Quality of care and in-hospital resource use in acute myocardial infarction: Evidence from Japan

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ABSTRACT

Objectives: To determine the association between quality of care in process and outcome measures and in-hospital resource use among patients admitted for acute myocardial infarction (AMI) in Japan.

Methods: We analyzed 23,512 AMI patients across 150 hospitals in Japan between April 2008 and March 2011. The exposure measure was inpatient hospital resource use, which was calculated from the sum of all hospital fees for healthcare services provided to AMI patients. Hospitals were then categorized into quartiles based on a risk-adjusted in-hospital resource use index. Quality of care was assessed using three process measures (in-hospital prescription of aspirin, β-blockers, and angiotensin-converting enzyme inhibitors/angiotensin receptor blockers) and two outcome measures (7-day and 30-day in-hospital mortality). Process and outcome measures were analyzed with multilevel logistic regression models that adjusted for patient and hospital characteristics.

Results: No significant differences in process measures were observed across the quartiles of in-hospital resource use. In contrast, hospitals with the lowest resource use were significantly associated with poorer outcomes (7-day in-hospital mortality OR: 1.851 [95% CI 1.327–2.582]; 30-day in-hospital mortality OR: 1.706 [95% CI 1.259–2.312]) than hospitals with higher resource use.

Conclusion: Poorer quality of care in outcome measures was significantly associated with lower resource utilization among AMI patients in Japanese hospitals, but process measures did not show similar associations.

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1. Introduction

Japan has aimed to stem rising healthcare expenditure through the implementation of a nationally uniform reimbursement fee schedule under a universal healthcare insurance system [1]. However, controlling costs has become more difficult in recent years, which may be due in part to Japan's rapidly aging population [2]. The rising financial burden of healthcare has made cost containment a high priority for many policymakers and hospitals. Understanding the relationship between healthcare spending and quality of care has important implications for policymakers, because the incautious reduction of healthcare services to control costs may result in insufficient provision of treatment. The simple reduction of healthcare use may therefore not necessarily be the optimal solution for containing costs [3].

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Several previous studies have examined whether higher hospital spending—which can be interpreted as the level of hospital resource utilization—is associated with better quality of care [4–13]. The majority of these studies are from the US, and results appear to be mixed: while some studies report that the quality of care across specific diseases has little or inconsistent association with spending [4–8], others have shown an association between lower mortality rates and higher healthcare spending for several diseases, including acute myocardial infarction (AMI) [9–13].

Japan currently faces major challenges due to limited healthcare resources unevenly distributed across the country. According to the Organization for Economic Cooperation and Development, there were 2.2 physicians per 1000 population in Japan in 2008, compared with 2.4 in the US in 2009 [14]. On the other hand, the number of hospitals per million population in Japan and the US was 68.5 and 18.9, respectively. Although the substantially higher number of hospitals in Japan may indicate that patients have relatively easier access to hospital services, Japanese hospitals may struggle to provide sufficient care due to geographic disparities in physician distribution, especially with fewer doctors in rural areas [15,16]; rural regions with lower population densities also tend to show higher levels of patient regional outflow [17]. These factors may contribute to a deficiency in healthcare resources in some hospitals, and patient admitted to these hospitals may be provided with lower quality of care.

As the relationship between in-hospital resource use and quality of care is likely affected by the health system in which it exists, the characteristics of the Japanese health system should be understood in order to judiciously interpret any findings. Japan has employed a universal health insurance system since 1961 [1,2], and all healthcare providers are paid the same amount for the same service under the hospital reimbursement system, which uses a national fee schedule. This fee schedule is identical throughout Japan regardless of regions, providers, or health plans. As a result, providers have no incentive to discriminate among patients based on their insurance coverage. Also, patients are free to obtain healthcare from any healthcare provider that they choose.

Although the relationship between in-hospital resource use and quality of care has been addressed in the US and other countries, there has yet to be an investigation of this relationship in Japan. In this study, we assess the association between in-hospital resource use and quality of care in process and outcome measures for patients admitted due to AMI in Japan.

2. Methods

2.1. Data source and study population

Data were collected from hospitals enrolled in the Quality Indicator/Improvement Project (QIP), which is administrated by the Department of Healthcare Economics and Quality Management at Kyoto University. The QIP uses a database of hospitals that provide administrative data under the Japanese diagnostic procedure combination/per diem payment system (DPC/PDPS). These data are presented in a standardized format for analysis with the objective of improving the quality and efficiency of healthcare. In addition to this DPC/PDPS data, each hospital in the QIP also provides data regarding hospital characteristics such as staff and bed numbers.

The study population consisted of patients admitted with a primary diagnosis of AMI, which was identified according to International Classification of Diseases, 10th Revision (ICD-10) code I21. We identified 27,574 AMI patients from 257 QIP member hospitals across Japan admitted between April 2008 and March 2011. Hospitals with fewer than 45 AMI cases over the 3-year study period were excluded. Also, patients who were hospitalized for longer than 90 days, those who were transferred to another facility, those who were discharged alive with a total length of stay (LOS) of less than four days, and those with missing data were also excluded from analysis. After exclusion, our study consisted of 23,512 patients admitted for AMI across 150 hospitals in Japan during a 3-year period.

2.2. Quality of care indicators

Hospital quality of care was analyzed using three process measures and two outcome measures.

The process measures were the in-hospital prescription of aspirin, β-blockers, and angiotensin-converting enzyme (ACE) inhibitors/angiotensin receptor blockers (ARB). These measures are based on the Center for Medicare and Medicaid/Joint Commission on Accreditation of Healthcare Organizations (CMS/JCAHO) core process measures for AMI [18].

Outcome measures of hospital care were assessed using 7-day and 30-day in-hospital mortality. These measures were based on the indicators provided by the Agency for Healthcare Research and Quality (AHRQ) [19]. In-hospital mortality, and not general mortality, was used because our database is unable to track patient outcomes after discharge. As a measurement of hospital quality of care, mortality that includes deaths occurring outside of the hospital is generally considered as having more face validity when compared with in-hospital mortality, because the former is less likely to be dependent on each hospital's discharge practices [20,21]. However, in-hospital mortality is a reasonably valid index when considering the intrinsic healthcare settings of Japan: first, inpatients in Japan are unlikely to be discharged without substantial improvements in health status. This can be shown in part by a relatively low all-cause 30-day readmission rate after AMI discharge (3.7% in Japan vs. 19.9% in the US) [22,23] and longer LOS durations (16.3 day in Japan vs. 5.7 days in the US) [22,24]. Furthermore, the hospital is the most frequent place of death in Japan, accounting for 81.1% of all mortality in 2000 [25]. In contrast, the percentage of patients who die in hospitals in other countries are substantially lower (41% in the US in 1998, 35.3% in the Netherlands in 1998, and 42% in Sweden in 1996) [25,26]. Moreover, previous studies in the US have shown that mortality and in-hospital mortality are highly correlated among AMI patients [27,28]. When taking into account the higher percentage of patients who die in a hospital in Japan, this correlation may be expected