Precision medicine
The BigMed Challenge
Erik Fosse
The Intervention Centre
OUS
Dagens praksis

Patients

Treatment

Results

Presisjonsmedisin

Patients

Analysis

Treatment

Results
Information overflow - The new clinical dilemma

Modern technology can provide large amounts of detailed, individualised information on each patient and their disease

• Genomics
• Radiomics
• Proteomics
• Sensor information
• Patients records

How can clinicians utilize this information for tailor made treatment?
Decision processes in the patient pathway
Decision requires many specialists in the same meeting

Decision on pathway

Referral  
Consultation

Meeting to decide pathway

Preop anaesthesia evaluation Fit for surgery?

Surgery  
Palliative intervention  
Drug/Radiation  
Decision

Postop med  
Postop med

Examinations
Blood samples  
X-ray  
CT  
MRI  
ECG  
Ultrasound  
Clinical examination  
Functional examination  
Tissue samples/biopsia  
PET  
Histology  
Gene sequencing  
Staging

Examinations
Pharmacogenetics  
tumor genomics  
Tissue samples  
MR  
CT  
Ultralyd  
other

The Intervention Centre
Artificial intelligence: Any device that perceives its environment and takes actions that maximize its chance of success at some goal

- Robots
- Machine learning
- Image interpretation
- Text analysis

Fig.: Teknologirådet
Machine learning requirements

• Reliable data
• High performance computing
• Algorithms
• Statistics
Efforts to provide health data for machine learning and science

• National
  • National variant data base
  • National health analysis platform

• Hospital
  • Clinical data warehouse
  • Quality registries
  • Informed concent studies
The economical challenge – how can we estimate the value of individualised treatment?

Value based health care:

\[
\text{Value} = \frac{\text{Health outcomes that matter to patients}}{\text{Costs of delivering the outcomes}}
\]

Michael Porter 2015
Creating a Value-Based Health Care Delivery System
The Strategic Agenda

1. Organize Care into Integrated Practice Units (IPUs) around Patient Medical Conditions
   - For primary and preventive care, organize to serve distinct patient segments

2. Measure Outcomes and Costs for Every Patient

3. Move to Bundled Payments for Care Cycles

4. Integrate Care Delivery Systems

5. Expand Geographic Reach

6. Build an Enabling Information Technology Platform

Michael Porter 2015
Artificial intelligence supports individualized medicine

- Analysis of radiology data
- Analysis of pathology data
- Analysis of genetic data
- Analysis of patient record text
- Analysis of sensor data
- Analysis of patient reported data
- Analysis of patient value
Individualized treatment - legal challenges

• Data availability for teaching the computer
• Sensitive data for training
• Conflicting laws
• Fast technologic development - does legislation comply?
The digital revolution – from horse to car
Initially they tried to make the car behave like a horse.
The digital revolution – from horse to car

Changed infrastructure:
- Roads
- Gaz stations
- Increased mobility, transportation

New legislation:
- Road Traffic Act: Speed limits, blood alcohol limits etc.

New police force:
- Traffic police
Backup