



Impact of a diagnosis-related group payment system on cesarean section in Korea



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ABSTRACT

Cesarean sections (CSs) are the most expensive method of delivery, which may affect the physician's choice of treatment when providing health services to patients. We investigated the effects of the diagnosis-related group (DRG)-based payment system on CSs in Korea. We used National Health Insurance claim data from 2011 to 2014, which included 1,289,989 delivery cases at 674 hospitals. We used a generalized estimating equation model to evaluate the association between the likelihood of cesarean delivery and the length of the DRG adoption period. A total of 477,309 (37.0%) delivery cases were performed by CSs. We found that a longer DRG adoption period was associated with a lower odds ratio of CSs (odds ratio [OR]: 0.997, 95% CI: 0.996–0.998). In addition, a longer DRG adoption period was associated with a lower odds ratio for CSs in hospitals that had voluntarily adopted the DRG system. Similar results were also observed for urban hospitals, primiparas, and those under 28 years old and over 33 years old. Our results suggest that the change in the reimbursement system was associated with a low likelihood of CSs. The impact of DRG adoption on cesarean delivery can also be expected to increase with time, as our finding provides evidence that the reimbursement system is associated with the health provider's decision to provide health services for patients.

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1. Introduction

Decisions on cesarean delivery involve weighing the positive effects against the risks for patients and fetuses, with cesarean delivery being occasionally appropriate if necessary. One suggested positive use is as an effective

life-saving method for both the mother and the fetus when complications arise during delivery [1,2]. Although cesarean delivery provides both maternal and neonatal safety and improved outcomes under certain circumstances, there is no evidence that cesarean sections (CSs) provides better outcomes overall [3,4]. It also has negative effects on patients, including increased maternal mortality, postpartum complications, and infant mortality [5–8]. Thus, physicians must carefully consider all options when deciding on the mode of delivery. However, the cesarean delivery rate has been increasing globally, and several countries have exceeded the World Health Organization (WHO) guideline of 15% [9,10]. According to the

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Organization for Economic Cooperation and Development (OECD), the cesarean delivery rate in Korea was 34.6% in 2012, which was highest rate in the world [11]. To control cesarean delivery, the government has evaluated the rate of cesarean delivery in each medical institute open to the public since 2002. Despite government efforts, there has been no major reduction of the high rate of cesarean delivery in Korea, which is considered as a problem that must be controlled.

Increases in cesarean delivery are associated with certain characteristics of the obstetric population, including maternal age and obesity [12,13]. Other factors that contribute to the cesarean delivery rate include changes in the patient-physician relationship and maternal request [14–16]. In addition, cost differences have an effect on the decision regarding mode of delivery. Previous studies have found that cost is possibly associated the cesarean delivery [12,13]. Few studies have examined the relationship between the reimbursement system and the cesarean delivery rate [17–19]. Because, the average cost of a cesarean delivery is at least two times higher than that of a vaginal delivery, the healthcare provider may be required to perform additional unnecessary procedures due to cost differences [20]. Thus, decision regarding the mode of delivery might be affected by any changes to the reimbursement system related to the cost of delivery.

In Korea, healthcare providers have been reimbursed through a fee-for-service system since the beginning of the National Health Insurance Service (NHIS). In 1997, the government decided to introduce the Diagnosis-Related Group (DRG)-based payment system to solve the problem of growing health expenditures under the fee-for-service system [21]. After several years of a pilot program the payment system was applied in 2002 to seven disease groups (lens surgery, tonsillectomy/adenoidectomy, appendectomy, inguinal/femoral hernia surgery, hemorrhoidectomy, uterine/adnexa surgery, and cesarean delivery) through voluntary participation. Recently, changes in reimbursement through mandatory adoption of the DRG system were phased in beginning on July 1, 2012, according to the type of hospital. From July 2012, the DRG system became mandatory in hospitals and clinics, and it was applied to general hospitals and tertiary hospitals beginning on July 1, 2013, with the exception of public hospitals, which had applied for a pilot test of a new payment system. There are four types of hospitals, classified according to medical law in Korea: clinic, hospital, general hospital, and tertiary hospital [22]. Criteria for classification are based on number of beds, medical service departments, functions, and certain certifications. The distinction between clinics and hospitals is based on the number of beds; additionally, most clinics have only one medical service department, and the size of a clinic is relatively smaller than that of a hospital. General hospitals provide a higher level of care for patients and must be a certain size (over 100 beds and 7 medical department), with specialists in each medical service department. Tertiary hospitals are designated among general hospitals by the Ministry of Health and Welfare every 3 years. These hospitals must fulfill the necessary conditions based on the selection standards of the Ministry of Health and Welfare according to the number of beds,

medical equipment, and human resources and the presence of over 20 medical service departments. According to the type of hospital, out-of-pocket costs for medical services were found to be different. The proportion of out-of-pocket costs was largest in tertiary hospitals and smallest in clinics [22]. The time at which the health policy was introduced differed by type of hospital, reflecting the different characteristics of hospital. These different characteristics of hospitals were also likely to affect the behavior of health-care providers in terms of patient care [23,24]. Thus, we expected differences in decisions regarding mode of delivery after the change to the reimbursement system.

In our study, we evaluated the impact of the DRG system on cesarean delivery in Korea based on the length of the DRG system adoption period in each hospital. Furthermore, we had examined the effects of DRG system on cesarean delivery by hospital (adoption of DRG system and location) and patient characteristics (parity and age), which could affect to decision on mode of delivery.

2. Methods

2.1. Database and data collection

We used NHI claim data in this study. These data included patient admissions from July 2011 to June 2014. We selected cesarean deliveries (DRG codes O0160 and O0170) and vaginal deliveries from the data. Vaginal deliveries were divided into two codes by parity (primiparous: O0200 and multiparous: O0290). Each code was subdivided by the severity of the complication and comorbidity (patient clinical complexity level [PCCL]: 0=no clinical complexity [CC], 1=minor CC, 2=moderate CC, 3=severe CC). We included clinics as almost 40% of participants were admitted to a clinic (in Korea, clinic-run operating rooms include facilities for inpatients). We excluded patients receiving medical aid, as they are exempt from the DRG system in Korea. We also excluded hospitals with a low inpatient volume (<50 patients during the total period) to control for any potential negative effects due to the small number of deliveries [18]. In addition, public hospitals, at which patients were exempt from the DRG system, were excluded, as they had instead adopted a new reimbursement system in Korea. A total of 1,289,989 hospitalizations at 674 hospitals were included in our analysis (cesarean delivery: 477,309; vaginal delivery: 812,680).

2.2. Variables

The outcome variable was the method of delivery: vaginal delivery (coded 0) or cesarean delivery (coded 1). We did not consider patient clinical factors such as previous CSs or induced labor, due to the limitations of our data. For similar reasons, we did not consider fetal conditions such as fetal stress or prolapse. We only considered the final method of delivery, which was recorded as a categorical variable. We used a binary variable to evaluate the likelihood of selection of cesarean delivery according to the length of the DRG adoption period.

We evaluated the effects of the DRG system based on the length of the DRG system adoption period. First, we

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