

50 Years of Medical Informatics, Telemedicine and e-Health

FRANCESCO SICURELLO

*President of IITM-International Institute of
TeleMedicine/@ITIM-Italian Association of
telemedicine and Medical Informatics;*

*Professor of Medical Informatics, University of Milano
Bicocca*

Medicine challenges

- Increase of elderly people
 - Chronic diseases (diabetes, COPD...)
 - Cardiovascular diseases
 - Cancer
 - Neuropathologies
 - NeuroSpine Injuries
- Infectious diseases. Today Coronavirus
- Genetic causes of diseases
- Diseases prevention (epidemiology)
- Rehabilitation
- Home care assistance
- Citizens/patients ask for more information

Challenges of healthcare providers (public and/or private)

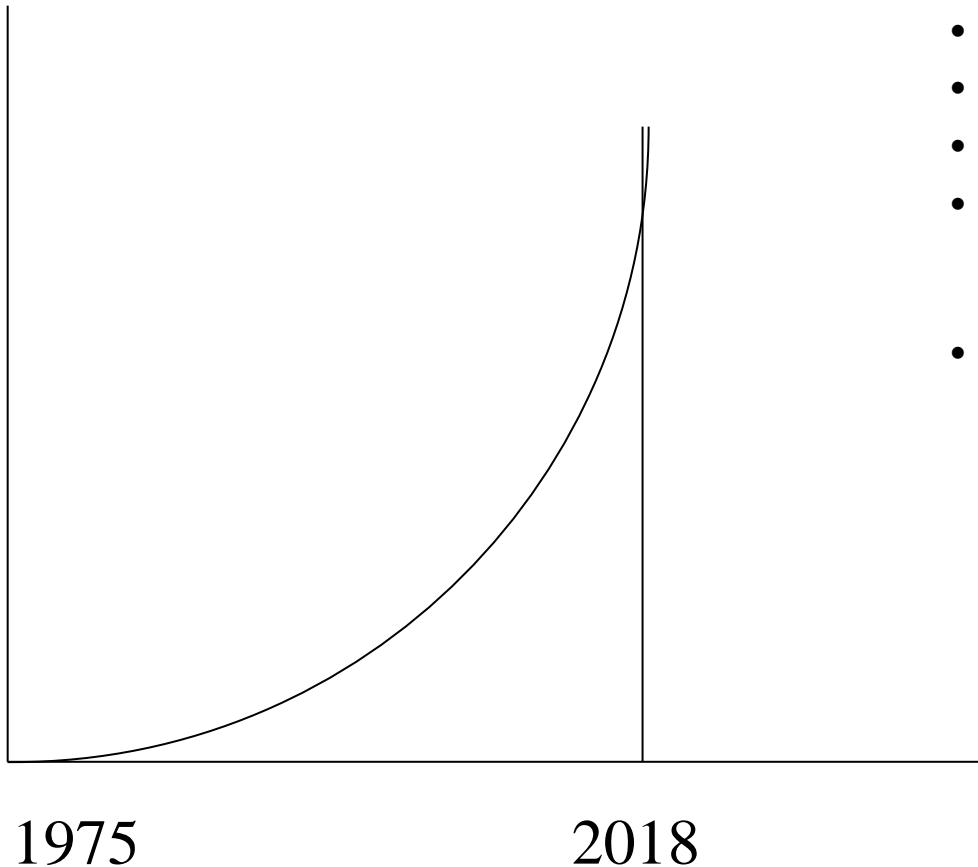
- To improve treatment and care of patients and quality of life of citizens.
- To reduce costs (expenditure control).
- To use advanced diagnostic and therapeutic technologies (CT, MRI, sensors of IoT, etc.) for a large number of patients/citizens.

ICT and Telemedicine can contribute to win this challenges:

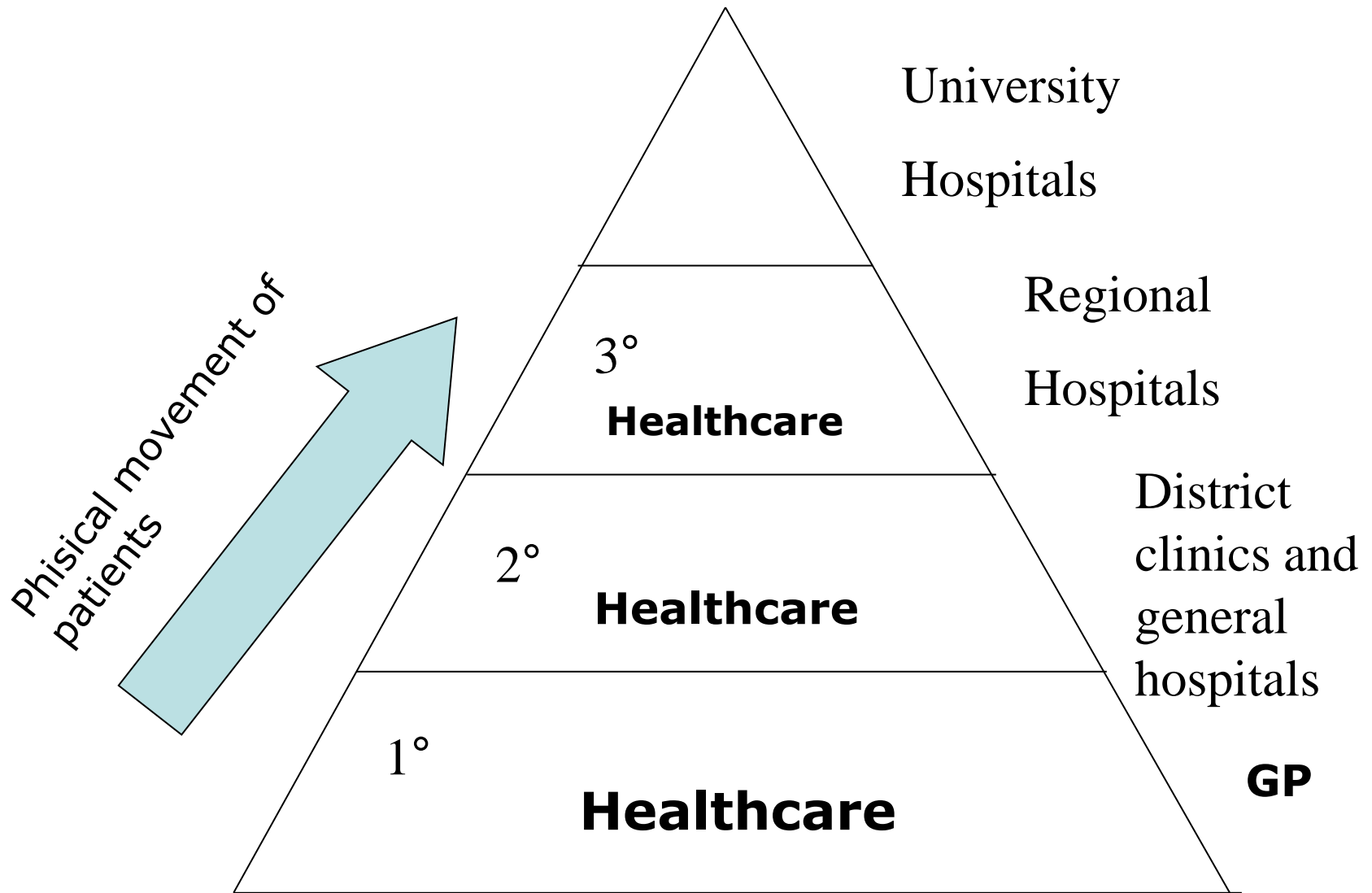
- Improving level of health maintainance.
- Reducing costs.
- Developing health networks between hospitals, GPs, Clinics....

ICT in health care delivery

Growing



- Globalisation
- Health care economics
- Patient process
- Medical profession
- New technologies (Smart Media & Mobile Health, AI, Big Data,..)
- HOSPITAL/HEALTH Networks



Medical informatics 1970

↓
Health telematics (Intra/extra hospital Net) 1990

↓
Telemedicine & e-Health 2010

In Italy (AIIM 1975-2002 & @ITIM 1999 till Now and other Associations)

Some Pioneers:

- E. Casiraghi, A. Serio, P. Mocarrelli, M. Stefanelli, T. Andreani, G. Degli Antoni, F. Pincioli, M. Bracale, Molino, Torasso, A. Rossi Mori, F. Ricci, A. Nicolosi, L. Milanese, G. Mauri, P. Cristiani, N. Balossino, S. Quaglini, F. Beltrame, S. Bella, G. Pellicanò, G. Mastronardi, S. Mazzoleni, D. Pisanelli, F. Ferri, M.C. Gilardi, M. Ciampi, M. Giacomini, C. Ruggiero, F. Piacentini, S. Pupolin, A. Di Tommaso, A. Morreale, M. Villa, A. Donzelli, E. Santoro, F. Cabitza, D. Pani, A. Murari, A. Orro, M. Cannataro, A. Lazzèro, G. Bertaina, C. Paglia, G. Andreoni, S. Corrao, R. Caruso, I. Pannone, P. Pugliafito, M. Bartolo, PM Gerthoux,

Focus

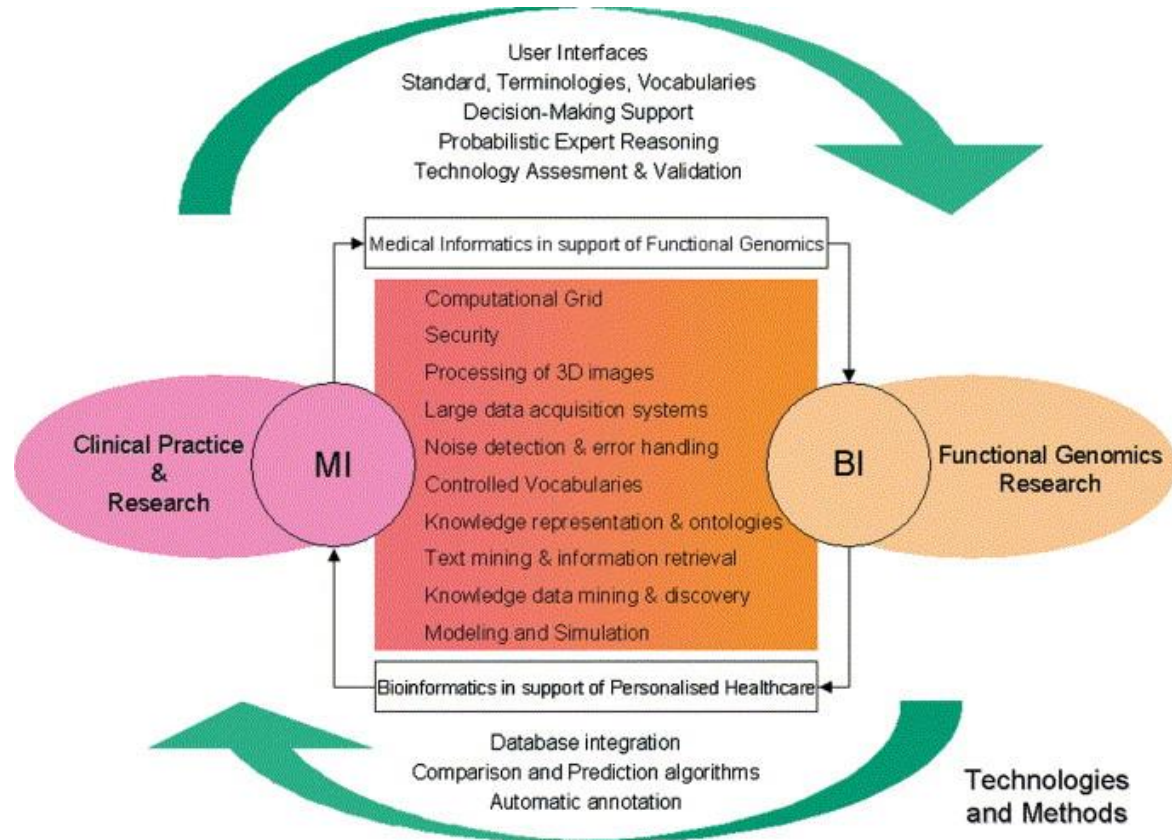
- Medical record
 - Electronic patient record
 - Patient data card
 - Hospital Information Systems
 -
- Record linkage
 - Integration of clinical database
 - Epidemiology
 - Evaluation of care and structures quality
 - Clinical research
 - Telemedicine (teleconsulting/telediagnosis)
 - Teleassistance/telemonitoring
 - Internet in health care & Medical www portals
 - Internet of Things (IoT), Big Data & Data Analytics
 - Health Networks & Data integration

INTEGRATION OF DIFFERENT BIO-MEDICAL DATA

At various levels for 'personalized' health care

- Molecule
- Cell
- Tissue
- Individual person (Clinical patients data)
- Population (Epidemiology, Public Health)

Synergy between Medical Informatics -MI & BioInformatics - BI



BioMedical Record Linkage: Synergy between MI and BI

Molecular Biology



**Genetic
Data Banks**



Method

Pattern matching

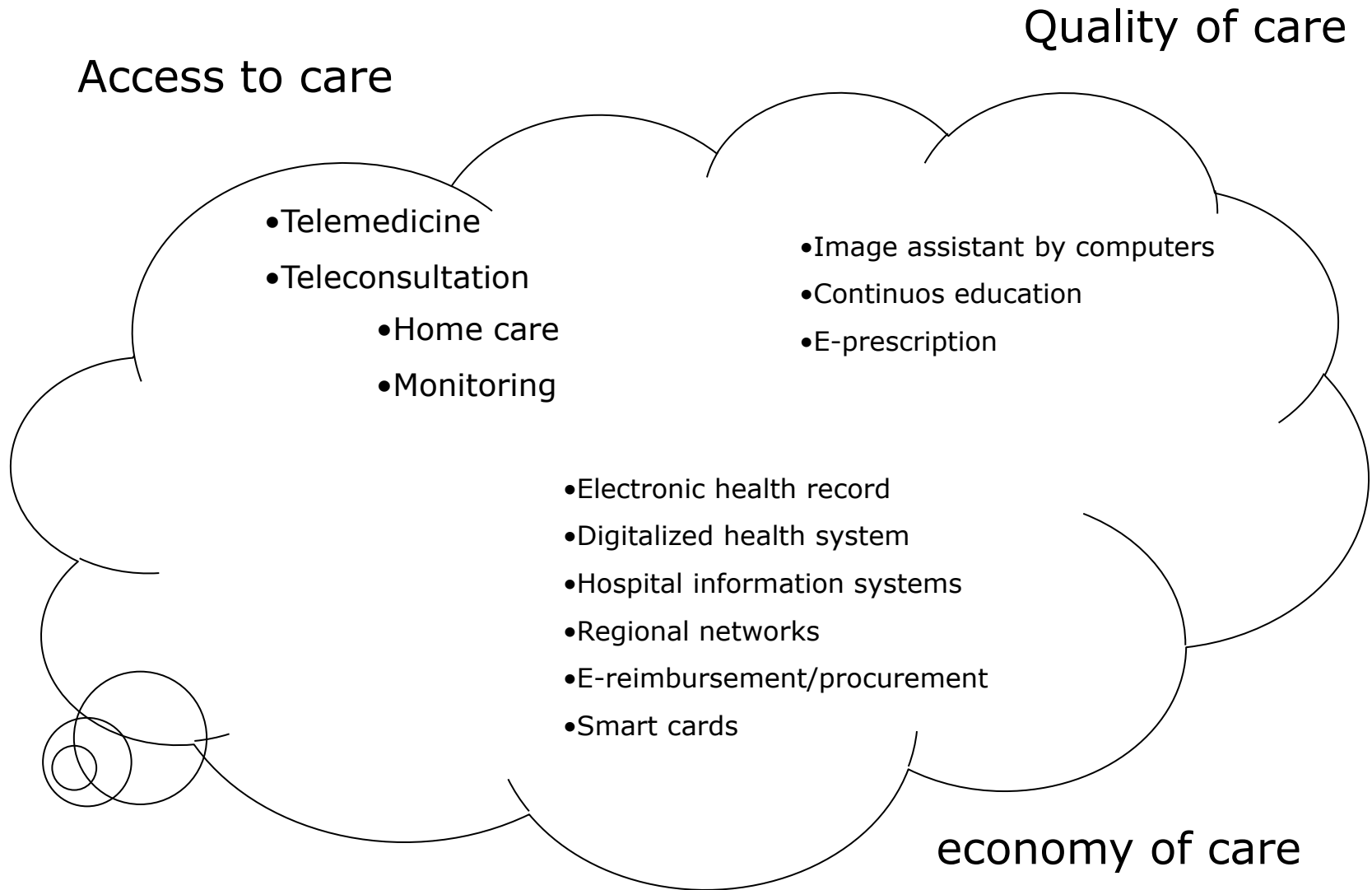


**Computerization
of Medical Record**

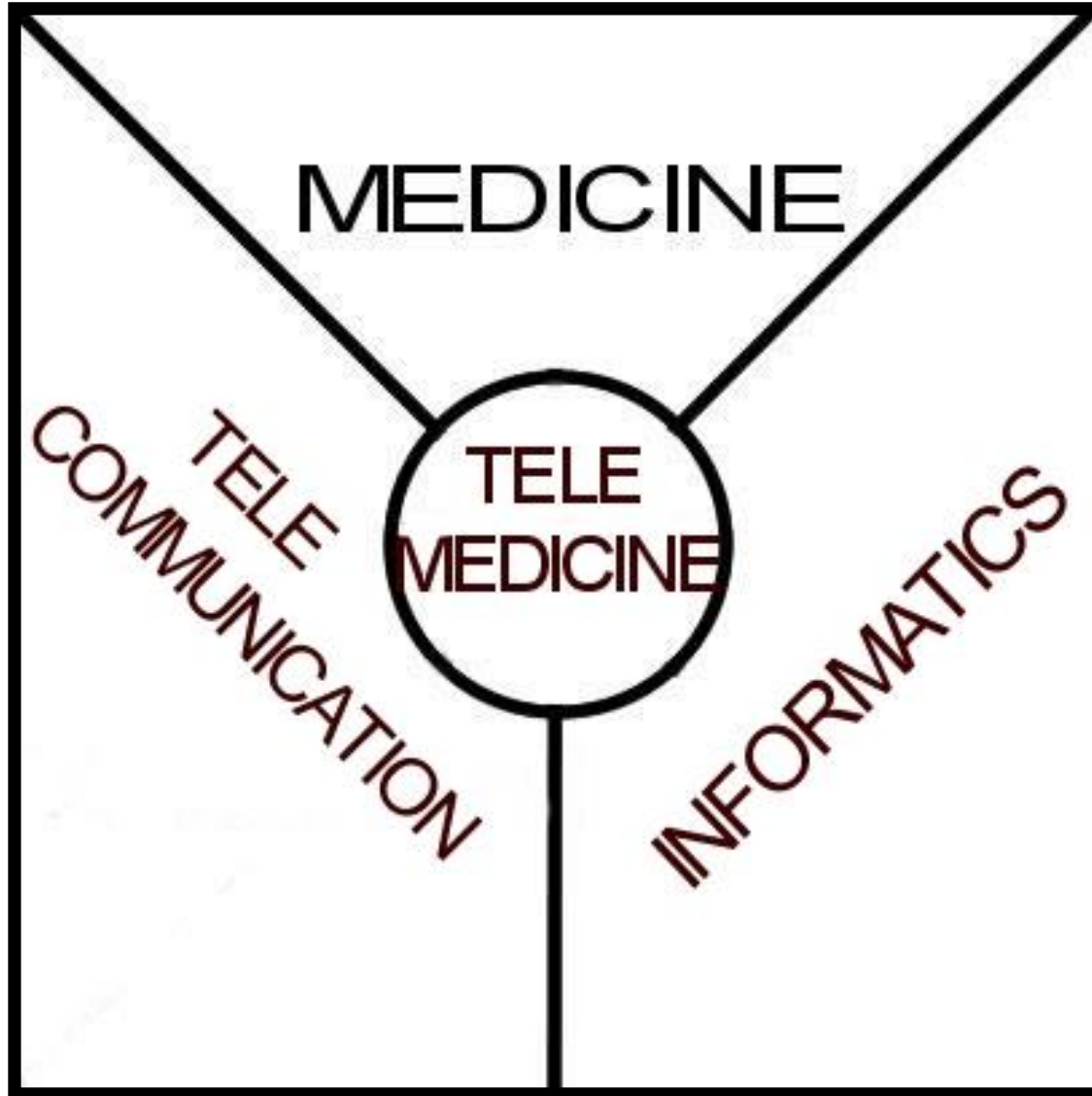


**Clinical
Data base**

e-Health



ICT CONVERGENCE



DEFINITION OF TELEMEDICINE /

The definition of telemedicine adopted by an international consultation group convened by the WHO in Geneva in December 1997 says:

“Telemedicine is the delivery of health-care services, where distance is a critical factor, by health-care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, and for the continuing education of health-care providers as well as research and evaluation, all in the interests of advancing the health of individuals and their communities.”

Telemedicine Activities:

- **Teleconsulting** (clinicians → clinicians)
- **Telediagnosis** (clinicians → physicians)
- **Telemonitoring** (clinical centers → patients)
- **Telerehabilitation** (Physiotherapists → patients)
- **Telesurveillance** [i.e. home telecare] (health structure → patients → health)
- **Tele-emergency** (first aid centers → ambulances → health operators → patients)

TELEMEDICINE APPLICATIONS

The main application areas of telemedicine systems are:

- telecardiology,
- teleradiology,
- telepathology
- Telediabetology
- teleophthalmology
- Telemonitoring
- Telerehabilitation
- Telehomecare

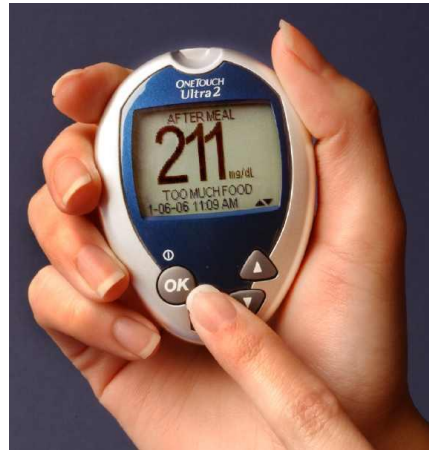
There are other specialties that use telemedicine services, as teledermatology, telesurgery, telepsychiatry etc.

TELECARE

- Telecare systems regard signal and data transmission from homecare, connection by IP based LAN, WAN, ...detecting automatically patient data and signals as EKG, EMG, spirometry, glucose level, etc. from home to TeleCare Health Service Center. It's necessary to delivery some Bio-Devices to patients



Some DEVICES



```
<?xml version="1.0"
encoding="ISO-8859-
1"?> <utenti>
```

```
<utente>
```

```
<nome>Luca</nome>
```

```
<cognome>Ruggero<
/cognome>
```

```
<indirizzo>Milano</in
dirizzo> </utente>
```

```
<utente>
```

```
<nome>Max</nome>
```

```
<cognome>Rossi</c
ognome>
```

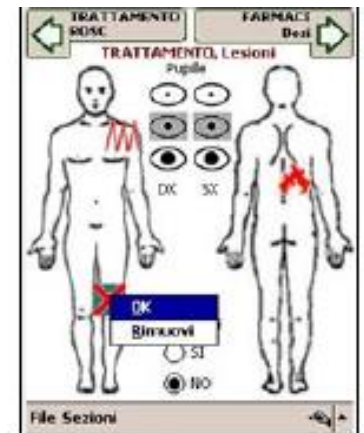
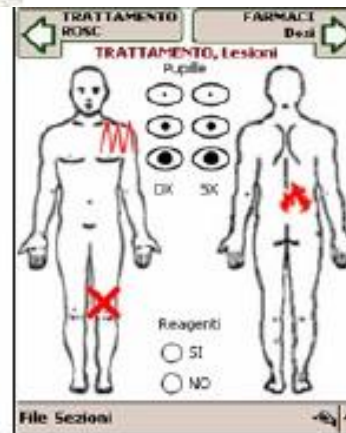
```
<indirizzo>Roma</in
dirizzo> </utente>
```

```
</utenti>
```

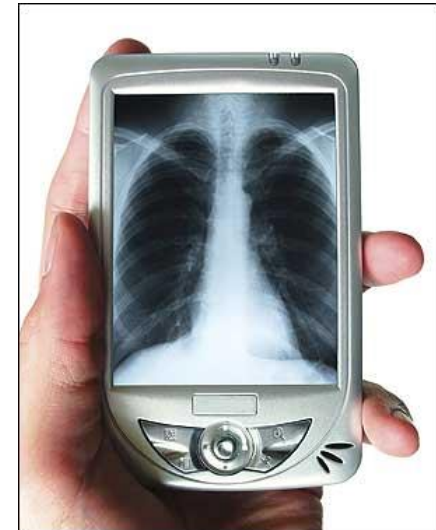
T-shirt with BIO-SENSORS



Device for emergency/



Portable Radiological Device



Other devices



Head Amp



PEET



Epilepsy Keypad



Finger Tap



Stereotaxic Instrument



Electropalatography



Microscope CO₂ Incubator



Tissue Stretcher



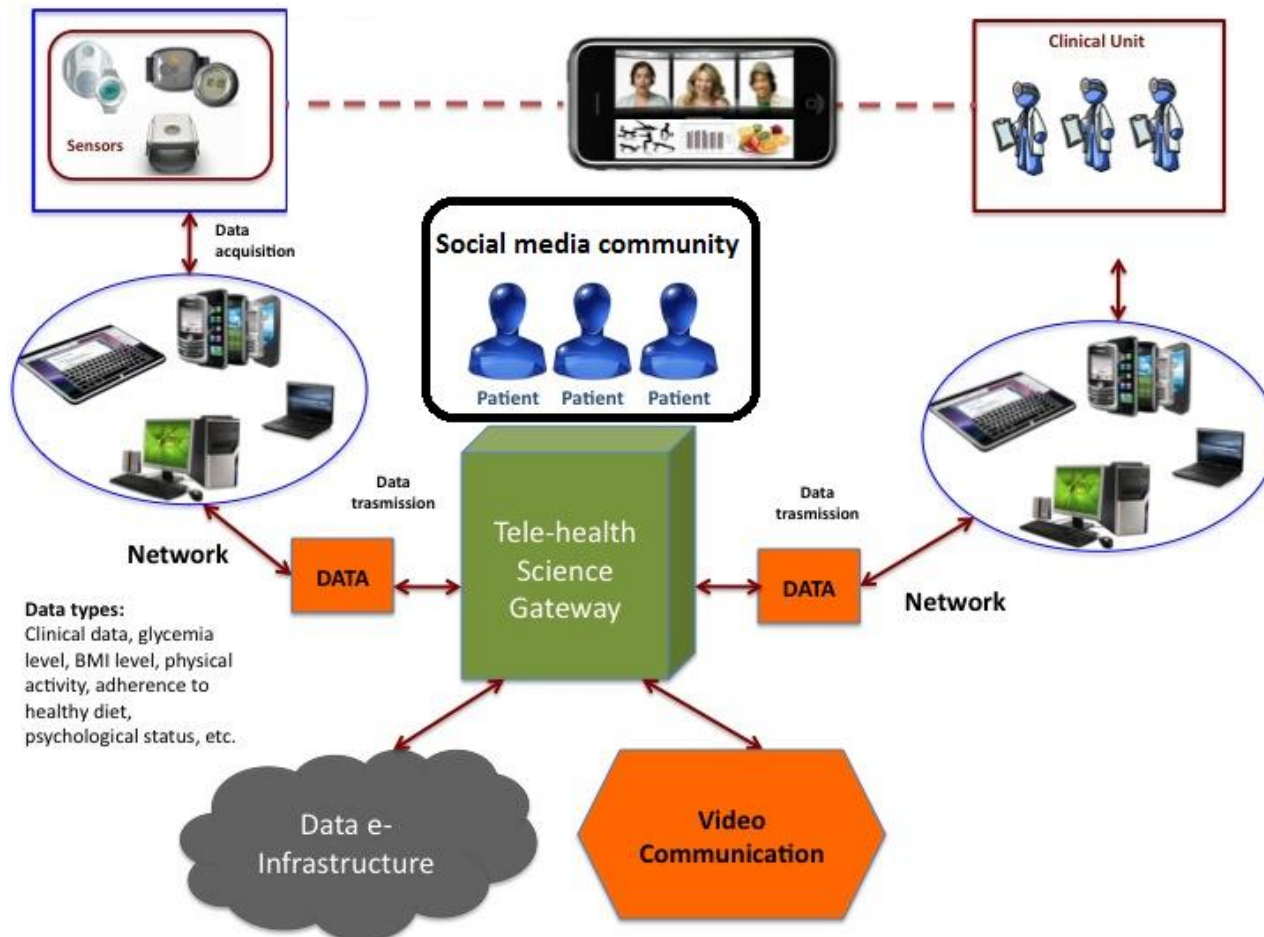
Torsional Tonometer



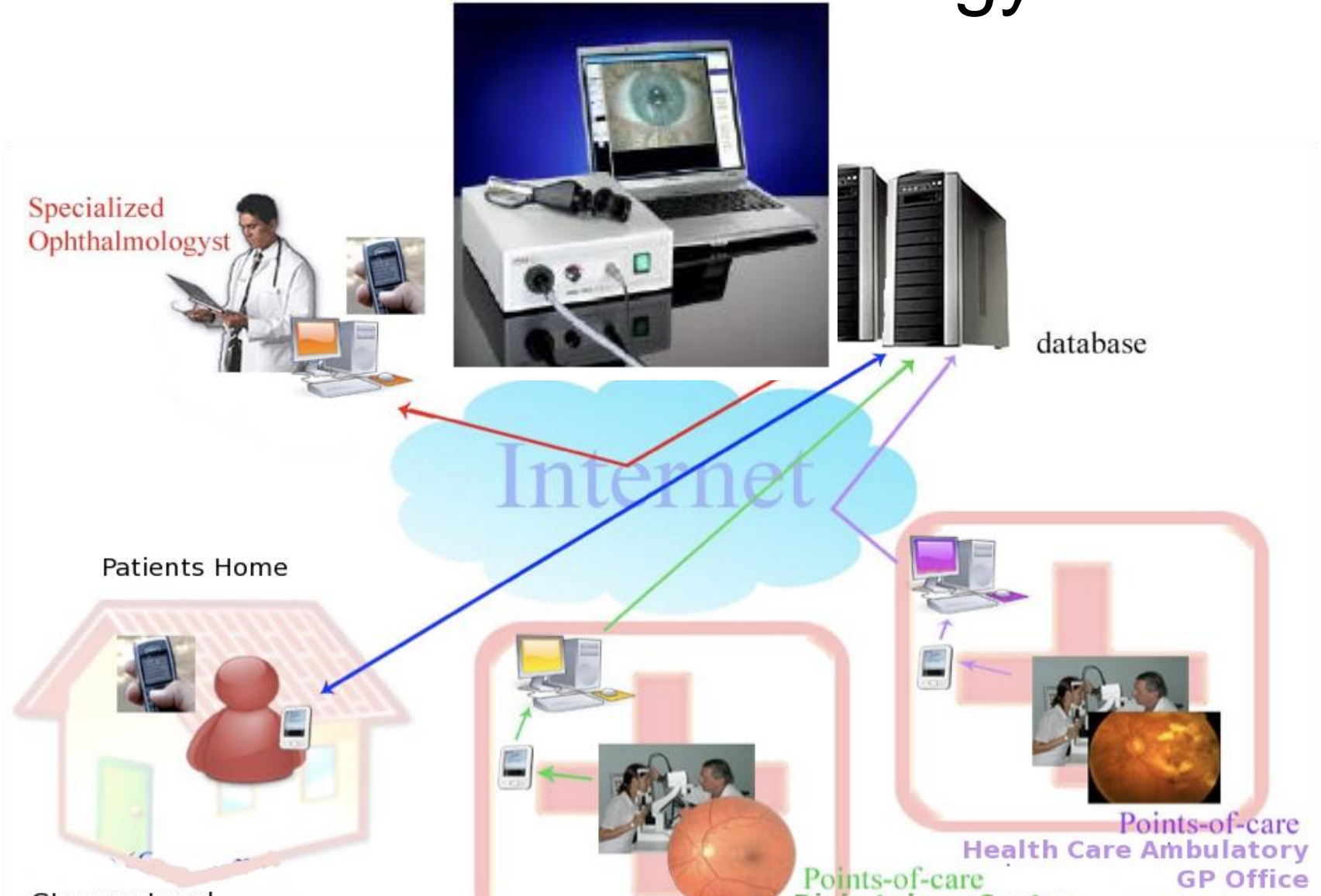
Lymphoedema Tonometers



TeleDiabetology



TeleOphthalmology

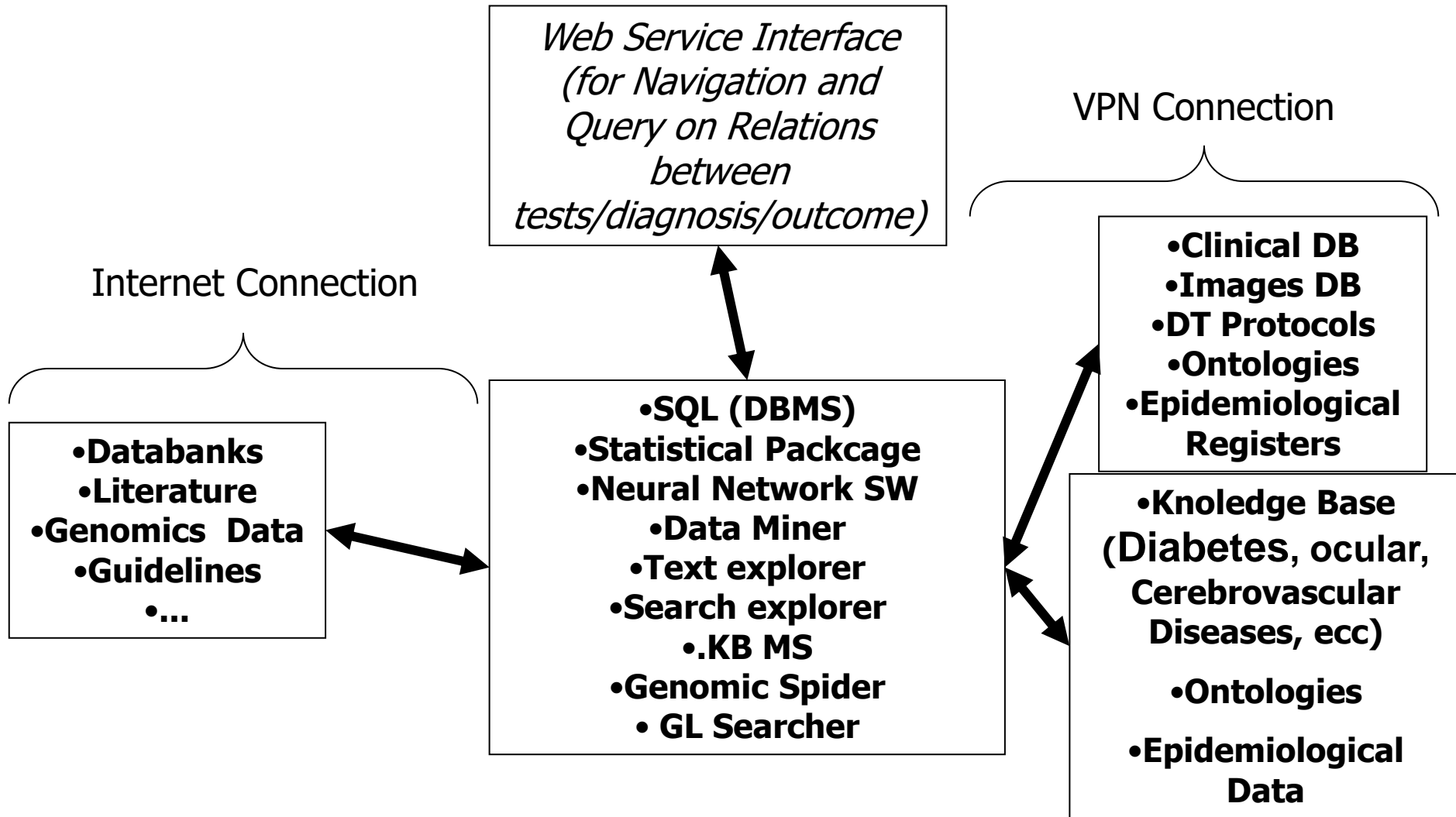


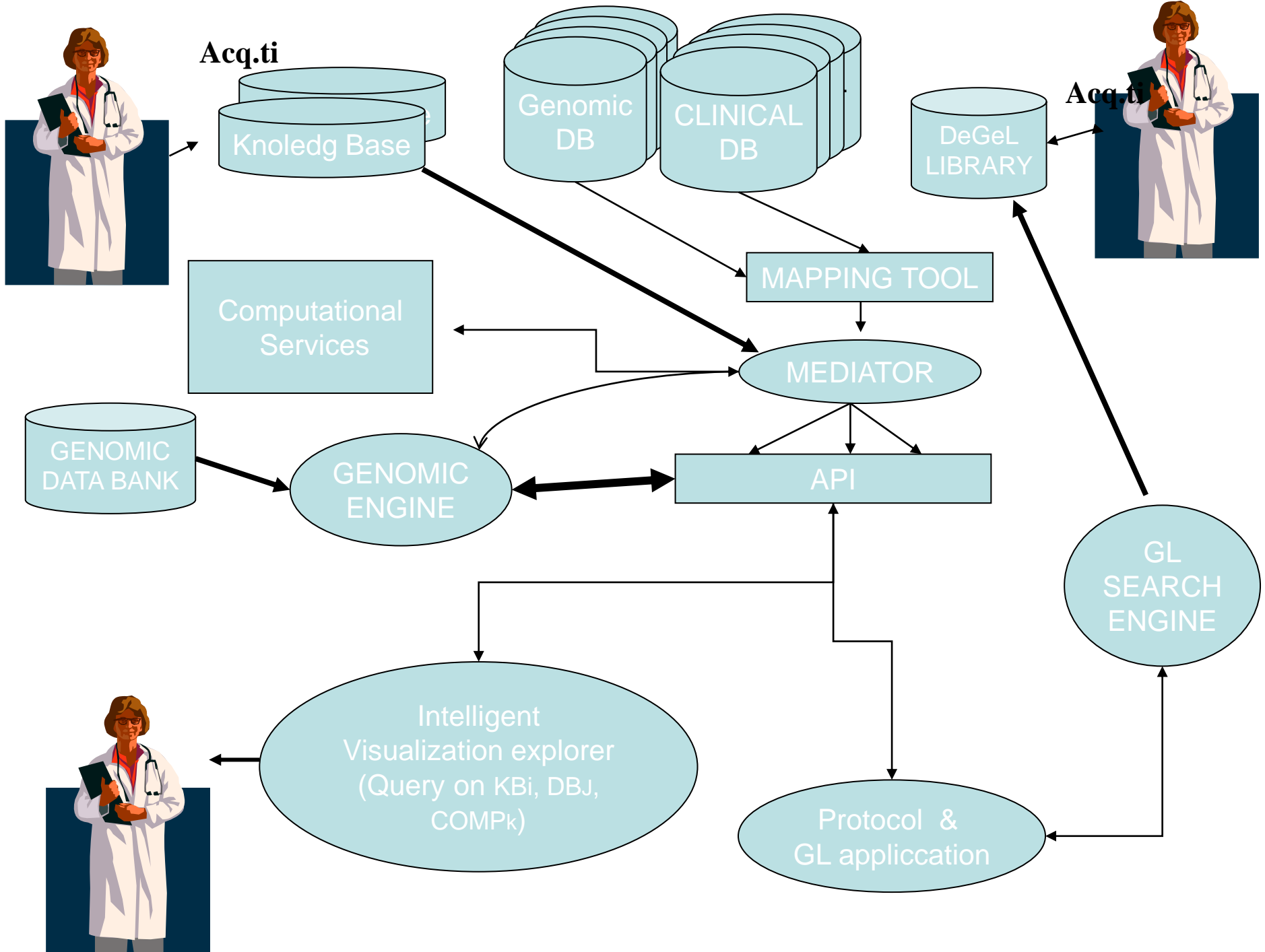
Telerehabilitation: distance activity for Psycho-physical care-treatment

- iCone Hand Rehab & Exoskeleton or walking wearable "robot"



NeuroWeb: European Project financed for DATA Integration in Neurologic Diseases





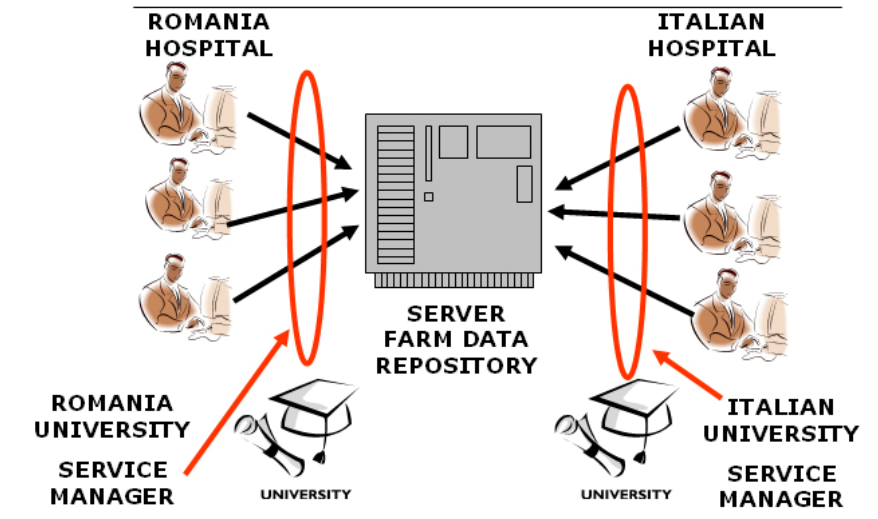
INTERHOSPITAL BETWEEN ITALY AND ROMANIA

Timisoara Hospital

Brescia Hospital

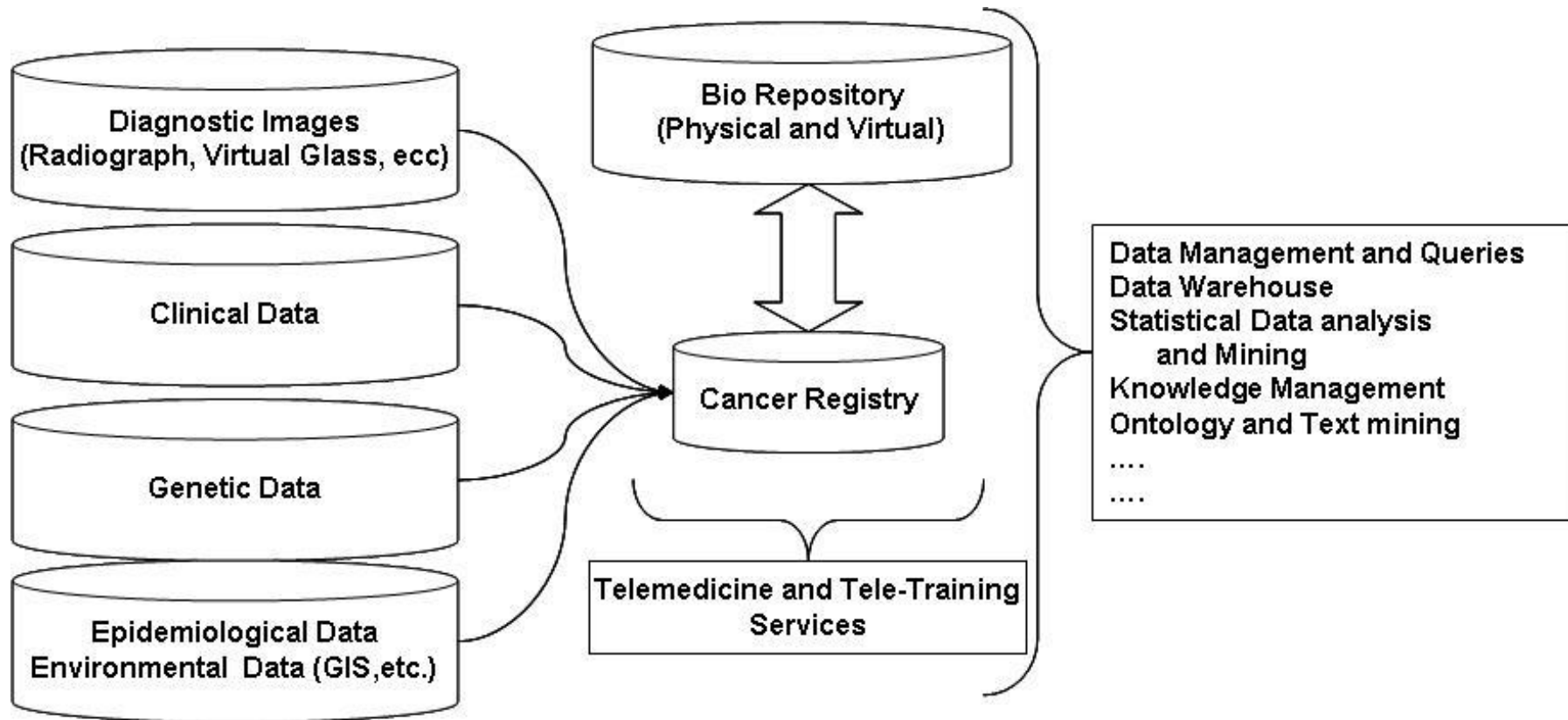
Florence Hospital

Network Schema



- Telecardiology
- Telepatology
- Teleradiology

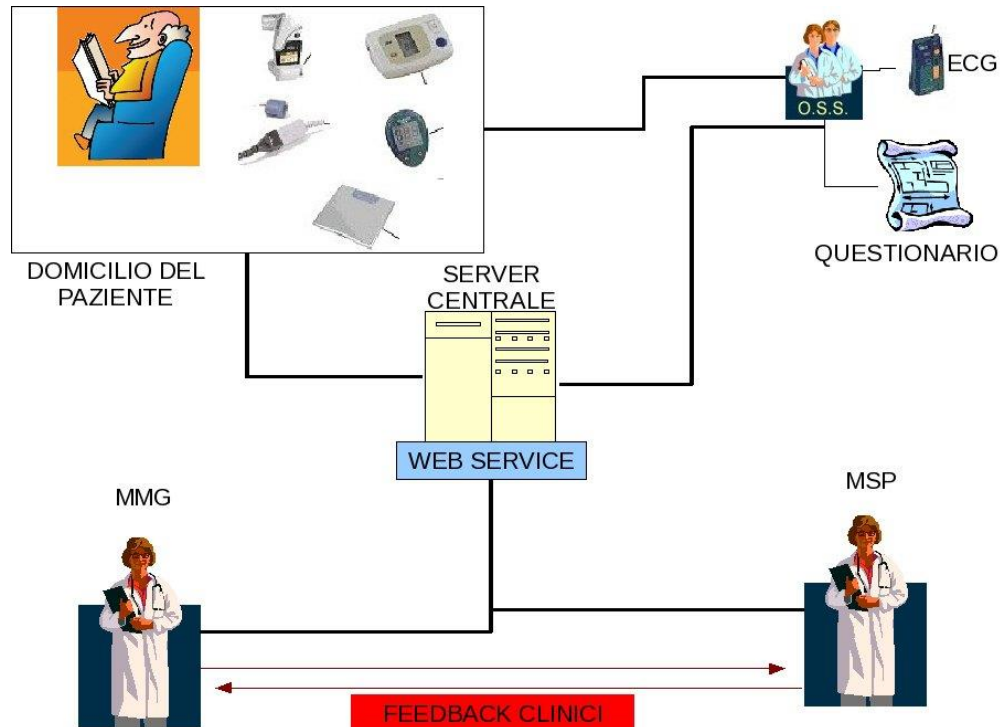
Telepatology Net for Cancer Registry: Epidemiology, Research and Treatment



New project: TeleMediCare platform for elderly and chronic patients with Coronavirus

Pazienti anziani cronici a rischio (cardiopatie, diabete, BPCO, tumori, deficit cognitivi, disabili post ictus....)

- Press. e Freq. Cardiac, EKG, Glucosio, Peso, SPO2, Spirometria, Temperatura*



Device: digital Pulse for SPO2

❑ Pulsimeter Watch



Glucometer Device



Kit of sensors

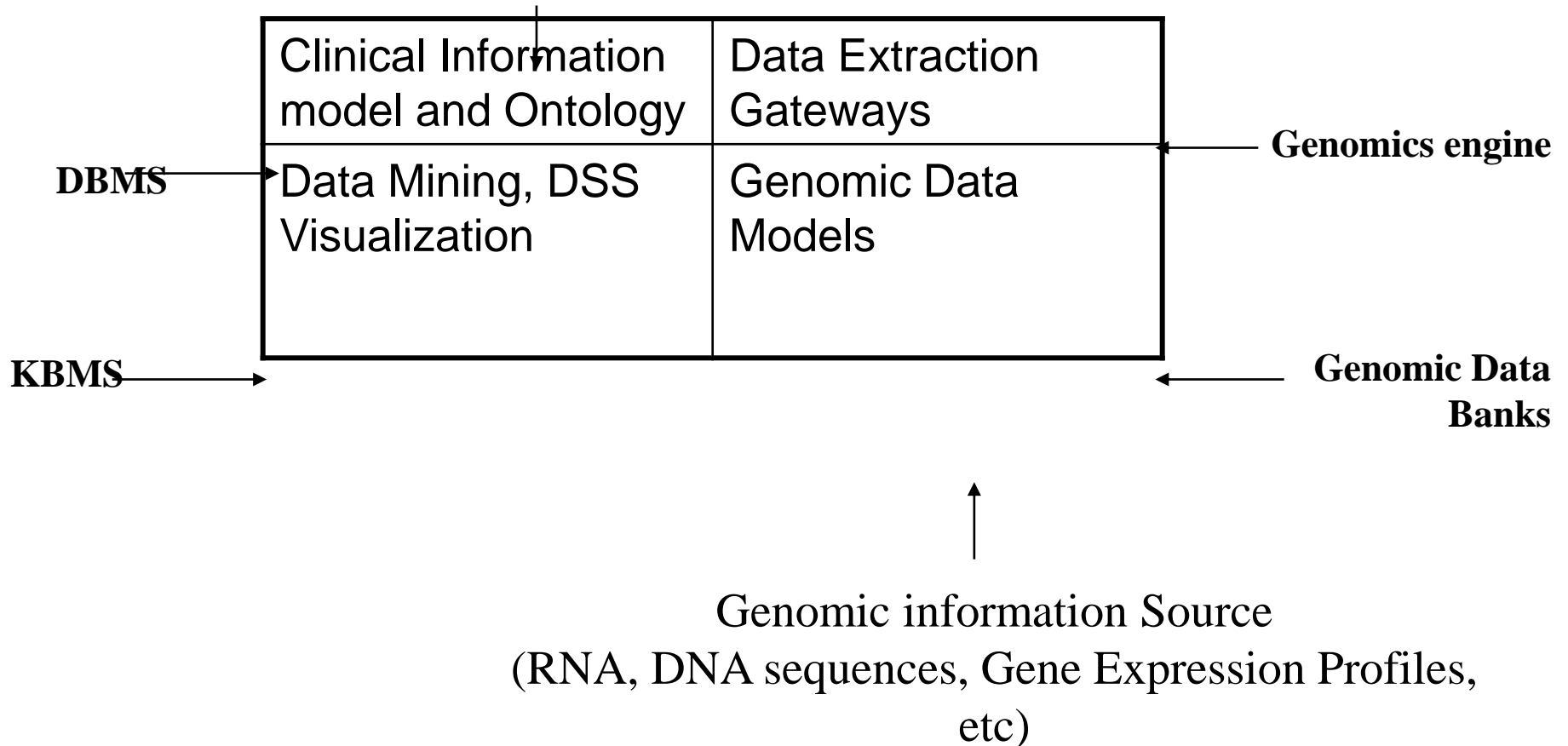


Using devices



Coronavirus Bioinformatics System for data integration

Genetic, Clinical, Epidemiological
Data



FIM-Fisica e Informatica in Medicina

- **5° Workshop nazionale
29-30 Maggio 2020, Milano**
- ***IAT: Info-Assistive Technologies***
- ***Telemonitoring e Riabilitazione***
- ***Intelligenza Artificiale e Robotica***
- ***Diagnostica per immagini, 3D Imaging e
Printing***
- ***Medicina Nucleare, Laser, ultrasuoni,
elettro e magneto-terapie***
- ***Medicina Fisica, Telemedicina, sensori,
biodevices e IoT***