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Difference in resource utilization between patients with acute and chronic heart failure from Japanese administrative database

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Abstract

Background: Many studies have reported economic evaluation of evolving agents or therapies for patients with heart failure (HF). However, little is known whether the disease progression category (acute or chronic HF) would be considered as a risk adjustment in health service research.
Objectives: This study profiles the difference in resource use or medical care for acute versus chronic HF.
Methods: This study analyzed 17,912 HF patients treated in 62 academic hospitals and 351 community hospitals. Study variables included demographic variables, comorbid status, physical activity or disease progression at admission, procedures and laboratory tests, type and dose of heart-related medications, length of stay (LOS), and total charges (TC; 1 US$=¥100) for acute and chronic HF. The independent contributions of disease progression categories on LOS and TC were identified using multivariate analysis.
Results: We identified 9813 chronic and 8099 acute HF patients. Median LOS was 18 days for both chronic and acute HF, whereas TC was US$5731 and US$6447, respectively. Regression analysis revealed that acute HF was associated with a slightly greater TC, whereas performance of procedures was the most prominent factor. As NYHA class was the next most influential factor, class 3 or 4 resulted in longer LOS or greater TC, than did class 1.
Conclusions: This study suggests that acute HF increased resource use slightly, whereas use of some practices indicated in critical care was affected more by the procedures performed. Disease progression category should remain an indicator for appropriateness of medical care.

Keywords: Heart failure; Case-mix; Resource use; Outcome

1. Introduction

Heart failure (HF) has been attracting clinical and economical attention because of its increased incidence in a growing elderly population [1–4]. In developed countries, rapid increases in healthcare expenditures have inevitably required monitoring of the quality and efficiency of medical care delivered to HF patients. Therapeutic innovation and assessment of cost-effectiveness surely have benefited HF patients [5,6].

In Japan in 2006, the burden of heart failure was estimated to be 12.3 million cases (1.46%), 14.1 million hospital days, and approximately 5.98 billion US dollars. Patients at least 65 years of age represented 54.4% of the cases, 85.3% of durations of hospital stay, and 70% of the expenditures [7].

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In order to improve the limited functional conditions or life expectancy, several types of new treatments and therapeutic guidelines have been established. For example, several studies performed economic analysis on beta-blocker agents and ultra-filtration technology [5,8]. Epidemiologic studies examining gender differences and evaluating care systems (e.g., acute care units for the elderly) have explored quality and efficiency by focusing on resource use or practice behavior [3,9–12].

When studying these issues, many factors, such as heart-related comorbidities, clinical severity related to daily activities (e.g., New York Heart Association classification), hospital functions, and urgency status at admission should be considered [13–15]. Disease progression classification such as acute or chronic HF may be another promising factor influencing the amount of medical care [15]. Many reports have targeted only acute or chronic HF, however, and little is known about the difference in cost or practice pattern for patients with acute versus chronic HF. In these settings, it is meaningful to test the impact of disease progression on health services, because some clinical experts would anticipate that more severe illnesses will result in increased cost of care.

In the present study, we compared patient baseline characteristics, treatment, and total hospital resource utilization for HF patients according to classifications of disease progression.

2. Materials and methods

In order to develop a Japanese case-mix classification system, the Japanese administrative database has been constructed by our research team in collaboration with the Ministry of Health, Labor and Welfare (MHLW) since 2002. For the present study, we used the database gathered by the MHLW between July 1 and December 31, 2006. The Japanese administrative database contains both discharge summaries and claim data in an electronic format that is useful for detailed profiling of practice pattern.

The database was also utilized by the MHLW for the payment system and disclosure of hospital performance among 731 institutions (including 80 university hospitals, the National Cancer Center, the National Cardiovascular Center, and 649 community hospitals). These 731 hospitals located throughout Japan play important roles, including the delivery of acute care, advancement of medical research, and education of students and trainees. In the present study, we analyzed HF cases treated at these hospitals which voluntarily participated in our research project.

2.1. Definition of variables

The present study included patients with HF as the principal diagnosis according to the International Statistical Classification of Diseases, 10th version (ICD10). Following the opinions of clinical experts, we collected information about the status of disease progression (acute or chronic HF), which was not originally listed in the ICD10 code, at admission. Heart transplantation cases were excluded from our study.

Acute HF was defined as the rapid or gradual onset of signs or symptoms of HF requiring urgent unplanned hospitalization or an emergency visit. Chronic HF was defined as the inability of the heart to supply sufficient blood volume for meeting the oxygen demand of major peripheral organs, resulting in the impairment of daily activities, which are often associated with pulmonary or systemic congestion [16–18].

Independent variables in the study included age, gender, use of an ambulance, outcome, disease progression (acute or chronic) at admission, status of comorbid conditions, New York Heart Association class as a surrogate marker of physical activity at admission, hospital function, diagnostic test, type of procedure, medication, and cost of care.

In the present study, we used length of stay (LOS) and total charges (TC: 1 US$=¥100) billed during admission as proxies for total in-hospital costs. In Japan, charges for hospital care are determined by a standardized fee-for-service payment system and considered to be good estimates of the costs of healthcare [19]. In this study, TC included physician fees, instrument costs, the costs of laboratory or imaging tests, and administration fees.

Patients were stratified by age into two groups: <65 years and ≥ 65 years. We used transfer by ambulance as a proxy for emergency admission. Various types of diagnoses in this database were recorded as ICD10 codes. To assess the degree of chronic comorbid conditions, we used the Charlson Comorbidity Index (CCI) [20]. Although the original CCI included heart failure, HF was not considered a comorbidity in the current study. Other heart-related comorbidities, not defined in the original CCI, included hypertensive diseases (I10, I11$–13$, I15$), valve diseases (I05$–08$, I35$–37$, I38, I39$), and cardiomyopathy (I42$–43$, I514–5, I517).

Performance of surgical procedures was examined; for example, cardiac surgery included percutaneous intracoronary intervention, coronary-aortic bypass graft, anti-arrhythmic procedures (pacemaker implantation, implantable cardioverter-defibrillator, and catheter ablation), and valve surgery. Use of diagnostic tests (cardiac catheterization, radiography, electrocardiography, echocardiography, and Swan–Ganz catheter) and supportive care (ventilation, dialysis, and rehabilitation) were also counted. In addition, we surveyed use of medications: digoxin, dopamine, loop diuretic (furosemide), spinorolactone, thiazide diuretics, angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, isosorbide dinitrate, and certain beta-blockers (Bisoprolol, carvedilol, and Metoprolol).

2.2. Statistical analysis

The frequency and proportion of categorical data were reported. Comparisons were made using Fisher's exact test. Continuous variables were compared using the Mann–