

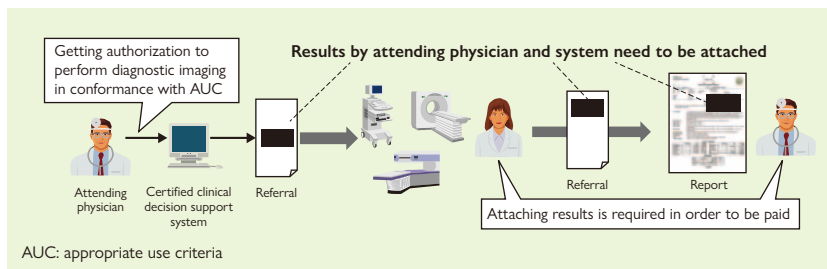
# Healthcare Systems

## 1 Using IT to Increase Diagnostic Imaging Workflow Efficiency

Healthcare providers have recently been working on improving healthcare quality and efficiency through optimization done by making the steps of primary care, diagnosis, treatment, and prognosis flow seamlessly as a single workflow. The increasingly rapid growth of this trend is increasing the importance of integrating medical and other information for individual patients. Diagnostic imaging is one example of the shift toward optimization. The USA is planning to begin full-scale use of appropriate use criteria (AUC) for this area in 2020. The plan calls for healthcare providers to use clinical decision support systems for authorization before imaging, and attaching the results to justify the imaging and the reporting.

To handle the increased burden in healthcare providers resulting from this workflow change, Hitachi, Ltd.'s Healthcare Business Unit is integrating the diagnosis image reporting workflow technology of USA medical imaging software company VidiStar, LLC (acquired in January 2018) with its diagnostic imaging medical device and system technologies. They will provide comprehensive solutions centered around information integration spanning from imaging to reporting.

Anticipating the introduction of similar policies designed to improve healthcare quality and efficiency, Hitachi will continue to provide customization and other services tailored to local needs.



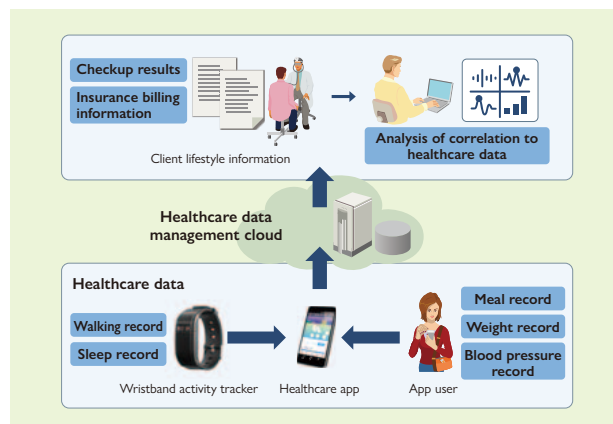
1 Workflow efficiency improvement

## 2 Use of Healthcare Data for Services from a Non-healthcare Provider

Recent interest in data usage is promoting the application of technologies such as big data and artificial intelligence (AI) to several different business areas, and Hitachi has received a variety of inquiries from companies looking to start new businesses driven by personal healthcare data (health and lifestyle data).

One example is from a company that is an existing data holder with client information related to its own services. It has requested assistance with product development and sales designed for anticipated buyers and made possible by combining its existing data with client lifestyle information. The key features the company hopes to provide are simple healthcare data acquisition methods, infrastructure enabling secure storage of information, and services adaptable to its business model.

Specifically, Hitachi is working on collaboratively creating new businesses with companies previously



2 Healthcare data storage and use

unrelated to healthcare. The businesses will consist of acquiring activity data from wristbands or other wearable devices, storing it in the cloud via smartphones, and providing analysis of its correlation to checkup results or health insurance billing information.

### 3 Contract Development and Manufacturing Organization for Cell Therapy at Hitachi Chemical

After acquiring Hitachi Chemical Advanced Therapeutics Solutions, LLC, Hitachi Chemical Company, Ltd. started a regenerative medicine business in April 2018 as a contract development and manufacturing organization (CDMO).

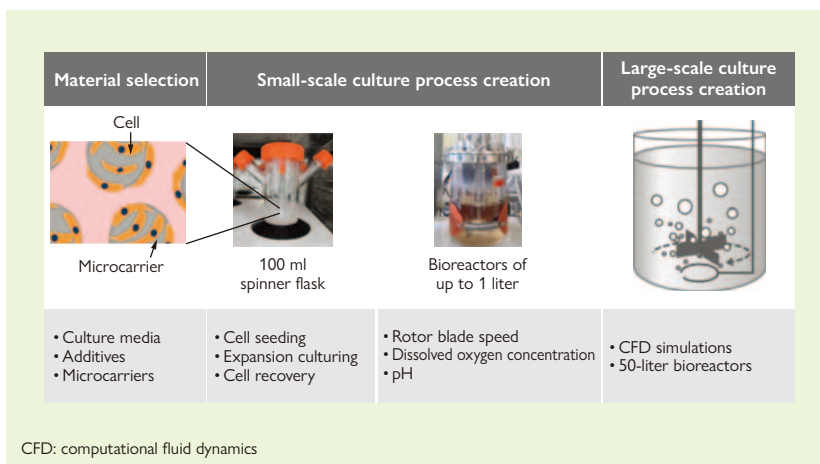
The new partnership benefits pharmaceutical companies by offering global CDMO services complimented by CDMOs' process scalability, business sustainability, access to cutting-edge technical expertise, cost efficiency without excessive overhead investment, and speed to market\*.

In addition, Hitachi Chemical is accelerating the development of bioreactor-based large-scale suspension culture technology to make this technology a de facto standard platform, which will be its value proposition to pharmaceutical companies.

Supporting regenerative medicine as a CDMO and contributing to the welfare of humanity are the missions that Hitachi Chemical pledges to society.

(Hitachi Chemical Company, Ltd.)

\* Source: "Market Size Determination for the Cell Therapy CDMO Market," BioInformation.com (2017).



3 Large-scale suspension culture program development scheme

### 4 SCENARIO View 64-row Multislice CT System Combining Low Radiation Dose and High Image Quality

SCENARIO View is a 64-row multislice computed tomography (CT) system developed by Hitachi and conceptualized as a three-way visualization tool (for diagnosis, examination, and imaging).

(1) As a diagnostic tool, SCENARIO View combines low radiation dose with high image quality at a high level using an original technology developed by Hitachi called iterative progressive reconstruction with visual modeling (IPV)\*<sup>1</sup>.

(2) As an examination tool, SCENARIO View provides efficient workflows by combining an automatic scan range setting function with a high-speed image reconstruction process to improve operation ease and reduce examination time.

(3) As an imaging tool, SCENARIO View has an operator-friendly design that incorporates the high-voltage X-ray generator and gantry into a single unit. Together with the three-unit configuration (gantry, patient table, and operator console), this design enables installation in facilities of limited space and makes it easy to maintain facility flow lines.



4 SCENARIO View 64-row multislice computed tomography (CT) system

SCENARIO View's scanning environment ensures patient-friendly imaging by using a new streamlined gantry design and widening the opening by 5 cm relative to previous SCENARIO models (to 80 cm in diameter)<sup>\*2</sup>. It also provides administrator-friendly imaging by increasing scanning throughput to help boost hospital management efficiency.

\*1 A next-generation iterative dose reduction function.

\*2 A winner of the 2018 Good Design Award.

## 5 X-ray System for Mass Gastric Screenings in Vehicles

With over 7 million people receiving gastric screenings every year in Japan, Hitachi has been providing vehicle-mounted X-ray systems for this sector since 1960. Hitachi's latest system maintains previous features such as the two-way arm and rolling bed, which can reduce the burden on examinees by moving the imaging equipment around them. Despite being a vehicle-mounted system, it can provide radioscopy and radiography with the same high quality images found in installed systems used in hospitals to help in early detection of health issues. The system's main features are as follows:

(1) X-ray transmission images are captured using a video-ready indirect conversion flat panel detector (FPD) that is the first vehicle-mounted unit of its kind in Japan<sup>\*1</sup>. It replaces conventional round images having peripheral distortion with square images of low peripheral distortion, providing clear X-ray images.

(2) Motion tracking noise reduction (MTNR)<sup>\*2</sup>, multi-dynamic range compression (DRC) processing and other image processing technologies allow a vehicle-mounted system to provide screening and scanning with the same high quality images of installed equipment.

(3) The volume of the remote operation console has been reduced by about 20% relative to previous Hitachi systems, increasing the layout freedom inside the vehicle.

\*1 From attached document search results of Pharmaceuticals and Medical Devices Agency as of January 31, 2017.

\*2 Winner of the Prize of the President of the Japan Patent Attorneys Association in the 2018 National Commendation for Invention Awards.



5 X-ray system for mass gastric screenings

## 6 ECHELON Smart 1.5 Tesla Superconducting MRI System Providing High Image Quality and Comfortable Screening Environment

ECHELON Smart is a magnetic resonance imaging (MRI) system that comes with noise-reduction technology and screener-assistance applications while providing the high image quality vital for medical examinations. These benefits ensure a comfortable screening environment for both patients and the screeners who operate the system.

To provide high image quality, ECHELON Smart digitizes the received MRI high-frequency signal directly to prevent noise contamination, and comes with optimized image composition technology (Smart Engine) made possible by a high-sensitivity 16-channel receiver coil system.



6 ECHELON Smart 1.5 tesla superconducting MRI system

To provide a comfortable screening environment, ECHELON Smart comes with noise reduction technology called Smart Comfort that reduces imaging noise by up to 94%, and a function for correcting patient movement called Radial Acquisition Regime (RADAR). These features are effective for a wide range of imaging. They enable a high degree of freedom in imaging conditions, supporting widespread application regardless of parameters such as the imaging location or imaging cross-section. Smart Comfort can be used together with RADAR to provide a screening environment suitable for patients who find MRI screening difficult. An automatic imaging range setting function is also provided to assist in making quick and accurate slice line settings that can be time-consuming for even experienced screeners. It reduces screening time to create a more comfortable screening experience for patients and improve screening efficiency.

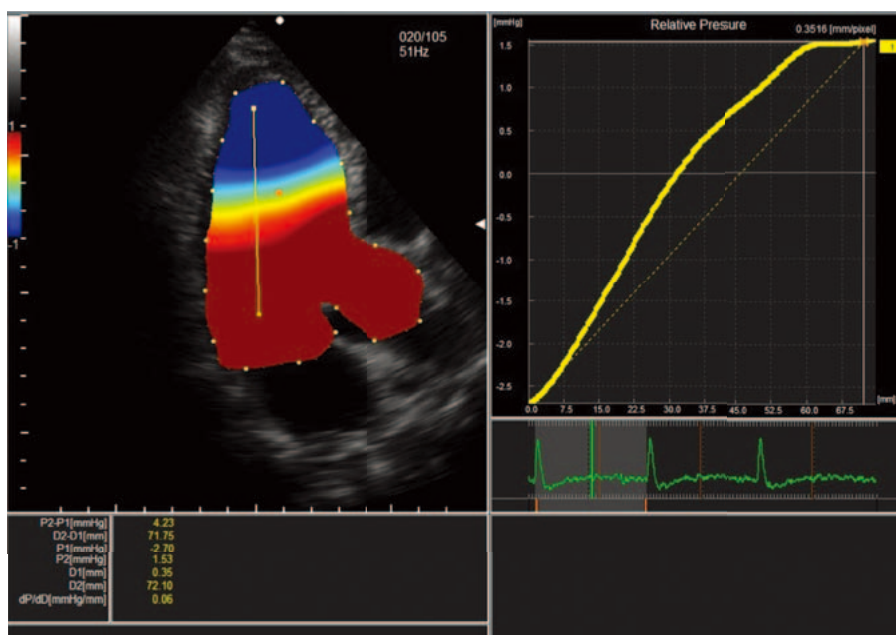
## 7 Hitachi Solution for Cardiovascular Medicine: Heart Failure Solution Package

The aging populations of the developed world and other countries are resulting in a growing number of patients presenting with heart failure. Since early detection is key for the treatment of this condition, more accurate diagnostic information needs to be provided.

Accurately measuring the heart's diastolic function is a vital requirement for diagnosing heart failure. But cardiac catheterization is the only accurate study method and is not easy to conduct. To address this problem, Hitachi has used noninvasive ultrasound to develop a vector flow mapping (VFM) function that displays the blood flow distribution within the heart in the form of velocity vectors.

A VFM relative pressure function has also been released. It can display the pressure distribution within cross-sections by using Navier-Stokes equations (equations describing the motions of fluids). It can provide color displays of high and low pressures as warm and cold colors, enabling simple and accurate measurement of the heart's diastolic function from its pressure distribution.

Hitachi hopes to assist in the early detection of heart failure by releasing a heart failure package centered around the VFM relative pressure function.



7 VFM relative pressure function