



Innovative AI Hospital System

Artificial intelligence (AI) technologies promote patient-friendly, high-quality medical care!

A database consisting of a large amount of data (big data) from the medical care-based Internet of Things (IoT) will be established. Its objectives include ensuring high-quality medical care in the “super-aging” society, suppressing national medical spending, enhancing the international competitiveness of the medical care industry of Japan, and reducing the workloads of medical care professionals. Furthermore, AI technologies will be used to create new platforms that will assist in the diagnosis, training, and communication of inter-medical care professionals as well as in improving their interactions with patients and their family members.



Program Director

Dr. Yusuke Nakamura

Director
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Research

Profile

Yusuke Nakamura, PhD, is currently the Director of the Cancer Precision Medicine Center, Japanese Foundation for Cancer Research, and Professor Emeritus at The University of Tokyo and Professor Emeritus at The University of Chicago. Since graduating from the Osaka University Faculty of Medicine in 1977, Dr. Nakamura has been one of the pioneers of genetic medicine, discovering a number of genetic disease markers useful for identifying pathogenetic mechanisms and treatment. His previous positions include the following: (i) Professor, Laboratory of Molecular Medicine, Institute of Medical Science, The University of Tokyo; (ii) Professor and Director, Human Genome Center, Institute of Medical Science, The University of Tokyo; (iii) Director, RIKEN Center for Genomic Medicine; (iv) Director, National Cancer Center Research Institute, Tokyo, Japan; (v) Special Advisor to the Cabinet Secretary General, Office of Medical Innovation, Cabinet Secretariat, the Government of Japan; (vi) Professor, Department of Medicine, Section of Hematology/Oncology, the University of Chicago; and (vii) Deputy Director, Center for Personalized Therapeutics, the University of Chicago. Dr. Nakamura has been the Director of the Cancer Precision Medicine Center since July 2018. He is listed as an author on more than 1,400 peer-reviewed international research articles that have been cited approximately 165,000 times.

Research & Development (R & D) Themes

The R&D activities in the following Sub-themes will be the pillars of the future AI hospital system:

A : A highly secure medical database and analytical technologies to find medically useful information

A medical database that contains clinical, imaging, pathological, and laboratory data will be created to improve medical practice. This database will support multiple languages, ensure data confidentiality, and possess defense capabilities against cyberattacks.

B : AI-assisted automated medical record system and support for bilateral communication in informed consent

AI and other technologies will be applied to create new platforms for the automated documentation of medical records, informed consent, and other medical care information. These will help improving patient satisfaction and decrease the workloads of medical care providers.

C : AI-assisted highly-sensitive and low-invasive testing of blood or other biological samples to enable the earliest detection of cancer and other severe diseases

AI technologies will be utilized to establish highly-sensitive and low-invasive test methods for cancer screening, very early detection of metastasis/relapse as well as finding the most appropriate drugs. This subarea also covers measures to assure the quality of test results and sample transportation. In addition, an AI-guided automated and safe endoscopy system will be developed.

D : Proof-of-concept study of AI hospital functions in clinical practice settings

In addition to the currently available information and communication technology tools for diagnosis and treatment, the AI-assisted methodologies, sensor instruments, and other technological innovations that are newly developed in Sub-themes A to C will be integrated for use in clinical settings. This will allow the AI to learn and improve diagnostic and decision-making algorithms so as to evolve into a highly efficient medical system.

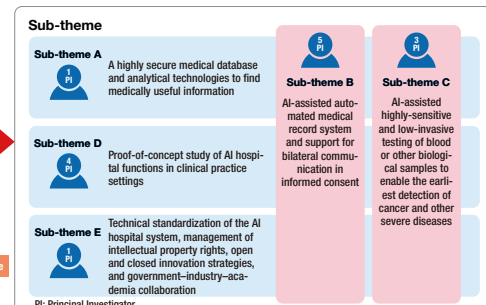
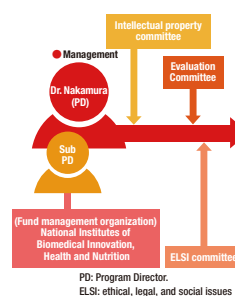
E : Technical standardization of the AI hospital system, management of intellectual property rights, open and closed innovation strategies, and government-industry-academia collaboration

To implement the innovations generated in Sub-themes A to D, social challenges related to the use of electronic medical information (e.g., financial costs, intellectual property rights, and other issues) will be investigated to find appropriate solutions.

Structural Organization

Under the leadership of the Program Director (PD) Dr. Yusuke Nakamura, this program will be run with the help of the following: Sub-PD Dr. Satoru Miyano (Director, Human Genome Center, Institute of Medical Science, The University of Tokyo) and Sub-PD Hiroshi Mano (CEO, EverySense, Inc., Tokyo, Japan); the ethical, legal, and social issue (ELSI) committee*; the intellectual property committee; the evaluation committee; and the fund management organization. R&D efforts in the five subareas will be mutually supportive and reinforcing.

*The mission of the ELSI committee is to identify and address ethical, legal, and social issues related to this program.



Exit Strategies

Scientists participating in this program will be encouraged to evaluate the applicability and practicality of their outcomes.

✓ Practical applicability of the AI hospital service package

The proposed AI hospital service package should be applicable to a wide spectrum of medical service providers, ranging from regional core hospitals to family physicians.

✓ Practical application of AI-assisted medical equipment

In this program, AI-assisted medical devices will be developed and evaluated in clinical settings in collaboration with the private sector; this sector will then apply for authorization to market the new products.

✓ AI systems that enhance physician–patient communication and reduce the workload of health care providers

The AI systems that will be developed in this program will help medical care providers keep enough time to talk with their patients and provide them with the sufficient information they need.

✓ Practical use of AI-assisted highly-sensitive hematological and other testing methods

Standard operating procedures and other technical requirements for the new AI-assisted laboratory tests will be established. These efforts will help overcome geographical access barriers to high-quality testing services.

Expected Outcomes

This program will develop a comprehensive package of advanced medical care services that are optimized by AI technologies and big data analytics. This program will help spread high-quality medicine that offers minimally invasive and personalized treatment options based on the genetic, physical, and lifestyle characteristics of individual patients.

The advantages of this high-quality medicine include prolonging healthy lifespans, suppressing the increasing health care expenditures by identifying ineffective therapies and therapeutics, and strengthening the workforce. Simultaneously, the new technologies that will become available through this program will help reduce the workloads of physicians, nurses, and other medical care personnel, thereby maintaining the availability of high-quality medical care services in the very high-aged society.

Moreover, the new technologies that will support the AI hospital system will increase the international competitiveness of the medical, pharmaceutical, and health care industries of Japan.

The following goals will be achieved by the end of FY 2022:

- A highly secure database of medical information will be created to extract and utilize medically useful information.
- Use of AI technologies in clinical practice will help reducing the workloads of medical care professionals and improve physician–patient interaction.
- New AI-assisted imaging and pathological telemedicine systems and highly-sensitive laboratory test methods will be developed using AI technologies.
- Model systems of the AI hospital will be operated at several medical centers.

AI supports that effectively assist physician–patient interaction and communication applied by the big data information.

