Can artificial intelligence (AI) save medicare from its crisis?
How are AI hospitals expected to reduce the burden on healthcare workers?

Advanced medical services using big data (such as image information and pathological diagnosis information) are being developed one after another. We interviewed with PD Yusuke Nakamura, who is known as one of the leaders of genomic medicine, about the possibility of "AI hospitals" that attract attention now.

Q: To begin with, please tell us about challenges faced by current medical workers.
P: Medical care is becoming ever more sophisticated and diversified. Accordingly, there are so many burdens on medical workers, which prevent the realization of personalized care. What should we do to reduce excessive burdens on medical workers, while continuing to provide advanced medical care to patients? It is a problem we must solve.

"A medical database should be established which can share electronic medical records"

Q: How should Japan's healthcare change to cope with a super-aging population?
P: In Japan today, there is no uniform electronic medical record system which includes the data from blood tests, biochemical tests, and imaging examinations. Such data is not shared.
Examination data is already being shared in Taiwan. For example, data from blood tests and imaging performed in Taichung can be used in Taipei. To prepare for Japan's super-aging society, we should consider how to collect, extract, and utilize valuable data as soon as possible. The goal is to provide more effective medical care (e.g., more appropriate preventive and treatment methods) to patients, based on a solid medical database. Without these advances, we will be unable to cope with problems, including increased medical care expenses.

Q: Do you mean that the establishment of such a database will facilitate the realization of personalized care?
P: Yes. For example, there are several causes of diabetes. Patients with diabetes may not be able to produce insulin, may respond poorly to insulin, or may not secrete insulin properly (even if they can produce it). If an appropriate drug is used for the specific cause of this (or any other) disease, the required treatment period will be shorter. All of these factors will lead to reduction of medical care expenses, and retention of the workforce.
Further, different colon cancer patients have different patterns of gene abnormality. Accordingly, the cancers' speed and effectiveness of drugs may vary by patient. Furthermore, individual genetic differences result in different side effects. Vast amounts of useful reference data will be necessary to provide safer, more effective medical care to patients in each phase. AI will be required to take advantage of such overwhelming amounts of data. AI is sure to change the future of medical care.

"It should be clear to whom medical information belongs"

Q: Next, please tell me about your efforts toward using AI for automatic record documentation at the time of care.
P: In clinical settings, doctors, nurses, and caregivers spend so much time in recording data that they cannot fully perform their actual duties. If they pay greater attention to the keyboard while talking only halfheartedly with patients, mutual trust and understanding will not be established. We hope AI will help realize more sympathetic medical care.
Yet, it is quite difficult to convert hospital conversations into text.
It is more difficult than we imagined to record voices in very noisy dispensary environments and convert them into text. We have compiled a medical dictionary with 370,000 words, and are currently trying to use it to increase the accuracy of converting spoken words into text.

**"Highly-sensitive tests will allow the earliest detection of cancer"**

**Q:** Please tell me about the third research theme: Development of AI-Assisted Highly-Sensitive Testing of Blood, etc. to Enable the Earliest Detection of Cancer Recurrence.

**PD:** The sensitivity of detection of early cancer using tumor markers is low; it is not easy to distinguish abnormality from normality. However, we believe that AI-assisted highly sensitive tests will be much more accurate. The test we are now developing can detect cancer at the operable level with an accuracy of 70 to 80 percent. This is quite a high accuracy level compared with tumor markers (with which the positive rate is 30 percent for liver cancer, and 50 percent for lung cancer). This test can be conducted in the same manner as blood tests, so it is minimally invasive, and good for patients.

**"The initiatives should be taken in standardization, but in principle, technologies should be made open"**

**Q:** Please tell me about management of intellectual property in your current research and development.

**PD:** If we protect our intellectual properties too strictly with patents, no one will be able to use them. We believe that it is important to make our technologies widely available. As a result, our technologies will become standard. Thus, we should take initiative in such standardization, while also disclosing our technologies in a controlled manner. International standardization and open/close strategies are two sides of the same coin. In this regard, we will carefully consider strategies.

**"We will quickly adopt new technologies and attend patients' feelings while providing medical care"**

**Q:** Lastly, what is your conception of future medical care?

**PD:** Due to shortages and uneven distribution of specialists, there are regional differences in levels of image diagnosis and pathological diagnosis. However, in the era of 5G and the enhanced accuracy of AI, you can send medical data and very quickly receive extremely accurate diagnostic results. Utilization of AI will resolve regional differences in the level of diagnosis and knowledge in various fields, thereby keeping the quality of medical care universally high. Unfortunately, in today's clinical settings, many medical workers are exhausted. I believe that the most important part of this program is to regain true medical care, where medical staff and patients can understand each other. It is hoped that competent use of new technologies and tools will facilitate this relationship.