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RESEARCH ON THE DEVELOPMENT OF REIMBURSEMENT ACCORDING TO EMR CERTIFICATION OF MEDICAL INSTITUTIONS

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ABSTRACT

EMR(Electronic Medical Record) is an information system at the “medical institution level” that digitizes existing medical records such as patient diagnosis, prescription, and examination and is attracting attention as a core infrastructure in terms of data utilization, administrative efficiency, and medical quality improvement. Nevertheless, in Korea, EMR development and maintenance costs are not classified as a health insurance fee schedule and are not directly compensated by fees. In this case, the medical institution is reluctant to invest in introducing the EMR system and may maintain the minimum cost or give up the investment in some cases. Hence, this study aimed to develop an appropriate compensation fee with the goal of providing financial incentives for medical institutions to use certified EMR to produce necessary information to promote public health and improve the value of health care.

In June 2020, 9 EMR suppliers were surveyed for development and certification costs, and 38 medical institutions were surveyed for EMR system maintenance costs and EMR certification management fee were developed. In the case of direct support for the EMR system with the establishment of a fee, the introduction of certified EMR will enable the exchange of medical information by creating standardized medical data. Furthermore, the quality and efficiency(cost) are expected to support the achievement of accessibility goals and value creation of information.

Keywords: EMR(Electronic Medical Record), Certification System, Compensation, Cost, Health Insurance Fee

1. INTRODUCTION

EMR (Electronic Medical Record) is a 'medical institution unit' information system that digitizes existing medical records such as patient diagnosis, prescription, and examination, and is attracting attention as a primary infrastructure in terms of data utilization, administrative efficiency, and improvement of medical quality[1]. Due to the efficiency, convenience, and potential of the digitized EMR, paper medical records have been converted to electronic form at home and abroad. According to the 2020 Health and Medical informatization survey[2], many medical institutions in Korea have introduced the EMR system, which is used in practice. They are using EMR (64.8-85.7%), even in cases where EMR and handwritten records are being used simultaneously. If included, it was found that most medical institutions use EMR at 96.5 to 100%. According to the survey results, 100% of tertiary general hospitals, 97.5% of general hospitals with less than 300 beds, and 90.5% of hospitals are using EMR [10-11]. As the use of medical records using EMR became common in medical institutions, the inefficiency problem caused by not using standardized EMR was raised, and the need to use standardized medical information increased. In response to this, Korea has been providing institutional support to facilitate electronic exchange of medical information not only in healthcare settings but also in the process of implementing related health policies, aiming to address the challenge of low rates of medical information exchange among healthcare institutions relative to the high adoption rate of Electronic Medical Records (EMR) and to contribute to patient safety and quality improvement in healthcare. Moreover, the EMR system certification system was implemented in June 2020 to induce the development of standard products through national certification of the EMR system, improve medical quality, enhance patient safety, and ensure continuity of care[16]. Therefore, this study aims to provide financial incentives for medical institutions to use certified EMRs to produce information necessary for promoting public health and improving the value of health care. are developing

2. MATERIALS AND METHODS

2.1. Review of EMR System Support System

Major foreign countries are making use of certified EMR systems to convert to a healthcare system in which patients can independently utilize their health information based on standardized information collection. Accordingly, a program that provides incentives or disincentives based on related performance is being operated for medical providers who produce and provide data using the certified EMR system. As of 2017, 13 countries (Australia, Austria, Canada, Chile, Estonia, Finland, Israel, Norway, Singapore, Spain, England, Scotland, and the United States) among major member countries, including the OECD, have developed EHR (Electronic Health Record) certification incentive system[1]. In 2004, the United States made a large-scale financial investment in health information technology, including incentives to promote the use of EMR. It established the Office of the National Coordinator for Health(ONC) under the Ministry of Health to improve the usability of patient-centered health information. Information Technology) was newly established and is being operated. In 2009, the Obama administration tried to promote the introduction and utilization of EHR through the HITECH Act[3]. The HITECH Act gave CMS (Center for Medicare & Medicaid Service) financial incentives to medical personnel and medical institutions to introduce EHR technology to improve the quality of care and prepare certification standards for exchanging and utilizing EMR[4]. The UK legally obliges medical institutions to submit medical information rather than using financial incentives like the US, but provides separate support for the cost of introducing EMR. In the case of Scotland, the cost of introducing a standardized EMR system called GPASS (General Practice Administration System for Scotland), developed and supplied by a private company, was supported by regional general practitioners (GP: General Practice)[5]. In addition, the central government provides financial support by reducing procurement costs through EMR software contracts and purchasing and distributing software through fund creation[6].

In Korea, in order to activate electronic medical information exchange through the EMR system certification system, administrative costs are compensated when medical information is submitted to a national institution or used for exchange between medical institutions. For instance, the Health Insurance Review and Assessment Service supports the submission of data such as medical records necessary for the review and evaluation of claims by medical institutions in the form of fee-based compensation, and KHIS is a part of the national-level informatization project, which is subject to participation in the EMR standardization and medical information exchange project. Institutions have been compensated in the form of government subsidies (incentives). Nevertheless, for the expanded application of the EMR system certification system, it is necessary to motivate participation through support for expenses incurred by medical institutions to meet the functionality, interoperability, and security requirements required by the certification system. Also, in the mid-to-long term, the certified EMR of medical institutions should be

used meaningfully as a policy, and compensation should be made according to the achievement of the goal. As a result of reviewing domestic and foreign cases, an appropriate level of compensation for EMR certification is recognized as a crucial policy tool to promote the spread of the certification system and to ensure consistency with utilization in the national health and medical policy, which is the ultimate goal of the system. Through the EMR certification system, standards-based medical data can be created as a strategy for establishing infrastructure for medical information, and appropriate compensation must be made for this to achieve the goals of quality, efficiency (cost), and accessibility of medical care in the national medical system using medical information and information can support value creation.

2.2. EMR Development and Certification Cost Investigation

2.2.1. Supplier EMR Development Cost

The EMR development and certification costs were investigated by 2022 by classifying the EMR system development cost[9] and certification cost for 9 EMR suppliers. Yet, in the case of clinics, the reality that medical institutions generally pay monthly fees to suppliers was considered. Therefore, the monthly usage fee was converted into one year, and the EMR development and certification cost was estimated by applying a 5-year service life according to the accounting treatment guidelines for intangible assets[7] and the Enforcement Rule of the Corporate Tax Act[8]. In the case of tertiary general hospitals, the cost was estimated by correcting the average number of beds in tertiary general hospitals to the average number of beds in tertiary general hospitals, considering that surveys were not conducted through suppliers, and most of them are developing EMR system products at the level of individual medical institutions.

Table 1: EMR Development Cost Analysis Result (Unit: Ten Thousand Won)

Type of Medical Institutions		Total Cost	EMR Development Cost		EMR Certification Cost	
			Cost	%	Cost	%
Clinic Level	Outpatient	822	639	77.7%	183	22.3%
	Outpatient+Inpatient	2,790	2,485	89.1%	305	10.9%
Hospital Level		11,900	9,890	83.1%	2,010	16.9%
General Hospital Level		47,050	36,707	78.0%	10,343	22.0%
Tertiary General Hospital Level		148,371	115,755	78.0%	32,615	22.0%

As a result of analyzing the EMR development and EMR certification costs, it was analyzed that the EMR development cost greatly increased depending on the type. In the case of clinics providing outpatient treatment services, the EMR-related cost estimated by considering the monthly average usage fee was 8.22 million won, and the additional certification cost due to EMR certification was 1.83 million won. On the other hand, in the case of clinics providing both outpatient and inpatient treatment, development and certification costs increased to 27.9 million as the number of users increased. In the case of a hospital level or higher, as the size of the hospital increases, the EMR development cost and certification costs also increase. In the case of the hospital level, it was around 119 million won, still it increased to 470.5 million won at the general hospital level, estimated to be 148,371 million won at the tertiary general hospital level.

2.2.2. Medical Institution EMR Maintenance Cost

For EMR maintenance costs, a cost survey was conducted by distributing a cost survey table to 585 medical institutions for one month in June 2022. According to a cost survey, by medical institutions that responded to the survey, 38 medical institutions included in the analysis were 10 tertiary general hospitals, 14 general hospitals, and 14 hospitals. As a result of the analysis, the annual EMR maintenance cost per institution showed a significant difference depending on the size of the medical institution. In the case of tertiary general hospitals, 509,474 million won, 797 million won in general hospitals, and 78.8 million won at the hospital level. In the case of tertiary general hospitals, it was analyzed that 50.9% of the total cost was labor costs for maintenance management. In the general hospital class, 31.2% of the total EMR maintenance cost was material cost, followed by labor cost with 27.1%. In the case of the hospital level, among the total costs investigated, equipment purchase cost was the largest at 46.3%, followed by labor cost at 24.4%.

Table 2: Annual EMR Maintenance Cost per Institution for Medical Institutions (Unit: Ten Thousand Won)

EMR Maintenance Cost Item	Type of Medical Institutions (%)	Total
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	Tertiary General Hospital	General Hospital	Hospital	
EMR Labor Costs for Maintenance, Repair and Management	259,526 (50.9%)	21,629 (27.1%)	1,924 (24.4%)	283,078 (47.4%)
EMR Related Equipment Purchase Cost (Applying Depreciation)	125,308 (24.6%)	14,521 (18.2%)	3,645 (46.3%)	143,474 (24.0%)
EMR Material Costs for Maintenance, Repair and Management	26,482 (5.2%)	24,847 (31.2%)	1,245 (15.8%)	52,574 (8.8%)
EMR Development Vendor Service Fees	94,446 (18.5%)	18,114 (22.7%)	206 (2.6%)	112,766 (18.9%)
Other Management and Operating Expenses	3,712 (0.7%)	590 (0.7%)	861 (10.9%)	5,162 (0.9%)
Total	509,474	79,701	7,880	597,055

The EMR investment and operation costs of the 2020 Health and Medical Informatization Survey[2] were compared and reviewed. As a result of the comparison, the EMR cost (development cost + maintenance cost) investigated in this study was lower than the EMR cost (investment cost + operating cost) of the KHIS EMR survey result. This difference in cost may have occurred due to the difference in the subject of investigation in the cost investigation. In other words, in the case of the EMR fact-finding survey, a cost survey was conducted targeting medical institutions, whereas in the case of this study, the EMR development cost is the cost surveyed targeting suppliers. On top of that, this study identified the cost structure as EMR development and maintenance costs by separating certification-related costs to link them with health insurance fees. Thus, there is a possibility that the difference occurred according to the category of items.

Table 3: Comparison of Cost Estimation Results related to EMR System (Unit : Ten Thousand Won)

Type of Medical Institutions		EMR Cost for This Study(A)			Cost of EMR Fact-Finding Results ¹⁾ (B)			Cost difference (A-B)
		Development cost	Maintenance cost	Total cost	Investment cost	Operating cost	Total cost	
Clinic Level	Outpatient	822	-	-	-	-	-	-
	Inpatient	2,790	-	-	-	-	-	-
Hospital Level		11,900	7,880	19,780	11,200	33,400	44,600	-24,820
General Hospital Level		47,050	79,701	126,751	76,200	54,700	130,900	-4,149
Tertiary General Hospital Level		148,371	509,474	657,845	411,400	288,400	699,800	-41,955

1) 2020 Health and Medical Informatization Survey (Korea Health Information Service, 2021)

3. RESULTS AND DISCUSSION

3.1. Development Model of Compensation Fee

As seen in the EMR system support system above, many medical institutions in Korea have established and operated hospital information systems, including the EMR system, since the 1980s in order to efficiently manage medical service-related tasks. Korea operates a Fee for Service system, which compensates for the cost of establishing a hospital information system, including the EMR system, by reflecting it as an indirect cost in the fee for each activity. Hence, if the EMR system construction and operation costs are compensated separately, there may be controversy over duplication of compensation. In addition, it is difficult to convince stakeholders of the logic that additional compensation is required to standardize the EMR system to increase interoperability in medical information exchange. Therefore, in this study, as shown in [Figure 1], we tried to develop the compensation fee by dividing the development and certification costs.

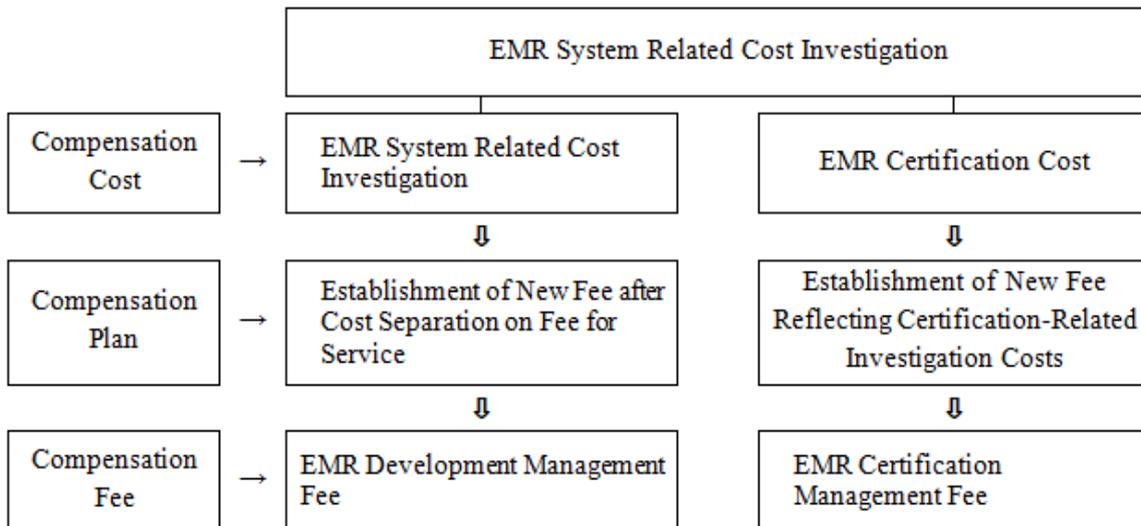


Figure 1: EMR System-related Cost & Fee Compensation Development Model

First, a model is proposed to establish a new fee for 'EMR development management fee (tentative name)' by deducting development cost. Then the operation of the EMR system developed and used by existing medical institutions from the existing fee (hospitalization fee and examination fee) to the amount of the researched cost. In this case, additional financial expenditure for health insurance does not occur even if a new fee is established by deducting the cost from the existing fee. Second, for the additional development and operating costs incurred by the EMR certification system, a new model was proposed to establish 'EMR certification management fees (tentative name)' equal to the costs investigated.

Hence, additional health insurance budget expenditures are accompanied if fees compensate for the cost of EMR certification. Through this, it is expected that motivation for the development and introduction of the EMR system can be generated when fee compensation is implemented only for medical institutions that introduce the certified EMR system.

3.2. EMR Development Management Compensation Fee

Compensation for EMR development costs requires a separate fee to be established for medical institutions to highly evaluate the utilization value of the EMR system as an informatization development project and promote related investments. Yet, as many medical institutions have already developed and operated EMR systems, they have developed an 'EMR development management fee' fee under fiscal neutrality. To this end, for the EMR development and operation costs investigated, the fee was separated from the current consultation fee and hospitalization fee by the amount of related expenses, and the 'EMR development management fee' was newly established and linked with fee compensation.

As a result of fee development, in the case of clinic level, 103 won per outpatient visit, 271 won per day of hospitalization, in the case of hospital level, 1,078 won per outpatient visit and 2,692 won per day of hospitalization, in the case of general hospital level, 1,249 won per outpatient visit, 5,538 won per day of hospitalization, tertiary general hospital level In the case of, 1,893 won per outpatient visit and 6,650 won per hospitalized day were calculated as the "EMR development management fee" fees.

Table 4: EMR Development Management Compensation Fee (Unit : Won)

Type of Medical Institutions	Health Insurance Fee(A)		EMR Development Cost Deduction Fee(B)		EMR Development Management Fee (A-B)	
	Consultation Fee per Visit	Admission Fee per Day	Consultation Fee per Visit	Admission Fee per Day	Outpatient per Visit	Inpatient per Day
Clinic Level	13,657	36,014	13,554	35,744	103	271
Hospital Level	16,643	41,541	15,565	38,850	1,078	2,692
General Hospital Level	25,318	112,218	24,069	106,680	1,249	5,538

Tertiary General Hospital Level	35,383	124,306	33,490	117,656	1,893	6,650
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3.3. EMR Certification Management Compensation Fee

In addition to the EMR development cost, the certification cost was investigated for the additional cost incurred by preparation, examination, and EMR certification system related to EMR certification. The EMR certification cost is an additional cost incurred to meet the EMR certification standards in addition to the EMR development and operation cost. Thus, additional expenditures of health insurance finances are accompanied by newly established compensation fees corresponding to the expenses investigated. Since the EMR certification management fee corresponding to the EMR certification cost is applied only to medical institutions that have received EMR certification, financial support is not available for medical institutions that are not EMR certified. As a result, it is expected that it will be possible to encourage medical institutions to participate in the EMR certification system because only medical institutions that have introduced the certified EMR system are eligible for support.

The certification EMR development cost was estimated by applying the cost scale surveyed to suppliers, and applying a useful life of 5 years in accordance with the Guidelines on Accounting for Intangible Assets [7] and the Enforcement Rule of the Corporate Tax Act [8]. Additionally, for the certified EMR operating cost, the result of the EMR system operating cost for medical institutions was applied, but the certified EMR operating cost was estimated by using the ratio of EMR certification cost out of the total cost in the supplier survey. The current EMR certification system development cost was analyzed to be about 151.2 billion won per year, with 12.7 billion won for clinics, 26.3 billion won for hospitals, 62.5 billion won for general hospitals, and 49.8 billion won for tertiary general hospitals. It was analyzed that the EMR certification cost (151.2 billion won) corresponds to about 26.1% of the EMR development cost (578.4 billion won).

Table 5: Estimation of Development and Operation Costs Related to EMR Certification (Unit : Ten Thousand Won)

Type of Medical Institutions		Accreditation EMR Cost per Institution per Year ¹⁾			Total Cost of Certification EMR for All Medical Institutions ⁴⁾
		Certification Development Cost ²⁾	Certification Operation Cost ³⁾	Total	
Clinic Level	Outpatient	37	-	37	1,128,422
	Inpatient	61	-	61	139,312
Hospital Level		402	1,331	1,733	2,625,900
General Hospital Level		2,069	17,520	19,589	6,248,766
Tertiary General Hospital Level		6,523	111,994	118,517	4,977,727
Total		9,091	130,846	139,937	15,120,127

- 1) Development and operation costs related to EMR certification
- 2) Utilize supplier survey results and apply 5 years of useful life
- 3) Calculate the certified EMR operation cost by separating it from the operating cost while utilizing the results of the survey for medical institutions
- 4) The total cost of the number of medical institutions is multiplied by the number of institutions by type of medical institution (2020) to calculate the annual cost of all institutions.

The criteria for calculating the fees related to EMR certification expenses amounting to 151.2 billion KRW were linked to basic medical items, including hospitalization fees (per day of hospitalization) and examination fees (per visit), based on the 2020 Health Insurance Statistical Yearbook. In order to distinguish the proportion of hospitalization fees and examination fees, the number of examinations and hospitalization days by type were divided, and fees were calculated accordingly.

The cost was calculated by dividing by the number of hospitalization days. The estimated “EMR certification management fee” was KRW 25.6 per outpatient visit and KRW 67.6 per day of hospitalization for the clinic level, KRW 219.2 (per outpatient visit) and KRW 547.1 (per day of hospitalization) for the hospital level, respectively, and KRW 352.0 per outpatient visit for the general hospital level, 1,560.3 won per day hospitalized, 533.4 won per outpatient visit, and 1,873.8 won per day hospitalized for tertiary general hospitals.

Table 6: Result of Development of Compensation related to EMR Certification linked to Examination Fee and Hospitalization Fee

Type of Medical Institutions	EMR Certification Cost(Ten Thousand Won) ¹⁾			EMR Certification Management Fee(Won) ²⁾ (tentative name)	
	Consultation Fee Linked	Inpatient Fee Linked	Total	Outpatient per Visit	Inpatient per Day
Clinic Level	1,224,463	43,271	1,267,734	25.6	67.6
Hospital Level	1,255,430	1,370,470	2,625,900	219.2	547.1
General Hospital Level	2,273,181	3,975,585	6,248,766	352.0	1,560.3
Tertiary General Hospital Level	2,092,919	2,884,809	4,977,727	533.4	1,873.8
Total	6,845,992	8,274,135	15,120,127	-	-

- 1) Separation of EMR certification-related expenses into the ratio of examination fee and hospitalization fee
- 2) Calculated by dividing the examination and hospitalization certification cost by the number of consultations and hospitalization days

4. CONCLUSION

In Korea, EMR development and maintenance costs are not classified as health insurance fees in the health insurance fee schedule still are all treated as indirect expenses. In the case of not being directly compensated in this way, medical institutions are reluctant to invest in the introduction of the EMR system, and may maintain only the minimum cost or give up the investment in some cases. Therefore, as shown in <Table 7>, this study investigates the EMR development cost and certification cost for EMR suppliers and the maintenance cost for the EMR system for medical institutions so that the fee can directly compensate the cost. “EMR development management fee” and “EMR certification management fee” were developed by reviewing the compensation scale and level.

Table 7: Result of Compensation Fee for EMR System Development and Certification Costs

Type of Medical Institutions		EMR Development Cost (Ten Thousand Won)		Accreditation EMR Cost (Ten Thousand Won)	EMR Development Management Fee(Won) (A-B)		EMR Certification Management Fee(Won)	
		Development Cost	Operation Cost		Outpatient per Visit	Inpatient per Day	Outpatient per Visit	Inpatient per Day
Clinic Level	Outpatient	128	-	37	103	271	25.6	67.6
	Inpatient	497	-	61				
Hospital Level		1,978	6,549	1,733	1,078	2,692	219.2	547.1
General Hospital Level		7,341	62,181	19,589	1,249	5,538	352.0	1,560.3
Tertiary General Hospital Level		23,151	397,480	118,517	1,893	6,650	533.4	1,873.8
Total		33,095	466,209	139,937	-	-	-	-

If the developed compensation fee is applied to the health insurance system, it will be possible to motivate the development and introduction of the certified EMR system. In the case of direct support for the EMR system due to the establishment of a fee, it is judged that medical institutions will be able to create standardized medical data through the introduction of certified EMR. It is expected to support the

achievement of goals and value creation of information. In reviewing such fee compensation, although establishing of highly reliable supporting data to be linked with fee compensation is of utmost importance, the following limitations exist in cost investigation.

Firstly, in estimating the EMR cost, despite trying to faithfully reflect the supplier's cost, the EMR development cost was a trade secret of the company, and the number of suppliers (nine) that cooperated with the investigation was small. Secondly, in the case of the clinic level, as a methodology for estimating the development cost, it was estimated based on the EMR monthly fee, and the maintenance cost was also not investigated, so the related cost was not reflected. The clinic level pays a monthly fee for the EMR development cost, and the maintenance of the EMR system was also reflected as much as possible. In the future, the review of the development cost and maintenance cost investigation for the clinic level should be closely discussed. Lastly, in estimating the EMR development cost, the useful life of the software according to the accounting treatment guidelines for intangible assets and the Enforcement Rules of the Corporate Tax Act was estimated by applying 5 years. Still, depending on how many years the actual EMR system has been used, a large difference in related development costs occurs. For that reason, further investigation on the years of use of the EMR system will be needed in the future.

In addition to the above review, regarding the reimbursement method under the fee-for-service payment system, it is worth noting that the reimbursement method is linked to the volume of medical services provided, thereby having the advantage of promoting behavioral changes through incentives. However, it also raises concerns about incentives being disproportionately concentrated in larger hospitals due to their higher patient volume. Therefore, there is a need to discuss alternative reimbursement methods for medical expenses when clinical information produced through certified EMR systems is linked to "Meaningful Use".

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