

**U.S. ARMY MEDICAL RESEARCH & MATERIEL COMMAND**



# **HealthGRID: Broadband Medical Networks**

**Dia CUDI de Institutos Nacionales de Salud  
6 Septiembre 2005**

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Broadband Medical Networks and GRID Technology  
Telemedicine & Advanced Technology Research Center  
(US Army Medical Research and Materiel Command)**

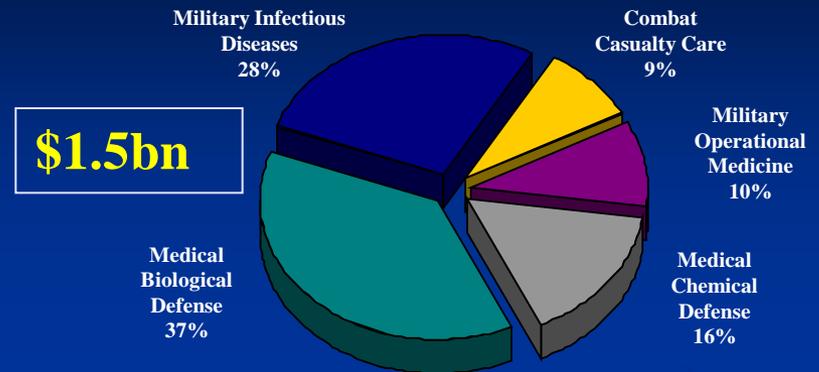
# Agenda

- TATRC Overview
- World Health Organization (WHO)
  - Resolution
  - Priorities
- Framework for Opportunities
- Wrap Up

# U.S. Army Medical Research and Materiel Command Core Medical S&T Program Areas

## Military Infectious Diseases

- Medical readiness
- Vaccines
- Biotechnology
- Prophylaxis/treatment drugs
- Diagnostics/prognostics
- Vector control



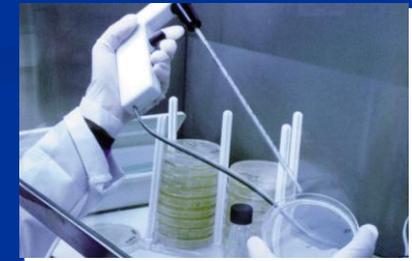
## Combat Casualty Care

- Lightweight medical equipment
- Medical C4ISR
- Trauma care
- Health monitoring and diagnostic technology



## Medical Biological Defense

- Vaccines/therapies
- Field-portable diagnostic systems
- Medical readiness
- Biotechnology



## Military Operational Medicine

- Soldier selection and sustainment
- Soldier performance
- Warrior system modeling
- Health hazards protection
- Diagnostics/prognostics
- Health monitoring



## Medical Chemical Defense

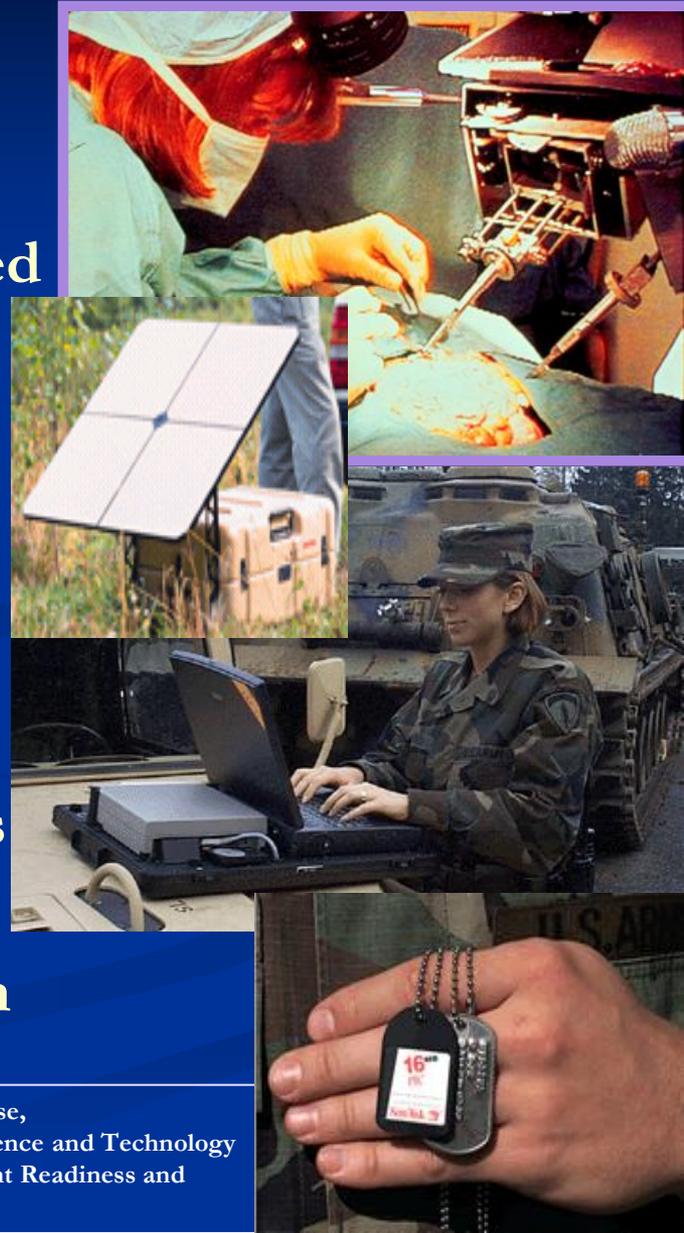
- Medical management of chemical warfare casualties
- Medical readiness
- Drug prophylaxes/pretreatments
- Diagnostics/therapeutics



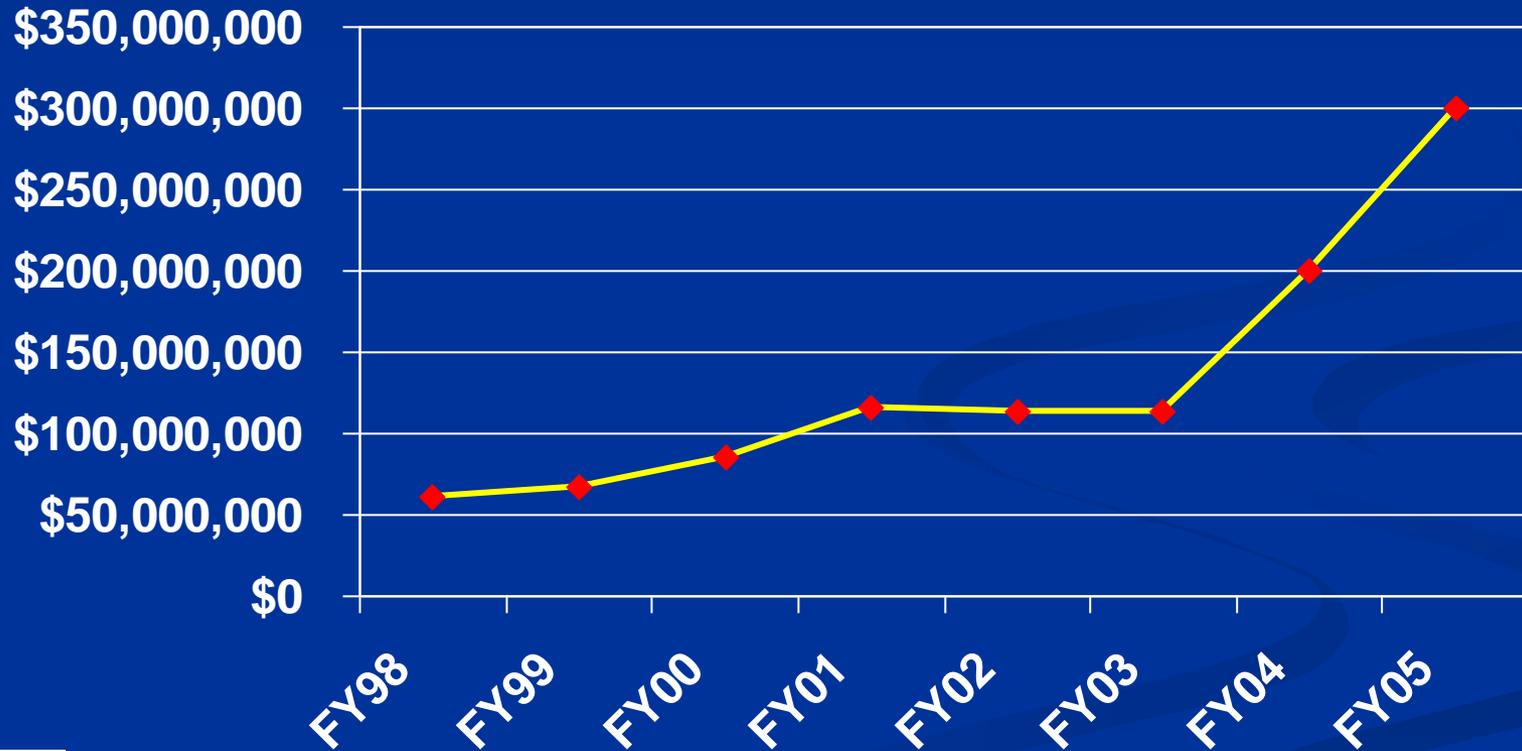
# Mission

Apply physiological and medical knowledge, advanced diagnostics, simulations, and effector systems integrated with information and telecommunications for the purposes of enhancing operational and medical decision-making, improving medical training, and delivering medical treatment across all barriers.

The program scope is to identify, explore, and demonstrate key technologies and biomedical principles required to overcome technology barriers that are both medically and militarily unique.



# Total Funding



# TATRC Funding Programs

- Congressional Special Interest
- Dual Use Science & Technology
- Small Business Innovative Research
- Defense Health
- Small Business Technology Transfer
- Federal Partnerships



# Leverages Academic Partnerships

## ...For Basic and Applied Research

- Georgetown University (CA-Medical Vanguard)
- Howard University (CRDA-Urban Telemed)
- Harvard University (CA-CIMIT)
- Mass Institute of Technology (CA-CIMIT)
- University of Maryland (IPA/CA – ORF)
- University of Utah (Contract-Teleophth)
- Rutgers University (CA-CEMBR)
- Saint Francis University (CRDA-CERMUSA)
- Drexel University (CA-CIMERC)
- Loma Linda University (CA-NMTB/Proton Beam)
- University of Tex - Houston HSC (CA-DREAMS)
- University South Florida (CA-Telerad/Adv Cancer Detect)
- University of Hawaii (CA-Telemed Curric'Im)
- University of Pittsburgh (Contract-GGTS)
- Stanford University (Contract-Affiliates Prog)
- Yale University (IPA-Adv Tech Watch)
- Texas A & M (CA-DREAMS)
- Johns Hopkins University (CA-Periscopic MIS)
- University of Southern California (CA-NGI)
- University of Oregon (CA-BBM)



# Uses DoD & Federal Partnerships

*...for Non-Medical and Supporting Technologies*

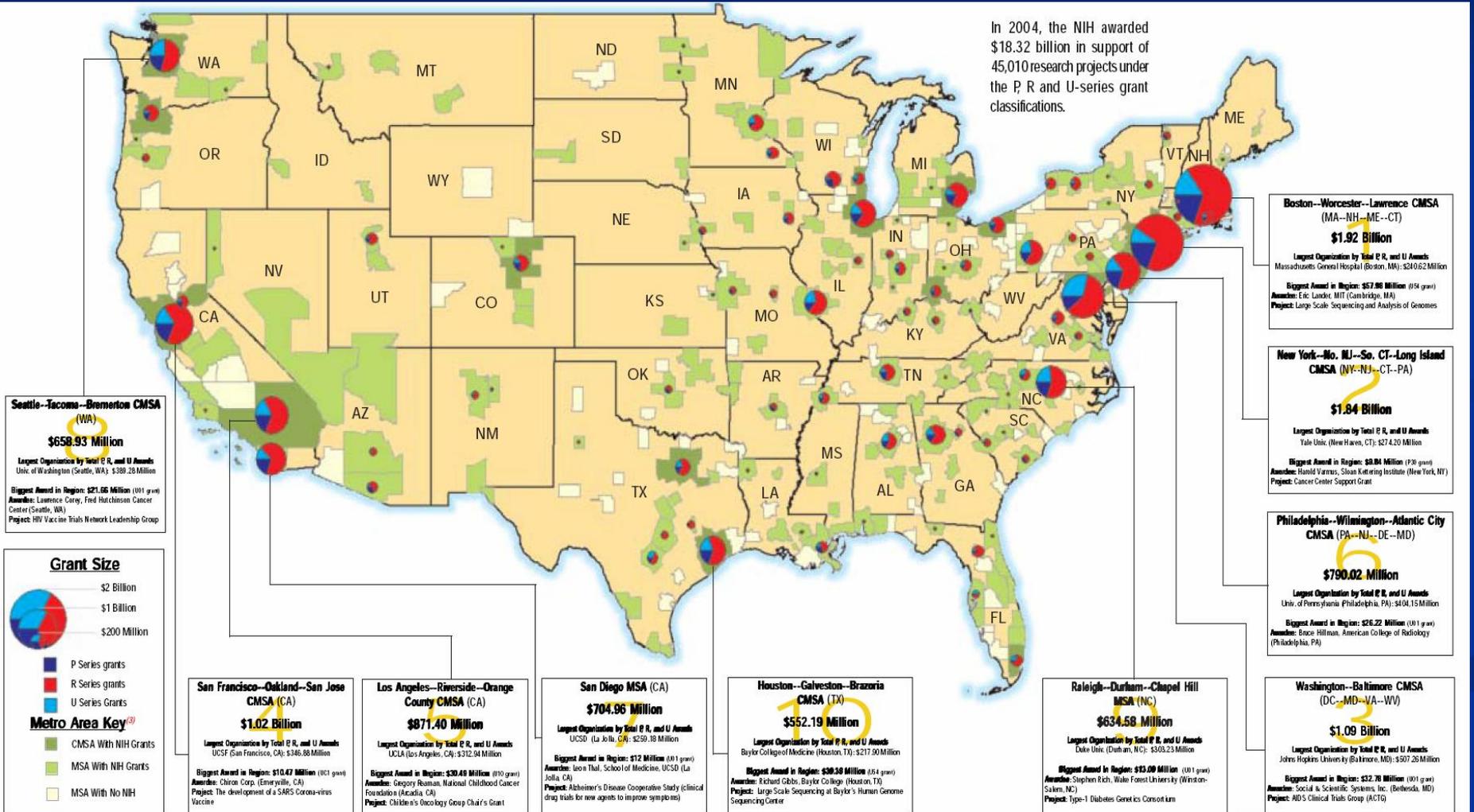
- U.S. Army Research Laboratory
- Los Alamos National Laboratory
- Sandia National Laboratory
- U.S. Army, Signal Battle Laboratory
- Commo & Electronic Command
- Oak Ridge National Laboratory
- Veterans Administration
- NASA
- DARPA
- National Library of Medicine (NIH)
- Agency for Health Research & Quality
- Food & Drug Administration
- Centers for Disease Control & Prevention
- \* Distributed, Synchronized Databases
- \* Advanced, Adaptive Multilevel Security
- \* Data Mining of Disparate Databases
- \* Secure Global Positioning System
- \* Network Management Tools
- \* Info Warfare Surveillance & Defense Tools
- \* Artificial Intelligence - Expert Systems
- \* Fault Avoidance and Recovery Systems
- \* Hands Free, Wireless Telecom
- \* Wireless Networking
- \* Data Compression
- \* High Bandwidth Datalinks
- \* Low Power Electronics
- \* Multi-platform, Interoperable Software
- \* Complex Modeling and Simulation

# 2004

## NIH Funding of Biomedical Research<sup>(1)</sup>

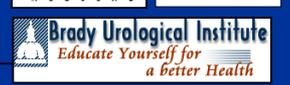
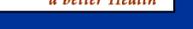
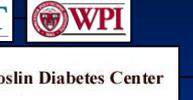
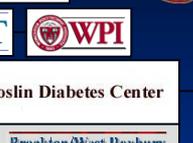
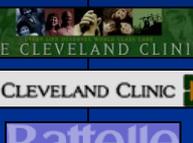
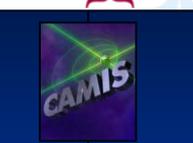
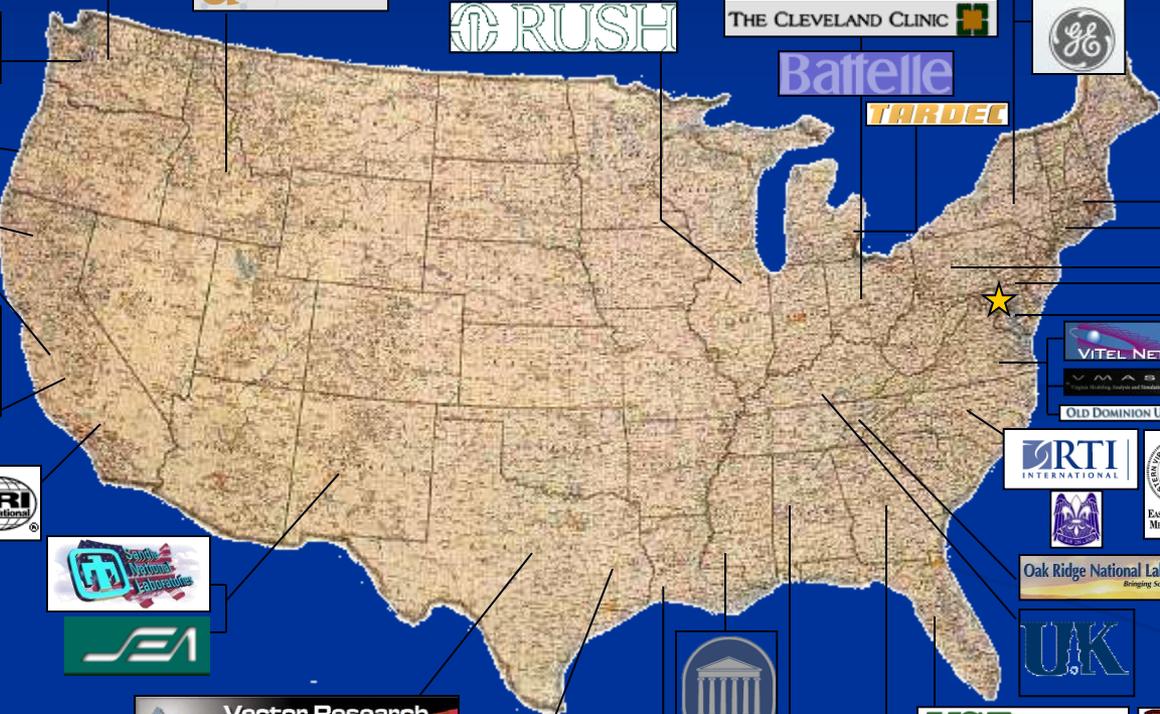
Aggregated by Metro Areas<sup>(2)</sup>

In 2004, the NIH awarded \$18.32 billion in support of 45,010 research projects under the P, R and U-series grant classifications.



(1) Based on NIH extramural support of research projects and centers (P-series), research project grants (R-series), cooperative research agreements (U-series).  
 (2) Awards were geocoded by the five-digit zip-code location of award recipients. Metro area shares were then aggregated by zip-code to metro-area correspondence.  
 (3) Metro areas are based on the 2000 US Census Bureau's definition of both Metropolitan Statistical Areas (MSAs) and Consolidated Metropolitan Statistical Areas (CMSAs).

# TATRC is a network of "Best of Breed" public/private advanced medical technology partnerships.



# Leverages International Partnerships

*...to Accelerate Development*

- US/Norway Telemedicine (Wireless, Handheld)
- European Union Collaboration
- NATO – Telemedicine Standardization Committee
- Canada: International Space Station (Telesurgery)
- South African Military Health Service (Peacekeeping)
- International Global Satellite System: Poland (CME)
- Landmine Victim Assistance: Central America > Bosnia > Afghanistan
- Partnership for Peace – Romanian Needs Assessment
- Fellowship Programs: Pakistani, Polish
- Yuma Proving Ground - Panama Telepathology – Hyperspectral Imaging
- Argentina – Civilian Medical Emergency Response
- Israeli Trauma Simulator
- South Korean Exchange Program
- ATA Symposiums
  - EU (2001) – Africa (2002) - Latin America (2003) - E.Europe (2004) – Asia (2005) – W. Europe (2006)

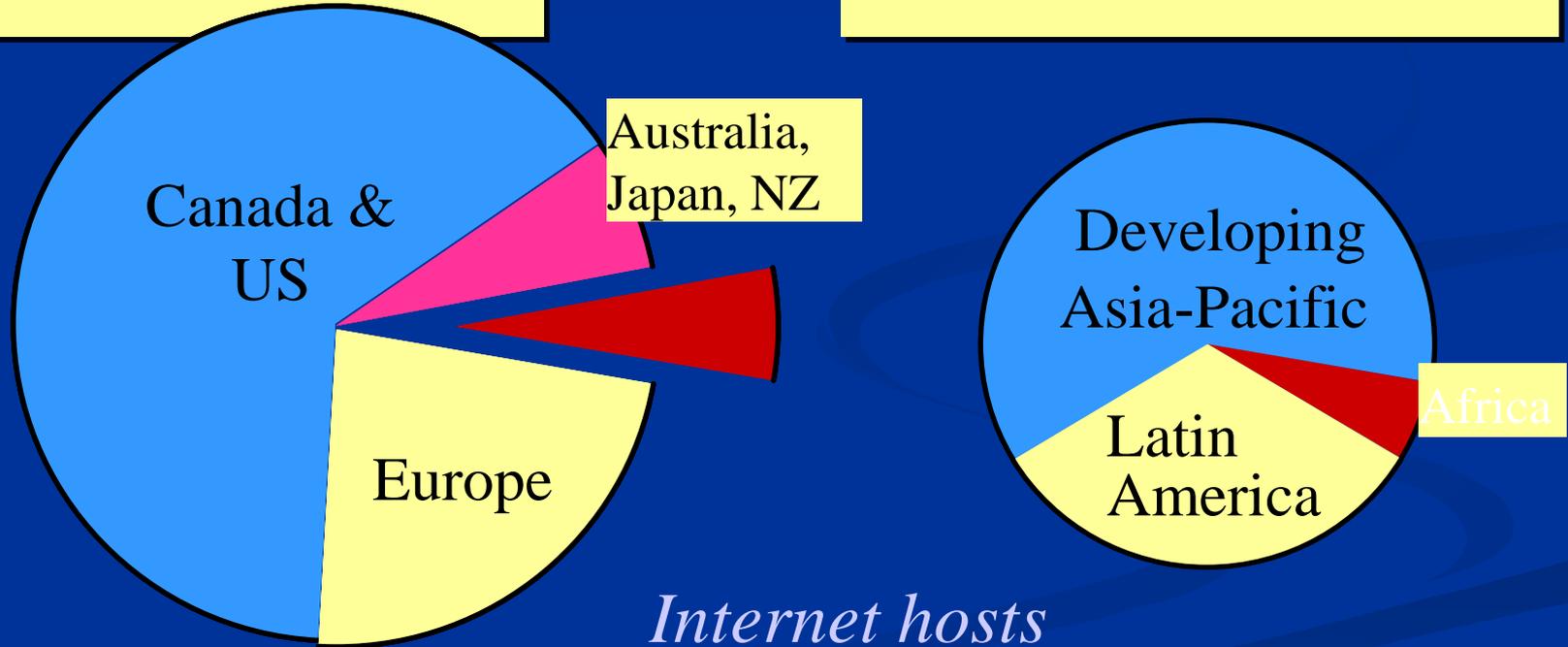
# Equity Our Biggest Challenge

## *High-income countries*

*16% population*  
*7% burden of disease*  
*89% health spending*  
*94% Internet hosts*

## *Low-income countries*

*84% population*  
*93% burden of disease*  
*11% health spending*  
*6% Internet hosts*





## HABEMUS.....

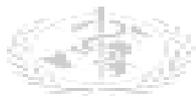
WHO eHealth Strategy  
Stratégie de l'OMS pour la cybersanté  
Estrategia de ciber salud de la OMS  
Стратегия ВОЗ в области электронного  
здравоохранения  
世界卫生组织的电子卫生保健  
إستراتيجية الصحة الإلكترونية لمنظمة الصحة العالمية

World Health Assembly, May 2005

## **eHealth Resolution WHA.58.28 Approved**

*[http://www.who.int/gb/ebwha/pdf\\_files/WHA58/WHA58\\_28-en.pdf](http://www.who.int/gb/ebwha/pdf_files/WHA58/WHA58_28-en.pdf)*

- **Develop a national eHealth strategy, including legal and infrastructure frameworks, and public-private partnerships**
- **Mobilize multi-sectoral collaboration**
- **Establish national eHealth centres and networks of excellence**



# Health in the Millennium Development Goals

## Health Targets

## Health Indicators

Millennium Development Goals, targets and indicators related to health

GOAL 1: ERADICATE EXTREME POVERTY AND HUNGER	GOAL 2: ACHIEVE UNIVERSAL PRIMARY EDUCATION	GOAL 3: PROMOTE GENDER EQUALITY AND EMPOWER WOMEN	GOAL 4: REDUCE CHILD MORTALITY	GOAL 5: IMPROVE MATERNAL HEALTH	GOAL 6: COMBAT HIV/AIDS, MALARIA AND OTHER DISEASES	GOAL 7: ENSURE ENVIRONMENTAL SUSTAINABILITY	GOAL 8: DEVELOPING COUNTRIES OBTAIN A BETTER INTERNATIONAL ECONOMIC ENVIRONMENT																																																																																											
Target 1: halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day	Target 1: halve by 2015, boys and girls everywhere, the number of children out of school	Target 1: increase gender parity in primary and secondary education and at all levels of education by late 2015	Target 5: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	Target 6: Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio	Target 7: Have halted by 2015 the spread of HIV/AIDS	Target 8: Have halted by 2015 the incidence of malaria and tuberculosis and begun to reverse the incidence of HIV/AIDS	Target 9: Integrate the socially and environmentally sound components of the Millennium Development Goals	Target 10: Halve by 2015 the proportion of people without sustainable access to safe drinking water	Target 11: By 2015, improve the lives of at least 100 million slum dwellers	Target 12: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system	Target 13: Address the special needs of the least developed countries	Target 14: Address the special needs of landlocked developing countries and small island developing states	Target 15: Develop countries' export capacity to diversify in accordance with their comparative advantages and to create and protect sustainable livelihoods	Target 16: In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries	Target 17: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications	Target 18: Increase gender parity in primary and secondary education and at all levels of education by late 2015	Target 19: Under-five mortality rate 20. Infant mortality rate 21. Neonatal mortality rate 22. Proportion of population fully immunized against measles	Target 20: Under-five mortality rate 21. Infant mortality rate 22. Neonatal mortality rate 23. Proportion of population fully immunized against measles	Target 21: Maternal mortality ratio 22. Proportion of births attended by skilled health personal	Target 22: Prevalence and incidence rates associated with malaria 23. Prevalence and incidence rates associated with tuberculosis 24. Prevalence and incidence rates associated with HIV/AIDS 25. Proportion of people living with HIV/AIDS who are on antiretroviral therapy 26. Directly Observed Treatment Short-course (DOTS)	Target 23: Prevalence of population with sustainable access to an improved water source, urban and rural	Target 24: Proportion of population with sustainable access to an improved	Target 25: Proportion of population with access to affordable essential drugs on a sustainable basis	Target 26: Proportion of population with access to affordable essential drugs on a sustainable basis	Target 27: Proportion of population with access to affordable essential drugs on a sustainable basis	Target 28: Proportion of population with access to affordable essential drugs on a sustainable basis	Target 29: Proportion of population with access to affordable essential drugs on a sustainable basis	Target 30: Proportion of population with access to affordable essential drugs on a sustainable basis	Target 31: Proportion of population with access to affordable essential drugs on a sustainable basis	Target 32: Proportion of population with access to affordable 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**Target 18:**  
**In cooperation with the private sector, make available the benefits of new technologies, especially information and communications.**

Source: Target 18 is one of the United Nations Millennium Development Goals. It was adopted by the United Nations General Assembly (A/59/L.16) on 22 September 2000, and the first report based on the Target was the Millennium Development Goals Report 2005 (A/60/146) on 22 September 2005. The Target was revised in the Millennium Development Goals Report 2008 (A/63/69) on 22 September 2008. Target 18 was revised in the Millennium Development Goals Report 2010 (A/65/69) on 22 September 2010. Target 18 was revised in the Millennium Development Goals Report 2012 (A/67/69) on 22 September 2012. Target 18 was revised in the Millennium Development Goals Report 2014 (A/69/69) on 22 September 2014. Target 18 was revised in the Millennium Development Goals Report 2016 (A/71/69) on 22 September 2016. Target 18 was revised in the Millennium Development Goals Report 2018 (A/73/69) on 22 September 2018. Target 18 was revised in the Millennium Development Goals Report 2020 (A/75/69) on 22 September 2020. Target 18 was revised in the Millennium Development Goals Report 2022 (A/77/69) on 22 September 2022.

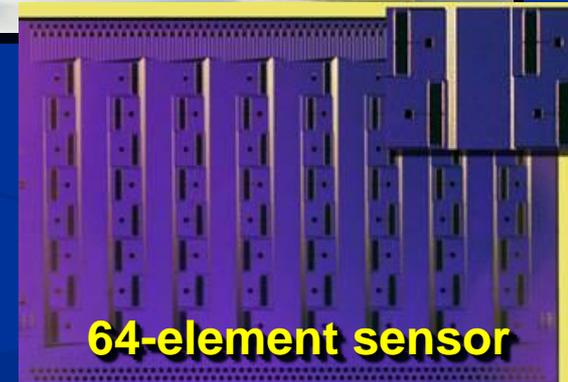
## WHA.58 Resolution 28 (continued)

- Promote international collaboration
- Provide technical support
- Facilitate integration of eHealth
- Continue to promote health awareness and healthy lifestyle through eLearning services
- Support inter-regional initiatives among groups of countries that speak a common language
- Document best practices and report on them

# TATRC Homeland Defense

## Chemical/Biological/Nuclear Threat Detection

- MEMS Sensor System
  - High Sensitivity
  - Nanoliter Samples
  - Short Analysis Time
  - High-density Information
  - Low Cost

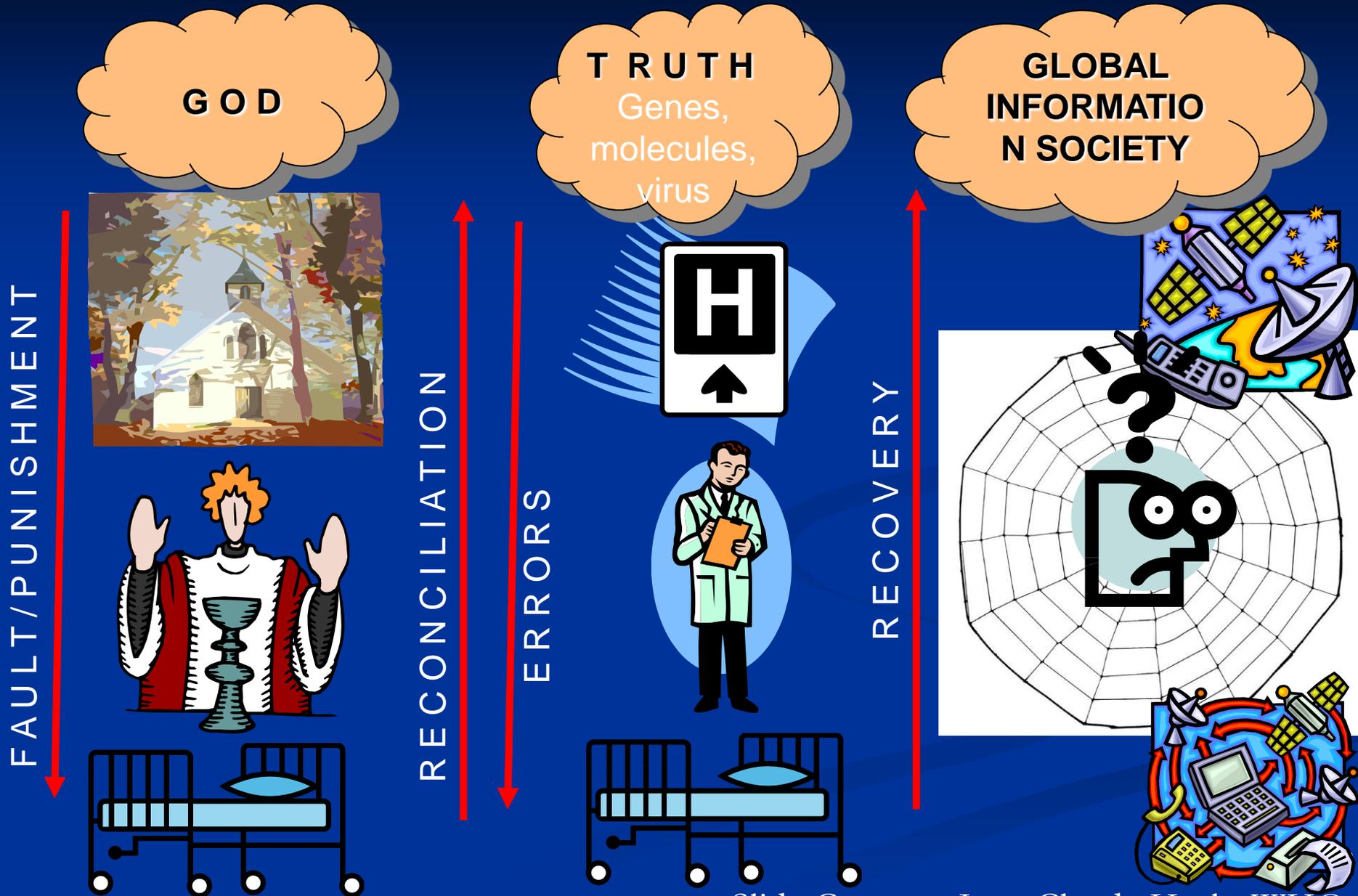


Typical of TATRC programs for threat detection is the MicroElectroMechanical sensor for detection of anthrax, developed through the Harvard Medical School Center for Integrating Medicine and Innovative Technology, the Draper Research Laboratory and MIT.

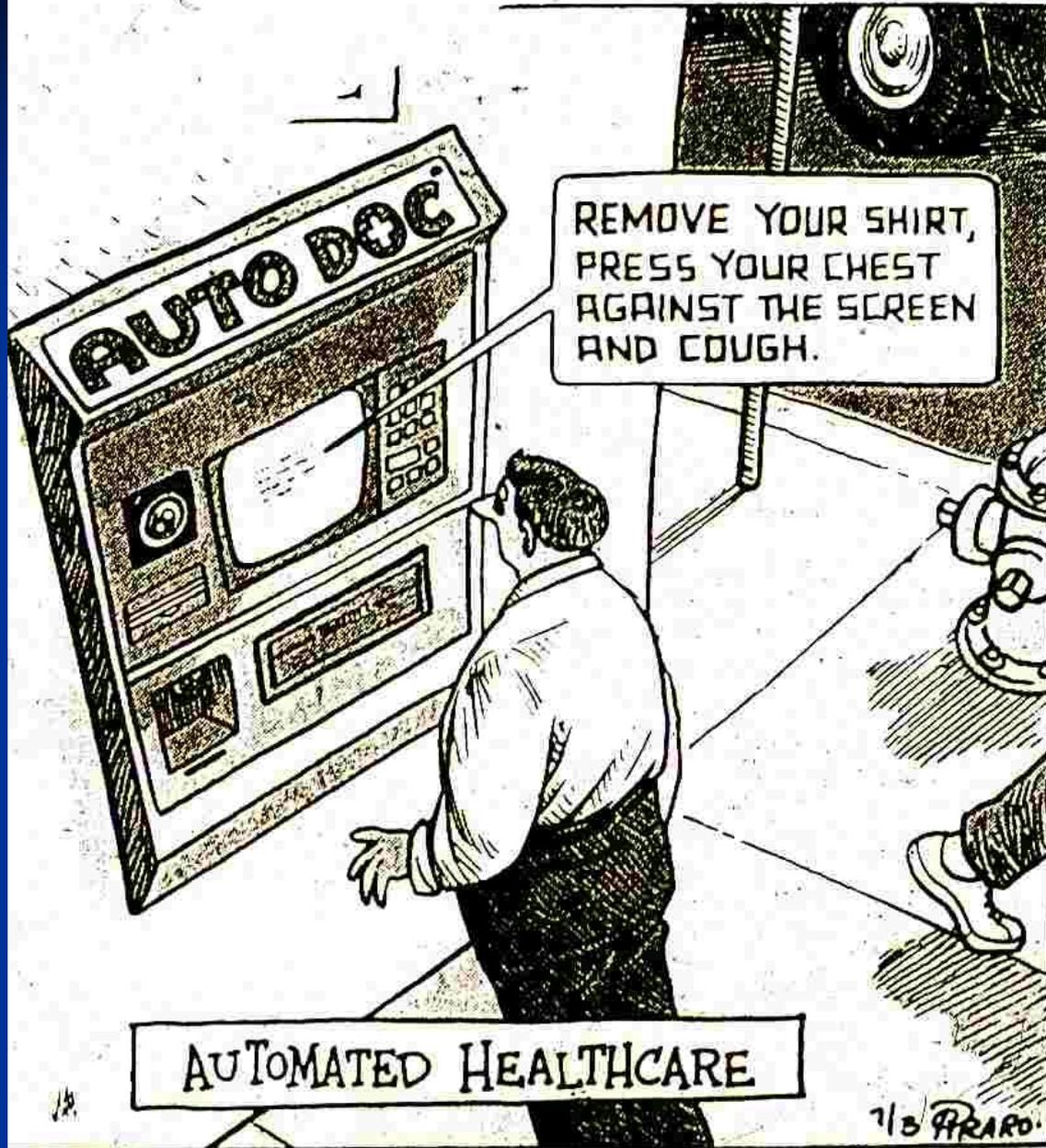
# WHA.58 Resolution 28: next steps

- 2nd World Summit on Information Society (WSIS), November 2005, Tunis
  - eHealth Report
  - Memorandum of Understanding with ITU
  - Memoranda of Understanding with satellite Telco companies
- World Bank commitment
- European Union and WHO partnerships

# Eschatological Approach of Health Paradigms



"Telemedicine System of the Future"



# Key Question

**“Are there unique, regional opportunities for technology development and/or avenues of collaboration?”**

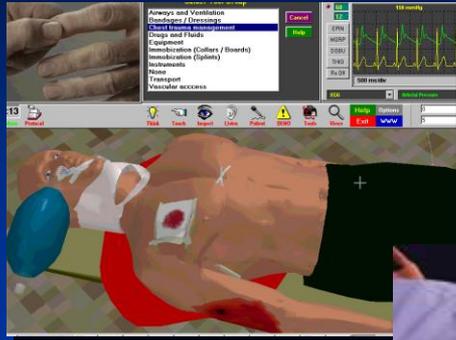
# TATRC Life Cycle Health Care Management

## 5 P's of Precision Healthcare

<b><u>Predictive</u></b>	Genetics, Bio-Informatics & Multi-Modality Imaging
<b><u>Preventive</u></b>	Disease Prevention
<b><u>Point of Care</u></b>	Mobile Communications, Ubiquitous Computing and Local Intelligence
<b><u>Parametric</u></b>	Multi-Parametric Information Reference to Patient Baseline and Standard Model
<b><u>Personalized</u></b>	Individualized Therapeutics to Each Patient

To care for the chronic diseases of middle age such as diabetes, hypertension and heart disease, TATRC focuses on the “5 Ps” to improve the delivery of health care service.

# TATRC Advanced Distributed Learning



PC-based Interactive  
VR/Multimedia



Digitally Enhanced  
Mannequins



Virtual  
Workbenches



Total Immersion  
Virtual Reality

To meet multiple training needs, TATRC is actively developing computer imaging technologies and telecommunications to achieve the most effective training possible.



# TATRC Life Cycle Health Care Management

Telemedicine is the cornerstone of TATRC geriatric care, such as the home monitoring equipment being developed in collaboration with the Mercy Health System to improve the management of congestive heart failure.

Home Health Congestive Heart Failure Protocol base data collection.

Parameters:

Blood Pressure

Heart Rate

Respirations

Oral Temperature

Heart and Lung  
Assessment with  
Stethoscope

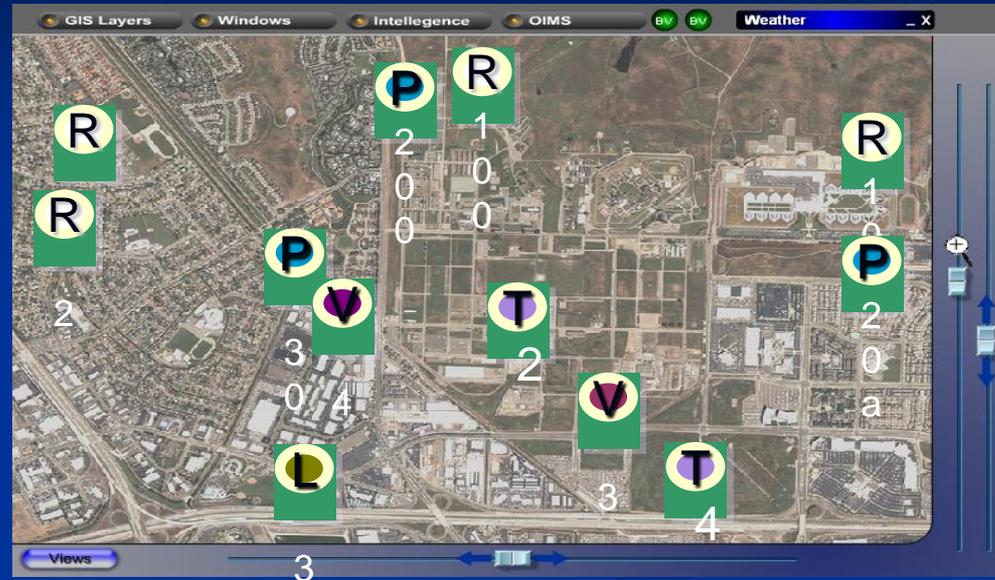
ECG

Oxygen Saturation



Assessment of general appearance, pedal edema and mental status will be obtained through the video camera, as well as questions presented by the telemed nurse.

# Wireless Sensor System for Water Supply Security



- Intelesense Technologies, Inc.
- Water quality management with real-time data
  - System of small, inexpensive sensors
  - Water & air quality measurements
  - Data transmitted to central server; live data stream anytime (e.g. GIS); system of alerts
- System deployed & evaluated Hawaii watershed

# Doing Business with TATRC

- **MRMC Broad Agency Announcement (BAA 05-1)**
  - <http://www.usamraa.army.mil/pages/index.cfm>
- **General process**
  - Submit pre- proposal to MRMC/TATRC
  - Review for scientific and programmatic merit
  - Award funding
  - Project monitoring and accountability
- **Broadband Medical Networking activities**
  - Integrated Research Team BMN
  - iGRID 26-30 September, San Diego, CA
  - HealthGRID

# Questions? More information?

- <http://www.tatrc.org>
- **Points of Contact:**
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    - [mkratz@tatrc.org](mailto:mkratz@tatrc.org)
    - ([mkratz@umich.edu](mailto:mkratz@umich.edu))
  - **Jan M. Patterson**
    - 310-574-8401
    - [patterson@tatrc.org](mailto:patterson@tatrc.org)

