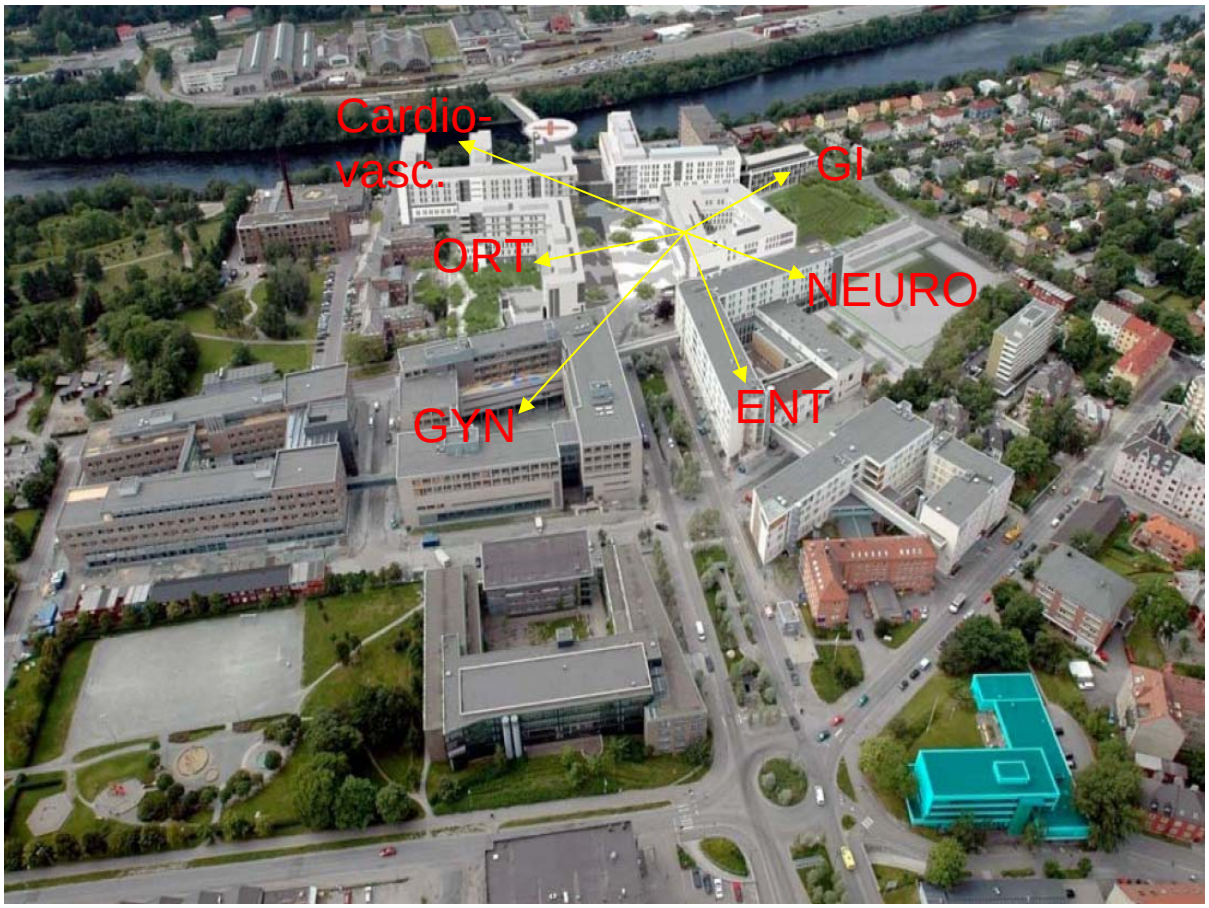
Operating Room of the Future

St. Olavs Hospital HF, Department of Surgery
Medical Faculty, NTNU

Annual report 2009



St. Olavs Hospital
University Hospital of Trondheim

NTNU – Trondheim
Norwegian University of
Science and Technology

Contents

Annual report 2009

Operating Room of the Future (ORF), Department of Surgery, St. Olavs Hospital and the Medical Faculty, NTNU

"The patients of today – The technology of tomorrow"

"A multidisciplinary arena for clinical research and development of medical technology"

Summary

The Operating Room of the Future is a cooperation between St. Olavs Hospital HF, University Hospital of Trondheim and the Norwegian University of Science and Technology (NTNU), Trondheim, Norway. The management of the unit is a responsibility shared between Department of Surgery and Institute of Circulation and Medical Imaging, the Medical Faculty, NTNU. The Operating Room of the Future (ORF) is an arena for research and development with the operating rooms as unique "laboratories", designed to develop, test and apply new technology and new treatment modalities.
The tasks of the University Hospital is defined in the "specialist health care act" and include treatment of patients, teaching of patients and relatives as well as research and teaching of health care personnel. The aim of ORF is to fulfil these goals.
The most important activity of this project is to provide safer and better patient treatment, more effective logistics and flexible architecture in the construction of new operating rooms. ORF is also a centre of competence for construction of operating rooms outside St. Olavs Hospital. A unique agreement with our industrial collaborators has made it possible for the health care trust of central Norway, St. Olavs Hospital and NTNU to perform research and development in central Norway.
The main focus has so far been image guided minimally invasive therapy. ORF has a close collaboration with National Centre for Advanced Laparoscopic Surgery (NSALK), SINTEF and National Centre of Competence – 3D ultrasound.
According to "National Plan for the Norwegian Health Authorities", Trondheim has a particular responsibility for research within the field of medical technology.
The ORF-project is multidisciplinary and an arena for clinical research and development of medical technology. Prototypes can be developed and tested in safe and controlled environments. ORF is structured to promote a close collaboration between clinicians, technologists, researchers and industrial partners. The most modern equipment available is used at ORF.

The operating rooms are equipped for minimally invasive therapy. The main focus is keyhole surgery of the abdomen (laparoscopic surgery) and endovascular therapy for diseases in the blood vessels. Minimally invasive therapy is less traumatic than traditional surgery.

ORF also shows that the concept of cross-disciplinary and cross-professional approach is advantageous. ORF has the facilities and logistics necessary to focus on research and projects which are based on a multidisciplinary approach. Studies are performed by PhD-candidates, scientists, students and clinicians. In addition, ORF with its technical equipment and design is perfect for teaching and education of students, doctors and nurses.

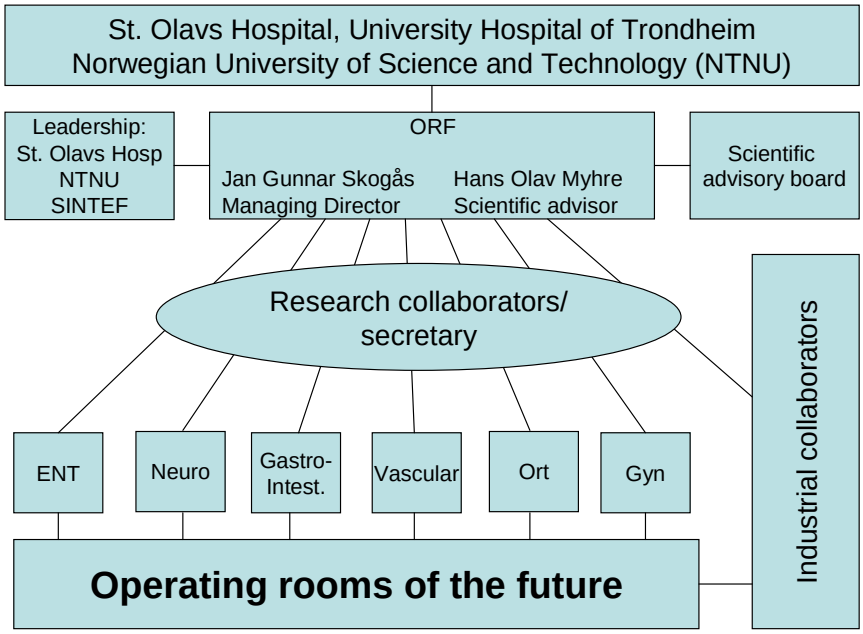
New methods for teaching have been tested, and transmission of imaging from the operating rooms to the lecture room with two-way communication, has been used on several occasions. This is regarded as an extremely valuable experience and the intention is to develop this further by using the excellent equipment and technological standard of the facilities. At ORF and NSALK several courses are arranged annually including courses compulsory for specialist candidates. ORF with integrated surgical lecture room is a unique environment for such courses.

New projects and investigations have started in 2009 and several projects are on the planning stage.

Preparing for endovascular therapy in a patient with aortic aneurysm

Laparoscopic surgery at ORF

Organisation



The staff at ORF

1 managing director
1 scientific advisor
1 research collaborator/endovascular activity
1 research collaborator/responsible for laparoscopic activity

Other personnel resources connected to ORF

1 responsible for endovascular activity
1 responsible for laparoscopic activity
1 OR nurse responsible for endovascular activity
1 radiologist
1 anaesthesia nurse
1 radiographer

Clinical activity

Altogether 266 operations were performed at ORF in 2009

Laparoscopic treatment

At ORF laparoscopic surgery as well as endoluminal surgery using flexible endoscopes and combined techniques is used. Such minimally invasive therapy has advantages both for the patient and economically, since the stay in hospital can be significantly reduced. There are still challenges regarding identification of tumors, blood vessels and lymph nodes. The collaboration with SINTEF and Centre of competence 3D-ultrasound, where also vascular surgeons and neurosurgeons are involved, has made it possible to cope with some of these problems using navigation and 3D-ultrasound. One of our fellows has developed an experimental model making it possible to identify a liver tumour with high accuracy using ultrasound and navigation. CustusX is a navigation tool which has been developed by SINTEF, and has been used during several adrenalectomies and similar operations. This work is part of a clinical multicenter study carried out in collaboration with Department of Surgery, Mesos Medical Centre, Utrecht, the Netherlands.

ORF has also been involved in the testing of a new laparoscopic instrument in cooperation with the University of Tübingen, Germany. The main goal is to improve the ergonomic during laparoscopic surgery (Surg Endosc 2009; Oct. Epub 209 Oct. 9).
ORF is taking part in a multicentre investigation where a new method for the treatment of morbid obesity has been tested. The principle is based on the implantation of electrodes placed on the vagus nerve (VBLOC). All the patients have now been included in this investigation and we are looking forward to observe the 3-year results.

In cooperation with Regional Centre for Morbid Obesity (RSSO) we have since 2005 carried out an investigation where surgery is compared with changes in life style in patients with morbid obesity.

In collaboration with SINTEF, Ronald Mårvik has been medical advisor for an EU-project, VECTOR. An advanced wireless endoscopic “pill” can be used for therapy and can be navigated non-invasively from the body surface.

Several surgeons from Norway, Denmark, Japan, the Netherlands and Germany have visited ORF in 2009. There is a synergy between NSALK’s simulator-based laboratory and ORF’s interactive lecture room. Thus, participants at courses and symposia can perform training on simulators and be present in the lecture room where they can observe procedures performed by laparoscopic/endoscopic technique.

During 2009 altogether 126 operations have been performed in the OR for laparoscopic surgery and 76 of them have been carried out for morbid obesity. We have also carried out endoluminal procedures with flexible endoscopes where tumours have been removed from the bowel using an intraluminal approach.

In 2009 126 operations have been performed at the laparoscopic operating room

Activity, laparoscopic surgery			
Gastroenterology	Laparoscopic	Fundoplication	7
	"	Cholecystectomy	1
	"	Gastric bypass	72
	"	Gastric sleeve	1
	"	Removal of gastric banding	1
	"	Removal VBLOC	1
	"	Reoperation Gastric bypass	1
	"	Gastric resection	1
	"	Hernia of the abdominal wall	3
	"	Hepatic resection	5
	"	Resection pancreatic tail	1
	"	Splenectomy	1
	"	Appendectomy	1
	"	Low anterior resection of colon	2
	"	Sigmoid resection	2
	"	Diagnostic	1
	Open resection of liver		1
	Endoscopic resection of mucosa		1
	Gastroscopy with sclerosing therapy		1
	Trans Endoscopic Microsurgery, TEM		1
Urology	Laparoscopic Nephrectomy		1
Endocrine surgery	Laparoscopic Adrenalectomy		15
Gynaecology	Removal of cyst		2
	Endometriosis		1
	Diagnostic laparoscopy		1
Orthopaedic surgery	Hip prosthesis		1
Total			**126**

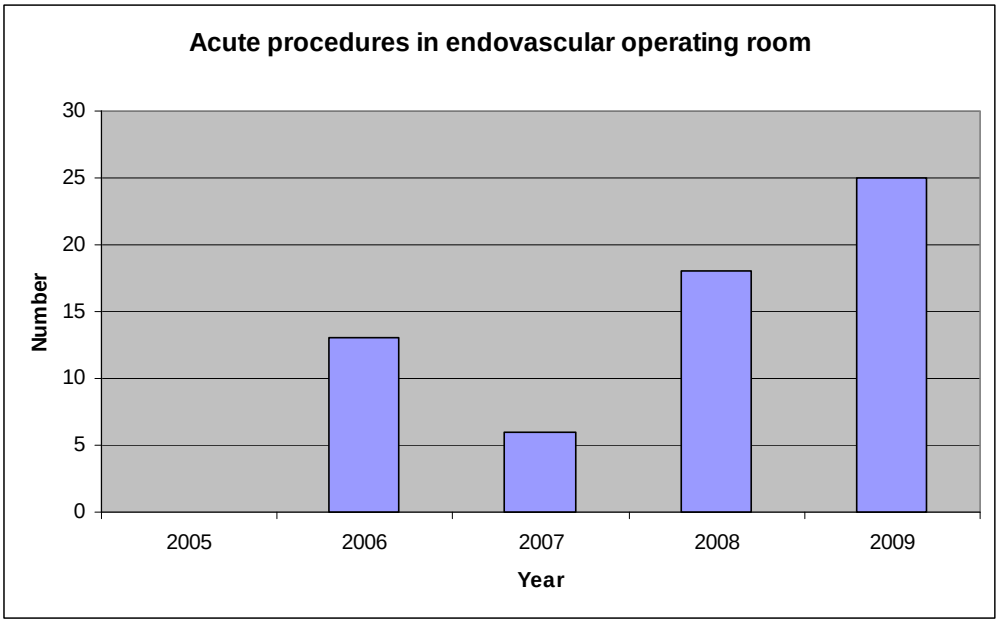
Endovascular treatment

Altogether 140 operations / procedures have been performed at the endovascular operating room, ORF. 25 of these were emergency cases. In stable patients suspected of having ruptured aortic aneurysms, a CT scan is performed to investigate whether they are candidates for endovascular treatment at ORF. In patients with traumatic injury of the thoracic aorta, stent-grafting is our first choice. The result following treatment of 9 such patients was presented at the annual meeting of the Norwegian Society for Vascular Surgery.

We have treated patients with aneurysms of the iliac artery, of the abdominal and thoracic aorta. The number of combined open and endovascular procedures is increasing. Thus, balloon dilatation and stenting is often performed simultaneous with an open operation like endarterectomy or bypass grafting. Such procedures can reduce the total hospital stay. A close collaboration between surgeon and radiologist is necessary and our goal is that vascular surgeons can develop sufficient skills in various endovascular techniques.

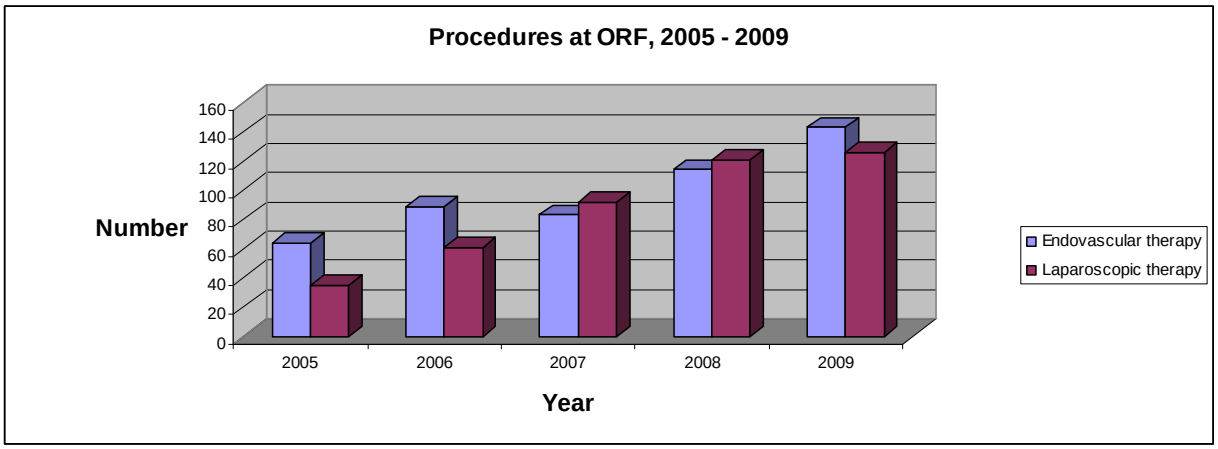
The lecture room at ORF is used on a regular basis for teaching vascular surgery to medical students, and transmission of percutaneous stent-graft procedures serves as a background for discussing patient histories and principles for handling aortic aneurysms. 27th of May 2009 was defined as “the day of vascular surgery”. This was a national event and ORF was heavily involved in the arrangement. Live transmission of the treatment of an AAA with stent-grafting was shown at NOVA cinema in the centre of Trondheim. This event was open to the public and was covered by local as well as national TV.

Two PhD-candidates have now included all patients in projects applying so-called DynaCT. This image modality has been applied both for the navigation as well as for deployment of stent-grafts. In addition several animal experiments, using navigation during stent-grafting, have been carried out. Radiography students at Sør-Trøndelag University College have performed investigations on radiation exposure connected to DynaCT. This investigation may in turn lead to prophylactic measures. At the endovascular operating room several gastroenterological procedures have been performed applying regular fluoroscopy.



In 2009, 140 operations have been performed in the endovascular operating suite

Clinical activity, endovascular operating room		
Elective procedures		
Vascular surgery / intervention	Stent-grafting thoracic aorta	4
	Stent-grafting abdominal aorta	34
	Secondary procedures abdominal stent-grafting	5
	Stent-grafting thoracic+abdominal aorta	1
	Stent for renal artery aneurysm	1
	Stent for radial artery aneurysm	1
	Stent for iliac aneurysm	2
	Combined procedures – TEA/PTA/cross-over	41
Emergency procedures		
Vascular surgery / intervention	Stent-grafting thoracic aorta	1
	Stent-grafting thoracic aortic injury	2
	Stent-grafting abdominal aorta	7
	Trombectomy/embolectomy+PTA emboli	5
	PTA critical ischemia	4
Gastroenterology	Stimulation of sacral nerves for anal incontinence (SNS)	31
Anaesthesia department	Correction of CVP during fluoroscopy	1
Total		**140**



Who is using ORF?

In addition to the laparoscopic and endovascular activity, various surgical and medical disciplines have used ORF for research and teaching during 2009;

- Endocrine surgery
- Department of urology
- Department of orthopaedic surgery
- Department of pulmonary diseases
- Gynaecology

Developing and testing medical technology

In addition to clinical activity the operating rooms at ORF have been used for experimental investigations as well as laboratory studies. Altogether 10 animal experiments have been carried out. We have also tested and developed new medical technology, prototypes as well as new equipment. This is part of clinical trials and PhD-projects.

SINTEF and PhD-candidates have used the operating rooms at ORF for 20 days for testing, calibration and mounting of navigational equipment. Navigation has been used for the deployment of stent-grafts with side-branches in an experimental model. We have also used navigation during laparoscopic surgery, which is investigated in a separate PhD-project. A new treatment modality for patients with abdominal aortic aneurysm has been tested experimentally. This method is representing a new principle and has so far not yet been tested out clinically. Internally and in collaboration with our industrial partners 10 weeks have been spent in ORF for testing of technological systems, quality control, safety control and upgrading as well as validation of medical technology.

Resource centre for new hospitals

ORF is a testing ground for integrating operating rooms in hospital structures and for implementing new technology and equipment. Thus, our facility has been used by the unit for our new hospital as well as other departments at St. Olavs Hospital and by the hospital development project for Central Norway, the contractor of the new University Hospital in Trondheim. Knowledge from ORF has been used both in phase 1 and 2, especially during planning and construction of new operating departments. In 2009 special focus has been on phase 2 regarding infrastructure, AV/ICT structure and technology at the operating rooms.

Teaching

Staff

- Medical personnel affiliated to ORF are going through annual certification in compliance with national regulations on the use and maintenance of electro-medical equipment.
- All surgeons at St. Olavs Hospital are going through courses on an annual basis regarding electro medical equipment.
- ORF has a number of highly qualified personnel focusing on the use of modern, advanced medical technology. Also this personnel is kept up-to-date through various courses and conferences.
- The personnel at ORF is contributing in the teaching of personnel from other departments at St. Olavs Hospital as well as personnel from other institutions, focusing on clinical procedures, research and application of medical technology.
- ORF has visitors from other hospitals. Organising and designing operating rooms has been a focus area.
- During a course in simulator training arranged by the National Centre for Advanced Laparoscopic Surgery, ORF has been used as an arena for transmission of operative procedures and for the dissemination of information about integration of new equipment applied during these procedures.
- The personnel at ORF have during 2009 attended courses within leadership and research organisation.

Live transmission of surgical procedure to the lecture room (ORF)

Students

- On a regular basis operative procedures have been transmitted from the operating rooms to the lecture room in connection with teaching of medical students, nurses and radiography students as well as other professional groups at St. Olavs Hospital, Sør-Trøndelag University College and NTNU.
- Operating room nurses and anaesthesia nurses have been taking part in this educational and tutorial activity.
- Master students as well as PhD-candidates at St. Olavs Hospital/NTNU/SINTEF have a good opportunity to experience a new medical technology and operations from the interactive surgical lecture room at ORF.

Conferences using live transmission

- 8th of May Norwegian conference on endometriosis for gynaecologists
- 13th of May Course in orthopaedic surgery on hip prosthesis
- 27th of May "The day of vascular surgery", transmission to Nova cinema
- 20th of Oct. The Nidaros Conference. Transmission to the lecture room at ORF
- 27th of Oct. Real-time transmission from Japan to ORF

Courses

"Week of courses" NTNU 2009

- October 12th -16th Medical students – live transmission of various procedures with associated lectures and also a hands-on course in vascular surgery/intervention.

Other courses

- August 19th Course for radiography students.

Electro medical equipment (EMU)

- 20th of January High-energy equipment
- 16th of February Imaging technology
- 17th of September Imaging technology
- 9th of November High-energy equipment
- 7th of December High-energy equipment
- 8th of December Endoscopic equipment

All surgeons at St. Olavs Hospital are invited to courses in the application of high-energy equipment for surgical use. So far about 50 % of the surgeons have taken such courses, which also include an exam. Courses in hygiene and patient safety have been arranged for all surgeons at our hospital. ORF has arranged these courses on behalf of Department of Hygiene and patient safety:

- 14th of May Hygiene and patient safety
- 24th of September Hygiene and patient safety

Other events

12th of November One Day Symposium, St.Olavs Hospital, Sør-Trøndelag University College and City of Trondheim. ORF was represented with 2 posters; "Operating Room of the Future (ORF) – a multidisciplinary arena for clinical research, quality assurance and development" and "Investigation of neuralgic pain in patients operated on for morbid obesity".

Transmission of laparoscopic procedure to the lecture room.
Medical students are following the operation.

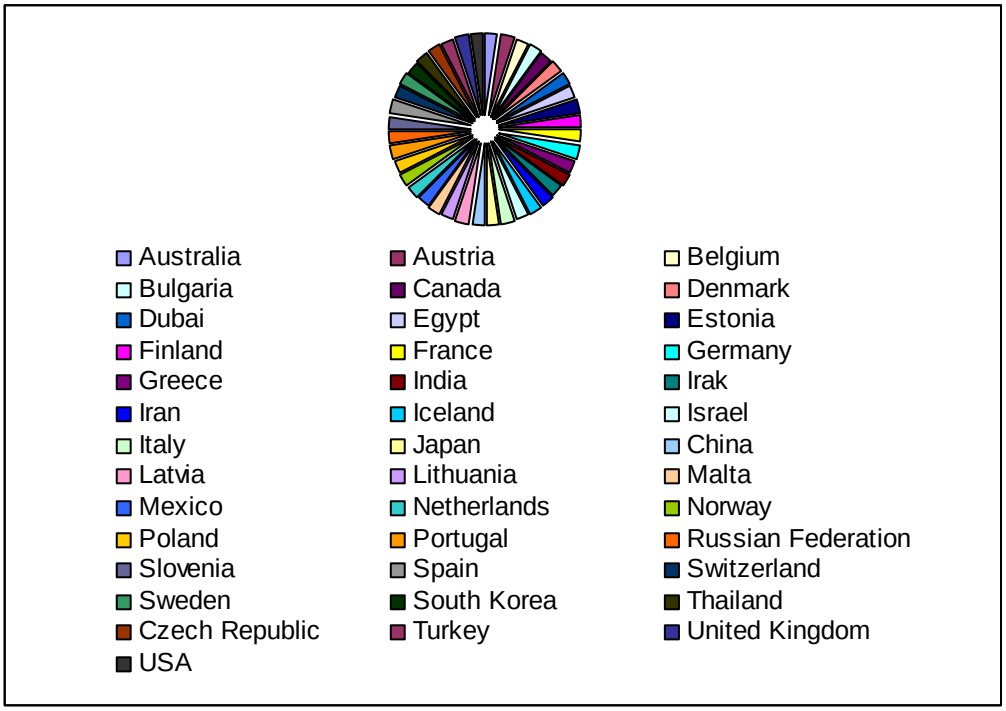
Visitors

Also in 2009 several national and international groups have visited ORF. Altogether 56 groups have been visiting ORF including participants at courses. The visits have been arranged as guided tours, lectures, meetings and courses with live transmission of operations to the lecture room. The groups have consisted of health care professionals, hospital planners, hospital administrators, members of the Norwegian parliament, state department employees, architects, representatives from the industry, scientists and journalists. In addition, ORF has received several groups internally from St. Olavs Hospital and Hospital Development project of Central Norway. Presentations have been given by representatives from St. Olavs Hospital, NTNU and SINTEF.
Operating room nurses, radiologists, anaesthesia nurses/doctors, radiographers and surgeons both from national and international hospitals have visited the operating room at ORF.

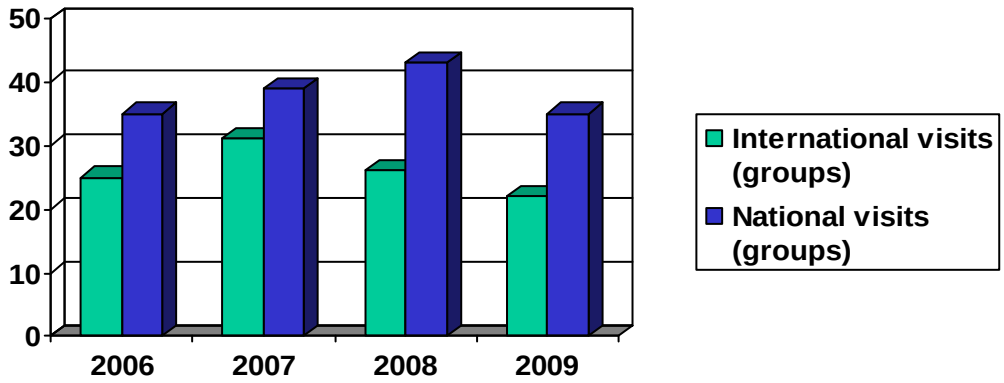
Scene from the lecture room, ORF.

Visitors at ORF 2006 – 2009

40 nationalities



Visitors at ORF 2006 - 2009



Upgrading of medical technology, ORF 2009

1. Further development of IP-based telemedicine, ORF. New IP technology is used via the research net – Uninet. Was used in connection with communication to various destinations in Asia and ORF during 2009.

2. New platform for high-energy equipment, diathermy and ligatures is established to all six ORF operating rooms in the new hospital.

3. We have not upgraded medical technology at OR1 and OR2 during 2009. However, the technology has been made ready for deconstruction and re-establishment.

4. Together with the partners of ORF, we prepared for implementing new technology in the new ORF operating rooms. This should then be ready from spring 2010. The new technology consists of:

    - New technology at all the ORF rooms, for live transmission to lecture rooms, seminar rooms and externally in the new hospital.

    - New integrated angiography laboratory at the Centre for Vascular and Cardiac diseases. In 2010 the Artis Zeego unit has been established.

    - New EndoAlpha for laparoscopic procedures.

    - New operating room concept with focus on integration and improvement of work-flow is installed at ORF operating room, GI surgery. It includes video-routing, special lightening and glass walls, making cleaning simpler and easier.

    - Operating robot, DaVinci, will be installed with main focus on urological, gynaecological and laparoscopic procedures.

Research and development

Supervision

Hans O. Myhre (scientific advisor ORF) has in 2009 been supervising 3 PhD candidates.

National and international committees

Ronald Mårvik:

- Leading the National task force responsible for the report:
  "Work-up and treatment of morbid obesity in secondary health care".
- Committee member Technology Committee and NOTES - Committee in European Associations of Endoscopic Surgery.
- Member of governing board, Norwegian Bariatric Association and Norwegian Thoraco-laparoscopic Union.
- Editorial Board, Medical Technology, NTNU
- Editorial Board, Surgical Endoscopy

Torbjørn Dahl:

- Norwegian council member in ESVS, European Society for Vascular Surgery.

Hans O. Myhre:

- Leader of the project "The day of vascular surgery" 27th of May 2009
- Member of the committee evaluating the thesis of Espen Bakke who defended his PhD at University of Oslo 3rd of June, 2009
- Member of the council European Society for Nanomedicine, where we also was one of the founders.

PhD-thesis, Master degrees, Bachelor degrees and other projects

Completed PhD

Andreas Seim, PhD, defended this thesis 24th of April, 2009**.** ”Process Analysis and Monitoring in Complex Perioperative Environments – Health Operations Management”. This was collaboration between ORF, Institute of Computer and Information Science, Massachusetts General Hospital/Harvard Medical School.

Ongoing PhD studies

Frode Manstad-Hulaas, PhD, medicine/medical technology
”Endovascular stent-graft implantation using navigation technology”. By using navigation and DynaCT intraoperativelly, one intends to make stent-grafting safer and simpler. A project based on experiments on a model has been published. The navigation system can visualise the instruments in a 3D image without the use of X-rays. All collection of data is finished and in 2009 the candidate has presented 3 papers at international conferences and 2 proceedings. The project will be finished in 2011.

Håvard Nordgaard, PhD, ”Ultrasound based blood flow imaging for control of cardiovascular surgery”. The candidate is supported financially through MI-Lab from 2009. Rune Haaverstad, MD, is the supervisor for this candidate. The project investigates the use of blood flow measurements for evaluation of coronary bypass grafting. He is going to deliver his thesis in 2010.

Berit Brattheim, MSc, health/medical technology
”Aortic Aneurysm Network: Coordination support for trans-organizational care processes”
The work is focusing on patients with abdominal aortic aneurysm. Part of the study is describing work flow when selecting patients for possible stent-grafting. During 2009 3 proceedings have been made and additionally the candidate has given 3 presentations at conferences. One article is under publication and one under preparation. The work is done in collaboration with Department for Electronic Patient Record (NSEP) and is a part of the so-called COSTT-project. The candidate will finish her work in 2012

Kari Ravn Eide, PhD, health/medical technology
”Dyna-CT for endovascular treatment of abdominal aortic aneurysm”
DynaCT is a new technology where a C-arm linked to the angiography laboratory rotates and gives CT-like images during intervention. Three papers have been published and three projects are running. The latter includes investigations on irradiation during the application of DynaCT and image quality following upgrading of the software. The PhD will be defended in 2011.

Ole Vegard Solberg, MSc, medical technology

”3D ultrasound for improved diagnosis and surgical guidance – reconstruction and integration of preoperative image data”. Two articles have been published and the third will be submitted in 2010. This project is in close cooperation with Centre of Competence 3D-ultrasound and the PhD-work will be finished in 2011.

Anna Aasgaard Rethy, PhD, medical technology
”The role of navigation and intraoperative imaging in laparoscopic surgery”.
Two articles have been submitted and two are under preparation. This work will be finished in 2012.

Reidar Brekken, PhD, medical technology
”Strain measurements in evaluation of abdominal aortic aneurysm (AAA)”
Strain in the aortic wall is investigated to evaluate the possibility of rupture. One paper is discussing the methodology, while another one is evaluating strain before and after endovascular treatment of abdominal aortic aneurysm. A method for visualisation of strain in a 3D anatomical model has been developed and published. Brekken’s PhD-thesis is a collaboration between ORF and Centre of Competence 3D-ultrasound. He is planning to finish his work in 2011

Håkon Olav Leira, PhD, medicine
”The application of DynaCT for bronchoscopy and endobronchial procedures”
The first part of this PhD study is experimental. One publication is under preparation. This project is organised by Department of Pulmonary Medicine.

Conrad Lange, PhD, clinical medicine
”Endovascular treatment of aneurysms”. The work includes investigations on endovascular treatment of inflammatory aneurysms and also the use of EVAR in elderly patients; above the age of 80. Clinical results and long-term results following endovascular therapy both for abdominal and thoracic aneurysms is a part of the investigation. The project will be finished in 2011.

Camilla Berge, PhD
”Time-trends and results following treatment of abdominal aortic aneurysm”
This investigation includes papers on time-trends in the treatment of abdominal aortic aneurysm. Furthermore, she has studied the long-term results following open surgery as well as endovascular therapy. Finally, she is going to investigate AAA in female patients. There are relatively few female patients who are treated for this condition and furthermore the mortality in women is high. Finally, aortic aneurysms rupture at a lower diameter in women than in men. This project will be finished in 2012.

Part of a PhD thesis

Tor Erik Evjemo, PhD, sociology
An ethnographic research design used in studies for identifying work-related activities in areas of collaboration and communication. The work is focusing on mode of collaboration in technologically complex environments. A part of this study is focusing on video recordings of communications/use of information in a high-tech setting. Employees have been interviewed and a paper from this work has been published. The PhD work will be finished in 2010.

Ongoing Master degrees

There are 2 ongoing Master degrees in health science associated with ORF;

Jenny Kristin Aasland defended her thesis 24th of August, 2010.
"Vascular surgery in Norway – an investigation based on the Norwegian Vascular Register -NORKAR"

Anne Karin Wik has planned the completion of her master degree in 2011.
"Health related quality of life and results following sacral nerve stimulation in patients with anal incontinence"

Completed Bachelor degrees

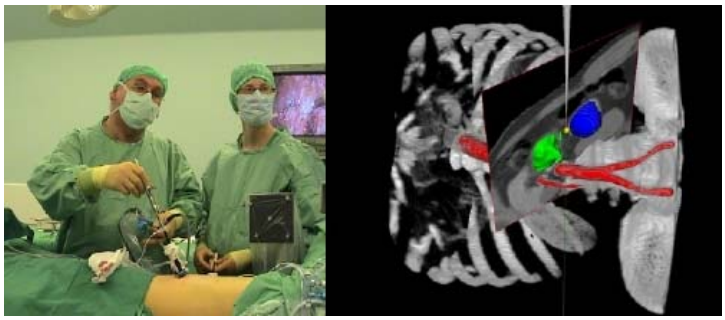
Two projects have been completed as collaboration between ORF and Sør-Trøndelag University College;

J. Fossen, K. Osland, C.G. Nordgård
”X-ray dose registration at the Operating Room of the Future”.

K Uv, B.G. Stjerne, H.G. Hansen
”Which factors contribute to an optimal collaboration between radiographers and operating nurses in an interventional laboratory/operating room”.

Other ongoing projects

AI Kvam, AK Wik, JG Skogås, JK Aasland
”Bacteriologic testing of mobile technical equipment used in an operating room”



Use of navigation during laparoscopic surgery

Studies / projects / international collaborators

- An excellent working relationship with our industrial collaborators has been established. The most important are SONY, Siemens, Olympus and Covidien. Agreements have been reached with Covidien and MediStim.

- ORF has a close collaboration with Sør-Trøndelag University College, the Medical Faculty, NTNU, National Centre for Advanced Laparoscopic Surgery, SINTEF and National Centre of Competence for 3D-ultrasound.

- Comparison of surgery (gastric bypass) with life-style modification in morbid obesity. This is a 5-year study being run by Centre for Morbid Obesity at St. Olavs Hospital. The patients included for surgical treatment are operated at ORF.

- ”The application of navigation for sacral nerve stimulation in patients with anal incontinence”. A pilot study was completed in 2007 and the main study started in 2008. Several patients have now been included and have completed their treatment.

- ”The effect of exercise before gastric bypass”. Tissue samples are retrieved pre- and intra-operatively to estimate whether the gene expression in tissue is changed in patients as a consequence of preoperative physical training. The intra-operative sample is taken in connection with the gastric bypass procedure, which is performed at ORF. This is a collaboration between NTNU and Centre for Morbid Obesity at St. Olavs Hospital, University Hospital of Trondheim

- University of Tübingen, Germany. Collaboration concerning development of an ergonomic grip for laparoscopic instruments.

- University Hospital, Barcelona. A collaborating effort evaluating the use of Olympus data technology in the operating room.

- EAES (European Association of Endoscopic Surgery): The Trondheim group has members in one of the NOTES-committees.

- University of Krakow. Intention on collaboration in an EU-project within the field of flexible endoscopy.

- Independent Public Medical Care Unit Military Hospital, Szczecin. EU-application in the field of teaching and training.

- Montsouris University Hospital, Paris. Study visit at Professor Brice Gayet's unit for laparoscopic liver surgery.

- Steinberg University, Berlin, Visiting Professor Marc Schurr in his animal laboratory in connection with the VECTOR project and work on OTSC-chips for closing gastric perforations in NOTES procedures.

- A collaborative effort has been established with Mesos Medical Centre, Utrecht, the Netherlands, in connection with navigation used in laparoscopy. A signed agreement has been reached for a multicenter study using the same protocol

- Electromagnetic positioning in the operating room. Work has been done to evaluate the potential and precision of electromagnetic position and direction measurements in real-time conditions in several types of operating rooms. A number of surgical instruments have been used to study the possible impact of these instruments. A paper describing the results on these measurements is under preparation. The main conclusion in that electromagnetic positioning is feasible. The work will continue with the intention of using this positioning device in both intravascular navigation and 3D-laparoscopic ultrasound.

- 3D ultrasound in laparoscopy. A solution based on micro-positioning and flexible ultrasound probe to be integrated in the navigation system CustusX, is being developed. The ultrasound application has so far been tested under laboratory conditions to evaluate the degree of precision. This work will be continued as laboratory experiments, primarily by comparing acquired ultrasound images with corresponding images acquired through the DynaCT scan. This project will be included in two master degrees and one PhD-thesis.

- High-definition video in laparoscopy. This is a comparative study aimed at evaluating the clinical significance of high-definition versus standard definition images. The images will be acquired from the same troacar-opening where both types of scopes will be pointing towards the same organ. The images will then be compared by an independent observer.

- Mapping of complications after operating table positioning of patients undergoing laparoscopic gastric bypass. The data collection has been done and the paper has been submitted for publication.

- Olympus has developed a prototype for new operating room light source replacing traditional light. This is collaboration between ORF and Olympus.

- Siemens, in collaboration with ORF, is developing a prototype for new operating light in vascular/endovascular therapy. An evaluation has been performed and the report is finished.
- Collaborative effort has been established between Sony Corporation, M Kano, V Liverød and JG Skogås, to investigate the application of holograms and 3D displays in the operating room.

- ”Micro-biological investigation of mobile equipment at operating departments”. This is a collaboration between St. Olavs Hospital, Department of hospital hygiene and ORF. The project has been financed through support from the local health trust. Measurement of the quality has been carried out in our new operating rooms at St. Olavs Hospital and compared to facilities in the old surgical operating department. All measurements have been finished and papers are under preparation.

- An ongoing collaboration with Technische Universität München concerning the pre- and intra-operative registration of CT-images. This is a part of the PhD-thesis of Frode Manstad-Hulaas. He is working together with Stefanie Demirci at CAMPAR (Chair for Computer Aided Medical Procedures & Augmented Reality), Fakultät für Informatik. Siemens Medical Solutions is also taking part in this project.

- Collaboration regarding electro-magnetic sensors in guide wires. This work is also part of Frode Manstad-Hulaas’ PhD work. The project is performed in collaboration with Lucian Gruionu, assistant professor at the Advanced Engineering Group, University of Craiova, Romania and Professor Kevin Cleary, The Imaging Science and Information Systems (ISIS) Centre, Georgetown University.

- Collaboration has been established with Massachusetts General Hospital (MGH) in Boston in the field of logistics. On of our PhD students has been visiting MGH and we are planning to continue this collaboration with Warren Sandberg, MD, Department of Anaesthesiology, MGH. He is now employed as professor II at Institute of Circulation and Medical Imaging.

- National Centre for Advanced Laparoscopic Surgery is through Ronald Mårvik represented as member in the Technology Committee EAES, which is responsible for a European Symposium every year. Through this work ORF is used as an arena to demonstrate new concepts as well as to establish procedures.

- The EU project VECTOR (Versatile Endoscopic Capsule for gastrointestinal Tumour recognition and therapy) is a large EU project with altogether 18 participants, including SINTEF and clinicians at St. Olavs Hospital through SMIT (Society for Medical Innovation and Technology). The project is focusing on the use of micro-technology for early detection and treatment of cancer in the gastro-intestinal tract. The project was initiated in September

2006 and will run out 2010. ORF will become an arena for testing prototypes within this project.

- Collaboration with Yonsei University Hospital, Seoul, S-Korea, regarding:
  - Medical teaching based on high-quality video.
  - The "intelligent" hospital by the application of a digital platform.
  - Health problems in the increasing number of elderly persons in the population.

  HD transmission by fibre-optic technology has been performed from ORF to Yonsei University Hospital.

- Project to investigate a model for systematic training of operating room personnel involved in the implantation of hip prosthesis ”Primary prosthesis for hip fractures”. The project is organised by Department of Orthopaedic Surgery, Lars Johnsen, MD, and Otto Schnell Husby, MD.

- Evaluation of algorithms used for image-to-image recording. This work was presented at the SMIT conference 2009. "Registration of intraoperative to postoperative CT volumes - validation of two algorithms".

- Evaluation of the feasibility of electro-magnetic navigation in bronchoscopy. Presented at SMIT 2009. "Feasibility of navigated bronchoscopy - an experimental animal model".

- Frode Manstad-Hulaas; Clinical investigation to explore optical and electro-magnetic navigation during complicated stent-graft procedures.

- Frode Manstad-Hulaas; Animal model to investigate the feasibility an accuracy of electro-magnetic navigation during complicated stent-grafting with side-branches for the renal arteries.

- Suhail A, Mårvik R, Kuhry E.
  Safe Access and closure in trans-gastric natural orifice endoscopic surgery (NOTES). Project period 2009-2014

- Kuhry E.
  Adhesion formation after laparoscopic and open surgery.
  Project period 2009-2014

- Kuhry E.
  Natural Orifice Transluminal Endoscopic Surgery (NOTES).
  Project period 2008-2011

- Mårvik R, Våpenstad C.
  Evaluation of the modules “Lifting and grasping” and “fine dissection” on VR simulator. Project period 2008-2009

- Mårvik R, Våpenstad C.

Predictive validity of the LapSim VR simulator. Project period 2008-2010

- Mårvik R, Våpenstad C.
  Analogue simulator with electro-magnetic tracking. Development of electro-magnetic tracking equipment. Project period 2008-2011

- Mårvik R, Nielsen M.
  Video conference network within laparoscopic surgery (Yonsey University Hospital, Korea). Project period 2008-2010

- Mårvik R.
  Ergonomic of laparoscopic instruments. Collaboration with University of Thübingen. Project period 2007-2009

- Mårvik R.
  Surgery for morbid obesity. Project period 2006-2011

- Yavuz Y.
  Hemodynamics and vascularisation issues during laparoscopic surgery
  Project period 2002-2009

CT scan showing stent-grafts in the aorta and the common iliac arteries

Publications

Vascular/endovascular therapy

Articles in international journals with peer review

Eide KR, Ødegård A, Myhre HO, Lydersen S, Hatlinghus S, Haraldseth O. Dyna-CT during EVAR – A comparison with multidetector CT. Eur J Vasc Endovasc Surg 2009; 37: 23-30

Altreuther M, Ødegård A, Aasgaard F, Lange CA, Myhre HO. Endovascular treatment of calcified plaque in the thoracic aorta after recurrent massive embolization. Int Angiol 2009; 28: 500-2

Seim AR, Fagerhaug T, Ryen SM, Curran P, Sæther OD, Myhre HO, Sandberg, WS. Causes of cancellations on day of surgery at two major university hospitals. Surg Innov 2009; 16: 173-80

Myhre HO, Winnerkvist A, Ødegård A, Stenseth R. Thoracoabdominal aortic aneurysm. Open surgery and endovascular therapy. Journal of the Norwegian Medical Association, Tidsskr Nor Laegeforen no 20, 22nd Oct. 2009, p 2127-2130

Myhre HO, Moen T, Ødegård A, Lange C, Nakken T, Egeland T, Torstensen K, Johnsen R. Possible association between human leukocyte antigen (HLA) and abdominal aortic aneurysm. The Surgeon 2009;1:26-27

Myhre HO, Jørgensen JJ. Vascular surgery in 2009. Leading article Journal of the Norwegian Medical Association, Tidsskr Nor Laegeforen no 20, 22nd Oct, 2009, p 2092

Presentations at international conferences

Myhre HO. CLINAM – 2nd European Conference for Clinical Nanomedicine. Panel-Debate “How to apply nanotechnologies in the clinic to solve medical problems?”, Basel, Switzerland, 27-29 April 2009

Myhre HO. The history of vascular surgery. ESVS, Oslo, Sept. 2009.

GA Tangen, F Manstad-Hulaas. Electromagnetic navigation accuracy using intraoperative CT image volumes in a vascular interventional OR setup. SMIT 2009, Sinaia, Romania, Oct 7-9.

F Manstad-Hulaas, S Demirci, M Pfister, S Lydersen, GA Tangen. Registration of intraoperative to postoperative CT volumes - validation of two algorithms. SMIT 2009, Sinaia, Romania, Oct 7-9.

Brattheim, Berit Johanne; Landmark, Andreas D. The EVAR follow-ups: position paper for the workshop in "Team meetings within the clinical domains", Interact 2009 12th IFIP TC13 Conference on Human-Computer Interaction; 2009-08-24 - 2009-08-28 Position paper (unpublished) + oral presentation

Brattheim, Berit Johanne; Landmark, Andreas D.; Toussaint, Pieter Jelle; Faxvaag, Arild.
Extending PACS by adapting messaging for clinical practice: a case study related to after-EVAR follow-ups. Poster session CARS, Berlin, June 23-27, 2009

Brattheim, Berit. Developing process support in an innovative clinical process crossing organizational boundaries: a case study related to EVAR treatment. 58th Nordic Radiological Congress & 19th Nordic Congress of Radiograph, Copenhagen, 2009, June 10-12
Abstract + oral presentation

Eide, KR. 58th Nordic Radiological Congress and 19th Nordic Congress of Radiography Copenhagen, June 10 – 12, 2009: DynaCT: Cross Sectional imaging during Endovascular Therapy.

Skogaas JG, Future Operating Room in Trondheim, St.Olavs Hospital, Norway. The modern AV-ICT and challenge of Visible Light in PACS,
May 2009, Marmaris University, Istanbul, Tyrkia.

Skogaas JG, Future Operating Room in Trondheim, St.Olavs Hospital, Norway. Are cold light sources really cold? June 2009: New York Medical Center, USA.

Skogaas JG, Future Operating Room in Trondheim, St.Olavs Hospital, Norway. "Medical Holography Project". June 2009: Sony, New York, USA

Presentations at national conferences

Brattheim, Berit Johanne. Coordination Challenges in Cross-institutional HealthCare processes. A case study of a novel vascular surgery treatment. The 2009 Norwegian PhD Candidate Seminar on Medical Technology; 2009-11-06 - 2009-11-06. NTNU

Eide, KR. 10-year anniversary of the Department of radiography, Sør-Trøndelag University College; Presentation of a PhD project: Testing of DynaCT during endovascular treatment of aortic aneurysm.

Myhre HO. Surgery today and tomorrow. Rotary, Oslo, 4th March 2009

Moen T, Myhre HO, Ødegård A, Lange C, Nakken T, Egeland T, Thorstensen, Johnsen R. Possible association between human leukocyte antigen (HLA) and abdominal aortic aneurysm. Winter meeting of Norwegian Society for Vascular Surgery, Skeikampen, 5th -8th March 2009 (The GORE-prize for best presentation)

Myhre HO. Presentation during visit by Stryker at ORF, 18th May, 2009.

Myhre HO. Operating room of the future, the activity during the period 2005-2009 – Seminar - Røros, 1st -2nd Oct. 2009

Myhre HO. Thoracoabdominal aortic aneurysm. Vascular Forum of Central-Norway. 27th Nov, 2009

Myhre HO. Injury of the axillary artery. Vascular Forum of Central-Norway. 27th Nov, 2009

Presentations at national courses and conferences

Skogås JG. Operating Room of the Future, St.Olavs Hospital.
Medical technology, course in hygienic and patient safety for technologists / scientists, January, 2009.

Skogås JG. Modern AV-ICT in medical technology at ORF, St.Olavs Hospital, Focus on safety and hospital management. February, 2009.

Skogås JG. The technology of the endoscope. Clinical application and high-energy technology. One-day course for operating room nurses. Sør-Trøndelag University College, St. Olavs Hospital, March, 2009.

Skogås JG. Future Operating Room in Trondheim, St.Olavs Hospital, Norway. Project and development. Ullevål University Hospital, Oslo, April, 2009.

Skogås JG. Future Operating Room in Trondheim, St.Olavs Hospital, Norway. Project and development, modern AV-ICT. Visit by neuro-surgeons. April, 2009.

Skogås JG. Future Operating Room in Trondheim, St.Olavs Hospital, Norway. Project and development, modern AV-ICT. Courses for gynaecologists, May, 2009.

Skogås JG. Future Operating Room in Trondheim, St.Olavs Hospital, Norway. Project and development, modern AV-ICT. NTNU, TEK-conference, December, 2009.

Abstracts

Moen T, Myhre HO, Ødegård A, Lange C, Nakken T, Egeland T, Thorstensen, Johnsen R. Possible association between human leukocyte antigen (HLA) and abdominal aortic aneurysm. Winter meeting, Norwegian Society for Vascular Surgery, Skeikampen, Gausdal, 5th -8th March, 2009.

Brattheim, Berit, Faxvaag, Arild, Seim, Andreas. Co-operation Support Through Transparency in the Clinical Case of EVAR intervention. 58th Nordic Radiological Congress & 19th Nordic Congress of Radiograph, Copenhagen, 2009 June 10-12. Abstract + oral presentation (unpublished)

Brattheim, Berit Johanne; Landmark, Andreas D.; Toussaint, Pieter Jelle; Faxvaag, Arild.
Extending PACS by adapting messaging for clinical practice: a case study related to after-EVAR follow-ups. International Journal of Computer Assisted Radiology and Surgery 2009; Volum 4. Suppl. 1 s. 305-306

Book chapters

Wesche J, Dahl T, Myhre HO. Acute axillary/subclavian vein thrombosis. In "Vascular Surgery. Cases, questions and commentaries, Second Edition". Geroulakos, Urk, Hopson, Eds. Springer Verlag, London Ltd.

Book review

Myhre HO. Book review. Bailey & Love's short practice of surgery, 25th edition. Norman S. Williams, Christopher J.K. Bulstrode, P. Ronan O'Connell (Eds.) Hodder Arnold, 2008, 1513 pp. Eur J Vasc Endovasc Surg 2009; 37: 372

Proceedings

Demirci S, Manstad-Hulaas F, Navab N. Quantification of Abdominal Aortic Deformation after EVAR. SPIE 2009, Conference Proceeding.

S. Demirci, F. Manstad-Hulaas, N. Navab. Extracting a Purely Non-Rigid Deformation Field of a Single Structure, Proceedings of "Bildverarbeitung für die Medizin" (BVM 2009), Heidelberg, Germany, March 2009

Laparoscopic surgery

Articles in international journals with peer review

Langø T, Leira HO, Tangen GA, Manstad-Hulaas F, Amundsen T. Electromagnetic Guided Bronchoscopy in a Live Animal Model: Feasibility and Accuracy in an OR Set-up. Submitted to IPCAI (1st International Conference on Information Processing in Computer-Assisted Interventions) 2010, 10 page paper will be published in LNCS (Lecture Notes in Computer Science) if accepted for congress. January, 2010.

Leira HO, Amundsen T, Tangen GA, Manstad-Hulaas F, Langø T. Development of a research platform for electromagnetic navigated bronchoscopy in a live animal model. Submitted to Minim Invasive Ther Allied Technol (MITAT), 2009.

Solberg OV et al. 3D ultrasound reconstruction techniques – A review. Submitted, 2009.

Muller S, Langø T, Brekken R, Ystgaard B. Degrees of bowel adhesion after repair of ventral incisional hernias: an ultrasonic method. Accepted for publication in JSLS, 2009.

Langø T, Nesbakken R, Færevik H, Holbø K, Reitan J, Yavuz Y, Mårvik R. Cooling vest for improving surgeons' thermal comfort: A multidisciplinary design project. Minim Invasive Ther Allied Technol (MITAT), 2009; 18:1:20-29.

Solberg OV, Langø T, Tangen GA, Mårvik R, Ystgaard B, Rethy A, Hernes TAN. Navigated ultrasound in laparoscopic surgery. Minim Invasive Ther Allied Technol (MITAT), 2009;18:1:36-53.

Kuhry E, Johnsen G, Mårvik R, Gaupset R. Surgery without scars. Tidsskr Nor Legeforen 2009; 129: 1234-5

Büchel D, Mårvik R, Hallabrin B, Matern U. Ergonomics of disposable handles for minimally invasive surgery. Surg Endosc 2009; Epub okt 29

Article in national scientific journal

Wik AK, Torvik R, Vinsnes AG, Hassel N, Johnsen G, Mårvik R.
Occurrence of neuralgic pain following laparoscopic gastric bypass. Research no. 4, 2009; 270-75

Presentations at international scientific conferences

Langø T. Image guided surgery and navigation system R&D in Trondheim at SINTEF and St. Olavs Hospital. Workshop at Technical University of Munich in ongoing collaboration. January 28, 2009.

Mårvik R. Egyptian Society of Surgeons, Kairo, 20.-21. januar;

“The future operating room at St. Olavs Hospital”

Mårvik R. Mexico City University, 23rd of March;
”The future OR at St. Olavs Hospital”
“Navigation in minimally invasive surgery”

Mårvik R. Nordic Society for gastroenterology. Stavanger, 9th of June;
”NOTES – where do we go from here?”

Mårvik R. Nordic Society for gastroenterology, Stavanger, 10th of June;
”The Operating Room of the Future, St. Olavs Hospital”

Mårvik R. EAES Technological Committee, 16th of June;
”The future OR for endoscopic surgery”

Mårvik R. The 17th EAES Congress in Prague, 18th of June;
“Antipacing technology for obesity surgery”
“Ergonomics of handles for minimally invasive surgery”

Mårvik R. Euro-Notes 24. – 26. September
Clossure of gastric perforation after NOTES with OTSC-clip and T-bar

Langø T, Bø LE, Johansen TF, Gjelsvik T. Ultrasound based localisation of wireless microrobotic endoscopic capsule for the GI tract. Oral presentation at the International annual conference of Society of Medical Innovation and Technology (SMIT). Sinaia, Romania, October 7-9, 2009.

Leira HO, Langø T, Tangen GA, Manstad-Hulaas F, Amundsen T. Feasibility of navigated bronchoscopy - an experimental animal model. Oral presentation at the International annual conference of Society of Medical Innovation and Technology (SMIT). Sinaia, Romania, October 7-9, 2009.

Hernes T, et al. Intraoperative Ultrasound. Oral presentation at the International annual conference of Society of Medical Innovation and Technology (SMIT). Sinaia, Romania, October 7-9, 2009.

Langø T, Ystgaard B, Müller S, Brekken R, Seternes A, Mårvik R. Degrees of bowel adhesions after repair of incisional hernias: an ultrasonic metod. Oral presentation at the International annual conference of Society of Medical Innovation and Technology (SMIT). Sinaia, Romania, October 7-9, 2009.

Langø T, Solberg OV, Tangen GA, Ystgaard B, Rethy A, Hernes TN, Mårvik R. Navigated ultrasound in laparoscopic surgery. Oral presentation at the International annual conference of
Society of Medical Innovation and Technology (SMIT). Sinaia, Romania, October 7-9, 2009.

Mårvik R. Lithuania Surgical Society, 25th of Nov., ”The future OR at St. Olavs Hospital”

Presentations at national scientific conferences

Langø T. Navigation and ultrasound imaging in laparoscopic surgery. Workshop for teachers of Physics in Norway. FOR, St Olavs Hospital, March 19th, 2009.

Langø T. Navigation and ultrasound in laparoscopic surgery – collaboration between SINTEF and St. Olavs Hospital. Presentation at seminar in biophysics, NTNU, 23rd of April 2009.

Våpenstad C. IT-Camp, NTNU, 10th and 24th of March, 2009. Presentation of NSALK, Operating Room of the Future etc.

Mårvik R. NTLF course in laparoscopic surgery, The National Hospital, 24th of September.
”Complications following anti-reflux surgery”
Instructor at hands-on course. Speaker and chairman during 5 courses in laparoscopy at NSALK/ORF, 23.-25. September.

Mårvik R. ”Efficiency and safety of trans-gastric closure in NOTES using OTSC system and T-bar: a randomised survival study in porcine model”, 26th of Sept.

Mårvik R. ORF-seminar, ”Endoscopic surgery in ORF”, Røros, 2nd of Oct.

Mårvik R. “Education in laparoscopic surgery at NSALK”
Compulsory course on surgery on animal models. 27th of Nov.

Mårvik R. Gastroenterologic Society of Central-Norway. ”NOTES in future surgery”, 27th -28th of Nov.

Mårvik R. Video conference from ORF:
”Academic Network for Research and Education”
Presentation “The future OR at St. Olavs Hospital”, to Napoli, Barcelona og Malaga.
Presentation “The future OR at St. Olavs Hospital” to South-Korea via Broadband Network.

Farup P, Blix I, Førre S, Johnsen G, Lange O, Johannessen R, Mårvik R
Why do some patients with gastroesophageal reflux disease have persisting symptoms? Nordic congress on gastroenterology, Stavanger

General ORF

Article in international journal

Strømmen M, Kulseng B, Vedus-Kjesås E, Johnsen H, Johnsen G, Mårvik R. Bariatric surgery of lifestyle intervention? An exploratory study of severely obese patients' motivation for two different treatments. Obesity Research & Clinical Practice (in press)

Presentations at international conferences

Brattheim, Berit. Inter-Institutional Care Process: Scenarios to Capture Demands for Workflow Support. The Medical Informatics Europe (MIE) Conference; 2009-08-30 - 2009-09-02.

Brattheim, Berit. Inter-Institutional Care Process: Scenarios to Capture Demands for Workflow Support. I: Medical Informatics in a United and Healthy Europe - Proceedings of MIE 2009. IOS Press 2009 ISBN 978-1-60750-044-5. s. - NTNU Studentpaper (Stud Health Technol Inform. 2009;150:414. PMID: 19745343 [PubMed - indexed for MEDLINE]

Bazilevs Y, Hsu MC, Zhang Y, Wang W, Liang X, Kvamsdal T, Brekken R, Isaksen J. Computational Vascular Fluid-Structure Interaction: Methodology and Application to Cerebral Aneurysms. 15th International Conference on Finite Elements in Flow Problems. Tokyo, Japan, April 1-3, 2009

Presentations at national/regional conferences

Brattheim, Berit. How new technology will change the referral pattern creating new challenges in the cooperation between hospitals. Presentation HelsIT - conference; 2009-09-23 - 2009-09-24

Brattheim, Berit. AAN: Aortic Aneurysm Network. Anniversary of the Department of Radiography, Sør-Trøndelag University College. 2009-09-08 - 2009-09-08.

Hansen R, Måsøy SE, Tangen TA, Deibele J, Angelsen BA. SURF update. **Invited lecture** at Annual meeting of the Norwegian Society for Ultrasound (NFUD), Oslo, April, 2009

Hansen R. Ultrasound contrast agents. **Invited lecture** at Annual meeting of the Norwegian Society for Ultrasound (NFUD), Oslo, April, 2009

Deibele J, Hansen R, Måsøy SE, Tangen TA, Johansen TF, Angelsen BA. How to build SURFing. Lecture at Annual meeting of the Norwegian Society for Ultrasound (NFUD), Oslo, April, 2009

Tangen TA, Hansen R, Måsøy SE, Angelsen BA. Ultrasound contrast imaging – SURF vs Pulse Inversion. Lecture at Annual meeting of the Norwegian Society for Ultrasound (NFUD), Oslo, April, 2009

Presentations with abstract

Brattheim, Berit Johanne; Karlsen, Ero Stig; Landmark, Andreas D.; Toussaint, Pieter Jelle.
Trans-organizational care processes: the need for a shared information space. Scandinavian Conference on Health Informatics; 2009-08-24 - 2009-08-26 ISBN 978-82-519-2443-6

Popular science and articles in magazines etc.

Myhre HO. The occurrence of vascular diseases is increasing. The day of Vascular Surgery, 27th of May, 2009. Tidsskrift Nor Legeforen nr 10, 2009; 129

Myhre HO. The need for vascular surgery is increasing. Adresseavisa, 28th of May, 2009. The day of Vascular Surgery, 27th of May, 2009, transmission of stent-graft procedure from ORF to NOVA cinema.

Visual media

Sintef.no – ”Ultrasound and image guided therapy”
http://www.sintef.no/Teknologi-og-samfunn/Medisinsk-teknologi/fagomrader/Bildestyrt-behandling/

”Scandinavian congress for gynaecologists” - Demonstration of laparoscopic surgery on endometriosis.Transmission of two live operations at St Olavs Hospital”

http://www.nce09.com/

“Operating Room of the Future in the new hospital”
http://www.stolav.no/templates/StandardMaster____97400.aspx

”Operating Room of the Future arranged national hands-on-course in endovascular therapy”
http://www.stolav.no/templates/StandardMaster____97401.aspx

”The day of Vascular Surgery 27th of May 2009. Arrangements at St.Olavs Hospital. Open day for the public, NOVA cinema”

Stolav.no: http://www.stolav.no/templates/StandardMaster____97647.aspx
NRK Trøndelag: http://www.nrk.no/nyheter/distrikt/nrk_trondelag/1.6620350

Dagsrevyen: http://www1.nrk.no/nett-tv/klipp/498085 (klipp kl.20.20)
Midt-Nytt: http://www1.nrk.no/nett-tv/klipp/497953
Den Norske legeforening: http://www.legeforeningen.no/id/154354

"Research network directly from St. Olavs Hospital to Barcelona, Napoli and Malaga"
Stolav.no: http://www.stolav.no/templates/StandardMaster____97941.aspx
Terena networking conference: http://tnc2009.terena.org/

Hospital Information Technology Europe:
http://www.hospitaliteurope.com/default.asp?title=HealthcareacrossEuropeaimstoimprove&page=article.display&article.id=17117

Sciencebuisiness.net:
http://bulletin.sciencebusiness.net/sb/login.php?page=/ebulletins/showissue.php3?page=/548/art/14103

Live surgery HD video transmission from Trondheim, Norway to Daejeon, South Korea. Standards-based Ventura solutions enabled the extremely high quality, low latency and error free IP transmission through 18 connected networks on its more than 20,000km route across the globe.
http://www.nevion.com/article.php?articleID=1539&categoryID=112
http://www.streamingmedia.com/press/view.asp?id=16033

"Digital technology used in hospitals: operation in full high-definition"
www.ntnu.no/eksternweb/multimedia/archive/00083/20091113_Digital_tek_83836a.pdf
http://www.nyteknikk.no/index.php?artikkelid=4190&back=1

Article in Tekniikka & Talous (Finish) 6th of Nov, 2009;
http://www.tekniikkatalous.fi/ict/article344546.ece

Finansavisen, 9th of Nov, 2009: "Storsatsing på St. Olav – Building Operating Rooms of the Future" – " HD of the heart".

http://www.stolav.no/templates/StandardMaster____98679.aspx?epslanguage=NO

Focus on ORF and minimally invasive surgery from the magazine "Dagens Næringsliv" the 12th of November 2009.
http://www.med-tek.no/images/Marketing/publikasjoner/artikler_og_media/Fornyelse_Helsesektoren_7.pdf

Stolav.no.18.09.2009: "The future into a new hospial"
http://www.stolav.no/templates/StandardMaster
98679.aspx?epslanguage=NO

Uninett - LIGHTPATHS
UNINYTT NR.4 - 2009: Key-hole surgery in HD, p18

http://forskningsnett.uninett.no/uninytt/2009-4/Uninytt_nr_4_09_LR.pdf

Uni-TV; Interview with R. Mårvik from ORF/NSALK

Honours and awards

Hans O. Myhre – The Heart Prize from ”Nasjonalforeningen” for cardiovascular research in Norway. The prize is given as recognition of important results in cardiovascular surgery in Norway. The prize was given on the 3rd of February, 2009.

Hans O. Myhre – Prize for the best presentation at the Annual Meeting of the Norwegian Society for Vascular Surgery - GORE-prize, 5th – 8th of March, 2009.

Economy/Results 2009

		NOK
ORF - costs		**Accumulated costs**
Salaries (5)		1 104 316,80
Travelling (71)		69 064,25
Consultant costs (67)		1 500,00
Courses, seminars, conferences (56)		45 171,62
Technical equipment		180 521,72
Instruments (4)		12 848,68
Other costs (incl.overhead)		0,00
Consumed 2009		**1 413 423,07**
Accumulated internal transferrals	271 610,54	

IB 2009	
Contribution 2009	1 500 000
Costs January-December	1 413 423,07
Positive balance at Dec 2009	**86 576,93**
Balance after internal transferrals	-185 033,61

Future plans / ORF in the new hospital

ORF has been up and running since 2005 and will continue within the new structure of the hospital, focusing on all departments involved in operative activity. The ORF will have an organisation similar to the present one, but the activity will be decentralised to clinical centres. Altogether 6 operating rooms will be involved and connected by a modern AV-ICT structure continuing the concept of the “interactive lecture room” making it possible to perform live transmissions and interactive communication in full high-definition quality. The main goal for working with the concept of ORF is to make a good platform for clinical research of high quality. At the same time we want to be a centre of competence for construction and for the administration of operating departments. A number of hospitals in Norway, as well as in other countries, are planning and building new operating departments. Operating rooms are expensive, both in construction and in running. One often has to change the facilities shortly after completion. We wish to continue working within this field to get more knowledge and to be able to optimise solutions for operating rooms as well as reducing costs. We also want to focus on architecture, use of materials, ergonomics, ICT-solutions, logistics and health economy to reduce construction costs and increase efficiency. A systematic approach is mandatory to develop sustainable knowledge on this matter.

ORF has a close collaboration with several other institutions. They represent the industry, clinical centres and technological research groups. Our main co-workers are St. Olavs Hospital, The Medical Faculty, NTNU and the research foundation SINTEF. Various centres of competence such as “The Centre of Competence for 3D-ultrasound“ and NSALK as well as Sør-Trøndelag University College, are important collaborators and will remain so in the future.

There is a great demand for a basis to do research on the level of master degrees. Thus, ORF has shown to be a good arena for this kind of research and we hope that this cooperation will continue in the future. ORF is also an excellent platform providing infrastructure for the established COSTT-project, which is investigating working relationships in a surgical department.

We wish to strengthen our international cooperation. There are a large number of international actors who wish to collaborate with ORF. So far we have focused on Massachusetts General Hospital, Boston, Operating Room of the Future in Tübingen and research groups at Krakow University in Poland. ORF has ties to EAES, SMIT and different patient registers. In 2008 collaboration was established with Yonsei University Health System, Seoul, Korea. Geriatric medicine, intelligent hospital and

transmission of high-quality medical information are some of the projects that have been initiated and will receive our attention during the next years.

The number of research candidates could have been increased if ORF had economy and better facilities to supervise more candidates. The PhD-candidates are financed through external funding. This has made it possible to maintain a good scientific activity in spite of a small annual budget. ORF has targeted 1-2 PhD-degrees and one master degree per year.

We wish to refine and expand indications for stent-graft treatment of aneurysms, dissections and traumas of the arterial system. This can be achieved by using stent-grafts with side-arms for the renal and mesenteric arteries. One project is to apply navigation to position such a device. We also want to treat ruptured aortic aneurysm to a greater extent by endovascular therapy. This project is performed in collaboration with Department of Anaesthesia and Department of Radiology. Developing DynaCT is a PhD-project, which is about to be finished. The new version of this equipment, ArtisZeego, Siemens, will give excellent possibilities for further research within this area.

We are invited to collaboration with Department of Biomechanics, NTNU, regarding mathematical modelling of blood flow. This is a tool with the potentials for application in planning of procedures to relieve obstruction of the arterial system. It could also be a method for evaluation of optimal treatment of patients with aneurysmal disease. As one of the founding institutions for the European Union for Nanomedicine, it is also natural that ORF starts working in the field of nanomedicine and genetic technology.

Within laparoscopic surgery the use of navigation during various procedures is still an important research topic. One important goal is to increase the safety of these procedures. New techniques for treating morbid obesity are being developed. An interesting principle is to apply a pacemaker to stimulate the vagus nerve in these patients. This work is organised through an international multicenter study.

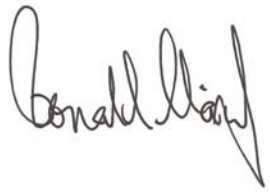
There are several possibilities regarding application on navigation within medicine. Within pulmonary medicine we want to use navigation in connection with endoscopy and endo-bronchial procedures. One project is using this technology for the treatment of anal incontinence. Furthermore, navigation technology is used in orthopaedic surgery during operation in the knee joint and in the vertebrae.

During 2009 ORF has developed, established and implemented a teaching system for all doctors at the operating clinics within the use of electro-surgical equipment. A certification programme has been developed for electro-surgery and fluoroscopy, where both X-ray protection and hygiene has been included. Through the Health Academy at the Regional Health Trust, collaboration has been established in order to expand this arrangement to all hospitals within central Norway.

Jan Gunnar Skogås
Managing Director, ORF

Hans Olav Myhre
Scientific Adviser, ORF

Torbjørn Dahl
Responsible Endovascular Therapy
Surgery



Ronald Mårvik
Responsible Laparoscopic

Collaborators from medical companies

Research collaborators

www.stolav.no/for