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Advancement of the Medical & Health Care

Banchong Mahaisavariya, MD
Professor of Orthopaedics
Faculty of Medicine Siriraj Hospital
President; Mahidol University

20st Century: Progress of Health Care

vaccines

radiology

antibiotics

surgery

devices

Prevention → Diagnosis → Treatment → Post Treatment

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Fetus → Neonatal → Child → Adult → Elderly

Bio Intelligence Age

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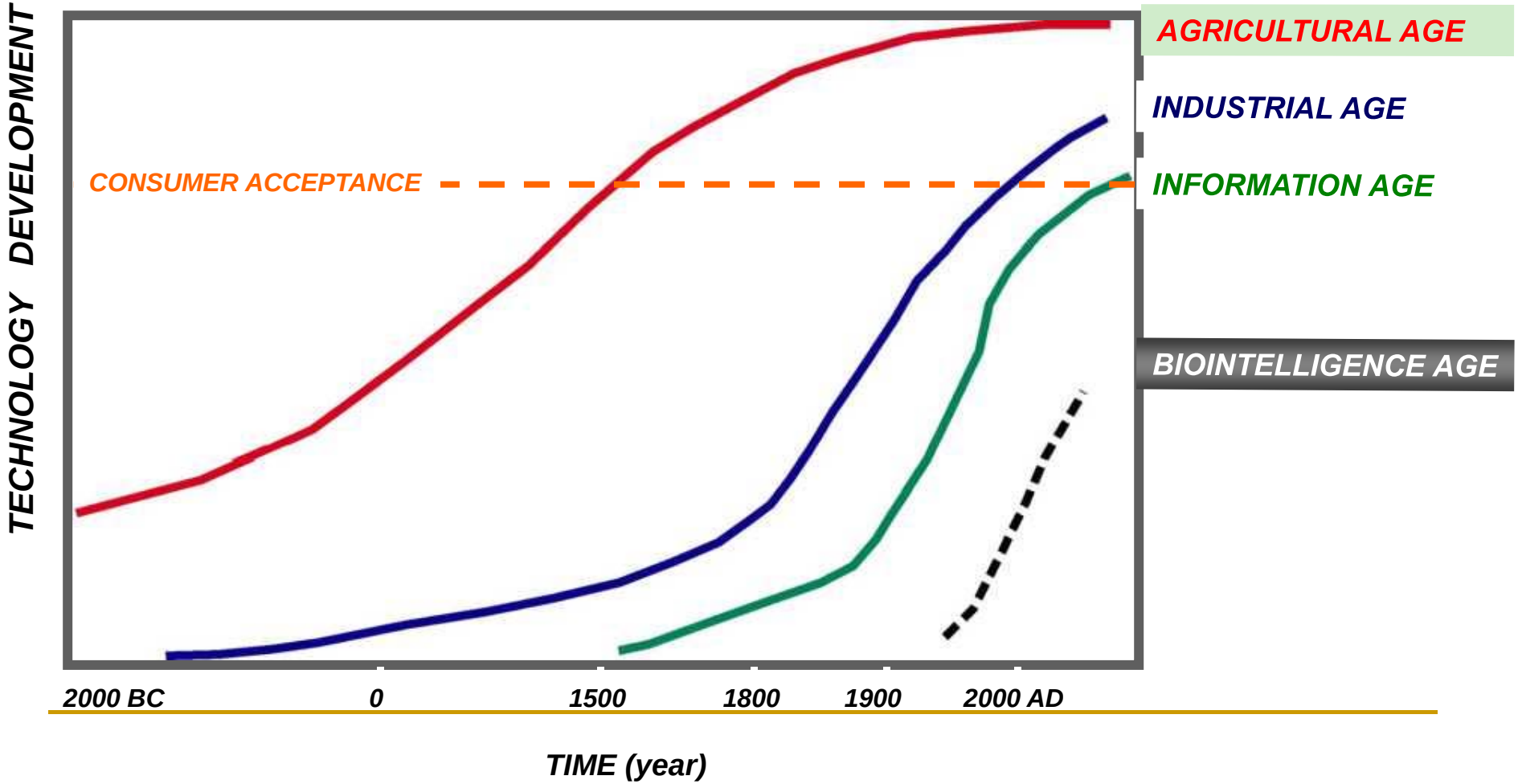

Bio Intelligence Age

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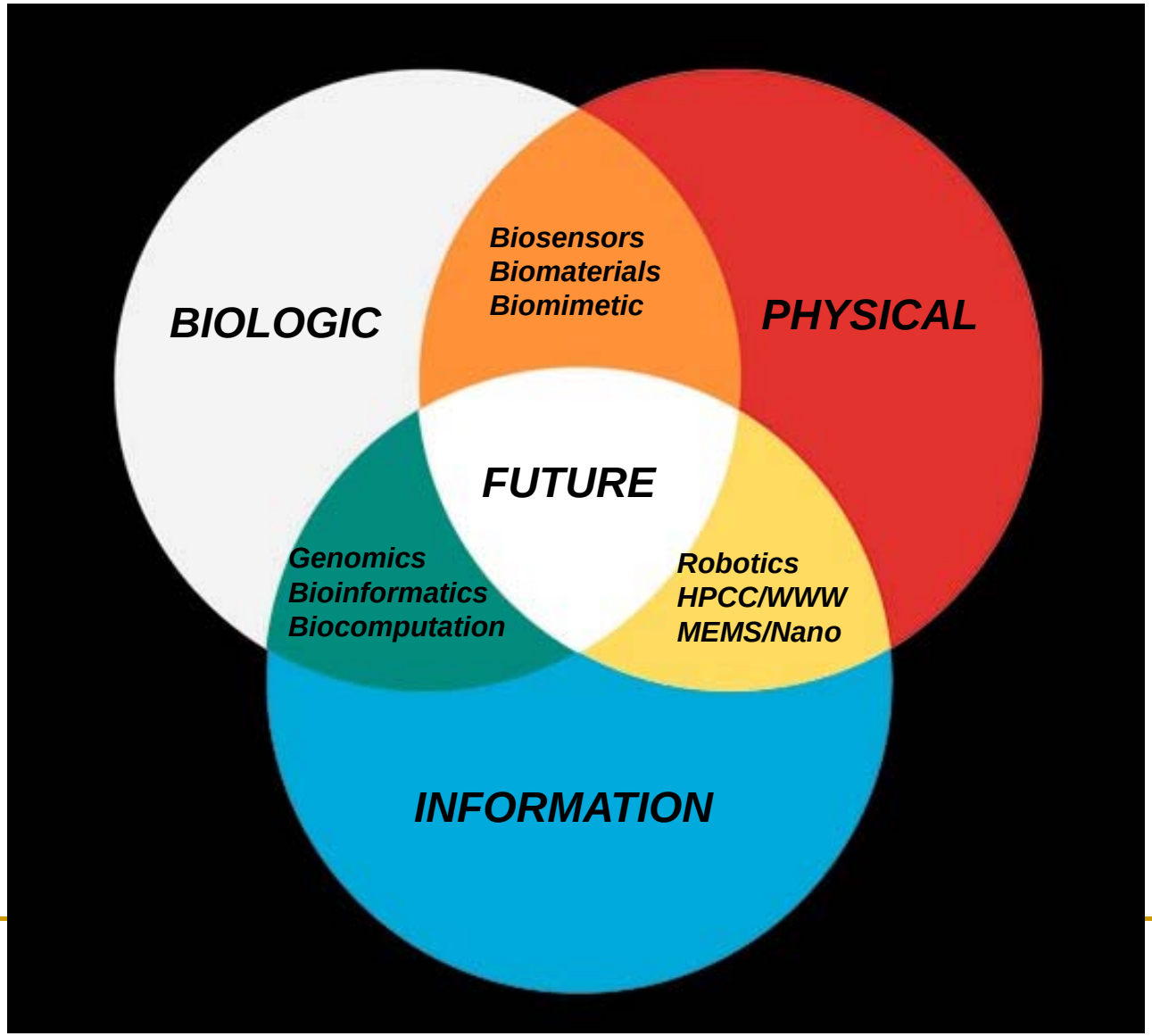
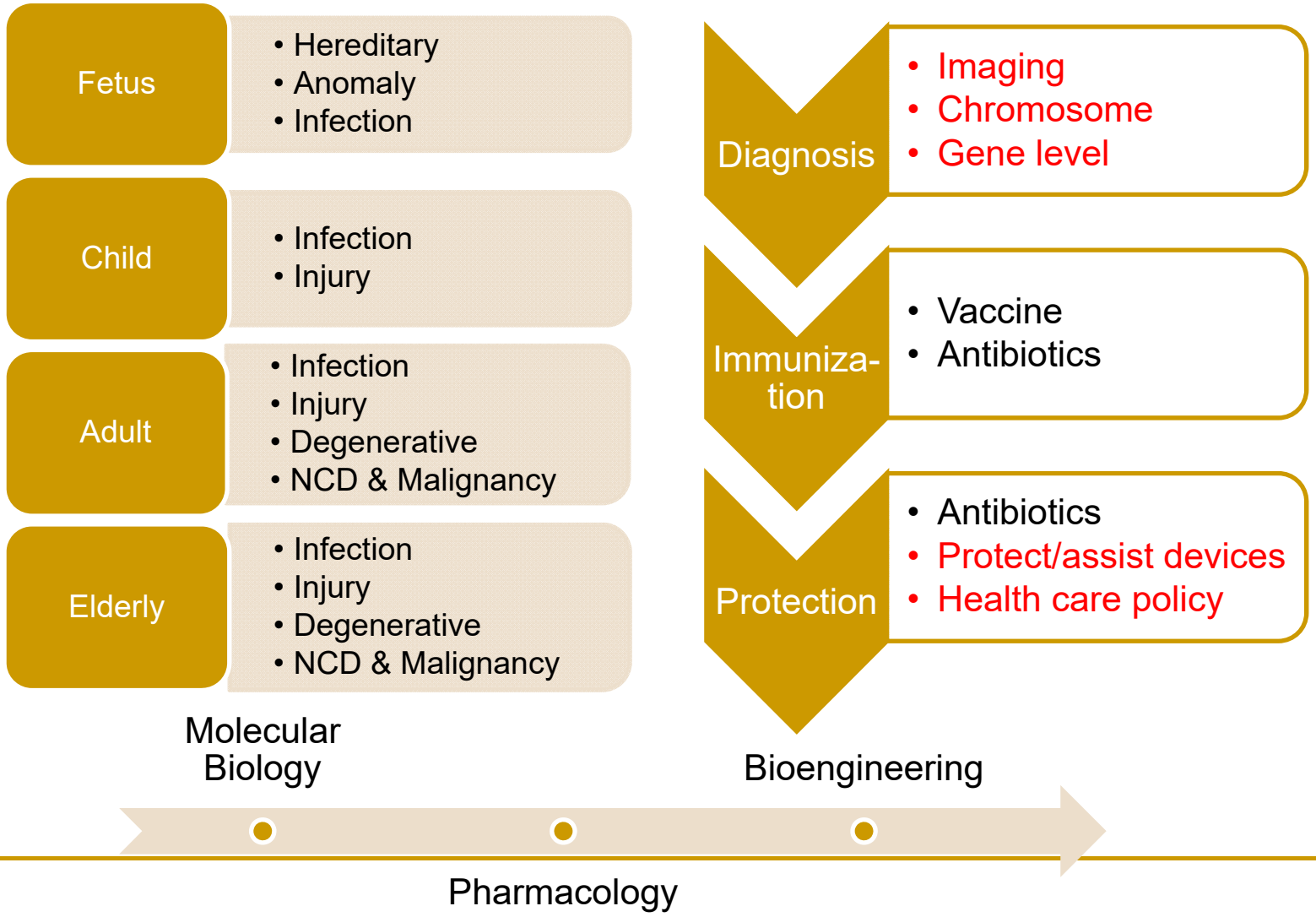


Prevention


Fetus
• Hereditary
• Anomaly
• Infection
Child
• Infection
• Injury
Adult
• Infection
• Injury
• Degenerative
• NCD & Malignancy
Elderly
• Infection
• Injury
• Degenerative
• NCD & Malignancy
Molecular Biology
Diagnosis
• Imaging
• Chromosome
• Gene level
Immuniza-tion
• Vaccine
• Antibiotics
Protection
• Antibiotics
• Protect/assist devices
• Health care policy
Bioengineering
Pharmacology

Diagnosis

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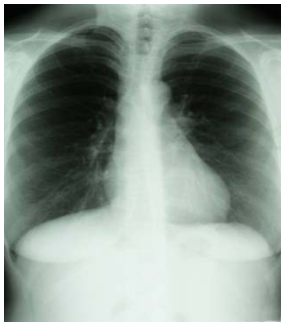
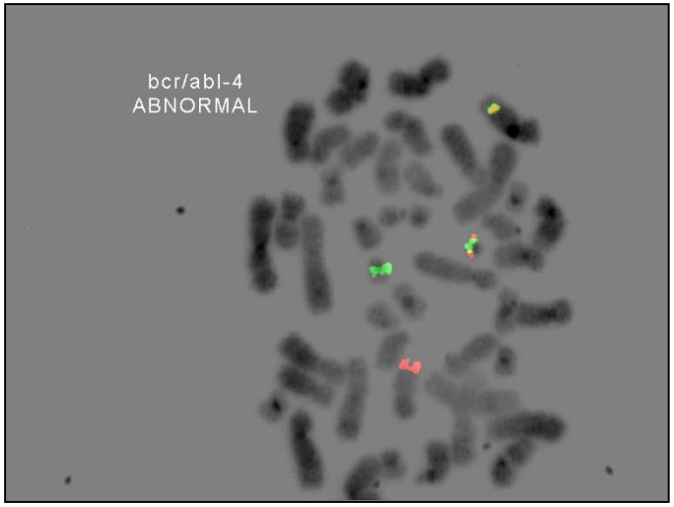
Macro	• Physical exam • Imaging
Micro	• Chemistry • Histopathology
Molecular	• Markers • Gene study
Other	• Electronic • Wave





Diagnosis

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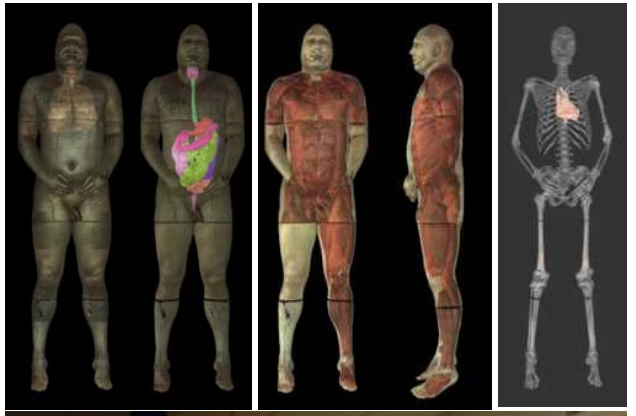
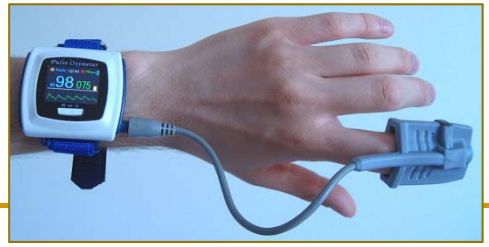
Physical	• Gross structure • Endoscopic • Imaging: X-ray, U/S
Chemical	• Lab profile • Tumor markers
Electrical/ Magnetic	• EKG,EMG,EEG • MRI
Gene	• Gene study





Treatment: Non Surgical

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Chemical	• Gas/fluid • Drugs
Wave	• Radiotherapy • Pace makers • Ultrasonic
Physical	• Rehabilitation • Assistive devices
Gene	• Gene Therapy

Surgical Treatment

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Logistic	• Transfer • Mobile OR
Training	• Virtual • Navigation
Setting	• Micro/Endoscopic • Robot/Tele-surgery
Devices	• Implants • Artificial devices

Advanced Technologies

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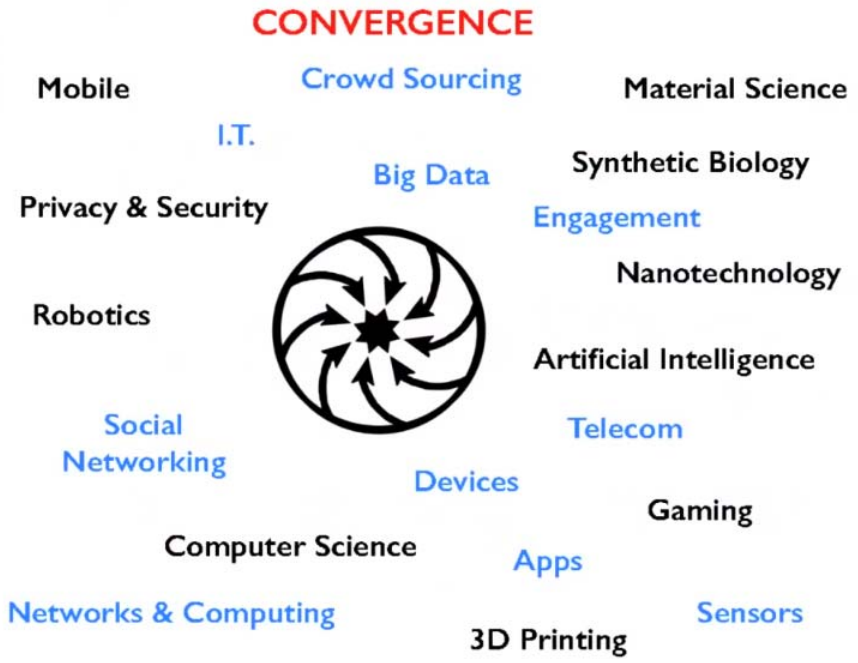

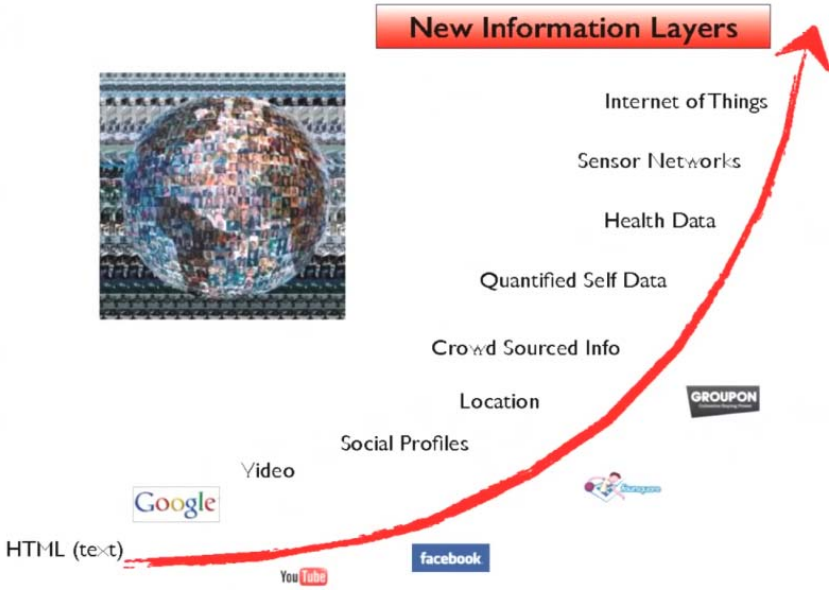

Advanced Technologies

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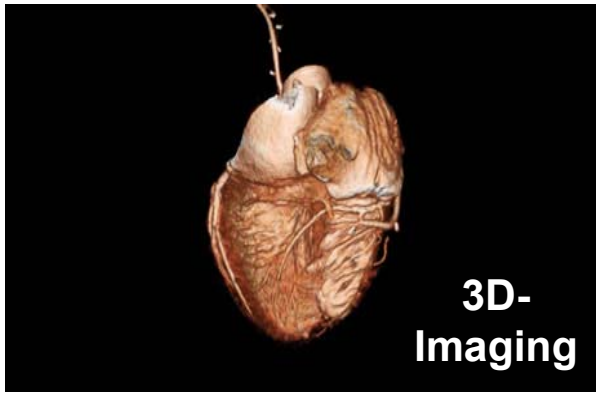

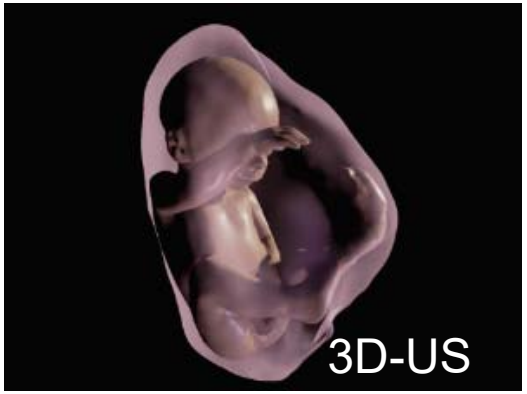

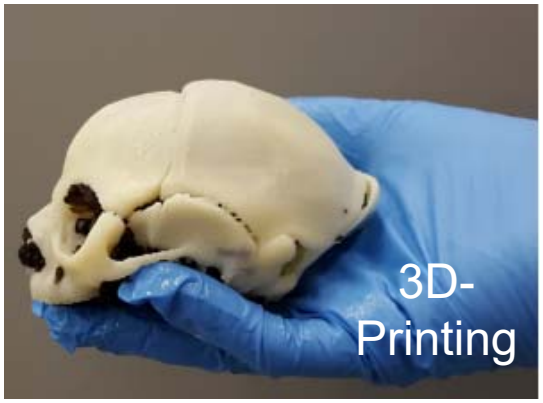

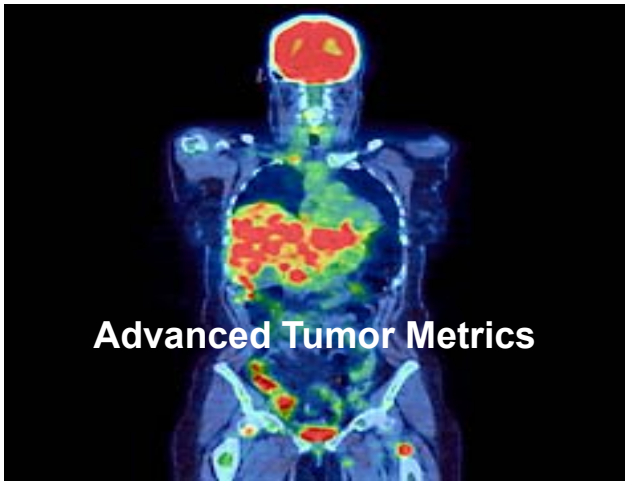

Trend in Health Care

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'Sick' Care' versus 'Health' Care

Next Steps in Healthcare
Volume Based ---> Value Based

Payment	Fee-for-Service	Outcome Based
Incentives	Volume	Value
Focus	Acute Episodes	Populations
Role of Provider	Single Episode	Care Continuum
Information	Retrospective	Predictive

Tele-Health: Overview

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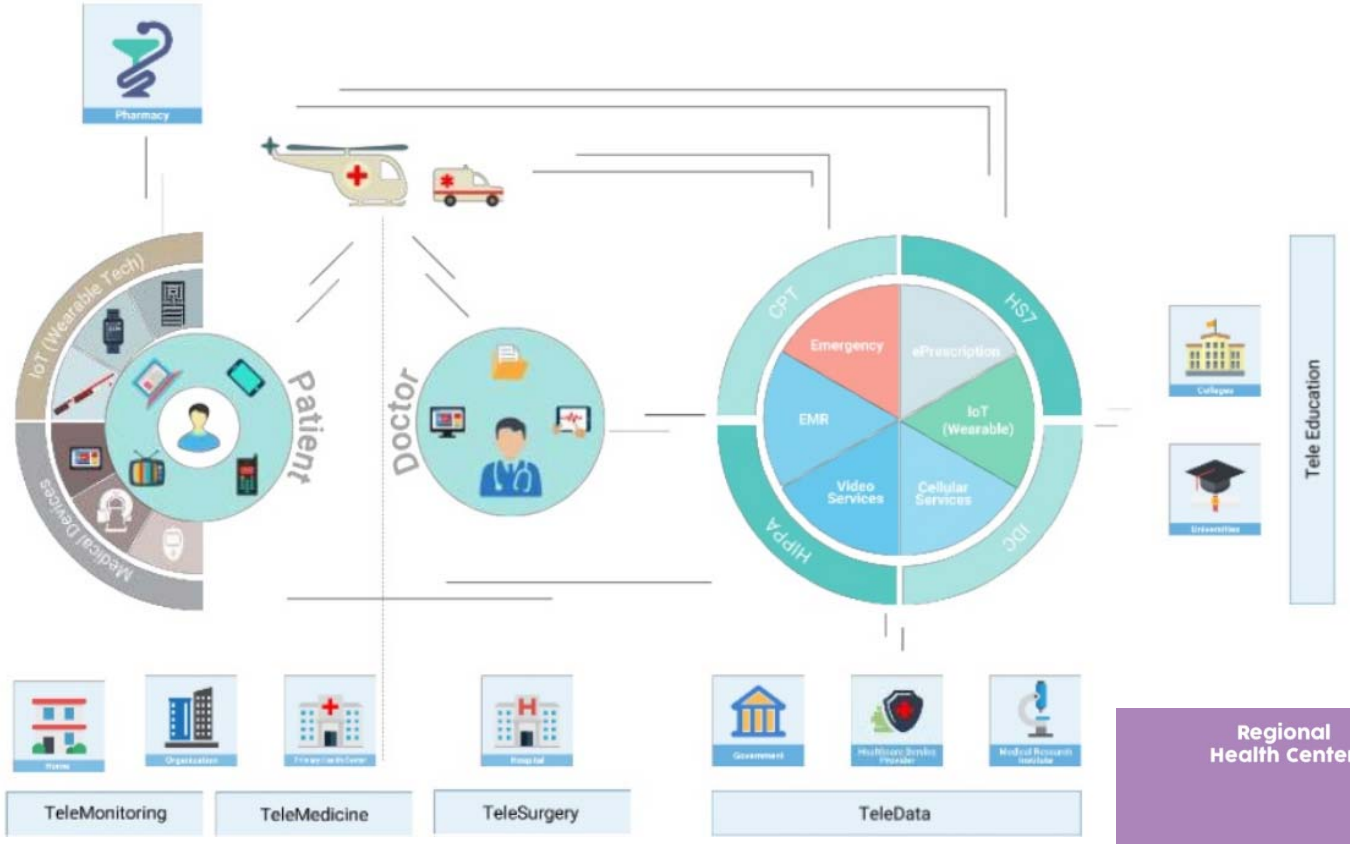
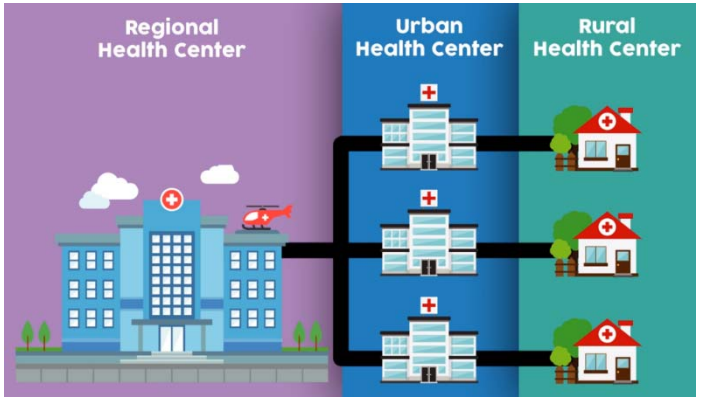


Digital Technology, Data Mx
& Connectivity are keys



Telemedicine & Applications

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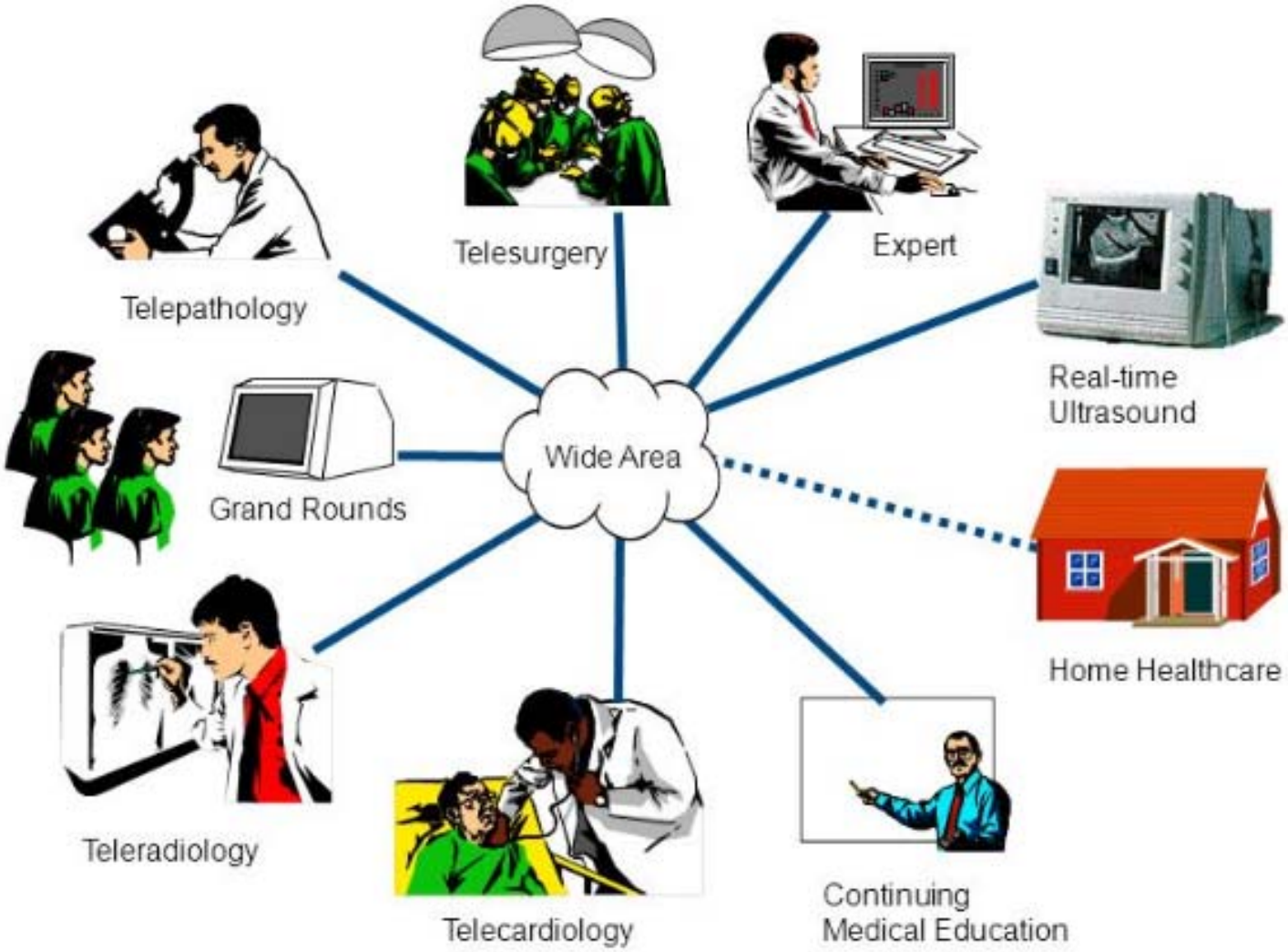
Digital Technology, Data Mx & Connectivity are keys

Telemedicine Overview



Solutions Available Today

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Teleradiology SPECIALISTS

CardioRad

TELE-

- Radiology
- Cardiology
- Neurology
- Ophthalmology
- Psychiatry
- Dermatology

SPECIALISTS ON CALL™
The Leader in Clinical Telemedicine

HubbleTelemedical
Real-Time Retinal Analysis

DermatologistOnCall®
Point. Shoot. Treat.

Telehealth +/- Robotic System

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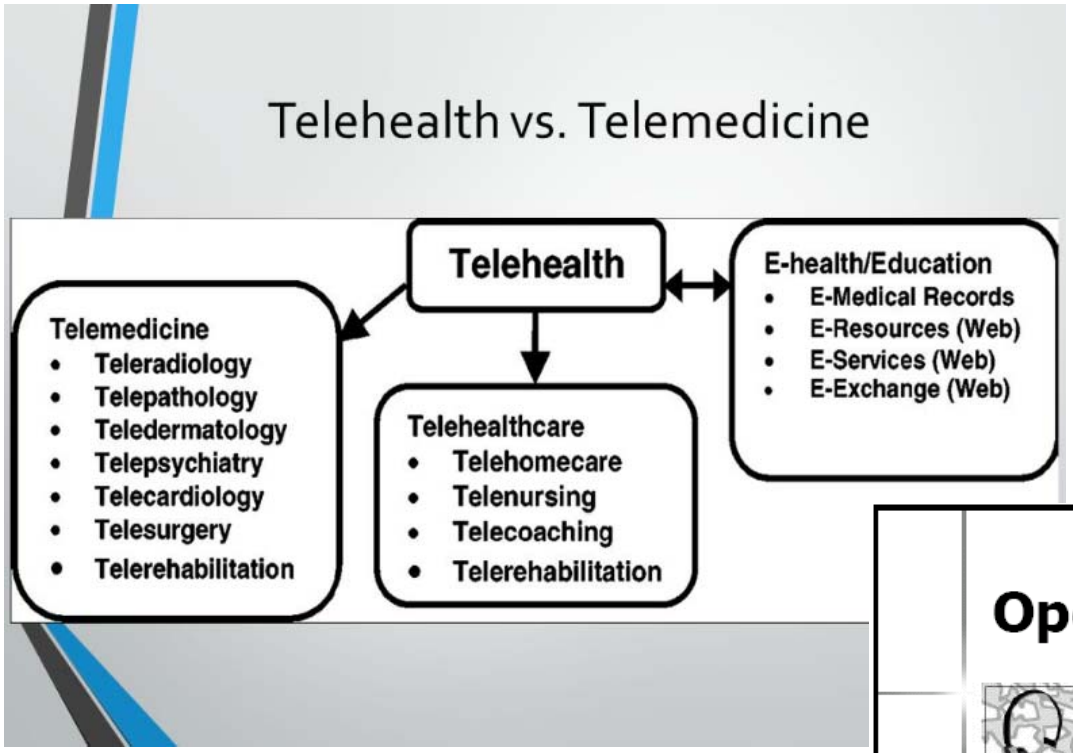
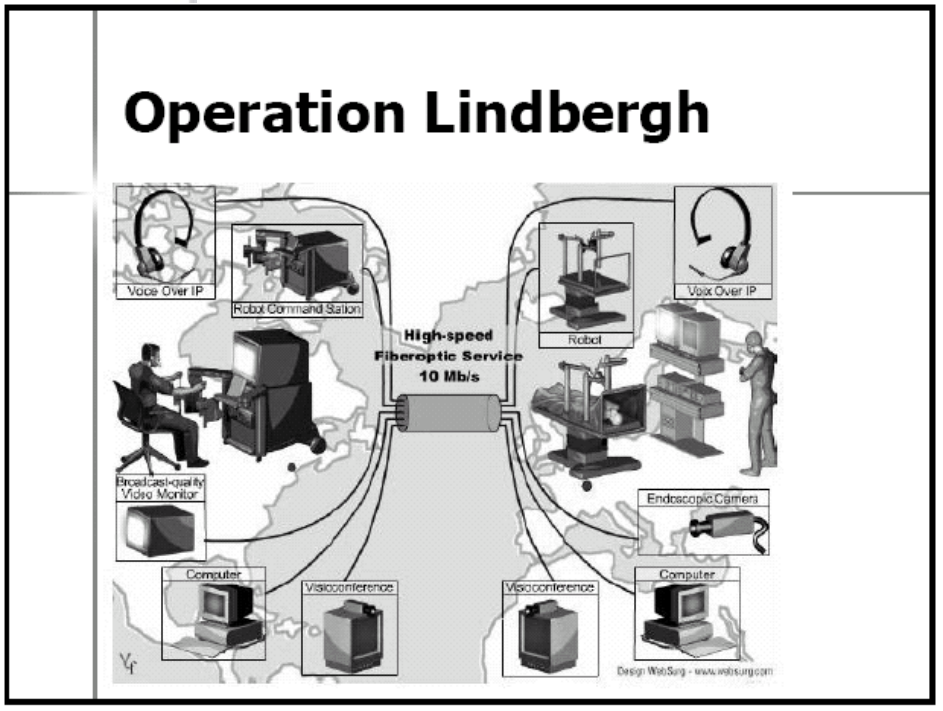
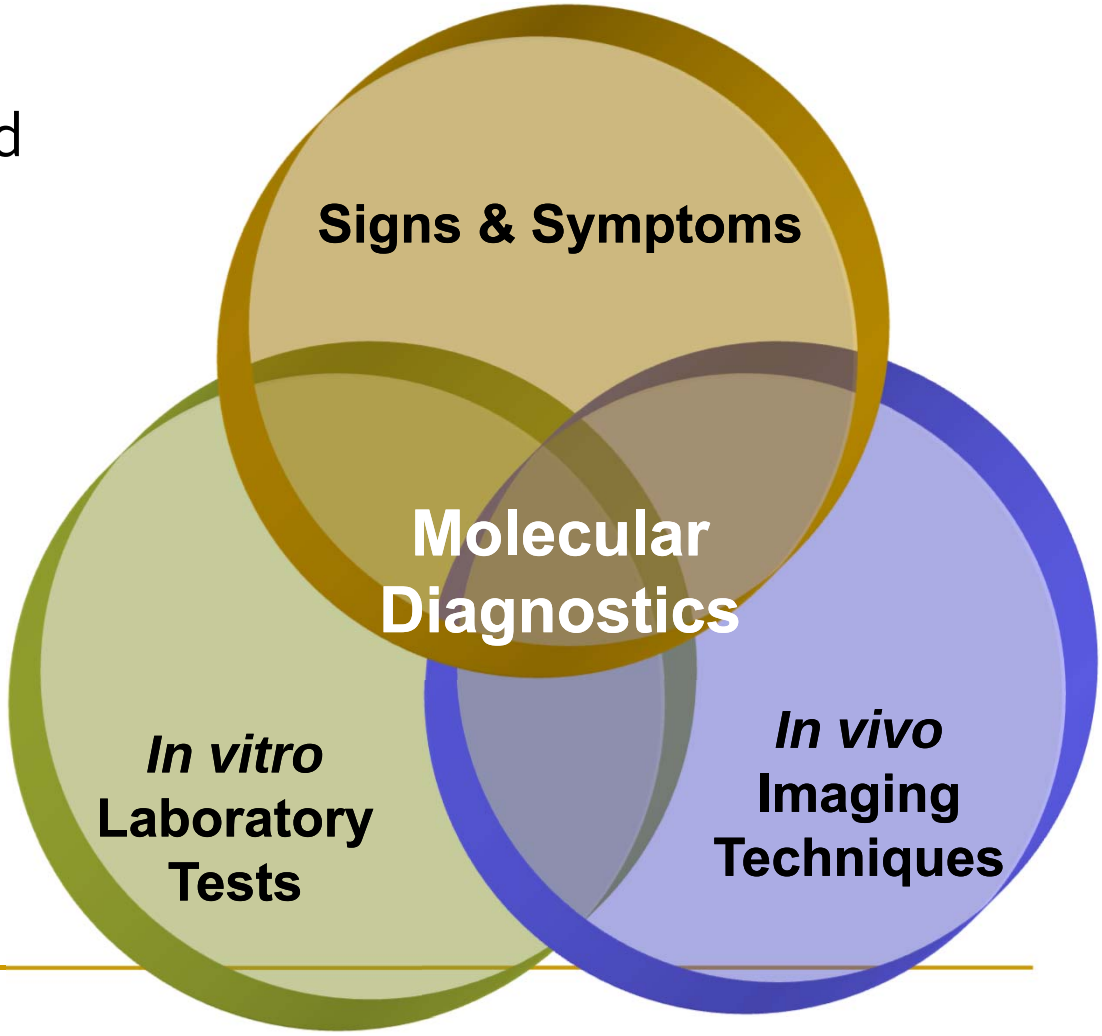




"Operation Lindberg":
Remote Transatlantic Tele-Surgery

Molecular diagnostics is at the core of the **personalized medicine** vision

Diseases will be diagnosed long before the patient begins to manifest any evidence using traditional tools



Logistic

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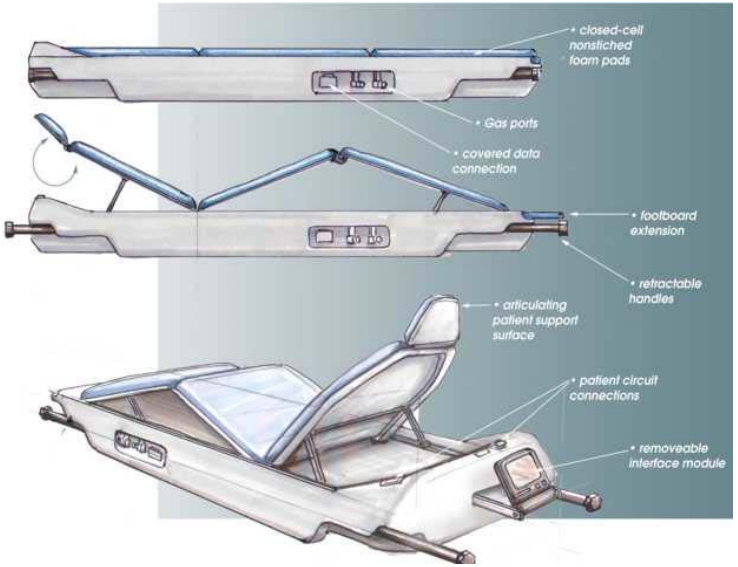

Virtual Surgery: Simulations

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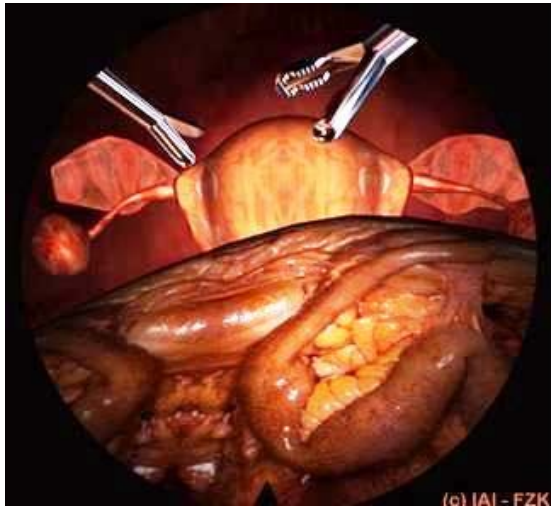

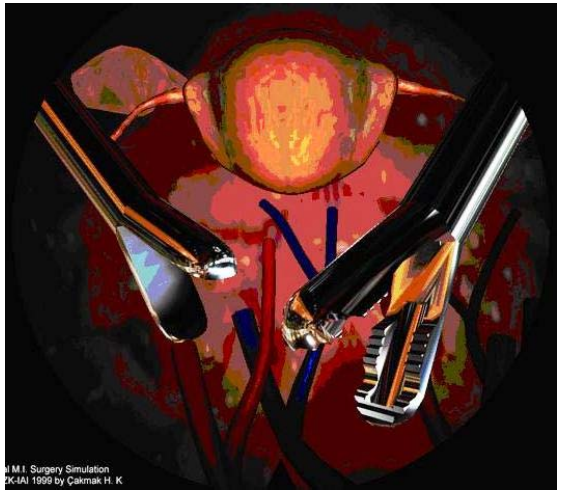

Navigation: Fluoronavigation

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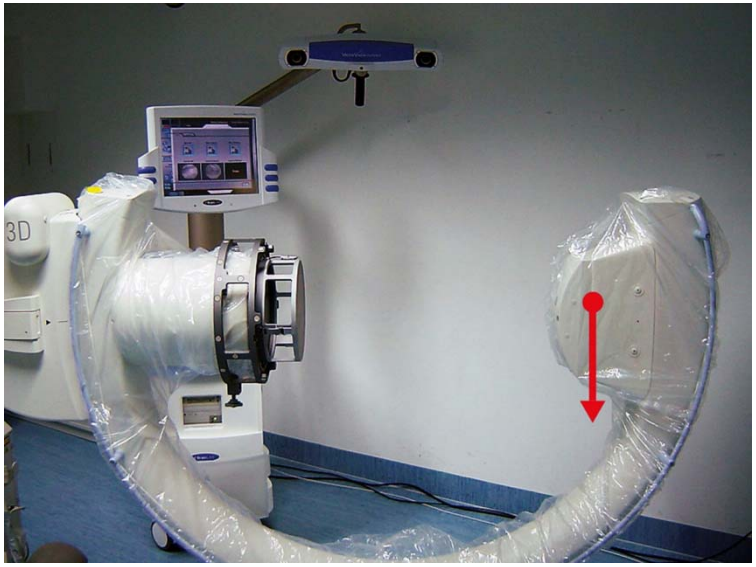

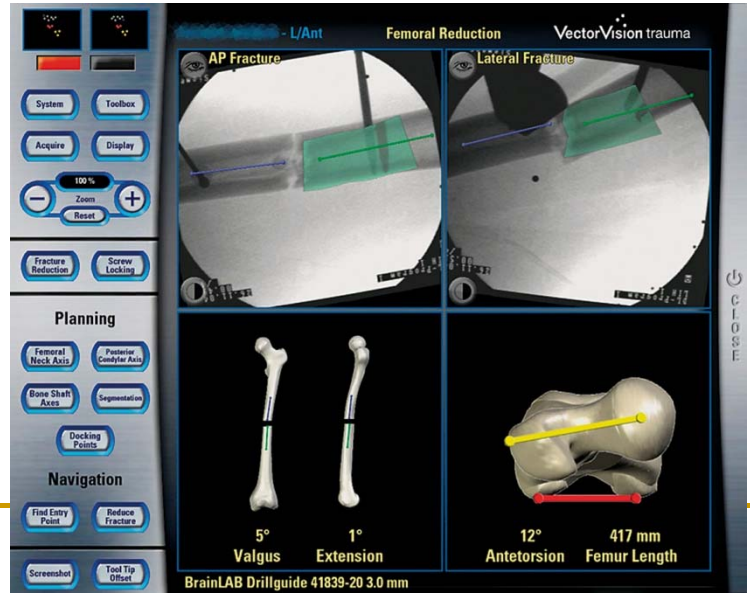

Operating Room: Future

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Robotic-Assisted Surgery

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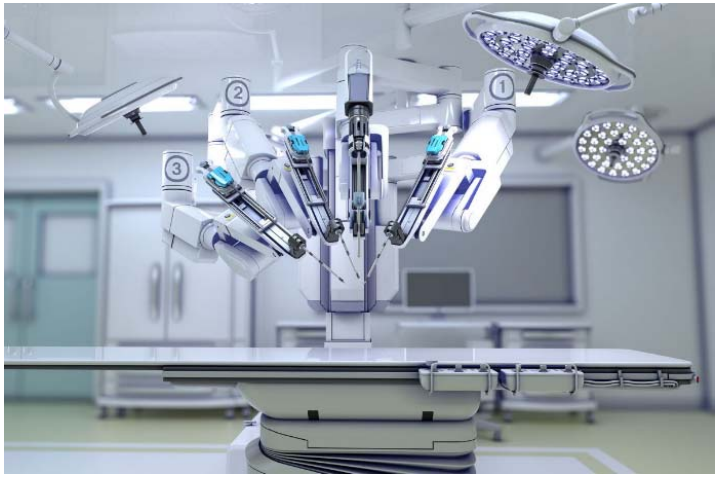
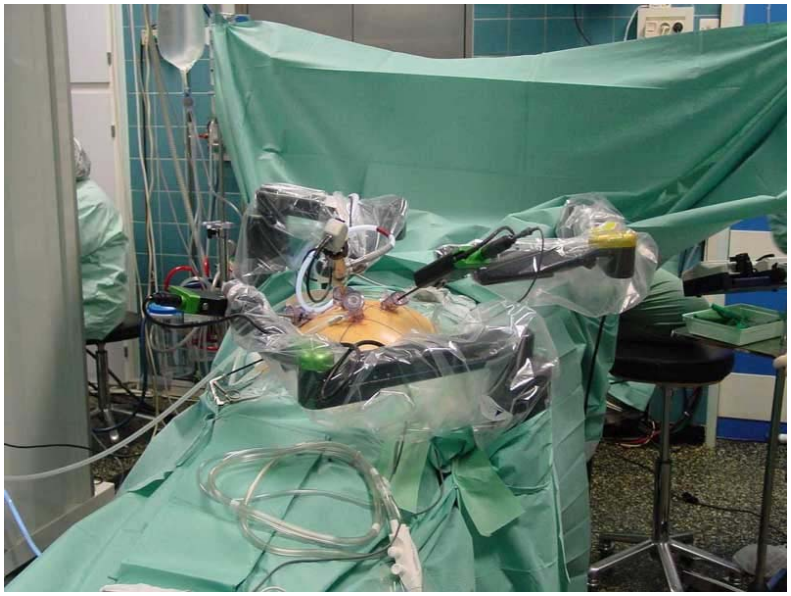
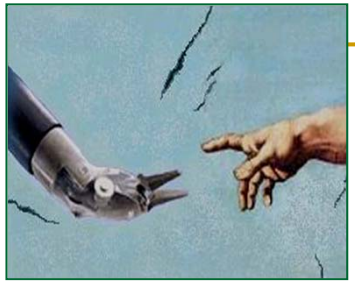


Laparoscopic Cholecystectomy





daVinci Robotic System

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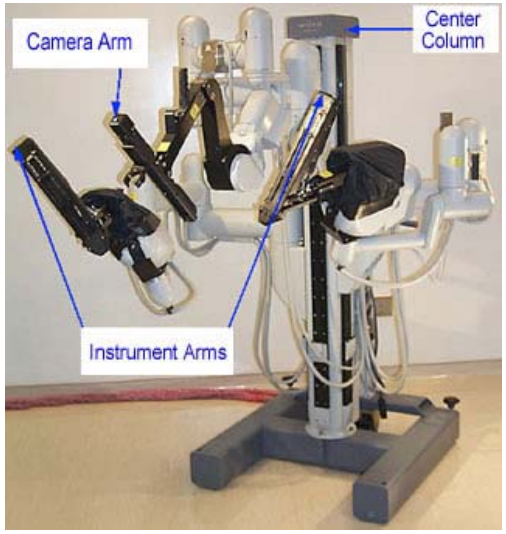

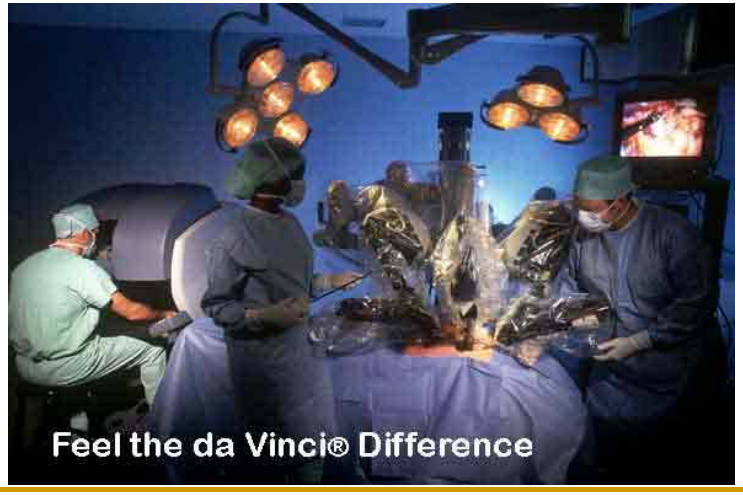

Customized Endoprosthesis:

Tumor Resection & Reconstruction

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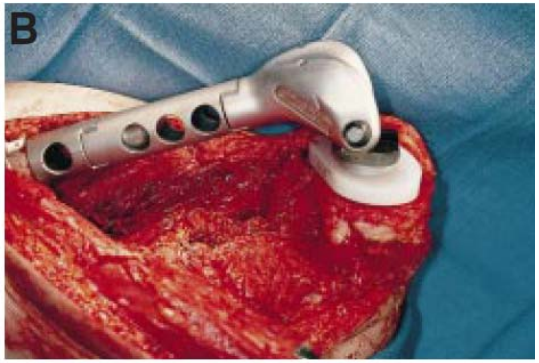

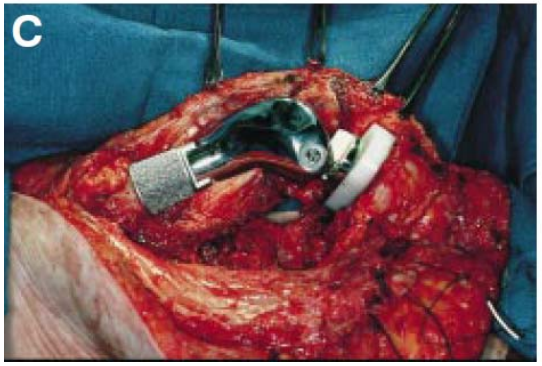

Specific Dimensions: Plate & Nail (Non-/Absorbable)

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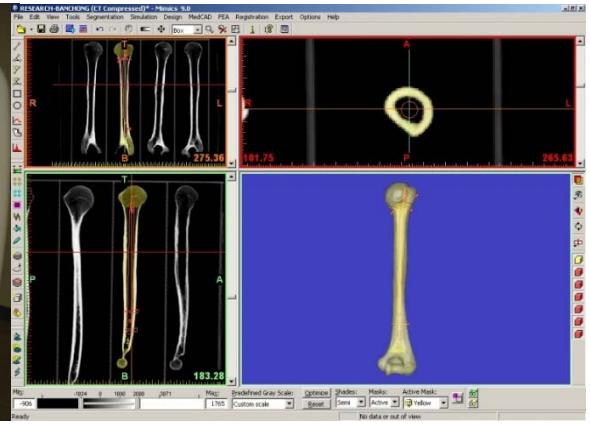

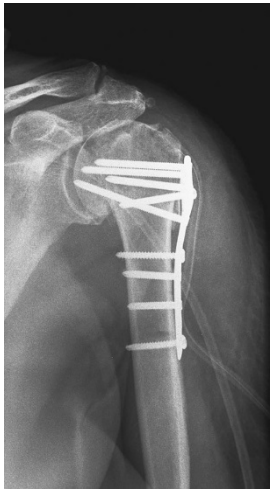

Artificial Jt/Prostheses: Specific Sized

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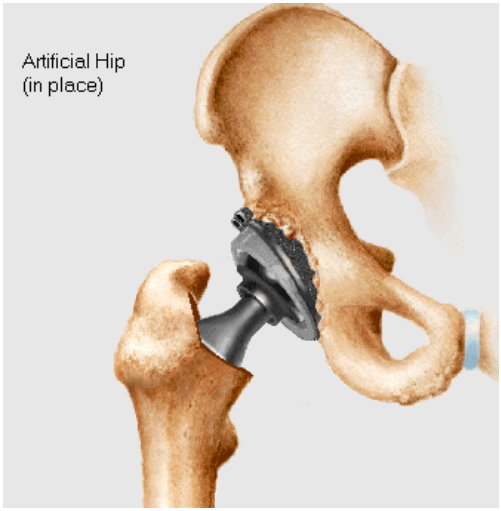

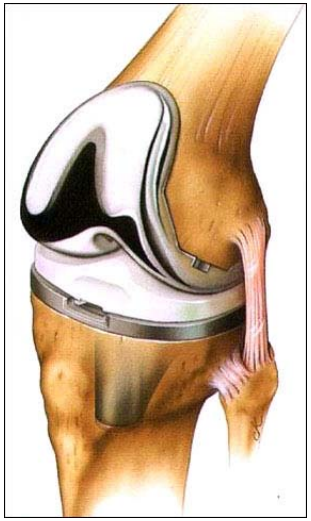

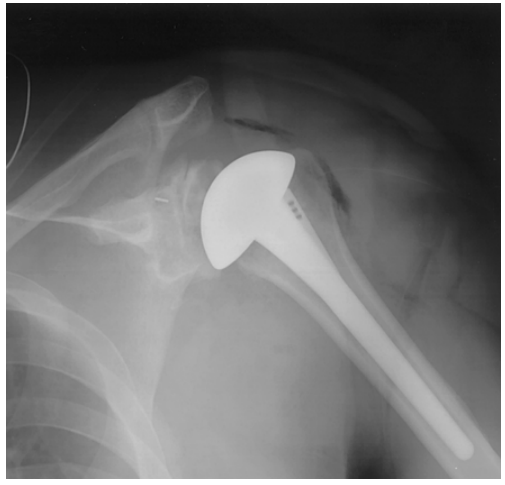

Artificial Retina

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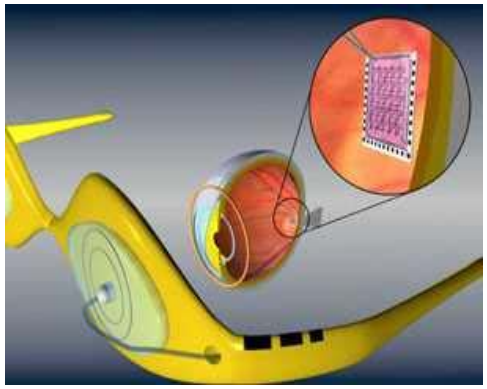

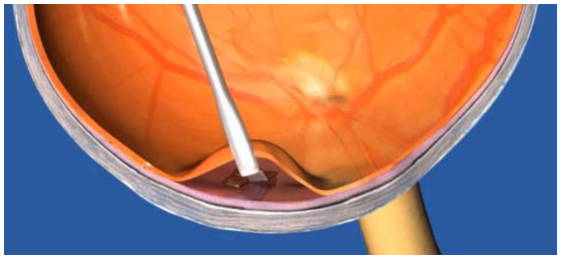

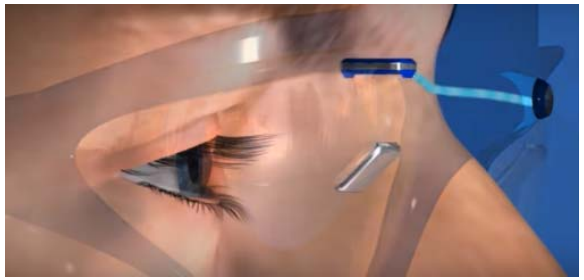

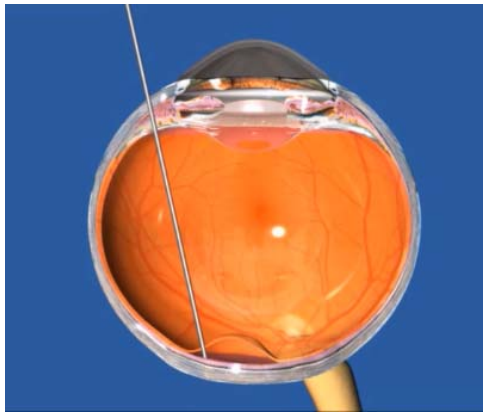

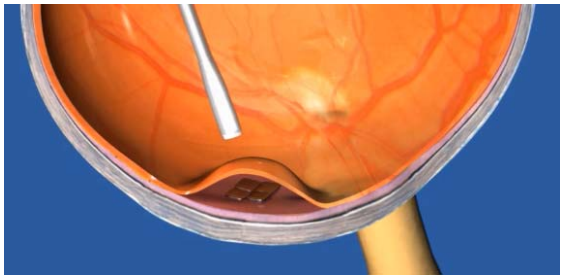

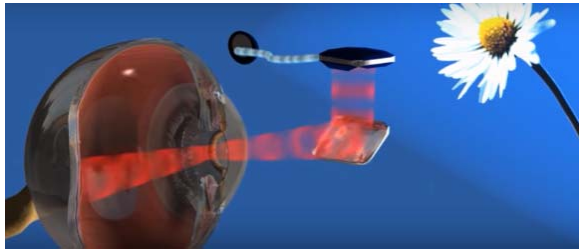

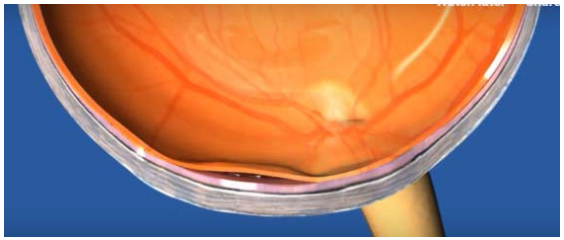

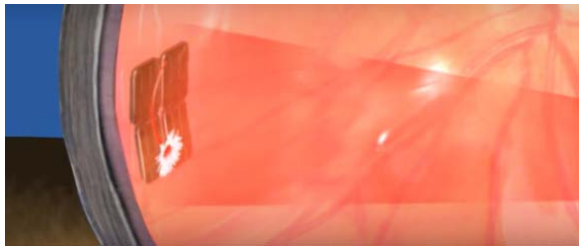

Smart Contact Lens

Intelligent & Smart Prostheses

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3D Printing in Medicine

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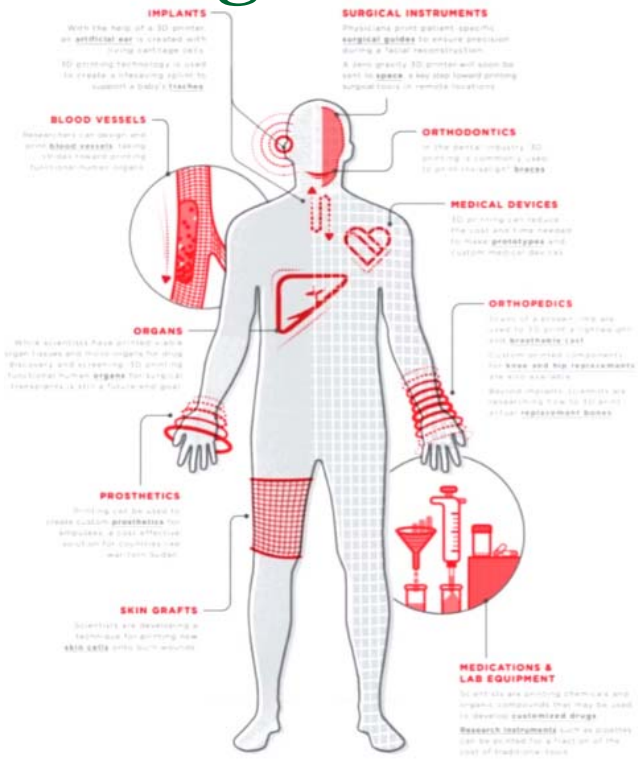
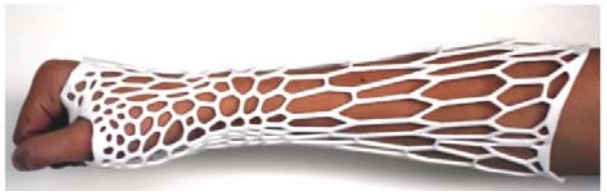
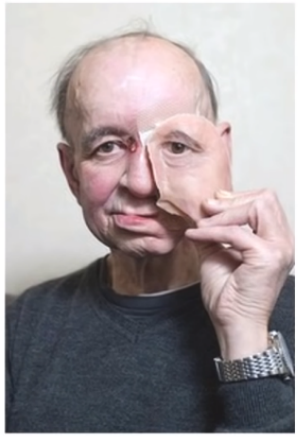




How a 3D printer gave a man his face - and his life - back

Richard Gray April 01, 2013



Eric Moger has a partial prosthetic face after suffering from face cancer. Photo: Supplied: Geoff Pugh

Assistive Technology (AT)

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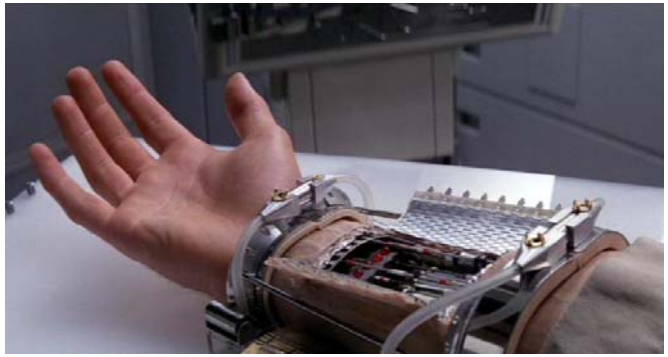
- Technology/Devices to enhance capability of seniors/elderly & handicaps “Less Dependence”



Assistive Device: The Blind

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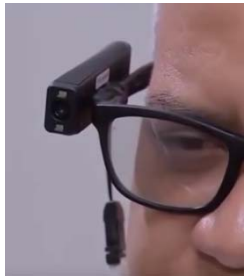
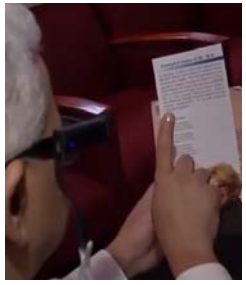
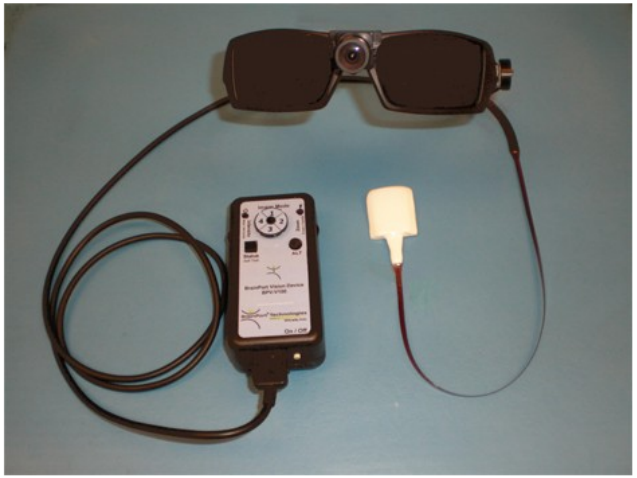
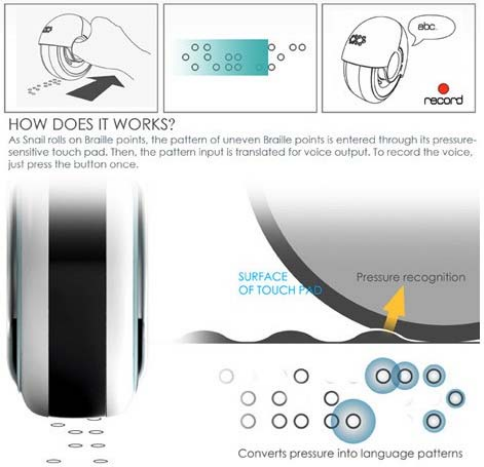


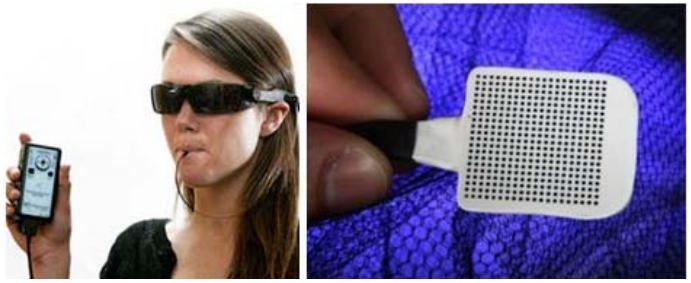


The Tongue-Tingling Vision Recreator

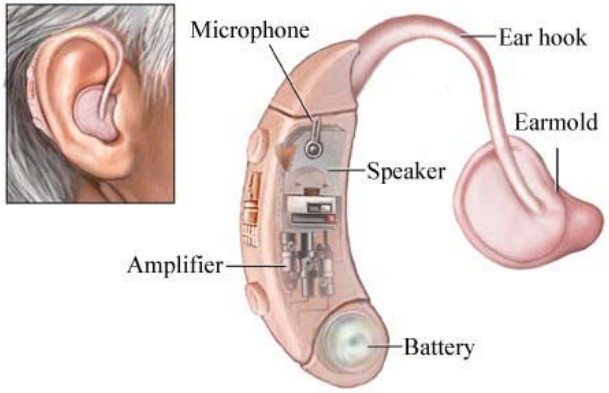


The Rolling Reader





Assistive Device: Impairment of Hearing



Assistive Device: Paralytic Patients

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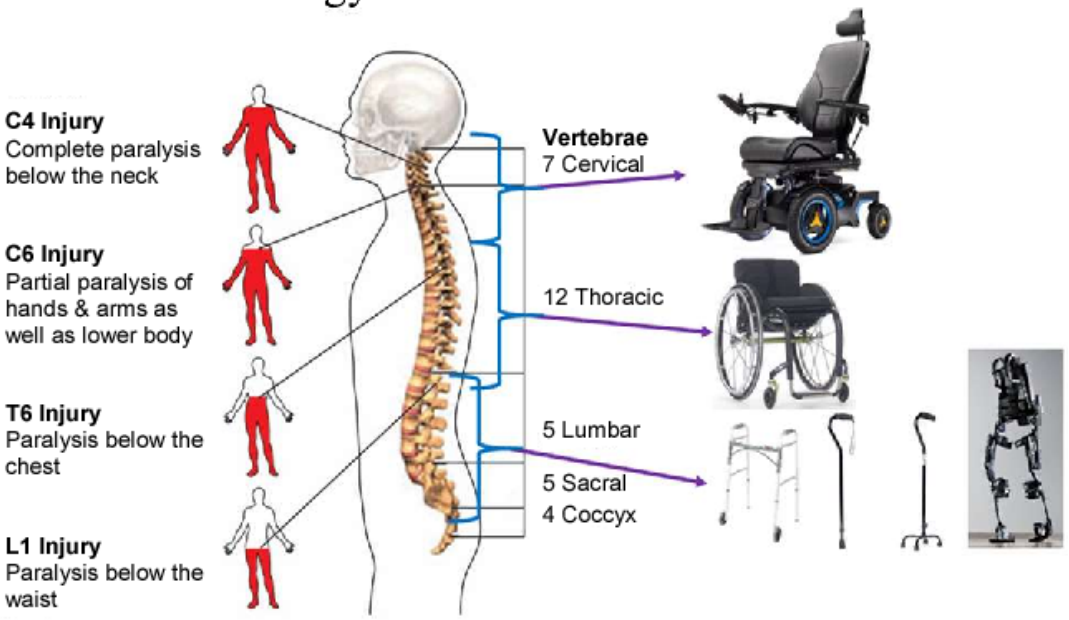
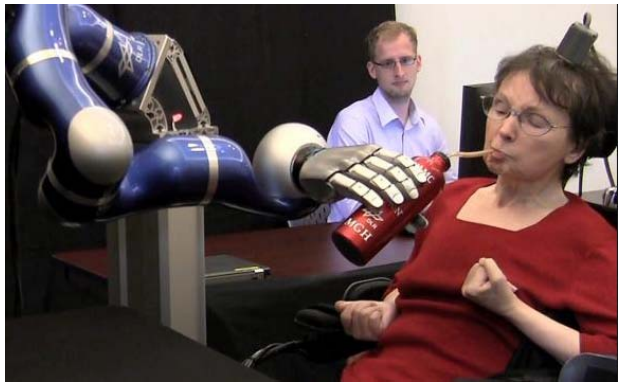
assistive technology.





Brain Machine Interface & Enhancing Memory Technology

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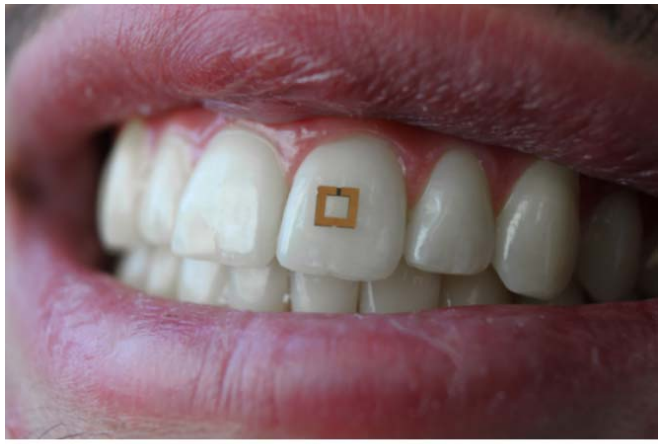
Source: *Wake Forest Baptist Medical Center*

Other Progression



Source: *SilkLab, Tufts University*

Source: *Peter Clarke/RMIT University*

An artificial pancreas

Tissue Engineering

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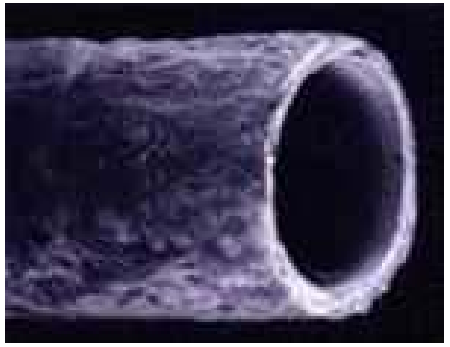
Artificial Ear

Liver Scaffolding



Artificial Blood Vessel

J. Vacanti, MD MGH March, 2000

AI in Medicine

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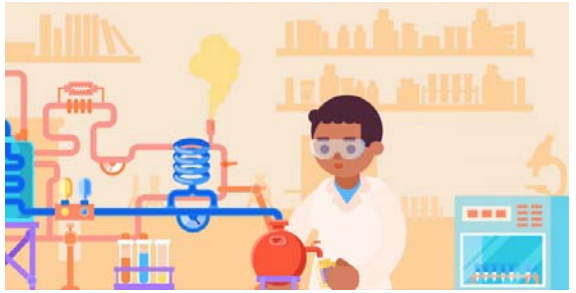
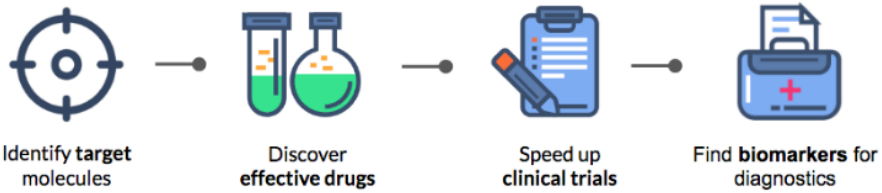
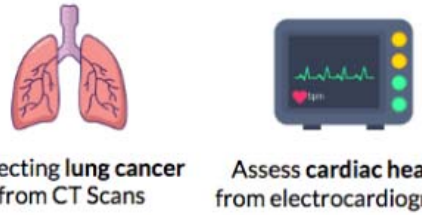
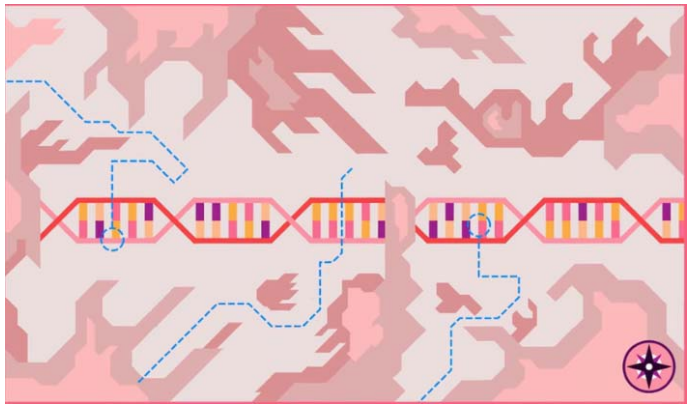
AI for Diagnostics, Drug Development, Treatment Personalisation, and Gene Editing



The 4 Stages in Drug Development







AI in Medicine

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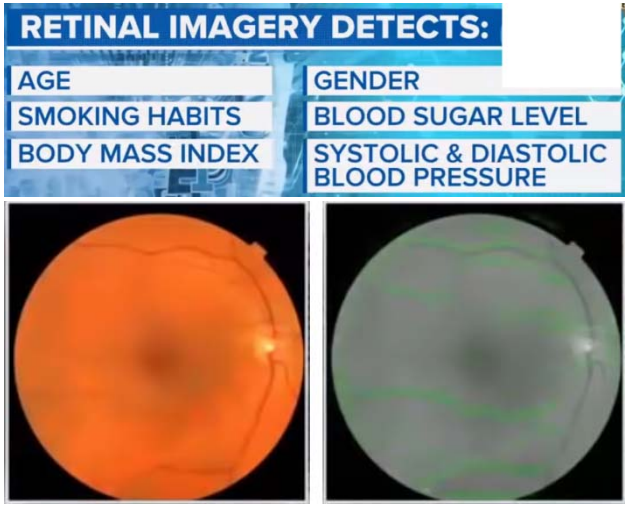

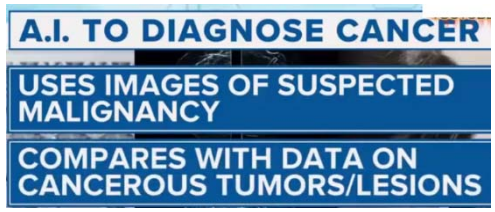

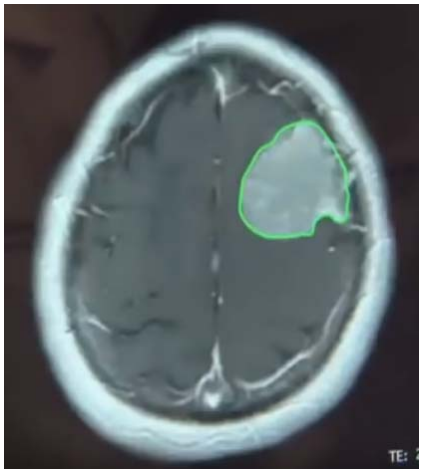

Internet of Things: In Health Care

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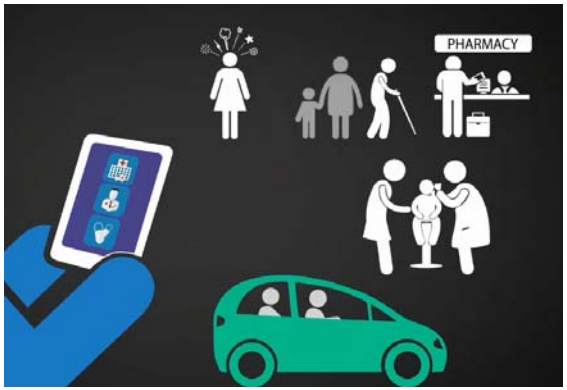

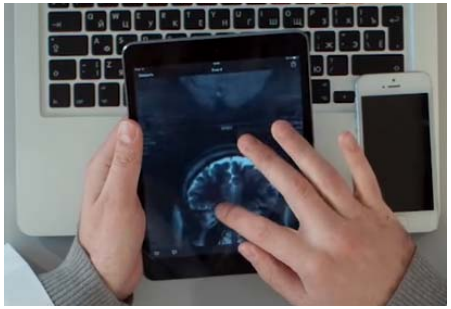

Internet of Things: In Health Care

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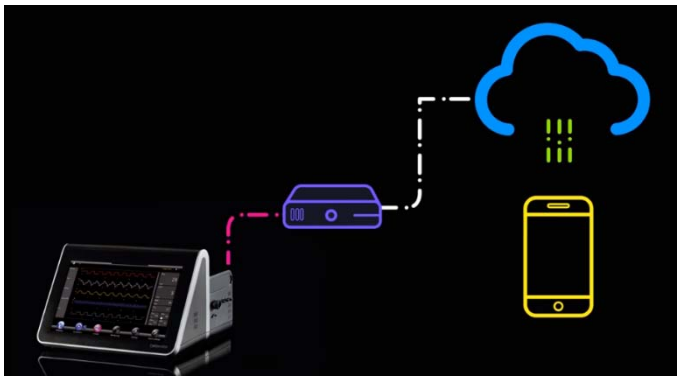
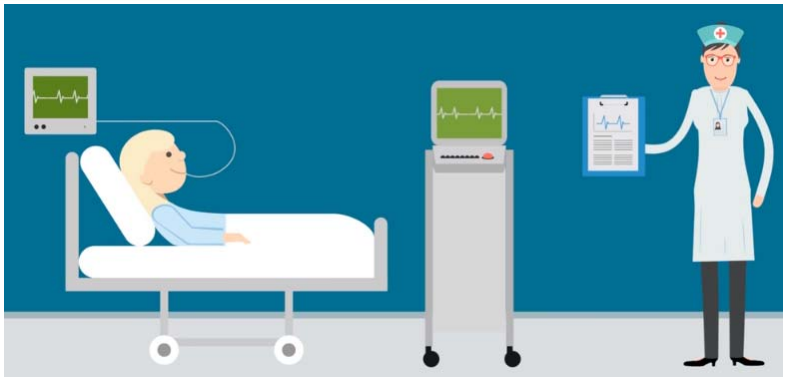
The Three P's x DMT:
Pervasive D, Personalised M, Persuasive T

Pervasive Diagnostics

Personalised Medicine

Persuasive Technology





Genomic Medicine

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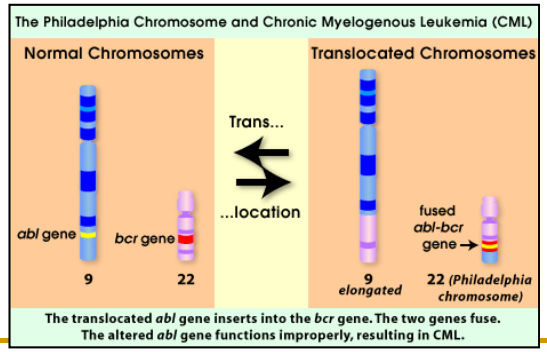
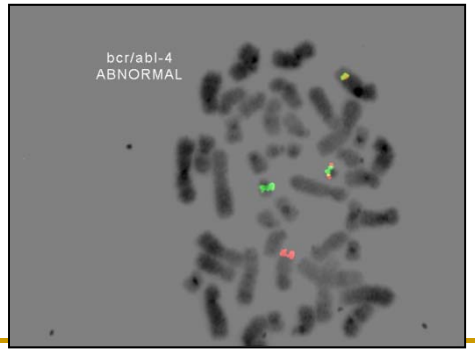
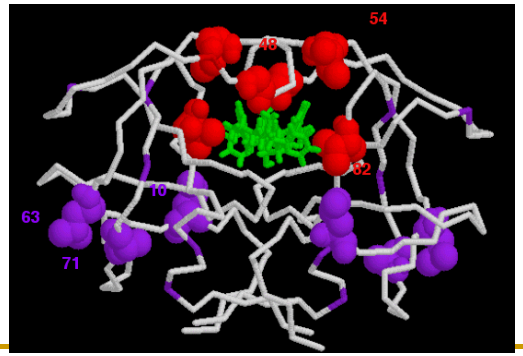
- Human Genome Project completed in 2003 provided access to the entire human gene sequence/ genome…..
- The genome is a set of tools enabling physicians to understand the biological & disease variability
- Understanding variability between individuals allows for more targeted /personalized healthcare based on genetic differences.







Genomic Medicine & *Personalization*

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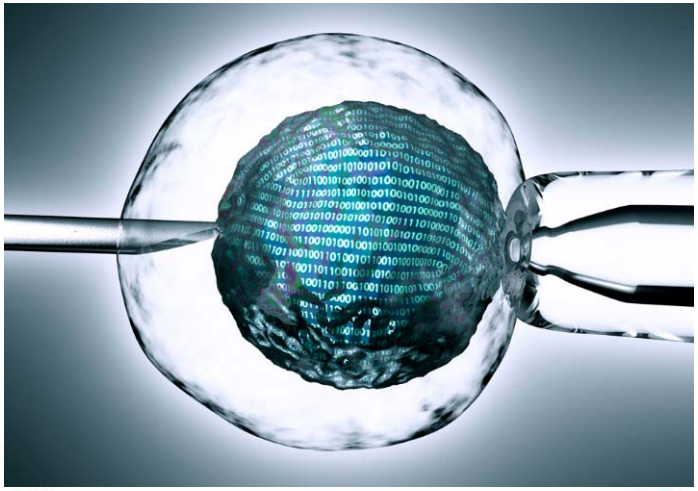
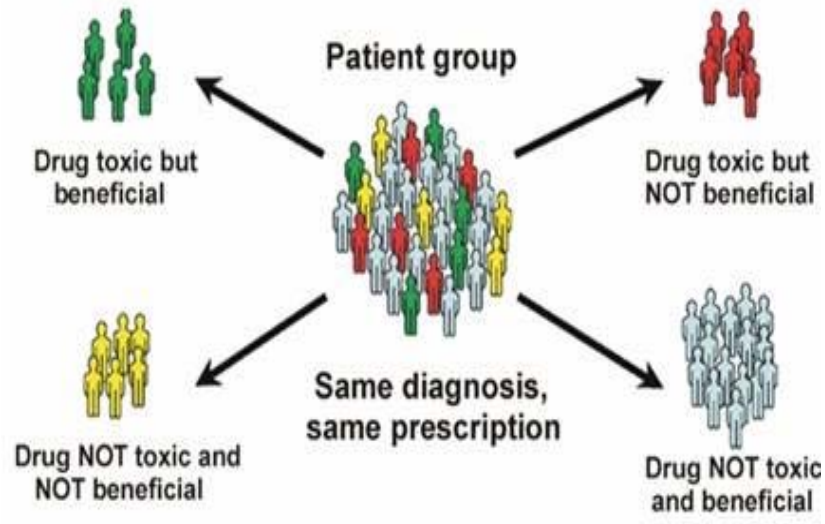
- Dx/ predict risk of disease
- Determine whether Rx is work
- Monitoring healthy people to detect early signs of disease
- Producing safer drugs by predicting potential for adverse effects earlier
- Gene therapy for hereditary diseases/ high risk CA





Genomic Medicine & *Personalization*

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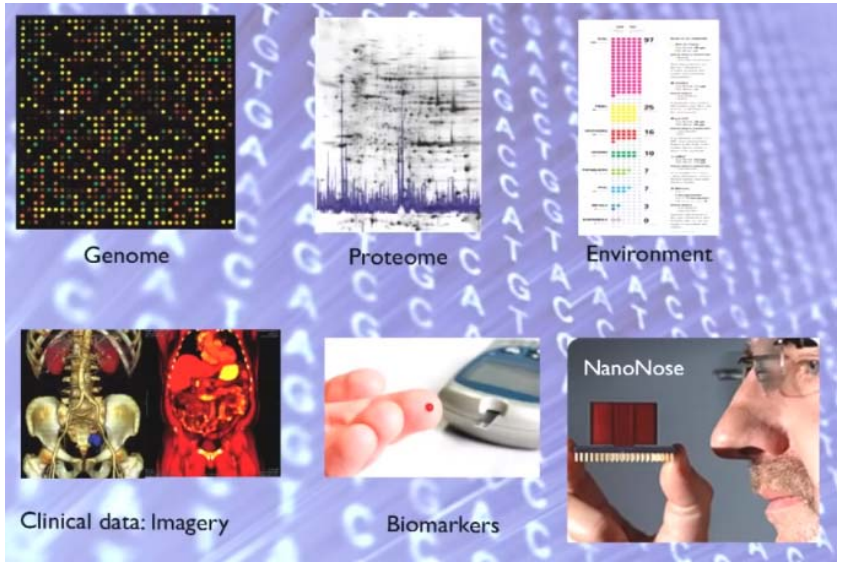
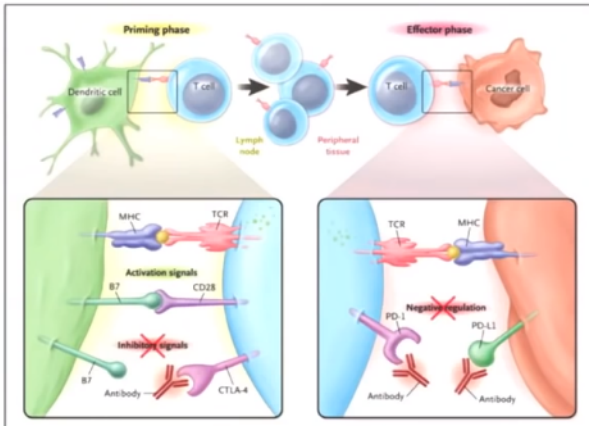


CANCER Rx

PD-1, or programmed death receptor 1
Unleashing the body's immune system to fight tumors.



Summary: Future Health Care Advancement

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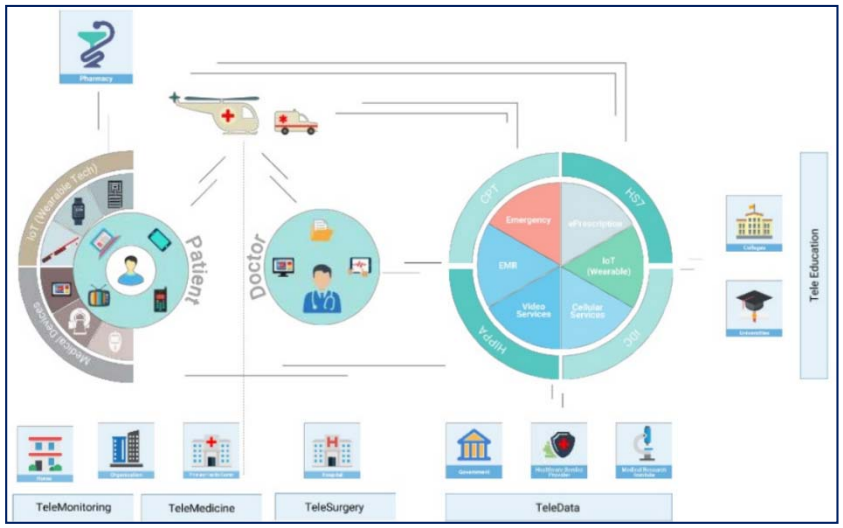
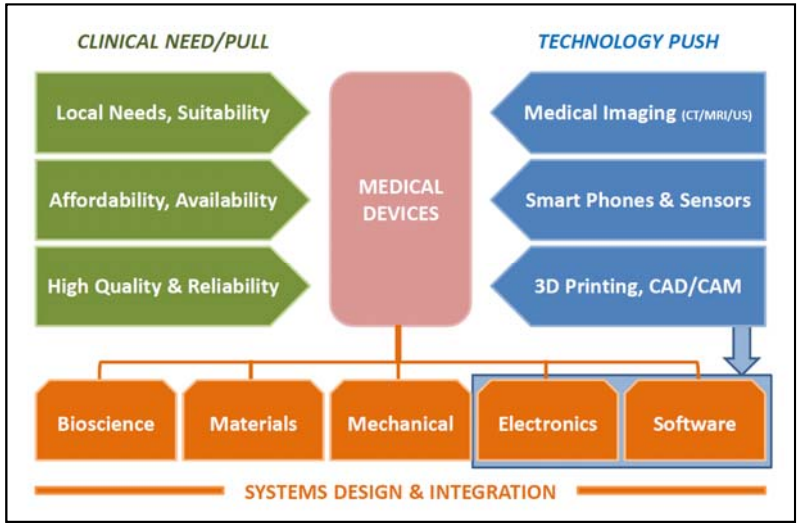
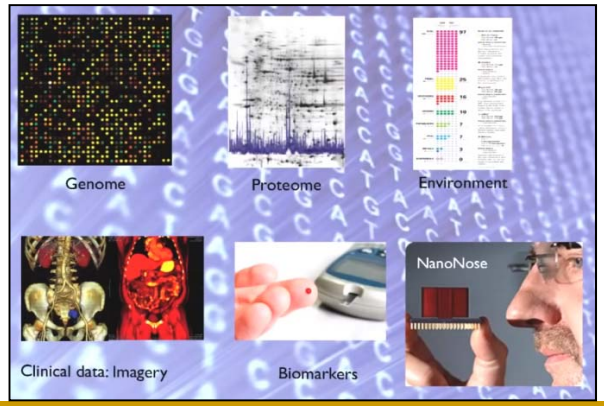
"Physician, Scientist & Engineer are Keys"







3 Major Modalities of Progression

- Tele-Health/Tele-Medicine
- Medical Devices/Equipment
- Genomic/Personalized Medicine