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## Original Article

# Chang Gung Research Database: A multi-institutional database consisting of original medical records

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## ABSTRACT

**Background:** The Chang Gung Research Database (CGRD) is a de-identified database derived from original medical records of Chang Gung Memorial Hospital (CGMH), which comprises seven medical institutes located from the northeast to southern regions of Taiwan. The volume of medical services performed in CGMH is large, and clinical and scientific studies based on the CGRD are reported to be of high quality. However, the CGRD as a useful database for research has not been analyzed before. The objective of the study was to analyze the CGRD with regard to its characteristics and coverage of Taiwan's population. **Methods:** We performed a nationwide cohort study using population-based data from the Taiwan National Health Insurance Research Database (NHIRD). All patients who had any medical record of outpatient visits or admission between January 1, 1997, and December 31, 2010, were included, and the sex ratio, age distribution, socioeconomic status, urbanicity, severity of illness, prevalence of specific disease, and coverage of the CGRD were analyzed.

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**Results:** The sex ratio, age distribution, socioeconomic status, and urbanicity of the population of the CGRD are different from those of Taiwan NHIRD and medical centers in Taiwan (all the pairwise  $p < 0.05$ ). The severity of comorbidities, and prevalence of specific diseases of the population of the CGRD are significantly higher than those of Taiwan NHIRD and medical centers in Taiwan for both outpatient and inpatient samples (all the pairwise  $p < 0.05$ ). The overall coverage of the CGRD was 21.2% for outpatients and 12.4% for inpatients. The disease-specific coverage of the CGRD was 27–34% for outpatients and 14–21% for inpatients.

**Conclusions:** The CGRD is a multi-institutional, original medical record-based research database with high overall and disease-specific coverage of Taiwan. The population of the CGRD has significantly higher severity of comorbidities, and prevalence of specific diseases than those of Taiwan NHIRD and medical centers in Taiwan.

## At a glance commentary

### Scientific background on the subject

The Chang Gung Research Database (CGRD) is a database derived from original medical records of Chang Gung Memorial Hospital (CGMH). The volume of medical services in CGMH is large, and studies based on the CGRD are reported to be of high quality. However, the CGRD has not been analyzed before.

### What this study adds to the field

This study indicates the CGRD is a multi-institutional, original medical record-based research database with high overall and disease-specific coverage of Taiwan. The population of the CGRD has significantly higher severity of comorbidities, and prevalence of specific diseases than those of Taiwan NHIRD and medical centers in Taiwan.

The Chang Gung Research Database (CGRD) is a de-identified database derived from medical records of Chang Gung Memorial Hospital (CGMH), and it is systematically updated annually to include new data generated in CGMH. CGMH, founded in 1976, is currently the largest hospital system in Taiwan, and it comprises seven medical institutes, which are located from the northeast to southern regions of Taiwan: Keelung CGMH, Taipei CGMH, Linkou CGMH, Taoyuan CGMH, Yunlin CGMH, Chiayi CGMH, and Kaohsiung CGMH. CGMH has 10,070 beds and admits more than 280,000 patients each year. The outpatient department visits and emergency department visits to CGMH were over 8,500,000 and 500,000, respectively in 2015 [1]. In recent years, the CGRD promoted clinical and scientific studies to a considerable extent. In 2015, more than 1800 studies were conducted by CGMH staff, and the studies were published in a diverse range of reputed journals. Some of these studies are based on the CGRD as multicenter research studies with relatively large sample sizes [2,3].

Although the CGRD is a medical record database with large volumes of data that are useful to perform several research studies and analysis, its characteristics and coverage have never been reported before. The objective of this study was to

analyze the CGRD with regard to its characteristics and coverage of Taiwan's population.

## Methods

### Study population

We performed a nationwide cohort study using population-based data from the Taiwan National Health Insurance Research Database (NHIRD), one of the largest administrative health-care databases worldwide. The National Health Insurance (NHI) program, implemented on March 1, 1995, is a single-payer compulsory and universal health insurance plan, and it now covers all forms of health-care services for over 99% of Taiwan's residents [4–8]. This high coverage rate (nearly 100%) enables studies based on the NHIRD to be nationwide and population-based. For researchers' convenience, the National Health Research Institutes (NHRI) of Taiwan sampled a representative database of 1 million patients from the year 2000 registry of all NHI enrollees ( $n = 23,753,407$ ) by using a systematic and random sampling method (Longitudinal Health Insurance Database, LHID2000) [6]. In LHID2000, no statistically significant differences exist in age, sex, or health-care costs between the sample group and all enrollees, according to NHRI Reports [6]. In this study, we used these databases for estimating outpatient visits and admissions of the sample cohort, as both include information about patient characteristics including sex, date of birth, date of admission, date of discharge, dates of outpatient visits, and up to three outpatient visit diagnoses and five discharge diagnoses [based on the International Classification of Diseases, Ninth Revision (ICD-9) classification] [9]. These databases have previously been used for various scientific studies, and the information they provide about diagnoses, hospitalizations, and prescription use has been proved to be of high quality [4,10–12]. The identification numbers of all patients in the NHIRD were encrypted to protect their privacy. The Ethics Review Board of our institution approved the study (CGMH-IRB No. 201600346B0).

### Study design

The flowchart of the patient enrollment process of study cohort is presented in Fig. 1. The study cohort was identified

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