associate Professor Ali Khaleghi, The K. N. Toosi University of Technology, Tehran, Iran, 3 months.

Assistant Professor Daisuke Anzai, Nagoya Institute of Technology, Nagoya, Japan, 4 months.

Stefan Fraedrich, MSc, Technical University of Dresden, Dresden, Germany, 11 months.

Jens Abraham, Technical University of Dresden, Dresden, Germany, 10 months.

Daninius Jankunas, MSc, Vilnius University, Vilnius, Lithuania, 3 months.

## RESEARCH PROFILE

The sensors, signals, and systems research group aims to facilitate deployment intelligent sensors and systems for different procedures in surgery, minimal invasive therapy and ambient point of care monitoring. The main focus area of research is in efficient design and development of novel sensors, power efficient real time signal processing algorithms, sensor data fusion, and wireless communication solutions for in vivo and ex vivo purposes. Some of our activities have been on studying the use of ultra wideband medical radars to estimate blood pressure, blood flow and tissue/organ motions. Furthermore, novel signal processing algorithms to facilitate power efficient processing of digital data in sensors, which are popularly called as sensor nodes in wireless communications networks. The digital sensor data fusion and multi parameter analysis are also active areas of research. We are working to design reliable, power efficient and robust wireless body area sensor networks for in vivo (implantable) and ex vivo use.

As part of the research results, two patent applications were filed in 2012. Since 2011, we are working on nano scale communication networks with the aim to having interfaces and communications with neuron for neuro-degenerative with more than 8 journal and conference papers published so far.

We have a close collaboration with the Department of Electronics and Telecommunications at the Norwegian University of Science and Technology (NTNU), Trondheim, and several national and international research institutions and companies participate in different projects.



In addition to several ongoing projects, the group participates in the projects COST action “Cognitive Radio and Networking for Cooperative Coexistence of Heterogeneous Wireless” and COST action 0902 “Cognitive Radio and Networking for Cooperative Coexistence of Heterogeneous Wireless”, which are funded by the COST, Research Council of Norway and Ministry of Foreign Affairs for 4 years. Furthermore, we are part of the HERD projects funded by the Ministry of Foreign Affairs, where we have 1 PhD student and 2 master students.

The research group, which is split between Oslo and Trondheim, has presently 10 PhD fellows and 8 Post doctoral fellows employed through the projects. Stig Støa defended his PhD thesis “Wireless Sensor Network for Medical Applications” in June 2012 and works as R&D Engineer at Novelda AS in Oslo. Dr. Sang-Seon Byun, Dr. Fabio Mesiti, Dr. Fei, Gao, and Dr. Amir Jabbari completed their Postdoctoral training and returned to their home countries such as South Korea, Italy, China, and Iran, respectively. Dr. Rie Komuro joined as an ERCIM Postdoc from Japan while Kashif Habib Sheikh and Mladen Veletic joined as PhD students.

## LONG TERM GOALS

The long term goal is to become the Norwegian Center of Excellence with international recognition.

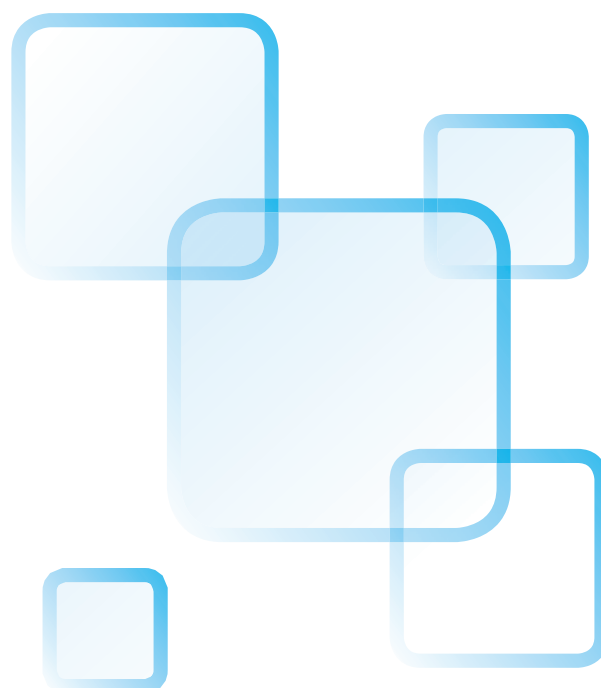
## PROJECTS

***The project portfolio consists of the following projects:***

- Medical Sensing, Localization, and Communications using Ultra Wideband Technology (MELODY), large scale ICT project funded by the Research Council of Norway for 2008-2012 successfully completed the mid term evaluation and has been approved for three more years funding from 2013.
- Adaptive Security for Smart Internet of Things in eHealth (ASSET), approved for funding by the Research Council of Norway for four years.
- NORBAS, approved for funding by the Ministry of Foreign Affairs of Norway for three years.
- Innovation grant for CameraPill, approved for funding by the Health Region South East for one year.
- EU FP7 project ULTRASPONDER completed after running for 4 years.

## INTERNATIONAL VISIBILITIES

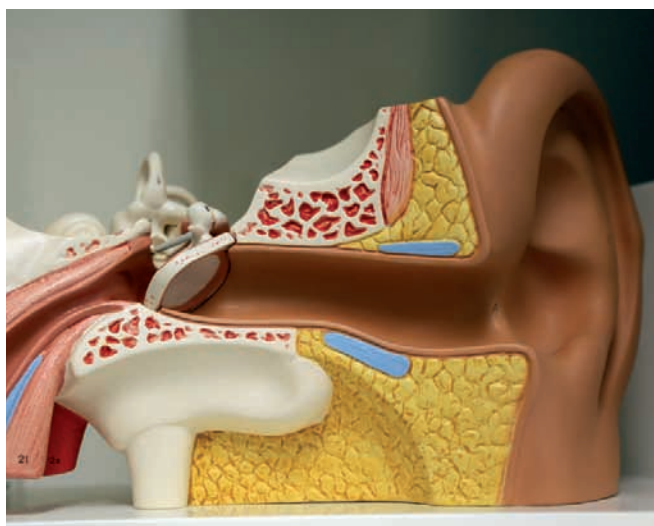
The IEEE/ACM international conference on Body Area Networks (BODYNETS) was successfully organized and chaired by the group in Sept. 2012, where some 130 participants attended the conference from worldwide. Furthermore, keynote presentations were given at the IEEE Symposium on Medical Information and Communications Technologies (ISMICT) in San Diego, CA, USA, March 2012 and the International Conference on Wireless Technology for Healthcare and Medicine, Oslo, Norway, April 2012.



## SECTION FOR RADIOLOGY RESEARCH | Section Manager Per Kristian Hol, MD, PhD

IMAGING RESEARCH  
AND IMAGE GUIDED INTERVENTION

Group leader: Per Kristian Hol, MD, PhD



A number of research projects using the 3T MR scanner or the combined angiographic suite are performed in corporation with different academic partners, including Departments of Neuropsychiatry and Psychosomatic Medicine, Oncology, Ear Nose and Throat, Neurosurgery, Neurology, Anesthesiology and Radiology. The research topics cover brain, spine, liver, prostate, brachial plexus and inner ear.

**A total of 11 PhD programs used the angiographic suite or the MR scanner for their research in 2012:**

Cand. Med. Trygve Kjelstrup:

***Axillary plexus block, nervestimulator, ultrasound and MRI***

Mentors: Øivind Klaastad and Harald Breivik, Department of Anaesthesiology, and Per Kristian Hol, The Intervention Centre, Oslo University Hospital

Cand. Med. Torbjørn Elvsåshagen:

***Neuroplasticity in patients with bipolar disorders***

Mentors: Ulrik Frederik Malt and Stein Andersson, Department of Neuropsychiatry and Psychosomatic Medicine, Oslo University Hospital. Espen Dietrichs, Department of Neurology, Oslo University Hospital. Ole Andreassen, Institute of Psychiatry, University of Oslo

M.Sc. Ralf Greisiger:

***Cochlear Implants and DynaCT imaging***

Mentors: Greg E. Jablonski and Terje Osnes, Dept of Ear Nose and Throat, Oslo University Hospital. Ole Jacob Elle and Per Kristian Hol, The Intervention Centre, Oslo University Hospital and Jon K. Shallop, Mayo Clinic Medical School

Cand. Med. Jarle Sundeth:

***Factors affecting the results of surgical treatment of cervical disc prolapse***

Mentors: Frode Kolstad, Department of Neurosurgery and Øystein Nygård, Trondheim University Hospital

Cand. Med. Karolina Ryeng Skagen:

***The vulnerable carotid artery plaque***

Mentor: David Russell, Department of Neurology, Oslo University Hospital

Cand. Med. Geir Ringstad:

***Assessment of Intracranial Pulsatility and Cardiac-beat Intracranial Volume Change using MRI***

Mentors: Per Kristian Eide, Department of Neurosurgery, Kyrre E. Eble, The Intervention Centre, and Noam Alterin, University of Miami, Florida, USA

Astrid Almaas, Elin Blakstad, Sissel Moltou and Kenneth Strømmen:

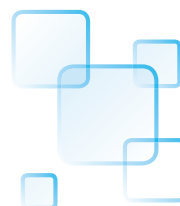
***Nutrition, growth and development of premature children***

Mentor: Christian A. Drevon, Department of Nutrition, Institute of Basic Medical Sciences, University of Oslo

Cand. Psych. Gudmundur Skarphedinsson:

***In vivo MR spectroscopy as a neuroimaging diagnostic study in children and adolescents with obsessive-compulsive disorders***

Mentor: Tord Ivarsson, Regionsenter for barn og unges psykiske helse (PBUP Øst og Sør)



## MR GUIDED HIGH INTENSITY FOCUSED ULTRASOUND TREATMENT

*Group leader: Per Kristian Hol, MD, PhD*

High Intensity Focused Ultrasound (HIFU)-therapy is completely non-invasive as the ultrasound energy is delivered outside the body, but focused in defined areas in an organ.

MR provides three-dimensional treatment planning and real-time temperature feedback. Integrating HIFU in MR-scanners melds the technology for visualization and treatment, optimize the procedure and increase the therapeutic potential of HIFU treatment.

The 3 T MR at the Intervention Centre has integrated HIFU equipment as part of a research agreement with Philips Medical Systems. Focus has been on both basic and clinical research projects. Organs to be studied have been uterus (uterine fibroids), liver and prostate.

### SENIOR RESEARCHERS

Per Kristian Hol, MD, PhD

Bjørn Edwin, Professor, MD, PhD

Frederic Courivaud, PhD

Trygve Storås, PhD

### PHD CANDIDATE

Eric Dorenberg, MD (*defended his thesis in 2012*)

### COLLABORATIONS

**Philips Medical System**

**Dept of Radiology, OUS**

(Eric Dorenberg, MD, PhD, and Erik Rud, MD)

**Dept of Gynecology, OUS**

(Kirsten Hald, MD, PhD, and Eva Ring, MD)

**Dept of Urology, OUS Aker**

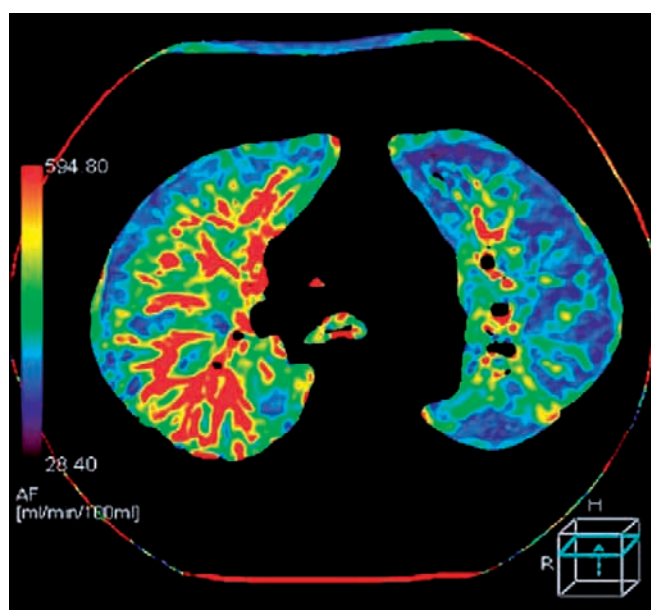
(Viktor Berge, MD, PhD, and Eduard Baco, MD)

**Norwegian School of Veterinary Science**

(Professor Lars Moe)

**Dept of Pathology, OUS Radiumhospitalet**

(Professor Aud Svindland)

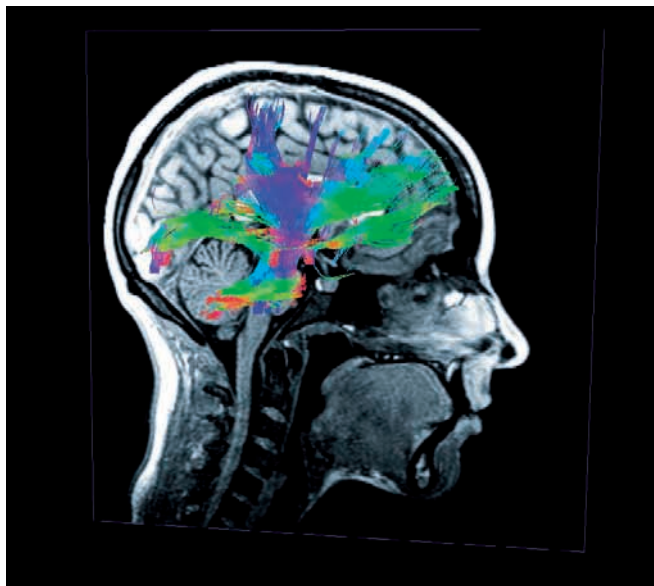




## SECTION FOR RADIOLOGY RESEARCH

## NEURO COGNITIVE IMAGING

Group leader: Associate professor Tor Endestad



The fMRI group at the research group for cognitive and clinical neuroscience at the department of Psychology, UiO work with basic research related to cognitive functions.

The group is engaged in the study of memory and cognitive control. In one of the programs studies of early visual memory are combined with attention to better understand the building block of the human memory system. In addition memory errors (false memories) and the relationship between executive functions and impulse control are studied. Both patients with focal brain injuries and psychological disturbances are included in the research. In another line of projects studies of brain damaged patient address frontal lobe damage, hormone influence on cognitive functions. In 2012 projects on genetics and depression, ME patients and ADHD has been included.

Several projects with cooperation between the Centre and Oslo University Hospital (FRONT, Cerebellum) were continued in 2012.

In addition to basic research, the group participate in the development of functional MRI as part of pre-surgical planning and improvement of neuropsychological diagnostics.



## ONGOING PROJECTS THAT CONTINUE IN 2012

## PHD PROJECTS

**Visual working memory**

PhD student: Dag Alnes

Principal res: Tor Endestad, Bruno Laeng

**Plasticity in the human visual system**

PhD student: Markus Handal Sneve

Principal res: Tor Endestad, Svein Magnussen

PhD finalised in 2012



### ***FRONT Frontal Lobe Injury and cognition***

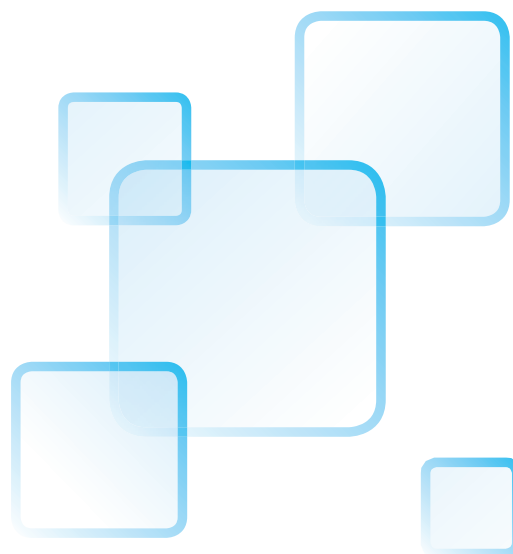
PhD Student: Marianne Løvås, Ingrid Funderud  
Principal Res: Tor Endestad, Anne Kristin Solbakk, Magnus Lindgren. PhD M. Løvås finalised in 2012

### ***Cerebellar damage and cognitive control***

PhD Student: Torgeir Moberget.  
Principal Res: Tor Endestad, Stein Anderson

### ***Positive and negative placebo***

PhD Student: Dan Mikael Ellingsen  
Principal Res: Tor Endestad, Siri Leknes



## **POST DOC PROJECTS**

### ***Parametric BOLD activation in multiple object tracking: Prediction of individual differences in attentional performance***

Post Doc: Thomas Espeseth  
PhD: Dag Alnes

### ***ADHD and Decision making***

Post Doc: Guido Biele and Inge Rasmussen  
PhD: Anastasia Movinkel, Mads Pedersen  
Med Stud: Mats Fredriksen

## **MASTER STUDENTS**

### ***Unconscious processing of emotions***

Master student Laura Bakke  
Principal Res: Tor Endestad, Bruno Laeng

### ***Language and cerebellum damage***

Master student Eva Hilland  
Principal Res. Tor Endestad, Torgeir Moberget

### ***Multiple object tracking and visual neglect***

Master Student: Dag Alnes  
Principle Res: Tor Endestad, Thomas Espeseth, Bruon Laeng

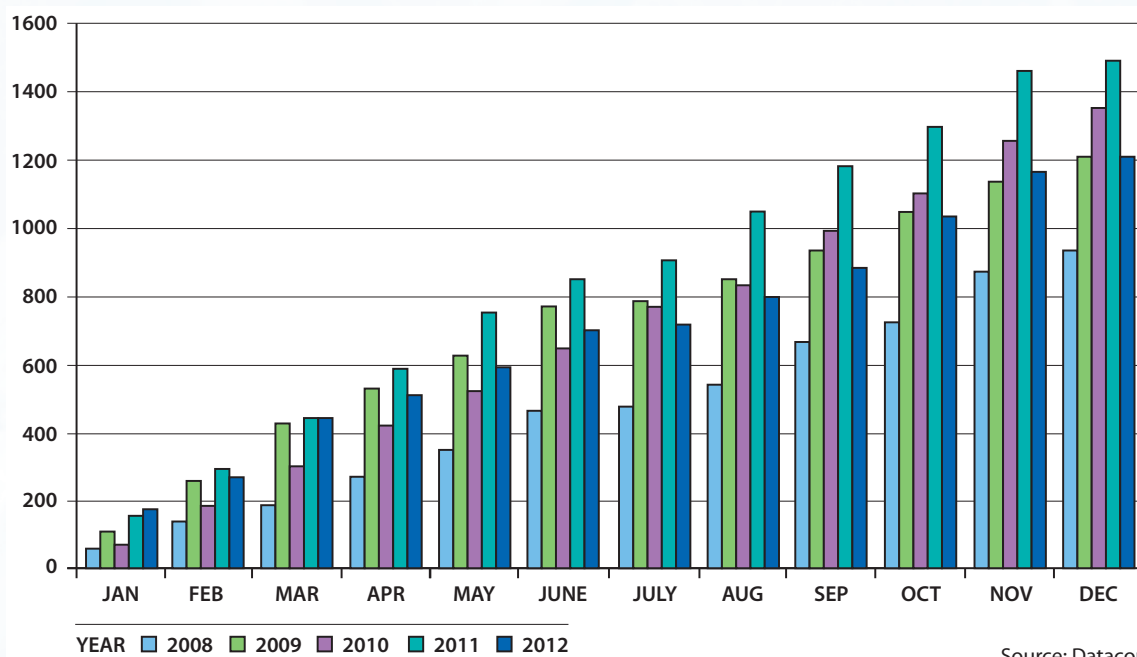
### ***fMRI as neurofeedback***

Master Student: Andre S. Nilsen

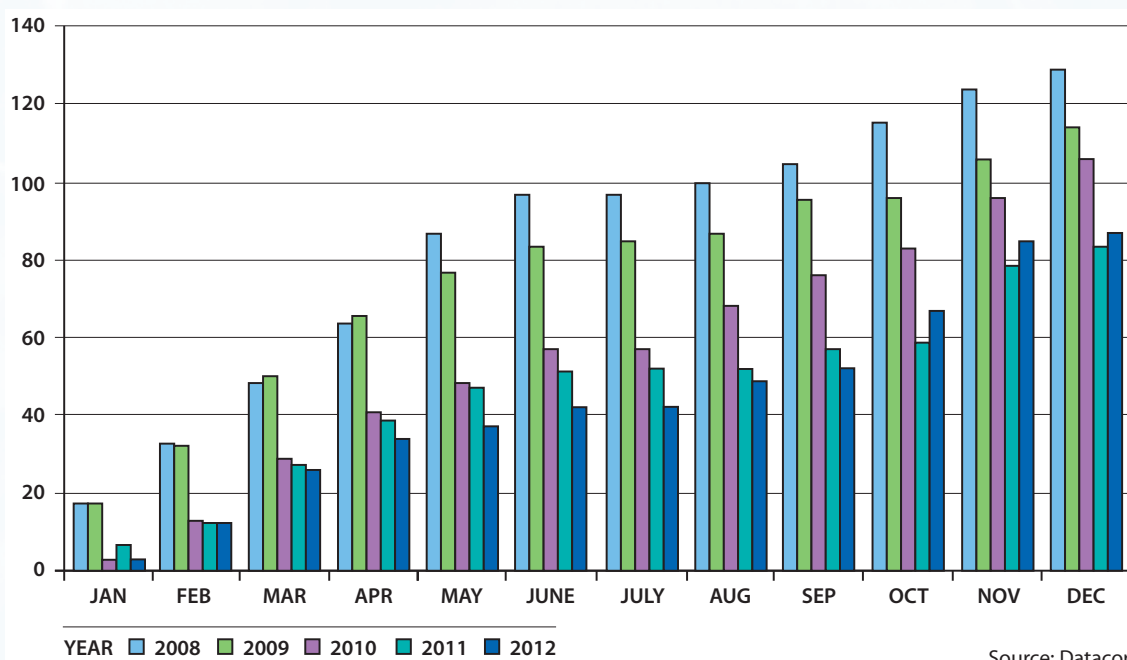
# Scientific statistics

The Intervention Centre 2012

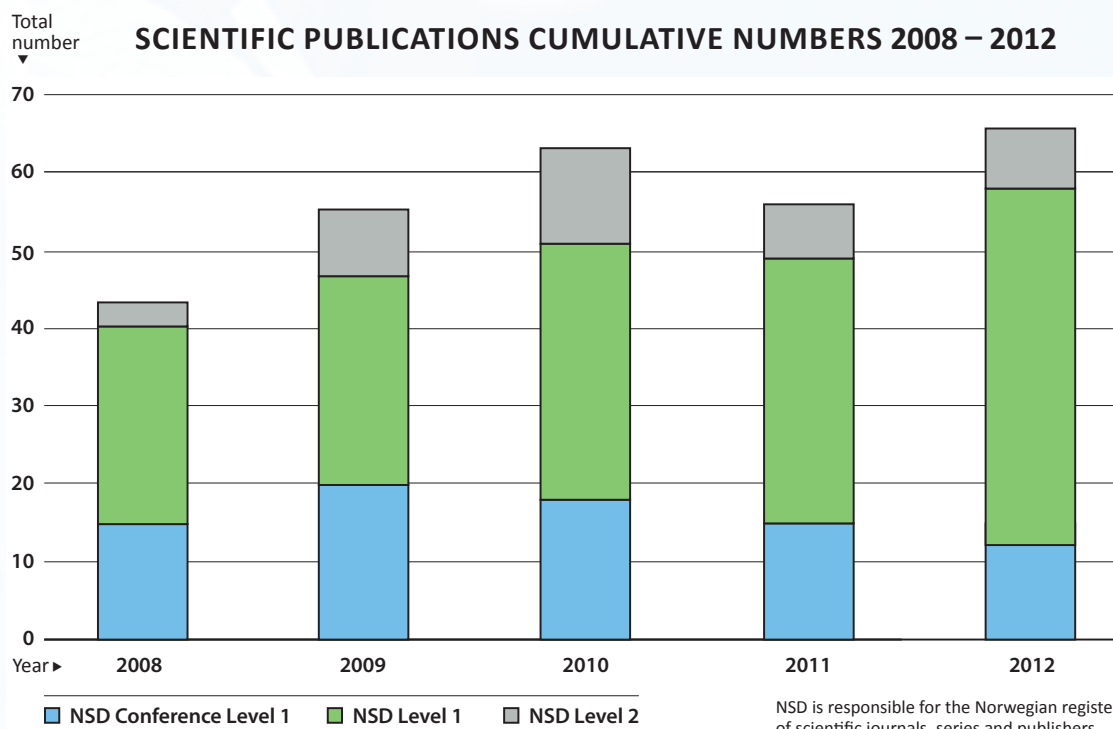
**CLINICAL PROCEDURES CUMULATIVE NUMBERS 2008 – 2012**



**PRE-CLINICAL PROCEDURES CUMULATIVE NUMBERS 2008 – 2012**















# Budget and expenditures

External funds administered by The Intervention Centre in 2012

SOURCE	INCOME	EXPENDITURE
Research Council of Norway	10.330.000	12.793.996
Regional Health Authority	5.257.716	3.344.268
European Commission	3.709.960	3.314.194
University of Oslo	520.000	520.000
Norwegian Cancer Society	1.330.000	593.621
Others	635.000	0





# Publications

## Scientific publications<sup>1</sup> from The Intervention Centre 2012 – 2008

<sup>1</sup> Scientific channels are journals, series and publishers that fulfill specific criteria given by the Norwegian register for scientific journals, series and publishers (NSD: [www.dbh.nsd.uib.no/kanaler](http://www.dbh.nsd.uib.no/kanaler)). There are two levels: **Ordinary publication channels** (level 1) and **highly prestigious publication channels** (level 2).

### 2012

#### Level 2 journals

1. Chavez-Santiago R, Nolan KE, Oliver H, De Nardis L, Ferro JM, Barroca N, et al.  
**Cognitive Radio for Medical Body Area Networks Using Ultra Wideband.**  
IEEE wireless communications 2012; 19(4): 74-81.
2. Bolstad N, Kazaryan AM, REvheim Me, Distant S, Johnsrud K, Warren DJ, Nustad K, Edwin B.  
**A man with abdominal pain: enough evidence for surgery?**  
Clin Chem. 2012 aug; 58 (8): 1187-90.

3. Floor PA, Kim AN, Wernersson N, Ramstad TA, Skoglund M, Balasingham I.  
**Zero-Delay Joint Source-Channel Coding for a Bivariate Gaussian on a Gaussian MAC.**  
IEEE Transactions on Communications 2012; 60(10): 3091-102.
4. Kazemeyni F, Johnsen EB, Owe O, Balasingham I.  
**Formal modeling and validation of a power-efficient grouping protocol for WSN's.**  
J. Logic. Algebr. Program, 81 (3), 284-97.
5. Knatten CK, Fyhn TJ, Edwin B, Schistad O, Emblem R, Bjørnland K.  
**Thirty-day outcome in children randomized to open and laparoscopic Nissen fundoplication.**  
J Pediatr Surg; 47(11): 1990-6.
6. Marangos IP, Buanes T, Røsok BI, Kazaryan AM, Rosseland AR, Grzyb K, et al.  
**Laparoscopic resection of exocrine carcinoma in central and distal pancreas results in a high rate of radical resections and long post-operative survival.**  
Surgery; 151(5): 717-23.
7. Mork BE, Hoholm T, Maaninen-Olsson E, Aanestad M.  
**Changing practice through boundary organizing: A case from medical R&D.**  
Hum. Relat., 65(2), 263-288.
8. Morvan T, Reimers EW, Samset E.  
**Efficient Image-Based Proximity Queries with 0 Object-Space Precision.**  
Comput. Graph. Forum, 31 (1), 62-74.
9. Sorensen AG, Emblem KE, Polaskova P, Jennings D, Kim H, Ancukiewicz M, et al.  
**Increased survival of glioblastoma patients who respond to antiangiogenic therapy with elevated blood perfusion.**  
Cancer Res; 72(2): 402-7.



## Level 1 journals

1. *Amini M, Gjovaag TF, Hisdal J, Mirtaheiri P.*  
**Novel Design of an Optical Probe for Detecting Perfusion Changes in Buccal Tissue.**  
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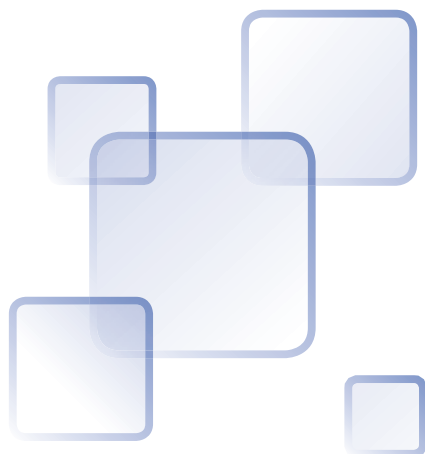
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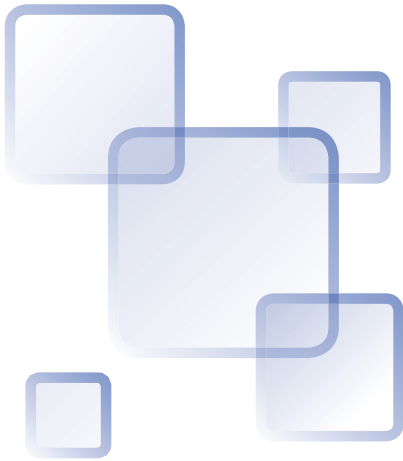
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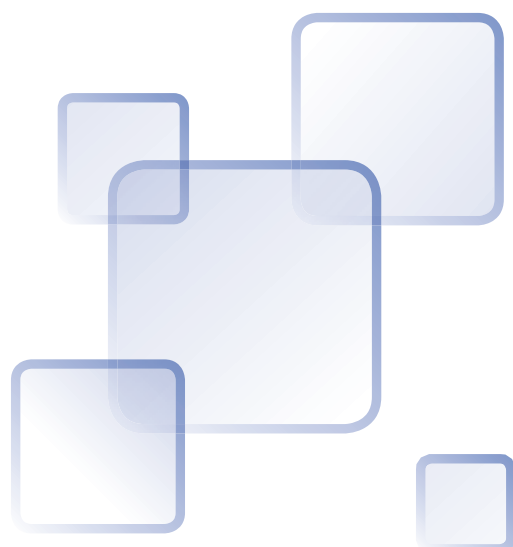
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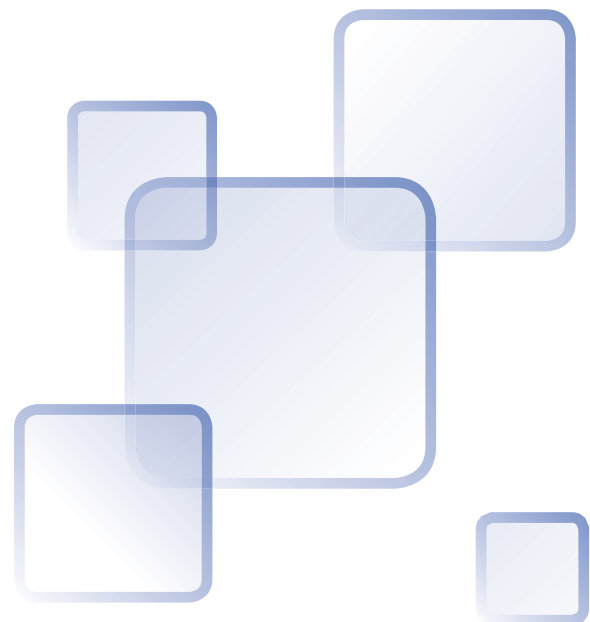
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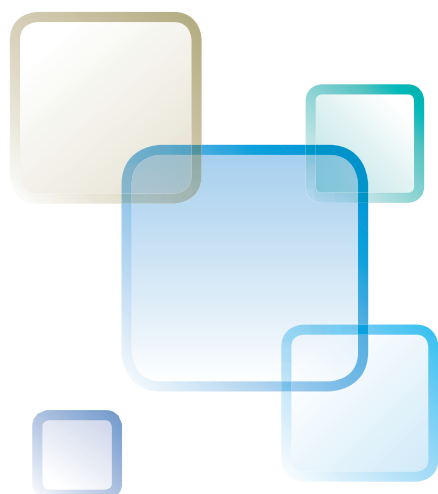
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