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Editor-in-Chief: Professor Thor Edvardsen MD, Center Director
Editor/Layout: Marianne Weberg MSc, Administrative Coordinator
Cover photo: Copyright, Oslo University Hospital
1. Summary

The Center for Cardiological Innovation (CCI) was officially established on October 31st, 2011. The CCI is hosted by Oslo University Hospital. The research partners at the center are Simula Research Laboratory and the University of Oslo. GE Vingmed Ultrasound AS, Kalkulo AS and CardioSolv LLC are the center’s industrial partners. In December 2012, it was decided that Medtronic Bakken Research Center B.V. will join the CCI as an industrial partner. Medtronic is a leading international medical technology company and brings world class expertise in therapy and disease management to the consortium.

CCI had its first full operating year in 2012. Throughout the year, research has resulted in 29 articles published in scientific journals by researchers affiliated with CCI. A total of 43 presentations and abstracts have been held at various prestigious international conferences within cardiology and biomedicine.

Three new PhD students have been recruited and started working for the CCI in 2012, and two PhD students have been identified for recruitment and will start working at CCI in 2013. Furthermore, one guest researcher and one research programmer started working for the CCI in 2012.

In 2012, the CCI established an external Scientific Advisory Board. The purpose of the Scientific Advisory Board will be to evaluate the center’s progress and operations.

CCI has been using temporary offices at the Institute of Surgical Research during 2012, but the Center has been granted new offices at Oslo University Hospital, Domus Medica II, which will serve as a focal point for communication and cross-disciplinary projects between the CCI partners. The new offices are anticipated to be ready for moving in February 2013.

2. Objectives

The aim of the Center for Cardiological Innovation (CCI) is to develop the next generation of ultrasound systems for cardiology. The proposed tools and technologies will be created through linking currently isolated diagnostic systems with advanced biomedical research, advanced patient-specific computer simulation, and multi-modality visualization techniques. The targeted clinical uses of the proposed innovations are for better triage and treatment of patients at risk of sudden cardiac death or suffering from heart failure, two of the biggest challenges in cardiology today.
3. Research plan

Every 30 seconds, a person in the Western world suffers sudden cardiac death (SCD) and/or death from heart failure (HF). These two conditions remain the major challenges in modern cardiology. However, new treatments now emerging offer hope in combating these events: triggers for rhythm disturbances in the heart can be destroyed by heat via ablation therapy, and pacemakers and defibrillators can be implanted to break up deadly fibrillation or ameliorate heart dysfunction. As current diagnostic tools for risk stratification of fatal events are clinically insufficient, the problem facing clinicians is to know when to apply these advanced treatments. The goal of the Centre for Cardiological Innovation (CCI) is to produce commercially and clinically driven advances in cardiac diagnostics and applications to solve this problem.

The heart can be regarded as an electromechanical organ. Ion flow through heart tissue elicits cellular changes that cause the heart to contract and pump. In clinical evaluation of this process, the two most important technical tools for the cardiologist are: 1) electrocardiogram (ECG) to assess electrical activity and 2) cardiac ultrasound (cU/S) to assess mechanical function. However, despite the close physiological coupling of electrical activity and mechanical function, the information from these two tools has only been combined to a very small extent in pursuit of an integrated electromechanical diagnosis of the heart. This is largely due to the fact that the relationship between cardiac electrophysiology and mechanics is so complex that designing such tools requires experimental studies and advanced mathematical models that are only now becoming available.

The CCI plans to use these emerging techniques to develop the next generation of cardiac ultrasound equipment, intended to achieve three goals:

1. Record electrical (ECG), mechanical, and anatomical (cU/S) data in a new integrated 3-dimensional cardiac scanner system.
2. Use scanner recordings together with advanced mathematical methods and simulation technology to build patient-specific diagnostic and predictive models.

In contrast to simply adding a new set of measurement indices to an already impressive list of diagnostic guidelines, or prescribing treatment based on those guidelines, the CCI will instead combine and extend currently isolated technologies into novel, integrated tools and applications. We will combine ECG and cU/S measurements into a new integrated scanning system, which we will then couple with advanced simulation techniques to prescribe treatment tailored for the individual patient. This approach is entirely novel, as integration of these modalities combined with the use of patient-specific simulation has never before been achieved. This innovation has the potential to change the paradigm of diagnostic cardiology and will represent a substantial market edge for the industrial partners.
4.1 Organization

The CCI is hosted by Oslo University Hospital and consists of a consortium of five partners from both research and industry in addition to the host institution. The research partners are Simula Research Laboratory and the University of Oslo. The user partners are GE Vingmed Ultrasound AS, CardioSolv LLC and Kalkulo AS. The CCI is located in Oslo, thus Oslo University Hospital constitutes as the physical hub for the CCI research activities.

4.2 Organizational structure

CCI is governed by a Board of Directors, for which representatives have been appointed by each of the partners. The following board members are appointed by the consortium participants:

- Gunnar Hansen, GE Vingmed Ultrasound, Chairman
- Are Magnus Bruaset, Simula Research Laboratory
- Audun Fosselie Hansen, Kalkulo
- Theis Tønnessen, Oslo University Hospital
- Brock Tice, CardioSolv
- Ivar Gladhaug, University of Oslo

From January 1st 2013, the following changes in the CCI Board will occur; Molly Maleckar will represent Simula Research Laboratory, Are Magnus Bruaset will represent Kalkulo and Drude Merete Fugelseth will represent the University of Oslo.

In 2012, the CCI established an external Scientific Advisory Board (SAB).

The SAB consists of the following members:

- Professor Olav Dössel, Institute of Biomedical Engineering Karlsruhe Institute of Technology, Germany.
  - PhD Natural Science
- Professor Luigi Paolo Badano, Head Noninvasive Cardiac Imaging Laboratory Azienda Ospedaliera di Padova Via Giustinian 2, Italy.
  - MD, University of Parma
- Professor James D. Thomas, Moore Chair in Cardiovascular Imaging, Cleveland Clinic.
  - BA, Applied Mathematics, Harvard College, Boston MA
  - MD, Harvard Medical School, Boston MA
- Professor Nicolas Smith, Head of Department, Biomedical Engineering Kings College, University of London. /Professor of Biomedical Engineering.
  - PhD (Engineering Science) University of Auckland
  - BE (Engineering Science) (First Class Honours) University of Auckland

The SAB will meet every 18 months and evaluate the center’s progress and operations. The SAB should in particular be concerned with:

- The quality of research and its relevance for commercial exploitation
- The level of collaboration across partners and the degree to which synergies are being leveraged
- The appropriateness of methods and approaches that are being employed in the different projects within the CCI
- The effectiveness of the organization and management structure
- The development of a joint center identity and the appropriateness of pan center activities
- To which degree the CCI is able to foster new ideas and to fuel innovation
- The business potential of each of the different activities
Management team

The Center’s Director, Professor Thor Edvardsen earned his Medical Degree (MD) at Haukeland University Hospital, University of Bergen and his PhD / Dr.Med. at University of Oslo. He is a board certified specialist in Internal Medicine and Cardiology and has been a senior staff member at Dept. of Cardiology at Oslo University Hospital, Rikshospitalet since 2002. He became acting chief of the Dept of Cardiology in 2012. He worked at John Hopkins Hospital, Baltimore, USA in 2003-2004. Edvardsen was reelected as a Board member of the European Association of Cardiovascular Imaging (EACVI) in 2012 and is now the Chair of the EACVI Scientific Documents Committee. He has more than 100 international scientific publications and 10 book chapters. He is active in clinical and experimental research in the area of myocardial function and has extensive knowledge of cardiac ultrasound, MRI, CT and hemodynamics.

The Center Director is assisted by a management team for daily operations. Eigil Samset is the center coordinator for the CCI. Representing the largest User Partner, GE Vingmed Ultrasound, he will help drive the center to ensure that the innovation objectives are met. Eigil Samset also holds a Professor II position and the department of informatics at University of Oslo. He has his Master from NTNU in engineering cybernetics with focus on medical applications. His PhD was conducted at the Medical Faculty of the University of Oslo where he developed new methods for utilizing MRI as an intra-operative imaging modality. He was invited to Harvard (Brigham and Women's Hospital) to perform his post.doc. on MRI guided cardiac ablation. He has also been a visiting researcher at Stanford University Hospital where he worked on intra-vascular ultrasound. Eigil Samset has worked academically with medical image processing, visualization, navigation and robotics for 11 years, managing research teams in Norway and across Europe. He has also 3 years experience as product and technology manager in the oil & gas business, managing software development team developing cutting edge applications for simulation and visualization.

In November 2012, Samuel Wall took over for Molly Maleckar as the Center’s Deputy Director of Scientific Computing, representing the research partner Simula Research Laboratory. Samuel Wall received his PhD in Bioengineering jointly from the University of California, Berkeley and the University of California, San Francisco, where his work focused on ventricular modeling and basic research into cellular therapies of the heart. He currently leads the Cardiac Modeling (CaMo) group at Simula, which explores methods of predictively simulating cardiac function across a wide range of temporal and spatial scales, from the subcellular calcium dynamics to the electromechanical pumping action of the entire heart.

Marianne Weberg is the Administrative Coordinator of the CCI. She provides administrative support and manages responsibilities of the CCI with respect to the Research Council of Norway and the host institution, Oslo University Hospital. Marianne Weberg has studied Health Economics and Management at the University of Oslo. She obtained her Master’s degree in Public Health Science with specialization in Public Health Nutrition, from Karolinska Institutet, Stockholm in 2012. The topic of her master thesis was cardiac rehabilitation and changes in health-related quality of life, based on a pilot study at Røros Rehabilitation, Norway. Throughout her years as a student, Marianne Weberg has worked at the municipality health care services in Oslo Kommune. In addition, she has taken part time education at the Norwegian School of Sports and Science.

**Figure 1:** Organization structure.
4.3 Partners

Each partner represents a unique and required element in the research and development chain leading to the industrial innovations targeted by the CCI.

**Oslo University Hospital**
- **Role:** CCI Host institution
- **Objective:** Improve procedures and services related to patient treatments. Obtain new diagnostic and therapeutic approaches to the benefit of patients suffering from cardiac diseases.
- **Contribution:** World class cardiology research group, access to hospital infrastructure and facilities.

**University of Oslo**
- **Role:** CCI Research Partner
- **Objective:** Strengthen quality of research in the field of cardiology and medical imaging. Contribute to research training (completed PhD program) and transfer of knowledge (publication, innovation).
- **Contribution:** Research infrastructure, senior personnel in both clinical research and computer science.

**Simula Research Laboratory**
- **Role:** CCI Research Partner
- **Objective:** Develop patient-specific simulation models to reveal mechanisms underlying cardiac disease, improve diagnostic techniques, and predict treatment outcome.
- **Contribution:** A research foundation for development of innovative, computationally efficient, and reliable algorithms and software.

**GE Vingmed Ultrasound**
- **Role:** CCI User Partner
- **Objective:** Develop new and improved products for cardiovascular ultrasound based diagnosis and treatment with high added value for patients and clinicians.
- **Contribution:** Market leading imaging platform and advanced quantitative analysis SW, commercialization pathway, market know-how and access to pre-market hardware and software.

**CardioSolv**
- **Role:** CCI User Partner
- **Objective:** Become world leader in software development for cardiac electromechanical applications. Bring state-of-the-art cardiac simulation out of academia and to the bed-side.
- **Contribution:** Access to mesh-creation tools, simulators, visualization tools, simulation analysis tools and consultations on cardiac simulation and arrhythmias.

**Kalkulo**
- **Role:** CCI User Partner
- **Objective:** Develop products (as modules or applications) that can be commercialized. Extend current software application framework to strengthen presence in the medical market.
- **Contribution:** Expertise and software tools for advanced computations and visualization.
4.4 Cooperation between the Center’s partners

In 2012, the scientific activities were organized in the form of three work packages, listed below. The progress and results from the work packages are presented to all partners and CCI staff at Work Package Review meetings quarterly.

1. WP1: Active force generation for triage of heart failure
2. WP2: Developing a new cardiac ultrasound probe for combined electromechanical recording
3. WP3: Patient-specific model construction

**Figure 2:** Illustration of how information, technologies and research methods are connected in the CCI.

Communication and dissemination of information is easily done through CCI’s wiki-page, which contains the presentations from meetings, relevant publications, and other documents. Furthermore, Journal Club meetings are arranged on a monthly basis. The aim of the Journal Club meetings is to present a topic of relevance to all partners; in addition the meetings serve as a venue for informal cross-disciplinary communication.
5. Scientific activities and results

The past year has resulted in numerous journal publications. A highlight of the results form 2012 is presented below. A complete publication list is in the appendix A3.

**Topic:** Strain by echocardiography is superior to ejection fraction in detection of reduced exercise capacity  
**Author(s):** Nina E. Hasselberg et al.

**Description:** Exercise capacity, assessed by maximal oxygen uptake (peak VO2) during exercise testing, has been shown to be one of the strongest predictors of cardiac health and survival. The muscle function of the heart can be assessed by strain technique obtained from ultrasound of the heart (echocardiography). This study showed that strain from ultrasound at rest correlated strongly to exercise capacity from bicycle exercise testing. Since strain was able to detect impaired exercise capacity we propose that strain may serve to predict future cardiac health and expected survival in patients.

**Topic:** Risk assessment of ventricular arrhythmias in patients with nonischemic dilated cardiomyopathy by strain echocardiography.  
**Author(s):** Kristina H. Haugaa et al.

**Description:** Dilated cardiomyopathy is a condition in which the heart becomes weakened and enlarged and pump function may be severely affected. Patients with this condition may additionally experience ventricular arrhythmias which can be life threatening. In this study, we showed that Mechanical Dispersion (an index which can be defined from ultrasound deformation analysis of the heart) can be used to predict ventricular arrhythmias in patients with dilated cardiomyopathy and may be used in risk stratification of life threatening arrhythmias in this patient group.

**Topic:** Patient specific model pipeline  
**Author(s):** Sam Wall, Sjur Gjerald

**Description:** Computer simulation of the electrical and mechanical dynamics of the heart can be a powerful tool to define diagnosis and the optimal treatment for various heart diseases. In order to make such simulation tools patient specific they have to be based on anatomical and physiological data from the patient being investigated. We have built a tool that is based in 3D ultrasound imaging of the left ventricle and which is able to turn this into a geometrical mesh suitable for computer simulation. As current ultrasound based methods do not allow a bi-ventricular (both left and right side of the heart) model to be generated, we have developed a tool that allows rapid creation of different “place-holder” right ventricles connected to a patient specific left ventricle. This is an important step to do realistic patient specific simulations.
**Topic:** Automatic aortic annulus diameter from 3D TEE images  
**Author(s):** Jørn Bersvendsen et.al  
**Description:** The aortic valve is crucial to the heart’s ability to efficiently pump blood to the body. When this becomes narrow and calcified, the life expectancy is very short unless appropriate therapy is delivered. For patients that are not candidates for surgery a new minimally invasive technique have been developed to deliver an artificial valve with a catheter-based technique. The artificial valve needs to be appropriately sized to fit the individual patient. We have developed a new algorithm that based on 3D trans esophageal ultrasound can automatically defined the size of the aortic annulus and thus the correct size of the artificial valve.

**Topic:** Electromechanical methods fraction in detection of reduced exercise capacity  
**Author(s):** Sam Wall, Joakim Sundnes  
**Description:** The mathematical methods needed to predict the electromechanical function of the left ventricle are computationally intensive, requiring solving many large systems of equations. Adding the complexity of the right ventricle to such models increased this load, and we have developed improved methods to allow for bi-ventricle simulations at higher speed. In addition, mathematical results need to be validated to show their utility, and we have used our models to help understand mechanical dysfunction in the injured ventricle.

**Topic:** A novel clinical method for quantification of regional left ventricular pressure-strain loop area: a non-invasive index for myocardial work  
**Author(s):** Kristoffer Russell et.al  
**Description:** While the heart is pumping blood to supply the entire body it is performing a significant amount of work. Normally this work should be evenly distributed through the different regions of the heart. However, some patients may have an imbalanced distribution of work, or even show to have parts of the heart doing work that is wasted. The work performed by the heart is closely linked to the blood pressure inside the heart, which cannot be directly measured from the outside of the body. By combining ultrasound imaging of the heart to measure deformation (strain) and a novel algorithm to estimate pressure changes we can define the work done by each part of the heart and identify any issues that impacts the efficiency of the pump function.
7. International cooperation

The CCI has an extensive international network that has been extensively engaged in the Center. This collaboration includes multi-center clinical studies, academic collaboration, EU-funded project and exchange of researchers. The CCI host, Oslo University Hospital (OUH) is the leading center in several international multi-center studies. Including a prospective study on arrhythmias after myocardial infarction in collaboration with the University Hospital of Leuven, Belgium, Rigshospitalet, Copenhagen, The Gentofte Hospital, Copenhagen and Sykehuset Sorlandet, Arendal, and the DOPPLER-CIP study including 1000 patients with suspected coronary artery disease, in collaboration with hospitals in several European cities; Leuven, Madrid, Pisa, London, Linköping, and Turku. OUH is also currently working on an emerging prospective study on arrhythmias in athletes in collaboration with universities and hospitals worldwide.

Simula has close ties with several academic groups in the USA and Europe including University of California, San Diego (UCSD), University of California, San Francisco, Oxford University, University of Utah and Karlsruhe Institute of Technology, Germany. In particular, since 2001, researchers in Cardiac Modeling at Simula Research Laboratory have engaged in active collaboration with the Cardiac Biomechanics Research Group at UCSD. This university conducts world-class research within the core areas of Simula research, including scientific computing and biomedical problems. At the graduate level, the National Research Council ranks UCSD first in the United States in bioengineering and biological sciences, both of which are relevant to Simula and of particular relevance to the CCI. In total, 10 researchers from the CCI visited UCSD for visits lasting from 1 week to 1 month, and included a Simula-sponsored workshop in the field of Cardiac Modeling. These in-person interactions between researchers from Simula and UCSD are complemented by joint publications and shared research proposals.

GE Vingmed Ultrasound was successful in getting funding from the EU for a Marie Curie project using the new European Industrial Doctorate scheme together with KU Leuven in Belgium. The project will train 5 PhD students and focus on improved ultrasound imaging for guidance of treatment for patient with cardiac arrhythmia. Simula, GEVU and OUH are all partners in the new Marie Curie project proposal coordinated by King’s Collage in the UK called Musik2020. Additionally, GEVU has an extensive global network, both within the company and with its customers and luminaries.

8. Recruitment 2012

The CCI have recruited three new PhD students that have begun working on tasks related to the Center’s work plan. Furthermore, one visiting researcher and one research programmer started working for the CCI in 2012.

- **Aleksandar Babic**, PhD-student, will work on the topic ‘CRT LV lead placement optimization’ for the CCI partner GE Vingmed Ultrasound.

- **Jørn Bersvendsen**, PhD-student will work on the topic ‘Cardiac modeling’ for the CCI partner GE Vingmed Ultrasound. He is funded through the Industrial PhD mechanism at RCN, and will work in close collaboration with the CCI.

- **Siri Kallhovd**, PhD-student, will work on the topic ‘Cardiac modeling’ for the CCI partner Simula Research Laboratory.

- **Erlend Aune**, MD, PhD, guest researcher, will work on the topic Prognostic implications of speckle tracking strain measurements in patients with heart failure for Oslo University Hospital.

- **Sjur Gjerald**, PhD, Research Programmer, will work on the topic Inverse solutions and identification of ischemic regions from ECG recordings; extension of this solution for other applications for the CCI partner Simula Research Laboratory.
**9. Communication and dissemination of activities**

CCI has published 29 scientific papers and held 43 presentations at international conferences as part of dissemination of results to users. In addition, the CCI has appeared in the media at several occasions, resulting in interviews with core researchers on television, radio and in Norwegian newspapers.

**Media outreach**

Interview with CCI’s Center Director Thor Edvardsen on the morning news at NRK (Norwegian state television) 02.05.2012.

**Poster presentation**

The American College of Cardiology, Chicago, 2012.

Thor Edvardsen, Nina E. Hasselberg, Kristina Haugaa.

**Poster presentation**

The European Society of Cardiology Munich, 2012.

Jørg Saberniak, Nina E. Hasselberg.

**Presentation**

The American Heart Association Los Angeles, November 2012.

Sebastian Sarvari.

**CCI contribution**


Thor Edvardsen.
## Appendix

### A1 Personnel

#### Key Researchers

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Main Research area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thor Edvardsen</td>
<td>OUH/UiO</td>
<td>Myocardial function and cardiac imaging.</td>
</tr>
<tr>
<td>Kristina Haugaa</td>
<td>OUH</td>
<td>Ventricular arrhythmias and prediction of SCD. Mechanisms of arrhythmias, impact of imaging in risk assessment of SCD and cardiogenetics.</td>
</tr>
<tr>
<td>Erik Kongsgård</td>
<td>OUH</td>
<td>Electro Physiology-treatment</td>
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<tr>
<td>Morten Eriksen</td>
<td>OUH</td>
<td>Development and validation of methods for analysis of myocardial strain recordings, with emphasis on assessment of mechanical work.</td>
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<tr>
<td>Lars Aaberge</td>
<td>OUH</td>
<td>Invasive cardiology and intensive coronary care</td>
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<td>Thorbjørn Holm</td>
<td>OUH</td>
<td>Inflammatory mediators and endothelial function as markers of prognosis in heart failure and after heart transplantation.</td>
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<td>Helge Skulstad</td>
<td>OUH</td>
<td>Mechanisms of myocardial function, Cardiac Imaging and Adult Congenital Heart disease.</td>
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<td>Ole-Gunnar Anfinsen</td>
<td>OUH</td>
<td>Cardiovascular function</td>
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<tr>
<td>Espen Remme</td>
<td>OUH</td>
<td>Cardiovascular function, imaging and biomechanics</td>
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<tr>
<td>Otto Smiseth</td>
<td>OUH</td>
<td>Cardiovascular function, imaging and biomechanics</td>
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<tr>
<td>Christian Eek</td>
<td>OUH</td>
<td>Echocardiographic stratification of patients with acute coronary syndrome</td>
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<tr>
<td>Einar Gude</td>
<td>OUH</td>
<td>Cardiovascular function, imaging and biomechanics</td>
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<tr>
<td>Hans Henrik Odland</td>
<td>OUH</td>
<td>Cardiovascular function, imaging and biomechanics</td>
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<tr>
<td>Arne Kristian Andreassen</td>
<td>OUH</td>
<td>Cardiovascular function</td>
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<tr>
<td>Kristoffer Russell</td>
<td>OUH</td>
<td>Dyssynchrony in the heart and novel methods for assessing global and regional myocardial function.</td>
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<td>Margareth Ribe</td>
<td>OUH</td>
<td>Cardiac imaging, ventricular function</td>
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<tr>
<td>Sebastian Sarvari</td>
<td>OUH</td>
<td>Cardiac imaging, ventricular function</td>
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<tr>
<td>Svend Aakhus</td>
<td>OUH</td>
<td>Echocardiography/Cardiology</td>
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<tr>
<td>Thomas Dahlslett</td>
<td>UIO</td>
<td>Echocardiography/Cardiology</td>
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<tr>
<td>Martin Reimers</td>
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<td>Echocardiography/Cardiology</td>
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<tr>
<td>Gunnar Hansen</td>
<td>GEVU</td>
<td>Ultrasound acquisition, processing and visualization</td>
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<td>Eigil Samset</td>
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<td>Stian Langeland</td>
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<td>Andreas Heimdal</td>
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<td>Fredrik Orderud</td>
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<td>Christian Tarrou</td>
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<td>Brock Tice</td>
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<td>Computational cardiac simulation methods and tools</td>
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<td>Robert Blake</td>
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<td>Computational cardiac simulation methods and tools</td>
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<td>Molly Maleckar</td>
<td>SRL</td>
<td>Computational cardiac electrophysiology (multipscale)</td>
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<tr>
<td>Sam Wall</td>
<td>SRL</td>
<td>Computational cardiac electromechanics; development of geometric models from echocardiographic data</td>
</tr>
</tbody>
</table>
## CENTER FOR CARDIOLOGICAL INNOVATION

### Glenn Lines
**SRL**  
**Topic**: Computational cardiac electrophysiology (multiscale)

### Ola Skavhaug
**SRL**  
**Topic**: Computational electrophysiology

### Joakim Sundnes
**SRL**  
**Topic**: Computational cardiac electromechanics

### Bjørn Fredrik Nielsen
**SRL**  
**Topic**: Inverse solutions and identification of ischemic regions from ECG recordings; extension of this solution for other applications

### Aslak Tveito
**SRL**  
**Topic**: Computational cardiac electrophysiology (multiscale)

### Marius Lysaker
**SRL**  
**Topic**: Inverse solutions and identification of ischemic regions from ECG recordings; extension of this solution for other applications

### Sjur Gjerald
**SRL**  
**Topic**: Inverse solutions and identification of ischemic regions from ECG recordings; extension of this solution for other applications

## Postdoctoral researchers with financial support from the center budget

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<th>Name</th>
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<tr>
<td>Jussi Koivumäki</td>
<td>Finnish</td>
<td>01.08.11-31.07.13</td>
<td>Developing an image-based modeling pipeline; Clinical pilot study for comparison of multimodality image based models and simulation results; Electrophysiological Modeling</td>
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## Visiting Researchers

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<tr>
<td>Erlend Aune</td>
<td>Norwegian</td>
<td>01.10.12-07.04.13</td>
<td>Prognostic implications of speckle tracking strain measurements in patients with heart failure</td>
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## PhD students with financial support from the center budget

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<tr>
<td>Nina Eide Hasselberg</td>
<td>Norwegian</td>
<td>06.06.11-05.06.14</td>
<td>Left ventricular function and risk of arrhythmia in patients with cardiomyopathies. Echocardiographic studies.</td>
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<tr>
<td>Jörg Saberniak</td>
<td>German</td>
<td>19.09.11-18.09.14</td>
<td>Myocardial function and prediction of ventricular arrhythmias in patients with arrhythmic right ventricular cardiomyopathy.</td>
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<tr>
<td>Jan Vecera</td>
<td>Czech</td>
<td>01.09.11-30.09.12</td>
<td>The onset of active myocardial force generation as a novel method for the assessment of the left ventricle dyssynchrony and its clinical value for the detection of responders in resynchronisation therapy.</td>
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<td>Aleksandar Babic</td>
<td>Serbian</td>
<td>01.10.12-30.09.15</td>
<td>CRT LV lead placement optimization</td>
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## PhD students working on projects in the center with financial support from other sources

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<tr>
<td>Vibeke Marie Almaas</td>
<td>UiO</td>
<td>Norwegian</td>
<td>01.10.10-30.09.13</td>
<td>Echocardiographic changes in patients with hypertrophic cardiomyopathy and arrhythmias.</td>
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<td>Marit Kristine Smedsrud</td>
<td>UiO</td>
<td>Norwegian</td>
<td>01.10.07-31.03.12</td>
<td>Myocardial viability assessment by echocardiography in patients with coronary artery disease.</td>
</tr>
<tr>
<td>Jørn Bersvendsen</td>
<td>NæringsPhD/GEVU</td>
<td>Norwegian</td>
<td>01.06.12-31.05.15</td>
<td>Cardiac modeling</td>
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<td>Siri Kallhovd</td>
<td>SRL</td>
<td>Norwegian</td>
<td>27.10.12-26.10.15</td>
<td>Cardiac modeling</td>
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## A2 Annual Accounts

### Funding

<table>
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<tr>
<th>Source</th>
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<tr>
<td>The Research Council</td>
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<td>The Host Institution (Oslo University Hospital)</td>
<td>4 628</td>
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<td>Research Partners</td>
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<tr>
<td>Enterprise partners</td>
<td>5 545</td>
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<td><strong>Total</strong></td>
<td><strong>24 936</strong></td>
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### Costs

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<td>The Host Institution (Oslo University Hospital)</td>
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<tr>
<td>Research Partners</td>
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<tr>
<td>Enterprise partners</td>
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<tr>
<td>Equipment</td>
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<td><strong>Total</strong></td>
<td><strong>24 936</strong></td>
</tr>
</tbody>
</table>

*All figures in 1000 NOK*
Scientific articles


12) Sept 18th, Opdahl A, Remme EW, Helle-Valle T, Edvardsen T, Smiseth OA: Myocardial relaxation, restoring forces and early-diastolic load are independent determinants of left ventricular untwisting rate. Circ 2012 Sep 18;126(12):1441-51.


14) Sept 18th, Smedsrud MK, Sarvari SI, Haugaa KH, Gjesdal O, Ørn S, Aaberge L, Smiseth O, Edvardsen T: Duration of myocardial systolic lengthening predicts the presence of significant coronary artery disease J Am Coll Cardiol 2012 Sep 18;60(12):1086-93.


Book/Article in book/Report


Lecture/Presentation

Dissemination measures for users


5) April 5th-7th, Edvardsen T., Stress echocardiography, infarction, reperfusion injury and viability. Sofia, Bulgaria. April 2012 EAE Teaching Course, Organized by Bulgarian Society of Cardiology

6) April 5th-7th, Edvardsen T., Prognostic value of deformation Imaging in ischemic cardiomyopathy. Sofia, Bulgaria. April 2012 EAE Teaching Course, Organized by Bulgarian Society of Cardiology


22) Sep 26th, Samset E., “Experience with Marie Curie projects in academia and industry”, RCN hosted visit by Alessandra Luchetti, Oslo.

23) Aug 28th, Samset E., “Marie Curie ITN: from an accepted proposal to a successful ongoing project”, SUMMER project summer school, Vienna – Austria


26) July 2012, Joakim Sundnes and Samuel Wall. Computer models of electro-mechanical interactions in the contracting heart. Workshop on computational models in biomechanics, Federal University of Juiz de Fora, Brazil.


31) July 2012, Joakim Sundnes and Samuel Wall. On the stability of operator splitting schemes for strongly coupled cardiac electro-mechanics. World Congress on Computational Mechanics, Sao Paulo, Brazil.


33) March 9th, Maleckar MM. “An Introduction to the CCI, II and Simula Research Laboratory.” Presentation to Arbeiderspartiet. Simula Research Laboratory, Fornebu.


38) Oct 31st, M.M. Maleckar, J. Koivumaeki, D. Belke, R.B. Clark, C. Kondo, W.R. Giles, Functional Consequences of Expression of Heart Sodium Channel Nav1.5 in Cardiac Fibroblasts and Myofibroblasts, Cardiac Physiome Workshop, San Diego, USA.


40) Oct 27th, T. Edvardsen. Clinical application of myocardial deformation imaging – case reports. EAE Teaching course, Skopje Macedonia.

41) Oct 27th, T. Edvardsen. How does deformation relate to contractility and myocardial function? EAE Teaching course, Skopje Macedonia.


**Dissemination measures for general public**

**Media outreach**

1) Only 1 out of 15 survives without a defibrillator. Dagbladet 2012, Sept 25th


3) So dangerous is stress for you. Dagbladet 2012, Sept 14th, page1 and 12


5) The hidden symptoms. VG 2012, June 14th, page 10-11

6) Long waiting lists can lead to new infarcts. NRK 2012 June 8th

7) The theories that can explain the mystery. VG p10-11. 2012 May 3rd


9) Screening can give false results. ABCnyheter, 2012, May 2nd

10) Can be caused by genetic heart disease. NRK - radio, 2012, May 2nd

11) Temporary autopsy report: Unclear diagnosis. VG 2012, May 2nd


14) Cocaine abuse can cause myocardial infarct. Aftenposten p9, 2012 April 11th.

15) Younger people suffers from myocardial infarct due to cocaine abuse. Dagbladet 2012 April 10th.

