HIRA
HEALTH INSURANCE REVIEW & ASSESSMENT SERVICE

THE HIRA ICT SYSTEM

DEVELOPED, ACCURATE, TECHNICAL AID: DATA

HIRA
HEALTH INSURANCE REVIEW & ASSESSMENT SERVICE

CONTENTS

The HIRA ICT System

HIRA employs six specialized, ICT-based systems that efficiently perform distinct yet synergistic roles to achieve HIRA's goals and effectively utilize collected healthcare-related big data.

HIRA ICT System was established for efficient operation of increasing NHI benefit claims review, quality assessment, and healthcare resources management. The system enables HIRA to review over 1.5 billion cases of benefit claims a year, conduct quality assessment on 35 items, support health care policy making decision with nation-wide healthcare data, as well as help prepare countermeasures to combat COVID-19.

2 HRAS
Health Data Review and Assessment System
Reviews claims and assesses quality of care

1 HDAS
Healthcare Data Acquisition System
Collects data in healthcare from healthcare providers

3 KPIS
Korea Pharmaceutical Information System
Tracks and traces nationwide drug distribution data

6 HBiG
Healthcare Big Data System
Assists users with detailed analysis using healthcare-related big data

4 DUR
Drug Utilization Review System
Transmits real-time information to ensure safe drug use

5 PIPS
Provider Integrated Profiling System
Provides data dashboard of each healthcare provider

The exceptional HIRA ICT System helped us more agile and more responsive to the worldwide crisis such as COVID-19 outbreak.

MILESTONES

Introduction period
1980s

Establishment and operation of an independent ICT system in order to conduct premium collection and management, claims review, benefit reimbursement, healthcare provider resources management, and analysis of procedure and drug price

Development period
1990s

Adoption of e-claim for data transmission, establishment of e-review system

Expansion period
2000s

Replacement of manual review staff with e-review, opening of portal system New system adoption for safe drug distribution and prescription

Advancement period
2010s

Introduction of the new generation claims review system to enhance the value of claims review process

Transition period
2020s

Swift adaption to changing ICT environment, realization of smart HIRA System for future through innovation

1994	Development and introduction of diskette submission / adoption of required field check, auto check
1996	Adopted EDI claim submission (clinic) / expert check, claims review on the computer screen
1997	Establishment of DRG
1998	Began to build integrated network for medical insurance / built eligibility database of the whole population
2003	Establishment of Data Warehouse for healthcare and medical information analysis
2006	International technology consulting on EDI medical information network (Japan)
2007	Established a Disaster Recovery (DR) Center
2008	Established the Korea Pharmaceutical Information Service (KPIS)
2010	Established the Drug Utilization Review (DUR)
2011	Established the Medical Claim Portal Service (MCPoS) and the Portal Service for healthcare provider businesses
2013	Established the New Generation Review and Assessment Service and the Auto Insurance Review System
2015	Established the Healthcare Big Data Open System
2016	Established the knowledge-based review system / Established the Pharmaceutical Serial Number System
2017	Established the Comprehensive Healthcare Data Analysis Platform
2017	Exported HIRA System to Bahrain
2018	Established the Review and Assessment Data Collection System and Benefit Information Analysis System
	Preparation of Smart HIRA System Implementation Promotion of HIRA Digital New Deal
2020	COVID-19 K-health system - DUR-ITS / Patient Data Management System / Face Mask Supply Inventory System - Operation management system for negative pressure wards

How the HIRA ICT System is used to tackle COVID-19 challenges
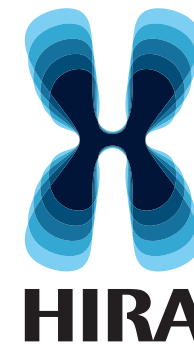
HIRA
The HIRA ICT SYSTEM

1

Providing information on high-risk groups

Provides (as of May 2020) DUR data on 1.15 million individuals at higher risk for COVID-19: recent travelers to high-risk countries, people who have been in close contact with confirmed patients, and patients recently released from quarantine.

→ Related system
Drug Utilization Review System(DUR)

2

Keeping up with the supply & demand of drugs

Provides inventory information for 35 drug items needed to treat COVID-19

→ Related system
Korea Pharmaceutical Information System(KPIS)

3

Securing health resources

Readily procures negative pressure isolation rooms for COVID-19 patients requiring critical care

→ Related system
Provider Integrated Profiling System(PIPS)

4

Stabilizing the supply & demand of face masks

Reduces wait times for purchasing face masks by offering real-time face mask inventory information (Social benefit: USD 16.2 million per week)

→ Related system
Drug Utilization Review System(DUR)

5

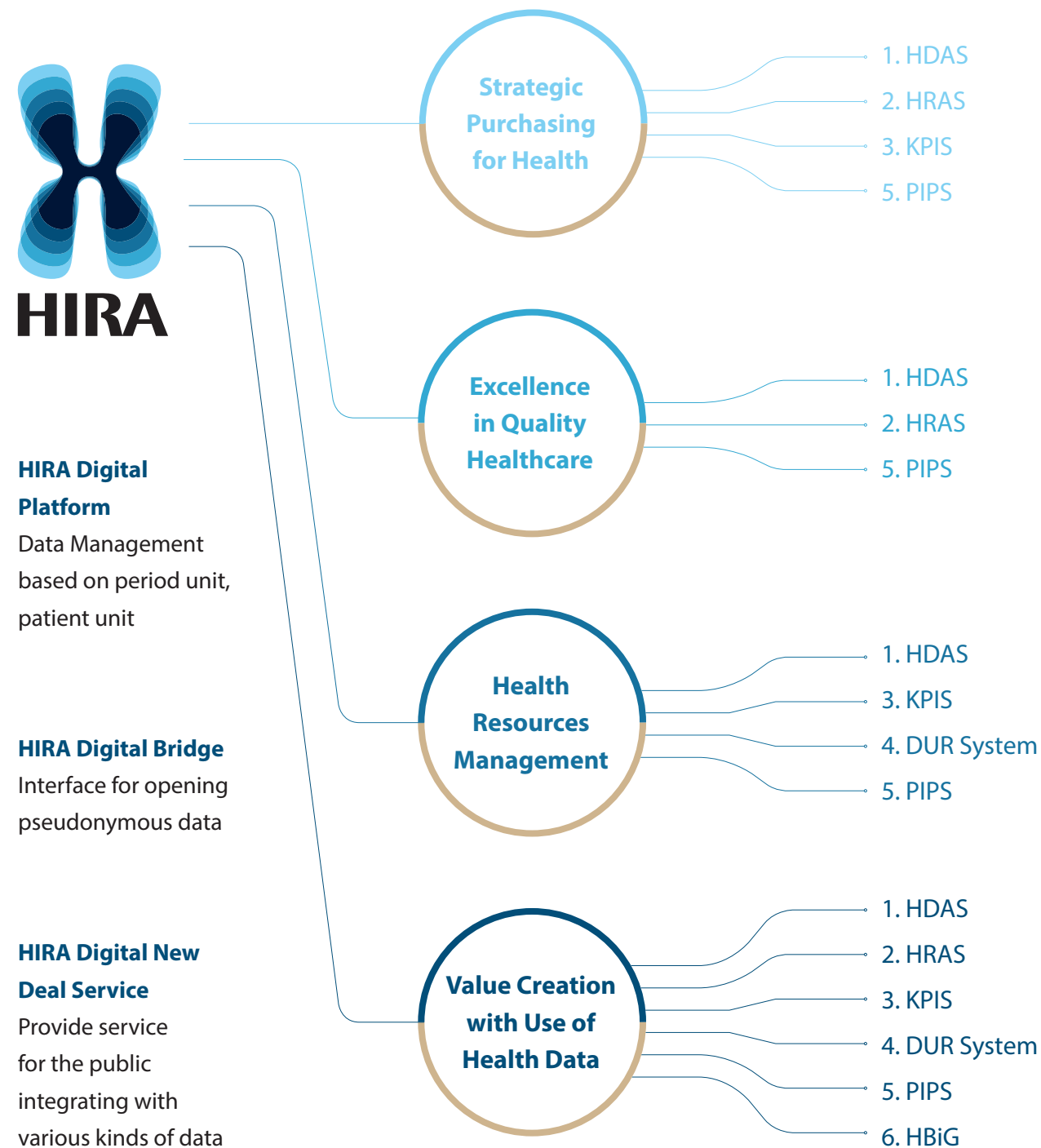### Sharing world's first de-identified COVID-19 clinical and patient dataset

Research completed by a total of 129 projects from 32 countries (as of October, 2020)
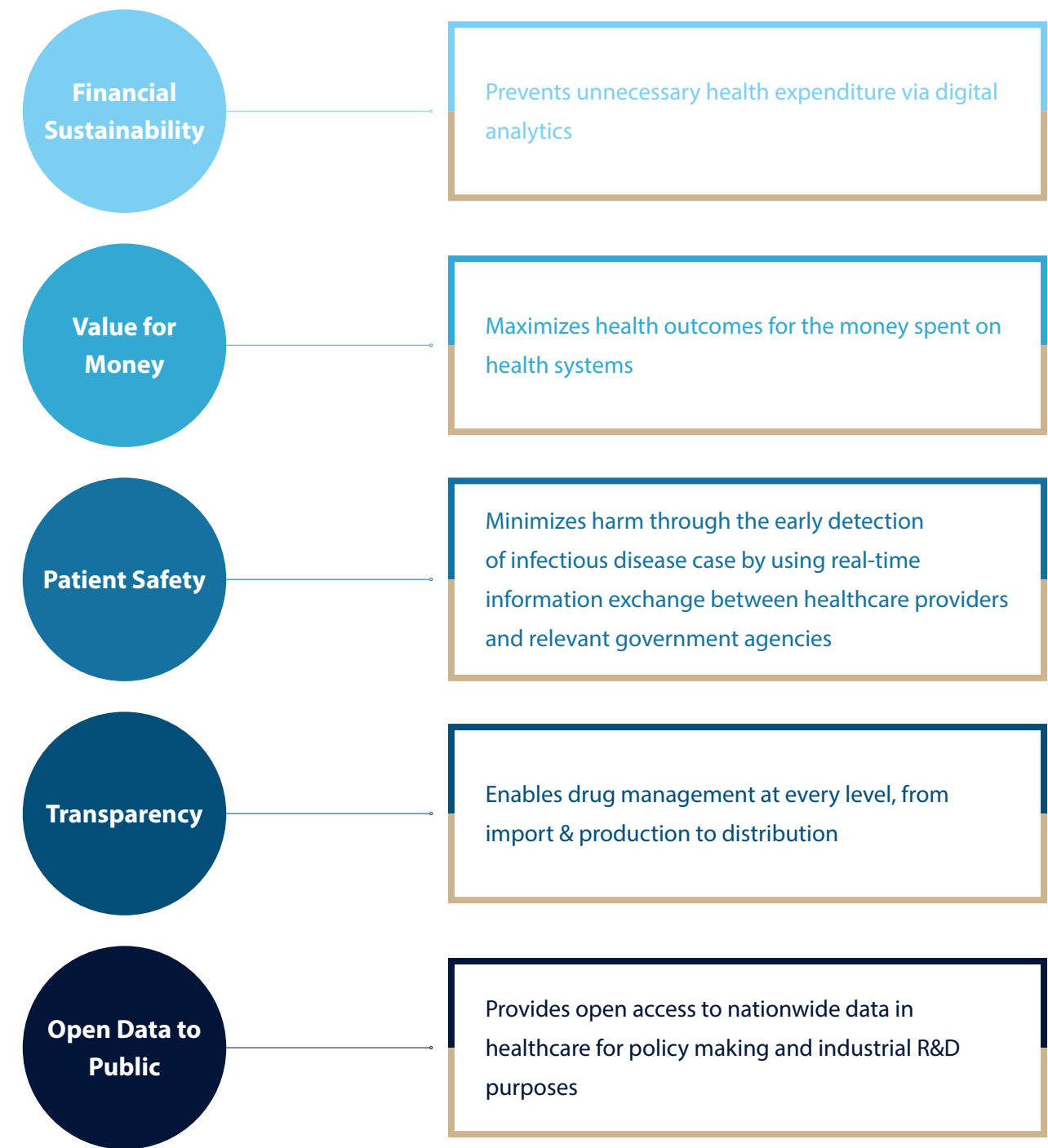
→ Related system
Healthcare Big Data System(HBiG)

The HIRA ICT System

What HIRA does

HIRA

Strategic Purchasing for Health
- 1. HDAS
- 2. HRAS
- 3. KPIS
- 5. PIPS

Excellence in Quality Healthcare
- 1. HDAS
- 2. HRAS
- 5. PIPS

HIRA Digital Platform
Data Management based on period unit, patient unit

Health Resources Management
- 1. HDAS
- 3. KPIS
- 4. DUR System
- 5. PIPS

HIRA Digital Bridge
Interface for opening pseudonymous data

HIRA Digital New Deal Service
Provide service for the public integrating with various kinds of data

Value Creation with Use of Health Data
- 1. HDAS
- 2. HRAS
- 3. KPIS
- 4. DUR System
- 5. PIPS
- 6. HBiG

What makes the HIRA ICT System special?

Financial Sustainability
Prevents unnecessary health expenditure via digital analytics

Value for Money
Maximizes health outcomes for the money spent on health systems

Patient Safety
Minimizes harm through the early detection of infectious disease case by using real-time information exchange between healthcare providers and relevant government agencies

Transparency
Enables drug management at every level, from import & production to distribution

Open Data to Public
Provides open access to nationwide data in healthcare for policy making and industrial R&D purposes

The six systems that make up the HIRA ICT System

① Healthcare Data Acquisition System(HDAS)

HDAS is used to collect and manage information about healthcare services provided and the resources status of healthcare providers.
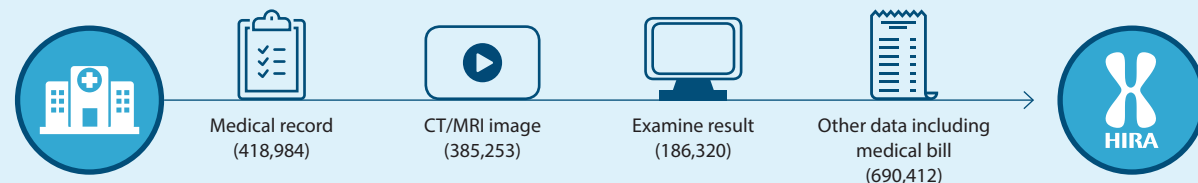
HIRA History: HDAS

HIRA has collected data from healthcare providers for claim submission and review purposes. In 1990, HIRA created the Electronic Data Interchange (EDI)-based HDAS to reduce the material costs related to the storage and digitation of paper claim documentation and increase the efficiency of data collection. In 2010, HIRA upgraded the system to a web-based data collection platform. The resulting system allows HIRA to exchange information of all sorts, including imaging and other non-standardized formats, with healthcare providers in real-time without any additional financial burden.

Achievement of the HDAS

Healthcare providers submit 1.5 billion benefit claims a year directly to HIRA via a dedicated portal service on the web, which does not incur cost for submission process. The web portal offers many services for higher efficiency, such as pre-screening to prevent return/re-submission and unnecessary administrative cost, high level of security based on digital authentication, streamlined process to save time spent for claim submission.

Status of collecting reference data from healthcare providers (as of 2019)

Medical record (418,984)

CT/MRI image (385,253)

Examine result (186,320)

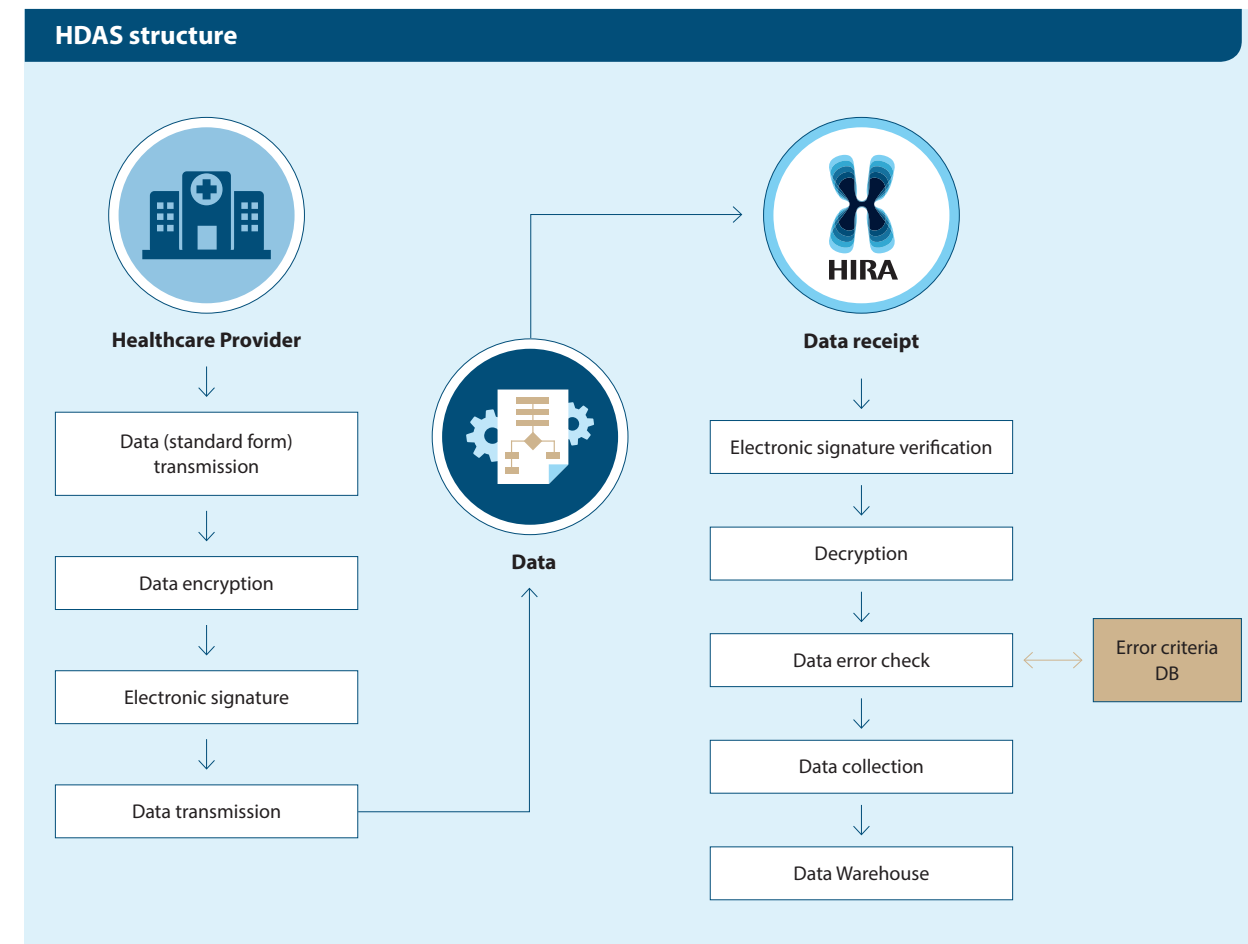Other data including medical bill (690,412)

Features and results(HDAS)

Data Transmission and Reception Digitally exchanges medical records and imaging between HIRA and healthcare providers with enhanced data security

Data Quality Assurance Minimizes the potential for data errors via automatic verification functionality in the healthcare data acquisition system(HDAS)

Data Availability Uses Collected data at no additional cost to manage healthcare costs and quality, develop action plans

Automated Healthcare Data Collection Exchanges data in real-time between HIRA and healthcare providers through direct connection to providers' EMR* and HIS*

* EMR: Electronic Medical Record, HIS: Hospital Information System

HDAS structure

Healthcare Provider

Data (standard form) transmission

Data encryption

Electronic signature

Data transmission

Data

Data receipt

Electronic signature verification

Decryption

Data error check

Error criteria DB

Data collection

Data Warehouse

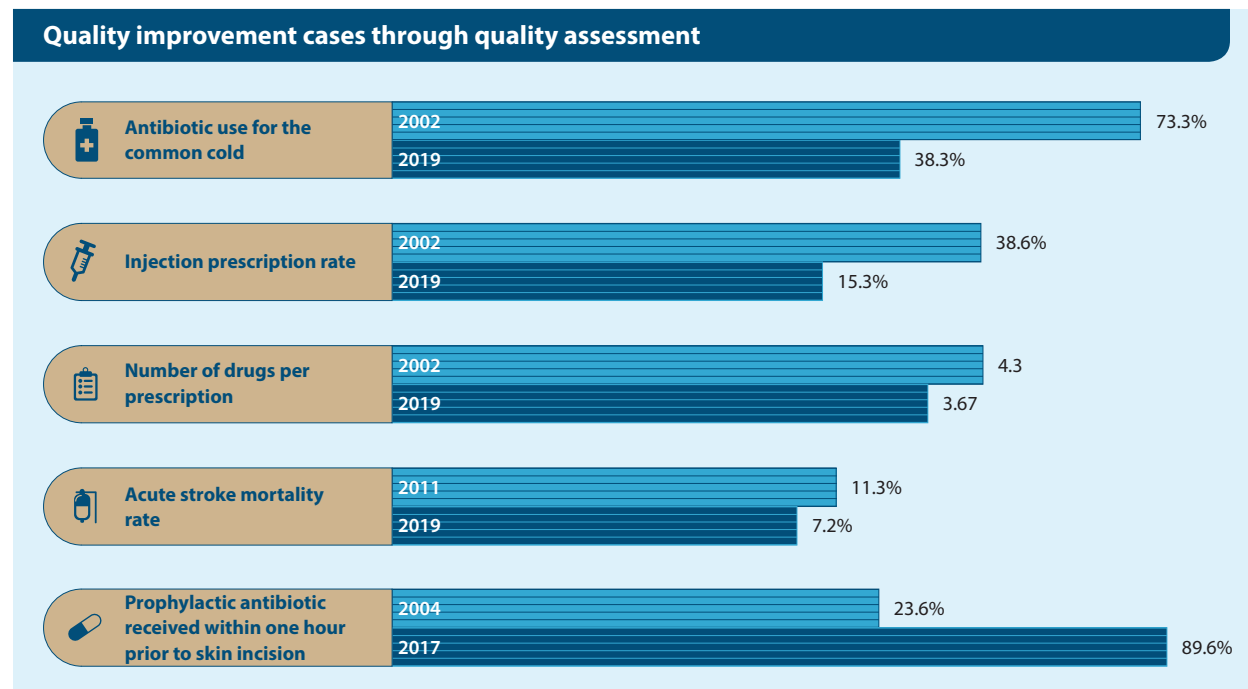# ② Health Data Review and Assessment System(HRAS)

The HRAS reviews claims and assesses the quality of care with data collected from HDAS

HIRA History: HRAS

The HRAS was introduced to replace the handwritten workflow that had been in use since 1977 due to ever increasing volume of claims and growing need for consistency of review results performed by staff. In pursuit of HIRA's goal to ensure quality of care, quality assessment features were added to the HRAS in 2000.

Achievement of the HRAS

→ Determines the amount of reimbursement for providers, prevents inadequate spending, and promotes appropriate level of medical bill and quality improvement

→ Saves approximately USD 1.25 billion annually in unnecessary healthcare expenditures

→ Improves the quality of healthcare according to various quality assessment indicators

Quality improvement cases through quality assessment

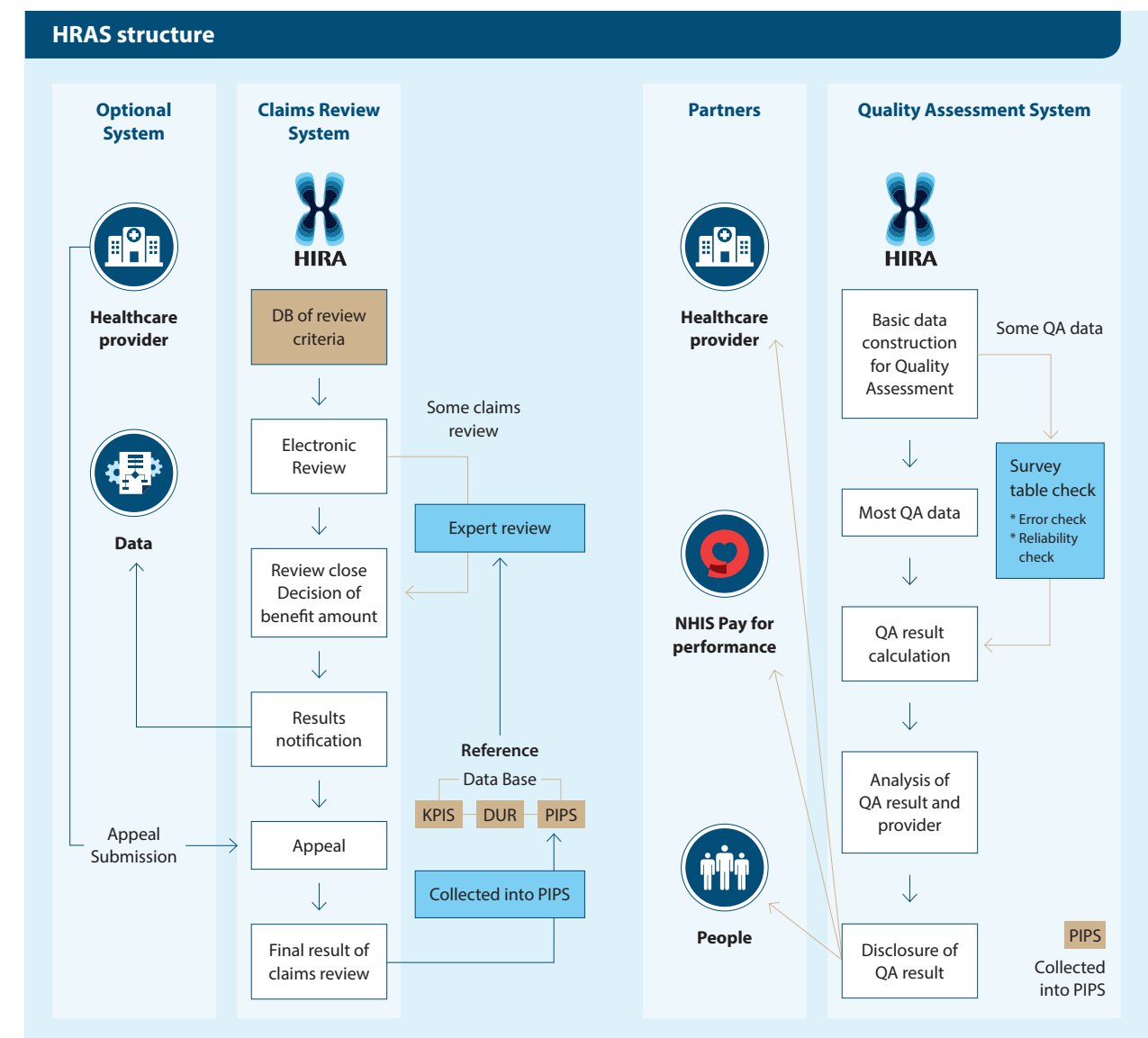| Category	Year	Value
Antibiotic use for the common cold	2002	73.3%
	2019	38.3%
Injection prescription rate	2002	38.6%
	2019	15.3%
Number of drugs per prescription	2002	4.3
	2019	3.67
Acute stroke mortality rate	2011	11.3%
	2019	7.2%
Prophylactic antibiotic received within one hour prior to skin incision	2004	23.6%
	2017	89.6%

Features and results(HRAS)

Claims Review Automatically reviews claims based on set criteria and provides references for expert reviews

Quality Assessment Calculates grades and conducts comparative analyses of the results after error and reliability check

Productivity Improvement Digitalized process improves productivity, allowing fast and consistent process and receiving constant feedback from users

HRAS structure

Optional System
- Healthcare provider
- Data
- Appeal Submission

Claims Review System — HIRA
- DB of review criteria
- Electronic Review
- Review close Decision of benefit amount
- Results notification
- Appeal
- Final result of claims review

Some claims review → Expert review

Reference Data Base: KPIS, DUR, PIPS → Collected into PIPS

Partners
- Healthcare provider
- NHIS Pay for performance
- People

Quality Assessment System — HIRA
- Basic data construction for Quality Assessment
- Most QA data
- QA result calculation
- Analysis of QA result and provider
- Disclosure of QA result

Some QA data → Survey table check (* Error check * Reliability check)

PIPS — Collected into PIPS

③ Korea Pharmaceutical Information System(KPIS)

KPIS tracks and traces drugs at every possible level: production, import, distribution

HIRA History: KPIS

KPIS was first introduced in 2007 to streamline the drug distribution process. In 2015, HIRA began to assign standard codes to each pharmaceutical product to easily track and trace in the market.

Achievement of the KPIS

Contributes to policy execution of the government by building national statistical infrastructure for pharmaceutical distribution, safe environment for drug consumption, and protection of NHI fund stability

Safe Distribution

Manages drug distribution data of all 28,197 pharmaceutical products across the country

Safe Durgs

Supports the safe distribution of 413 different drugs

Recalls drugs

Recalls 1.66 million drugs that may be contaminated with a carcinogen

How the KPIS is used to fight COVID-19

The KPIS actively monitors the drug distribution network in real-time to produce information that is essential to timely supply COVID-19 treatments. By managing the number of patients that are treatable with current pharmaceutical stocks, Korea was easily able to administer treatment without any shortage of medication throughout the entirety of the outbreak.
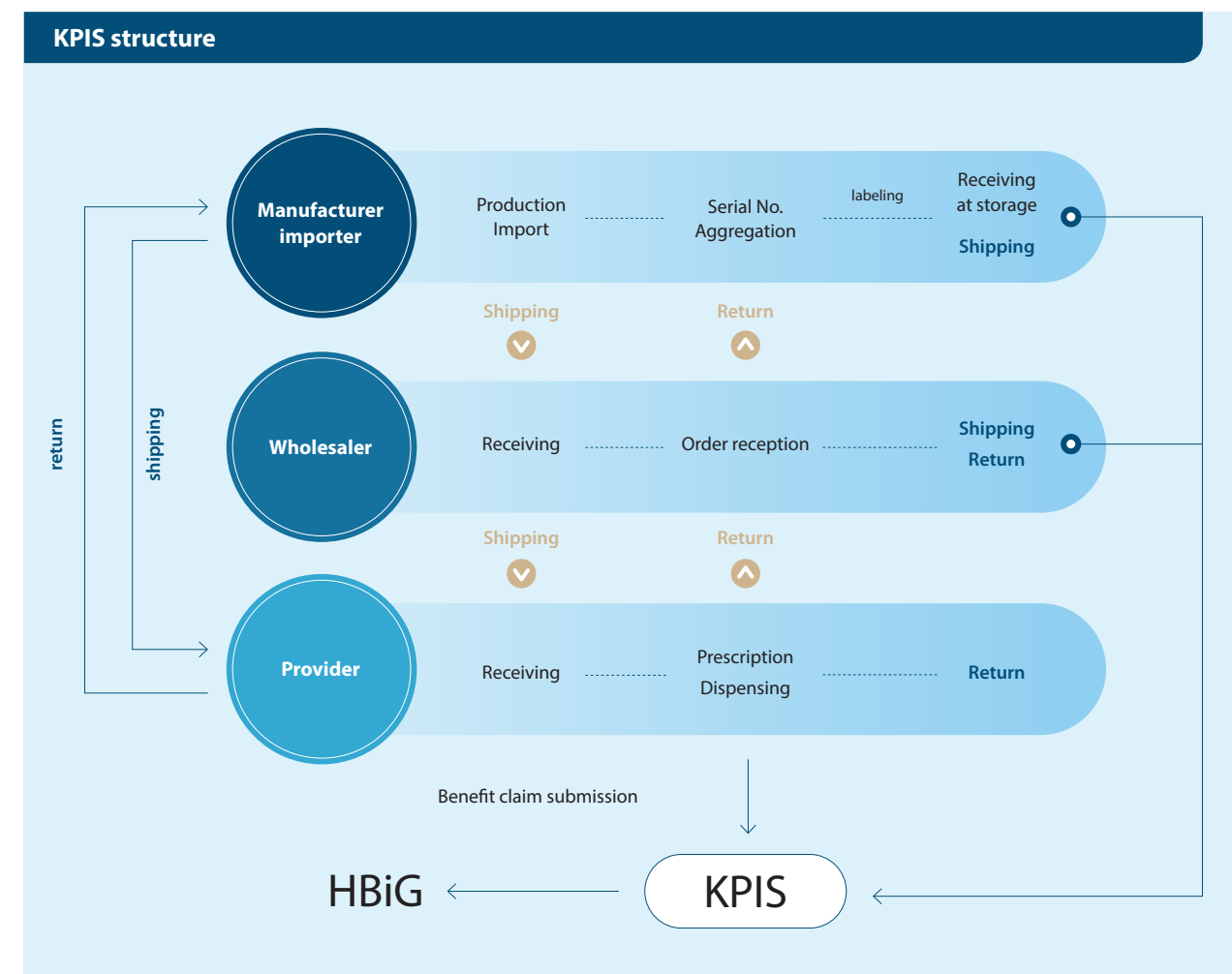
Features and results(KPIS)

Distribution Information Management Collects and manages the records of drug production, import, supply and consumption from manufacturers, importers, pharmaceutical companies, and providers

Drug Safety & Risk Management Prevents illegal drug distribution including narcotics, sets a proper volume level for drug inventories, and recalls potentially harmful drugs

Drug Inventory Management Effortlessly provides supplies of drugs through inventory management, and reduces expenses by preventing excessive overstocking

Personal Protective Equipment Management Can be expanded to manage other personal protective equipment(PPE) such as face masks, gloves and goggles

KPIS structure

Manufacturer importer — Production Import · Serial No. Aggregation · labeling · Receiving at storage · Shipping

Shipping / Return

Wholesaler — Receiving · Order reception · Shipping / Return

Shipping / Return

Provider — Receiving · Prescription Dispensing · Return

return / shipping

Benefit claim submission

HBiG ← KPIS ←

(4) Drug Utilization Review System (DUR)

DUR System transmits real-time information to minimize and prevent the unsafe drug use.

HIRA History : DUR System

The need for a system that promotes safe drug use came in 2003 due to problems related to exceeding drug safety standards and the steady increase in side effects from drug misuse. Due to the devastation caused by the 2015 MERS outbreak in Korea, the DUR system functionality was expanded gradually over time to provide real-time information to prevent the spread of infectious disease.

Achievement of the DUR System

Enables real-time data exchange between HIRA and healthcare providers, and diverse service provision for patients and healthcare providers

No. of providers that installed DUR (as of June, 2020)
78,294 providers (99.4% of subject of DUR installation)

Prevention of inadequate blood donation (3,951 cases, as of August, 2020) No. of cases shared on the people who took drugs not allowed for blood donors (5,127,208 cases, as of August, 2020)

Total of 3.6 million cases reported on in response to infectious diseases(MERS, Ebola, Yersinia pestis, etc) from 2015 to April 2020

Reduced pharmaceutical expenditures by USD 46 million by preventing improper drugs consumption in 30.94 million cases

How the DUR System is used to fight COVID-19

Stabilizing the face masks supply and demand
The DUR System is able to track face mask purchases per person in order to implement the government proposed rotation scheme for a stable supply to the public.

Providing real-time information on high-risk groups
The DUR System alerts healthcare providers in real-time on information about patients that might put them at higher risk for COVID-19 infection. This includes information on recent travel to high-risk countries, contact with confirmed patients, and patients recently released from quarantine.
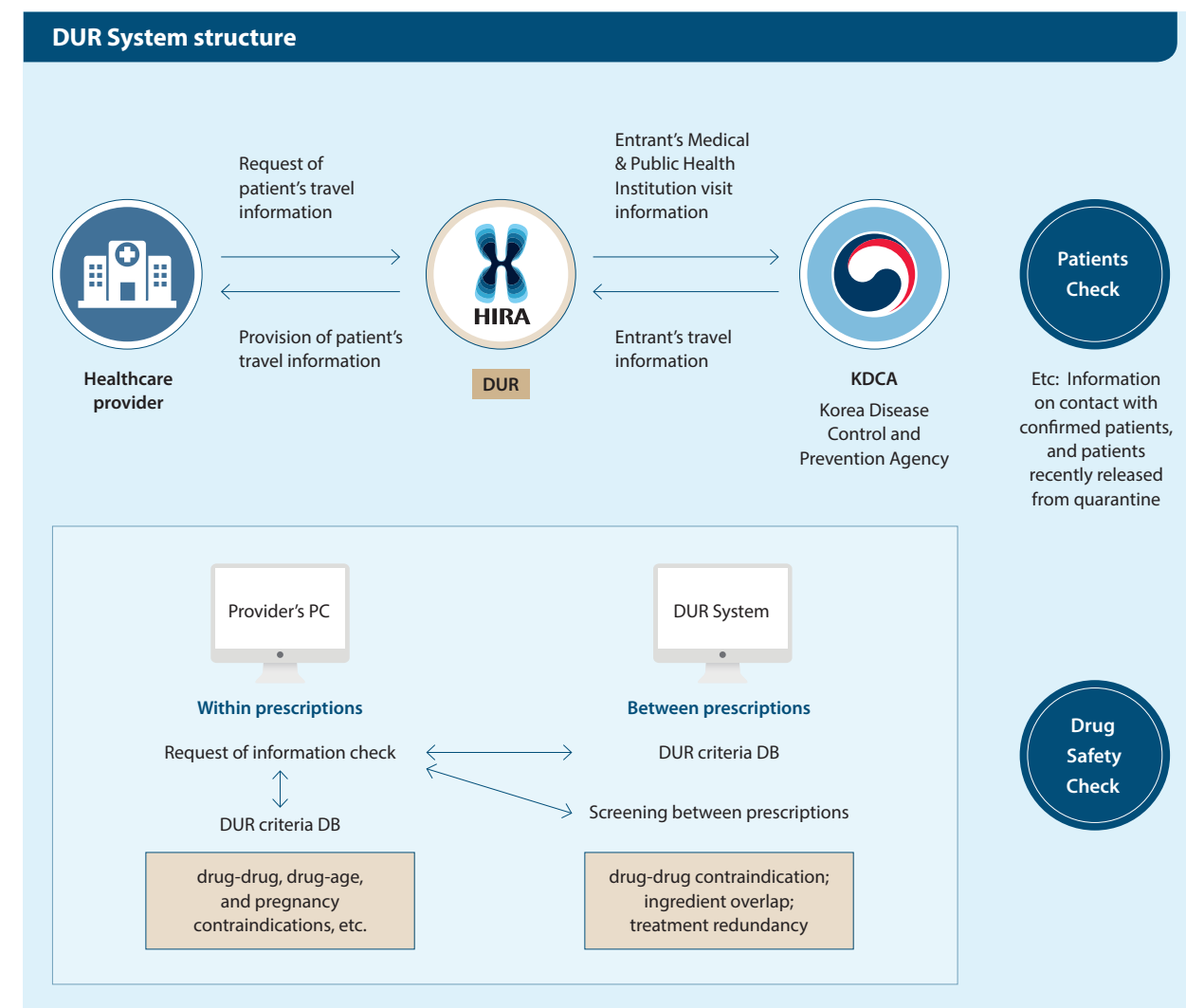
Features and results(DUR System)

Drug Safety Review Reduces the risk of potential improper drug use by providing safety information on drug-drug, drug-age, and pregnancy contraindications and ingredient overlap

Medication history check Enables patients to make informed decision about their health, and physicians to provide safe medical services

Saving drug expenditure Eliminates needless medication-related expenditures by preventing the overlapping prescriptions and side effects

Sharing information with partners Exchanges real-time safety information between the government and partner agencies

DUR System structure

Healthcare provider

Request of patient's travel information

Provision of patient's travel information

HIRA

DUR

Entrant's Medical & Public Health Institution visit information

Entrant's travel information

KDCA
Korea Disease Control and Prevention Agency

Patients Check

Etc: Information on contact with confirmed patients, and patients recently released from quarantine

Provider's PC

DUR System

Within prescriptions
Request of information check
DUR criteria DB
drug-drug, drug-age, and pregnancy contraindications, etc.

Between prescriptions
DUR criteria DB
Screening between prescriptions
drug-drug contraindication; ingredient overlap; treatment redundancy

Drug Safety Check

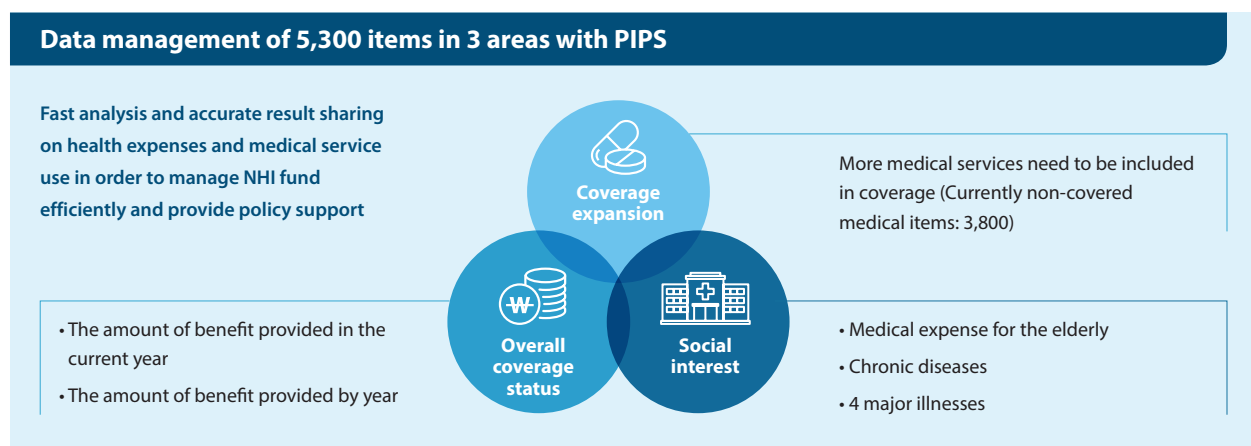# ⑤ Provider Integrated Profiling System (PIPS)

PIPS is a provider-focused, comprehensive data dashboard to provide the detailed status of each provider at a glance

HIRA History: PIPS

HIRA had long collected and managed the provider status information. Using the provider status information that HIRA has long managed, PIPS was developed as an integrated data-driven system.

The data and analysis provided by PIPS about the current status of a provider's health resources have allowed HIRA to improve the level of its assessment expertise. PIPS also greatly assists with the re-allocation of health resources via its health resource status monitoring.

Achievement of the PIPS

Provides effects analysis on coverage expansion policy, efficient expense management of NHI fund, and nation-wide monitoring of healthcare service use

Managed the status of 96,253 providers and analyzed relevant data indicators (as of June 2020)

Data management of 5,300 items in 3 areas with PIPS

Fast analysis and accurate result sharing on health expenses and medical service use in order to manage NHI fund efficiently and provide policy support

Coverage expansion

More medical services need to be included in coverage (Currently non-covered medical items: 3,800)

• The amount of benefit provided in the current year
• The amount of benefit provided by year

Overall coverage status

Social interest

• Medical expense for the elderly
• Chronic diseases
• 4 major illnesses

How the PIPS is used to fight COVID-19

The PIPS has been utilized to allocate health resources to the right place in emergency area. Healthcare providers can assign critical patients with COVID-19 to suitable facilities by providing real-time information on the availability of negative pressure isolation rooms.
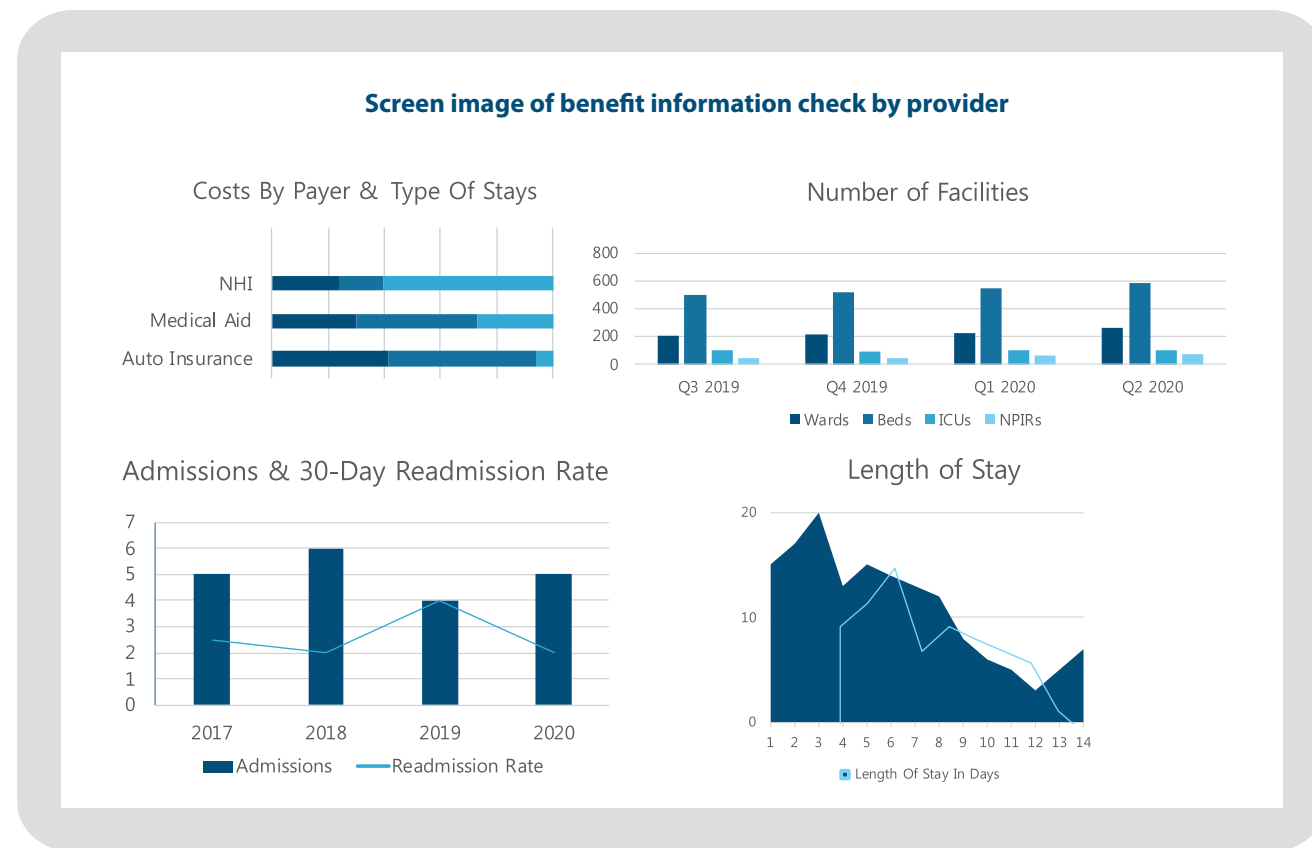
Features and results(PIPS)

Health Resources Monitoring Monitors in real-time the status of all health resources belonging to each healthcare institution

(Provider Status Info) Name & location of facilities and info. on the personnel and medical devices; number of beds & rooms

Provider Profiling Analyzes the patterns of claims and provision of care to grasp each healthcare provider's characteristics and tendency. Compares healthcare providers of similar level of care in order to produce detailed information on the characteristics of target providers' healthcare services and the patients they serve

Provider Monitoring Detects suspicious providers who might potentially claim unfair charges by cross-referencing common fraudulent claims

(Analysis Indicators) Provides the status of cost and quality of care provided by provider, ALOS and CI *statistics, *ALOS : Average Length Of Stay / CI : Cost Index

Screen image of benefit information check by provider

Costs By Payer & Type Of Stays

Number of Facilities

Admissions & 30-Day Readmission Rate

Length of Stay

(6) Healthcare Big Data System (HBiG)

HBiG is a data system that supports the decision-making process of various external parties, such as government agencies, researchers, and corporations, by aggregating provider-collected and externally-collected data.

HIRA History : HBiG

As data emerged as the driving force of the 4th Industrial Revolution, countless possibilities for the application HIRA's wealth of data have come to light. Departing from the traditional focus on solely supplying healthcare statistics, HIRA began in 2015 to provide a variety of data that can be used in research and industrial applications across all fields of healthcare.

Achievement of the HBiG

Produces and releases accurate and consistent statistics based on the Big Data collected during the operation of National Health Insurance

Provided 150 datasets to researchers (2018) and approx. 37,000 datasets to the private market

Produces national health statistics of Korea

Provided data to the pharmaceutical industry to develop new drugs

※ Export contracts with approx. 21 different countries (as of November 2019)

How the HBiG is used to fight COVID-19

The HBiG shares de-identified COVID-19 patient data with domestic and international researchers as real-world clinical data. Data analysis using the HBiG helps physicians make decisions for treatment in clinical field and it could engage in producing effective measures to fight the global spread of the novel infectious disease.

Features and results(HBiG)

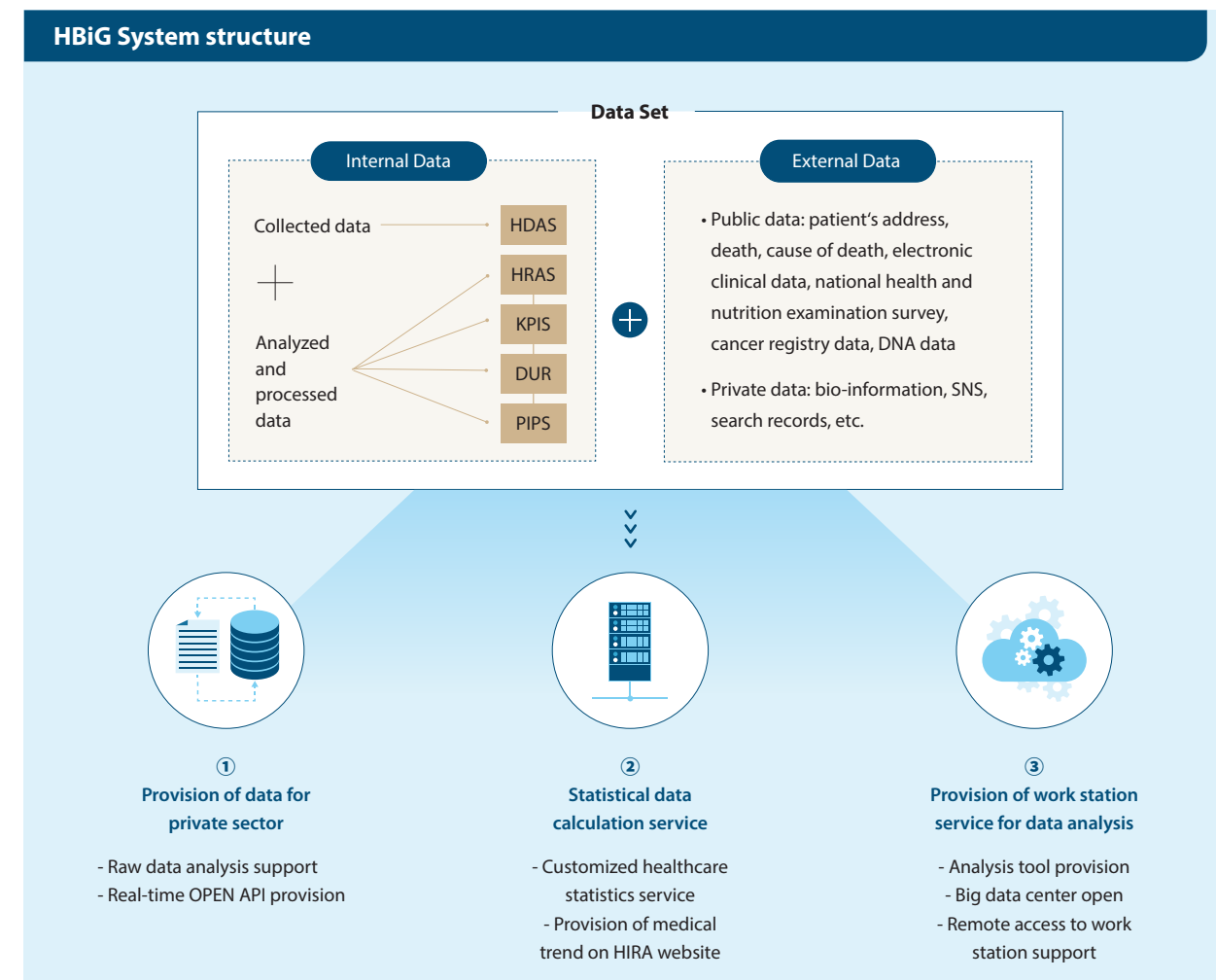**Data Provision** Supports R&D for the government, medical field, academia, and private sector by providing big data in healthcare to users

Monitoring & Forecasting Enables monitoring and forecasting of healthcare utilization nationwide with HBiG

Various Access Methods Offers access to online analysis systems (Virtual PC, VDI* System) as well as offline access to HIRA Big Data centers that users can visit at their own convenience
* VDI: Virtual Desktop Infrastructure

Personal Information Protection Safeguards personal information through a 3-step de-identification process

HBiG System structure

Data Set

Internal Data

Collected data
+
Analyzed and processed data

HDAS
HRAS
KPIS
DUR
PIPS

External Data

• Public data: patient's address, death, cause of death, electronic clinical data, national health and nutrition examination survey, cancer registry data, DNA data

• Private data: bio-information, SNS, search records, etc.

① **Provision of data for private sector**
- Raw data analysis support
- Real-time OPEN API provision

② **Statistical data calculation service**
- Customized healthcare statistics service
- Provision of medical trend on HIRA website

③ **Provision of work station service for data analysis**
- Analysis tool provision
- Big data center open
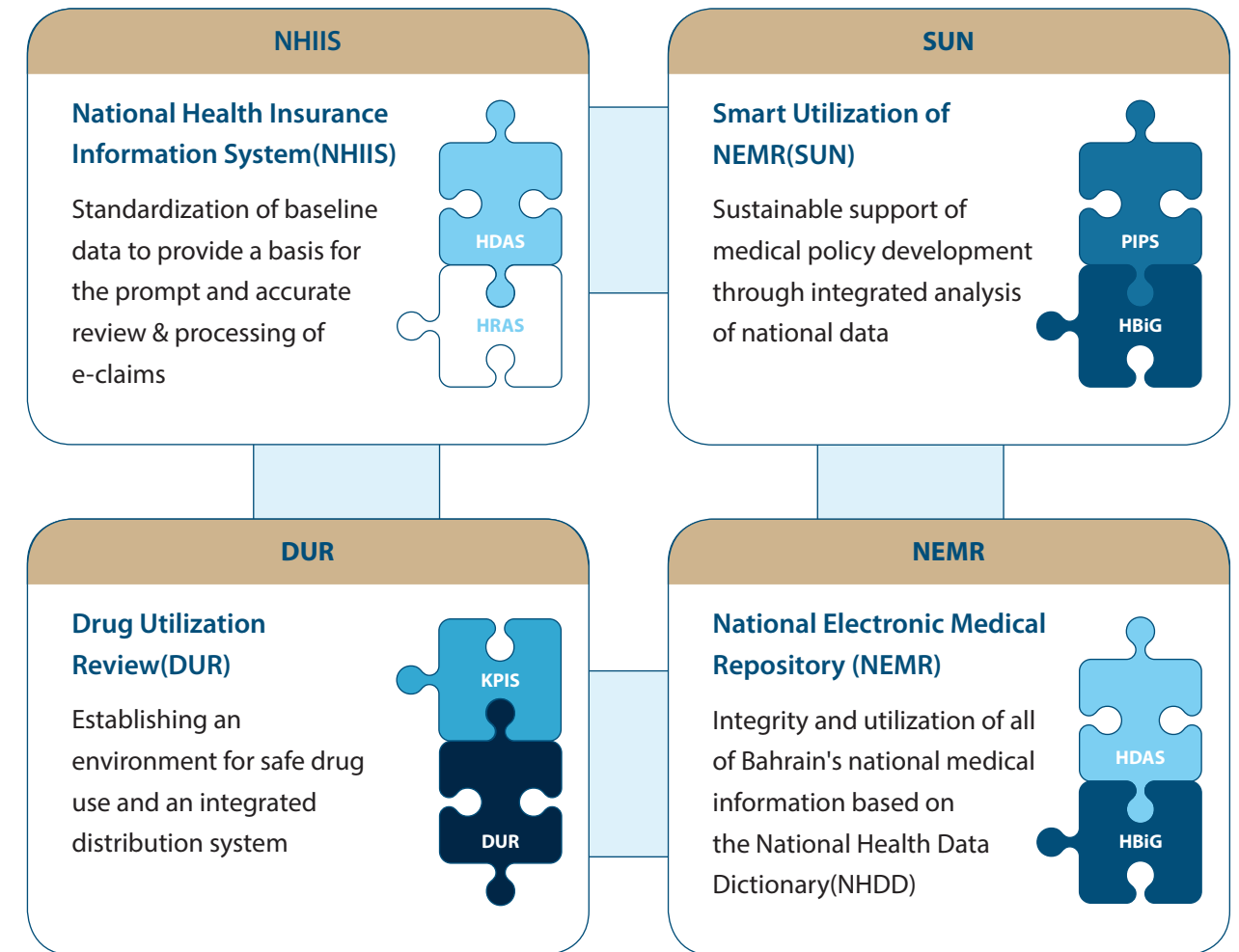- Remote access to work station support

International Cooperation with the Expanded HIRA ICT System

Each individual system of the HIRA ICT System can be combined in various ways to create synergistic effects. HIRA has constructed an ICT-based health insurance management system for Bahrain's mandatory national healthcare insurance system. Korea and Bahrain successfully completed SEHATI-IT Project which is a great example of how the integrated HIRA ICT System can be implemented.

This project serves as a proud example of international cooperation in the healthcare sector at its best. The SEHATI-IT System will be a useful model for other countries trying to introduce a national healthcare management system.


Bahrain National Health Insurance System Reform Joint Project between the Republic of Korea and the Kingdom of Bahrain

NHIIS

National Health Insurance Information System(NHIIS)

Standardization of baseline data to provide a basis for the prompt and accurate review & processing of e-claims

HDAS
HRAS

SUN

Smart Utilization of NEMR(SUN)

Sustainable support of medical policy development through integrated analysis of national data

PIPS
HBiG

DUR

Drug Utilization Review(DUR)

Establishing an environment for safe drug use and an integrated distribution system

KPIS
DUR

NEMR

National Electronic Medical Repository (NEMR)

Integrity and utilization of all of Bahrain's national medical information based on the National Health Data Dictionary(NHDD)

HDAS
HBiG

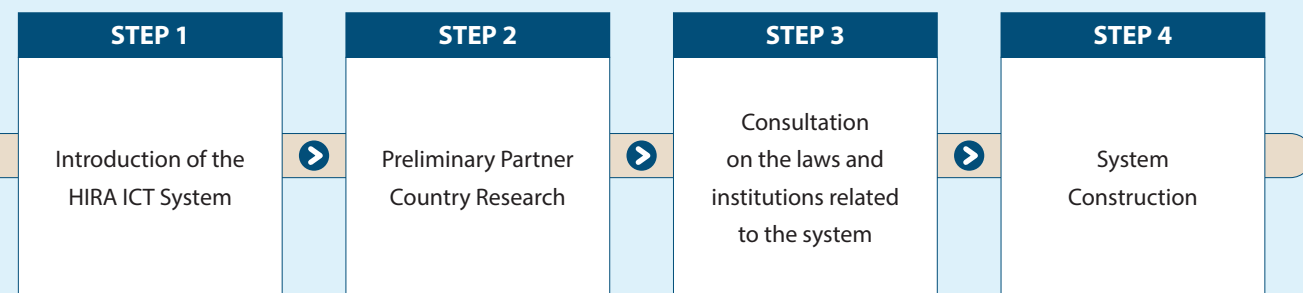**Results achieved with SEHATI-IT project(Bahrain)**

1. Contributed to the development of the SEHATI-IT system, the primary initiative of the Bahrain government's National Healthcare Strategy (2016-2025)
2. Manages health resources on the national-level & established a data collection system to manage public health
3. Improved the efficiency of the drug distribution system by replacing the offline drug reporting system with a simplified online system
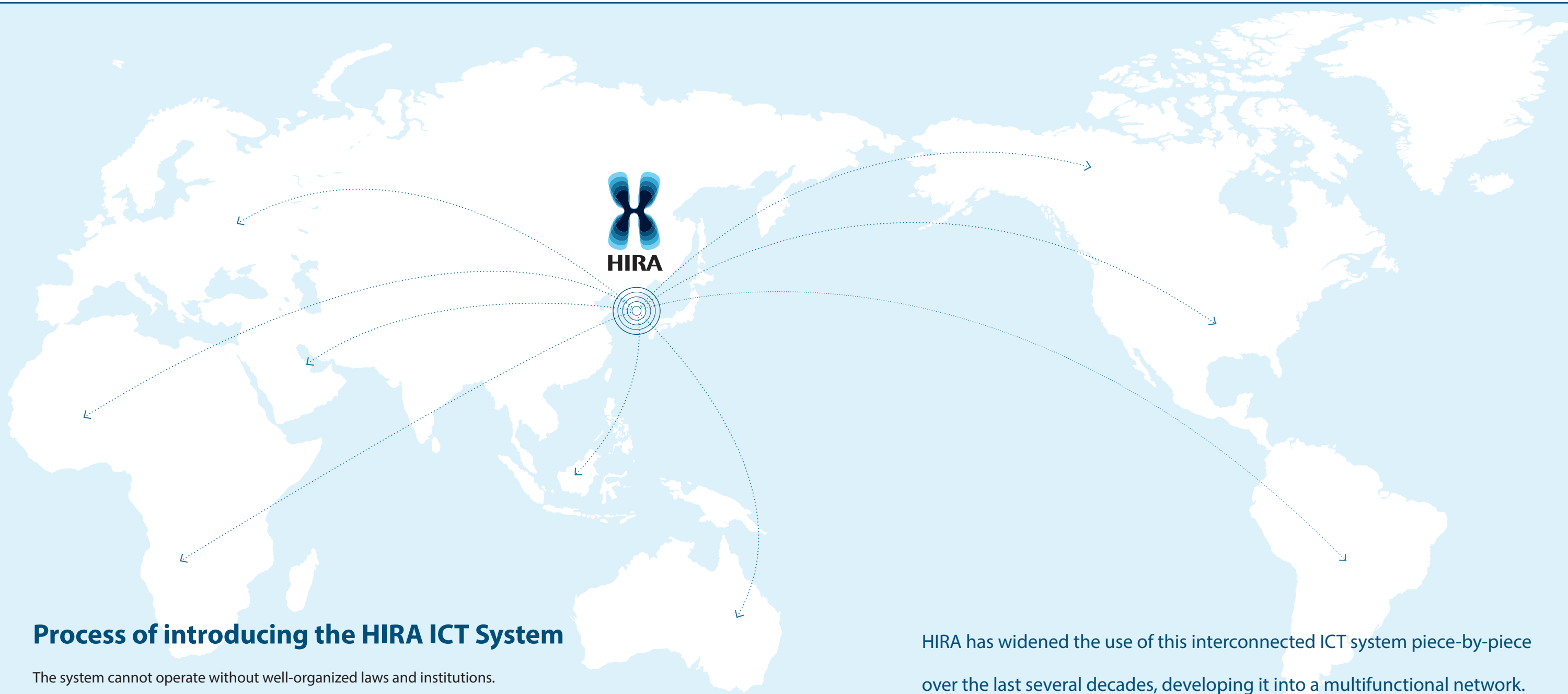
Process of introducing the HIRA ICT System

The system cannot operate without well-organized laws and institutions.
Therefore, research of the partner country in advance is necessary to construct a system successfully.

STEP 1	STEP 2	STEP 3	STEP 4
Introduction of the HIRA ICT System	Preliminary Partner Country Research	Consultation on the laws and institutions related to the system	System Construction

HIRA has widened the use of this interconnected ICT system piece-by-piece over the last several decades, developing it into a multifunctional network. HIRA currently shares its institutional memories and experiences in developing systems with the international community. We will continue to strive toward this kind of international cooperation in order to bring Universal Health Coverage and build a healthier world. We hope that you take an interest in and help to support us in all our endeavors.