Effects of the Revised Operating Guidelines on the Attending Hospital Program in Korea

Yeongho Oh

【Principal Researcher】
Yeongho-Oh Research Fellow, Korea institute for Health and
          Social Affairs

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Summary 《

1. Research Background and Purpose

□ The Korean government introduced the Attending Hospital
Program (AHP) in 2003 with a number of goals, including
making better use of doctors' specialties (under today's
specialist-centered decision-making structure in the Korean
healthcare system) and helping small- to medium-sized
hospitals make better use of idle medical resources and
doctors. However, the AHP has yet to achieve its stated
objectives. Although the Korean government revised the
operating guidelines for attending hospitals in 2009 in an
effort to support the success of the program, no evaluative
studies have been conducted on how effective the program
has been so far. The purpose of this study is to analyze and
evaluate the effects that the revised operating guidelines for
attending hospitals have had since 2009, with a view to
assessing the prospects of the AHP and finding implications
for its future improvement.

2. Research Method

□ To assess the current status and trends of hospitals that have applied to be attending hospitals, application data submitted to the Ministry of Health and Welfare (MOHW) and the Health Insurance Review and Assessment Service (HIRA) over a 10-year period (2006 through 2015) were gathered and analyzed. The assessment of the services provided by attending hospitals was based upon the attending hospital billing data that HIRA collected throughout the same 10-year period. The program's effects were subjected to interrupted time-series analysis, for which the number of attending hospitals, number of patients using the hospitals, number of services provided by the hospitals, and amounts of expenses charged by the hospitals were used as variables.

3. Findings

□ The number of medical institutions participating in the AHP decreased from 520 in 2006 to 428 in 2015. While the number of participating hospitals increased from 56 to 67 during the same period, the number of participating doctors dropped from 464 to 361. From 2009 to 2014, 55 percent of attending hospitals filed billing data for the attending services they provided. The number of attending

services provided annually increased from 1,221 in 2005 to 1,470 in 2009 and 6,048 in 2014. Although the number of services provided increased by an average of 4.7 percent annually from 2005 to 2009, the rate skyrocketed to 32.7 percent annually for the period from 2009 to 2014.

☐ The implementation of the revised operating guidelines for attending hospitals, which started in 2009, has exerted positive effects on the program in general, increasing the number of attending hospitals as well as the number and duration of the attending services they provide. In particular, the revised guidelines dramatically increased the number and duration of attending services provided by hospital-scale medical institutions. Attending services in internal medicine, urology, orthopedics, surgery, obstetrics and gynecology, neurology, and psychiatry have seen especially significant increases. While the overall number of medical institutions participating in the program dropped somewhat, the number and duration of attending services provided increased, showing significant rises in 2013 and 2014. In other words, the revised guidelines have had a greater effect on the quality rather than the quantity of attending hospitals under the program.

4. Conclusion

□ The revised operating guidelines for the AHP, introduced in 2009, have positively influenced the program overall, particularly by increasing the number and duration of attending services provided. While the number of medical institutions participating in the AHP remains stagnant, the number of attending services provided by participating medical institutions has been growing consistently. It is thus time to explore policy measures to expand the outward reach of the AHP. The absence of a securely established health care delivery system in Korea has led private clinics and hospitals to compete against one another for outpatients and hospitalized patients with the same diseases and symptoms. As private clinics, too, need to be equipped with cutting-edge equipment and facilities in order to survive this intensifying competition, they have been forced to over-invest in equipment, which, in turn, has had the effect of raising the average cost of medical services for the public. Policy measures should therefore be devised to expand the AHP as a means of helping establish a more efficient system of health care delivery.

I Introduction

I

Introduction 《

Enhancing the efficiency of healthcare has been one of the top-priority policy objectives in Korea, with policymakers and healthcare practitioners intent on making better use of the limited medical resources. The efficiency of healthcare can be ensured only when the three pillars of the national healthcare system—medical and health resources, organizations, and delivery system—function uninterrupted. The system of health care delivery, in particular, is the key to the efficiency of healthcare.

The Korean healthcare system, however, lacks a well-established and coherent system of health care delivery. While the specialist-centered structure of decision-making persists in the Korean healthcare system, the growing number of private clinics remain under-used, while small- to medium-sized hospitals are struggling to access available medical resources and recruit doctors. It was against this backdrop that the Korean government introduced the Attending Hospital Program (AHP) in 2003 (National Assembly Health and Welfare Committee (NAHWC), 2005).

The AHP enables private clinics to provide continuous services for their patients using medical resources (facilities, equipment, and doctors and nurses) available in the same community.

After the Medical Security Reform Committee first proposed the idea in 1994, lawmakers completed the legal groundwork in 1999, launched a pilot project in 2001, and introduced the full program in 2003. Approximately 30 clinics and hospitals participated in the pilot project in 2001, but only 16 provided attending services. While the number of participating medical institutions grew to 76 in 2009, only 23 (30.3 percent) provided attending services. Although observers had proposed deregulation and the reform of the health service pricing and payment systems and rules governing medical disputes as preconditions for the success of the AHP, the Korean government failed to respond to these demands effectively. The failure to motivate clinics and hospitals to participate deprived the AHP of effectiveness (Kim, 2011).

The outbreak of Middle East Respiratory Syndrome (MERS) in Korea in May 2015 highlighted the importance of establishing an effective health care delivery system. While the immediate cause of the MERS crisis was Korea's lack of an effective epidemic control system, the more fundamental cause behind the Korean medical community's failure to stem the spread of the MERS outbreak and prevent it from escalating into a healthcare crisis was the fact that Korea had no coherent health care delivery system. The absence of such a delivery system has been fostering excessive investment nationwide in the acquisition of medical resources, increasing the regional disparity in access

to medical resources and care, promoting the disproportionate concentration of patients in large hospitals, and contributing to the growing weakness of primary care institutions. In the meantime, recruiting doctors to work at regional base hospitals, including public medical centers, outside the Seoul-Gyeonggi region is again becoming a critical policy issue. As of 2010, the number of specialists per 100 hospital beds in small- and medium-sized cities and rural communities across Korea was 6.9 for public regional base hospitals (not counting the public healthcare clinic doctors), which was only 60.9 percent the number at general hospitals (12.1) (Oh, 2015). The establishment of a coherent health care delivery system is the first step toward solving these problems. The most realistic and effective route toward achieving this goal is to ensure the success of the AHP that has already been introduced and implemented.

Major studies on Korea's AHP include Lee (1994), Lee et al. (2001), Lee et al. (2002), Lee et al. (2005), and Kim et al. (2010). Yet few studies have been conducted on the state of the program since the revised operating guidelines were introduced in 2009. The early studies (Lee, 1994; Lee et al., 2001; and Lee et al., 2002) focused upon the economic effects of the program and suggested measures for establishing the program securely. Lee et al. (2005) surveyed the actual conditions of the AHP, identified issues, and suggested possible solutions. Kim et al. (2010) suggested the development of a more rewarding medical

pricing system and diverse models of attending hospitals for different regions. In the many years that have passed since these studies were conducted, the healthcare environment and market in Korea have changed profoundly. The time has thus come to conduct another study on the AHP in order to survey the actual conditions in which the program is being implemented and propose new reform measures. The Korean government introduced revised operating guidelines for the AHP in August 2009, but no research has been done on how this policy change has influenced the AHP. We now need to analyze actual data and surveys to determine policy measures necessary to ensure the success of the program. Particular attention is needed to review the medical pricing system, the rules governing medical disputes, and other legal reforms needed to increase the participation of private clinics in the AHP. Most importantly, we need to look for ways to establish the AHP securely, especially at public and regional base hospitals across Korea.

The objective of this study is to provide an assessment of the effects that the revised operating guidelines have had on the program since 2009, with a view to finding implications for the measures needed to ensure the success of the program. Specifically, this study first assesses whether the revised operating guidelines have increased or decreased the number of medical institutions participating in the program. Second, it

evaluates whether the revised guidelines have increased or de-creased the volume of attending services provided by partic-ipating medical institutions. Third, this study identifies policy implications, based upon the foregoing assessment, for se-curely establishing the AHP.

II

Theoretical Discussion and Literature Survey

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1. Concept and Legal Grounds of the AHP

1) Concept

Attending hospital programs differ from country to country. In general, though, the program is an arrangement in which private medical practitioners, unaffiliated with any general hospitals, refer their patients to hospitals, according to the terms and conditions of existing contracts, so that their patients may receive the hospitalization and/or specialized care they need (Health and Welfare Forum, 2000), while the hospitals allow the private practitioners to access and use their medical facilities, equipment, and personnel. The program is generally established to maximize the efficiency of the use of medical resources in providing medical services and care for patients (Baek, 2005).[1]

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[1] There are two main ways in which hospitals utilize available medical personnel to provide services for patients. In the first, it is only the full-time medical staff hired directly by hospitals who provide medical services for patients at those hospitals. This is the arrangement in Korea. The other way, as practiced in the United States and elsewhere, allows doctors not hired by or affiliated with hospitals to perform surgery and provide other medical services at those hospitals. In the latter arrangement, hospitals hire only the minimum numbers of doctors, mostly specialists in certain departments, as their employees. All other doctors maintain their own private practices and perform surgeries and provide other medical services that require complex

2) Legal Grounds

Article 34 (Annex) of the Enforcement Rules of the Medical Service Act (MSA) in Korea includes inpatient rooms, emergency rooms, operating rooms, intensive care units, diagnostic testing rooms, radiation equipment rooms, recovery rooms, physical therapy rooms, traditional medicine therapy rooms, pathology dissection rooms, drug preparation rooms, traditional medicine boiling rooms, medical record and archive rooms, disinfection facilities, food preparation facilities, laundry facilities, hospital morgue, extract processing rooms, self-generating facilities, emergency vehicles, and other such equipment and facilities as parts of hospitals. Of these, traditional medicine boiling rooms, medical record and archive rooms, feeding facilities, laundry facilities, and extract incinerators are facilities that two or more medical institutions may share (Article 34.20 (Annex 2), Enforcement Rules of the MSA). The government authorities have determined that physical therapy, operating, drug preparation, and inpatient rooms shall not be open to such sharing (MOHW Decision Nos.

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equipment and facilities by referring and admitting their patients to hospitals with which they have entered into contracts. The first arrangement is referred to as a "closed hospital system," and the latter, as an "open hospital system." In other words, open hospitals allow physicians attending to their clients to make use of the medical personnel, facilities, and equipment available at larger hospitals serving the given community. The open hospital system thus enhances the efficiency of medical resource utilization and increases the quality of services available to patients (Jeong, 2012).

65507-159, 547, and 1023).

The recent amendment of the MSA, however, has expanded the range of medical equipment and facilities that are open to sharing. According to Article 39 of the MSA, for example, medical practitioners may use the facilities, equipment, and personnel of a given medical institution, with the consent of the head of that institution, in providing medical services. The head of the medical institution may allow unaffiliated medical practitioners to provide medical services using the resources of the institution when deemed necessary to treat patients of that institution. In the event a medical accident occurs while an unaffiliated medical practitioner is providing services using the resources of a given medical institution, liability is to be attributed to the practitioner if the accident is found to be the fault of the practitioner or to the medical institution if the accident is the result of defects in the institution's equipment or facilities.

Pursuant to the revised operating guidelines handed down by the Korean government in August 2009,[2] the Rules of

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2) The Korean government revised the operating guidelines for the AHP in August 2009 to allow hospitals to enter into attending hospital agreements, introduce a digital platform supporting the AHP, and overcome the shortcomings and issues that were identified during the AHP implementation process. The changes that the revised guidelines introduced can be summarized as follows. First, hospitals can now enter into attending hospital agreements with other hospitals. Whereas hospitals were allowed to enter into such agreements with only independent private medical practitioners in the past, they can now enter into such agreements among themselves as well. Second, the revised guidelines introduced additional changes that attending hospitals must report

Operation for Attending Hospitals have been amended so that participating hospitals can devise and implement their own policies, in consultation with private medical practitioners, on how the proceeds of medical services and liabilities in medical disputes are to be shared.

〈Table 2-1〉 Sample Operating Guidelines

Type	Description
Scope of participation	All private medical practitioners in the region in which the Attending Hospital is located.
Contract period	Contract to be renewed with the consent of both parties every year.
Service protocol	Private practitioners may admit patients to the Attending Hospital and/or perform surgery on and/or provide other necessary services for those patients by filing requests for hospitalization and/or surgery in the names of the specialists of relevant fields at the Attending Hospital.
Service cooperation	(1) The Attending Hospital shall establish a system of prioritized cooperation to cater to private practitioners'

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to the authorities. Should hospitals intent on participating in the AHP undergo any changes in their status that are relevant to the MOHW's decision on whether to approve their applications, they must now report such changes to the MOHW. Third, the revised guidelines also altered the ways in which attending hospitals can claim benefits from the National Health Insurance (NHI). The revised guidelines introduced a detailed expense form that hospitals are required to fill out so as to prevent errors in reporting expenses. Fourth, the special benefits for attending hospitals that were announced in the details of NHI benefits and expenses were stricken off. Fifth, the provisions of attending hospital agreements that allow parties to enter into additional or separate contracts for the joint use of facilities and equipment were repealed. Now, hospitals and private practitioners entering into attending hospital agreements do not need additional contracts for the sharing of medical resources. Sixth, the revised guidelines also recommended the use of digital technology for advertising the AHP. The Hospital Association, HIRA, Medical Association, and other such organizations were thus advised to introduce the AHP via their websites and digital platforms in order to raise public awareness of the program.

Type	Description
	requests for the hospitalization of and surgical treatment for their patients. (2) Private practitioners shall comply with the Attending Hospital's service protocol and consult with the relevant departments/specialists to ensure cooperation prior to sending patients for admission.
Profit allocation	The proceeds from medical services provided for patients who received surgical treatment and/or other medical services from private practitioners based on the resources of the Attending Hospital shall be divided between the Attending Hospital and the practitioners according to mutual agreement.
Medical disputes	In the event patients dispute the processes or outcomes of the medical services they received from private practitioners at the Attending Hospital, all liabilities shall be assigned in accordance with the mutual agreement, with the Attending Hospital cooperating as much as possible to facilitate the resolution of the disputes.
Compliance	In admitting, performing surgery on, and providing other services for patients at the Attending Hospital, private practitioners shall comply with all general rules and policies of the Attending Hospital, as shall the Attending Hospital's own doctors. The Attending Hospital reserves the right to terminate contracts with private practitioners who dishonor the hospital and/or breach the terms and conditions of contracts.
Operating Committee	An Attending Hospital Operating Committee shall be established to accommodate discussions on the operation of the program. The rules governing the committee shall be decided separately.

Note: This table provides an excerpt from the operating guidelines of an actual hospital participating in the AHP in Korea. Much of the guidelines is the same from hospital to hospital.

3) Eligibility Criteria

Hospitals or medical institutions of higher (larger) categories can apply to become attending hospitals. These are medical institutions capable of offering at least five inpatient beds for the

treatment of patients referred via the AHP. The revised guidelines of 2009 have enabled hospitals to enter into attending agreements with other hospitals (not just independent private practitioners) and allowed medical institutions larger than hospitals to participate in the program. Participating doctors, i.e., independent private practitioners, must be based in geographical proximity to attending hospitals so that they can participate in making rounds and providing emergency care. Attending hospitals can allow private practitioners with specialties that are lacking in their own departments to participate in the program. Medical institutions wishing to become attending hospitals are required to submit their applications, along with operating plans, contracts with private practitioners, tables showing how proceeds are to be shared, and lists of participating hospitals and practitioners to the MOHW and HIRA (Kim, 2011). Each time an attending hospital changes the terms and conditions of its contract with private practitioners (e.g., the ratios according to which the proceeds are to be shared), it must submit the revised contract, along with a list of the private practitioners and hospitals that are parties to the revised contract, to HIRA (MOHW, 2009).

[Figure 2-1] Attending Hospital Application Procedure

Attending hospital applicant		MOHW
	New applicant: Submits required documents	Application submitted
- New applicant : receives official letter from MOHW when granted application - Periodical evaluation (annual) : requests for improvements made where applicable		Review of operating standards, etc. (Document-based, on-site inspection may be performed when necessary.)
- Result announced after document review		MOHW

Source: MOHW (2009).

4) Limits of the AHP

There are a number of structural obstacles preventing the widespread success of the AHP in Korea today. First, the current government-mandated medical service pricing system does not differentiate between the cost of services provided and the fees paid to doctors, imposing an additional burden on participating hospitals and practitioners to devise a separate plan for distributing the proceeds. This necessity for another agreement is often a source of conflict. Second, there is no clear standard by which liabilities can be attributed and medical disputes settled. In all cases, patients receiving care at an

attending hospital are tended to by their attending physicians using medical resources available at the hospital. When medical accidents occur, patients demand that the attending hospital bear responsibility. As the attending physicians are not hired directly by the hospital, the AHP can make dispute resolution quite complicated (Lee et al., 2002). A two-party dispute between the patient and the hospital can easily evolve into a more complex three-party dispute involving the private practitioner/attending physician as well.

2. Literature

There are three main types of literature on the AHP in Korea. The first involves studies examining the economic effects and necessity of the AHP (Lee, 1994; Lee et al., 2001; and Lee et al., 2002), while the second type provides empirical analyses on the actual operations of attending hospitals (Lee et al., 2005, and Kim, 2011). The third kind provides analyses of opinion polls on the AHP (Park, 2009, and Han, 2010).

1) Economic Effects of the AHP

The literature confirms that the AHP indeed generates a sizable economic effect, particularly by facilitating the efficient use of medical resources, increasing hospitals' revenues, re-

ducing the costs of tending to patients, and decreasing the overall financial burden of healthcare on citizens.

Based upon an opinion poll involving 76 private practitioners, Lee et al. (2001) sought to analyze the anticipated economic effects of the AHP, which was still in the preparation stage at the time. The authors compared the personnel, facilities, and equipment owned by private practitioners and how much of the same resources that the practitioners would use at attending hospitals. The authors concluded from their analysis that the AHP could help reduce the medical human resources required by 2.2 percent to 42.9 percent, the facilities required by 6.7 percent to 74.5 percent, and the equipment required by up to 6.3 percent (depending on the types of equipment).

Lee (1994) performed a simulation of the AHP, then still being prepared, and found that the introduction of the AHP would increase the net income of hospitals first and the revenue of private clinics second by enabling the latter to treat patients requiring hospitalization as well. Lee et al. (2001) compared and analyzed the changes that the AHP had caused in the revenue structures of two medical institutions—one public hospital and one private clinic—outside the Seoul-Gyeonggi region, concluding that hospitals with idle facilities and equipment would benefit financially from the AHP. The net gains contributed by the AHP (attending hospital's medical proceeds, AHP-related internal cost at attending hospital, and money

paid to private practitioners) was between KRW 64 million and KRW 180 million for the attending hospital and between KRW 40 million and KRW 92 million for the private practitioner in the first half of 2001 alone.

Lee et al. (2001) also found that the partnership between the public hospital and the private practitioner reduced, with re-spect to ENT services, the total medical cost by 10.5 percent, the total amount of NHI payouts by 5.5 percent, and the total non-NHI-covered medical cost by 37.4 percent. With respect to neurosurgery, the partnership reduced the total medical cost by 24.7. percent, the total NHI payouts by 24.6 percent, and the total non-NHI-covered medical cost by 25.9 percent.

Lee et al. (2002) estimated how the introduction of the AHP would reduce the overall financial burden of healthcare on the general public (i.e., by reducing investment in necessary facili-ties) based upon assumptions regarding the shares of AHP pro-ceeds in medical revenue and percentages of hospitals partic-ipating in the program. Depending on the proportion of total hospital revenue made up by the proceeds of the AHP, total medical costs would be reduced by 0.15 percent (where AHP proceeds make up one percent of total hospital revenue), 1.53 percent (10 percent), 3.06 percent (20 percent), and 6.11 per-cent (40 percent). The AHP, moreover, was estimated to reduce the amount of investment in facilities needed by newly opened private practitioners by 41.7 percent overall.

2) Actual Conditions of the Operation of Attending Hospitals

Relatively few studies have been conducted in Korea that empirically analyze the problems with the actual conditions of the AHP and suggest possible policy measures to solve them. Lee et al. (2005 and 2008) examined the actual conditions of the AHP by surveying attending hospitals and private practitioners. Regarding their motives for participating in the program, attending hospitals indicated the use of idle resources and attraction of patients, while private practitioners pointed to the continued management of patients, use of medical equipment, and increased profits. As for factors obstructing the progress of the AHP, attending hospitals identified the lack of awareness, limited rewards, and lack of a clearly established service protocol, while private practitioners identified the difficulty of fitting their patients into the attending hospitals' service schedules, distance to hospitals, limited rewards, lack of understanding of patients, and cumbersome nature of the service protocol. When asked to identify the top-priority policy issue that must be addressed before fostering the AHP, both sides pointed to the reform of the medical pricing system. Other choices included the amendment of the applicable law and development of better measures for settling disputes.

Han et al. (2010) conducted a telephone survey of officers in charge of managing the AHP at various medical institutions and

examined their suggestions for policy changes to be made to the AHP. The study found that, while the number of patients using the medical institutions participating in the program has increased, overall interest in the program has decreased over time due to the lack of legal and policy incentives promoting the improvement of the management environments at participating institutions. Even working-level officers at attending hospitals showed low awareness of the AHP. The current medical pricing system, which sets excessively low prices for medical services and refuses to distinguish between the costs of services and fees to be paid to doctors, has made it difficult for hospitals and private practitioners to come up with satisfactory standards for the sharing of proceeds. Therefore, regarding the changes that need to be made, the survey participants identified the introduction of a new medical pricing system, raising of the rates for medical services provided through the AHP, and permission for attending hospitals to bill the costs of services provided by private practitioners as their own. Moreover, the survey participants emphasized the importance of establishing a systematic mechanism for settling disputes involving the AHP (Kim et al., 2011).

3) Perceptions of the AHP

There are two different perceptions of the AHP: that of serv-
ice providers (hospitals and doctors) and that of consumers
(patients). As for the former, Kim et al. (1996) surveyed the
willingness of private practitioners in Daegu to participate in
the AHP. Of the respondents, 65.2 percent hoped to enter into
partnerships with attending hospitals. The most prevalent
cause for not wishing to partner with attending hospitals, how-
ever, was the lack of financial benefits. Reluctant practitioners
pointed to the low rates for medical procedures and the addi-
tional amounts of time that the AHP would require of them as
the main factors discouraging them from participating. The re-
spondents also stressed the need for policy incentives encour-
aging attending hospitals and private practitioners to partic-
ipate and a more appropriate reward system. Park (2009) sur-
veyed local residents using primary medical institutions and
public healthcare clinics in County H in Gangwon-do to identi-
fy their perceptions of the AHP and the factors influencing
them. Although only 12.5 percent of the surveyed locals were
aware of the AHP, 73.8 percent expressed a willingness to use
the program after hearing about it. Han et al. (2010) similarly
surveyed the residents of City Y in Gyeongsangbuk-do regard-
ing their perceptions of the AHP. While only 17.1 percent of
the surveyed locals were aware of the AHP, 61.1 percent an-

swered that they would use the AHP for the treatment of or surgery for their acute or chronic diseases (Kim et al., 2011). To ensure the success of the AHP, it is important to raise public awareness of, and make people more open to, the program. This may require policy incentives, such as lowering the out-of-pocket expenses patients are required to pay upon using the services of attending hospitals.

3. Departure from the Literature

This study departs from the existing literature by examining the changes in the healthcare environment, surveying the general characteristics of Korea's healthcare system, and analyzing the impact that the policy change introduced in 2009 has had on the AHP. Many years have passed since the last study on the existing literature was conducted. Given the rapid changes that have taken place in the healthcare environment and market since then, it is important to once again examine the conditions of the AHP and find new policy solutions for improvement. This study, in particular, overcomes the limitations of existing evaluative studies on the AHP. The Korean government has so far commissioned four studies on the AHP: Lee et al. (2001), Lee et al. (2002), Lee et al. (2005), and Kim et al. (2011). The two earlier studies explored the likely economic effects of the

AHP before the program was fully implemented. Lee et al. (2005) targeted attending hospitals and independent private practitioners, while Kim et al. (2011), the most recent of these studies, was exclusively focused upon the development of a new medical pricing system for the AHP and different models of the AHP for different regions. All these studies, however, lack time-series analyses showing the evolving conditions in which AHP participants are operated.

This study therefore focuses upon surveying the changes that have been taking place in medical institutions since the revised operating guidelines were introduced in 2009, particularly with a view to thoroughly analyzing the changes in the volumes of services provided and amounts of medical costs.
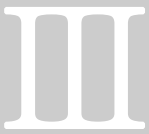
Ⅲ Research Method

III   Research Method 《
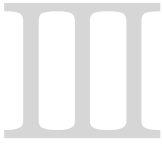
1. Data

The effect of the revised operating guidelines for the AHP, implemented in 2009, can be gauged by measuring the changes in the number of participating institutions and volume of services provided. Our analysis in this regard is based upon the attending hospital applications submitted to the MOHW and HIRA since 2005. To determine the changes in the volume of services provided under the AHP, we also look at the AHP billing data submitted by attending hospitals to HIRA from 2005 to 2014. The scope of our analysis starts in 2005, not in 2003, when the AHP was first introduced, based on the presumption that the AHP had become stable and effective by 2005.

2. Model of Analysis

In an effort to examine the effect of the revised operating guidelines (ROGs), we resort to the interrupted time-series analysis. Data that show abrupt changes in the observed values due to external shocks, such as policy changes, during a given time series are regarded as "outliers." Outliers whose occurrences can be attributed to definite causes and time spans are

known as "interruptions" (Lee and Kim, 2003). Interrupted time-series analysis is a method of statistical analysis suited to analyzing the effects of such interruptions and specifically involves examining changes in the time-series data at the time, t, when an interruption occurred (Kim, Kim, and Lee, 2003). By comparing the pre- and post-interruption time series, this method allows us to judge the effect of the given interruption (Song, 2005). Interrupted time-series analysis can be conducted using a variety of models tailored to different types of data. Examples include the autoregressive (AR) and autoregressive integrated moving average (ARIMA) models for linear data, autoregressive conditional heteroskedasticity (ARCH) and generalized ARCH (GARCH) models for nonlinear data, and segmented regression (SR) model for visualizing the effects of interruptions. In this study, the SR model is used, as it is well suited to assessing interruptions caused by policy changes with a high level of verifiability and also enables researchers to trace the diverse paths and outcomes involved in the effects of policy interventions (Wagner, Soumerai, Zhang, and Ross-Degnan, 2002). Since Campbell, Stanley, and Gage (1963) introduced it as the most powerful of all quasi-experimental models, the SR model has been widely used in a number of fields, including econometrics, medicine and pharmacology, and public administration (Wager et al., 2002).

In the SR model, the time variable is included in the re-

gression in order to determine the effects of a given inter-ruption or policy intervention. To determine the long-term ef-fects of a given policy intervention, for example, the time ser-ies preceding the intervention is defined as zero, and the time series following the intervention is defined as one (Song, 2013). This time variable does not exist in reality, but is a proxy or an instrument used to determine the enduring effects of policy changes. As such, it does not represent the independent and exclusive effect of the passing of time, meaning that we should not dismiss the possibility of there being multiple other causes behind the observed changes over time (Song, 2013). Although the SR model is not suited to clearly establishing the causal re-lationship between a given policy intervention and the depend-ent variables, it can still visibly confirm that the given policy intervention has exerted noticeable effects over time.

Assuming that the uninterrupted time series, Z_t, follows the pre-interruption ARIMA model ((p, d, q) × (P,D,Q)s) with a sea-sonal period of S so that the external shock, m_t, exerts addi-tional effects, an interrupted model of analysis such as the SR model can be expressed as shown below:

$$Y_t = m_t + Z_t, \quad (1-B)^d (l-B^s)^D \varnothing_p(B) \Phi_p(B^s) Z_t = \theta_0 + \theta_q(B) \Theta_Q(B^S) a_{t.}$$

Here Y_t represents the interrupted time series; $\varnothing_p(B)$ and

$\Phi_P(B^s)$ represent the non-seasonal and seasonal AR polynomial models, respectively; and $\theta_q(B)$ and $\Theta_Q(B^S)$ represent the non-seasonal and seasonal MA polynomial models, respectively. a_t captures the white noise, WN($0, \sigma^2$) (Kim and Seong, 2011).

The interruption variable, m_t, usually consists of a pulse function ($P_t^{(T)}$) and step function ($S_t^{(T)}$), as shown below:

$$P_t^{(T)} = \begin{cases} 0, & t \neq T, \\ 1, & t = T, \end{cases} \qquad S_t^{(T)} = \begin{cases} 0, & t < T, \\ 1, & t \geq T, \end{cases}$$

This is when an interruption occurs at time $P_t^{(T)}$, with effects extending to time T only. $S_t^{(T)}$ represents an interruption whose effects extend beyond the time of occurrence, T. The typical interruption variable, m_t, takes on the following expression:

$$m_t = \frac{\omega(B)}{\delta(B)} B^b I_t, \qquad I_t = P_t^{(T)} \text{ or } S_t^{(T)}.$$

Note that $\omega(B) = \omega_0 - \omega_1 B - \cdots - \omega_s B^S$ and $\delta(B) = 1 - \delta_1 B - \cdots - \delta_r B^r$. Also, b represents the delay in the effect of the interruption; $w(B)$, the initial anticipated effect of the interruption; and $\delta(B)$, the enduring effect of the interruption (Kim and Seong, 2011).

Our focus is on whether the ROGs have increased the number of participating institutions and volume of services provided, and, if so, to what extent. In other words, our goal is to confirm, using an interrupted time-series analysis model, whether there has been any structural break in the time series since the AHP was first introduced. While numerous mathematical models can be used to assess responses to policy interventions, the specific function of the policy change and the response used in this study is shown in Figure 3-1.

We may posit the following four scenarios regarding the sections and inclines of the lines representing the trends in the number of participating institutions and volume of services provided. First, as shown by Line 1, the incline can remain the same while only the section increases. Second, as shown by Line 2, the section and incline can both increase in a linear manner after the policy change. Third, as shown by Line 3, the section can remain the same while the incline increases. Fourth, as shown by Line 4, the incline can remain the same for some time after the introduction of the policy change before suddenly increasing.

[Figure 3-1] Scenarios for the Effects of the ROGs on the AHP
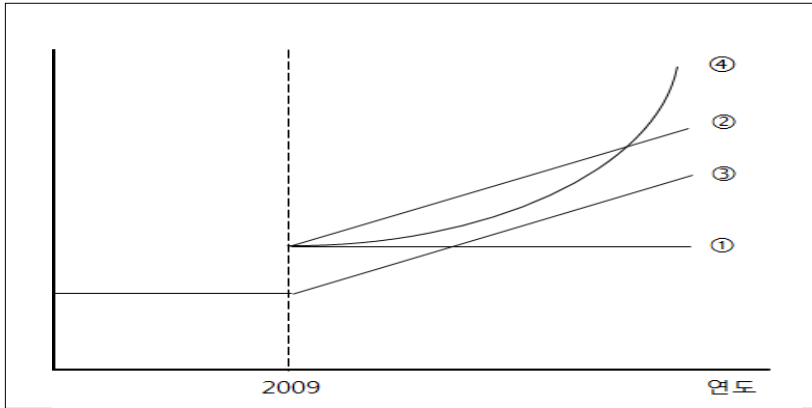
$$Y_t = \alpha + \beta_1 T + \beta_2 OH + \beta_3 AOH + \beta_4 AOH^2 + \varepsilon_t$$

Here, Y_t equals the response series at time t—i.e., the number of hospitals and clinics participating in the AHP, the volume of services (number, duration, and cost of services) provided under the AHP, and the volume of services by hospital type and specialized department.

T = time variable with values ranging from 1 to 10.

$$OH = \begin{cases} 1 : \textit{After policy change} \\ 0 : \textit{Prior to policy change} \end{cases}$$

$$AOH = \begin{cases} (year - 2009) : \textit{After policy change} \\ 0 : \textit{Prior to policy change} \end{cases}$$

$$AOH^2 = AOH \times AOH$$

$\alpha, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ and so forth are estimated coefficients, and ε_t is an error term.

The equation above is designed so that the coefficients of the time variable, T, capture the changes in the trend lines representing the number of participating institutions and volume of services provided. In the meantime, the three regression coefficients, OH, AOH, and AOH^2, capture the structural changes in the trends since the introduction of the ROGs. The section and incline of the trend lines prior to the introduction of the ROGs are α and $\beta 1$, respectively, while the section and incline of the trend lines after the introduction of the ROGs are $(\alpha + \beta_2)$ and $\{\beta_1 + (\beta_3 + \beta_4)\}$. Our focus is on the signs, sizes, and statistical significance of β_2, β_3, and β_4.[3)]

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3) The equation was established, in light of the linearity of the policy effect, as follows:

$$Y_t = \alpha + \beta_1 T + \beta_2 OH + \beta_3 AOH + \varepsilon_t$$

Scenario 0: $\beta_2 = 0, \beta_3 = 0$

    i.e., the policy had no effect whatsoever

    $\Rightarrow Y_t = \alpha + \beta_1 T + \varepsilon_t$

Scenario 1: $\beta_2 \neq 0, \beta_3 = 0$

    i.e., the policy resulted in an overall change of β_2, without affecting the trend at all

    $\Rightarrow Y_t = \alpha + \beta_1 T + \beta_2 OH + \varepsilon_t$

Scenario 2: $\beta_2 \neq 0, \beta_3 \neq 0$

    i.e., the policy has resulted in an overall change of β_2 while changing the trend by β_3 as well

    Incline of the time trend line: from β_1 before policy to $\beta_1 + \beta_3$ after policy

    $\Rightarrow Y_t = \alpha + \beta_1 T + \beta_2 OH + \beta_3 AOH + \varepsilon_t$

Scenario 3: $\beta_2 = 0, \beta_3 \neq 0$

    i.e., the policy has changed only the trend by β_3

    Incline of the time trend line: from β_1 before policy to $\beta_1 + \beta_3$

Having set up this model, a key question we now face is how to interpret the coefficients of AOH and AOH^2, which affect the coefficient and incline of OH. If there were factors other than β_2, β_3, β_4 or their regression coefficients that have affected the number of participating institutions and the volume of services provided, our model would capture the effects of these other factors as well, making it difficult for us to conclude that the changes in these two dependent variables are attributable solely to the introduction of the ROGs. Unlike other medical services in general, however, services provided under the AHP are seldom influenced by patients' idiosyncratic sociodemographic factors. Therefore, in analyzing the changes caused by the introduction of the ROGs in 2009, we need to simply consider whether there were any other policy changes preceding or antedating the introduction of the ROGs in 2009. Fortunately,

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after policy
$$\Rightarrow Y_t = \alpha + \beta_1 T + \beta_3 AOH + \varepsilon_t$$

Scenario 4: $\beta_2 \neq 0, \beta_3 \neq 0, \beta_4 \neq 0$

    i.e., the policy has resulted in an overall change of β_2, with an enduring effect afterward taking on the following binomial form:

$$\Rightarrow Y_t = \alpha + \beta_1 T + \beta_2 OH + \beta_3 AOH + \beta_4 AOH^2 + \varepsilon_t$$

Where the policy has caused an overall change of β_2, we must single out the effect of the passing of time (β_3, β_4). If $\beta_4 > 0$, it means that the effect of the policy due to the passing of time continued to drop to a certain point, before rising back up again. If $\beta_4 < 0$, the effect of the policy due to the passing of time continued to increase to a certain point, before decreasing afterward.

Point in time where the policy effect begins to reverse: $-\dfrac{\beta_3}{2\beta_4}$

there were no other such policy changes, which adds to the simplicity of our interpretation.

3. Validity of the Model

Before applying the interrupted time-series analysis model as proposed, we first need to identify our model so as to ensure that the time-series data we use to estimate the regression model for each section satisfies the assumed requirement of stationarity (Song, 2005). Time-series data arranged in chronological order must maintain a certain equilibrium irrespective of the passing of time in order to support statistical estimation and verification. The purpose of identifying our model is therefore to determine the difference required to convert the abnormal time series into a normal time series and decide the orders (p, d, and q) of the seasonal or non-seasonal AR and MA models (Hahm, 2005). In identifying the ARIMA model of a given time series, we first need to determine whether the given data constitute a normal time series. If the given time series is abnormal, we need to convert it into a normal time series so that the resulting model is discernible by an autocorrelation function (ACF) or partial autocorrelation function (PACF) (Park, 2003).

Box and Ljung proposed verified statistics based upon the autocorrelation function of all residual terms regarded as a single group (Ljung, G. M. and Box, G. E. P. (1978). "On a Measure

of Lack of Fit in Time Series Models." *Biometrueka.* 65. 297).

$$Q^* = n(n+1) \sum_{k=1}^{K} r^{2_k}(\hat{e})/(n-k)$$

Where Q^* is large, the autocorrelation coefficient of the residual terms as a group is statistically non-zero. In such a situation, the white noises of the estimated models are correlated to one another, meaning that we must choose a different model. To decide the optimal time period, the Schwarz's Bayesian criterion (SBC, or the Bayesian information criterion (BIC)) is considered:

$$SBC = \ln\delta_e^2 + (p+q)\ln n$$

Now, we need to look for orders p and q that carry the smallest SBC (BIC).

IV

Results

IV ~~~~~ Results ≪

1. Participation in the AHP

The number of medical institutions that applied to participate in the AHP decreased from 520 in 2006 to 428 in 2015. While the number of hospitals participating in the program for the purpose of sharing their medical resources increased only slightly from 56 to 67 over the same period, the number of private clinics and hospitals participating in the program to gain access to the resources of other hospitals declined from 464 to 361 (Table 4-1).

〈Table 4-1〉 Number of Applying Institutions by Year

(Units: number of medical institutions, percentage)

Type	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Hospitals providing resources	56	52	51	63	60	57	60	63	68	67
	(100)	(92.9)	(91.1)	(112.5)	(107.1)	(101.8)	(107.1)	(112.5)	(121.4)	(119.6)
Hospitals and clinics in need of resources	464	422	434	437	387	369	361	365	365	361
	(100)	(90.9)	(93.5)	(94.2)	(83.4)	(79.5)	(77.8)	(78.7)	(78.7)	(77.8)
Overall	520	474	485	500	447	426	421	428	433	428
	(100)	(91.2)	(93.3)	(96.2)	(86.0)	(81.9)	(81.0)	(82.3)	(83.3)	(82.3)

Note: The figures in parentheses indicate the rate at which the number of medical institutions has increased since 2006.
Source: HIRA, internal documents

Table 4-2 shows the changes in the number of resource-sharing hospitals that provided medical services under the AHP by year. This figure increased by 175 percent from 2008 (prior to the introduction of the ROGs) to 2014 (after the introduction of the ROGs), suggesting the significant effect that the ROGs have had. In particular, the percentage of medical institutions providing services under the AHP was at its highest, at 85.7 percent, in the first year of the ROGs. While the percentage of medical institutions providing services under the AHP decreased somewhat afterward, the ROGs appear to exert a lasting impact nonetheless (Table 4-2 and Figure 4-1).

〈Table 4-2〉 Number of Medical Institutions Providing Services Under the AHP

(Units: number of medical institutions, percentage)

Type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Mean
Hospitals providing resources	14	20	17	20	54	31	22	27	35	35	27.5
	(28.0)	(32.8)	(27.0)	(30.8)	(85.7)	(51.7)	(38.6)	(45.0)	(55.6)	(51.5)	(45.6)
Hospitals and clinics in need of resources	50	61	63	65	63	60	57	60	63	68	61
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

2. Provision of Services Under the AHP

Over the 10-year period, the number of medical institutions with records of providing hospitalization-related services under the AHP increased by 2.5 times; the number of related services provided, by 6.1 times; the duration of related services pro-

vided, by 7.6 times; and the cost of related services provided, by 6.5 times. The introduction of the ROGs has had considerable effects, increasing the number of service-providing medical institutions by 58 percent; the number of services provided, by 35 percent; the duration of services provided, by 42 percent; and the cost of services provided, by 69 percent from 2008 to 2010.

⟨Table 4-3⟩ Changing Volumes of Services Provided Under the AHP

Type		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Hospitalization	Number of institutions	14	20	17	19	38	30	22	27	35	35
		(100)	(142.9)	(121.4)	(135.7)	(271.4)	(214.3)	(157.1)	(192.9)	(250.0)	(250.0)
	Number of services	963	916	1,062	871	693	1,173	1,051	1,184	3,562	5,875
		(100)	(95.1)	(110.3)	(90.4)	(72.0)	(121.8)	(109.1)	(122.9)	(369.9)	(610.1)
	Duration of services (days)	5,129	4,965	6,621	4,321	3,726	6,126	4,689	5,225	22,384	38,997
		(100)	(96.8)	(129.1)	(84.2)	(72.6)	(119.4)	(91.4)	(101.9)	(436.4)	(760.3)
	Cost of services (in KRW 1,000)	848,663	1,059,141	1,171,897	770,466	766,307	1,303,819	1,173,002	1,281,326	3,881,859	5,474,213
		(100)	(124.8)	(138.1)	(90.8)	(90.3)	(153.6)	(138.2)	(151.0)	(457.4)	(645.0)

Note: The figures in parentheses indicate the rates at which the numbers/amounts had increased since 2005.

[Figure 4-1] Annual Changes in Services Provided Under the AHP (Hospitalization)
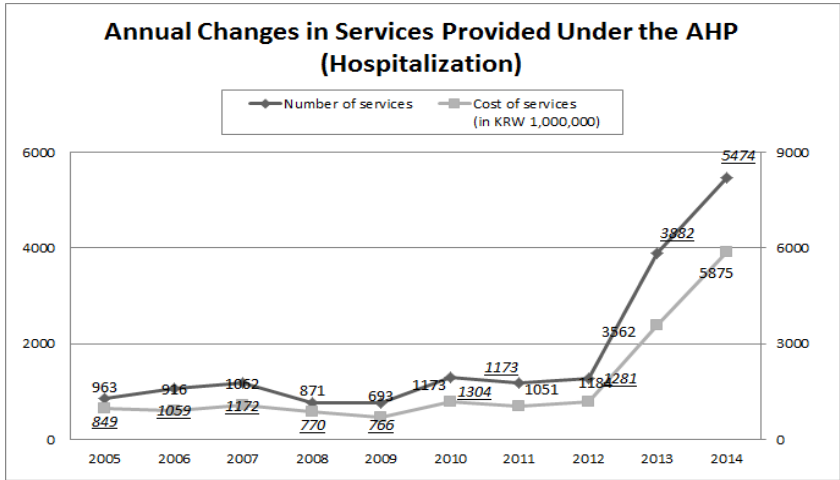

Among the higher-level general hospitals (HLGHs) participating in the program, the number and cost of services provided under the AHP grew by 1.78 times and 1.14 times, respectively, over the 10-year period. In particular, from 2008 to 2010, the number of services provided increased by 11.7 percent, while the cost of services dropped by 1.4 percent. Among general hospitals (GHs), the number and cost of services provided under the AHP grew by 1.49 times and 2.66 times, respectively. Around the time that the ROGs were introduced, from 2008 to 2010, the number of services dropped by 24 percent, while the cost of services rose by 67 percent. As for hospitals, the number and cost of services provided under the AHP increased by 9.4 times and 34.2 times, respectively. From 2008 to 2010, the number and cost of services provided jumped quite dramati-

cally by 620 percent and 196 percent, respectively. The ROGs, in other words, have exerted the most visible effects on hospitals participating in the AHP.

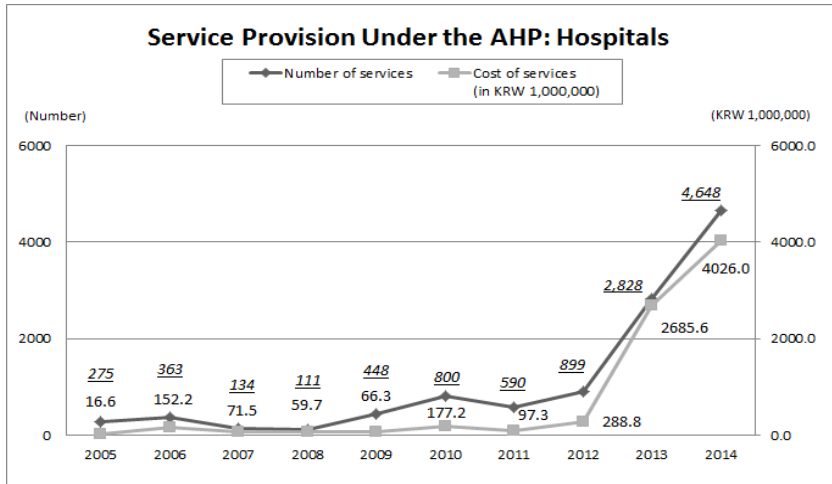[Figure 4-2] Service Provision Under the AHP: HLGHs
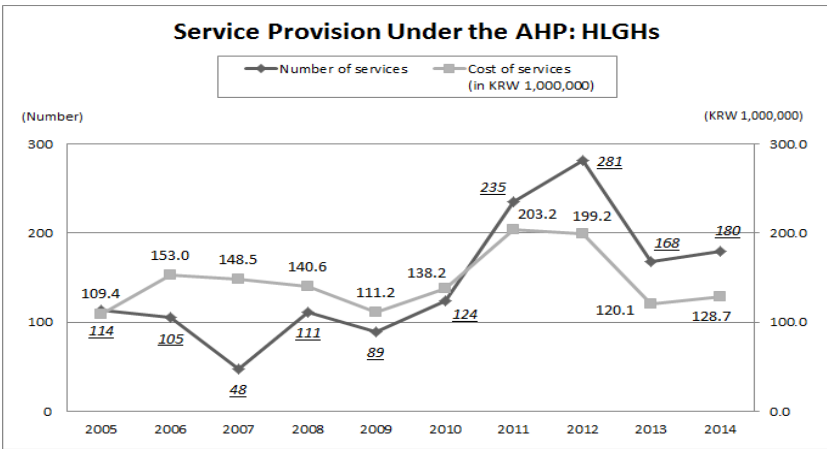
[Figure 4-3] Service Provision Under the AHP: GHs
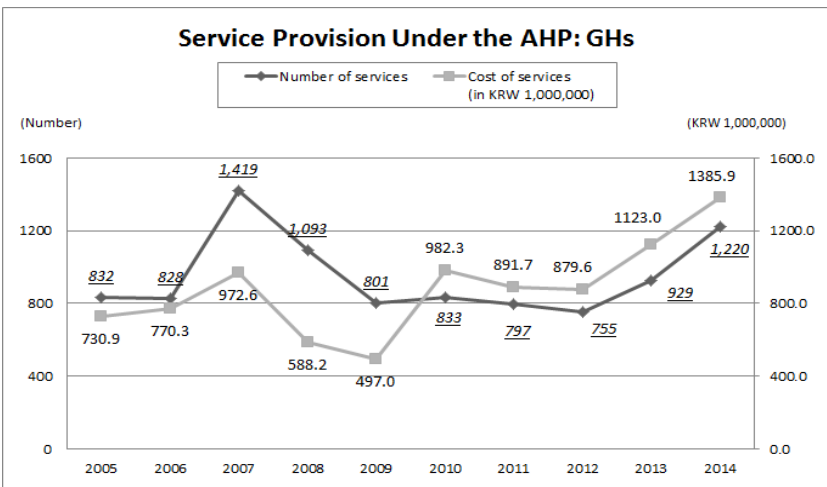
〔Figure 4-4〕 Service Provision Under the AHP: Hospitals

〈Table 4-4〉 Service Provision Under the AHP by Year and Institution Type

Type		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
HLGHs	No. of services	114	105	48	111	89	124	235	281	168	180
		(100)	(92)	(42)	(97)	(78)	(122.8)	(232.7)	(278.2)	(166.3)	(178.2)
	Duration of services (days)	470	606	560	486	334	406	597	594	353	345
		(100)	(129)	(119)	(103)	(71)	(117.0)	(172.0)	(171.2)	(101.7)	(99.4)
	Cost of services (in KRW 1,000)	109,375	153,042	148,473	140,578	111,211	138,155	203,246	199,241	120,081	128,669
		(100)	(140)	(136)	(129)	(102)	(122.0)	(179.5)	(175.9)	(106.0)	(113.6)
GHs	No. of services	832	828	1,419	1,093	801	833	797	755	929	1,220
		(100)	(100)	(171)	(131)	(96)	(102.1)	(97.7)	(92.5)	(113.8)	(149.5)
	Duration of services (days)	4,596	3,758	6,331	3,966	2,488	4,404	3,473	3,339	4,866	6,315
		(100)	(82)	(138)	(86)	(54)	(169.4)	(133.6)	(128.4)	(187.2)	(242.9)
	Cost of services (in KRW 1,000)	730,897	770,300	972,612	588,247	496,955	982,295	891,741	879,568	1,123,021	1,385,851
		(100)	(105)	(133)	(81)	(68)	(188.5)	(171.1)	(168.8)	(215.5)	(266.0)
Hospitals	No. of services	275	363	134	111	448	800	590	899	2,828	4,648
		(100)	(132)	(49)	(40)	(163)	(161.9)	(119.4)	(182.0)	(572.5)	(940.9)
	Duration of services (days)	417	1,189	450	515	966	2,095	1,115	1,976	17,518	32,510
		(100)	(285)	(108)	(124)	(232)	(141.7)	(75.4)	(133.7)	(1,185.3)	(2,199.6)
	Cost of services (in KRW 1,000)	16,553	152,186	71,532	59,723	66,267	177,210	97,334	288,834	2,685,562	4,026,001
		(100)	(919)	(432)	(361)	(400)	(150.7)	(82.8)	(245.6)	(2,283.5)	(3,423.3)

Note: The figures in parentheses indicate the rates at which the numbers/amounts had increased since 2005.

〈Table 4-5〉 Changes in Service Provision Under the AHP After the Introduction of the ROGs

Type		2005	2008	2010	2014	('14/'05)	('10/'08)
Overall	No. of services	963	871	1,173	5,875	6.10	1.35
	Duration of services (days)	5,129	4,321	6,126	38,997	7.60	1.42
	Cost of services (in KRW 1,000,000)	849	770	1,304	5,474	6.45	1.69
HLGHs	No. of services	114	111	124	180	1.58	1.12
	Duration of services (days)	470	486	406	345	0.73	0.84
	Cost of services (in KRW 1,000,000)	109	141	138	129	1.18	0.98
GHs	No. of services	832	1,093	833	1,220	1.47	0.76
	Duration of services (days)	4,596	3,966	4,404	6,315	1.37	1.11
	Cost of services (in KRW 1,000,000)	731	588	982	1,386	1.90	1.67
Hospitals	No. of services	275	111	800	4,648	16.90	7.21
	Duration of services (days)	417	515	2,095	32,510	77.96	4.07
	Cost of services (in KRW 1,000,000)	17	60	177	4,026	243.22	2.97

As for the types of specialties involved in the services provided under the AHP, internal medicine made up the largest share of the total number of services provided in 2014 (56.2 percent), followed by urology (12.8 percent), orthopedics (7.8 percent), surgery (5.8 percent), neurosurgery (5.0 percent), and obstetrics and gynecology (4.5 percent). In terms of the cost of the services provided, internal medicine again claimed the largest share (46.9 percent), followed by orthopedics (12.3 percent), urology (8.8 percent), surgery (7.8 percent), neurosurgery

(7.5 percent), and obstetrics and gynecology (7.3 percent) (Figure 4-5).

〔Figure 4-5〕 Composition of Services Provided Under the AHP by Specialty (2014)
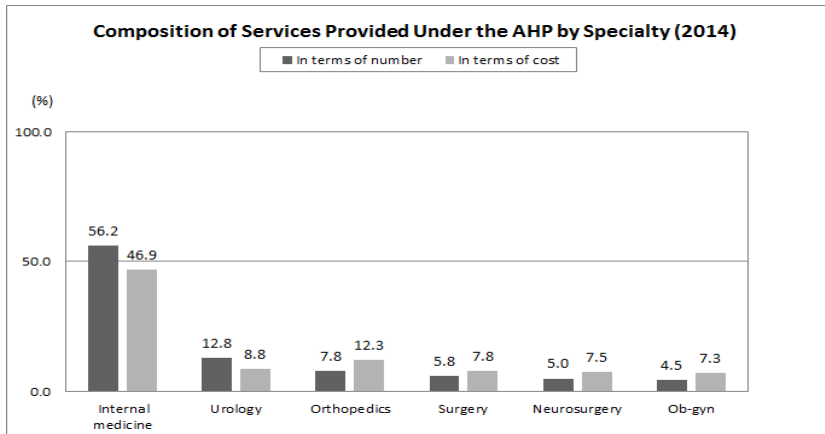
During the five-year period from 2010 through 2014, neurology saw the greatest increase in the number of services provided under the AHP (47.0 times), followed by internal medicine (23.4 times), ENT (22.2 times), psychiatry (13.8 times), and orthopedics (9.6 times). In terms of cost, neurosurgery saw the greatest increase (82.2 times), followed by neurology (28.6 times), ENT (20.0 times), orthopedics (18.7 percent), psychiatry (14.2 times), internal medicine (12.8 percent), obstetrics and gynecology (5.5 times), and urology (1.2 times) (Figure 4-6).

[Figure 4-6] Changes in Services Provided Under the AHP by Specialty (2010 to 2014)
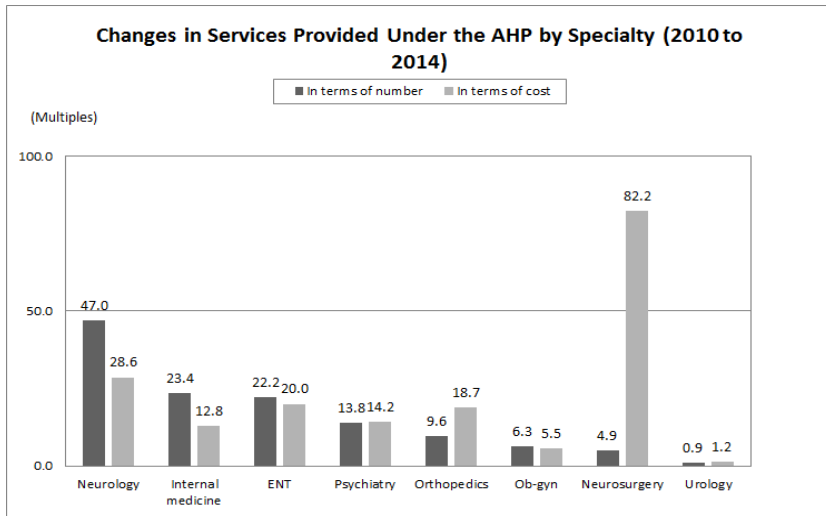
3. AHP Trends

We have so far examined the changes in the volume of AHP services provided at the medical institutions participating in the program both before and after the ROGs were introduced in 2009. If, however, the changes in the number of participating institutions and volume of services provided under the AHP were not exclusively attributable to the ROGs, analysis of these changes, in their absolute terms, would not tell us much about whether the ROGs have had the intended effect. This is why it is necessary to analyze the annual time-series data, spanning

10 years, on the number of participating institutions and volume of services provided. Therefore, the focus of this section is whether the two measures have increased since the ROGs were introduced, and, if so, whether such increases carry statistical significance. In other words, we employ the interrupted time-series analysis method to find any structural breaks in the trend lines for the two measures after the introduction of the ROGs.

1) Trend in the Number of Participating Institutions

Table 5-10 lists the results of our interrupted time-series analysis on the number of medical institutions participating in the AHP as well as the number of medical institutions with records of providing AHP services. The model for each dependent variable is provided with two estimates. The smaller the SBC, the more fitting the model. Hence, we use the models with the smaller SBC values to explain the estimates of the dependent variables.

First, note that in all three models concerning attending hospitals, participating private clinics, and attending hospitals with records of providing AHP services, the time variable (T) bears statistically significant positive values. In other words, the number of medical institutions participating in the AHP and providing services under the program has been growing over the last 10 years. This suggests that the healthcare community

has maintained its interest in the AHP, which was first in-
troduced in 2003. The effect of the ROGs, which is the main
subject of this study, varies somewhat from model to model.
While the effect was nearly non-existent in the model for par-
ticipating medical institutions, it was found to be statistically
significant in the model for attending hospitals with records of
providing AHP services.

The model with the number of participating hospitals as the
dependent variable features the section (OH) representing the
change in the variable in the year immediately following the in-
troduction of the ROGs, the signs of the inclines (AOH and
AOH^2) indicating continued changes in the variable since 2009,
and absolute values and their statistical significance. The co-
efficients of OH, AOH, and AOH^2 are all negative (β_2=-.423,
p<0.01; β_3=-.081, p<0.10; β_4=-.012, p<0.10), suggesting that the
introduction of the ROGs failed to increase the number of par-
ticipating hospitals. This may be because the program and the
ROGs have not been advertised well or because medical practi-
tioners were not sufficiently convinced of the need of the AHP,
or both. While the number of participating private clinics
shows a trend similar to that of participating hospitals, the in-
troduction of the ROGs has caused the number of participating
private clinics to increase since 2009, although more sig-
nificantly in the immediate aftermath than over the following
years (β_3=.036, p<0.10; β_4=-.011, p<0.01).

While the introduction of the ROGs has not increased the number of participating hospitals, it has increased the number of participating hospitals providing services under the AHP (β_2=.562, p⟨0.05). However, the number of participating hospitals with records of providing services under the AHP has been on the decline since the ROGs were introduced in 2009, albeit at a slowing pace as the years go by (β_3=-.603, p⟨0.01; β_4=.081, p⟨0.05).

⟨Table 4-6⟩ Estimates of the Numbers of Participating Hospitals, Private Clinics, and Participating Hospitals with Records of Service Provision

Variable	ln (participating hospitals)		ln (participating private clinics)		ln (participating hospitals with records of service provision)	
	Model 1 (1,1,0)	Model 2 (2,1,0)	Model 1 (1,1,0)	Model 2 (2,1,0)	Model 1 (1,0,0)	Model 2 (2,0,0)
Constant	-.444*** (.085)	-.368* (.142)	-.137** (.036)	-.158* (.063)	2.689*** (.176)	2.459*** (.162)
AR1	-.781* (.395)	-.243 (.714)	-.920*** (.159)	.448 (.543)	-.556 (.630)	-.868** (.235)
Difference	1	1	1	1	-	-
Time (T)	.159*** (.028)	.137* (.047)	.042** (.011)	.048* (.019)	.077 (.066)	.161** (.060)
OH	-.423*** (.074)	-.396** (.128)	-.198*** (.029)	-.205** (.049)	.828** (.249)	.562** (.199)
AOH	-.081* (.034)	-.048 (.069)	.036* (.014)	.031 (.031)	-.612*** (.144)	-.603*** (.121)
AOH^2	-.012* (.006)	-.015 (.011)	-.011*** (.002)	-.011* (.005)	.101** (.030)	.081** (.022)
Adj-R^2	.895	.847	.881	.812	.918	.940
BIC	-4.648	-4.278	-5.649	-5.186	-2.119	-2.440

Notes: 1) The figures in parentheses indicate standard error (SE).
2) The asterisks, ***, **, and *, indicate statistical significance of one percent, five percent, and 10 percent, respectively.

2) Trend in the Use of AHP Services at Participating Hospitals

Let us now discuss the results of our time-series analysis on the service records of participating hospitals, with a focus on statistics accompanying smaller SBC (indicating greater fitness of the models). Here, the introduction of the ROGs in 2009 appears to have exerted a positive effect on increasing the number of services provided as well as the duration (counted in days) of the services provided (Table 5-11). This is evident in the section OH indicating the changes in these variables in the year immediately following the introduction of the ROGs as well as in the signs of the inclines of the lines AOH and AOH^2 indicating continued changes after 2009, as well as their absolute values and statistical significance. In the model for the number of AHP services provided as the dependent variable, the coefficients of OH (immediate effect of the ROGs) did not show any statistical significance, but were positive (β_2=.043, p>0.10). The coefficients of the lines AOH and AOH^2 (trend over time) were negative and positive, respectively (β_3=-.093, p>0.10; β_4=.065, p<0.05), suggesting that the number of services provided decreased briefly after the ROGs were introduced, but the pace of the decrease slowed significantly over the years.

Similar effects are observed with respect to the duration of AHP services provided as well. Interestingly, the coefficient of

OH emerged here with statistical significance and as positive (β_2=.601, p<0.01). The coefficients of the lines AOH and AOH2, on the other hand, were negative and positive, respectively (β_3=-.377, p<0.01; β_4=.149, p<0.01), suggesting that the duration of services briefly dropped in the immediate aftermath of the ROGs' introduction, but the pace of decrease slowed significantly over the years.

The ROGs were also found to have been exerting continued effects, albeit with little statistical significance, on the cost of AHP services provided. The coefficients of the lines AOH and AOH^2 were both positive (β_3=.183, p>0.10; β_4=.033, p>0.10), suggesting that the cost of AHP services has been on rise since the ROGs were introduced. The relatively small statistical significance may be due to the fact that few time series were subjected to the analysis.

⟨Table 4-7⟩ Number, Duration, and Cost of AHP Services Provided

Variable	AHP Service Provision					
	Number		Duration		Cost	
	Model 1 (1,0,0)	Model 2 (2,0,0)	Model 1 (1,0,0)	Model 2 (2,0,0)	Model 1 (1,0,0)	Model 2 (2,0,0)
Constant	7.105*** (.159)	7.147*** (.182)	8.662*** (.407)	9.031*** (.109)	6.953*** (.304)	6.908*** (.278)
AR1	-.423 (.495)	-.641 (.555)	-.415 (1.178)	-.984*** (.052)	-.397 (.500)	-.795* (.432)
Time (T)	.043 (.060)	.030 (.070)	.003 (.160)	-.149** (.040)	-.027 (.115)	-.005 (.104)
OH	.059 (.226)	.043 (.250)	-.093 (.731)	.601*** (.130)	.026 (.430)	-.145 (.353)
AOH	-.178 (.117)	-.093 (.133)	-.180 (.420)	-.377*** (.080)	.024 (.224)	.183 (.208)
AOH^2	.082*** (.022)	.065** (.024)	.077 (.100)	.149*** (.015)	.075* (.041)	.033 (.039)
Adj-R^2	.966	.973	.751	.944	.922	.957
BIC	-2.485	-2.728	-0.744	-2.230	-1.191	-1.776

Notes: 1) The figures in parentheses indicate standard error (SE).
   2) The asterisks, ***, **, and *, indicate statistical significance of one percent, five percent, and 10 percent, respectively.

3) AHP Service Provision by Institution Type

The ROGs have apparently exerted different effects on different types of medical institutions. For example, they failed to significantly alter the number and duration of AHP services provided at HLGHs. The cost of AHP services provided at HLGHs, however, decreased immediately following the introduction of the ROGs (β_2=-.473, p⟨0.05), while the coefficients of the lines AOH and AOH^2 were positive and negative, respectively (β_3=.451, p⟨0.01; β_4=-.103, p⟨0.01). This suggests that, while the ROGs failed to exert any effect on the cost of AHP services at HLGHs immediately after their introduction,

they did succeed in increasing the revenue generated by HLGHs through the provision of AHP services over the years.

〈Table 4-8〉 Number, Duration, and Cost of AHP Services Provided at HLGHs

Variable	HLGHs					
	Number		Duration		Cost	
	Model 1 (1,1,0)	Model 2 (2,1,0)	Model 1 (1,1,0)	Model 2 (2,1,0)	Model 1 (1,0,0)	Model 2 (2,0,0)
Constant	-1.694 (.891)	-1.406 (1.511)	.707 (.759)	.531 (1.030)	11.707*** (.132)	11.679*** (.191)
AR1	-.861* (.307)	.123 (.875)	-.544 (1.049)	-.793 (2.398)	-.850* (.364)	-.877** (.323)
Difference	1	1	1	1	-	-
Time (T)	.509 (.286)	.456 (.490)	-.242 (.246)	-.166 (.348)	.059 (.049)	.051 (.071)
OH	-.752 (.730)	-.877 (1.408)	.358 (.664)	.071 (1.278)	-.473** (.178)	-.182 (.236)
AOH	-.205 (.358)	-.182 (.782)	.531 (373)	.459 (.719)	.451*** (.099)	.158 (.140)
AOH^2	-.086 (.059)	-.066 (.124)	-.071 (.074)	-.060 (.159)	-.103*** (.020)	-.037 (.026)
Adj-R^2	.604	.300	.435	.651	.761	.758
BIC	0.213	0.783	-0.592	-1.072	-2.309	-2.297

Notes: 1) The figures in parentheses indicate standard error (SE).
2) The asterisks, ***, **, and *, indicate statistical significance of one percent, five percent, and 10 percent, respectively.

In the meantime, while the ROGs have not significantly altered the number of AHP services provided at GHs, they have had some effects on the duration and cost of AHP services provided at these hospitals. The number of AHP services provided by GHs dropped immediately after the ROGs were introduced (β_2=-.622, p〈0.05), while the coefficients of the lines AOH and AOH^2 were negative and positive (β_3=-0.256, p〈0.10; β_4=0.033, p〉0.10), respectively. The duration of AHP services, on the oth-

er hand, showed positive coefficients for the lines AOH and AOH^2, albeit without statistical significance, suggesting that the duration of AHP services provided at these hospitals has been increasing over time. The cost of AHP services, too, showed little change immediately following the introduction of the ROGs, but the coefficient for the line AOH was positive (β_3=0.323, p<0.10), suggesting that it, too, has been increasing over the years.

⟨Table 4-9⟩ Number, Duration, and Cost of AHP Services Provided at GHs

Variable	GHs					
	Number		Duration		Cost	
	Model 1 (1,0,0)	Model 2 (2,0,0)	Model 1 (1,0,0)	Model 2 (2,0,0)	Model 1 (1,0,0)	Model 2 (2,0,0)
Constant	6.532*** (.153)	6.866*** (.225)	8.378*** (294)	8.529*** (.366)	13.648*** (.305)	13.722*** (.245)
AR1	-.564 (.481)	-.711* (.342)	-.409 (.520)	-.471 (.516)	-.239 (.648)	-.695* (.359)
Time (T)	.159** (.059)	.027 (.086)	.017 (.112)	-.034 (.142)	-.044 (.119)	-.068 (.093)
OH	-.622** (.231)	-.132 (.311)	-.449 (.433)	-.344 (.522)	-.143 (.478)	-.092 (.321)
AOH	-.256* (.113)	-.264 (.167)	.019 (.220)	.093 (.269)	.285 (.231)	.323* (.182)
AOH^2	.033 (.023)	.056* (.032)	.019 (.043)	.013 (.048)	-.017 (.046)	-.022 (.033)
Adj-R^2	.799	.674	.628	.630	.692	.840
BIC	-2.510	-2.029	-1.288	-1.293	-1.388	-2.042

Notes: 1) The figures in parentheses indicate standard error (SE).
　　　 2) The asterisks, ***, **, and *, indicate statistical significance of one percent, five percent, and 10 percent, respectively.

The ROGs have had the most dramatic effect on the AHP services at hospitals since 2009. First, the coefficient of OH with respect to the number of services provided by hospitals was positive and statistically significant (β_2=.2.350, p<0.01). The

coefficients of the lines AOH and AOH^2 were also positive (β $_3$=.271, p>0.10; β_4=.135, p<0.01), suggesting that the number of AHP services provided at hospitals has been growing sig-nificantly since the ROGs were introduced. The same pattern is observed with respect to the duration of the AHP services provided at hospitals, with the OH coefficient being positive (β_2=.1.519, p<0.05), while the coefficients of the lines AOH and AOH^2 were negative and positive, respectively (β_3=-.360, p>0.10; β_4=.259, p<0.01). The ROGs, however, do not seem to have exerted a noticeable effect on the cost of AHP services provided at hospitals. Although the cost of services provided at these hos-pitals increased significantly according to the raw data, the ex-treme year-to-year fluctuations and relatively short span of the time series may be behind the failure to prove, statistically, that the ROGs have had a significant effect on the cost of AHP serv-ices at hospitals.

〈Table 4-10〉 Number, Duration, and Cost of AHP Services Provided at Hospitals

Variable	Hospital					
	Number		Duration		Cost	
	Model 1 (1,0,0)	Model 2 (2,0,0)	Model 1 (1,0,0)	Model 2 (2,0,0)	Model 1 (1,0,0)	Model 2 (2,0,0)
Constant	6.534*** (.222)	5.326*** (.115)	6.966*** (.433)	5.128*** (.222)	10.836*** (.711)	9.019*** (.575)
AR1	-.862*** (.224)	-.993*** (.015)	-.835** (.269)	-.990*** (.022)	-.760** (.323)	-.948*** (.095)
Time (T)	-.494*** (.082)	-.022 (.042)	-.224 (.160)	.493*** (.081)	.099 (.264)	.774** (.212)
OH	2.350*** (.296)	.529*** (.136)	1.519** (.578)	-1.316*** (.264)	.057 (.956)	-2.292** (.691)
AOH	.271 (.160)	.532*** (.083)	-.360 (.314)	.168 (.162)	-.254 (.517)	-.009 (.420)
AOH^2	.135*** (.031)	-.009 (.016)	.259*** (.061)	.006 (.030)	.210* (.099)	.018 (.078)
Adj-R^2	.972	.962	.940	.921	.884	.911
BIC	-1.017	-0.710	0.163	0.172	1.109	0.847

Notes: 1) The figures in parentheses indicate standard error (SE).
2) The asterisks, ***, **, and *, indicate statistical significance of one percent, five percent, and 10 percent, respectively.

V

Conclusion

V

The Korean government introduced the Attending Hospital Program (AHP) in 2003 with a number of goals, including making better use of doctors' specialties (under today's specialist-centered decision-making structure in the Korean healthcare system) and helping small- to medium-sized hospitals make better use of idle medical resources and doctors. However, the AHP has yet to achieve its stated objectives. Although the Korean government revised the operating guidelines for attending hospitals in 2009 in an effort to support the success of the program, no evaluative studies have been conducted to find out how effective the program has been so far. The purpose of this study is thus to analyze and evaluate the effects that the revised operating guidelines for attending hospitals have had since 2009, with a view to assessing the prospects of the AHP and finding implications for its future improvement.

The findings of this study are as follows. First, although the number of medical institutions participating in the AHP decreased by 17.7. percent, from 520 in 2006 to 428 in 2015, the number of attending hospitals where AHP services were actually provided grew by 150 percent, from 14 to 35, over the same period of time. More specifically, the introduction of the ROGs increased the number of attending hospitals participat-

ing in the program by 17.6 percent, from 51 to 60, and also increased the number of attending hospitals with records of AHP service provision by 55 percent, from 20 in 2008 to 31 in 2010.

Second, the ROGs also affected the provision of AHP services, increasing the overall number, duration, and cost of services provided under the AHP by 6.1 times, 7.6 times, and 6.5 times, respectively, from 2005 to 2014. In particular, the number, duration, and cost of services provided under the AHP grew by 35 percent, 42 percent, and 69 percent, respectively, at around the time the ROGs were introduced.

Third, of the various types of medical institutions, hospitals were where the ROGs' effects have been most noticeable. While the ROGs increased the number of services provided under the AHP at HLGHs by 12 percent, the duration and cost of such services decreased by 16.0 percent and 2.0 percent, respectively, in the meantime. After the ROGs were introduced, the number of services provided at GHs fell by 24.0 percent, while the duration and cost of services grew by 11.0 percent and 67.0 percent, respectively. By contrast, hospitals saw significant increases in the number, duration, and cost of AHP services provided, recording 621 percent, 307 percent, and 197 percent, respectively.

Over the last 10 years, and particularly around the time when the ROGs were introduced, the AHP appears to have made little progress, especially in terms of the number of participating

medical institutions. Upon examining the provision of services by participating hospitals, however, we can see that the AHP and ROGs in particular have generated significant changes, with both the number and duration of services provided under the AHP increasing greatly. Service provision improved especially in 2013 and 2014, most notably at hospitals participating in the AHP. Interrupted time-series analysis confirms these effects, supporting the conclusion that the ROGs have significantly increased the number and duration of services provided by participating hospitals in particular.

To promote the success of the AHP, it is important to actively advertise the program to medical institutions in general to encourage more of them to participate in it. Furthermore, the medical pricing system for AHP services and the laws and rules governing the settlement of medical disputes should be brought up to date to facilitate participating medical institutions' provision of AHP services.

The absence of a well-established medical service delivery system in Korea has led private clinics and hospitals to compete against one another for outpatients and hospitalized patients with the same diseases and symptoms. As private clinics, too, need to be equipped with cutting-edge equipment and facilities in order to survive this growing competition, they have been forced to over-invest in medical equipment, which, in turn, has had the effect of raising the average medical costs for

the public. The establishment of a coherent health care delivery system is the first step toward solving these problems. The most realistic and effective route toward achieving this goal is to ensure the success of the AHP that has already been introduced and implemented.

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