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Decentralization and centralization of healthcare resources: Investigating the associations of hospital competition and number of cardiologists per hospital with mortality and resource utilization in Japan

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ABSTRACT

Objective: To investigate the associations of hospital competition and number of cardiologists per hospital (indicating the decentralization and centralization of healthcare resources, respectively) with 30-day in-hospital mortality, healthcare spending, and length of stay (LOS) among patients with acute myocardial infarction (AMI) in Japan.
Methods: We collected data from 23,197 AMI patients admitted to 172 hospitals between 2008 and 2011. Hospital competition and number of cardiologists per hospital were analyzed as exposure variables in multilevel regression models for in-hospital mortality, healthcare spending, and LOS. Other covariates included patient, hospital, and regional variables; as well as the use of percutaneous coronary intervention (PCI).
Results: Hospitals in competitive regions and hospitals with a higher number of cardiologists were both associated lower in-hospital mortality. Additionally, hospitals in competition regions were also associated with longer LOS durations, whereas hospitals with more cardiologists had higher spending. The use of PCI was also associated with reduced mortality, increased spending and increased LOS.
Conclusions: Centralization of cardiologists at the hospital level and decentralization of acute hospitals at the regional level may be contributing factors for improving the quality of care in Japan. Policymakers need to strike a balance between these two approaches to improve healthcare provision and quality.

1. Introduction

The decentralization of healthcare has been on the policy agenda for many years, with proponents and opponents debating its benefits on the basis of conceptual schemes and empirical studies [1–7]. Advocates of decentralization point to its wide range of merits [1–5]; emphasizing the potential improvements to resource allocation, welfare, and access to healthcare due to local knowledge and the effective and flexible use of resources to address local needs. In contrast, it has been argued that other problems can arise from decentralization [6,7]. The concept of decentralization has been used in a number of disciplines (e.g. management and political science) with multiple concepts that often are not well defined [1,2]. Even though there is still a lack of complete understanding of its roles, reforms containing facets of decentralization

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have been introduced, perhaps as indications of current policy trends [7]. The implementation of such reforms would more likely result in confusion, rather than provide the expected improvements in health services. Further clarification of the effects of the decentralization of healthcare resources is needed. Similarly, the effects of centralization of healthcare resources may also be beneficial to policymakers, as this approach can be effective when economies of scale can be exploited or when health services can be improved with greater coordination [4].

Despite the wide general discussion about decentralization and centralization, empirical evidence showing the effects of these two approaches in healthcare remains limited. These approaches have been generally understood within conceptual frameworks and discussed with a focus on theoretical aspects for entire healthcare systems, which is difficult to examine quantitatively. Furthermore, it would be difficult to investigate these approaches in a single analysis because they rarely operate simultaneously [4]. Several studies have addressed the effects of decentralization, but the findings are inconsistent [3–7]. With an increasing need to provide more healthcare services using existing resources, the efficient allocation of resources is a critical target for policymakers and other stakeholders. The decentralization and centralization of resources may provide essential tools for improving this efficiency.

In this study, we focus on the decentralization and centralization of resources with respect to acute myocardial infarction (AMI). This disease was selected due to its substantial disease burden and high mortality rate. Furthermore, the success of AMI treatment is heavily dependent on quick access to healthcare, and better outcomes are associated with treatment by experienced cardiologists. As a result, AMI was deemed to be an appropriate disease for analysis due to its reliance on specific healthcare resources.

Decentralization of healthcare resources is characterized by a wide dispersion of resources (e.g. physician and hospitals). This approach is thought to improve the quality of care because patients would receive healthcare services more easily and in a timely fashion by improving access to healthcare. Also, this may incentivize the improvement of quality of care by healthcare providers by encouraging competition. The de-concentration of healthcare resources in a given region can be expressed by the Herfindahl–Hirschman Index (HHI), which is a commonly accepted measure of market concentration. This index takes into account both the number and the size of competitors [8], which in this context refers to individual healthcare providers. Numerous studies using the HHI index have focused on the impact of hospital competition on quality of care [9–15], which has been discussed mainly in the US [16] and the UK [17]. The results appear to be inconclusive, potentially due to variations in indicator measurement methods, outcomes, and study settings. Studies investigating the impact of hospital competition in AMI have also shown inconsistent conclusions [12,13]. However, hospital competition in the previous studies has been understood in the context of antitrust in healthcare markets rather than the allocation of healthcare resources [16].

On the other hand, the centralization of healthcare resources is described by the accumulation and concentration of resources in a few specific institutions. This is likely to yield economies of scale by sharing facilities, jointly purchasing supplies, and coordinating administrative services [18,19]. Patients admitted to hospitals with sufficient staff are more likely to receive prompt treatment. Moreover, patients may be provided better quality of care through cooperation and coordination among healthcare providers [19,20]. This is demonstrated in the concentration of physicians who are generally responsible for the diagnoses and treatments that influence mortality rates. Due to a general lack of large-scale data suitable for inter-provider comparisons, only a few studies have investigated the impact of the size of physician groups; these studies have shown that larger physician groups are more likely to be engaged in efforts to improve the quality of care [21–23]. With regard to AMI, it has been reported that when compared with patients treated by physician groups in the same hospitals, those treated by solo physicians were less likely to receive invasive procedures within a day of admission and more likely to die [23].

1.1. The Japanese healthcare system

Japan adopted a universal health insurance system in 1961 [24,25]. Under the uniform insurance system, all healthcare providers are reimbursed equally for the same service according to a national fee schedule. This fee schedule is universal regardless of region, provider, or health plan. Patients are therefore free to obtain healthcare from any healthcare provider.

In an effort to improve geographic accessibility to acute care, the Japanese system for acute inpatient care—known as the diagnostic procedure combination/per-diem payment system (DPC/PDPS)—was implemented in April 2003 [25]. Of the 8862 general hospitals in Japan, the number of hospitals enrolled and in the process of enrollment in the DPC/PDPS system (hereafter referred to as DPC hospitals) was 1557 (17.57%) as of June 2010 [26]. Despite the relatively small number of DPC hospitals distributed across Japan, the number of beds available in these hospitals accounts for more than half of the total hospital beds in Japan.

Previous studies that have addressed the decentralization or centralization of resources in a healthcare setting have focused on developing theoretical frameworks or describing healthcare system reform at the national level, rather than conducting empirical analyses (e.g. allocation of healthcare resources). The aim of this study was to investigate the associations of hospital competition and number of cardiologists per hospital (indicating the decentralization and centralization of healthcare resources, respectively) with 30-day in-hospital mortality, healthcare spending, and length of stay (LOS) among patients with AMI in Japan. We sought to achieve this by testing the following four hypotheses.