



## The Comparison of the Global Surgery Fees and the Actual Cost in Two Educational Hospitals Affiliated to Tehran University of Medical Sciences

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### ABSTRACT

**Background:** Global surgeries include ninety operations in the common surgical procedures, with the annual fixed fees; which the insurance companies pay hospitals accordingly. The aim of this study was to compare the global fees to these surgeries' real costs and to investigate the affecting factors in two teaching hospitals affiliated to Tehran University of Medical Sciences.

**Methods:** This longitudinal retrospective descriptive-analytic study was conducted on all hospital records with global surgeries in three months in 2012 to 2013 in two educational hospitals affiliated to Tehran University of Medical Sciences. Data were collected using the researcher's -made checklist and extracted from the HIS (Hospital Information System). SPSS<sub>20</sub>, EXCEL, and STATA software were used to analyze the data and to obtain the difference between the recorded costs and global fees.

**Results:** The global fees were less than the recorded costs in both hospitals. The recorded costs in hospital B were much less than hospital A for the same surgeries. In hospital B, costs have been reduced for some surgeries in 2013 compared to 2012 by reducing the patients' length of stay and time management.

**Conclusion:** Fees in the referral hospitals of Tehran University, which usually involve complicated patients, should be determined more accurately. However, this study suggested that hospitals can greatly reduce the cost of global surgeries through clinical and cost management.

**Keywords:** Global surgery, Hospital, Fee

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## Introduction

One of the most important ways to control health care cost in various insurance systems, is to use different types of payment systems (1). Nowadays, in many developing countries, there is an increasing recognition for the potential payment methods and different payment methods used as one and therefore, some countries have made changes in their payment systems to achieve their goals (2).

The health-care payment method in Iran is based on the combination of methods. One part is based on the K coefficient, which its relative value can be annually revised. The cost is covered partially by the case payment method where payment for each stage of care is determined before providing the service. In this method, patients are classified according to the disease table (3). The case payment system in Iran is known as the "Global System." This system was implemented since 1999 and is currently being used for payment in the second and third levels of health care service (4). In other words, in order to control costs and optimal use of resources, a certain amount of payment is considered for patient treatment by type of illness in this method. This amount is specified for hospitals and is an indication of the DRG system (5). DRG or Dependent Diagnostic Group is a system that classifies patients according to the disease diagnosis and the resources used (6). The main goal of the DRG was to manage various surgical and clinical interventions (7). However, the global system is different from the DRG system: The main diagnostic classes and the related diagnostic group which are considered comprehensively in DRG do not exist in the "global system". Also, a class for untrue and inconsistent information as well as the patient's discharge status was not considered in the global system. Variables such as age, sex, presence or absence of complications and associated illnesses, the specific level of complications and associated illnesses, birth . admission weight in newborns, the severity of the disease or the level of clinical complexity of the patient and the risk of death are the factors that cannot be determined in this system (4). In DRG, each group is assigned to a code that is linked and coordinated with the

International Classification of Diseases, but there is no coding system in the "Global system".

On the other hand, the relative weight or cost weight, which is separately determined in calculating the patient's costs for each group in DRG system, is not considered in the global system. In the global system, the total cost of each of the 60 surgical groups is the sum of the cost for surgeon wage, surgeon's assistant, operating room, anesthesia, visits, counseling, electro, testing, pathology, and other average costs of that group in any type of hospital. In Iran, according to the global system, "the relative weight . cost weight" factor is not considered in each surgery group, and the payment factor per item . standard rate is not considered as well (5).

Various studies have been conducted on the difference between the actual cost and the global surgeries fees (8-17), which have presented different results in this regard. Some studies have shown that fees were higher than actual costs, while others have shown the opposite. On the other hand, price changes since 2011 to 2013 showed that medicine costs, consumer goods, etc. had increased, and the inflation rate in the health market was almost twice more than the inflation rate in the general product market (8), while the increase in fees was not consistent with the costs changes. Insurance companies are only obligated to pay approved and global fees (9). Therefore, the comparison between the announced fees by the Ministry of Health and the actual cost of the hospitals affiliated to the University of Medical Sciences in Tehran, which provide service to a large number of patients, is inevitably necessary.

## Materials and Methods

This study was a retrospective, longitudinal, descriptive-analytic study. The study investigated all hospital records with global surgery for three months in August, September, and October in 2012 and the same months in 2013 in two hospitals affiliated to Tehran University of Medical Sciences. It should be noted that these two educational, general hospitals were located in the same district in



Tehran. They also were similar regarding the number of surgeries and surgery departments. Census method was used for sampling. Hospital A had a total of 993 global surgeries during the three months in 2012, and 856 cases in the same period in 2013. Hospital B had 1036 global surgeries during the three months in 2012 and 1116 cases in the same period in 2013. The total of 3995 cases in both hospitals was examined. It is worth noting that, according to experts, these hospitals had more surgeries in these three months than the other months therefore, this period was chosen. For a better understanding, two years (2012 and 2013) were reviewed. These hospitals were both educational and general hospitals. The number of approved beds in hospital A was 508, and in hospital, B was 329. Both hospitals were located in the same district in Tehran (district 6), therefore, they were comparable regarding the social kind of admitted patients.

The data collection tools were the basic insurance global billing and the patient's bill extracted from HIS and hospital records. Also, a series of effective qualitative information such as medical practitioner, the type of insurance, the title of surgery and the admission and discharge date were also extracted. All billing information sent to the insurer companies, as well as hospital cost by the title of the cost item were collected for all patients.

Surgeries were divided into the specialty groups including 1 - delivery 2 - caesarean 3 - othersurgeries related to the obstetrics and gynecology department 4-general surgery 5-orthopedic 6-urology 7-ENT 8- thoracic. Doctors were categorized and coded based on their academic rank to assistant professors, associate professors, full professors, contract doctors and doctors employed outside the hospital. The types of insurance were also coded and divided into social security, Iranians, armed forces, villagers and the government employees' insurance.

In order to avoid co linearity of the costs, some items were considered together as follows: the total cost of the drug includes, operating room and departmental drugs, total cost of consumable materials including operating room and department material, total surgical cost including surgeon's

wage, assistant surgeon, counseling and operating room, total preclinical costs including laboratory, radiology, ultrasound, etc.

The difference between the hospital's actual cost and the global bill sent to the insurance company was used as a dependent variable in the analysis.

Data analysis was done by two descriptive and analytical methods. In the descriptive part, the average of all cost items in Rail was calculated for all types of surgeries. The difference between the global bill and the actual cost of the hospital, by the name of the surgery, was investigated through the Excel software.

In the analytical part, since the variables were normal, the linear regression model was used to determine the effective factors that affect the difference between a global bill and the actual costs by using STATA software.

In the analytical method, the difference between a global bill and the actual costs for different items were measured in each hospital first. Then two hospitals were compared regarding the group specialties. Since the data were as integrated as possible, there was no linearity in data.

The grouping of all surgeries during that period was as follows: Delivery and caesarean section were placed into two groups separately due to their high frequency.

Other surgeries in the gynecology department include: legal abortion (curettage), unilateral or Bilateral ovarian cysts, single or multiple myomectomy, excision of fibroid tumor of uterus, abdominal approach, hysterectomy, tracheloplasty (Shirodkar or Lash type procedure), diagnostic laparoscopy with or without fulguration of ovarian or peritoneal lesions with or without lysis of adhesion and single or multiple aspiration and biopsy, Ectopic Pregnancy (tubal), salpingectomy or oophorectomy, posterior-anterior colporrhaphy with or without anterocele, posterior colporrhaphy; repair of rectocele, unilateral or bilateral ovarian resection with or without cysts and colpoperineorrhaphy; suture of injury of vagina or perineum.

General surgery group: cholecystectomy, Fissurectomy with or without posterior sphincterotomy, excision of pilonidal cyst or sinus,



all types of hernias, appendectomy with pyrethronitis, all types of thyroidectomy, radical mastectomy, hemorrhoidectomy with or without fistulectomy and fissurectomy, breast mass with partial mastectomy, splenectomy, ventriculus shunt to peritoneum or pleuria in other places, fistulectomy, incision and drainage is chioirectal abscess, excision of nail matrix, partial or complete (e.g. ingrown or deformed nail), global circumcision, Splenectomy or repair of its rupture and fissurectomy with or without sphincterotomy

The orthopedic group includes: removal of buried wire, pin, screw or mental band, rod, nail or plate, opened manipulation the forearm by fixing the bone, closed manipulation the tibia and fibula, amputation of the thumb or arm or leg, closed manipulation distal radius, simple forearm, closed manipulation of femoral neck fracture, neurolysis of each nerve in the wrists or arm or leg.

The urology group includes: Urethropexy with or without unilateral hernia, radical prostatectomy, varicocele in the abdomen with or without hernia repair, cysturoperoscope with fullgurization and large bladder tumors, nephrectomy, incomplete orthorectomy, unilateral hydrocele, urethral ulceration, prostate resection from the intestinal tract, nephrolithotomy for kidney stones, direct cystioporthoscopy, internal orthorhombia

ENT group includes: septoplasty with or without cartilage implant, tansillectomy, primary or secondary adenoidectomy, tympanoplasty with or without mastoidectomy with ossicular chian reconstruction, Unilateral radical (Caldwell-Luc)sinus with or without removal of polyps, dacryocystorhinostomy (fistulization of the lacrimal sac into the nasal cavity), nasal fracture reduction in a closed approach, nasolacrimal duct mucus with or without rinsing, without insertion of the tube or stancia involves general anesthesia of tonsils and carpal tunnel radicals. It is necessary to mention that this study tried to comply with Helsinki declaration principles.

## Results

In hospital A, there were a total of 1,849 global surgeries in 6 months during 2012 and 2013 and in

hospital B there were 2151 global surgeries at the same time. Hospital B had around 300 global surgeries more than Hospital A.

18 % of the global surgeries in hospital A and 14 % in hospital B were related to the delivery procedures. 21 % of the global surgeries in hospital A and 32 % in hospital B were related to caesarean deliveries, which indicated that hospital B was more likely to perform caesarean procedures. Therefore, about one-third of global surgeries in Hospital B were caesarean deliveries.

32 % of global surgeries in hospital A and 23 % in hospital B were related to other operations in the department of obstetrics and gynecology. Thus, 71 % of global surgeries in hospital A and 69 % in hospital B were related to the department of obstetrics and gynecology.

23 % of global surgeries in hospital A and 9 % in hospital B were related to the department of general surgery. Hospital A had more orthopedics and urology surgeries, with 102 cases and 6 % of global surgeries, compared to hospital B, with only 1 % of surgeries in these departments. In the six months of the study, only about 7 cases, representing 0.4 % of the total of global surgeries in ENT and Thorax department were recorded in hospital A, while hospital B had 480 cases (22 % of the total global surgeries) in this department.

63 % of the patients in hospital A and, 64 % of the patients in hospital B had social security insurance, which is approximately the same in both hospitals. It showed that nearly two-thirds of the surgeries in both centers were covered by this insurance company. Policymakers should pay particular attention to social security insurance, since it is the most important insurance company in the medical centers. In both hospitals, 23 % of the patients had self-employed insurance (Iranian) which is the second most important insurance company in the country.

2 % of patients in hospital A and 1 % in hospital B had armed forces insurance. Villagers insurance covered 5 % of patients in hospital A, and 7 % in hospital B. The government employees' insurance also covered 7 % of patients in hospital A, and 5 % in hospital B. On average, about 86 percent



of patients had social security and Iranian health insurance which are the two major insurance companies, thus, special attention should be given to these two insurance companies.

46 % of surgeries in hospital A and 68 % of surgeries in hospital B were performed by assistant professors. Accordingly, 17 % and 16 % of surgeries in hospitals A and B were performed by associate professors, 21 % of the surgeries in the hospital A and 7 % in the hospital B were performed by the full professors and 16 % of surgeries in the hospital A and 9 % in the hospital B were performed by the residents and contract doctors. Results showed that the academic level of surgeons in hospital A was significantly higher than hospital B.

The average length of stay in hospital A was 3.3 days, and in hospital B was 3.18 days.

For all surgeries in the groups mentioned above, the difference between the global fees and the actual cost of the hospital was calculated, which is presented in Tables 1 and 2.

In the analytical section, the dependent variable (Y) was the difference between actual cost and the global fees sent to the insurance companies.

Information related to physicians and insurance as well as billing items were considered as independent variables. In the first part, surgeries based on the specialized grouping, were compared in the two hospitals in terms of the differences in the global fees and actual costs. In the case of delivery, other practices in the gynecology department and general surgery, hospital B the difference between the actual costs and global fees compared to hospital A was less, which was statistically meaningful. Regarding caesarean section, the difference between the actual cost and the global fees in hospital B was higher than hospital A. Due to the limited number of samples in the case of orthopedics, urology, ENT, and thoracic, statistical comparisons were not possible.

The two hospitals were also analyzed separately; the results are presented in Table 3:

**Table 1.** Information of the cost of global surgeries in two hospitals in 2012 based on the surgery departments

Title	Hospital A					Hospital B				
	The average of length of stay	Surgery frequency	The average of Pglobal costs	The average of actual costs	The averagedifference of global and actual cost	The average of length of stay	Surgery frequency	The average of global costs	The average of actual costs	The averagedifference of global and actual cost
Delivery	2.5	178	3689103	7199501	3510297	1.7	125	3433472	3820744	387272
Caesarean	2.6	194	6490393	9261585	2771192	2.6	314	4860041	7432306	2572265
Section										
Other	3.6	313	4836255	6969506	2133251	4.8	244	5068991	6630711	1561720
surgeries related to the obstetrics and gynecology department										
General	4.1	248	6578250	9502254	3032827	5.6	104	4634770	7292098	2657328
Surgery										
Orthopedic	3.1	34	3803729	5746225	1942496	11.4	8	8440372	10468197	2027825
Surgery										
Urology	3.5	23	6257682	8932049	2674367	5	2	4318000	5465346	1147346
ENT and thoracic	2.5	3	3925925	16228272	12302247	2.2	229	3574540	4043325	468786
Average	3.3		5383667	8122625	2738958	3.3		4453037	6050884	1597847



**Table 2.** Information of the cost of global surgeries in two hospitals in 2013 based on the department of surgery

Title	Hospital A					Hospital B				
	The average of length of stay	Surgery frequency	The average of global costs	The average Of actual cost s	The averagedifference of global and actual cost	The averageof length of stay	Surgery frequency	The average of global costs	The average of actual costs	The averagedifference of global and actual cost
Delivery	2.5	149	3886338	9869871	5983533	1.9	172	4106809	4971088	864279
Caesarean Section	2.7	196	7802008	12574016	4772009	2.5	362	5871548	8682723	2811174
Other surgeries in obstetrics and gynecology department	3.4	271	5827639	8910136	3082497	4.6	251	5561053	7705733	2144680
General Surgery	4.4	190	8524956	13286949	4761993	4.9	97	6092952	8664938	2571987
Orthopedic Surgery	3.7	35	4184415	8340671	4156255	2	1	1987100	4140368	2153268
Urology	4.1	11	6950567	11410698	4460132	2	1	5153000	4384746	-768254
ENT and thoracic	2.2	4	5009255	30215581	25206326	2.2	236	5665059	6718121	1053062
Average	3.3		6483922	10966015	4512093	3		5502506	7470368	1967863

**Table 3.** Regression analysis of independent variables with different global and actual cost in the two hospitals

Variable	Hospital A				Hospital A			
	Coefficient	T	Std. error	P > t	coefficient	T	Std. error	P > t
Length of stay	67263.57	6.55	10265.79	0.000	- 114692	- 6.26	18312.69	0.000
Doctor	-	-	-	-	-	-	-	-
Associate Professor	388098.4	5.38	72123.38	0.000	347438.7	4.05	85720.17	0.000
Professor	202214.5	3.07	65901.96	0.000	248750.2	1.94	128231.7	0.053
Article 88 and Resident	165130.3	2.16	76295.88	0.031	176996	1.62	108929.2	0.104
Basic Insurance Organization	-	-	-	-	-	-	-	-
Self Employed(Iranian)	476035.4	7.00	68015.09	0.000	456320.9	6.04	75607.52	0.000
Armed Forces	254305.9	1.55	163933.9	0.121	223660.8	0.82	271107.1	0.409
Villagers and Rescue of Tehran	293766.8	2.51	116944.2	0.021	648328.1	5.27	123013	0.000
Government employees	295704.1	2.91	101458.1	0.004	353668	2.42	146114.5	0.016
Grouping the type of Surgeries	-	-	-	-	-	-	-	-
Cesarean section	72665.29	0.58	126269.5	0.565	416687.1	3.15	132465.9	0.002
Other surgeries in obstetrics and gynecology department	440826.5	3.60	122618.9	0.000	- 1529718	-9.80	156169	0.000
General surgery	-385092.3	- 2.95	130711.4	0.003	- 1383425	-7.74	- 178727.8	0.000
Orthopedics and Urology	1154470	6.84	168858.1	0.000	- 1322453	-3.06	- 431686.5	0.002
ENT and thoracic	923117.3	4.59	200915.5	0.000	- 1142546	-7.51	152117	0.000
Cost of medication	1.008	23.93	0.042	0.000	0.875	23.19	0.037	0.000
Cost of consumables materials	0.893	31.17	0.028	0.000	0.768	16.82	0.045	0.000
Cost of operating room	0.306	8.80	0.237	0.000	-1.071	-20.52	-1.173	0.000
Anesthetic cost	- 2.275	- 16.38	0.138	0.000	0.703	5.96	0.118	0.000
Staying cost (bed and nursing)	0.464	16.49	0.028	0.000	1.183	28.99	0.408	0.000
Para-clinical cost	0.768	10.44	0.073	0.000	1.581	11.79	0.134	0.000



## Discussion

Since insurance companies pay only the approved global fees and do not accept any additional fees, it is essential to check the actual costs of hospitals and compare them with the global fees sent to insurance companies. Regardless of the reason for the cost differences, it causes higher bill for the patient (especially in the years before 2014 and during this study) or the government (especially in the years after 2014 when health reform plan was implemented). Therefore, the present study was conducted to compare the actual cost of the hospital with the global fees and the factors affecting it. The findings will guide health system managers and policymakers in this area to reduce the financial burden of hospitals which ultimately lead to direct payments of the patients.

The main findings of this study showed that in both hospitals, the actual total cost was higher than global fees sent to the insurance companies. In the three months of study in 2012, hospital A had an average of 2,700,000,000 Rials insurance coverage deficiency for each surgery and hospital B had an average of 1,600,000 Rials insurance coverage deficiency. Consequently patient have been charged. The total amount was 2700 million and 1,600 million Rials, respectively for each hospital. In the three months of the survey in 2013, the cost difference increased significantly. Hospital A had an average of 4,500,000 Rials insurance coverage deficiency for each surgery, and hospital B had an average of 2,000,000 Rials, insurance coverage deficiency. As a result, during the three month period, direct cost for patients was about 3,900 million Rials in hospital A and 2,200 million Rials in hospital B.

Abbasi Moghaddam's study at the Imam Hospital of Neurosurgery Department in 1994, concluded that cost of all surgeries was higher than global fee except for laminectomy, nasolacrimal. Therefore, it is necessary to increase the rate of global fees for health services, including surgery and hospital services (11). Gholamzade Nikjou in a study at Imam Reza Hospital in Tabriz in 2013 also concluded that the cost of renal transplantation

surgery was higher than global fees. There was a significant relationship between the cost of renal transplantation in non-global cost and the global cost paid by the insurance companies (9).

This showed the hospital responsibility in cost management and clinical management of the patients. In Hospital B, cost management improved in 2013 compared to 2012, and the hospital management could reduce the length of stay and its costs in some items. In general, this hospital showed less difference in global fees and actual costs compare to hospital A. As mentioned earlier, these two hospitals were close in terms of geographical location, number of patients, number of beds, and both were affiliated to Tehran University Medical Sciences, which confirmed that they should have the same protocol for treatment, but showed a large difference in billing cost for various surgeries. As indicated in the previous section, all surgery groups, except for the caesarean section in hospital B, showed less difference compare to hospital A. Accordingly, the cost of some caesarean deliveries in hospital B was not accepted by the insurance company for various reasons, so the difference increased greatly. It seems that the doctors in hospital B performed caesareans which the insurance companies did not approve of and were registered as unacceptable caesareans for the insurance.

This suggests that cost management and clinical management can largely control costs. A study by Arab in the Cancer Institute in 2003-2004 stated that there was a significant difference between the global cost and the actual cost of surgeries. This difference was statistically significant in 2003. Therefore, that the global costs of surgery were higher than actual cost. Some of these differences were related to problems in hospitals that can be solved by management measures, and the rest were related to the insurance companies and the calculation of the global cost of surgery (5). Pirnia and Amani, in a study in Imam Khomeini and Fatemi hospitals in Ardebil, by comparing the global fees and the hospital bill in 2010 stated that hospitals were profitable only if they use a part-time surgeon and have only one day



of stay for each surgery. They also stated that the global cost of Tonsillectomy surgery paid by the insurance company is less than the actual cost and it is necessary to make a substantial adjustment to global fees (12).

Also, it is clear that educational hospitals should pay both the treatment and the training costs. Kayai in a study at Shahid Rajaei hospital in Qazvin in 2006, stated that the cost of global surgeries despite facilitating communication process between the educational hospitals and insurance companies, especially in the centers where residents study, was less than actual costs. Also, results indicated a financial loss in many surgeries such as a hernia, appendectomy, distal forearm fracture and cholecystectomy in the educational hospitals. The difference in the cost in global surgeries in the orthopedic sector where residents were not employed was much less, and in the majority of global surgeries, hospitals received not much profit (13).

These results are not consistent with some studies in other cities: Hosseini Ishpela, in Bushehr in a study in 2011 stated that the difference in costs in 86 % of 1286 investigated cases was in the benefit of the hospital. Based on the results, two common surgeries of caesarean section (32 %) and delivery by a physician (22 %) respectively in 92 % and 81 % of cases brought financial benefit to the hospital (10). Omrany Khoy in a similar study on 1667 patients, conducted in one of Bushehr's hospitals in 2001, concluded that in 34.3 % of patients (570 patients) their bills were higher than their approved global fees while in 65.8 % (1097 patients) the approved global fees were higher than their bill expenses and the difference between the billing expenses and the global fees was significant (15). Nozari in a study at Shahid Faghihi Hospital in Shiraz in 1999 stated that the hospital had financial benefit in twenty cases in the global surgeries that accounts for 92.5 % of the total surgeries, on the other hand, in six cases in the global surgeries which is related to 7.5 % of global surgeries, it faced financial loss (14).

Insurance companies have different point of views in this regard Hajj Ghassemali and

Mahmoudi, in their study in private hospitals under the contract of the Health Insurance Organization in 2003, concluded that, in 3881 examined cases, the highest number of surgery was related to caesarean section by 25 % (n = 976 cases). Also, in all 60 surgeries, except for partial excision of nail matrix, the cost of the global surgery was higher compared to private hospitals, and the total cost of surgeries in the private hospitals for insurance companies was less than governmental hospitals. Due to the high number of surgeries in educational hospitals, especially for caesarean section and delivery, it is likely that it would bring a huge loss for the insurance companies, so authors suggested that the cost of global surgeries should be reviewed in the governmental sector (16).

It seemed that global fees in hospitals affiliated to Tehran University of Medical Sciences, which were generally referenced for complicated patients with underlying illnesses were not commensurate with real costs. The difference between the global fees and actual costs for the hospital will load financial burden to the hospitals in the long term. Generally, university hospitals face a budget deficit, and ultimately patients should pay the costs which lead to a high rate of out-of-pocket costs.

According to a study by Rashidian et al. a variety of financial misconducts can take place in hospitals, such as double counting of the services or the failure to comply with approved fees. Some services such as laboratory tests are considered in global fees, but hospitals may preoperatively deliver these services to the outpatient and charge them and then again receive global money. Although the case mentioned above is in response to the inadequate costs of global surgeries, but it is considered as financial abuse and should be addressed, because the main goal is not to reduce hospital costs, but to reduce the cost of health care system (17).

### Conclusion

Based on the results, it was suggested that the average cost of global cases should be assessed in different hospitals and different settings, and fees should be reviewed and determined according to



the hospital conditions as well as the specific conditions of the patients. Also, the annual increase rate in fees should be in line with the inflation and costs in the educational and therapeutic centers in the recent years. In this regard, hospital authorities should work together to examine the clinical and cost protocols and to use each other's experiences in clinical and costs management.

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### Authors' contributions

Rashidian A and Radinmanesh M designed research; Rashidian A and Radinmanesh M and Arab M conducted research; Radinmanesh M and Afshari M Shahinfar Z wrote the paper. Radinmanesh M had primary responsibility for final content. All authors read and approved the final manuscript.

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