



ProCardio Center for Innovation



Annual Report | 2020
ProCardio Center for Innovation

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Center Director

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Maria Christine Ruud, MSc Center coordinator
Professor Thor Edvardsen MD, PhD, FESC
Professor Eigil Samset, PhD

Design: Maria Christine Ruud

Introduction by the Center Director

Dear colleagues, partners and friends,

Our first annual report is reporting on only one month, December 2020. Nevertheless, we have a lot to report. Workplans, meetings, employments and even some disseminations.

I am very happy that we have come closer and started to know each other. In particular, I am happy about the start of employments and the skilled people we have employed so far. I am sure we will make a great team. For 2021, I wish for face to face meetings. We have managed well with our virtual meetings, and we have been flexible to adapt to whatever situation. Nonetheless, nothing can replace the joy and contact with in person meetings.

I want to thank every single one of the team for your positive input, good spirits and good ideas. I look very much forward to a productive, exciting, and joyful collaboration for the next years to come.

Oslo 27.03.21

Kristina



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SUMMARY

The Precision Health Center for optimized cardiac care and Innovation (ProCardio) is hosted by Department of Cardiology, Oslo University Hospital, Rikshospitalet. The scientific idea behind ProCardio is to develop, test and validate new tools that can reliably predict an individual patients' disease progression, estimate risk of sudden cardiac death and provide a longitudinal view of past and future care pathway options enabling optimal disease treatment. In particular, the opportunity to make use of cutting edge technology such as artificial intelligence, has the potential to make critical breakthroughs in the treatment of cardiovascular disease.

The ProCardio partners are Oslo University Hospital, the University of Oslo, Norwegian University of Science and Technology, Sørlandet Hospital HF, GE Vingmed Ultrasound AS, Dips AS, Sesam.IO AS, GE Healthcare, Baker Heart and Diabetes Institute, Simula Research Laboratory AS, and Medtronic Norway AS.

At ProCardio, researchers and industrial partners work together to ensure that our ideas turn into products that benefit patients. Researchers from Oslo university hospital, UIO, NTNU, SIMULA, and Sørlandet Sykehus work together with GE, producing cardiac ultrasound devices, Medtronic developing implantable defibrillators, and DIPS, providing patient record systems. Furthermore, our partnership with SESAM ensures secure data processing. The Baker Institute from Australia will provide a comprehensive clinical database for ProCardio artificial intelligence systems. Together, we will improve the prognosis of heart disease patients.

OBJECTIVES

The primary objective of the ProCardio Center is to create a clinically driven, validated ICT platform for cardiology that will enable a step change in individualized healthcare, providing the best possible treatment and risk prevention by using big data and artificial intelligence.

Based on leading edge research, this platform will facilitate fusion and analysis of rich and diverse data, integrating a wealth of available information into the workflow of clinical cardiology, and tailor individual care to prevent over- and under-treatment.



Some of the members from OUS with Center director, Professor Kristina Haugaa in front. Copyright: OUS

RESEARCH PLAN

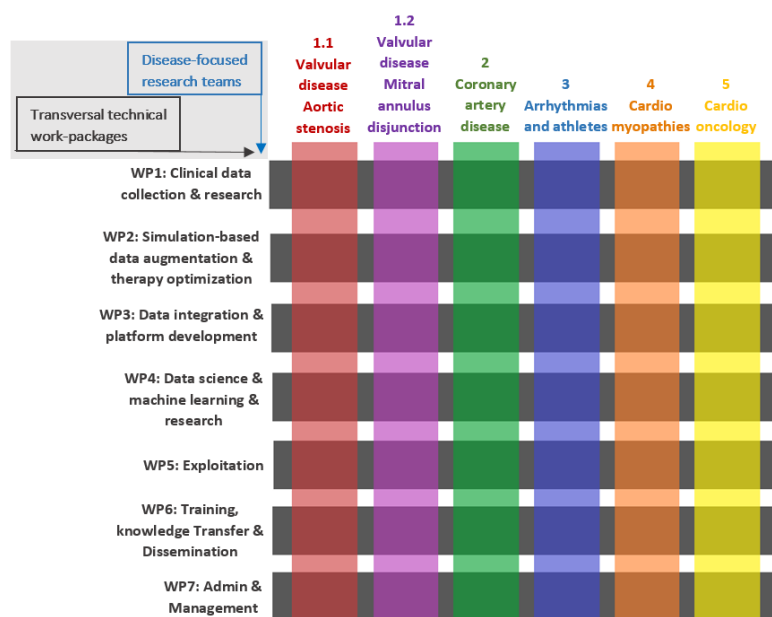
The most substantial impact of the ProCardio on Norwegian and European societies will be its impact on healthcare. In spite of recent advances leading to decreased mortality rates, CVD remains the most common cause of death in Norway accounting for more than one in four deaths. The associated costs are enormous.

The envisioned uptake of ProCardio tools will have substantial impact for individual patients with metrics such as cost per Quality Adjusted Life Year gained. Even more important, these improvements will benefit patients by

- 1) improved selection criteria
- 2) individually optimized treatment
- 3) more accurate follow-ups
- 4) reduced hospitalization stays and procedures
- 5) personalized advice on health bringing activities e.g. exercise

ProCardio will have governing structures and operating mechanism that will guarantee a targeted effort to produce results that can be exploited by the partners and lead to value creation in Norway, through the engaged industrial end-users. The center is also strongly in line with the strategies of research partners (NTNU, SRL, UiO, OUS) and who are all member of the NHT cluster. OUS director of Innovation is invited as part of the management team to ensure continuous focus on innovations. Lastly, clinical partners participating in ProCardio will benefit from sizeable value pools from more effective cardiac care.

In order to foster an application-driven mindset and to uncap technical synergies across ongoing projects, ProCardio methodology was designed to focus on a bidimensional approach concept of having “vertical” research teams focusing on a target cardiac disease while the technical work will be coordinated “horizontally” to enable crosspollination of breakthroughs and integration of knowledge in a single platform. Lastly, common management, coordination and knowledge-transfer mechanisms will work across the entire center.



The bidimensional model with vertical clinical targets and horizontal technical targets.

To reach our objectives and milestones, ProCardio activities are organized in a separate document (Work Plan) that is annually reported. A group leader with expertise in the field is leading each research team and work-package.

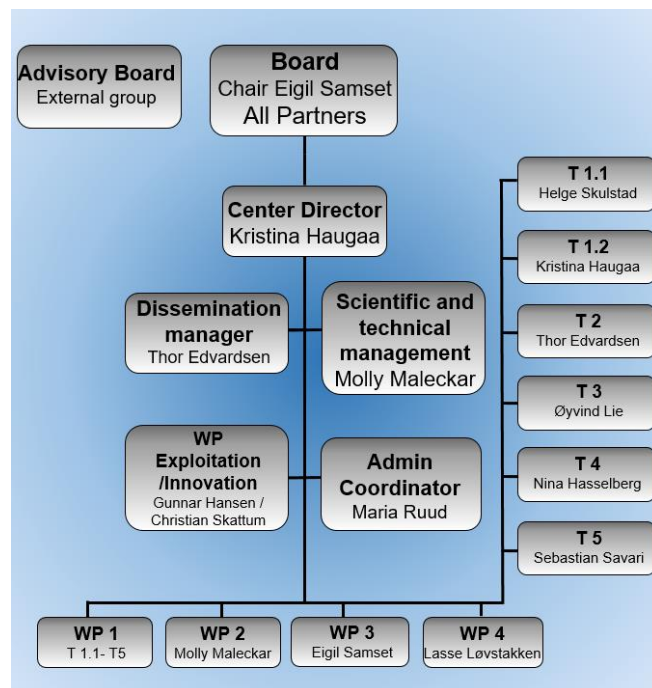
ORGANISATION

STRUCTURE

The center director, Kristina Haugaa is responsible for heading the center management, for providing research funding and controlling costs, for maintaining research progress, planning and reporting to the board, the partners, and RCN, and for timely and adequate progress of doctoral education. In addition, the center director will be assisted by the Scientific and Technical Manager who will be responsible for coordinating work of the teams.

Each clinical task group (T) is lead by clinical research and innovation deputies, liaising with WP leaders which ensure transversal synchronization of technical work among the different teams. In parallel, exploitation, dissemination and innovation activities will be supervised by designated managers, namely Gunnar Hansen (GEVU), Thor Edvarsen (UiO) and a representative from OUS Dept. of Innovation, Christian Skattum. Dr. Mary Maleckar from SRL will act as a Scientific & Technical Manager and Maria Christine Ruud is the Administrative Coordinator.

ProCardio will be governed by a board composed of a member appointed by each of the core partners – GEVU, OUS, SS, MDT, SRL, UiO and NTNU - and the chairman shall be a representative of GEHC (Eigil Samset, Chief Technology Scientist, Cardiology Solutions), hence providing vote majority to user partners as requested in the SFI guidelines.



The organizational map of ProCardio

ProCardio board

Eigil Samset (Chairman), *GE Healthcare*

Bjørn Bendz, *OUS*

Axel Borge, *Sesam*

Liv Bollvåg, *DIPS*

Mirco de Melis, *Medtronic*

Rune Wiseth, *NTNU*

Hilde Nebb, *UiO*

Samuel Wall, *Simula*

Gunnar Hansen, *GE Vingmed*

Michael Band, *Mass General Brigham*

Harald Brunvand, *Sørlandet Sykehus HF*

Tom Marwick, *Baker Institute*

The ProCardio board



Center Director

Kristina Hermann Haugaa, MD, PhD, FESC, Head of Outpatient Clinic and Genetic Cardiac Diseases, Department of Cardiology, Oslo University Hospital, Rikshospitalet. Associate professor at the Institute of Clinical Medicine, University of Oslo.



Kristina Haugaa is the Center director at ProCardio Center for Innovation, an SFI Center for research-based innovation funded by the Research Council of Norway. Dr. Haugaa is a board certified specialist in Internal Medicine and Cardiology. Her research is focused on developing risk stratifying tools for life threatening ventricular arrhythmias and sudden cardiac death and management of genetic cardiac diseases.

Dr. Haugaa has supervised and co-supervised >15 PhD candidates to complete their thesis. She has twice been awarded the teacher of the year by medical students.

She has over 200 international scientific publications in peer-reviewed journals. She was awarded with Oslo University Hospital's Early Career Award in June 2018 for her excellent research and leadership skills and with the Research prize from the Norwegian Society of Cardiology in 2020.

Haugaa is the academic Secretary of the European Heart Rhythm Association (EHRA) and member of the EHRA executive board..

Kristina Haugaa is also the chair of T1.2 on Mitral Annulus Disjunction.

Dissemination Manager

Professor Thor Edvardsen, MD, PhD, FESC, FEACVI, the EACVI Past-President 2020-22. He is Director, Dept. of Cardiology at Oslo University Hospital in Norway and a professor at the Institute of Clinical Medicine at the University of Oslo.



He has published more than 300 international scientific publications in peer-reviewed journals, and more than 20 book chapters and books. Numerous of these articles are published in Circulation, Journal of the American College of Cardiology, European Heart Journal and other prestigious journals in cardiology. Average impact factor pr article is 7.5 and Hirsch index is 60 by Clarivate Analytics, Web of Knowledge.

He has supervised and co-supervised 25 PhD candidates to complete their thesis, and is active in clinical and experimental research in the area of myocardial function. Edvardsen has extensive knowledge of cardiac ultrasound, CMR, CT and hemodynamics.

Thor Edvardsen is also the chair of T2 on coronary syndromes.

Board Chair

Prof. Eigil Samset is the Chief Technology Scientist in GE Healthcare Cardiology Solutions.



He is responsible for technology development, artificial intelligence and digital transformation for the cardiology care area across all product lines in GE Healthcare. He has been with GE Healthcare for 10 years, driving strategic direction for AI in cardiovascular ultrasound and building strong partnerships both clinically, technologically and commercially. Eigil Samset has a strong clinical background, spending 11 years in clinical research departments at Oslo University Hospital, Harvard Medical School and Stanford University Hospital with research in MRI, CT and ultrasound. He holds a PhD in MRI and is a professor in medical imaging.

Eigil Samset is also the chair of WP3 on Data integration & Platform development.

Innovation Manager

Christian Skattum, Cand polit. Head of innovation unit at Oslo University Hospital



As head of the innovation unit at OUH I work in close collaboration with all our clinics and the top management of the hospital to explore both commercial and non-commercial opportunities for service innovation and product innovation. Our objectives are to link people and projects across the hospital with external partners and take innovation from idea to implementation. Together with the ProCardio team we work to fulfill the vision of research based innovation to improve patient treatment and sustainable healthcare services at the Oslo University Hospital.

Scientific and technical management

Molly Maleckar, PhD, is a Research Professor at Simula Research Laboratory.



Molly Maleckar is a primary Principle Investigator and the ProCardio Technical Coordinator as a member of the Management Group.

Dr. Maleckar counts with long and successful experience in leading scientific teams and directing large scientific efforts both at Simula and at renowned international institutions, including tenure at the Allen Institute in Seattle, WA, and co-leadership of a recently concluded Marie Curie Training Network (AFib-TrainNet) and co-management of a Norwegian Centre for Research-based Innovation (Centre for Cardiological Innovation). She has led or co-led numerous international projects with European and North American partners in both national and pan-European funding instruments.

Dr. Maleckar's expertise is core to the ProCardio Centre's goals: central to her research interests are the use of multi-scale computation and simulation of the heart to lend mechanistic insight to ischemic heart disease, fibrotic disease, and atrial fibrillation. Her aim is to further couple these powerful, biophysically-based simulation technologies to advances in machine learning to improve diagnosis and prognosis in the clinic, making her well-suited to drive this effort in ProCardio. Furthermore, her current leadership on national and international scientific boards will augment the Centre's impact by dissemination and connection to other synergistic efforts.

Molly Maleckar is also the chair of WP2 Simulation-based data augmentation & therapy optimization.

Exploitation Manager

Gunnar Hansen (MSc) is the **Global Clinical Research Manager for GE Cardiovascular Ultrasound** working at **GE Vingmed Ultrasound R&D head quarter in Horten**.



He has 36 years of experience in different roles within ultrasound R&D, marketing, and customer support. The last 2 decades he has been working to build GE CV Ultrasound global research program with external technical and clinical research partners to build GE brand and new product solutions to the market.

In ProCardio, he will serve as Exploitation Manager, focusing on commercialization of results from the program for the industrial partners.

He will also represent GE in several work packages. He also served as chairman of the board for the previous SFI with OUH (CCI – Center for Cardiological Innovation).

T 1.1 Valvular disease chair

Helge Skulstad, MD, PhD, FESC, FEACVI, Head of Section of Cardiac Function, Department of Cardiology, Rikshospitalet, OUH. He is also an Associate Professor at Institute of Clinical Medicine, University of Oslo and Associated Editor in **Scandinavian Cardiovascular Journal**.



Cand med, University of Oslo, 1990. PhD, University of Oslo 2006: "New insights into the function of normal and ischemic myocardium. A clinical and experimental ultrasound study". Board certificate in Internal Medicine in 2000 and Cardiology in 2006.

He has over 70 papers international scientific publications. His main topics of research is cardiac function by echocardiography, cardiac mechanics, dyssynchrony and congenital heart disease.

Helge Skulstad is group leader of T1, Valvular disease, at ProCardio. His main interest in ProCardio is to develop automatic detection of severe valvular heart disease to improve diagnosis and treatment of these patients.



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T 3 Arrhythmias and athletes chair

**Øyvind Haugen Lie, MD,
PhD, Department of
Cardiology, Rikshospitalet,
Oslo University Hospital**



Øyvind Haugen Lie successfully defended his PhD thesis "Risk stratification and management of patients with right ventricular arrhythmias" in December 2018. His supervisors were Associate Professor Kristina Hermann Haugaa, MD, PhD and Professor Thor Edvardsen, MD, PhD.

During his fellowship, Lie was awarded with Prof. J. Roelandt's Young Investigator Award for best original work in clinical science at the 2017 EuroEcho-Imaging Congress. The award was given in recognition of the work "Harmful effects of exercise intensity and exercise duration in patients with arrhythmogenic cardiomyopathy".

Lie also won the best poster prize in the session for "Diagnostic and therapeutical strategies for cardiac disease" at the annual Center for Heart Failure Research Symposium two years in a row. He was given the prize in recognition of the work "How many are too many – Frequent premature ventricular contractions and left ventricular function" and "V-3 QRS-duration of premature ventricular contractions relates to ventricular tachycardia in patients with outflow tract arrhythmia", respectively.

T 4 Cardiomyopathies chair

**Nina Eide Hasselberg, MD,
PhD, Consultant Cardiologist,
Dept of Cardiology, Oslo
University Hospital, Rikshospitalet.**



Nina Hasselberg is leading the Cardiomyopathy work package at ProCardio Center for Innovation, an SFI center for research-based innovation funded by the Research Council of Norway. As a postdoctoral researcher, she will conduct research and supervise PhD students in the field of genetic cardiomyopathies and cardiac imaging.

Dr. Hasselberg is a board certified specialist in Internal Medicine and Cardiology. She finished her PhD thesis at the University of Oslo with supervisor associate professor Kristina Haugaa and professor Thor Edvardsen in April 2016. In 2016/17 Dr. Hasselberg was a postdoctoral candidate at University of Pittsburgh Medical Center, Pittsburgh, USA. Her research is focused on genetic cardiomyopathies, heart failure and using cardiac imaging for prediction of outcomes. Dr. Hasselberg has several publications in peer-reviewed journals.

Hasselberg is an EACVI Education Committee member for 2021/22 and was the former Norwegian ambassador of HIT (Heart Imagers of Tomorrow), the young community of EACVI, from 2013-2019.

T 4 Cardiooncology chair

Sebastian Imre Sarvari, MD, PhD, Cardiologist, Cardio-oncologist at Echo lab. at the Department of Cardiology, Oslo University Hospital, Rikshospitalet.



Sebastian Imre Sarvari is the leader for the Cardio-oncology work package at ProCardio Center for Innovation, an SFI center for research-based innovation funded by the Research Council of Norway.

Dr. Sarvari is a board certified specialist in Internal Medicine and Cardiology. He has been a researcher with main focus on cardiac imaging, cardio-oncology and sports cardiology at the Dep. of Cardiology, OUS, Rikshospitalet since 2009 and completed his Ph.D. in 2013. He was a postdoctoral candidate at Hospital Clinic, Barcelona, Spain in 2014-2015. He has over 40 international scientific publications in peer-reviewed journals. He is the consultant cardio-oncologist since January 2018 at the Dep. of Cardiology, OUS, Rikshospitalet.

WP 4 Data science & machine learning & research chair

Lasse Løvstakken, PhD, Professor, Dept. Circulation and Medical Imaging, Norwegian University of Science and Technology.



Lasse Løvstakken is a professor and the head of the ultrasound research group at the Dept. of Circulation and Medical Imaging, NTNU. He also has a central role in the Centre of Innovative Ultrasound Solutions, an on-going SFI hosted by the NTNU ultrasound group. Løvstakken finished his engineering PhD in 2007 in medical technology at NTNU.

He is a former recipient of the Young Research Talent grant from the Norwegian Research Council, and a former member of the NTNU Outstanding Academic Fellows program. His research efforts are in medical ultrasound imaging, with interests in image formation, signal processing, machine learning, and visualization. Clinical applications have been mainly in cardiovascular disease. He has published > 60 papers in international journals, is coinventor of 3 patents in the field of medical ultrasound imaging, and has supervised 6 PhD students to completion as main supervisor.



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Admin Co-ordinator

Maria Christine Ruud, MSc,
ProCardio coordinator,
consultant at the Department
of Cardiology, Oslo
University Hospital.



Maria Christine Ruud earned her Master of Biomedical Science at Katholieke Universiteit Leuven (KU Leuven), Belgium. Her thesis, titled "Genetic editing of Smads" focused on genetic modifications of Smad proteins of the TGF- β pathway, using the CRISPR/Cas9 system and was conducted at Tsinghua University in China during a 6-month research exchange.

In August 2019 she joined Kristina Haugaas team, Research Group for cardio genetics and sudden cardiac death as a consultant and she will take on the role as a coordinator for the newly started SFI, ProCardio Center for Innovation.



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PARTNERS

ProCardio will leverage the combination of leading research institutes and forefront industrial health tech providers, all under the clinical guidance of award-winning cardiologists at Oslo University Hospital (e.g. Kristina Haugaa; ERA-NET on Cardiovascular Diseases, with several awarded Early Career Scientists, and Thor Edvardsen, elected president of the European Association for Cardiovascular Imaging). In addition, it will build from the achievements from the Center for Research-based Innovation (SFI) Center for Cardiological Innovation, a highly successful SFI with excellent achievements; patents and a proven record of accomplishment in bring innovations to market. In addition, ProCardio will build on the SFI Centre for Innovative Ultrasound Solutions (CIUS, 2016- 2023), as well as Center for Biomedical Computing (SFF, 2007-2017)– hence providing extensive research capacity to support ProCardio' s ambitious vision.

The ProCardio Center is comprised of 11 partners with OUS being the host partner:



Partner name: Oslo University Hospital

Knowledge: 1) Dept of Cardiology at OUS is the largest interventional department in the Nordic countries with more than 4100 PCIs and 1600 ablations every year, 2) Front line cardiac research player and world-class clinical expertise; 3) hosted the SFI Center of Cardiological Innovation, which was a highly successful SFI

Resources: a) Infrastructures to host the ProCardio center, b) administrative support towards daily run of the center, c) image and EMR data (>1000 patients)



Scientific partners:



Partner name: The Baker Heart and Diabetes Institute

Knowledge: 1) Outstanding diabetes & cardiac research center, with global visibility, contributing to ProCardio with strong complementary expertise in the field of cardio-oncology

Resources: a) Extensive clinical database of multi-modal data



Partner name: Norwegian University of Science and Technology

Knowledge: 1) Acknowledged as a SFI center for Innovative Ultrasound Solutions (CIUS); 2) Extensive know-how on medical imaging technology, in particular ultrasound; 3) expertise in artificial intelligence and machine learning algorithms; 4) Centre of excellence for translational medical research at the interface of epidemiology, genetics, statistics, bioinformatics and systems biology

Resources: a) Extensive databases with follow up echocardiographic studies and outcome data; b) Computational infrastructure to train and run resource-intensive AI algorithms; c) Databases on genetic markers to be coupled with cardiac imaging in HUNT database and its digital infrastructure, and also a substantial number of other omics data such as NMR-based metabolomics, CVD-related protein arrays, transcriptomics and other targeted protein biomarkers.



Partner name: Simula Research Laboratory AS

Knowledge: 1) Acknowledged as a Centre of Excellence (SFF, the Center for Biomedical Computing), 2) Mathematical growth models for cardiac physiology, growth, and remodeling, 3) data-driven models and analysis for risk prediction; 4) Computational Cardiology Models for biophysical simulation

Resources: a) Access to large computational cluster facilities for training and deployment of resource-intensive algorithms and models



Partner name: Sørlandet Hospital

Knowledge: 1) Leading clinical and experimental research expertise in the area of myocardial function; 2) Extensive hands-on experience on clinical trials to assess new diagnostic technologies and therapies (e.g. we established the IMPROVE study)

Resources: a) image data and EMR data (>2000 patients); b) inclusion of cardiac patients with heart failure and myocardial infarction in ongoing and future research projects





UiO : University of Oslo

Partner name: University of Oslo

Knowledge: 1) Oldest and largest research and educational institution in medicine in Norway, 2) K.G. Jebsen Centre for Cardiac Research is a global reference in the field of cardiology, combining outstanding PIs with an extensive international network of research partners

Resources: a) PhD training for OUS-hosted researchers



GE Healthcare

Partner name: GE Healthcare

Knowledge: World class design and manufacturing of diagnostic imaging and monitoring systems; 2) Extensive expertise in cardiology diagnostics, artificial intelligence development for imaging and waveforms, together with deep market understanding

Resources: a) Direct access to access to Edison AI Workbench; b) Fast-track integration of innovations into commercial products and application to other imaging modalities beyond ultrasound

Industrial partners:



Partner name: DIPS AS

Knowledge: 1) Leading supplier of patient electronic medical records software solutions to Norwegian hospitals; 2) Expertise in eHealth, data integration activities and IT platform development

Resources: a) access to DIPS Arena - a fully integrated patient record system including closed loop medication, charting, booking and planning, electronic document workflow, CPOE, multimedia and reporting



GE Vingmed Ultrasound

Partner name: GE Vingmed Ultrasound

Knowledge: GE's center of excellence on ultrasound engineering; 2) World-class know-how in cardiovascular ultrasound acquisition, processing and analysis, speckle-tracking and strain imaging, artificial intelligence in ultrasound, 3D visualization and quantification; 3) Extensive insight on regulatory requirements and ultrasound market intelligence

Resources: a) provide ultrasound equipment and software to the center to ensure successful execution of clinical projects and data acquisition; b) Through the Developer Partnership Program industrial partners can benefit from a "fast track to innovation", which allows 3rd party solutions to distributed to the GEHC installed based through the GEHC Marketplace





Partner name: Medtronic Inc

Knowledge: 1) World's largest medical technology company, offering a large breadth and depth of innovative therapies, including forefront treatments for cardiac and vascular diseases; 2) extensive expertise in clinical trial protocol development and implementation; 3) VBHC approaches for therapy optimization and chronic care programs; 4) Manufacturing of devices (both for delivering therapies as well for diagnostic purposes (sensors))

Resources: a) access to state-of-the-art medical devices; b) capable of designing and building custom-made devices addressing the needs of individual or groups of patients according the specifications provided by a physician/project



Partner name: Sesam AS

Knowledge: 1) Development of GDPR compliant data management solutions; 2) Data privacy expertise; 3) Creation of interfaces and standards for sharing of data in of Health analytics

Resources: a) access to the Sesam Data Integration Hub Platform-as-a-service, via an in-kind platform subscription; b) consulting services around architecture, along with assistance to connect data sources, transforming data and delivering data where it is needed



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PARTNER COOPERATION

In order to ensure effective dissemination of management goals and coordination of efforts among the partners, the center leader will establish an integrated meeting schedule. This includes weekly meetings within individual project teams, biweekly meetings among teams and center leaders, and monthly digests shared across the entire coordination committee to ensure communication and timeliness of result reporting. The supervisory board will meet bi-annually, in sync with the planned training and dissemination workshops. The center will employ one administrative officer for economy, human resources, reporting, and web information.

Due to the ongoing pandemic, all meetings will be temporarily held online.



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SCIENTIFIC ACTIVITIES

Partner	Type	Title/topic	Country/ Location	Names	Date	Link (if applicable)
OUS	International webinar	"ARRHYTHMIC MITRAL VALVE PROLAPSE" Role of imaging	Virtual	Kristina Haugaa	December 2020	
OUS	EACVI, best of imaging. international conference	Chair for young investigator award	Virtual	Kristina Haugaa	December 2020	https://www.escardio.org/Congresses-&-Events/EACVI-Congress
OUS	EACVI - Best of Imaging 2020, organizer/ President	Inaugural session, chair of sessions, closing session	Virtual	Thor Edvardsen	December 2020	https://www.escardio.org/Congresses-&-Events/EACVI-Congress
OUS	EACVI, best of imaging. international conference. Abstract presentation	Automated echocardiographic left ventricular strain measurements using deep learning	Virtual	Magnus Rogstad tjernet	December 2020	https://www.escardio.org/Congresses-&-Events/EACVI-Congress
OUS	EACVI, best of imaging. international conference. Abstract presentation	Mitral annulus disjunction is associated with adverse outcome in Marfan and Loeys-Dietz syndromes	Virtual	Monica Chivulescu	December 2020	https://pubmed.ncbi.nlm.nih.gov/33280029/



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INTERNATIONAL COOPERATION

ProCardio partners have long-standing collaborations with excellent collaborators at world-class institutions, such as the established relations and experience from previous multicenter trials with Johns Hopkins Hospital (Prof. João AC Lima), KU Leuven (Prof. JU Voigt) and Mayo Clinic, MN, USA (Prof. Michael Ackerman), among many others.

ProCardio will also benefit from several ongoing large projects (e.g. SysAFib (EraCoSysMed, 2016-2019), as well as other ongoing research efforts, such as the funded FRINATEK research project on High-Dimensional Learning (FunDaHD, 2016-2019). Furthermore, two partners in the ProCardio Center for Innovation are international: Medtronic Inc (NED) and The Baker Heart and Diabetes Institute (AUS).

The ProCardio host, Oslo University Hospital (OUS) is the leading center in several international multicenter studies. One of these studies is a prospective study on arrhythmias after myocardial infarction (IMPROVE). The study has been acknowledged as a study supported by the European Association of Cardiovascular Imaging. Many European universities and hospitals collaborate in IMPROVE; Sykehuset Sørlandet, Université Rennes-1, Rennes, France, University Hospital Liege, University Hospital Brussels and Silecian Heart Center, Zabrze, Poland. Other important collaborators are Mayo Clinic, Rochester, MN, University of Pittsburgh, PA and Johns Hopkins University, Baltimore, MD, USA.

Through the Electromechanical Presages of Sudden Cardiac Death in the Young: integrating imaging, modelling and genetics for patient stratification (EMPATHY) project, OUS is collaborating with Maastricht University Medical Center, Cardiovascular Research Institute Maastricht (CARIM) (Prof. J. Lumens) and IRCCS Instituto

Auxologico Italiano, Laboratory of cardiac arrhythmias of genetic origin (Prof. L. Crotti).

Center partner Simula is in collaboration with the University of Washington, University of Copenhagen/Rigshospitalet, Karolinska, and Uppsala University for a project on the risk analysis for major adverse cardiac events of intake ECGs for patients admitted for confirmed COVID-19 infection.



RECRUITMENT

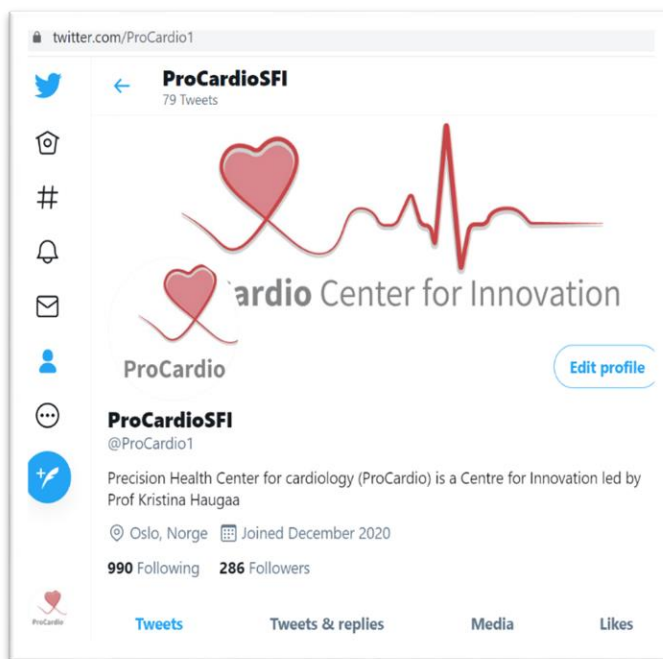
Maria Christine Ruud
M.Sc.
Affiliation: Oslo University
Hospital
Center Coordinator



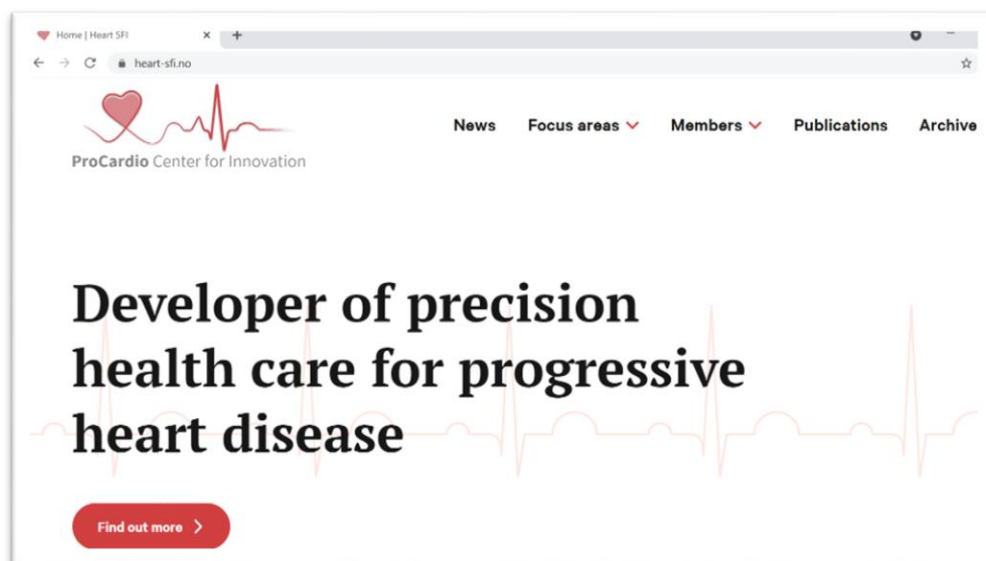
DISSEMINATION ACTIVITIES

The management responsibilities for the dissemination activities will be supervised by a Dissemination Manager (Thor Edvardsen, UiO) to ensure an active involvement of all partners (and end-user organizations in the dissemination of the project results. Hereto, his role as Past President of the European Association of Cardiovascular Imaging (EACVI, ~18000 active members) provides the opportunity to quickly disseminate the outcomes of ProCardio to a highly relevant audience. The scientific results and the technological advancements obtained within ProCardio (cf. sections 6-7) will be either published in high profile, high impact, peer-reviewed journals, and/or will be protected through patents. All scientific publications will be open-access.

In December 2020, we established the ProCardio Home web page (www.heart-sfi.no) and a twitter account (@ProCardio1). Further steps are outlined in a separate dissemination plan.



Screen capture of the ProCardio Twitter account



Screen capture of the ProCardio Web Page



ProCardio Center for Innovation

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