

# Does the approved tariff cover the actual cost of global surgical procedures?

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## Research

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# Abstract

**Background:** Following the implementation of the health transformation plan in Iran and the significant increase in medical tariffs, it seems there is still a considerable gap between the actual cost of the Global Surgical procedures (GSPs) and the approved tariffs. The aim of this study was to compare the actual costs of GSPs with approved tariffs in hospitals affiliated to Qazvin University of Medical Sciences in 2016.

**Methods:** In this cross-sectional study, data of 6,126 GSPs performed in three hospitals were extracted from Hospital Information System and approved tariffs were also obtained from the Supreme Council of Health Insurance. The difference between the average actual costs of a GSP and its tariff was considered as the tariff-actual cost gap. Regression test was used to determine the factors affecting the tariff-actual cost gap using SPSS.21.

**Results:** The average actual cost of GSPs was 503 USD while the average tariff was 361 USD, indicating a significant negative gap between the approved tariffs and the actual cost of GSPs. In fact, for each procedure, the hospital suffered an average of 142 USD losses. In 54 of 63 GSPs, the average actual cost was 0.3% to 307.4% higher than the tariff. The highest negative gap was related to the "femoral fracture fixation" with -307.4%. The gap was higher in older patients, females, and patients with a longer stay, orthopedic specialty, and full-time surgeons ( $p < 0.05$ ).

**Conclusions:** The findings of this study showed that tariffs covered only 71.8% of actual costs. It is suggested that in the tariff setting of GSPs, factors such as inflation rate, patient's age, comorbidity, disease severity, and hospital function (teaching or referral center) be considered. In addition, hospital management can also reduce the gap by modifying processes and managing resource consumption, especially medicines and consumables items.

## Background

Among different sectors of the health system, hospitals consume a large proportion of the total health expenditure (1). Hence, paying attention to its revenues and costs is very important (2). Patients expect to receive the required services with high quality and at the right time. On the other hand, health care providers expect to receive appropriate and timely reimbursements for the services provided (3). The main method of hospital reimbursement in Iran is the fee-for-service; but since 1999, a form of the case-based payment system called "global payment" has been used for some common surgical procedures, now extending to 90 surgeries (4). In this method, a fixed amount as a tariff is determined for the reimbursement of the cost of these surgeries, which are called Global Surgical procedures (GSPs). The basis for payment is each case of surgery cases (patients), not services. The global payment is an imitation of the Diagnosis Related Groups (DRG) payment system (5). In fact, the global payment method can be called a quasi-DRG.

In the global payment system, the total cost of a GSP consists of the surgeon and assistant surgeon wages and the costs of operating room, anesthesia, physician counseling, electrocardiography, laboratory tests, pathology, imaging, medicine and consumable items, and other expenses. Therefore, the purchaser, like a patient or an insurer, pays at a specified and predetermined price for each GSP, regardless of its actual costs, and the costs beyond that cannot be reimbursed (6). Factors such as age, sex, and disease severity do not affect the amount of reimbursement (5, 7). The only adjuster in the global payment system is the degree of hospital accreditation that only affects hoteling costs; but other costs, such as surgeon's wage, are not affected.

Medical tariff setting is one of the most important policy tools of governments to control the health services market; it affects equity, access, efficiency, utilization, accountability, and quality (8). The rationality and reality of medical tariffs are one of the challenges of the Iranian health system; it seems approved medical tariffs are below the actual cost of services (9). The reality of GSP tariffs has been questioned after the implementation of the global payment system in Iran over the past two decades. The results of previous studies suggest that the actual cost of GSP is higher than their reimbursement rate, and the tariffs do not cover the actual cost of GSPs (5, 7, 10–12).

Surgical procedures are an essential and often expensive component of public health in developed and developing countries (13). In Iran, GSP cases constitute a notable proportion of patients admitted to hospitals; so, the tariff of GSPs is directly related to the performance and income of hospitals, insurers, and patient care quality (7). Unrealistic tariffs below the actual costs can lead to reduced hospital income, economic pressure on hospitals, the spread of informal payments, increased induced demand, increased out-of-pocket payments for patients, reduced access and quality of services, and dissatisfaction of patients, hospitals, and insurers (3, 14). In order to solve the problem of unrealistic tariffs, following the implementation of the health transformation plan (HTP), hospital tariffs were increased and updated in the third phase (15). The findings of a study showed that the HTP has doubled medical tariffs (3). Therefore, it was expected that with these reforms, the gap between the actual cost of GSPs and approved tariffs would reduce.

Because the major part of the hospital's costs and revenues is related to surgical procedures, the determination of the gap between approved tariffs and actual costs and some affecting factors can help hospital managers to better use the limited resources and adopt some strategies to reduce this gap. Therefore, the aim of this study was to answer the question "Does the approved tariff for GSPs cover the actual cost in the selected hospitals affiliated to Qazvin University of Medical Sciences, Iran?"

## Methods

This is a retrospective descriptive study conducted in three hospitals affiliated to Qazvin University of Medical Sciences in Iran. In this study, data of all 6126 GSPs from March 21, 2016, to March 20, 2017, were used in the study.

Hospital information system (HIS) was used to collect the required data. Information including the name of surgical procedure, surgical specialty, surgeon's practice (full or part-time), length of hospital stay, type of insurance, age, and gender of the patient, and the cost of the GSPs was extracted. In addition, the approved tariffs for GSPs were derived from the annual directive of the Supreme Council of Health Insurance. GSPs were categorized into six groups of general surgery, urology, eye, orthopedics, obstetrics and gynecology, and neurosurgery.

The cost of items making up the hospital bill included the surgeon's wages, the cost of anesthesia and the operating room, medicines, hoteling, and other diagnostic and treatment procedures that had been recorded as actual costs on the patient's bill. The difference between the average actual costs of a GSP and its tariff was considered as the tariff-actual cost gap (positive or negative). Since a part of hospital costs (with the aim of reducing out-of-pocket payments of patients) was compensated by government subsidies, the amount of government subsidy plus the patient's copayment and the amount of insurer's reimbursement, collectively, were considered as the hospital revenue from a GSP. The revenue from each GSP was compared with its approved tariff, and the difference between them was considered as a tariff-revenue gap.

Frequencies, means, and standard deviations were used for the description of the data. In the analytical section, the gap between the approved tariff and the actual cost of the bill was considered as a dependent variable and its relationship with independent variables (type of insurance, type of surgeon's practice, patient's age, length of hospital stay, and surgery specialty) was analyzed using regression test in SPSS software. The exchange rate of Rials to USD in 2016 was based on the data from the Central Bank of Iran (one USD = 31500 Rials) (16). This study was approved by the ethics committee of Shahid Beheshti University of Medical Sciences (code: IR.SBMU.PHNS.REC.1395.82).

## Results

Based on the findings of the study, 53.6% of the patients were female; the mean age was 39 (SD = 8.2) years and 65% of them were covered by Iranian Health Insurance. The average length of stay (LOS) in the hospital was two (SD = 0.1) days. 50% (3089 cases) of GSPs were related to the general surgery, 20% (1256 cases) to the obstetrics and gynecology, and 13% (819 cases) to the eye surgery groups. The most common surgical procedures were cataract (774), vaginal delivery (683), cholecystectomy (567), inguinal hernia repair (542), appendectomy (540), cesarean Sect. (337), and hemorrhoidectomy (330).

The average cost of GPSs was 503 USD while the average tariff was 361 USD, indicating a significant negative gap between the approved tariffs and the actual cost of GPSs. In other words, tariffs covered only 71.8% of actual costs. The most expensive surgical procedure was "femoral fracture fixation" with the average total cost of 5764 USD, and the highest tariff was related to "craniotomy" with 1020 USD.

Out of 63 GSPs performed in three hospitals, in nine cases, the average actual cost was 0.1–29.4% lower than the tariff. The highest positive tariff gap was related to the "nasolacrimal duct probing" with 29.4%.

In 54 GSPs, the average actual cost was 0.3–307.4% higher than the tariff. The highest negative gap was related to the “femoral fracture fixation” with 307.4% (Table 1).

Table 1  
The highest and lowest actual tariff-cost gap and revenue-cost gap of GSPs

Gap type		Surgical procedure	Gap (%)	Gap (USD)
Actual cost-Tariff	Lowest	Nasolacrimal Duct Probing	+ 29.4	33
		Femoral shaft fracture(open)	+ 22.0	170
		Craniotomy	+ 19.0	194
		Femoral Shaft Fractures(closed)	+ 18.3	92
		Orchiopexy	+ 11.7	33
	Highest	Femoral fracture fixation	-307.4	2572
		Metacarpal amputation	-149.1	279
		Nail excision	-142.9	90
		Tibia shaft fractures (open)	-129.1	564
		Radius and Ulnar Shaft Fractures (open)	-105.6	543
Actual cost-revenue	Lowest	Femoral shaft fracture(open)	+ 33.3	301
		Nasolacrimal Duct Probing	+ 29.4	33
		Bronchoscopy	+ 27.6	87
		Femoral shaft fracture(closed)	+ 27.1	151
		Laminectomy, Fasciotomy, Foraminotomy	+ 24.5	244
	Highest	Metacarpal amputation	-86.8	216
		Nail excision	-55.6	55
		Cystourethroscopy	-43.8	94
		Femoral fracture fixation	-40.4	980
		Diagnostic laparoscopy	-37.7	150

On the other hand, the average hospital revenue from each GSP, which is the sum of the insurer reimbursement, the patient copayment, and the government subsidy, was 488 USD. Compared to the average actual cost of each GSP, the revenue gap was – 15 USD. In 23 GSPs, the average actual cost was 0.1–33.3% lower than the revenue earned. The highest positive gap between the actual cost and revenue was related to “femoral shaft fracture (open)” with 33.3%. The revenue from this surgery was 301 USD

higher than its cost. In 40 GSPs, the average actual cost was 0.4–86.8% higher than the revenue earned. The highest negative gap between the actual cost and revenue was related to the "metacarpal amputation" with – 86.8% (Table 1).

The highest actual tariff-cost gap in GSPs was related to orthopedic surgeries with an average of -219 USD per procedure and the lowest gap was related to neurosurgeries with an average of -9 USD per procedure. In addition, the highest actual revenue-cost gap was found in the orthopedic surgeries with – 60 USD per procedure. In contrast, for each neurosurgery operation, 142 USD were earned more than the actual cost. On average, for every obstetrics and gynecology procedure, 37 USD government subsidies were paid, the highest among GSPs groups. The lowest subsidy (14.5 USD per surgical procedure) was paid for urology.

The total amount of negative gap resulting from the difference between the tariff and the actual cost in 6126 GSPs was 863325 USD. In fact, for each procedure, the hospital suffered an average of 142 USD losses. Nevertheless, considering the revenues, the amount of the gap reduced to 85020 USD and the loss per surgical procedure dropped to 14 USD. The total amount of government subsidies paid to hospitals for performing GSPs was 143290 USD.

The factors affecting the gap between the approved tariffs and actual costs were examined through the multiple regression model (Table 2). The results of the multiple regression model showed that the overall results were significant ( $F = 203.44$ ,  $p < 0.001$ ). In other words, a proper relationship was observed between independent and dependent variables. The age and sex of the patient, the length of stay, the type of surgical specialty, and the type of surgeon's practice had a significant effect on the tariffs-actual cost gap. The gap was higher in older patients, females, and patients with a longer stay, orthopedic specialty, and full-time surgeons.

Table 2

Results of multiple regression model: the effective factors on the tariff-actual cost gap

Variables		Unstandardized coefficients		Standardized coefficients	t	p	95% CI	
		B	S.E	$\beta$				
Age	-	-1.05	0.15	-0.09	-6.95	0.00	-1.35	-0.76
LOS	-	-81.2	1.86	-0.48	43.45	0.00	-84.8	-77.5
Gender	Male	ref						
	Female	-26.7	5.71	-0.06	-4.68	0.00	-37.9	-15.5
Hospital type	Teaching	ref						
	Non-teaching	2.4	8.51	0.01	0.28	0.77	-12.8	19.1
Insurance type	Social security	ref						
	Iran health insurance	5.5	5.73	0.01	0.96	0.33	-5.7	16.7
	Relief committee	-9.5	19.2	-0.00	-0.49	0.62	-47.2	28.2
	Armed forces	-9.3	13.8	-0.01	-0.67	0.50	-36.3	17.7
surgical specialty	orthopedics	ref						
	urology	186.3	12.6	0.22	14.84	0.00	161.7	210.1
	general surgery	147.4	9.12	0.32	16.17	0.00	129.5	165.3
	eye	158.6	12.4	0.24	12.81	0.00	134.3	182.8
	obstetrics and gynecology	71.3	12.8	0.13	5.58	0.00	46.2	96.3
	neurosurgery	346.9	67.6	0.05	5.13	0.00	214.3	479.5
Surgeon practice	Full time	ref						
	Part time	67.3	5.22	0.15	12.87	0.00	56.9	77.5

## Discussion

The results of the study showed that the actual cost of GSPs is significantly higher than what is reimbursed, and tariffs cannot cover the full cost of the actual costs, which would lead to financial losses for hospitals. According to our findings, the approved tariff covers only 71.8% of the actual costs. Similar findings have been reported in other previous studies in Iran. In the study of Chatruz et al., tariffs were found to cover 71.5% of the actual costs of GSPs, which is consistent with our findings (7). Gholamzadeh et al. study also revealed that the actual cost of kidney transplantation (a global surgical procedure) is much higher than its reimbursement (12). Jennetti et al. showed that the actual cost of eye surgeries exceeded its approved tariffs and the hospital incurred a loss of 551,000 USD per year (17). In addition, in the study of Kalhor et al., the average cost of 66 radiological services was higher than their tariff (18).

Similar findings have also been reported in some international studies. Law-ki et al. in France showed that for each case of "bioprosthetic abdominal wall reconstruction," the hospital suffered a loss of 15,233 Euros, and the reimbursement of the DRG system did not cover all costs (19). The findings from a study in Italy showed that DRG tariffs were lower than the actual cost of thyroidectomy (20). A study by Varga et al. in Hungary showed that there was a significant gap between actual costs and the reimbursement of health insurance for the esophageal cancer treatment (21). The findings from Mishra et al. study in Norway showed that although DRG reimbursement covered heart transplant costs, for lung transplant and thoracotomy, the actual costs were higher than the level of DRG reimbursement (22). In addition, a study in India indicated that state-owned insurance (RSBY) reimbursed hospitals in many surgical procedures at much lower rates than the actual costs (23).

Some of the reasons for this gap are related to insurers. For example, they do not reimburse the cost of some medicines and medical supplies or do not accept the use of some more expensive techniques, such as laparoscopy for surgery. In addition, the lack of attention to the production cost of services, the inflation rate, the type and function of the hospital, the age and gender of the patient, the disease severity, and comorbidity in tariff setting are the factors causing a difference between the tariff and the actual cost (6). The growth of tariffs for medical services should be based on the inflation rate (24). In recent years, due to the dramatic changes in the exchange rate and rising inflation, the prices of medicines and consumable items have increased dramatically, which has led to an increase in the cost of surgical operations in hospitals, while tariff rates have not risen in line with inflation.

In addition, in teaching hospitals, because of the nature of the hospital's function, more medical supplies (such as gloves) are being used or the services are repeated for which, the insurers do not reimburse beyond the approved tariff level. In addition, for a university referral hospital that usually cares for complicated patients, a different tariff must be set (5). Patient comorbidity is also not considered in tariff setting, while this can lead to a longer stay of patients and then higher costs. Failure to determine the actual tariff that covers the actual costs of the service can result in incomplete treatment and early discharge, resulting in increased surgical complications, re-admission rates, and treatment costs (6).

Of course, it should be noted that the gap between the approved tariffs and the actual costs has another side, and that is the resources management in hospitals. Given that GSPs are common surgeries that

have a relatively similar pattern of resource consumption, hospital management is also required to focus on resource consumption, especially medicines and medical supplies, as well as additional patient stays. A study in Isfahan showed that about 16% of GSPs costs are related to medical supplies, that resource management in this area can significantly reduce costs (25). In another study in social security hospitals, despite the same conditions, the lack of attention to resources management in some hospitals caused a greater gap between tariffs and actual costs (11).

The age of the patient had a significant effect on the tariff-actual cost gap; as the age increases, the gap increases. Various studies have also shown that older patients account for a larger share of service utilization and medical costs (26, 27). Due to conditions such as comorbidity or disease severity, older patients appear to consume more resources, leading to increased costs.

Surgeries on women led to a higher tariff-actual cost gap. In general, women tend to use more services and spend more money on health care than men (28). A study in India showed that sex-specific conditions accounted for 27% of hospital admissions and 15% of costs in women, which was higher than in men (29). In our study, 20% of the GSPs volume was attributed to obstetrics and gynecology surgeries, and the obstetrics and gynecology group ranked as the second-largest tariff-actual cost gap. Since these surgical procedures are dedicated only to women, the type of service used by women is a factor in creating a higher gap.

According to our findings, the average LOS was the strongest factor affecting the tariff-actual cost gap; for each day increase in LOS, -81.2 USD was added to this gap, which is consistent with the findings of an Iranian study (5). According to the global payment system guidance, for each GSP, a standard LOS is anticipated. In our study, the LOS of 15 GSPs was over-standardized. For example, the standard LOS for metacarpal amputation is 1.8 days, but in our study, it was 3.5 days. The findings of a study in Iran showed that 21.7% of the GSPs costs are related to hoteling (25); so, with an increase in the LOS, hospital costs would naturally increase (30). The findings from previous studies indicate that hospital costs can be reduced by safe reduction of the LOS (31). By reducing the LOS, in addition to controlling the hoteling cost, the consumption of medicines and consumables items, as well as hospital infections and their costs, can also be reduced. Moreover, the tariff-actual cost gap was higher in orthopedic surgeries than in other specialties. It seems that the use of different brands of implants, many of which not reimbursed by insurers, is the reason for the increased gap.

## Conclusions

The findings of this study showed that the approved tariff for many GSPs does not cover the actual costs, which results in significant financial losses for hospitals. The congruence of medical services' tariffs with their actual costs would make the hospitals not suffer from many economic problems due to their costs, accept approved tariffs, and receive no under-table payments; moreover, insured persons, especially vulnerable and low-income groups, would have access to suitable services. It is suggested that in the tariff setting of GSPs, factors such as inflation rate, patient's age, comorbidity, disease severity, and

hospital function (teaching or referral center) be considered. In addition, hospital management can also reduce the gap by modifying processes and managing resource consumption, especially medicines and consumables items.

## **Abbreviations**

GSPs

Global Surgical procedures, DRG:Diagnosis Related Groups, HTTP:Health Transformation Plan, HIS:Hospital information system.

## **Declarations**

### **Ethics approval and consent to participate**

This study was approved by the ethics committee of Shahid Beheshti University of Medical Sciences (code: IR.SBMU.PHNS.REC.1395.82).

### **Consent for publication**

Not applicable

### **Availability of data and materials**

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

### **Competing interests**

The authors declare that they have no competing interests

### **Funding**

There is no funding.

### **Authors' contributions**

EZ and MH designed the study and its overall methodology. EZ contributed in data analysis and edited the article. AD and MH contributed in data gathering and prepared the initial draft of the article and also edited the article. EK translated the manuscript and edited the article. All authors read and approved the final manuscript.

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