

The Effect of Payment Methods on Dental Service Mix: An Economic Retrospective Cohort Study

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Abstract

Introduction: The number of dental services provided is related to the type of services needed by a population and treatment decision making by dentists. This descriptive study aimed to compare the dental service mix in two different payment systems. **Methods:** The dental records of a long-established dental clinic were reviewed. Treatment performed, during October 2018 and October 2019, by 36 dentists, 12 dentists worked in both payment method periods, 12 of them worked only in salary, and 12 of them worked in fee for service (FFS) period. **Results:** Preventive dental services and practices without treatment (visits, diagnostic radiography, and referrals) decreased, and practices included aggressive treatments (randomized controlled trial, extraction, and crown) and highly aggressive procedure (surgery) increased from salary to FFS period. The total activities of dentists were higher in FFS. **Conclusion:** According to our results, in a salary system, the dentist was more likely to refer and perform preventive treatments, whereas in the FFS payment system, the dentists choose more aggressive treatments. Payment method may change dental service mix.

Keywords: Dentistry, fee for service, fixed payment method, health economy, payment method

BACKGROUND

The knowledge required for dentists have significantly changed. Some issues, such as demographic changes, changing patterns of diseases, new technologies, and economic considerations, can affect the combination of dental services provided.^[1] Dentists are part of the health system although much of their activities in the provision of care is driven by the “profit principle” to maintain the viability of their practices.^[2]

The supply of dental services is frequently associated primarily with the time spent by the dentist.^[3] The type and frequency of services are referred to as service mix.^[4] Factors related to the dental practitioners’ practice style and patients are associated with the service mix in dentistry. Though several studies have attempted to explain the variation in service patterns, most studies have modeled these factors separately or have included only a limited subset of potential sources of influence on service patterns.^[5] Variation in service rates is also related to the dimensions and types of practices.^[6]

Dentist-related factors include the dentist’s practice beliefs, clinical decision-making, and the dentist–patient interaction. Age and the geographic location are also associated with service patterns. Patient-level factors such as nonemergency visits, dental insurance, and socioeconomic status are related to variations in service rates.^[6-8] Economic literature offers theoretical insight into the effectiveness of various remuneration methods in influencing the dentists’ behavior and job satisfaction.^[9,10] Payment mechanisms have significant effects on clinical decision-making.^[11,12]

Payment systems have been manipulated in an attempt to achieve policy objectives and as a strategy to improve the quality of care and management, cost containment, health

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indicators, and efficiency.^[13] There are two major categories of payment methods in dentistry: (1) salary or fixed payment and (2) fee for service (FFS). Primary care dentists are more likely to accept salaried employment in underserved areas compared to the FFS system, as a fixed income provides more financial security.^[14] In a salaried system, the dentist's income depends on the number of hours worked. This payment method is expected as a result to be associated with reduced activity, increased referrals to specialists and hospitals as dentists concentrate on patients who bring with them the lowest demands.^[15]

The FFS and target payments link payment to output and are based on the number of patients. FFS improves clinical activity and is associated with earlier restoration of caries, more frequent appointments, and less preventive advice given to patients. The most important risk for the patient is that the dentist may prescribe excessive treatments and interventions.^[16] Overtreatment occurs among dentists paid by FFS and under treatment may occur in salaried employment where over and under treatment are measured by comparing the prevalence of "complex" treatments with explicit guidelines for those treatments.^[17] The aim of this study was to describe the service mix of private general practitioners and to investigate the association of service mix with the method of payment in one dental clinic that had both of payment methods.

METHODS

In this retrospective cohort study, a clinician from the suburbs of Tehran with more than 35 years of work experience and a history of changing management and payment method was approached. The clinic was first established under the salary system, but the owner decided to change the payment system to the FFS and to outsource its management in 2018. This clinic was selected because it experienced a change in the payment method and had a good paper and computerized archive. The head of the clinic consented to the study. This study was approved by the Ethics Committee of the Tehran University of Medical Sciences (code 42794260).

The records of 36 dentists who worked in both periods of payment methods, nine dentists who worked only in the FFS method, and nine dentists that were only in salaried employment were reviewed. We randomly select patient records from October 1 to 30, 2018 for the salary period and March 1 to 30, 2019 for the FFS period ($n = 85$ records per dentist for each period). The total number of files was 3060.

In case of incomplete information or ambiguity, the records were excluded from the study. Data of specialized services, including orthodontic treatments, implants, and crown lengthening surgery, records of patients under 18 years old, and charity services were excluded. The number of services was then calculated including single visits without treatment, restorations, endodontic treatments, extractions, impacted tooth surgery, radiography without treatment, scaling, and patient referrals. Next, dental services were categorized into four groups:

- (1) practices without treatments (visits, diagnostic radiography, and referrals);
- (2) practices included preventive treatments (simple restorations, and scaling);
- (3) practices included aggressive treatments (randomized controlled trial, extraction, and crown); and
- (4) practices included highly aggressive treatments (surgery).

The differences in dental service mix were compared among 36 dentists. Dentists Nos 1 to 12 worked in both payment methods, dentists Nos 12 to 24 worked only in the salary period, and dentists Nos 25 to 36 worked only in the FFS period.

Statistical analysis was performed by IBM SPSS software statistics for windows version 22 (IBM Corp., NY, US). To assess the effect of the variables, a generalized estimating equation analysis was used. Payment method was considered as a dependent variable and referral, visit, wisdom teeth extraction, molar teeth extraction, frontal teeth extraction, scaling, restoration, endodontic treatment, surgery, crown, and radiography were considered as independent variables.

RESULTS

In the present study, 3060 records containing dental services provided by 36 dentists in a dental clinic that experienced a change in the payment method were reviewed. Table 1 summarizes the results of the activities of 12 dentists, whom worked in both salary and FFS periods. The number of referrals, visits, and radiographies without any procedure decreased ($P < 0.05$) after the payment method changed. The number of restorations increased in the salary group, but the difference was marginally not significant ($P = 0.0501$). The number of dental operations, endodontic treatments, and posterior teeth extractions increased significantly ($P < 0.05$). The total activities of the FFS group ($n = 2554$) were higher than the salary group ($n = 1910$).

Table 2 summarizes the results of the activities of 24 dentists of whom 12 worked only in the salary and 12 worked only in the FFS period. The number of visits without any procedures, referrals, scaling, and restoration was significantly higher in the FFS period compared to the salary period ($P < 0.05$). The rate of radiography without any following procedure was higher in the salary group; however, the difference was not significant ($P = 0.124$). Extraction of molar teeth, surgery, crown, and endodontic therapy was significantly higher in the FFS period ($P < 0.05$). The total activities of the FFS group ($n = 2861$) were higher compared to the salary group ($n = 2624$).

The aggregation of Tables 1 and 2 indicates that rate of radiography, scaling, referrals, and visits was significantly higher in fixed payment period ($P < 0.05$). Extracting wisdom and molar teeth and crown, surgery, and endodontic treatment increased significantly in FFS period ($P < 0.05$). Restoration increased significantly from salary to FFS. The total activities of dentist increased from 3627 in salary group to 4602 in the FFS group.

Table 1: Comparison of services provided by 12 dentists working in payment methods of salary and fee for services (FFS)

Dental services	Salary	FFS	Difference	95% CI		B	SE	P-value
				Lower	Upper			
Radiography	135	111	-24	0.069	-0.037	0.046	0.015	0.030
Extraction of wisdom tooth	188	229	+41	-0.210	-0.760	0.014	0.052	0.040
Extraction of molars	308	561	+253	-0.550	-0.018	0.014	-0.270	0.040
Extraction of frontal tooth	81	91	+10	-0.140	+0.390	0.013	0.012	0.870
Crown	139	330	+191	-0.150	-0.070	0.016	0.015	0.000
Restoration	370	351	-19	-0.640	0.320	0.010	-0.053	0.050
Endodontic therapy	366	598	+233	0.211	0.026	0.014	0.239	0.001
Surgery	22	155	+133	0.210	0.270	0.290	0.155	0.001
Referral	104	41	-63	-0.150	-0.030	0.040	-0.640	0.001
Scaling	125	83	-42	-0.190	0.610	0.059	0.144	0.001
Visit without any following procedure	72	4	-68	0.150	0.349	0.036	-0.329	0.001
Total	1910	2554	+644					

Statistical analysis: Generalized estimating equation model was applied. Model: Intercept. Dependent variable: payment method. Independent variables: dental services. $P < 0.05$ was considered as significant. CI, confidence interval; SE, standard error.

Table 2: Comparison of services provided by 24 dentists who worked in either the salary method or fee for services (FFS)

Dental services	Salary	FFS	Difference	95% CI		B	SE	P-value
				Lower	Upper			
Radiography	120	87	+33	-0.07	0.400	0.015	0.045	0.124
Extraction of wisdom tooth	475	790	+315	-0.21	0.780	0.050	0.014	0.001
Extraction of molars	483	450	+67	-0.35	0.060	-0.27	0.014	0.049
Extraction of frontal teeth	94	101	+81	0.14	0.390	0.012	0.013	0.789
Crown	78	159	+81	-0.19	-0.09	0.150	0.012	0.001
Restoration	532	471	-61	-0.74	-0.32	0.053	0.010	0.001
Endodontic therapy	365	493	+128	0.20	.0255	0.219	0.014	0.001
Surgery	24	93	+69	0.210	0.270	0.155	0.290	0.001
Referral	129	51	-78	-0.13	-0.06	0.640	0.024	0.001
Scaling	250	144	-106	-0.20	0.057	0.134	0.059	0.002
Visit without any following procedure	74	22	52	0.15	2.490	0.304	0.0313	0.020
Total	2624	2861	+237					

Statistical analysis: Generalized estimating equation model was applied. Model: Intercept. Dependent Variable: payment method. Independent variables: dental services. $P < 0.05$ was considered as significant. CI, confidence interval; SE, standard error.

The result of our study shows that preventive services and nontreatment procedures decreased in the FFS period and also shows that aggressive and high aggressive treatments increased from the salary period to the FFS period ($P < 0.05$).

DISCUSSION

The present study was conducted to examine the impact of payment method on the services provided by dentists through reviewing patient records. The results showed that dentists in a fixed salary system, in which the number of patients does not contribute to a rise in income, tended to carry out low-risk treatment services, so the rate of patient referrals and visits without any treatment was high in the salary payment system.

On the other hand, there were more preventive services, including scaling and restorations in the fixed salary group.

In the FFS system, the dentists carried out more patient care and more aggressive services such as endodontic, surgery, and third-level preventive services such as dental crowns because of the fact that their income depended on the number of services.

By reviewing patient records, it was found that dentists in the FFS system provided more services to each patient. The findings of this study were similar to the result of a study by Voinea-Griffin *et al.* conducted in England in 2003. The results of the payment system change in the NHS system from the traditional method to a method with bonus led to more activities of dentists. A first-year assessment of the program revealed that family practitioners accomplished 98% of the available points for clinical indicators, much higher than the predicted 75%.^[18]

Whittaker and Birch found that the same change in the payment method led to some dentists self-selecting “out” of the NHS in England and a redistribution of care provided

under the NHS away from clients with regular visits and toward “hard to reach” client populations.^[19]

Our findings were also similar to a study by Marco in Chile. In this study, the activities of dentists in two periods of using and not using the FFS system were studied. Investigation of the 6-year-old patients’ files showed that the activities of dentists in tooth extraction increased by 22%.^[15]

One of the strengths of this study was to compare the behavior of dentists in two systems in the same working place. This can be a great help in controlling variables such as the inherent behavior of individuals. Variables such as change of the working place were also controlled, and the only change was in the payment method.

We also selected one group of dentists that worked in only one period. The findings of the two groups of dentists were similar. Therefore, the payment method can be considered an effective factor in the decision of dentists.

The limitation of this study was the absence of a payment system other than fixed salary and FFS system. In Iran, unlike many other countries, the capitation payment method is not used. If it was possible to compare with other payment systems, it would be more likely to achieve better results. Another limitation was lack of knowledge about the amount of fixed salary. We only knew the type of system, but we did not know the conditions of the contract. It is recommended that a study be conducted to measure the amount of salary in addition to the payment method to determine the impact of the payment method more clearly.

CONCLUSION

In conclusion, the service mix of dentists shifts toward preventive services in the salary system and toward more treatments activities in the FFS payment system. This study found that the payment mechanism had significant effects on clinical decision-making.

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Conflicts of interest

There are no conflicts of interest.

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