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Models of reimbursement to healthcare service providers and a practice based on diagnosis related groups

Sağlık hizmeti sunucularına geri ödeme modelleri ve teşhis ilişkili gruplara dayalı bir uygulama

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ABSTRACT

Objective: Reimbursement methods are important for the provision and continuity of health services. Reimbursement methods significantly affect elements such as quality and efficiency in the provision of health services. In addition, the size and diversity of the services provided by health institutions are also affected by reimbursement systems.Although there are many different reimbursement mechanisms for health service providers, case-based payment-DRG (Diagnosis Related Groups) is among the reimbursement methods used in terms of efficient use of resources and reimbursement according to costs. In this respect, reimbursement methods are explained in general terms in the study and the case-based-DRG method is discussed in detail.

Methods: In the study, case mix indexes (CMI) were calculated with the DRG data of 27 hospitals located in Ankara. The hospitals studied were evaluated according to their role groups and the severity levels and cost requirements of the cases were compared. In addition, the actual allocations sent according to the global budget in the studied hospitals were compared with the

ÖZET

Amaç: Sağlık hizmetlerinin sunulması ve devamlılığı açısından geri ödeme yöntemleri önem arz etmektedir. Geri ödeme yöntemleri sağlık hizmetinin sunumunda kalite ve verimlilik gibi unsurları önemli ölçüde etkilemektedir. Ayrıca sağlık kuruluşlarının sunduğu hizmetin büyüklüğü ve çeşitliliği de geri ödeme sistemlerinden etkilenmektedir. Sağlık hizmeti sunucularına yapılan geri ödeme mekanizmaları çok çeşitli olmakla beraber kaynakların verimli kullanılması ve maliyetlere göre geri ödeme yapılması açısından vaka başı ödeme-TİG (Teşhis İlişkili Gruplar) kullanılan geri ödeme yöntemleri arasında yer almaktadır. Bu itibarla çalışmada geri ödeme yöntemleri genel anlamda anlatılmış vaka başı-TİG yöntemi detaylı olarak ele alınmıştır.

Yöntem: Çalışmada Ankara ilinde yer alan 27 hastanenin TİG verileriyle vaka karma indeksleri (VKİ) hesaplanmıştır. Çalışılan hastaneler rol gruplarına göre değerlendirilerek vakaların ağırlık dereceleri ve maliyet gereksinimleri kıyaslanmıştır. Ayrıca çalışılan hastanelerde global bütçeye göre gönderilen fiili

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budget allocations formed according to the DRG-CMI and the differences between them were emphasized. The findings obtained as a result of the study indicate that reimbursement based on case-by-case basis is important for the financial sustainability of healthcare providers.

Results: BMI values of Group A hospitals were higher than Group B and C hospitals and A role group hospitals among the hospitals located in Ankara were affected negatively as role group by failure to perform planning according to DRG-CMI in 2023. C role group hospitals are the hospitals most positively affected. If planning were performed according to DRG-CMI the allowance distribution table of the hospitals would be formed very differently. Since the allowance planning performed according to DRG-CMI takes into consideration the complexity and costs of the cases, it shall lead to a more correct allowance distribution for A group hospitals compared to B and C group hospitals.

Conclusion: The Ministry of Health hospitals in the province of Ankara were analyzed by being divided according to the DRG data and role groups and CMI calculations were performed in this study. As expected, CMI values of A role group hospitals were found higher compared to the B and C group hospitals. In the case that reimbursement is made according to DRG-CMI, it is observed that A role group hospitals dealt with more severe and complex cases compared to the other role groups and needed higher allowance in terms of source requirement.

Key words: Reimbursement, case mix index, diagnosis related groups

ödenekleri TİG-VKİ'ye göre oluşan bütçe ödenekleri ile karşılaştırılmış ve arada oluşan farklar vurgulanmıştır. Çalışma sonucunda elde edilen bulgular vaka başı-TİG'e göre geri ödeme yapılmasının sağlık hizmeti sunucularının finansal sürdürülebilirlikleri açısından önem arz etmektedir.

Bulgular: A rol grubu hastanelerin B ve C grubu hastanelere göre VKİ değerleri daha yüksek çıkmıştır ve A rol grubu hastaneler TİG-VKİ'ye göre ödenek planlaması yapılmamasından negatif etkilenmiştir. C rol grubu hastaneler ise en fazla pozitif yönde etkilenen hastanelerdir. Eğer TİG-VKİ'ye göre bir planlama yapılmış olsaydı hastanelerin ödenek dağılım tablosu çok farklı şekilde oluşacaktı. TİG-VKİ'ye göre yapılan ödenek planlama vakaların kompleksliliği ve maliyetleri dikkat almasından dolayı A grubu hastanelerin B ve C grubu hastanelere göre daha doğru bir ödenek dağılımına neden olacaktır.

Sonuç: Ankara iline bağlı Sağlık Bakanlığı hastaneleri TİG verileri ile rol gruplarına göre ayrılarak analiz edilmiş ve VKİ hesaplamaları yapılmıştır. Beklenildiği gibi A rol grubu hastanelerin B ve C grubu hastanelere göre VKİ değerleri daha yüksek çıkmıştır. TİG-VKİ'ye göre geri ödeme yapılması durumunda A rol grubu hastanelerinin diğer rol gruplarına göre daha fazla ağır ve kompleks vakalara baktığı, kaynak gereksinimi açışından daha fazla ödenek ihtiyacı olduğu görülmektedir.

Anahtar Kelimeler: Geri ödeme, vaka karma indeksi, teşhis ilişkili gruplar

INTRODUCTION

Access to healthcare services is the leading fundamental rights for human beings. One of the main duties of states is providing its citizens with the access to healthcare services. It is becoming more expensive to provide healthcare services due the developed technology and increasing costs in the field of health. Therefore reimbursement after provision of healthcare service gets important (1).

Since sources are scarce, the concept of cost gets important for enabling individuals to live healthily using those scarce sources. The method of earning the incomes to be earned against the costs borne for sustaining the healthcare services and using the existing sources efficiently is important (2). The incomes that the healthcare service providers will earn for providing continuity of the service basically consist of the payments made by the state, insurance institutions or the individuals purchasing healthcare service directly. The methods of reimbursement are significant for provision of such incomes (3).

The fundamental purpose of development of models of reimbursement in healthcare services is enabling the diseased individuals to benefit from the healthcare service and protecting the patients against the financial risks that may arise (4). On the other hand, it is significant to create a reimbursement system according to costs for the service providers, a significant element of the health system to sustain their existence. In this context, the methods of reimbursement assume a duty of balance both for the service purchasers and for the service providers (5).

This paper explains the methods of reimbursement in general terms and discusses in detail the Diagnosis Related Groups (DRG) included in payment per case among the methods of reimbursement. The case mix indices (CMI) of hospitals located in the province of Ankara was calculated and the severity of hospitals' focus on complex cases and their resource requirements has been determined in this paper. Furthermore the global budget allowances which hospitals receive actually and the potential allowance distribution if they received allowance for DRG-CMI were calculated and both situations were compared.

METHODS OF REIMBURSEMENT

The payments for the service provided in health institutions are either paid personally by the individuals purchasing the service or paid by third party institutions (6). The financing of the services offered in Turkey are paid by third parties in general. Examining the distribution of financing of the health expenses, the share of governmental health expenses within the total health expenses realized as 76.4% in 2022. The rate of payment of health expenses out of pocket was 18.5% within the total health expenses (7).

The methods of reimbursement made to health institutions are divided into two as forward and backward payments on time basis. Forward payments are the payments made before the healthcare service is offered. These are daily payments, global budget payments, payment per capita-DRG (Diagnosis Related Groups) and budget payments. Backward payments on the other hand cover the payment made after the healthcare service is offered. The payments made per service could be held as an example for backward payments (8).

Fixed and variable payments are revealed in the methods of reimbursement depending on the quantity of the service offered. Fixed payments are payment of fixed amount regardless of the quantity of the service offered. Variable payments on the other hand cover the payments increasing/decreasing in line with the quantity of the service offered (8).

The methods of reimbursement could generally be listed as methods of payment per capita, payment per service, payment per day, global budget, budget with expense item, value based payment and payment per case (9).

Method of Payment per Capita

It is the method of payment made on the basis of the total number of individuals offered healthcare service. Payment is generally made in financial periods according to the number of individuals at the beginning of the period. The quantity and type of the service which individuals purchase from the service provider are not taken into consideration in this payment method. The method of payment per capita is more commonly used in the healthcare services where family practice is performed (8).

Method of Payment per Service

It covers the payments made for the service unit produced by the healthcare service providers. The transactions of reimbursement are performed over the amounts predetermined per service for the healthcare service offered. The health institutions send the invoices on service basis to the reimbursing institution in specific periods after the service offered and the payment is made to the health institutions after the necessary review is performed (10).

Method of Payment per Day

It consists of the systems of payment made for the healthcare services offered in the health institutions on the basis of duration. The payments made per day are generally used for intensive care at hospitals (1).

Different pricings are in question in the reimbursement made depending on the nature of the healthcare service provider, in the method of payment per day. There is difference between the unit prices per day to be received by an education and research hospital at the third grade and a small size hospital located in a county (11).

Global Budget Method of Payment

It is provision of a fixed budget to Health Institutions for the expenses they incurred. The reimbursement is realized in this payment method in specific periods by the reimbursing institution after reaching an agreement over a total amount independently from the quantity of the service given. A total expense top limit is defined in this payment method and it is targeted at controlling the health expenses for the healthcare service providers (12).

The global budget practice which started to be implemented in Turkey as of 2006 was enforced for the first time by concluding a lump sum price agreement among the Ministry of Health, the Ministry of Labor and Social Security and Ministry of Finance. The transaction of sending invoice to the Social Security Institution (SGK) by the hospitals within the scope of agreement ended in line with the global budget practice and the examinations are performed using the MEDULA system, the information network of SGK. Effort was paid to access the hospital invoice records electronically, decrease the paper costs, perform the transactions faster and prevent any potential abuses by preventing any potential mistakes, thanks to the MEDULA system. (5, 13).

Method of Budget with Expense Item

The method of budget payment with expense item is transferrin a fixed amount to the budget payment items for a specific period of time. Calculation is performed by taking the realizations of particularly the expenses of the previous year into consideration for each budget item in this method and considering the inflation and growth data of countries. Although it resembles the global budget payment system, the difference of this method from the global budget method is that the relevant payments are calculated at the level of budget items and payments are sent on the basis of those items (14).

Method of Value Based Payment

Another payment method which has started to become important today among the payment methods is the value based payment. It is expressed in the 2025-2027 medium term program published in the official gazette dated 05.09.2024 and numbered 32653 that value based reimbursement method will start to be used and an effective reimbursement shall be made by performing analyses regularly. The hospitals are assessed within the framework of infections, recovery process, patient safety, repetition of the disease as well as the concepts of effectiveness and cost in the value based payment. This payment method focuses on improvement of the quality of patient care. The value judgment in treatment of patients comes to the forefront at this point and it is quite difficult to measure this value (14).

Transformation into healthy individual and high quality life is assessed as output in the value based

payment system. On the other hand, when costs are calculated on patient bases rather than clinic basis, value increase shall be ensured since separate cost and output measurement shall be performed for each patient (Seyfioğlu, 2019).

Method of Payment per Case

The method of payment per case consists of the payments made by the health institutions for each case treated. This method deals with the amounts determined for each case or diseases and transactions of reimbursement are realized over those amounts. The similar treatments applied are divided into specific groups and payments are made according to similar case categories in the method of payment per case. In this manner, the categorized diseases have similar diagnoses and treatments, hospitalization periods and source consumptions within their own groups. Since the sources consumed by assessing the severity of the diseases within each group in the transactions of treatment shall be shaped according to these severity levels, reimbursements shall increase or decrease depending on these severity levels (2). Diagnosis related groups (DRG) are one of the most significant payment models used in the method of payment per case.

DIAGNOSIS RELATED GROUPS (DRG)

Diagnosis related groups (DRG) are a reimbursement model used in the method of payment per case. It is a classification method covering grouping of clinic and cost data in diagnoses and treatments and inclusion of similar diseases in specific groups. Furthermore DRG system is a system where the inpatients are subjected classification. It is a coding system where both the costs are controlled and clinic transactions are taken into consideration. The reimbursement method according to DRG-CMI adopts an approach of classifying the sources on the basis of severity of the cases and centering the concepts of cost and clinic (16). The purposes of reimbursement based on DRG-CMI include distributing fairly the scarce resources according to case severities and types, providing efficient and effective operation of the hospitals, collecting systematically the meaningful clinic data (17).

Doctors may tend to such diagnoses and treatments more expensive and more complex to perform among the case groups in DRG. None the less, they do not want to perform the cheaper transactions and may want to direct to other hospitals. Furthermore, method of payment case-DRG is very important for controlling costs. In certain cases, it may lead to too much service provision (18).

Cost control is kept at the forefront in DRG and DRG becomes important on which cases the hospitals shall head for. The DRG-CMI based payment system commonly used in the world was applied in Turkey in 2015 as 5% of the global budget and this rate was increased up to 10% in 2016. The transaction of sending payment on the basis of DRG was annulled in the Ministry of Health in August 2016 and merely used in statistical studies (14).

DRG Formation Process

Diseases are grouped according to the main diagnosis and disease transactions respectively in DRG. At the later stage, diseases are determined as relative value rather than treatment expenses. The DRG formation process is realized under 4 titles. These are the processes of pre-assessment, MDC (Major Diagnosis Classification), field assignment and detection of DRG respectively (17).

Pre-assessment covers the stages of general collection of data and detailed examination of the same. At this stage the information related to the disease obtained from the patient's file is examined in detail. Another issue to be assessed is assessment of demographic data covering information such as the patient's age, sex, period of hospitalization etc. Furthermore, the diagnoses containing clinic data, supplementary diagnoses and clinic transactions performed are realized in the pre-assessment stage (19).

MDC assignment consists of the processes where the processes of the data obtained after the pre-assessment are entered in the system. The reason for treatment of the patient is coded as the main diagnosis. MDC assignments conforming to the main diagnosis are performed as a consequence of coding the diseases supplementary to the main diagnosis and other factors. MDCs consist of 25 classes. MDC disease classes and abbreviations are given as example in the Table 1 (17).

Table 1. Example MDC Classification

MDC CLASSIFICATION	NUMBER OF DRG	MDC ABBREVIATION
MDC - 99 False DRGs	6	
MDC - 00 Preliminary - Major Diagnosis Classes	12	A
MDC - 01 Nervous System Diseases	53	B
MDC - 02 Eye Diseases	20	C
MDC - 03 ENT & Mouth Diseases	28	D
MDC - 04 Respiratory System Diseases	42	E
MDC - 05 Circulatory System Diseases	67	F
MDC - 06 Digestive System Diseases	52	G
MDC - 07 Hepatobiliary System Diseases	29	H
MDC- 08 Musculoskeletal and Collagen Tissue Diseases	79	I
MDC - 09 Skin and Breast Diseases	29	J
MDC - 10 Endocrinal and Metabolic Diseases	19	K
MDC - 11 Kidney and Urinary Tract Diseases	37	L
MDC - 12 Male Reproductive Organs Diseases	19	M
MDC -13 Female Reproductive Organs Diseases	20	N
MDC - 14 Pregnancy, Birth and Puerperium	17	O
MDC - 15 Newborn (and Other Neonates)	25	P
MDC- 16 Blood and Blood Producing Organs Diseases	10	Q
MDC - 17 Neoplastic Diseases	18	R
MDC - 18 Infectious and Parasitic Diseases	17	T
MDC - 19 Mental Health Disorders	13	U
MDC - 20 Alcohol/Drug Use/Organic Mental Health Disorders depending thereon	8	V
MDC - 21 Injury, Intoxication and Toxic Drug Effects	24	W,X
MDC - 22 Burnts	8	Y
MDC - 23 Factors Affecting Health and Other Type of Contacts Established through Healthcare Services	13	Z

Field assignment is performed according to the type of transaction performed for the patients in the stage of field assignment. These occur in three main classes and surgical field codes are included within the range of 01-39, other field codes are included within the range of 40-59 and medical field codes are included within the range of 60-99 (20).

DRG formation is realized in the final stage, the stages of disease diagnoses and treatments, field assignment and DRG formation grouped in the first three stages are formed automatically by the program (Figure 1) (21). DRG code structure consists of three sections. There is one letter in the first section. This indicates the MDC group. The field where it is located is determined in the second section. Here, it represents the field within the range of 01-99. A, B, C, D and Z letters are used in the third section. Those letters indicate that the source used vary from the higher to the lower. The letter Z represents the situations where the source is unique and distinction cannot be made (17).

The example on how the DRG code assignment occurs has been shown in Table 2.

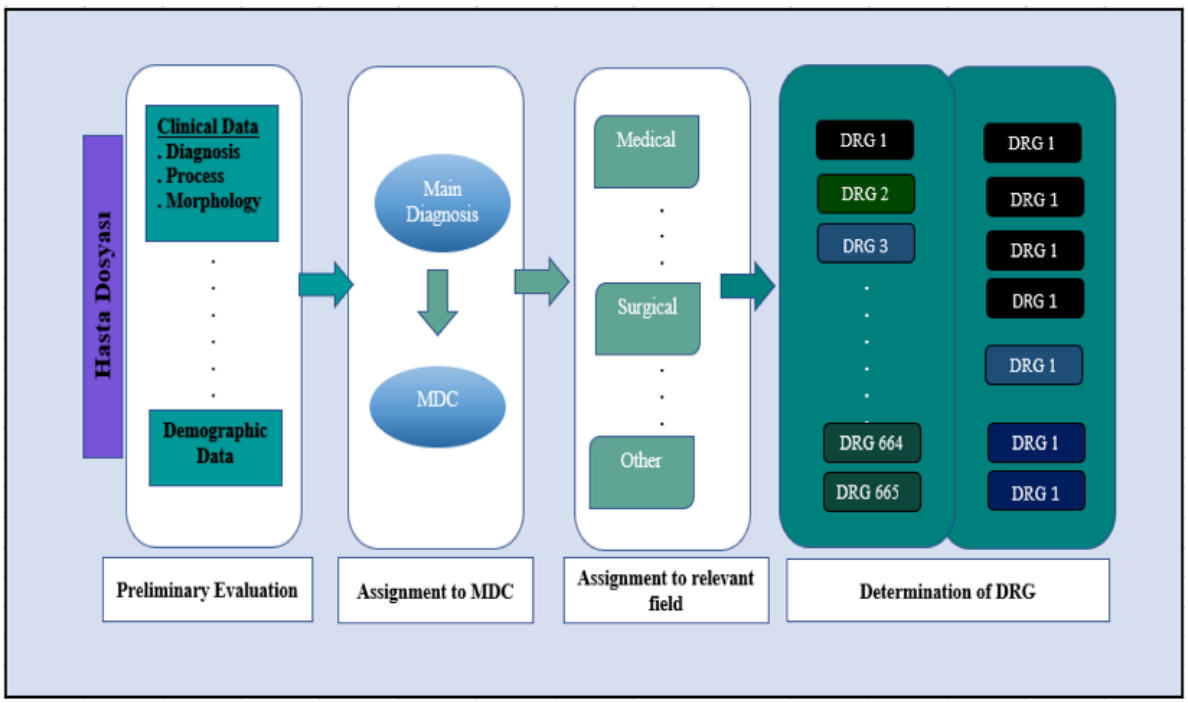

Figure 1. DRG Formation Process (14)

Table 2. Example DRG Code

DRG Code	MDC Abbreviation	Disease Diagnosis Code	Other Explanation
F60A	F Circulatory System Disorders	60 With Acute Myocardia Infarct, Without Invasive Cardiac Examination Transactions, Catastrophic	A With Severe KK
F60B	F Circulatory System Disorders	60 With Acute Myocardia Infarct, Without Invasive Cardiac Examination Transactions, Catastrophic	B Without Severe KK

DRG IN REIMBURSEMENT SYSTEMS

The stages of costing in the financing processes are started at hospitals after performance of the coding transactions according to DRG. Since classification is performed according to severity of the cases in the diagnoses and treatments performed at hospitals, costs are observed to have increased in line with the severity degree of the cases. DRG-CMI based payment system targets at making much payment for severe cases and making payment according to the degrees for cases not very severe. A fair payment system is realized in this manner (3).

DRG-CMI based payment system requires relative value and CMI (case mix index) for performing severity degree of the cases and source distribution. The relative value is a value indicating how much or few sources are used in the treatment of any disease compared to the sources used in the treatment of other diseases (Aral, 2014). In other words, the relative value is the severity of the cases compared to one another. It is found by dividing the average cost of a DRG into the average cost of all DRGs (23).

Calculation of the relative value is performed by dividing the average cost of a DRG into the average cost of all DRGs. Calculation of the relative value is realized with the following formula;

Relative Value=(Average Cost of a DRG)/(Average Cost of all DRGs)

CMI enables us to make comparison among hospitals. CMI is an index used for measuring how severe cases are the treatments performed at hospitals in medical terms (3).

Calculation of the CMI is realized with the following formula;

CCI=(ToTotal Relative Value)/(Total Number of Cases)

For example, assume that hospital A dealt with 100 cases and assuming that the total relative value of these cases compared to their severity in the DRG is 120; CMI is calculated as follows:

CMI= 120/100, CMI= 1,2

Finding the CMI calculated lower than one reveals the result that treatments simpler in terms of severity are performed at the hospital and finding CMI higher than one reveals the result that more complex cases are treated compared to the average (24).

There are two methods in the payment planning toward DRG-CMI. The first one of these is planning payment over the base price. The institution performing reimbursement determines a base price in this method. The payment is made by multiplying this base price with DRG relative value. The second is performing payment planning according to the budgeting method. In this method, the amount obtained as a consequence of multiplying the base price, total number of cases in the previous year and CMI values of the previous year constitutes the reimbursement size (14).

MATERIAL and METHOD

The research covers the 2023 DRG data of the hospitals in the province of Ankara affiliated with the Ministry of Health. The data of 30 hospitals were used but 3 hospitals were not included in the calculations due to merger with another hospital, in the paper. The remaining 27 hospitals were assessed according to the role group classes determined by the Ministry of Health. Research was performed in 5 hospitals in the AI role group, 3 in AI branch role group, 1 in AII role group, 1 in AII branch role group, 7 in B role group and 10 in C role group. Furthermore, the data used were obtained with reference to the permits of the Ministry of Health General Directorate of Public Hospitals dated 22.07.2024 and numbered E-96773357. The data obtained from the Ministry of Health were analyzed by means of Microsoft Excel program and CMIs were calculated. The purpose of CMIs calculated is calculating the source requirement degrees of the hospitals against the services they offer. Furthermore, the allowances which the hospitals covered in the research in 2023 from the global budget were compared to the situation if

allowance distribution is made according to DRG-CMI and the differences between were calculated. The restriction of the research is that it was performed only in the province of Ankara and does not cover the hospitals located in other provinces. The names of the hospitals covered in the research were coded since they did not want their names to be shared. The originality of the research is that the data of global budget actually realized were compared to the budget arising according to DRG/CMI.

The study was approved by the Ankara University, Presidency of Ethics Board (Date: 13.05.2024 and Number: 83).

RESULTS

The hospitals in the province of Ankara were firstly classified on role group basis. They were divided into totally 6 role groups being AI, AI Branch, AII, AII Branch, B and C role groups. The case mix indices were calculated using the DRG data of 2023. The CMIs found allowed to make an assessment of the hospitals in the province of Ankara in terms of both the role groups and the source requirements of province-wide hospitals. The province-wide average CMI value in Ankara realized as 1,39. The total and role group based DRG data of 27 hospitals located in the province-wide Ankara are given in the following Table 3.

AI role group hospitals consist of education and research hospitals and the advanced level operations are general performed in these hospitals. Examining Table-4, we observe that the average CMI of 6 hospitals of AI role group located in Ankara is 1,51. The AI group 3rd hospital is at the top of this group with CMI value of 1,72. As may be observed herein the AI group 3rd hospital is a hospital where top level treatments in terms of difficulty are performed. Depending on this, the source requirement becomes higher than other hospitals within the same role group. On the other hand, the AI group 4th hospital got the lowest value within the role group with its CMI of 1,08. It could be found out that this hospital actually serves as a second grade hospital.

Table 3. DRG Data according to Role Groups in Province-Wide Ankara

HOSPITALS ACCORDING TO ROLE GROUPS	NUMBER OF CASES	TOTAL RELATIVE VALUE	CMI
AI Role Group Hospitals	320.095,00	484.448,54	1,51
AI Branch Role Group Hospitals	56.026,00	80.239,35	1,43
AII Role Group Hospitals	13.459,00	14.852,15	1,10
AII Branch Role Group Hospitals	5.695,00	5.564,51	0,98
B Role Group Hospitals	58.773,00	58.964,04	1,00
C Role Group Hospitals	22.961,00	19.949,37	0,87
TOTAL	**477.009,00**	**664.017,96**	**1,39**

Table 4. AI Role Group Hospitals DRG Data

HOSPITALS ACCORDING TO ROLE GROUPS	NUMBER OF CASES	TOTAL RELATIVE VALUE	CMI
AI Group 1st Hospital	34.298,00	42.782,91	1,25
AI Group 2nd Hospital	101.014,00	142.303,38	1,41
AI Group 3rd Hospital	146.139,00	250.964,17	1,72
AI Group 4th Hospital	14.775,00	15.925,10	1,08
AI Group 5th Hospital	23.869,00	32.472,98	1,36
TOTAL	**320.095,00**	**484.448,54**	**1,51**

AI branch group role group hospitals are education and research hospital and they serve in a specific field in healthcare service. Examining the AI branch group hospitals, it could be observed that totally 3 hospitals in the province of Ankara belong to this role group (Table 5). The role group CMI average is 1,43. The highest CMI value is the AI branch group 2nd hospital with 2,45. This hospital is one which serves all over Turkey for advanced level and special group of patients and where treatments requiring advanced specialization on the case level are performed. The AI branch group 3rd hospital ranked as the second with CMI value of 1,55 is a hospital where treatments with high case severity level are performed. The high level of DRG values of these hospitals indicates that the source requirement is high.

On the other hand, the AI branch group 1st hospital received a value close to the role group average with CMI of 1,31. Since AI branch group hospitals generally perform treatments for a specific disease group, their patient groups are patients who need long term treatment and the treatment transactions performed require particular specialization. Furthermore the patients in this role group receive treatment for diseases which could be treated on outpatient basis and which require monitoring. For this reason it has received a value lower than the role group average.

There are two hospitals in AII and AII branch role groups (Table 6). Among those hospitals, the AII group 1st hospital has CMI of 1,10 and AII branch group 1st hospital has CMI of 0,98. Both hospitals have a CMI value lower than the general average of the province of Ankara. Furthermore AII branch group 1st hospital offers treatments for a special group in terms of service provided and performs transactions with daily added value not very high. For this reason the CMI of the hospital is found to be lower than the other AII group hospital.

Table 5. AI Branch Role Group Hospitals DRG Data

HOSPITALS ACCORDING TO ROLE GROUPS	NUMBER OF CASES	TOTAL RELATIVE VALUE	CMI
AI Branch Group 1st Hospital	34.190,00	44.693,43	1,31
AI Branch Group 2nd Hospital	1.845,00	4.519,89	2,45
AI Branch Group 3rd Hospital	19.991,00	31.026,03	1,55
TOTAL	**56.026,00**	**80.239,35**	**1,43**

Table 6. AII Role Group Hospitals DRG Data

HOSPITALS ACCORDING TO ROLE GROUPS	NUMBER OF CASES	TOTAL RELATIVE VALUE	CMI
AII Group 1st Hospital	13.459,00	14.852,15	1,10
TOTAL	**13.459,00**	**14.852,15**	**1,10**
AII Branch Group 1st Hospital	5.695,00	5.564,51	0,98
TOTAL	**5.695,00**	**5.564,51**	**0,98**

The hospitals in B role group are hospitals of smaller size compared to A role group and they lack education and research activities (Table 7). The average CMI of this role group was calculated as 1,00. It realized below CMI of 1,39 which is the average of Ankara. The hospital with the highest value of 1,43 within the group is the group B 7th hospital. And the hospital with the lowest CMI is the group B 2nd hospital. One may explain the high CMI value of the group B 7th hospital with being close to the center of the province and high county population. On the other hand the reason for low CMI of the group B 2nd hospital may be the fact that it serves in a small county and consequently has less branch doctors.

High CMIs could result from diversity of branch doctors, availability of advanced level medical devices, availability of advanced level intensive care services etc. in general terms. For this reason it could be expected that B role group hospitals have lower CMIs compared to the A role group hospitals. Furthermore CMIs of B role group hospitals could not be expected to be found high since they are hospitals located in big county centers and advanced level treatments cannot be performed in those hospitals.

The hospitals in C role group are county state hospitals which are smaller in size compared to the group B hospitals (Table 8). The average CMI of the role group realized as 0,87. The hospital with the highest value was group C 2nd hospital. It has CMI of 1,30 which is approximately fifty percent higher than the average of the role group. CMI may have resulted from preference of this hospital by the patients who cannot take appointment in the province since it is close to the center of the province. On the other hand, the hospital with the lowest CMI was group C 10th hospital with the value of 0,61. This hospital is the hospital of county with the lowest population density within the role group. Lowness of this value may have resulted from low population.

The allowances received by 27 hospitals located in Ankara from 2023 Ministry of Health global budget and the relative value as well as the allowances to be received in the case allowance is planned according to DRG/CMI are given in Table 9.

Table 7. B Role Group Hospitals DRG Data

HOSPITALS ACCORDING TO ROLE GROUPS	NUMBER OF CASES	TOTAL RELATIVE VALUE	CMI
Group B 1st Hospital	10.433,00	12.441,50	1,19
Group B 2nd Hospital	6.555,00	4.860,06	0,74
Group B 3rd Hospital	7.841,00	7.837,28	1,00
Group B 4th Hospital	6.411,00	6.807,35	1,06
Group B 5th Hospital	10.405,00	7.632,55	0,73
Group B 6th Hospital	12.565,00	12.847,95	1,02
Group B 7th Hospital	4.563,00	6.537,35	1,43
TOTAL	**58.773,00**	**58.964,04**	**1,00**

Table 8. C Role Group Hospitals DRG Data

HOSPITALS ACCORDING TO ROLE GROUPS	NUMBER OF CASES	TOTAL RELATIVE VALUE	CMI
Group C 1st Hospital	506,00	483,48	0,96
Group C 2nd Hospital	1.315,00	1.711,98	1,30
Group C 3rd Hospital	3.989,00	3.205,67	0,80
Group C 4th Hospital	2.105,00	1.792,37	0,85
Group C 5th Hospital	3.123,00	2.753,48	0,88
Group C 6th Hospital	730,00	712,16	0,98
Group C 7th Hospital	5.205,00	4.488,48	0,86
Group C 8th Hospital	2.362,00	2.105,26	0,89
Group C 9th Hospital	2.182,00	1.816,35	0,83
Group C 10th Hospital	1.444,00	880,14	0,61
TOTAL	**22.961,00**	**19.949,37**	**0,87**

Table 9. Allowance Distribution Table

HOSPITALS ACCORDING TO ROLE GROUPS	NUMBER OF CASES	TOTAL RELATIVE VALUE	CMI	TRANSFORMED CMI	GLOBAL BUDGET ALLOWANCE SENT FOR INPATIENT	ALLOWANCE TO BE SENT ACCORDING TO DRG	ALLOWANCE TO BE SENT ACCORDING TO DRG/CMI	DIFFERENCE ACCORDING TO DRG (TRY)	DIFFERENCE ACCORDING TO DRG (%)	DIFFERENCE ACCORDING TO DRG/CMI (TRY)	DIFFERENCE ACCORDING TO DRG/CMI (%)
AI-1	4.298	2.783	1,25	0,90	919.976.459	757.549.668	650.260.778	162.426.791	18%	269.715.681	36%
AI-2	101.014	142.303	1,41	1,01	2.140.574.789	2.519.741.603	2.442.668.747	-379.166.814	-18%	-302.093.958	-14%
AI-3	146.139	250.964	1,72	1,23	3.519.308.558	4.443.779.620	5.251.374.925	-924.471.063	-26%	-1.732.066.368	-49%
AI-4	14.775	15.925	1,08	0,77	278.994.735	281.983.021	209.147.443	-2.988.286	-1%	69.847.292	25%
AI-5	23.869	32.473	1,36	0,98	1.307.015.516	574.993.501	538.301.734	732.022.015	56%	768.713.781	59%
TOTAL	**320.095**	**484.449**	**1,51**	**1,09**	**8.165.870.056**	**8.578.047.413**	**9.091.753.628**	**-412.177.357**	**-5%**	**-925.883.572**	**-11%**
AI Br-1	34.190	44.693	1,31	0,94	859.337.611	791.378.918	711.875.398	67.958.693	8%	147.462.213	17%
AI Br-2	1.845	4.520	2,45	1,76	205.657.275	80.032.919	134.919.609	125.624.356	61%	70.737.666	34%
AI Br-3	19.991	31.026	1,55	1,11	779.453.025	549.372.605	586.723.672	230.080.420	30%	192.729.353	25%
TOTAL	**56.026**	**80.239**	**1,43**	**1,03**	**1.844.447.912**	**1.420.784.442**	**1.433.518.679**	**423.663.469**	**23%**	**410.929.233**	**22%**
AII-1	13.459	14.852	1,10	0,79	284.357.358	262.984.479	199.701.614	21.372.879	8%	84.655.745	30%
TOTAL	**13.459**	**14.852**	**1,10**	**0,79**	**284.357.358**	**262.984.479**	**199.701.614**	**21.372.879**	**8%**	**84.655.745**	**30%**
AII Br-1	5.695	5.565	0,98	0,70	99.663.797	98.529.827	66.248.468	1.133.970	1%	33.415.329	34%
TOTAL	**5.695**	**5.565**	**0,98**	**0,70**	**99.663.797**	**98.529.827**	**66.248.468**	**1.133.970**	**1%**	**33.415.329**	**34%**
B-1	10.433	12.442	1,19	0,86	124.149.754	220.299.512	180.780.671	-96.149.758	-77%	-56.630.917	-46%
B-2	6.555	4.860	0,74	0,53	77.366.854	86.056.251	43.906.243	-8.689.397	-11%	33.460.611	43%
B-3	7.841	7.837	1,00	0,72	159.725.728	138.773.376	95.449.792	20.952.352	13%	64.275.936	40%
B-4	6.411	6.807	1,06	0,76	107.850.867	120.536.582	88.073.671	-12.685.715	-12%	19.777.196	18%
B-5	10.405	7.633	0,73	0,53	74.890.382	135.148.257	68.220.193	-60.257.875	-80%	6.670.189	9%
B-6	12.565	12.848	1,02	0,73	210.754.426	227.496.452	160.074.036	-16.742.026	-8%	50.680.390	24%
B-7	4.563	6.537	1,43	1,03	173.113.913	115.755.738	114.121.828	57.358.175	33%	58.992.085	34%
TOTAL	**58.773**	**58.964**	**1,00**	**0,72**	**927.851.925**	**1.044.066.168**	**750.626.434**	**-116.214.243**	**-13%**	**177.225.490**	**19%**

Table 9 (cont.). Allowance Distribution Table

HOSPITALS ACCORDING TO ROLE GROUPS	NUMBER OF CASES	TOTAL RELATIVE VALUE	CMI	TRANSFORMED CMI	GLOBAL BUDGET ALLOWANCE SENT FOR INPATIENT	ALLOWANCE TO BE SENT ACCORDING TO DRG	ALLOWANCE TO BE SENT ACCORDING TO DRG/CMI	DIFFERENCE ACCORDING TO DRG (TRY)	DIFFERENCE ACCORDING TO DRG (%)	DIFFERENCE ACCORDING TO DRG/CMI (TRY)	DIFFERENCE ACCORDING TO DRG/CMI (%)
C-1	506	483	0,96	0,69	24.732.662	8.560.898	5.628.883	16.171.765	65%	19.103.779	77%
C-2	1.315	1.712	1,30	0,94	12.398.110	30.313.737	27.157.347	-17.915.627	-145%	-14.759.236	-119%
C-3	3.989	3.206	0,80	0,58	74.625.975	56.762.250	31.389.855	17.863.725	24%	43.236.121	58%
C-4	2.105	1.792	0,85	0,61	47.805.105	31.737.189	18.595.975	16.067.916	34%	29.209.130	61%
C-5	3.123	2.753	0,88	0,63	38.564.990	48.755.399	29.580.641	-10.190.409	-26%	8.984.349	23%
C-6	730	712	0,98	0,70	32.106.335	12.610.095	8.465.410	19.496.240	61%	23.640.925	74%
C-7	5.205	4.488	0,86	0,62	85.753.615	79.476.747	47.162.147	6.276.867	7%	38.591.468	45%
C-8	2.362	2.105	0,89	0,64	53.514.021	37.277.479	22.863.741	16.236.542	30%	30.650.280	57%
C-9	2.182	1.816	0,83	0,60	35.147.620	32.161.799	18.422.987	2.985.822	8%	16.724.633	48%
C-10	1.444	880	0,61	0,44	30.812.929	15.584.488	6.536.602	15.228.440	49%	24.276.327	79%
TOTAL	**22.961**	**19.949**	**0,87**	**0,62**	**435.461.363**	**353.240.081**	**215.803.587**	**82.221.281**	**19%**	**219.657.775**	**50%**
GRAND TOTAL	**477.009**	**664.018**	**1,39**	**1,00**	**11.757.652.410**	**11.757.652.410**	**11.757.652.410**	**-**	**0%**	**0**	**0%**

CMI 1,39 corresponding to total allowance of TRY 11,757,652,410 sent from the global budget, and the global budget allowance which the hospitals should receive according to the total relative values and CMIs were recalculated while calculating Table-7. The allowance to be received for the relative value was obtained by multiplying the unit base price obtained by dividing the total actual global budget allowance sent for the inpatient into the total relative value with the relative value of the hospital. The actual global budget allowance which the hospitals received was redistributed according to CMIs in the allowance distribution according to CMIs. Here, the CMIs were transformed and calculated according to the CMI average in the province. The calculations were transformed by dividing the CMI of the concerned hospital into provincial average CMI. The calculations were performed paying attention that the allowances to be distributed after CMIs and the total distributed global budget allowance are the same.

For example for A1 role group 1st hospital;

Base Price = (Global Budget Allowance) / (Total Relative Value) = (11.757.652.410) / 664.018

Allowance to be received according to the relative value=Base price*relative value of the hospital

In this context; it was calculated as follows:

Allowance to be received according to the relative value = 42782,91*17707 = TRY 757.549.668

The transformed CMI was found as follows: **CMI = 1,25 / 1,39 = 0,90** The transformed CMI was multiplied with the actual allowance and the allowance to be received according to DRG/CMI was calculated. However, the correction coefficient of 1,04393107278404 was applied for all hospitals with the assumption that the total distributed global budget is the same. In this manner the allowance to be received by all hospitals became the same as the total global budget allowance.

Allowance to be received according to DRG-CCI 919.976.459*0,90/1,043393107278404=650.260.778

was calculated as above.

The global budget allowance to be distributed was calculated for hospitals on the basis of the results both according to the relative value and according to the CMI.

Examining Table-9 27 hospitals included in the scope of the research were given allowance of TRY 11.757.652.410 from the global budget in 2023. The indebtedness condition of the hospitals is taken into consideration by the Ministry of Health while performing planning. Comparing the actually planned global allowance and the global allowances to be received according to the relative value according to the role groups; it is observed that AI and B role group hospitals were affected negatively at the amounts of TRY 412.177.357 and TRY 116.214.243 respectively. If planning were performed according to DRG; the A1 and B role group hospitals would have received higher global budget allowance. The hospitals in the other role groups were affected positively by failure to perform planning according to DRG. If CMIs were added to this distribution model as well, the A1 role group hospitals would be affected more positively and receive allowance of TRY 925.883.572 higher. On the other hand, the negative condition in the B role group would become positive and it would receive allowance of TRY 177.225.490 less.

It is observed that dealing with complex cases and naturally service provision costs in the services offered by the hospitals are disregarded while planning allowance from the global budget. Examining Table-9 carefully, it is observed that allowances of the A1 role group hospitals were shifted particularly to B and C role group hospitals. If a distribution were performed according to DRG-CMI the hospitals in the A role group would have received allowance higher approximately 11% of the total allowances. On the other hand, B and C role group hospitals received allowance approximately 19% and 50% higher respectively from the global budget allowances.

When assessment is performed specific to the role groups according to DRG-CMI;

It was calculated that the biggest difference in

the AI role group was in AI role group 3rd hospital with approximately TRY 1.732.066.368 million. There was a difference of approximately TRY 302.093.958 million in the AI role group 2nd hospital. The other hospitals were affected positively in allowance distribution according to global budget. It was observed that the number of cases of the hospitals affected positively were quite lower than that of the hospitals affected negatively. AI branch role group hospitals shall receive allowance higher approximately 11% in total when allowance planning is performed according to DRG-CMI.

It is observed that the AI branch role group hospitals were affected positively by performance of planning for AI branch role group hospitals according to global budget. If planning were performed according to DRG-CMI, AI branch role group hospitals would have received allowance lower approximately 22% in total.

On the other hand; AII, AII branch, B and C role group hospitals were affected positively by performance of planning according to DRG-CMI in the global budget allowance planning performed in 2023. Only the B role group 1st hospital experienced a negative effect of approximately 46%. Furthermore, particularly C role group 10th hospital gained 79% positive allowance benefit since planning was not performed according to DRG-CMI. If allowance planning were performed according to DRG-CMI for C role group hospitals an allowance loss of 50% would be in question.

In summary, A role group hospitals among the hospitals located in Ankara were affected negatively as role group by failure to perform planning according to DRG-CMI in 2023. C role group hospitals are the hospitals most positively affected. If planning were performed according to DRG-CMI the allowance distribution table of the hospitals would be formed very differently. Since the allowance planning performed according to DRG-CMI takes into consideration the complexity and costs of the cases, it shall lead to a more correct allowance distribution for A group hospitals compared to B and C group hospitals.

DISCUSSION

The role of financing is major for continuity of financial sustainability against the services which hospitals offered. The role of the reimbursing party is very significant in the process of transfer of financing sources to hospitals. Although various methods are used in the reimbursement systems, most reimbursement methods contain various advantages and disadvantages within themselves. DRG data and CMIs of 27 hospitals located in the province of Ankara were analyzed in our paper with respect to the method of DRG per case. There are not many researches in the Turkey with respect to this field when the literature is looked through. When the researches performed are examined;

Avcil et al. found the CMI average as 1,56 in their study conducted in using 2011 data in 3 education and research hospitals and 1 state hospital (16). The CMI of the hospital was found as 0,89 in the study performed by Özkan and Ağırbaş at a university hospital in Ankara using March 2015 data (25).

January data of Adana Numune Hospital and Ankara Education and Research Hospital were compared by Aydemir and Ağırbaş and CMIs of 1,34 and 1,22 were obtained respectively (3). In this study, 2023 average CMIs of the A role group hospitals of the province of Ankara are found 1,48.

CMI values of B group hospitals were found as 0,88 in the DRG group studies performed by Özkan and Ağırbaş all over Turkey (25). Sayar and Ağırbaş found the CMI value as 0,81 in 235 B group role affiliated with the Ministry of Health in the study they performed in (26). CMI was detected as 1,00 for B group hospitals in the province of Ankara in this study. It is observed in the studies performed as B role group that B group hospitals in the province of Ankara have high CMI, and this indicates that B group hospitals in the province of Ankara dealt with higher number of complex cases.

CMI of the hospitals in AII role group was detected as 1,01 in the study conducted by Işıkçelik, Öztürk and Ağırbaş (14). In this study, CMI value

of AII-1 hospital, AII hospital of the province of Ankara was found as 1,10. High CMI value of AII-1 hospital could be interpreted as the need of the concerned hospital for more source requirement.

As a consequence, the Ministry of Health hospitals in the province of Ankara were analyzed by being divided according to the DRG data and role groups and CMI calculations were performed in this study. As expected, CMI values of A role group hospitals were found higher compared to the B and C group hospitals. In the case that reimbursement is made according to DRG-CMI, it is observed that A role group hospitals dealt with more severe and complex cases compared to the other role groups and needed higher allowance in terms of source requirement.

It is considered that reimbursement according to DRG-CMI shall play significant role for measurement of costs and controlling the same. It is considered that payments to be made to the hospitals according to DRG-CMI shall be more realistic and fair. Furthermore, hospitals shall be ensured to assess clinical transactions and cost factors jointly thanks to DRG and take rational decisions in this manner. On the other hand, it is considered that cost analyses should regularly be performed at hospitals and relative values should be updated for the treatment transactions applied.

Global budget practice is currently available at Ministry of Health and university hospitals in Turkey and reimbursement is performed by SGK, the third party payer according to the lump sum protocol. Majority of the expenses of the hospitals of Ministry of Health is personnel and supplementary payment expenses. It is suggested paying personnel and supplementary payment expenses which are fixed expenses using again with the global budget; and paying the expenses of operation, medical material, medical drug and laboratory constituting the variable expenses according to DRG-CMI while making reimbursement to hospitals. It is considered that the reimbursement model to be applied in this manner shall provide cost control in clinic transactions and shall prevent unnecessary actions and transactions. Furthermore, it is considered thinking about the general economic conditions that the healthcare service financing shall be more efficient and it shall be an effective reimbursement model for saving.

It is suggested making reimbursement according to DRG-CMI in the Ministry of Health hospitals and University hospitals and private hospitals in Turkey. The burden of patients with high cost and complex cases all over the country shall be undertaken jointly by all health institutions in the system of reimbursement made in this manner.

ETHICS COMMITTEE APPROVAL

* The study was approved by the Ankara University, Presidency of Ethics Board (Date: 13.05.2024 and Number: 83).

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1. Şengül H, Bulut A. Sağlık Hizmetlerinde Ödeme Mekanizmaları ve Teşhis İle İlişkili Gruplar. Estüdam Halk Sağ Derg, 2019;4(2):196-209.
2. Buğdaycı M, Yumrukaya L, Yeğenoğlu S. Sağlık Kurumlarına Yapılan Geri Ödeme Yöntemlerinin Sağlık Ekonomisi Perspektifinden İncelenmesi. J Fac Pharm Ankara Univ, 2022;46(1):231-8.
3. Aydemir İ, Ağırbaş İ. Sağlık Kurumlarına Yapılan Geri Ödeme Yöntemleri: Teşhis İlişkili Gruplar. Hacettepe Sağ İd Derg, 2017;20(1):1-21.
4. Çağlar F, Koçyiğit S. Teşhis İlişkili Gruplara Dayalı Geri Ödeme Sistemi ve Vaka Bazlı Bir Simülasyon. Ulus Sağ Yön ve Strateji Araş Derg, 2020;6(1):108-26.
5. Arık Ö, İleri YY. Sağlıkta Geri Ödeme Sistemleri ve Global Bütçe. Gümüşhane Üniv Sağ Bil Derg, 2016;5(4):78-92.
6. Casto AB, Forrestal E. Principles of Healthcare Reimbursement. 4th ed. Chicago: American Health Information Management Association, 2013.
7. TÜİK. (2023). Sağlık Harcamaları İstatistikleri. Erişim: https://data.tuik.gov.tr/Bulten/Index?p=Saglik-Harcamalari-Istatistikleri-2022-49676#:~:text=Hanehalklar%C4%B1%20taraf%C4%B1ndan%20tedavi%2C%20ila%C3%A7%20vb,%18%2C5%20olarak%20ger%C3%A7ekle%C5%9Fti.
8. Demirel G. Sağlık Hizmetlerinde Geri Ödeme Yöntemleri. Selçuk Sağ Derg, 2020;1(2):97-117.
9. Öztürk F. Sağlık Kuruluşlarında Geri Ödeme Yöntemleri ve Tanıya Dayalı (Paket) Fiyat Uygulanan Laparoskopik Ameliyatların Hizmet Maliyetlerinin Belirlenerek Sut Fiyatıyla Karşılaştırılması. Yüksek Lisans Tezi. Dokuz Eylul Üniversitesi Sağlık Bilimleri Enstitüsü, 2015.
10. Akyürek ÇE. Sağlıkta Bir Geri Ödeme Yöntemi Olarak Global Bütçe ve Türkiye. Sgd-Sos Güven Derg, 2012;2(2):124-53.
11. Şantaş F, Çıraklı Ü. Sağlık Hizmetlerinin Finansman ve Geri Ödenme Yöntemleri: Türkiye'de Mevcut Durum. Ulus Sağ Yön ve Strateji Araş Derg, 2019;5(1):12-20.
12. Çelik Y. (2011). Sağlık Ekonomisi. Siyasal Kitapevi, Ankara.
13. Kördeve M. Sağlik Ödemelerinde Yeni Bir Kavram: Medikal Muhasebe. Çukurova Üniv Sos Bil Enst Derg, 2017;26(2):1-13.
14. Işıkçelik F, Öztürk N, Ağırbaş İ. (2019). Sağlık Hizmetlerinde Geri Ödeme Yöntemlerinden Teşhis İlişkili Gruplar. Sgd-Sos Güven Derg, 2019;9(2):431-48.
15. Seyfioğlu F. (2019). Değer Temelli Sağlik Hizmetleri Modeli. Hacettepe Sağ İd Derg, 2019;22(4):799-822.
16. Avcil M, Beylik U, Doluküp İ. Sağlık Hizmetlerinde Teşhisle İlişkili Gruplar: Koah Vakaları Üzerine Karşılaştırma. Sağlık Perfor ve Kalite Derg, 2014;7(1):21-42.
17. Ministry of Health. Teşhis İlişkili Gruplar İleri Klinik Kodlama Standartları. Ankara: Sağlık Hizmetleri Genel Müdürlüğü, 2013.
18. Carrin G, James C. Reaching Universal Coverage via Social Health Insurance: Key Design Features in the Transition Period. Geneva: World Health Organization (WHO), 2004.
19. Kurşun A, Yümsel Ö. Icd-10 ve Tig Uygulaması: Faturalandırma Sürecinde Alternatif Bir Yol. Soc Sci Stud J (Sssjournal), 2022;3(9):789-99.

20. Ayanoğlu Y, Beylik U. Sağlık İşletmelerinde Geri Ödeme Modeli Olarak DRG: Kavramlar, Metodolojiler, Ülke Deneyimleri ve Karşılaştırmaları. Ankara: Gazi Kitabevi, 2014.

21. Ministry of Health. Teşhis İlişkili Gruplar Bilgilendirme Rehberi. Ankara: Sağlık Hizmetleri Genel Müdürlüğü, 2014.

22. Aral A. Sağlıkta Yeni Dönem DRG (TİG). Ankara: Bizim Akademi Yayınları, 2014.

23. Beylik U, Yılmaz A. Akça N. Hastanelere Geri Ödemede Sağlık Uygulama Tebliği İle Tanı İlişkili Grupların Karşılaştırması: Kolesistektomi Vakası Örneği. İşlet Bil Derg, 2015;3(2):39-53.

24. Aslan EÇ, Orhan M. Covıd-19 Pandemisinin Hastanelerin Vaka Karma İndeksine Etkisinin Değerlendirilmesi: Tanımlayıcı Bir Araştırma. Türk Klin Sağ Bil Derg, 2022;7(3):888-98.

25. Özkan O, Ağırbaş İ. Sağlık Bakanlığı Global Bütçesinin Teşhis İlişkili Gruplara Göre Dağıtımı. Ankara Üni Tıp Fak Derg, 2018;71(3):163-71.

26. Sayar B, Ağırbaş İ. Sağlık Hizmetleri Finansmanı ve Geri Ödeme Yöntemleri: Teşhis İlişkili Gruplar Uygulama Örneği. Gümüşhane Üni Sağ Bil Derg, 2019;12(1):306-14.