

# Operating Room of the Future



ST. OLAVS HOSPITAL  
TRONDHEIM UNIVERSITY HOSPITAL



NTNU – Trondheim  
Norwegian University of  
Science and Technology

Today's patients treated with technology of tomorrow

## FOR INFRASTRUCTURE



*Here, we have one of the world's most high-tech and advanced university hospitals. But its most notable feature is invisible to the naked eye: a high level of skill, close teamwork between the university and the hospital, and a heartfelt commitment to the patients. This gives us the opportunity to create the best education and research arena for the health service of the future.*

*Stig Slørdahl,  
Dean of the Faculty of Medicine,  
NTNU*

**Trondheim is the first university hospital in Norway completely integrating patient treatment, research and teaching.**

St. Olavs Hospital and the Norwegian University of Science and Technology, NTNU, are forerunners in developing an integrated university clinic by joining university and hospital. Research and teaching are natural parts of the integrated hospital activity. The students face patients from day one, and take part in an attractive and integrated learning environment. In the new buildings, researchers, students and health care providers work side by side. This provides for a close cooperation between clinical and basic research and makes the "Trondheim Model" unique both nationally and internationally.

The project "Operating Room of the Future" (FOR) is a collaboration between St. Olavs Hospital, University Hospital of Trondheim and The Norwegian University of Science and Technology (NTNU).

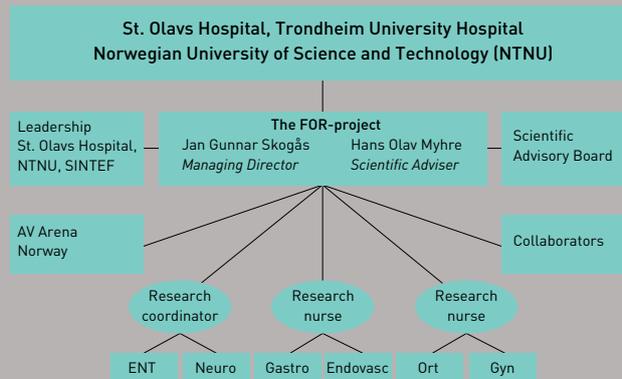
FOR is an arena for research and development which includes six operating rooms, one for each operating clinic. The operating rooms are unique "laboratories" made for the development, testing and clinical implementation of new technology and new treatment modalities.



The most important goal for FOR is research to obtain better and more safe patient care, more efficient logistics and better architecture of operating departments. Teaching is also an important task for FOR.

FOR is a center of competence for design of operating departments and today we have agreements with our industrial collaborators making it possible for the health care authorities of central Norway to realize such research and development.

The FOR-project is multidisciplinary with close collaboration between clinicians, technologists, scientists and industry. FOR is a research platform where new prototypes can be developed and tested under safe conditions. The most modern medical equipment will be available at FOR, with focus on: Today's patients treated with technology of tomorrow.



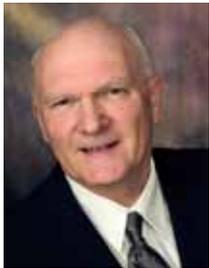
*Jan Gunnar Skogås, Managing Director, Operating Room of the Future*

## Research at Operating Room of the Future (FOR)

FOR is a research platform focusing on image-guided minimally invasive surgery, or so-called key-hole surgery. Such treatment is less traumatic for the patients and may give less complications than traditional open surgery. The intraoperative use of ultrasound combined with navigation is an example of a research project at our institution. This principle is now tested out in neurosurgery, laparoscopic surgery and in vascular surgery. New projects have started at the departments of ear, nose and throat diseases, oral surgery, gynaecology, orthopaedic surgery and pulmonary medicine.

Various imaging modalities are tested for application in diagnosis and for post-operative follow up. Research projects within logistics and organisation of operating departments are also carried out at FOR. In addition to clinical research, experimental studies are performed. All research projects are evaluated by the scientific advisory board.

At present 10 PhD candidates have FOR more or less as the basis for their research projects. Most of the research at FOR is multi-disciplinary and the research foundation SINTEF, National Center of Competence 3D ultrasound as well as industrial companies are important collaborators.



*Hans Olav Myhre – Emeritus Professor of Surgery  
Scientific Adviser*

**AV Arena Norway** is a resource network within medicine and media technology that performs pilot projects as test beds for new application of digital media in the healthcare. The network has members from research, industry and healthcare.

The resource network was initiated by the Operating Room of the Future, St. Olavs Hospital, Trondheim University Hospital, in 2010. The network was initiated to bring competence in media technology together with healthcare organizations as new digital media technology represent a developmental key to major challenges in the healthcare sector.

The goal is to establish a leading international innovation platform within medicine and media technology. Media technology is a key technology within minimal invasive surgery which has been a central focus with the Operating Room of the Future since it was established in 2005. This resource network is focusing on new digital learning tools for employees and patients and digital patient interaction.

Together with strong media technology competence we aim to perform pilot projects that brings medical as well as organizational benefits in the healthcare sector. The Operating Room of the Future has a well established work method in transforming the good ideas into solid projects. The results will be a growing portfolio of pilot projects and applications. The attractiveness of this portfolio will be the key for the long term perspectives of this innovation platform.

**We dare to be at the forefront of innovation within medicine and media technology.**

**SINTEF** The Operating Room of the Future serves as research facilities for several of the projects initiated and run by the research institute SINTEF. The collaboration between SINTEF, NTNU, Norwegian University of Science and Technology, and St. Olavs Hospital, Trondheim University Hospital, has a long tradition within interdisciplinary and translational research covering minimally invasive image guided interventions and medical technology. Especially, the activity covering the National Center of Competence in ultrasound and image guided therapy has been internationally recognized through the development of new solutions improving therapy of patients. In addition, the Operating Room of the Future serves, through collaboration with SINTEF, as research infrastructure for a large number of national and international projects funded by EU, The Research Council of Norway and industry. Competence development within navigation, registration, visualization, ultrasound and imaging technologies has been the main research and innovation activities.

Together with the Intervention Centre at Oslo University Hospital, the Operating Room of the Future is on the National roadmap of research infrastructures in Norway. The Government white paper on research, "Climate for Research", assigns the Research Council the responsibility for drawing up a Norwegian roadmap for investment in research infrastructure. The Roadmap is to present national and international large-scale projects in which the Research Council recommends investing in the near future.

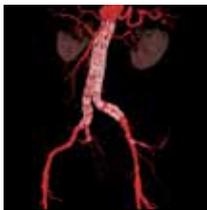
## FOR at St. Olavs Hospital

At the new St. Olavs Hospital, University Hospital of Trondheim, we now have 6 operating rooms, one at each operating centre, connected to the FOR-organisation. In addition to clinical research, experimental studies are also performed at FOR. All the FOR operating rooms have infrastructure including HD quality allowing live transmission of operative procedures. They also have the most advanced operating rooms existing today. Integrated solutions allow advanced operating techniques and have attracted the attention of several visiting surgeons. For surgeons in operative clinics, FOR is taking care of the compulsory training programme and certification in the use of electro-medical equipment and in hospital hygienics.

FOR is represented at the following centers:



**FOR at the Center for Gastrointestinal Diseases** The Operating Room of the Future at the Center for Gastrointestinal Diseases is among the most advanced operating rooms existing at St. Olavs Hospital, Trondheim University Hospital. Integrated solutions allow the application of both laparoscopic techniques and operations via flexible instruments from inside the lumen of the gastrointestinal tract. The methods can also be combined whenever necessary. A close collaboration with SINTEF and the National Center of Competence 3D Ultrasound has led to important progress by obtaining more precise surgery using 3D Ultrasound and navigation during the procedures.



**FOR at the Center for Cardiovascular Diseases** The Operating Room of the Future at the Center for Cardiovascular Diseases is made as a hybrid operating room where open surgery as well as intervention/angiography can be carried out. The operating room is equipped with the angiography unit "Artis Zeego". Research programs are carried out to develop better methods of surgical treatment by applying ultrasound and navigation. Several projects are using the technology at the Operating Room of the Future including cardiologists and cardiac surgeons who are implanting heart valves by minimally invasive techniques.



**FOR at Department of Obstetrics and Gynecology** One important research field at the Department of Obstetrics and Gynecology is robotic surgery. This surgery fits well in at the Operating Room of the Future – It is high-tech, innovative and has a great potential for the future. FOR is extremely useful in the training and certification of the personnel in the application of electromedical equipment and this is a unique service to the operating clinics. The clinic is extremely pleased with the close collaboration with FOR and look forward to contribute with an increasing number and scientific projects.



**FOR at the Clinic of Ear-Nose-Throat, Eye and Maxillofacial surgery** One of the strategic goals of the Department of ENT is to be in the forefront professionally as well as from a scientific point of view and to strengthen the collaboration with the technological research groups at SINTEF and NTNU. Together with the Department of Oral Surgery it is planned to establish a national center for minimally invasive endoscopy. The Clinic aims to be at a high level in the development and clinical testing of new technology for diagnosis and treatment. The collaboration with FOR is essential to fulfil these goals.



**FOR at the Department of Neurosurgery** The most important research profile is the application of ultrasound within image guided minimally invasive neurosurgery. This technology, in combination with navigation, has been applied in several areas. The research at the Department has the background in clinical needs and through a multi-disciplinary approach combining technological and clinical research, less traumatic and safer treatment modalities are developed. The research at the Department of Neurosurgery is carried out in a close collaboration with SINTEF and NTNU – including Center of competence 3D Ultrasound.



**FOR at the Department of Orthopaedic Surgery** The cooperation between the Department of Orthopaedic Surgery and The Operating Room of the Future is perhaps of special advantage for National Center for Orthopaedic Implants (NKSØI). The main goal of this unit is the development of products within orthopaedic implants. This requires the involvement of the industrial companies and FOR is helping to build a good framework for cooperation with industrial partners.

## COLLABORATORS FROM MEDICAL COMPANIES:



[www.olympus.com](http://www.olympus.com)



[www.siemens.com](http://www.siemens.com)



[www.sony.com](http://www.sony.com)



[www.covidien.com](http://www.covidien.com)

## RESEARCH COLLABORATORS



[www.sintef.no](http://www.sintef.no)



[www.ntnu.no](http://www.ntnu.no)



[www.stolav.no](http://www.stolav.no)



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**BASIC HOSPITAL DATA:** Founded in: 1902 Number of beds: 1042 Clinics and Departments: Children, Anaesthesia and Emergency medicine, Cardiology, Clinical Service, Ear-Nose-Throat, Eye and Maxillofacial Surgery, Laboratory Medicine, Medicine, Oncology, Orthopaedy and Rheumatology, Physical Medicine and Rehabilitation, Radiology and Nuclear Medicine, Surgery, Thoracic and Occupational Medicine, Cardiothoracic Surgery, Mental Health Care, Neuro, Obstetrics and Gynecology Number of operating rooms: 43