

Press Release

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AECOPD System for Precision Medicine

Ministry of Science and Technology (MOST) today holds a press conference for Prof. Feipei Lai's team, based in MOST Joint Research Center for AI Technology and All Vista Healthcare (AINTU), to publish Acute Exacerbation of COPD (chronic obstructive pulmonary disease). Their team supported by MOST has developed the system to offer COPD patients precise healthcare services and remind them for early treatment by a smart wearable device, including to control their body state immediately by a long-term continuous evaluation and to predict possible seizures in future 7 days.

A Lung Disease We Can't Ignore: COPD

According to the statistics of World Health Organization (WHO) in 2018, COPD has killed 3 million people and become the 3rd place among the top 10 leading causes of death in the world, which means one person dies for this fatal disease every 10 seconds. In Taiwan, chronic lower respiratory disease is at the 7th place among the top 10 leading cause of death. There are over 5000 people died for obstructive pulmonary every year.

Dr. Jung-Yien Chien, an attending physician in the Department of Internal Medicine (NTUH), says that COPD is caused by long-term respiratory inflammation that will obstruct the respiratory tract and cause breathing difficulty. Its main symptoms include tachypnoea, cough, and expectoration, which are caused by smoking, air pollution, infection, and the ageing of the lung. Its initial symptoms are not obvious to be diagnosed, so that several common symptoms, such as long-term cough, phlegm, wheezing, are easily misrecognized to be common cold or asthma. Many diagnosed cases are mostly near middle or severe situation. Although COPD is hard to be cured, the patients are still able to control it and to avoid the possibility of acute exacerbation, such as to

quit smoking, to avoid pernicious gases, to take medication, to rehabilitate, and to exercise.

Build Personal Precision Medical Services with AI, Big Data and Open Data

According to Executive Yuan's "Biomedical Industry Innovation Program (BIIP)" and "AI Taiwan Action Plan," MOST has supported 4 top universities of Taiwan to set AI innovation center since 2018: Taiwan University (AI technology and biomedical technology), National Tsing Hua University (intelligent manufacturing), National Chiao Tung University (applied AI), National Cheng Kung University (biomedical AI research). Prof. Lai's team of AINTU developed AECOPD system for 3 years which creates a personal platform with no space limit and offers continuing medical services for patients by using technologies, such as AI, big data, cloud computing, and other smart devices in an interdisciplinary try with medicine. The precision of this model can reach 92.5%, which may reassure the patients and reduce the possibility of acute exacerbation.

Co-Director of AINTU Li-Chen Fu points out that new technologies, such as AI, big data, and cloud computing, urge us to think how to link with current industries and services (for example, top ICT and medical industries of Taiwan) in the future direction. AINTU will keep developing top AI technology, and use resources from industry, government, and academia in the biomedical and AI fields to build AI biomedical platform with an interdisciplinary approach for upgrading the biomedical level and the industry of precision medicine in Taiwan.

As an example, Prof. Lai's team, NTU Medical Genie, is the one that uses NTU medical system to be their research field, emphasizes medical application, develops clinical AI technology, test, and application, builds precision medicine of AI consulting system, and offers doctors diverse and personal advices for disease prevention, diagnosis, and rehabilitation care when making decision making.

Using Smart Wearable Device to Protect the Health

To reduce the risk of acute exacerbation, Prof. Lai with NTU Medical Genie creates AECOPD system with a wearable device, IoT surrounding Cloud-based Healthcare Platform, disease prediction models, smart mobile apps, and builds a lifestyle observation platform of NTU Medical Genie to help patients control and predict their states, to monitor their

living style and environment, and to update information (heart rate or blood oxygen level) to the system for medical personnel making decisions. They inducted a machine learning program to develop the model of disease prediction models, and carried out a long-term assessment to 114 COPD patients by tracking their lifestyle and collecting information of their environment and clinical data, such as Modified Medical Research Council (mMRC) and COPD Assessment Test (CAT) for one and half year. The precision of AECOPD system is up to 92.5%, but will be minor reduced to 83.6% if they only have information of lifestyle and environments. This important finding exactly shows that information of lifestyle and living environment is important to the development of Precision Medicine.

Prof. Lai indicates that AECOPD system solves the problem that the traditional six-min walking test, used to evaluate cardiorespiratory endurance and to control the patients' condition, requires medical personnel to follow with the patients in the hospital. The system can make the patient accomplish the test easily with the assist of smart wearable device and computer vision, and immediately upload the test results to the NTU Medical Genie Healthcare Platform. AECOPD can predict possible seizures in future 7 days by the data of personal activity and environment updated daily, and immediately inform medical personnel to start certain systems, such as health care, examination, and treatment, in an earlier stage for the urgent case. Prof. Lai expects that the final goal is to develop a personal precision medical service platform by using AI and big data to connect several and various information with smart wearable device to reduce patients' inconvenience and to offer a better medical service.

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