Perspectives in the E-health Policies

February 4, 2013

Yasuo Sakamoto

The Ministry of Internal Affairs and Communications

ICT Utilization Strategies in the Medical Field

Issues in the Medical Field

Taking advantage of ICT's ability to transcend time and distance

World's most advanced telecommunications infrastructure

New trends

○ **Barrier-free "ubiquitous society"**

(Connecting people to people, people to things, and things to things)

○ **Developments in easy-to-use ICT**

(Dramatic improvements in user interfaces)

- ・Cloud computing   ・SNS
- ・Smartphones   etc.
- ・Smart TVs

○ **Development of new ICT**
- ・ Communication Robots
- ・ Sensor network
- ・ M2M   ・Big data   etc.

Issues

○Information security
○Personal information/Privacy protection

Medical Related Computerization

○ Realization of the best practice in each area
- ・Verification of qualitative and quantitative effectiveness
- ・Identification of technical and practical issues

○ Expansion of information-sharing systems and covered fields
- ・Within medical facilities (hospitals, clinics)
- ・Medical treatment, nursing care, pharmacies and home care
- ・Medical and healthcare fields

○ Expansion of shared information and its continual utilization

○ Emergency and remote treatment, etc.

○ International cooperation

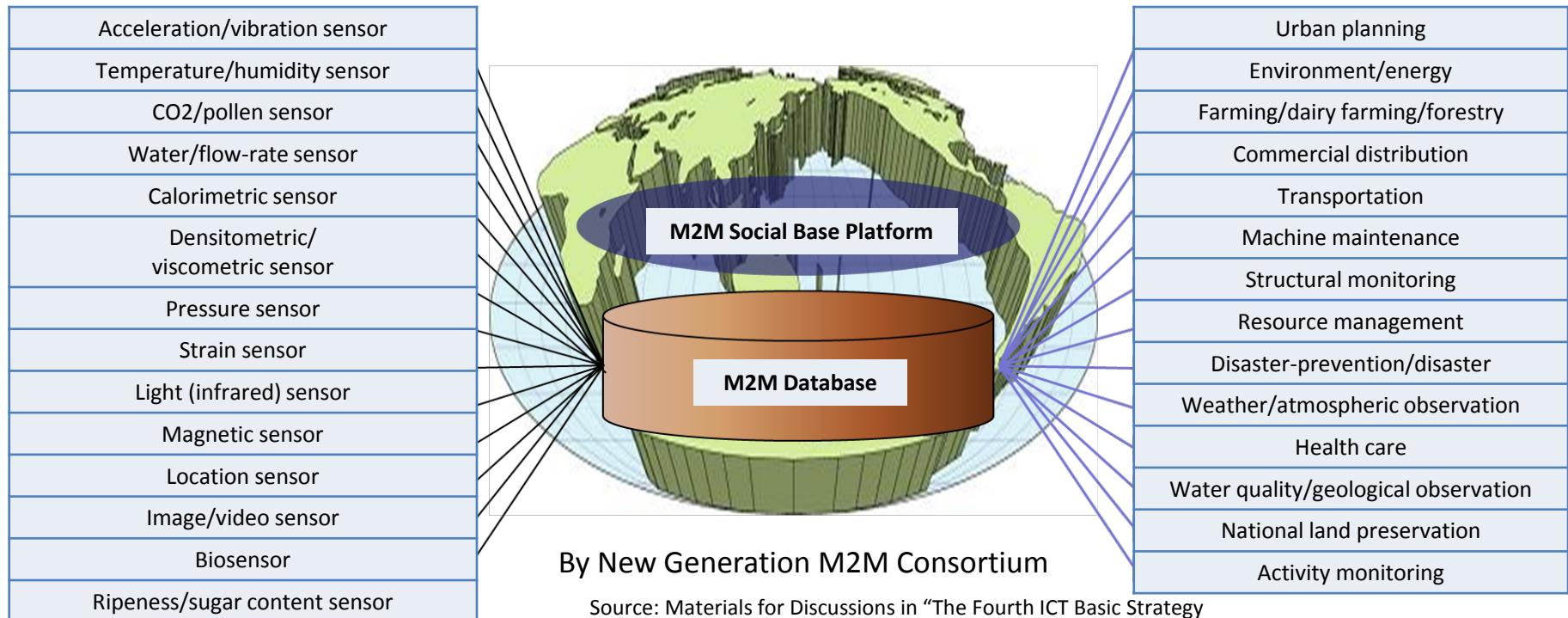○Administration of health-medical-welfare information platform development (Development and operating costs, etc.)

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Trends in ICT

● **Changing trends in ICT are altering its applications**

○ Utilization of wireless broadband

○ Cloud computing

○ Big data, M2M, sensor network

○ Improvements in user-interface

○ Diffusion of SNS

○ Diffusion of smartphones, smart TV's, etc.

➡ Alterations in ICT Application

Sensors	Applications
Acceleration/vibration sensor	Urban planning
Temperature/humidity sensor	Environment/energy
CO2/pollen sensor	Farming/dairy farming/forestry
Water/flow-rate sensor	Commercial distribution
Calorimetric sensor	Transportation
Densitometric/viscometric sensor	Machine maintenance
Pressure sensor	Structural monitoring
Strain sensor	Resource management
Light (infrared) sensor	Disaster-prevention/disaster
Magnetic sensor	Weather/atmospheric observation
Location sensor	Health care
Image/video sensor	Water quality/geological observation
Biosensor	National land preservation
Ripeness/sugar content sensor	Activity monitoring

M2M Social Base Platform
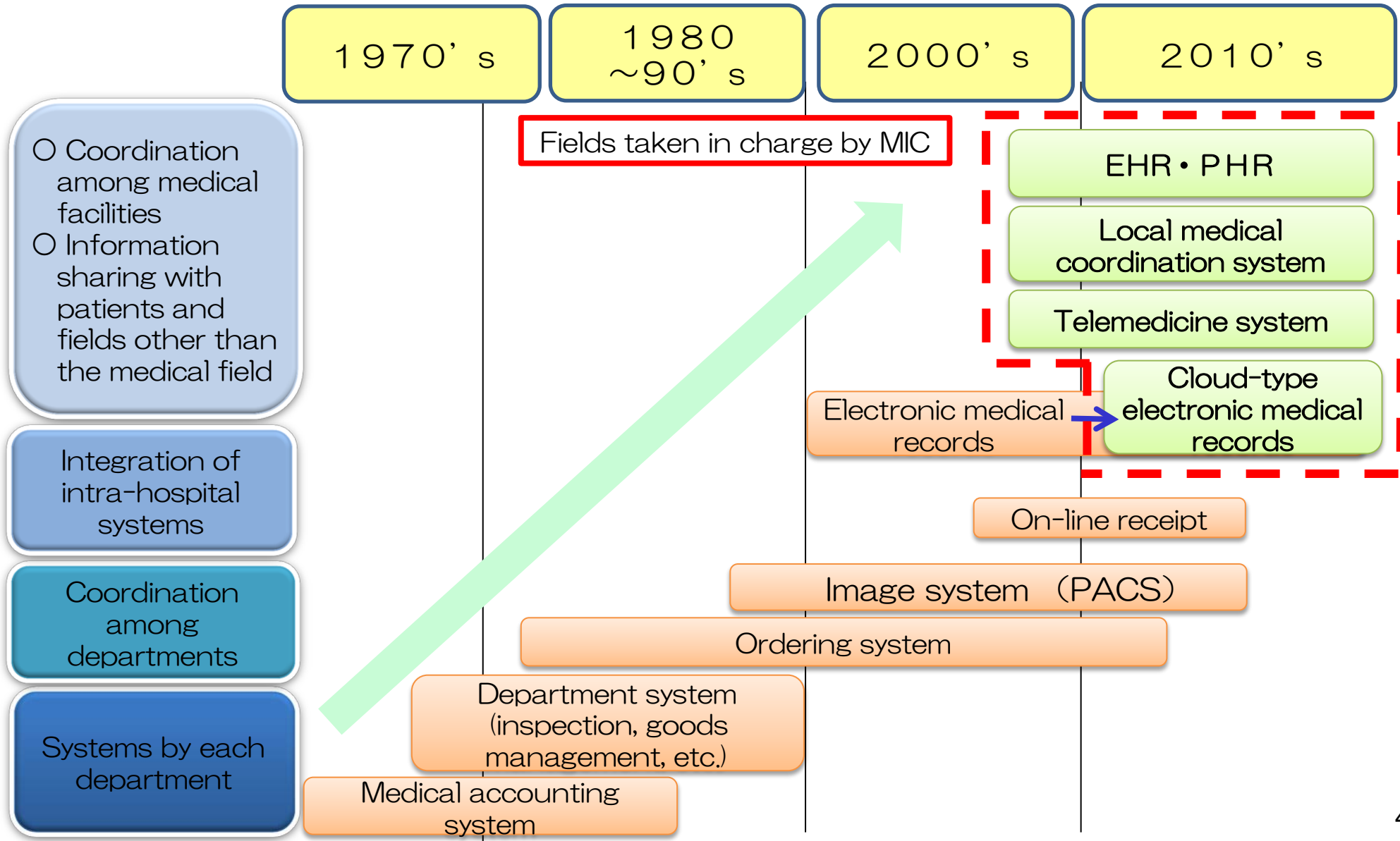
M2M Database

By New Generation M2M Consortium

Source: Materials for Discussions in "The Fourth ICT Basic Strategy Board," board member Morikawa's explication data.

ICT Application in the Field of Medical Care
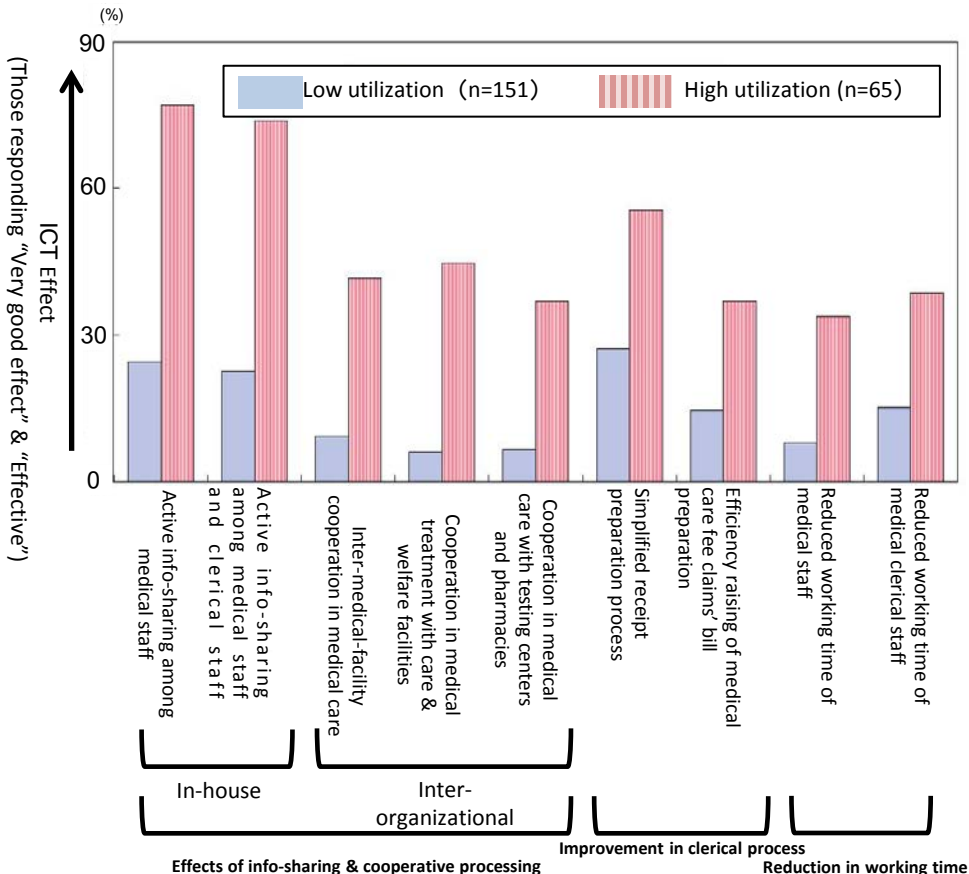
Progress of ICT in the Medical Field

ICT has been progressing from the system coordination by each department or among departments in a medical facility to information sharing among medical facilities and with patients and fields other than the medical field.

1970's	1980 ~90's	2000's	2010's

Fields taken in charge by MIC

○ Coordination among medical facilities
○ Information sharing with patients and fields other than the medical field

Integration of intra-hospital systems

Coordination among departments

Systems by each department

EHR・PHR

Local medical coordination system

Telemedicine system

Electronic medical records → Cloud-type electronic medical records

On-line receipt

Image system （PACS）

Ordering system

Department system (inspection, goods management, etc.)

Medical accounting system

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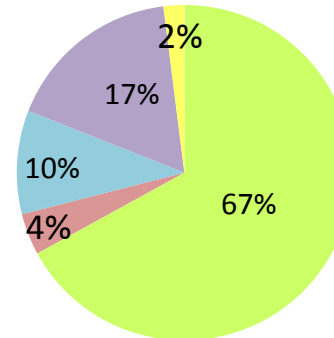# Effects of ICT Utilization in the Medical Field

- The more aggressive the ICT utilization by the medical facility is, the greater the extent of information-sharing and the more efficient the routine office will be.
- The Electronic Health Record (EHR) (medical information link platform), especially, shows improvements in quality of medical treatments and office work.

Relationship of ICT Utilization and Its Effects in Medical Facilities
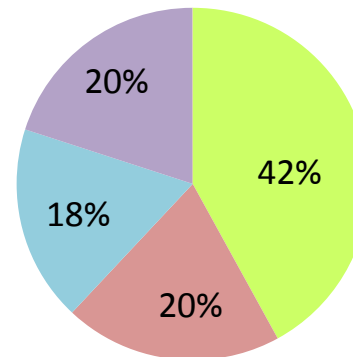
(%)

ICT Effect
(Those responding "Very good effect" & "Effective")

Low utilization (n=151)　　High utilization (n=65)

90
60
30
0

Active info-sharing among medical staff
Active info-sharing among medical staff and clerical staff
Active info-sharing among medical staff and clerical staff
Inter-medical-facility cooperation in medical care
Cooperation in medical treatment with care & welfare facilities
Cooperation in medical care with testing centers and pharmacies
Cooperation in medical care with testing centers and pharmacies
Simplified receipt preparation process
Efficiency raising of medical care fee claims' bill preparation
Reduced working time of medical staff
Reduced working time of medical clerical staff

In-house

Inter-organizational

Improvement in clerical process

Reduction in working time

Effects of info-sharing & cooperative processing

Effects of Programs Using the EHR

Medical Facilities

- 67% Improved quality in medical treatments
- 4% Reduced time in examinations i. e., greater number of patients treated per a day
- 10% Better inter-facility cooperation
- 17% More efficient office work
- 2% Others

Pharmacies

- 42% Improved quality of medication advices
- 20% Shortened time for input of prescription info i. e., reduced input errors
- 18% Better inter-facility cooperation
- 20% More efficient office work
- Others

Local ICT Projects Implemented throughout Japan

- Over 550 projects have been completed, of which 111 are in the medical fields.
- The majority are in imaging telediagnosis, emergency medicine, health-care, etc.
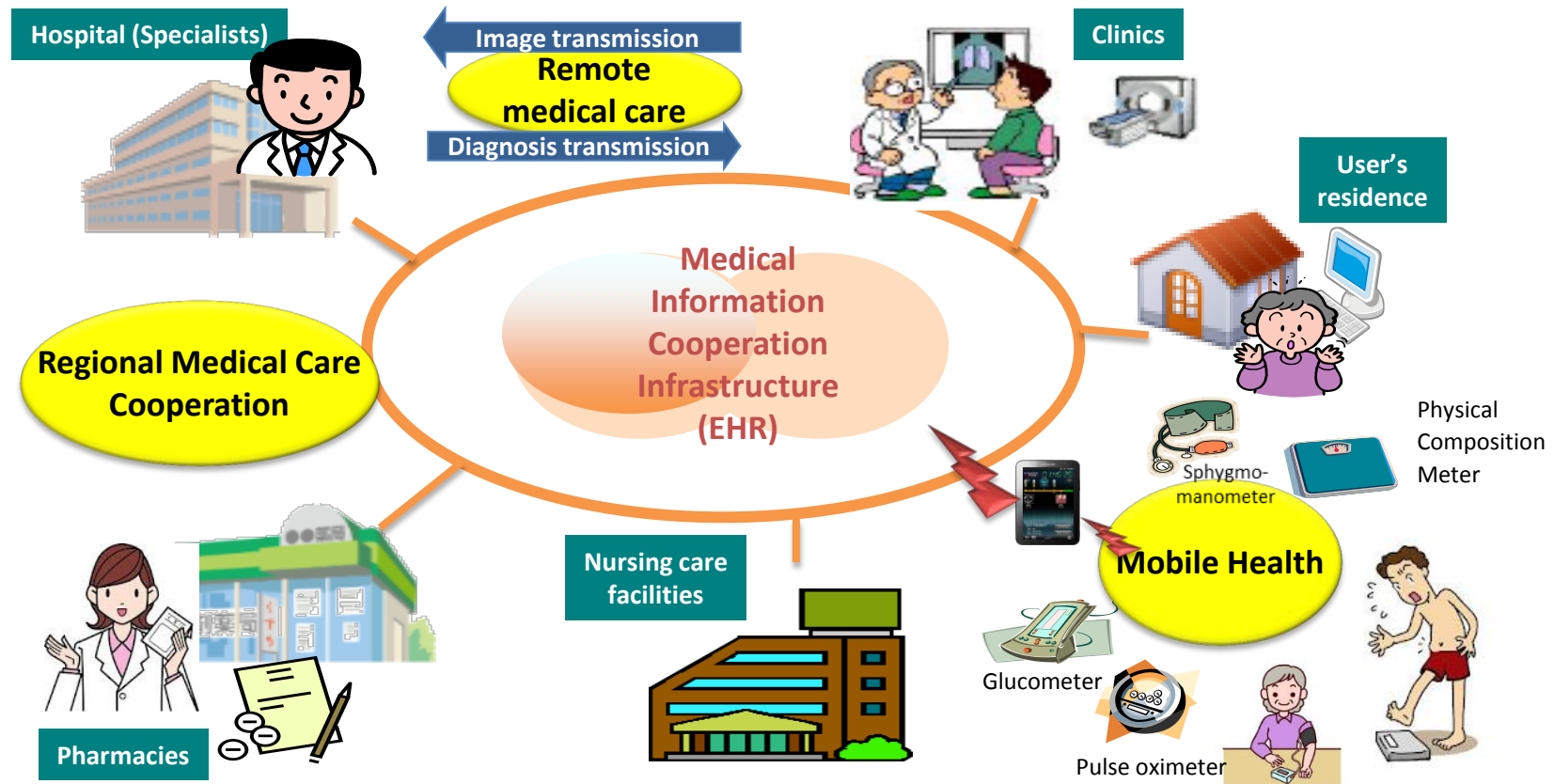
Examples		
Medical Activities	○	Imaging telediagnosis
	●	Telemedicine for patients staying home, support of visiting nursing
	△	Medical info-sharing (Disease control, e-medical records)
	▲	Emergency support (Info-sharing of patients in transit, etc.)
Non-medical Processes	▢	Healthcare, assisting preventive medicine
	■	Medical health information management support
	◇	Care-welfare s service network
	◆	Others (dissemination of health information, medical education, etc.)
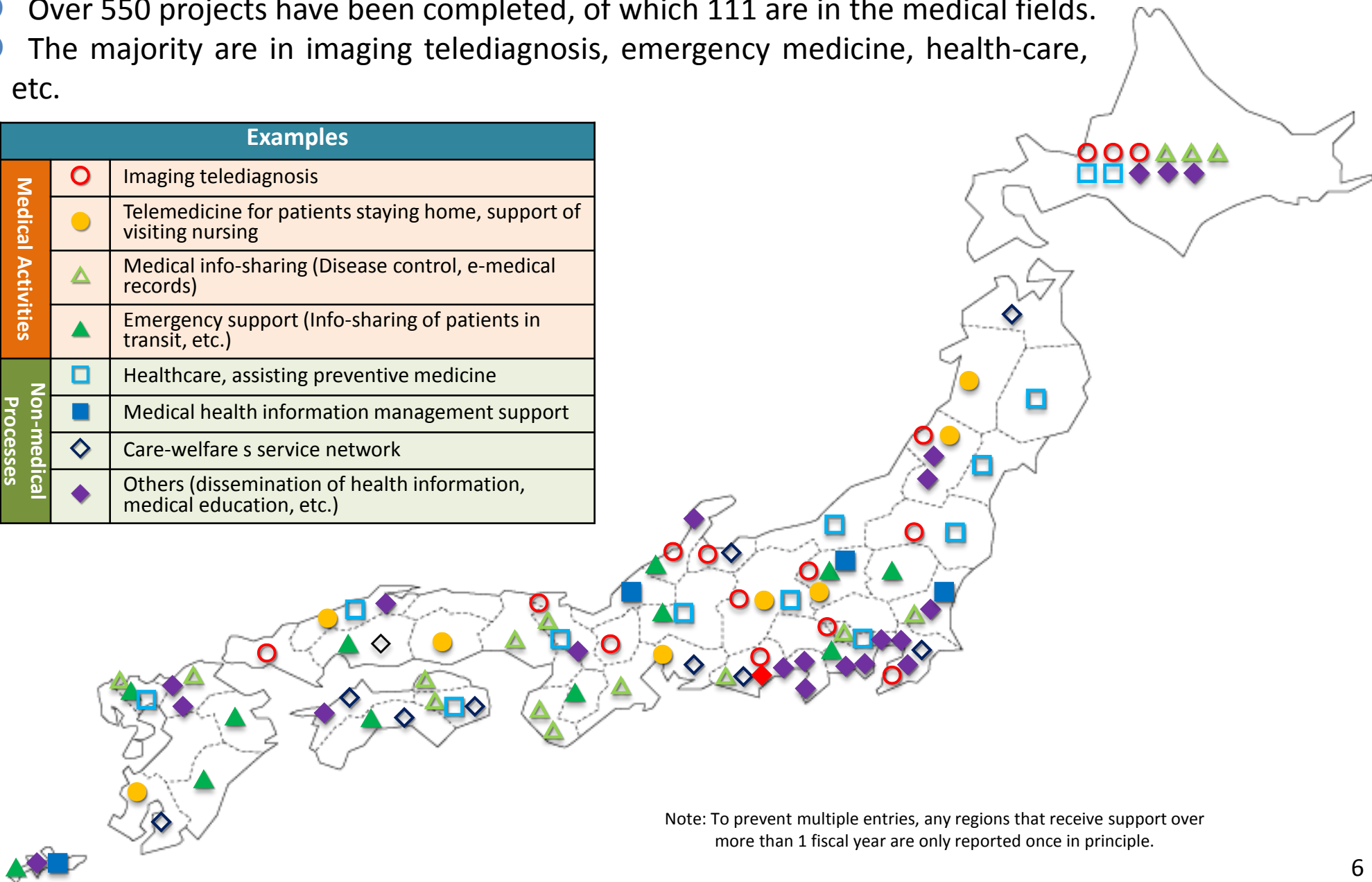
Note: To prevent multiple entries, any regions that receive support over more than 1 fiscal year are only reported once in principle.

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Development of Infrastructure for Collaboration in Medical Information

- Provide contiguous medical services by sharing medical information on patients among medical institutions and so forth.
- Cost saving due to elimination of multiple tests and multiple administrations
- Refer to and share medical records of patients if necessary, not only in normal times, but also in the times of disasters.

Hospital (Specialists)

Image transmission

Remote medical care

Diagnosis transmission

Clinics

User's residence

Medical Information Cooperation Infrastructure (EHR)

Regional Medical Care Cooperation

Physical Composition Meter

Sphygmo-manometer

Mobile Health

Nursing care facilities

Pharmacies

Glucometer

Pulse oximeter

- Formulate technological specifications for sharing information among various areas in regard to medical information cooperation infrastructure
- With regard to formulated specifications, develop dissemination in cooperation with bodies relevant to standardization related to medical information provision.

[Reference1] Project for Medicine-pharmacy coordination (Kagawa Prefecture)

■ Outline of project

● The following environments are constructed to realize effective prescription and dosage by establishing infrastructures for wide-area circulation of information on medical treatment, dispensing and medical checkups in the entire area.
- 1) Information described in prescriptions issued at hospitals and clinics is digitalized and provided to pharmacies.
- 2) "Web Medicine Notebook" which allows patients to utilize their own medication history information where necessary is provided.
- 3) Patients can give feedbacks on their daily state of drug administration and medication to personal physicians and dispensers.

■ Major matters to be verified

＜ Technical verification ＞
・Digitalization of prescription information and a system for its safe circulation
・A system for efficient sharing and coordination of prescription information and dispensing information
・A system that allows patients to access to their own dosage history through mobile phones, etc.

＜Verification of effects＞
・Appropriate medical examination based on past dosage history
・Appropriate instructions on drug administration based on past medical examination history (reduction in overlapping dosage, prevention of harmful effects when taken together)
・Reduction rate of errors of and time for input of information on prescription at pharmacies, etc.

Medical institutions

Dispensing information
Drug administration information

Local governments

Prescription information
Medical examination and treatment information

Medical check-up information

EHR

Prescription Information

Drug administration information

Dispensing information
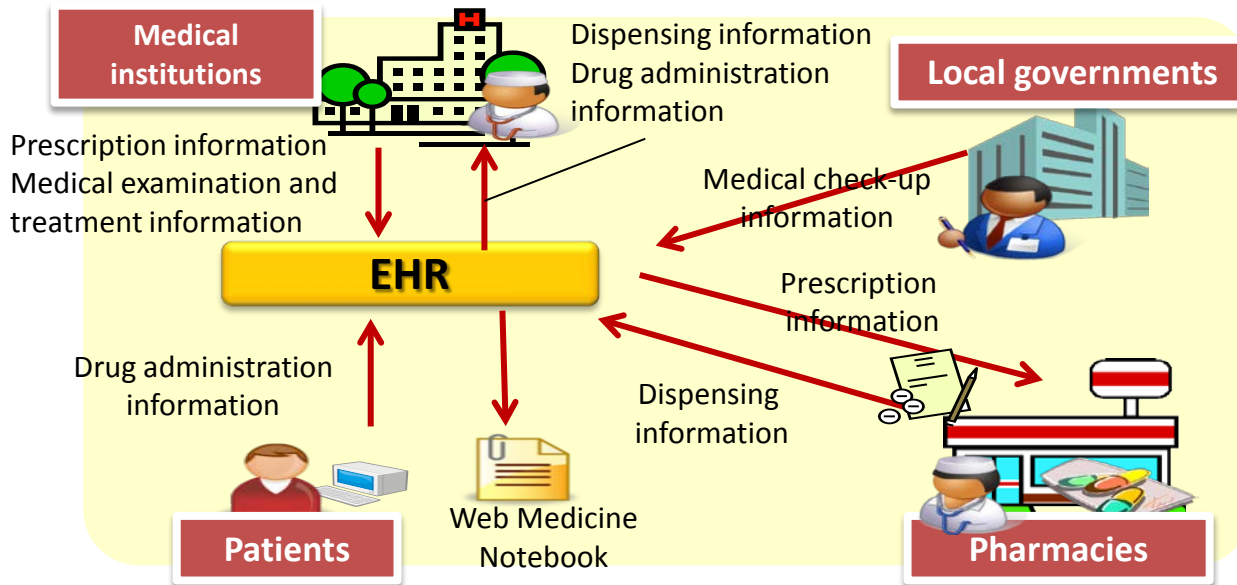
○Cooperating organizations and associations
・Kagawa Prefecture, Takamatsu City, Miki-cho, Sanuki City
・Kagawa Medical Association, Kagawa Pharmaceutical Association
・Kagawa University, Tokushima Bunri University, etc.

Patients

Web Medicine Notebook

Pharmacies

[Reference2] Project for Medicine-nursing care Coordination (Hiroshima Prefecture)

■ Outline of project

● An infrastructure for wide-area circulation of information on medical examination and treatment, dispensing and nursing care is constructed in the entire area and the following systems are established.

1) Establishment of a medical treatment-nursing care coordination model for efficiently referring to and sharing information of patients on medical examination, dispensing and nursing care among various categories of business (including deliberations on desirable information that should be shared by medical care and nursing care)

2) A system of safe registration of information on patients by visiting doctors and nurses, care helpers who are involved in home care and home nursing care.
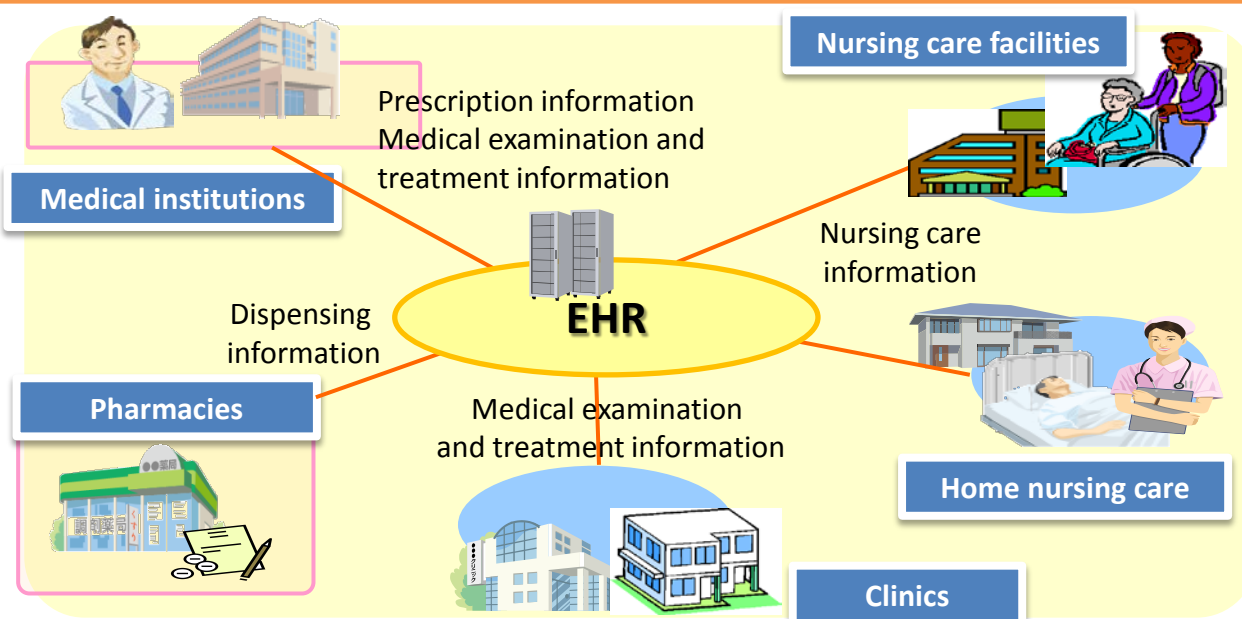
■ Major matters to be verified

＜Technical verification＞
・A system for safe and efficient provision of information to medical institutions, nursing care facilities and parties concerned of home care and home nursing care
・A system for safe browsing of medical examination information at home and for registration of new information, etc.

＜Verification of effects＞
・Reduction rate of overlapping medical check-ups and dosage
・More efficient works of nursing care facilities, visiting doctors and nurses
・Reduction rate of the frequency of outpatient visits and outpatient costs
・Reduction rate of the average admission days of patients
・Reduction of mortality rate by regular home medical examination and care
・Reduction rate of medical expenses, etc.

Nursing care facilities

Prescription information
Medical examination and treatment information

Medical institutions

Nursing care information

Dispensing information

EHR

Pharmacies

Medical examination and treatment information

Home nursing care

Clinics

○Cooperating organizations and associations
・JA Onomichi Hospital
・Onomichi Medical Association
・Matsunaga Numakuma Medical Association
・ Innoshima Medical Association
・Onomichi Pharmaceutical Association
・Fukuyama Pharmaceutical Association
・Mihara Pharmaceutical Association
・Onomichi Liaison Council for Care Facilities
・Onomichi City, Fukuyama City, Mihara City, etc.

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[Reference3] Project for Medical Coordination Using Hospital ID Cards(Shimane Prefecture)

■ Outline of project

●The following environments are constructed to realize one-stop medical services through common hospital ID cards (provisional name) in the entire area.
1) Personal health information (information on specified medical checkups), medical examination information and dispensing information are registered and shared among parties concerned and local residents can make a reservation for medical examination
2) Emergency care facilities can refer to information on vacant beds of local medical institutions and history of medical examination and drug administration of emergency patients
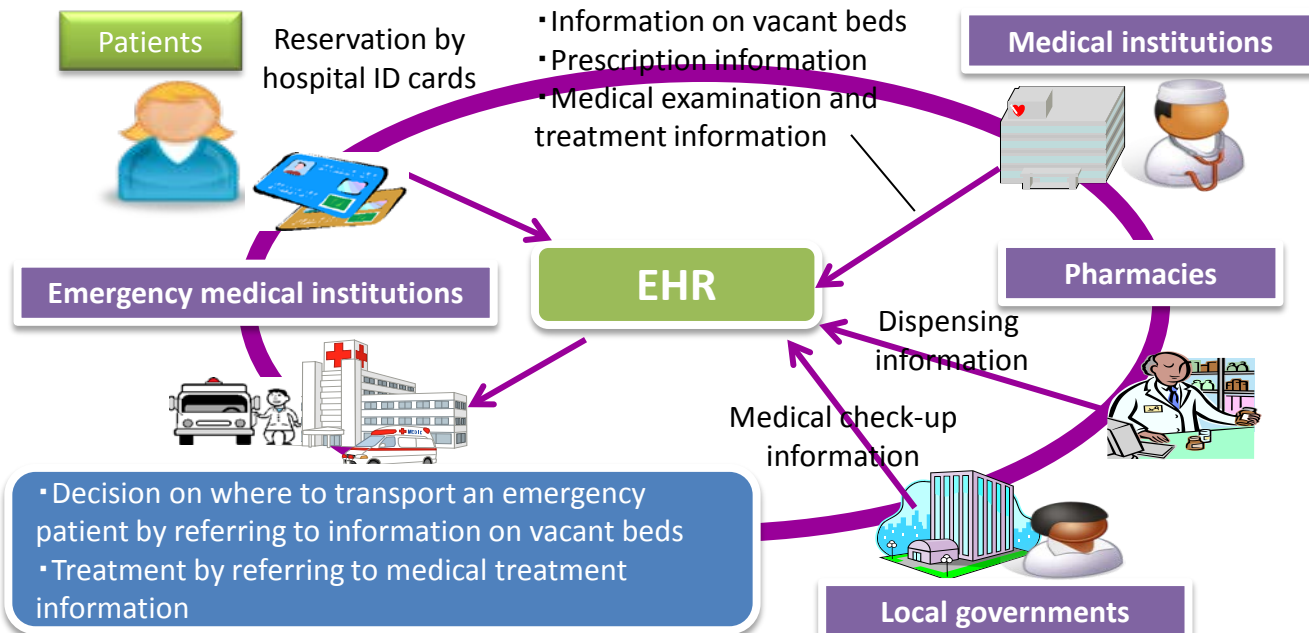
■ Major matters to be verified

＜Technical verification＞
・Coordination of information owned by medical institutions, pharmacies and local governments
・Function of reservation for medical examination through common hospital ID cards (provisional name)
・Information coordination in emergency medical care settings

＜Verification of effects＞
・Improvement of service levels of medical care, medical examination, dispensing and dosage
・Reduction rate of overlapping medical examinations and dosage Improvement rate of vital data (e.g. blood pressure, blood glucose level) of patients with chronic diseases, etc.

Patients
Reservation by hospital ID cards
・Information on vacant beds
・Prescription information
・Medical examination and treatment information

Medical institutions

EHR

Emergency medical institutions

Pharmacies

Dispensing information

Medical check-up information

・Decision on where to transport an emergency patient by referring to information on vacant beds
・Treatment by referring to medical treatment information

Local governments

○Cooperating organizations and associations
・Shimane Prefectural Central Hospital
・Shimane University Hospital
・Ohda Municipal Hospital
・Izumo Medical Association
・Ohda Medical Association
・Shimane Pharmaceutical Association
・Izumo Fire Department,
・Izumo City, Ohda City, Hikawa-cho, etc.

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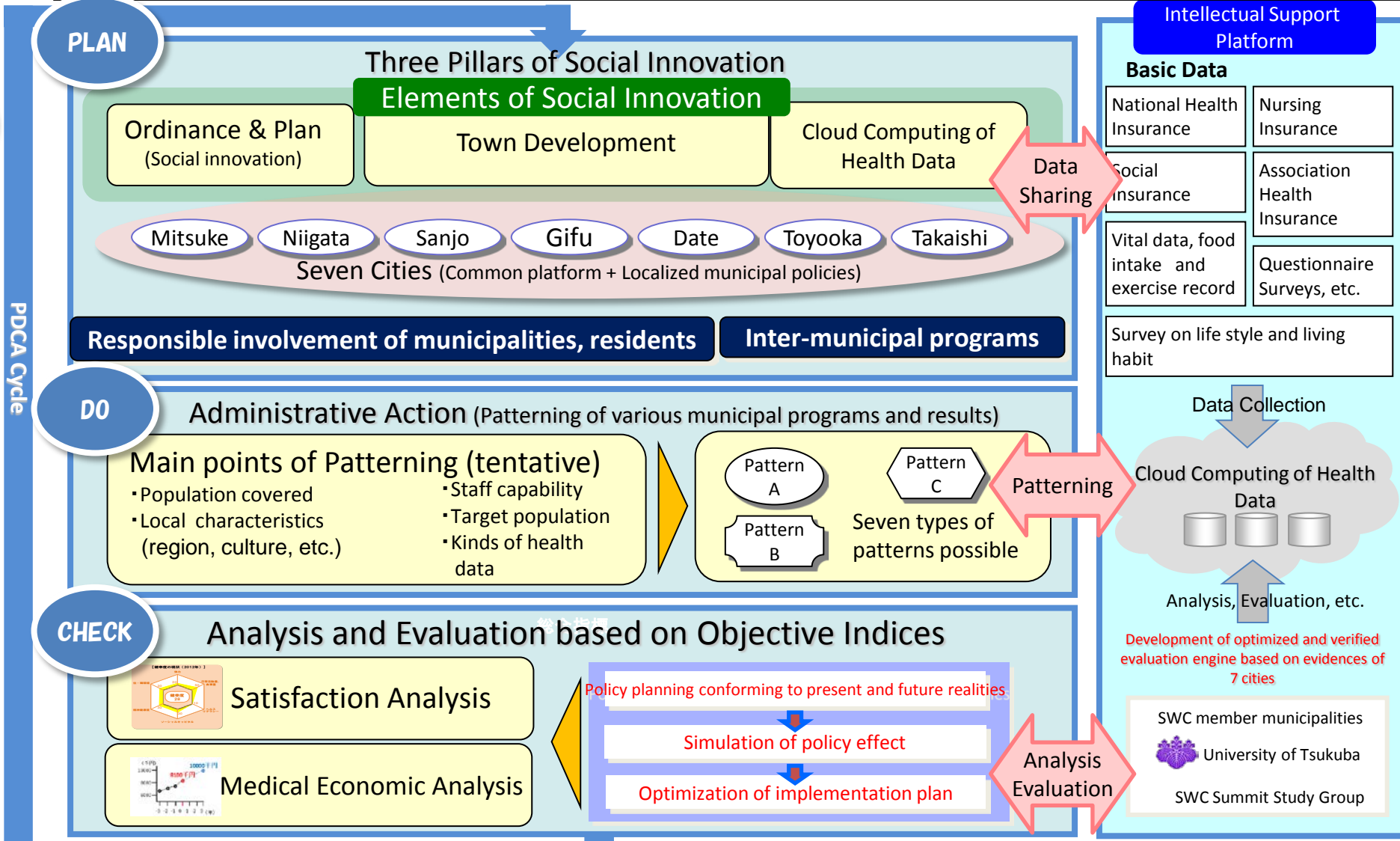# Assisting Healthcare through ICT Utilization (Smart Wellness City Project)
Mitsuke City, Niigata Prefecture and Environs (Comprehensive Project for special districts)

Project Overview

- Approach to visualizing residents' health conditions by comprehensively gathering and analyzing their health information in the area such as data for the National Health Insurance and Social Insurances, health data, etc. so that municipalities can objectively draft and verify evidence-based measures.
- Seven cities including Mitsuke City in Niigata Prefecture share the platform.

ACTION

■ Renders easy review of municipal programs
■ Provides program models for other municipalities

PDCA Cycle

PLAN

Three Pillars of Social Innovation

Elements of Social Innovation

| Ordinance & Plan (Social innovation) | Town Development | Cloud Computing of Health Data |

Seven Cities (Common platform + Localized municipal policies)
Mitsuke · Niigata · Sanjo · Gifu · Date · Toyooka · Takaishi

Responsible involvement of municipalities, residents   **Inter-municipal programs**

DO

Administrative Action (Patterning of various municipal programs and results)

Main points of Patterning (tentative)
- Population covered
- Local characteristics (region, culture, etc.)
- Staff capability
- Target population
- Kinds of health data

Pattern A, Pattern B, Pattern C — Seven types of patterns possible

Patterning

CHECK

Analysis and Evaluation based on Objective Indices

Satisfaction Analysis

Medical Economic Analysis

Policy planning conforming to present and future realities
↓
Simulation of policy effect
↓
Optimization of implementation plan

Analysis Evaluation

Intellectual Support Platform

Basic Data

National Health Insurance	Nursing Insurance
Social Insurance	Association Health Insurance
Vital data, food intake and exercise record	Questionnaire Surveys, etc.
Survey on life style and living habit	

Data Sharing

Data Collection

Cloud Computing of Health Data

Analysis, Evaluation, etc.

Development of optimized and verified evaluation engine based on evidences of 7 cities

SWC member municipalities
University of Tsukuba
SWC Summit Study Group

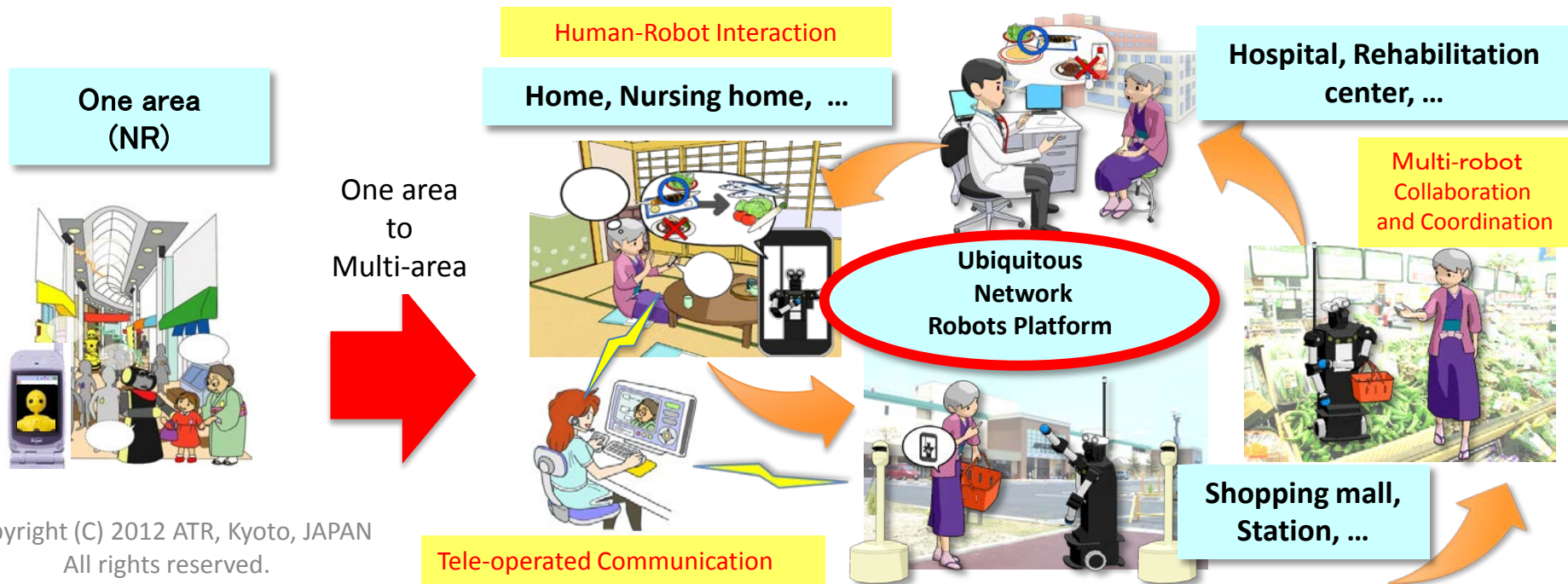# Ubiquitous Network Robots for Life Support

◎Objective
Nationwide installation of network robots (for nursing care, monitoring, etc.) by 2020
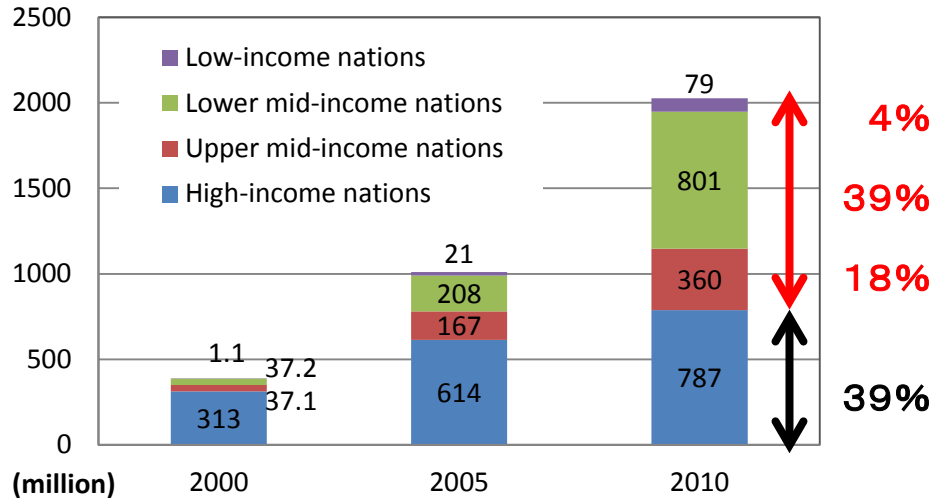
◎ Expected capabilities (life-support activities to promote social participation for the aged and the challenged)
Shopping assistance, reducing burdens on care takers (**remote active listening service,** etc.), monitoring (gathering information on family members of the aged, etc.), **healthcare** (gathering and storing biological information, **healthcare advise**), guidance information: services mainly for communication

**One area
（NR）**

One area
to
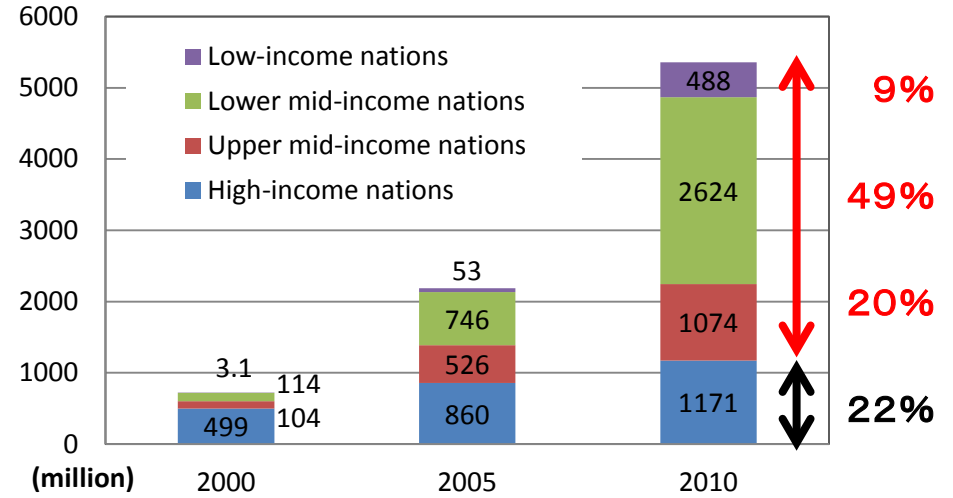Multi-area

Human-Robot Interaction

Home, Nursing home, …

Hospital, Rehabilitation center, …

Multi-robot
Collaboration
and Coordination

**Ubiquitous
Network
Robots Platform**

Tele-operated Communication

**Shopping mall,
Station, …**

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Mobile Health（mHealth) Trend

Change of The World Mobile-phone User Population

Legend:
- Low-income nations
- Lower mid-income nations
- Upper mid-income nations
- High-income nations

2000: 313, 37.1, 37.2, 1.1
2005: 614, 167, 208, 21
2010: 787, 360, 801, 79

4%
39%
18%
39%

Change of The World Internet-user Population

Legend:
- Low-income nations
- Lower mid-income nations
- Upper mid-income nations
- High-income nations

2000: 499, 104, 114, 3.1
2005: 860, 526, 746, 53
2010: 1171, 1074, 2624, 488

9%
49%
20%
22%
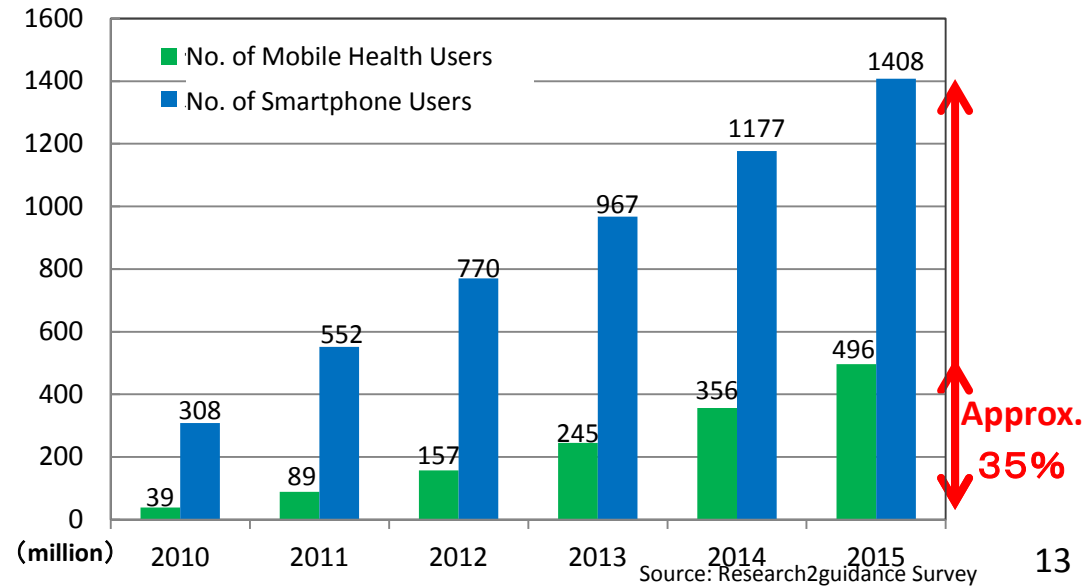
Source: "2012 White Paper Information and Communications in Japan", Ministry of Internal Affairs and Communications

Miniaturization and Cost Reduction of Sensors

- Size (of chips)
- Price for sale (average)

About 85% reduced
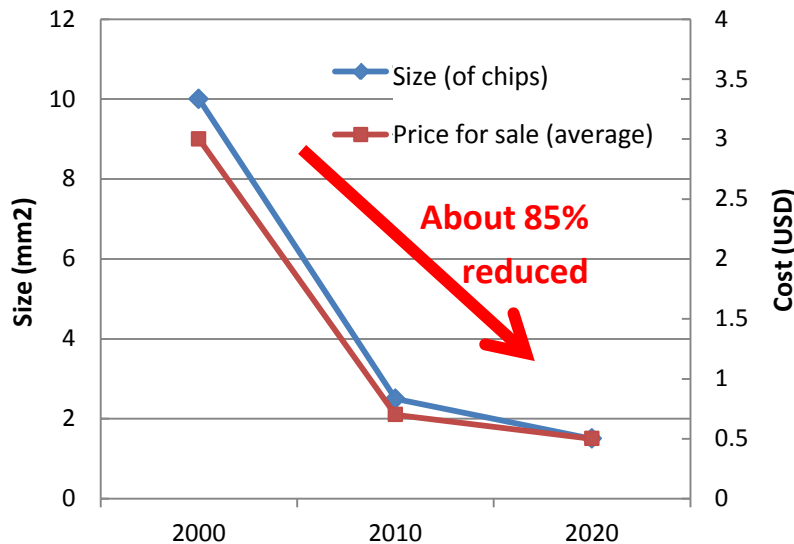
Source: "Active Japan ITC Strategy", Ministry of Internal Affairs and Communications

Interest toward Mobile Health

- No. of Mobile Health Users
- No. of Smartphone Users

2010: 39, 308
2011: 89, 552
2012: 157, 770
2013: 245, 967
2014: 356, 1177
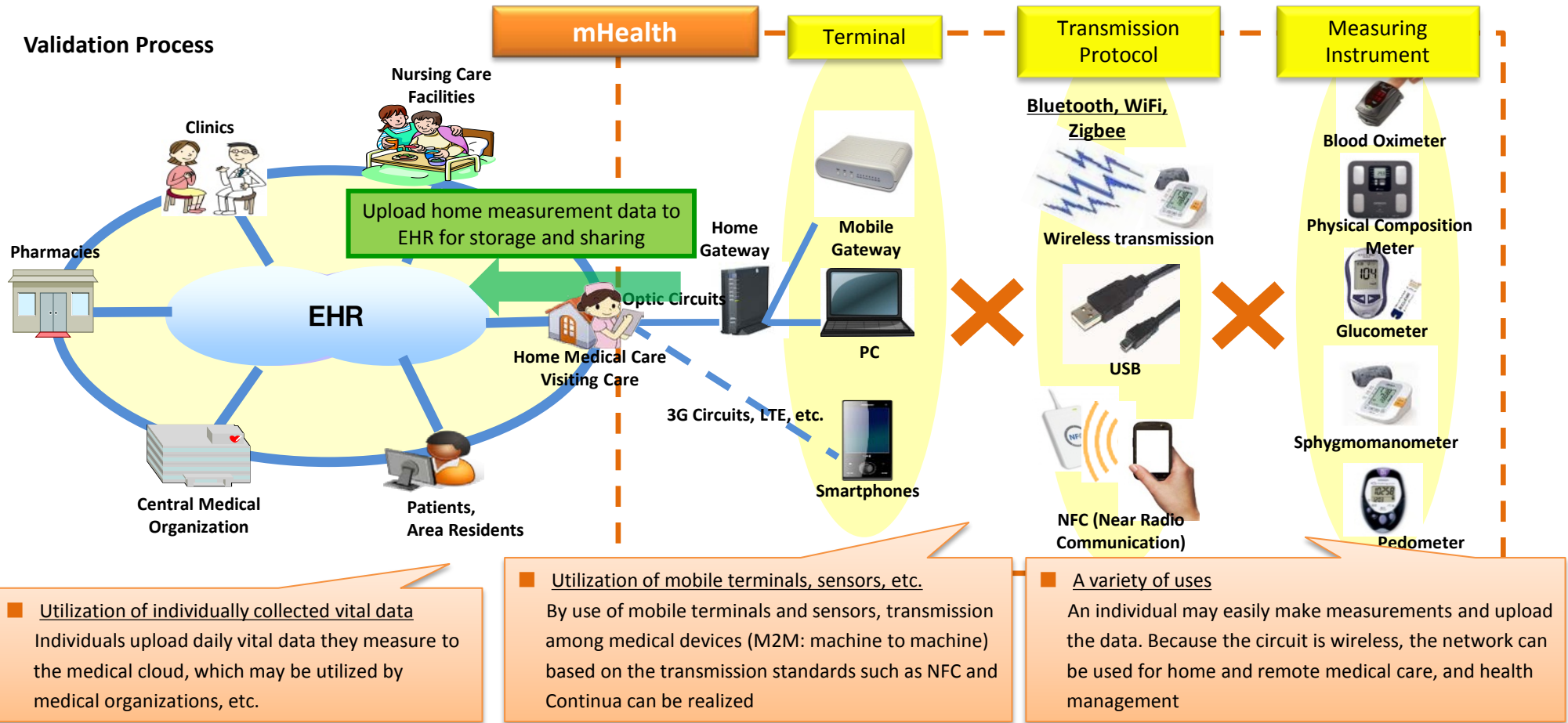2015: 496, 1408

Approx. 35%

Source: Research2guidance Survey

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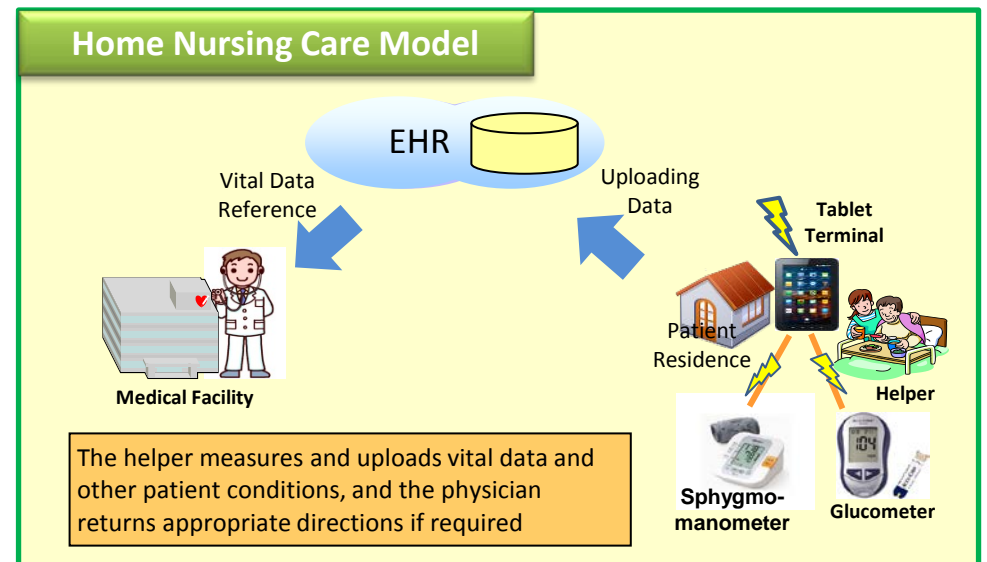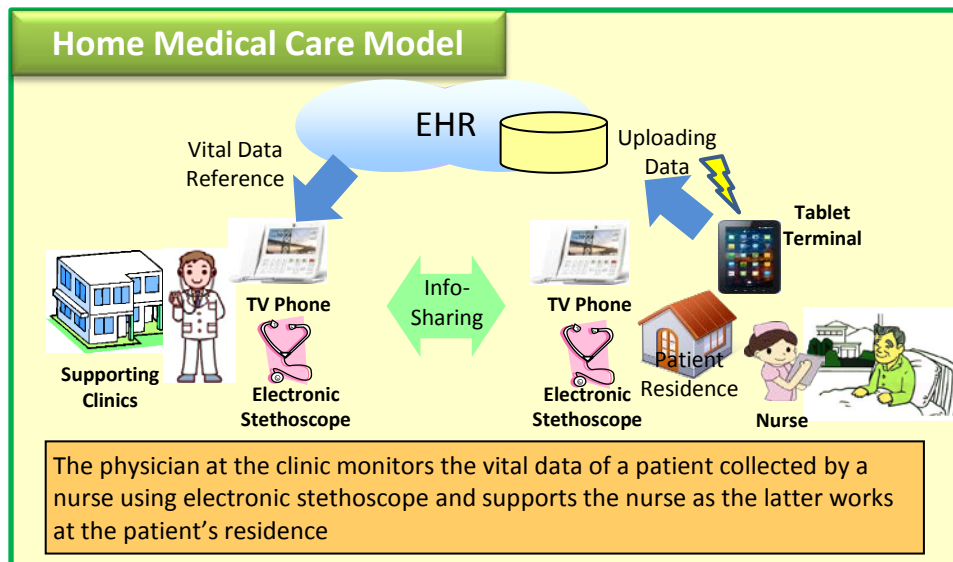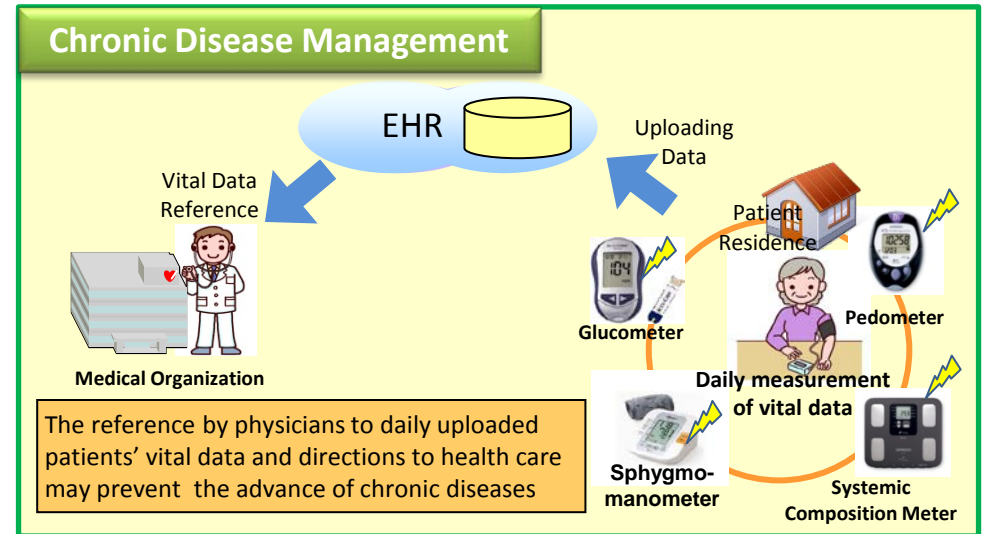# Mobile Health (mHealth) – Establishment of Home Medical Treatment/Nursing Care ICT System
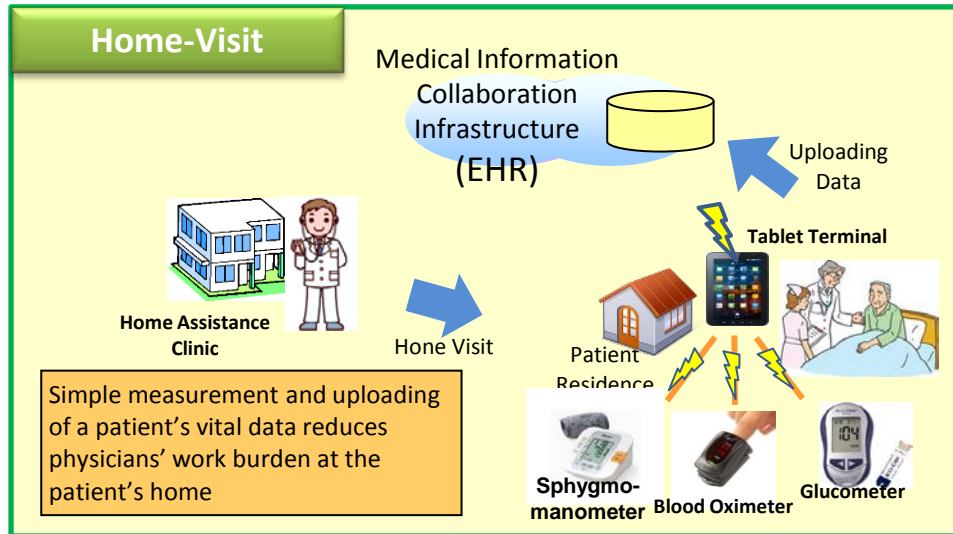
● Verify appropriate combinations of "terminal X Transmission Protocol X Measuring Instruments" according to users, communication environment and conditions of patients, and ideal situation of network security, transmission standards and user interface

● Collecting and grasping daily information on home-staying patients accurately utilizing mobile terminals, sensors or the like, and register and accumulate it in EHR, and realize sharing of home medical care and the nursing ICT system

Validation Process

mHealth　　　**Terminal**　　　**Transmission Protocol**　　　**Measuring Instrument**

Nursing Care Facilities

Clinics

Pharmacies

Upload home measurement data to EHR for storage and sharing

EHR

Home Gateway

Optic Circuits

Home Medical Care Visiting Care

3G Circuits, LTE, etc.

Central Medical Organization

Patients, Area Residents

Mobile Gateway

PC

Smartphones

Bluetooth, WiFi, Zigbee

Wireless transmission

USB

NFC (Near Radio Communication)

Blood Oximeter

Physical Composition Meter

Glucometer

Sphygmomanometer

Pedometer

■ Utilization of individually collected vital data
Individuals upload daily vital data they measure to the medical cloud, which may be utilized by medical organizations, etc.

■ Utilization of mobile terminals, sensors, etc.
By use of mobile terminals and sensors, transmission among medical devices (M2M: machine to machine) based on the transmission standards such as NFC and Continua can be realized

■ A variety of uses
An individual may easily make measurements and upload the data. Because the circuit is wireless, the network can be used for home and remote medical care, and health management

■ Carry out proposals, standardizations of communications standards, best-practices, or the like through the venues of ITU (International Telecommunication Union).

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Mobile Health (mHealth) – Examples of Use of Home Medical Treatment/Nursing Care ICT System

- Use of mobile terminals and sensors renders the system user-friendly, thereby allowing anyone to upload and record information
- Sharing uploaded medical information of patents, a variety of professionals such as physicians, nurses and care managers are able to provide timely medical care services

Home-Visit

Medical Information Collaboration Infrastructure (EHR)

Uploading Data

Tablet Terminal

Home Assistance Clinic

Hone Visit

Patient Residence

Sphygmo-manometer   Blood Oximeter   Glucometer

Simple measurement and uploading of a patient's vital data reduces physicians' work burden at the patient's home

Chronic Disease Management

EHR

Vital Data Reference

Uploading Data

Patient Residence

Pedometer

Glucometer

Medical Organization

Daily measurement of vital data

Sphygmo-manometer

Systemic Composition Meter

The reference by physicians to daily uploaded patients' vital data and directions to health care may prevent the advance of chronic diseases

Home Medical Care Model

EHR

Vital Data Reference

Uploading Data

Tablet Terminal

TV Phone

Info-Sharing

TV Phone

Supporting Clinics

Electronic Stethoscope

Electronic Stethoscope

Patient Residence

Nurse

The physician at the clinic monitors the vital data of a patient collected by a nurse using electronic stethoscope and supports the nurse as the latter works at the patient's residence

Home Nursing Care Model

EHR

Vital Data Reference

Uploading Data

Tablet Terminal

Patient Residence

Helper

Medical Facility

Sphygmo-manometer

Glucometer

The helper measures and uploads vital data and other patient conditions, and the physician returns appropriate directions if required

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Coping with Large-scale Disasters

Problems in Computerization of Medical Information on which the Great Earthquake Shed Light

Issues that Accompanied the East Japan Great Earthquake

- Because medical information recorded on paper, basic data of patients, was largely lost in the disaster, provision of appropriate medical treatment was difficult, which caused great communications difficulties among the medical staff and placed a large burden upon them.

- Due to the lack of information on prescription and dispensation of the medicine to the patients, physicians could not decide which drugs to prescribe for fear of double prescription. This placed a large burden on the them.

- For physicians, the prescription details are important as they must repeat determinations of patients' blood glucose level, ECG, blood pressure level, etc. at each examination.

- All of the medical records were carried off by the tsunami. Physicians examined patients twice as many as patients as normal without any records.

- Accordingly, it would be mandatory to strengthen the medical systems against damage from natural disasters, i. e., aim at computerization of medical records so that physicians and other medical workers may access cloud computing systems through the use of note book computers and satellite communications system.

- In short, there should be a system in which medical records may easily be compiled, stored, and shared through a personal computer and appropriate communications environment.

- Storage, handing over and coordination of patient data is necessary. To prevent confusion, such as lack of prescription details and other problems, detailed medical records require a centralized storage system.
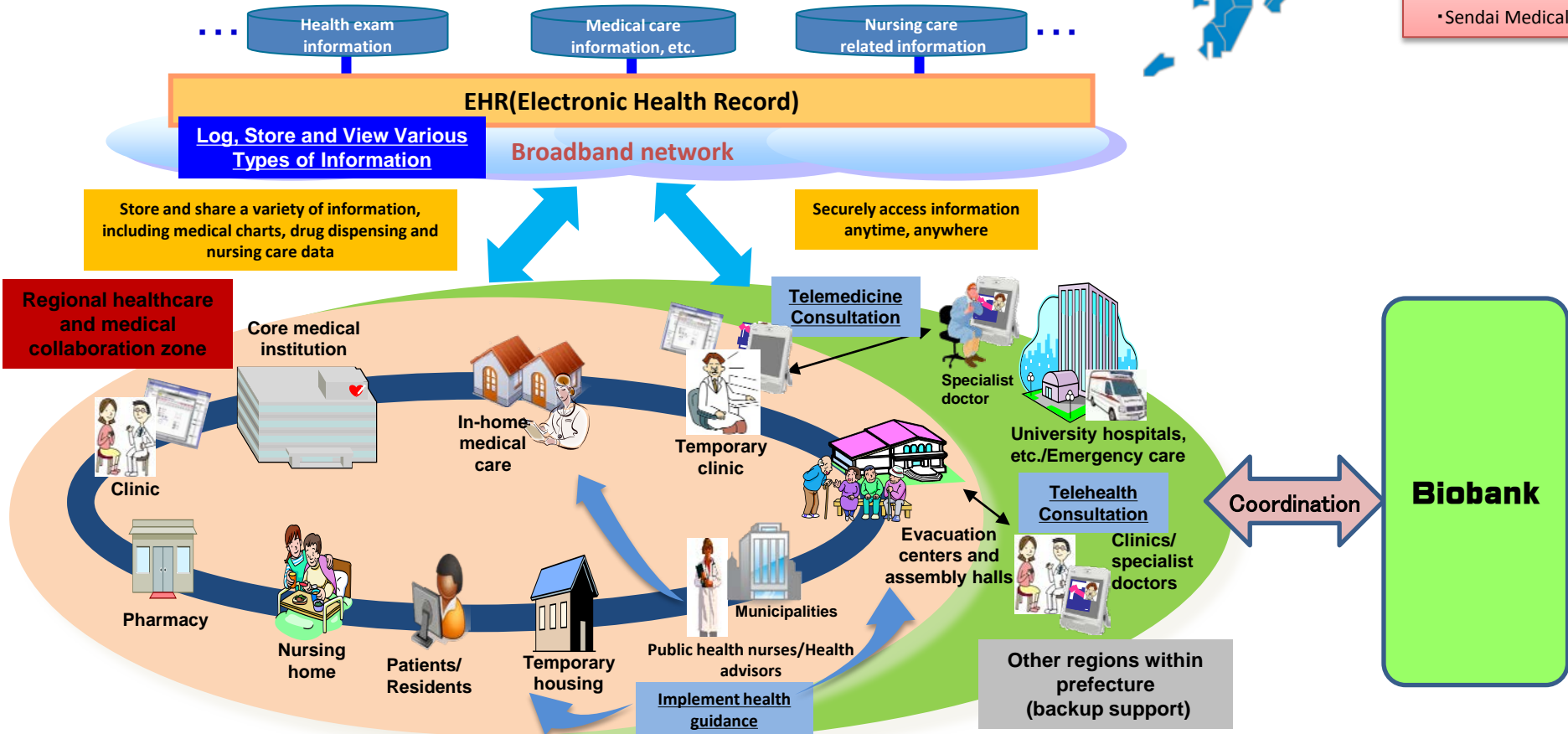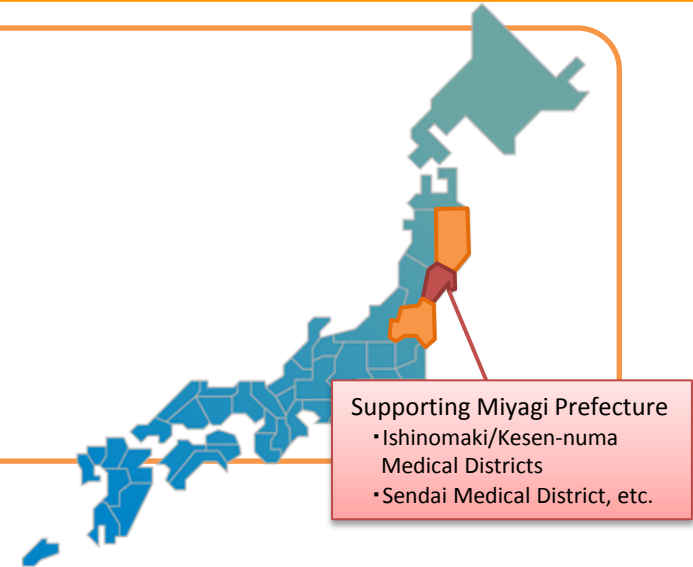
■ On the whole, necessitate EHR, which electronically records and stores patients' medical treatment and prescription information recorded in medical facilities, and permits physicians and other medical staff to refer to and share the information as required.

Tohoku Medical Megabank

■ Outline of project

■ For reconstruction in response to the Great East Japan Earthquake, MIC aids financially local governments (Iwate Prefecture, Miyagi Prefecture and Fukushima Prefecture) affected by the tsunami to construct EHR (Electronic Health Records)

■ To be more specific, MIC helps them to construct the following systems
　１）Store and share a variety of information, including medical charts, drug dispensing and nursing care data
　２）Telemedicine with video phone
　３）Implement health guidances

Supporting Miyagi Prefecture
・Ishinomaki/Kesen-numa Medical Districts
・Sendai Medical District, etc.

Health exam information

Medical care information, etc.

Nursing care related information

EHR(Electronic Health Record)

Log, Store and View Various Types of Information

Broadband network

Store and share a variety of information, including medical charts, drug dispensing and nursing care data

Securely access information anytime, anywhere

Regional healthcare and medical collaboration zone

Core medical institution

In-home medical care

Telemedicine Consultation

Specialist doctor

University hospitals, etc./Emergency care

Temporary clinic

Clinic

Pharmacy

Nursing home

Patients/ Residents

Temporary housing

Municipalities

Public health nurses/Health advisors

Implement health guidance

Evacuation centers and assembly halls

Telehealth Consultation

Clinics/ specialist doctors

Other regions within prefecture (backup support)

Coordination

Biobank

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Programs for the Future

ICT Utilization Strategies in the Medical Field

Issues in the Medical Field

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World's most advanced telecommunications infrastructure

New trends

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(Connecting people to people, people to things, and things to things)

○ **Developments in easy-to-use ICT**

(Dramatic improvements in user interfaces)

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○ Emergency and remote treatment, etc.

○ International cooperation

○ Administration of health-medical-welfare information platform development (Development and operating costs, etc.)

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Programs for the Near Future

Assumptions

○ Coping with large-scale natural disasters

○ Responding to problems of the super aging society

○ <mark>From fragmented information to a holistic view…</mark>

 Development of a system that is possible to be deployed on a nation-wide basis by combination of the best practices

・Evidence-based quantitative approach

○ <mark>Computerization of medical records by maximum utilization of newest technical renovation</mark>

1) Expansion of continuous, sharable range

 Facility, Information, System, Equipment, etc.
 Medical Treatment, Nursing Care, Social Welfare, etc.

2) To connect them, standardization of a variety of healthcare fields must be implemented

3) Review of the rules on the protection of information security, personal Information, etc. to meet the requirements of ICT technology

4) Desirable administration of health-medical-welfare information platform development (development and operating costs)

○ <mark>Importance of International Cooperation</mark>