



THE FUTURE IS BRIGHT FOR PRECISION MEDICINE IN SOUTH KOREA

SEOUL NATIONAL UNIVERSITY HOSPITAL is spearheading efforts to integrate clinical research and medical care.

For more than a century, Seoul National University Hospital (SNUH) has played a leading role in advancing medicine and healthcare. Among their many breakthroughs, SNUH doctors generated and delivered South Korea's first IVF baby, and performed the country's first successful liver transplantation. In 2018 they introduced a liver cancer detection method that can improve diagnostic accuracy by more than 30 per cent.

The hospital is a thriving medical innovation hub that

makes the most of technologies related to precision medicine and medical artificial intelligence.

"Medicine is undergoing a revolution," says Youngil Koh, a haematologist at SNUH who leads several genome-health data projects at the Office of Hospital Information and Center for Precision Medicine. "The information we gather in clinical practice is becoming digitized in every aspect and can be utilized to improve patient care."

The hospital's digital health systems are exemplified

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by the work of Hyung-Chul Lee and Chul-Woo Jung, anaesthesiologists at SNUH, who launched VitalDB and the

Vital Recorder in November 2017. This is an open-access repository of vital signs data from patients under general anaesthesia.

VitalDB is expected to be a valuable resource for predictive models for patient outcomes, much like the MIMIC database from the MIT Lab for Computational Physiology has become a go-to source for health data after it compiled more than 40,000 anonymized patients admitted to intensive care units in Boston between 2001 and

2012. To digitize and store the data, Lee and Chung developed the Vital Recorder, a program to record high-resolution, time-synchronized physiological data from anaesthesia equipment including patient monitors, anaesthesia machines, brain monitors, cardiac monitors and infusion pumps. Lee says the Vital Recorder is an open-source tool which could lead to the development of artificial intelligence technologies for patient safety in hospitals.

Collaboration

SNUH collaborated with MIT, the National University of Singapore (NUS), and the Korea National Enterprise for Clinical Trials (KONECT) to run the Korea Clinical Datathon (KCD) 2018, an event to explore emerging issues at the interface of healthcare, information and technology. Taehoon Ko, a research professor at the Office of Hospital Information at SNUH, and a member of the KCD 2018 winning team, says SNUH is preparing useful data, including electronic health records, medical images, patient monitoring data and surgical video data through collaboration between its departments.

The importance of standardizing clinical data

SNUH is leading efforts to standardize South Korea's clinical data, in cooperation with both government and industry. "The drive to standardize clinical data is a national-level activity, and SNUH is the leading institution on this project," Koh explains. "We are working with the government and electronic health record (EHR) vendors to achieve data structuralizing and establish standards for medical terminology to improve information exchange between hospitals and institutions."

Finding a way to ensure the privacy and security of the data, but not impeding information

exchange is critical to the success of the programme, Koh adds.

World-class health IT solutions

Building on SNUH's expertise in improving management efficiency and medical IT solutions, the hospital established a spin-off company called ezCaretech Co., Ltd. in 2001. The company set up a ground-breaking medical information system for Seoul National University Bundang Hospital, a branch of SNUH that became the first to be digitized in the Asia-Pacific region.

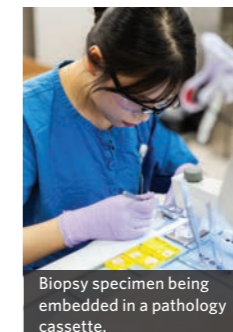
Now recognized as Korea's leading company in the EHR field, BESTCare 2.0, a fully integrated electronic medical record developed by ezCaretech, has the rare distinction of achieving Office of the National Coordinator for Health Information Technology certified status in the USA, where its solutions are being adopted by several hospitals. The company signed a contract with the California-based Aurora Behavioral Health Care Group to implement the BESTCare 2.0 hospital information system in the group's 14 hospitals.

Lung cancer detection

In a first for South Korea, SNUH uses Lunit Insight for Chest Radiography Nodule Detection, an AI-powered medical imaging solution co-developed by Lunit and the Department of Radiology at SNUH. The technology can provide early diagnosis of lung cancer or lung metastatic cancer with 97 per cent accuracy. It also identifies small lung cancer nodules, which are obscured by other organs. In August 2018, this software was approved by the Korea FDA.

Cancer genomics and beyond

The last five years have also seen major advances and investment in cancer genomics. SNUH has been designated as a



Biopsy specimen being embedded in a pathology cassette.



Jeong Mo Bae, a molecular pathologist at SNUH, selects cancer tissue for genomic sequencing.



Kyung Hwan Kim and Youngil Koh, presenters at the Global Genomics Forum at HIMSS 2019, with members of the SNUH Hospital Information Systems Team.

Korea Research Driven Hospital, a Ministry of Health and Welfare project to promote world-class research and development in key fields. Since 2014, SNUH has run the cancer and inflammation and metabolism units, proving its effectiveness through clinical research. Currently, SNUH has developed five panels targeting lung cancer, haematology cancer, pan-cancer, brain glioma and paediatric brain tumours.

Global outreach

SNUH last year undertook a large-scale project to apply a next-generation sequencing (NGS) pipeline in clinical sites and implement a precision medicine platform. Syapse, a US-developed centralized solution for precision medicine and data management, will be used to exchange clinical and genomic data with institutions around the world.

"SNUH is working on standardizing and expanding this innovative platform. Syapse could be used at many institutions in Korea, in other

parts of Asia and the rest of the world," says Koh. He emphasizes that the hospital is "very open to collaboration with domestic and international partners, especially in the fields of genomics and informatics."

Kyung Hwan Kim, a cardiothoracic surgeon and chief information officer at SNUH, says, "SNUH is Korea's leading hospital utilizing a powerful information system with NGS pipelines. Considering medicine globalization trends, a platform allowing for exchange of clinico-genomic data across continents will lead to future precision medicine."

Kim also says SNUH welcomes doctors and researchers interested in clinical informatics who would like to join its exploration of human health. ■



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