

## Technology changes medicine

### *Imaging*

- Fluoroscopic guidance
- Ultrasound
- Videosocpic surgery

### **Computerisation**

- Automated procedures
- Robots

#### **Communication**

- Digital information
- Telemedicin
- Patient information

#### **Miniturization**

- Imaging fMRI, Pet, Optical
- Microtechnology
- Nanotechnology

#### Biomolecular science

- Cell engineering
- Gene sequencing

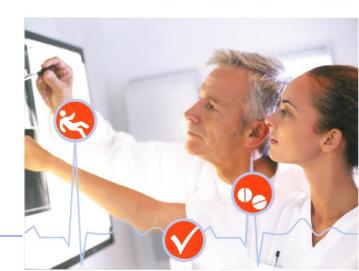
# Challenges in technology dependent medicine

- Introduction and quality control of new methods
- Documentation- HTA
- Clinical trials- Collaboration with industry
- Organization of expensive, advanced ORs i hospital



Meld. St. 10 (2012–2013) Melding til Stortinget

God kvalitet – trygge tjenester Kvalitet og pasientsikkerhet i helse- og omsorgstjenesten



## The Intervention Centre - Tasks

#### Marker#5

- Develop new procedures and methods
- Develop new treatment strategies
- Compare new and established treatment strategies
- Study social, economic and organizational cosequences on new methods
- Provide Image physics services to the South East Health Region (since 2010)





## The Intervention centre

A common toolbox for all clinical specialities
An exclusive organization
Not part of the surgical block
Not part of Radiology

A dedicated staff of 45 fully employed persons 60% non medical: engineers, physicists

Approved both as animal experimental lab and OR for human use



## **Deliveries 1996-2011**

#### New clinical methods

- > 10000 patients
- > 600 animal experiments

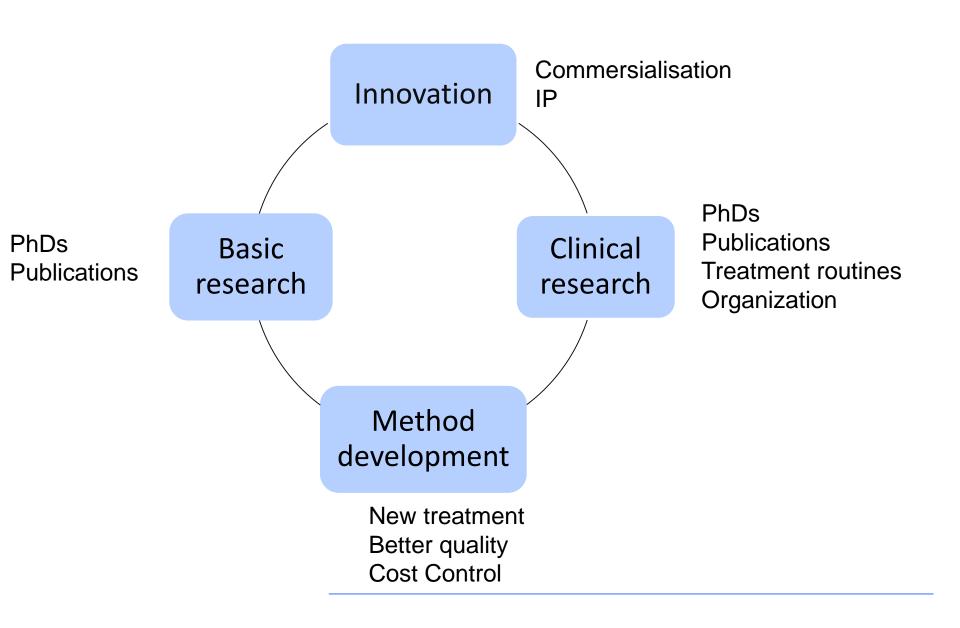
#### Research

25 PhDs, > 500 scientifc papers

### Intellectual property

20 patents, 6 companies for medical technology: Healthy pointers, Alertis, Osteomycure, SimSurgery, Cardiaccs, LightOR

## R&D value chain



# Outcome studies necessary for evaluating new techniques and technologies

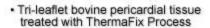
- Clinical
  - Mortality
  - Morbidity
  - Durability
- Patient experience
  - Quantitative
    - Quality of life
    - Pain
  - Qualitative
    - Semistructured/Structured interviews
- Economical
  - Cost utility studies
    - Cost/Qaly



# Percutaneous valve replacement 2008

#### Edwards Sapien THV







 Balloon expandable stainless steel stent for sutureless implantation

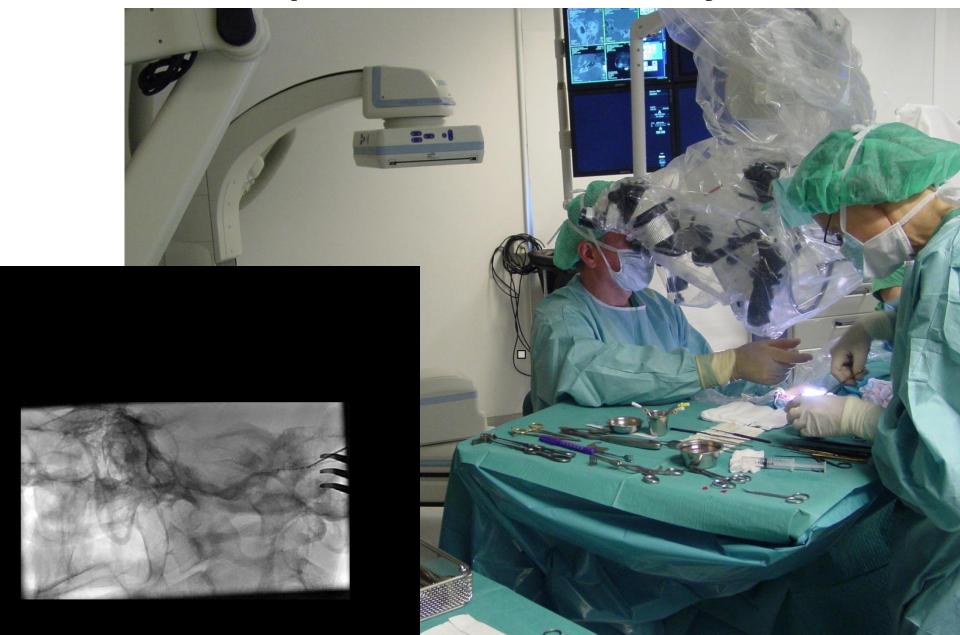


Medtronic pulmonary valve



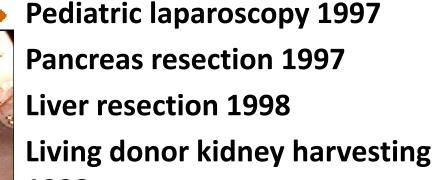


# Cochlear implantation in the hybrid suite



## Introduction of videoscopic guided surgery at IVC

- Fundoplicatio redo 1996
- Adrenalectomy 1996
- Colon resection 1996

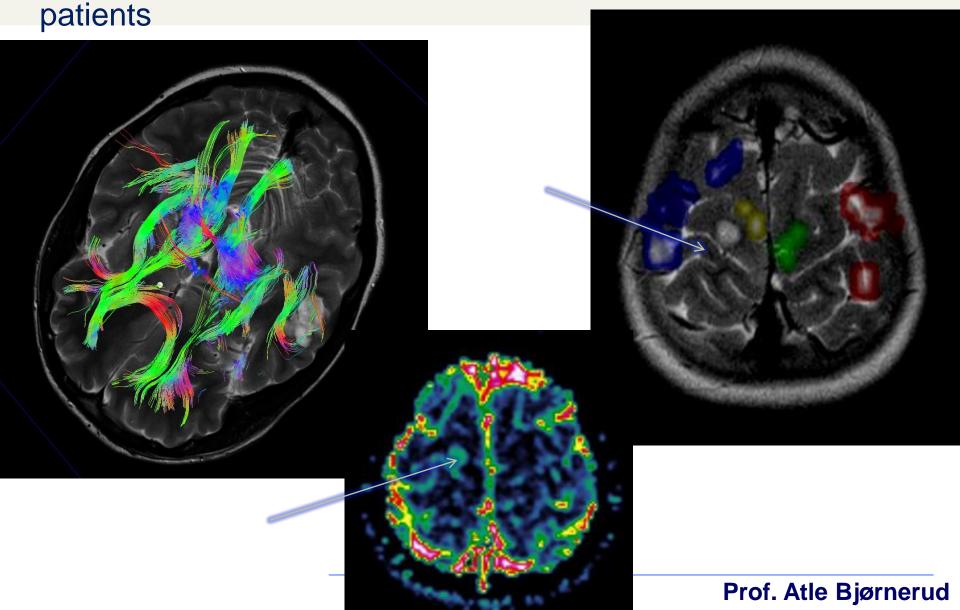


Total prostatectomy 1999
Whipple 2007
Robotic cardiac surgery 2001
Endobronchial ultasound 2008



#### **Preoperative planning**

Combination of fMRI, DTI and PWI significantly improves the clinical value of MRI in the management of brain tumour



# "Everybody" needs a Robot

Cardiac surgery:

Minimal invasive coronay surgery

Valve surgery





### **Urology:**

Prostatectomy

### Gynaecology:

Tube reconstruction

MEDISINSK TEKNIKK

## daVinci-robot på plass i Orkdal

En lang sommer med mye arbeid ble nylig avløst av den første operasjonen med daVinci-roboten på Orkdal sjukehus. Gleden lå godt synlig i korridorene.

AV FRODE NIKOLAISEN, ST. OLAVS HOSPITAL

- Jeg er veldig glad for at ting endelig har kommet i gang. Det har vært veldig mye jobb siden det ble bestemt at det skulle satses på robotkirurgi hos oss, så dette er bra, sier seksjonsleder Oddrun Krogstad ved operasjonsavdelingen på Orkdal sjukehus.
- Såpass mye spenning har det vært at jeg drømte om daVinci i natt!

#### Mange og brede smil

På pauserommet ved Operasjonsavdelingen går praten løst om tidenes første operasjon med daVinci-roboten på Orkdal sjukehus. Roboten kom på plass etter at Orkdal sanitetsforening la nesten 25 millioner på bordet til innkjøp, med blant annet et klart forbehold om at roboten skulle ha tilhold ved Orkdal sjukehus og at den ikke flyttes til Trondheim.



# Robot donation to influences hospital management

Will donate a «cancer machine» to I Arendal

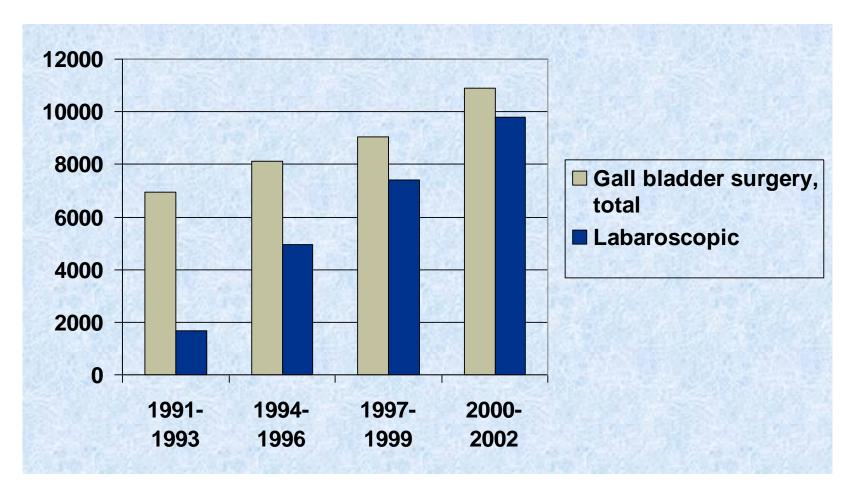
The company O.G Ottersland will donate 25 million NOKs for a "Da Vinci-robot" to the department of Surgery at «Sørlandet sykehus» in Arendal on the

condition that it is placed at the Arendal hospital

The management at Sørlandet sykehus has decided that all prostatic cancer shall be treated at the Hospital in i Kristiansand.

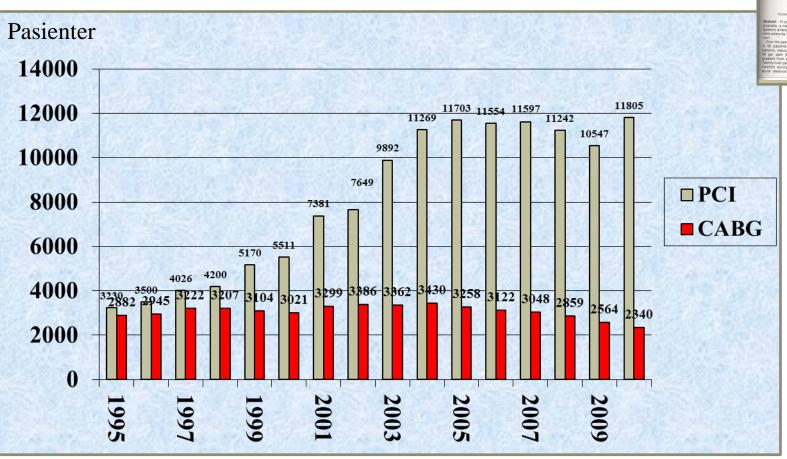
A lot of criticism of this decision has been raized and now the company O.G. Ottersland joins the fight to reverse the decision.

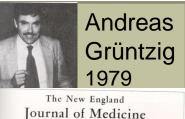
# Gall bladder Surgery in Norway



Bakken IJ, Skjeldestad FE, Mjåland O, Johnson E: Kolecystectomi I Norge 1990-2002. Tidsskr Nor Lægeforen 2004; 124: 2376-8

# Treatment of coronary stenosis In Norway





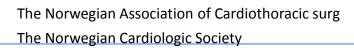
4Copyright, 1979, by the Massachusetts Medical Society

NONOPERATIVE DILATATION OF CORONARY-ARTERY STENOSIS

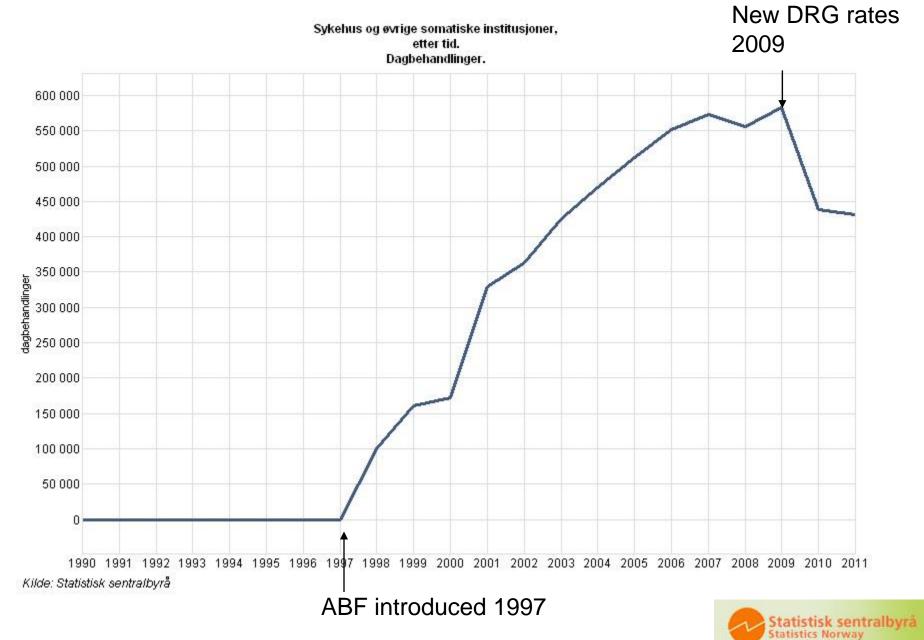
ANDREAS R. GRÜNTZIG, M.D., ÄKE SENNING, M.D., AND WALTER E. SIEGENTHALER, M.E.
act in percutaneous transluminal coronary and by bynass, was later processes; in five

y, a catheter system is introduced through a a ratery under local anesthesia for dilate a stepry by controlled inflation of a distensible balmost sittable to the past 18 months, we have used this technic statents. The technic was successful in 32 more states the presence of a sutainties.

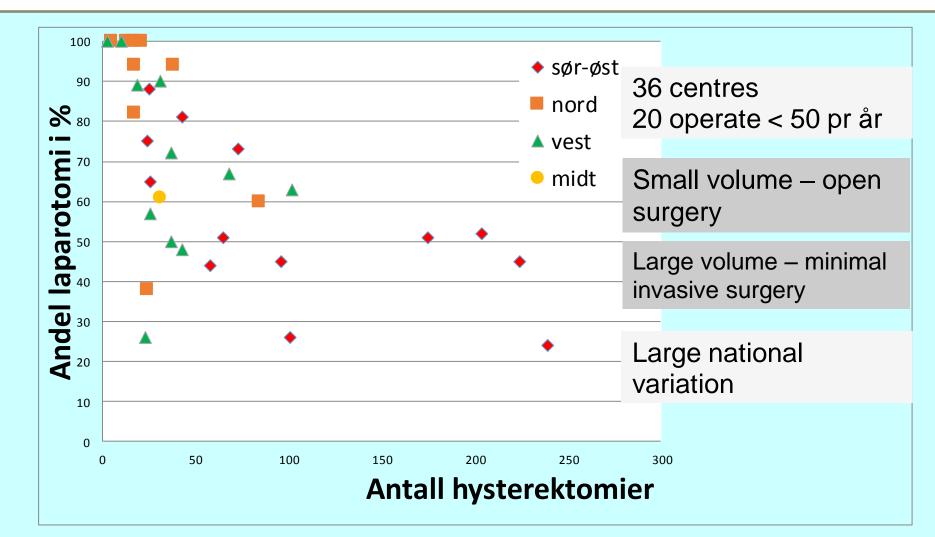
nonth, see have used the faching the form of the procedure, and a short his form of the fo







# Open vs Minimal Invasive Surgery for Uterine Fibromas 2009



Kilde: JM Goderstad et al, OUS, Ullevål sykehus

# Change in Roles

- Cardiologists become cardiac surgeons
- Radiologists perform more complicated procedures
- Surgeons become computerized

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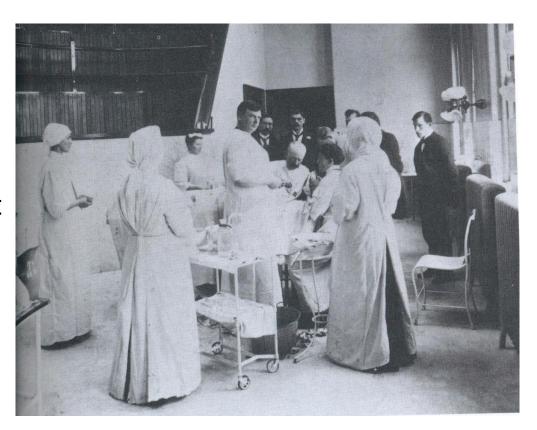
 Engineers, mathematicians and physicists enter the hospitals

Need for a change in organization?

a Downa offer from the

# The technology based medicine demands new solutions

- New competence and training
- Increased specialization
- Complex organization
- Profesionalized R&D and introduction of methods
- Utilization of technology
- More focus on treatment
- Less focus on care
- Sentralization and specialisation of hospitals
- Surgery and Internal Medicine converge



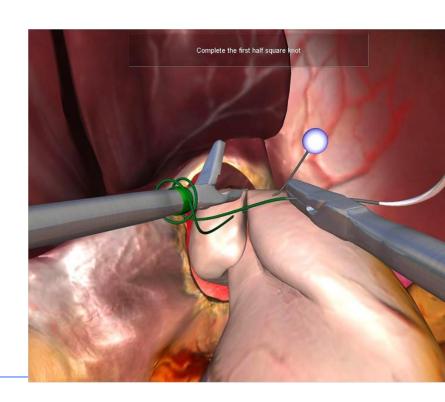
OR at St Lukes hospital, St. Paul, Minnesota 1890

## Technology development has led to:

- Advanced treatment can be offered during short hospital stays – more patients are treated
- New treatment options are known to the patients
- Medical professionals can adapt new methods
- New and updated technology is required

#### Consequence:

- Pressure on economy and organization
- Capital costs more important for the hospital economy



# Consequences

The responsibility for care and follow-up is moved from the hospital to the general practitioners

Patients in hospital are more severely ill now than earlier. Patients that are discharged are also more severely ill

The collaboration between primary heath care and hospitals has become the most important challenge in modern health care

# **Cultural challenges**

## In industry:

•When new technology is introduced, the production is reorganized to fit the technology

## In hospital:

•When new technology is introduced it has to fit the excisting structure.

## Handicraft culture vs. Industrial culture

Handicraft

Industry

**Ownership** 

**Product development** 

**Knowledge transfer** 

Collaboration

**Decision** 

**Value** 

Treatment

Individual

**Integrated** 

Personal

Interdisciplinary

**Individual** 

**Procedure** 

**Tailor-made** 

Company

Separated

**Explicit** 

**Cross disciplinary** 

**Evidence based** 

Product

**Standardized** 

