LETTER FROM ASIA-PACIFIC REGION

Letter from Korea

> *Respirology* and the Asian Pacific Society of Respirology represent a remarkable array of countries, cultures and lung disease profiles in the Asia-Pacific Region. There are often interesting changes, developments, controversies and problems that occur in the Region that go unappreciated—and often unnoticed—by others in this region. The Editors in Chief felt that this presented an opportunity to know more about our Region whilst providing some entertaining reading.
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> It is our hope that our readers will enjoy the 'Letter', look forward to reading it and ultimately offer to contribute and help to inform us of what is happening in their 'backyard'. Correspondence and opinions about the 'Letter' are welcomed.

Korea is relatively a small country with a total area of 100 210 km^2. However, Korea is not small at all in economic terms. Nominal gross domestic product (GDP) is $1.53 trillion, ranked 11th in the world. Korea is the world's largest spender on research and development with respect to GDP and a leader in science. As the society has become developed, Korean pulmonologists are increasingly interested in research. Moreover, the number of publications from Korea in respiratory medicine is growing year by year. In this letter, I will briefly introduce data sources in Korea that can be used in respiratory research.

Korea is one of the most technologically advanced countries in the world. High-speed internet is available in any place throughout the country, even in the subway. The Korean Information Technology (IT) industry is one of the best in the world. Korean smartphones are competitive with Apple devices, and Korea is one of the largest semiconductor manufacturers in the world. The use of these IT technologies in respiratory research is now feasible. Nowadays, research using 'big data' is a hot topic in Korea.

One of the unique characteristics of the Korean health care system is National Health Insurance (NHI). It is mandatory by law that all Koreans are covered by a single, government-run form of insurance. NHI covers more than 50 million people. The population of Korea in 2017 was about 51 million. Moreover, Korea is an aging society with the number of elderly people (aged over 65 years) comprising 14% (i.e. 7.3 million) of its total population. Thus, there are a lot of patients with chronic respiratory disease such as COPD. The claims data generated by this unique system can be very useful for research. It provides a unique and unbiased overview of healthcare utilization and cost data (including all primary care, pharmacy and hospital data) on a national level. It also contains other valuable information such as age, gender, socio-economic status, diagnostic code, department, prescription and location of hospitals. NHI and the Health Insurance Review and Assessment Service (HIRA) provide this substantial data generated by the claims process to researchers in Korea. The HIRA database offers interesting opportunities for real-life respiratory research. Many Korean respiratory researchers have published articles arising from analyzing this data. For example, we showed that medical utilization and costs were higher in patients with asthma–COPD overlap than in COPD patients without asthma.[1]

Claims data itself is valuable for research. Moreover, HIRA also provides results of quality control assessment to researchers. Since 2015, HIRA has performed annual qualitative assessments of management of several diseases, including asthma and COPD, provided by all medical institutions in Korea. For asthma, about 800 000 patients and 17 000 health care institutions are assessed annually. For COPD, about 140 000 patients and 7000 health care facilities are monitored. This assessment has resulted in an increase of inhaler use and pulmonary function test (PFT). During this quality control assessment, valuable national data were collected which can be used for research in asthma and COPD. Recently, the current status of asthma care in Korea was reported by analyzing these data.[2]

Air pollution in Korea is also a hot topic. The average Particulate Matter (PM)$_{2.5}$ levels are 27.9 µg/m^3, the highest level in the Organisation for Economic Co-operation and Development (OECD).[3] Fortunately, it is extremely easy for Koreans to track air pollution levels in real time. Information on daily air pollution levels has been provided by the Korean Ministry of Environment website for many years. Using these air pollution data in respiratory research is also very interesting. There have been several studies using these data, for example, Jo *et al.* reported that concentrations of PM$_{2.5}$ mass and some of the PM$_{2.5}$ constituents were associated with increased COPD-related hospital visits.[4]

Korea Centers for Disease Control (KCDC) has surveyed respiratory viral infection status since 2000. The purpose of this survey is to identify the causative virus of acute respiratory infectious disease. KCDC provides this information to the public as weekly virus outbreak information. This includes information of adenovirus, parainfluenza virus, respiratory syncytial virus, rhinovirus, coronavirus, bocavirus, metapneumovirus and influenza virus activity. This valuable information is used for flu alert and to detect

Figure 1 Smart phone application for prediction and forecast of COPD exacerbation.

outbreaks of fatal viral diseases such as Middle East Respiratory Syndrome (MERS).

Integration of these big data sets from different sources can generate important public health outcomes. Recently, researchers in Korea combined HIRA data with other data sources such as air pollution, weather, respiratory virus infection and web searches. The substantial data generated by this process is now being used for research in asthma and COPD. Moreover, using these big data sets can produce prediction models for asthma and COPD exacerbations. This can enable patients to be informed of the risk of exacerbations via smartphones applications, which will be evaluated for clinical efficacy (Fig. 1).

Korea, once one of the poorest countries in the world, has now become a highly developed country with an established reputation in respiratory research. Korea has the advantage of unique research sources such as nation-wide data on health care claims, air pollution and respiratory virus monitoring. Using these big data sets as tools for respiratory research will result in important public health outcomes in the near future.

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