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Original Article

Validity of diagnoses, procedures, and laboratory data in Japanese administrative data

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ABSTRACT

Background: Validation of recorded data is a prerequisite for studies that utilize administrative databases. The present study evaluated the validity of diagnoses and procedure records in the Japanese Diagnosis Procedure Combination (DPC) data, along with laboratory test results in the newly-introduced Standardized Structured Medical Record Information Exchange (SS-MIX) data.

Methods: Between November 2015 and February 2016, we conducted chart reviews of 315 patients hospitalized between April 2014 and March 2015 in four middle-sized acute-care hospitals in Shizuoka, Kochi, Fukuoka, and Saga Prefectures and used them as reference standards. The sensitivity and specificity of DPC data in identifying 16 diseases and 10 common procedures were identified. The accuracy of SS-MIX data for 13 laboratory test results was also examined.

Results: The specificity of diagnoses in the DPC data exceeded 96%, while the sensitivity was below 50% for seven diseases and variable across diseases. When limited to primary diagnoses, the sensitivity and specificity were 78.9% and 93.2%, respectively. The sensitivity of procedure records exceeded 90% for six procedures, and the specificity exceeded 90% for nine procedures. Agreement between the SS-MIX data and the chart reviews was above 95% for all 13 items.

Conclusion: The validity of diagnoses and procedure records in the DPC data and laboratory results in the SS-MIX data was high in general, supporting their use in future studies.

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Introduction

Administrative databases are widely used in medical research studies.^{1–4} Their large sample size, population representativeness, and clinical information enables large-scale studies to be conducted inexpensively.^{5,6} However, the use of administrative databases for research is based on an assumption that databases convey reasonably accurate data for health status and service utilization information. Because the use of inaccurate data could produce biased results,^{6,7} validation of the information recorded in administrative databases is essential.

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In previous validation studies, comorbidities were recorded with high specificity, but their sensitivities were low and variable across different diseases.^{8–13} Studies have also shown that, despite accurate recording of major procedures, such as surgeries and invasive examinations, minor procedures not related to reimbursements were often under-reported.^{14–16} However, literature on validation studies is sparse compared with the widespread application of databases, and administrative database research has often used non-validated diagnostic or procedural codes.¹⁷

The Japanese Diagnosis Procedure Combination (DPC) database has been widely used in clinical epidemiology studies.^{18–21} The DPC data are unique in that distinctions are made between main diagnosis, comorbidities, and complications, and unlimited numbers of procedures and medications can be recorded.²² In addition, the National Hospital Organization (NHO) introduced the Standardized Structured Medical Record Information Exchange (SS-MIX)

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standardized storage²³ to its hospitals, enabling daily laboratory data to be recorded. However, there have been no validation studies for either the DPC or SS-MIX data.

The aim of the present study was to evaluate the validity of diagnoses, procedures, and laboratory results recorded as DPC and SS-MIX data. We conducted a multicenter validation study in NHO hospitals using chart review results as reference standards.

Methods

Data source

In Japan, the DPC-based lump-sum payment system was introduced in acute-care hospitals nationwide from 2003.²⁴ The DPC data used for payments include patient demographics and selected clinical information, admission and discharge statuses, diagnoses, surgeries and procedures performed, medications, and special reimbursements for specific conditions. Diagnoses are recorded using International Classification of Diseases, Tenth Revision (ICD-10) codes by the attending physicians. Suspected diagnoses are allowed to be recorded, but are designated as such. There are six categories of diagnoses, each with a limited number of recordable diseases. One diagnosis each is coded for “main diagnosis”, “admission-precipitating diagnosis”, “most resource-consuming diagnosis”, and “second most resource-consuming diagnosis”. A maximum of four diagnoses each can be coded for “comorbidities present at time of admission” and “conditions arising after admission”. All procedures performed during hospitalization are recorded according to the Japanese fee schedule for reimbursement.

The NHO was established in 2004 to take over the management of the national hospitals. As of October 2014, there were 143 hospitals nationwide run by the NHO, including both general acute-care hospitals and specialized long-term-care hospitals. Fifty-four hospitals from 35 prefectures had implemented the DPC-based payment system, and the mean number of acute-care beds in these 54 hospitals was 410 (range, 135–730). All NHO hospitals provide administrative claims data to the Medical Information Analysis (MIA) databank, which is managed by the Clinical Research Center at NHO Headquarters. In NHO hospitals with implementation of the DPC-based payment system, the DPC data are also stored in the MIA databank. In addition, the NHO preliminarily introduced the SS-MIX standardized storage²³ to its hospitals in 2013. The SS-MIX storage enables medical chart information from different vendors, including daily laboratory data, to be recorded in a standardized manner. In the SS-MIX storage,

laboratory data are specified using JLAB-10 codes. The flow of data is shown in Fig. 1.

We conducted the present study on patients admitted to four acute-care NHO hospitals with implementation of both the DPC-based payment system and SS-MIX storage. The four hospitals were a 380-bed hospital in Shizuoka Prefecture, a 280-bed hospital in Kochi Prefecture, a 380-bed hospital in Fukuoka Prefecture, and a 420-bed hospital in Saga Prefecture. Laboratory data collected from the SS-MIX storage at each hospital and DPC data extracted from the MIA databank were compared with chart review results.

Study population and variables

Among the patients aged ≥ 18 years on admission who were eligible for the DPC-based payment system and admitted and discharged between April 1, 2014 and March 31, 2015, we randomly selected 100 patients from each hospital, aiming to conduct 400 chart reviews in total.

The items examined in the study are presented in Table 1. The 17 diagnoses were diseases used for calculating the Charlson comorbidity index (CCI),^{25–27} which is widely used for risk adjustment in administrative database research studies. We also evaluated whether 10 specific procedures were performed on the day of admission. These procedures were selected from those used to

Table 1
Items examined in the study.

Diagnoses

Myocardial infarction
Congestive heart failure
Peripheral vascular disease
Cerebrovascular disease
Dementia
Chronic pulmonary disease
Rheumatic disease
Peptic ulcer disease
Mild liver disease
Diabetes without chronic complications
Diabetes with chronic complications
Hemiplegia or paraplegia
Renal disease
Any malignancy, including leukemia and lymphoma, except malignant neoplasm of skin
Moderate or severe liver disease
Metastatic solid tumor
AIDS/HIV

Procedures [codes]

Urine tests (general) [D000]
Urine microscopy [D002, D002-2]
Bacterial microscopy [D017]
Bacterial culture [D018]
Heart rate/respiration monitoring [D220]
Pulse oximetry [D223]
Radiography [E002]
Computed tomography scan [E200]
Peripheral intravenous infusion [G001]
Urinary catheter insertion [J063]

Laboratory data

White blood cell count
Platelets
Hemoglobin
Prothrombin time international normalized ratio
Na
Aspartate transaminase
Total bilirubin
Creatinine
Total cholesterol
C-reactive protein
Glucose
Hemoglobin A1c
Brain natriuretic peptide

AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus.

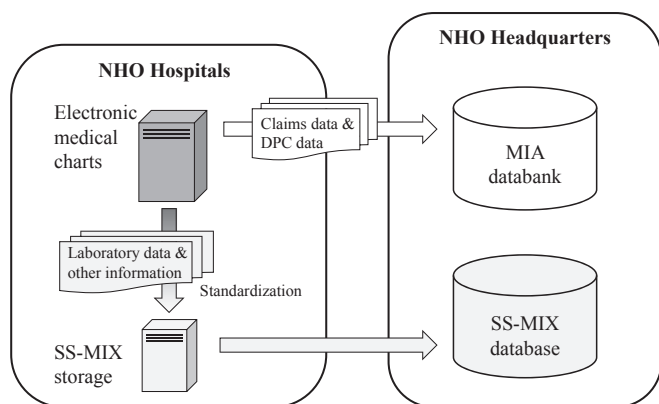


Fig. 1. Flow of data in the National Hospital Organization. DPC, Diagnosis Procedure Combination; MIA, Medical Information Analysis; NHO, National Hospital Organization; SS-MIX, Standardized Structured Medical Record Information Exchange.

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