



The effect of centralization of health care services on travel time and its equality



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ABSTRACT

Objectives: To analyze the regional variations in travel time between patient residences and medical facilities for the treatment of ischemic heart disease and breast cancer, and to simulate the effects of health care services centralization on travel time and equality of access.

Methods: We used medical insurance claims data for inpatients and outpatients for the two target diseases that had been filed between September 2008 and May 2009 in Kyoto Prefecture, Japan. Using a geographical information system, patient travel times were calculated based on the driving distance between patient residences and hospitals via highways and toll roads. Locations of residences and hospital locations were identified using postal codes. We then conducted a simulation analysis of centralization of health care services to designated regional core hospitals. The simulated changes in potential spatial access to care were examined.

Results: Inequalities in access to care were examined using Gini coefficients, which ranged from 0.4109 to 0.4574. Simulations of health care services centralization showed reduced travel time for most patients and overall improvements in equality of access, except in breast cancer outpatients.

Conclusion: Our findings may contribute to the decision-making process in policies aimed at improving the potential spatial access to health care services.

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1. Introduction

Japan's health care system underwent fundamental changes in the early 1960s with the introduction of two major policies: universal health insurance and free access to care. Universal health insurance ensures that all citizens are able to obtain necessary health care, while free access grants patients the freedom to seek care from any

provider within the country. These policies were designed to ensure that the Japanese people would be able to obtain necessary health care wherever and whenever it was needed [1]. Since the implementation of these policies, Japan has consistently performed well in health metrics such as average life expectancy [2]. However, the circumstances surrounding the provision of health care have been changing, and various challenges have appeared in recent years. For example, investigations of regional variations in the Japanese health care system have revealed an uneven distribution of physicians [3], variations in locations of medical institutions and patient treatments [4], and disparities in mortality rates [5].

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Several studies conducted in various countries have investigated the time taken for a patient to travel from their residence to a medical facility (hereinafter referred to as “travel time”). These studies have addressed travel times for patients with traumatic injuries [6], emergency conditions such as acute myocardial infarction [7], and cancer [8]. In Japan, a simulation analysis showed that the centralization of emergency services through the redistribution of emergency care beds and physicians would result in increases to patient travel times [9]. However, little is known about travel time for outpatient treatments requiring frequent visits or about the possible regional variations in patient travel time in Japan.

Travel time should be minimized for patients with acute diseases that require prompt treatment (such as acute myocardial infarction) to ensure better prognoses. Similarly, patients requiring non-emergency care (such as outpatient treatments for cancer patients) may also be affected by lengthy travel times, as these can increase patient burdens and affect treatment adherence and efficacy. An analysis on patient travel times for both these types of care would be beneficial for supporting health policy decision-making processes.

Both acute myocardial infarction and cancer are included in the “Five Diseases, Five Fields of Medicine” strategy in Japan, which forms the core of regional health policies at the prefectural level with the aim of providing comprehensive secondary and tertiary care within each region. Japan comprises 47 prefectures; these prefectures are analogous to the states of the U.S., and are the geographic units at which regional health programs are frequently implemented and managed. Cancer treatments have also been addressed by the Japanese Ministry of Health, Labour and Welfare’s Commission on the Promotion of Cancer Treatment Standardization [10], which aims to reduce regional disparities in different facets of health care provision (such as the availability of medical technologies) and standardize specialist treatments throughout the country. In the face of a seemingly inexorable increase in health care spending, the regionalization and centralization of health care services is frequently considered as a means to contain costs while improving the quality and efficiency of care [11]. The prefectures in Japan have been undertaking preparations for a shift toward the centralization of health care services to government-designated regional core hospitals. However, a consequence of this centralization policy is a reduction in the number of hospitals available to treat specific diseases, which may in turn increase inequalities in potential spatial access to care.

In Kyoto Prefecture, located on the main island of Honshu, regional disparities in mean travel time have been reported in patients seeking inpatient and outpatient treatment for ischemic heart disease, breast cancer, and other diseases at the municipality (sub-prefectural geographic unit) level [12]. The designation of regional core hospitals and the centralization of health care services may potentially exacerbate problems of pre-existing inequalities in patient access. Investigating the possible effects of centralizing health care services on patient travel time and access is therefore necessary to predetermine the appropriateness of such a policy.

The objectives of this study were to analyze the regional variations in travel time between patient residences and medical facilities for the treatment of ischemic heart disease and breast cancer, as well as to simulate the possible effects of centralization of health care services to regional core hospitals on patient travel time and equality. Ischemic heart disease and breast cancer were selected as target diseases for this analysis because they represent conditions requiring acute care and non-emergency multidisciplinary care, respectively.

2. Methods

2.1. Data

Data from a total of 5,854,918 anonymized medical reimbursement claims (hereinafter referred to as “claims data”) filed between September 2008 and May 2009 were obtained from the Kyoto branch of the Japan Health Insurance Association. The target diseases were identified using the relevant disease classification codes from the Japanese Social Insurance system (902: ischemic heart disease; 206: breast cancer). We identified a total of 60,280 claims for patients who had received inpatient or outpatient treatment for either ischemic heart disease or breast cancer during the study period. From these 60,280 claims, 456 claims exhibited data discrepancies where the total number of days of medical care and medical expenses was registered as zero; these claims were excluded from analysis. The remaining claims were then collated and examined in order to remove multiple claims by the same patients, resulting in a total of 5416 individual patients. Next, patients with a residential postal code outside of Kyoto Prefecture (i.e., individuals residing outside of Kyoto Prefecture) and those whose travel times were over 300 min (5 h) were also excluded. This cutoff of 300 min was based on calculations of the time required to travel from Kyoto Prefecture to any of the adjacent prefectures. The application of these exclusion criteria removed a further 953 individuals, leaving a total of 4463 patients in the final sample for analysis.

Each individual patient had a single claims record per medical facility, regardless of how many times a patient visited a particular facility. Accordingly, this study was not able to conduct a weighted analysis according to the frequency of patient visits.

2.2. Calculation of patient travel times

We first developed a table of postal codes and positional coordinates using the postal code list [13] released by the Japan Post Service Co., Ltd in conjunction with the (street) block-level location reference [14] released by Ministry of Land, Infrastructure, Transport and Tourism. In the interest of protecting personal information, patient and medical facility postal codes were truncated from the original seven digits to the first six digits. The positional coordinates of the 10 possible seven-digit postal codes matching each of the six-digit codes were then obtained from the table mentioned above, and the central points of each group of seven-digit codes were used as the assumed positional

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