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## REVIEW ARTICLE

# Comparison of dental practice income and expenses according to treatment types in the Japanese insurance system

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**Summary** Dental practice income and expenses according to treatment types were compared in order to obtain information for cost accounting of dental treatments and to establish successful management methods for dental treatments in order to improve the balance of dental clinics.

The results of our study are as follows: (1) For class I restoration for molars, the balance of inlay restoration was higher than that of CR filling, while the balance per minute for CR filling was higher than that for inlay restoration. Inlay restoration would be more profitable for dental clinics with a relatively small number of patients, whereas for clinics with many patients, composite resin filling would be more profitable to increase income. (2) There is a need for a system to increase the number of patients receiving regular dental check-ups. (3) It is important to train dental hygienists to perform regular dental check-ups. (4) There is a need to reconsider the present medical fee points for oral hygiene instruction and root canal treatment because their balance per minute is quite low. (5) It is important to establish a system to increase the number of patients who choose non-insured treatment for crown restorations in order to increase the management balance of dental clinics in Japan.

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## 1. Introduction

In the Japanese social health insurance system, Japanese citizens living in Japan have been covered by social health insurance plans since 1961. Most of the dental practice income in Japan is from insured medical care. Since medical fee points have been publicly determined, the market mechanism does not work for the price of medical and dental services. Thus, there is little interest in cost reductions, including cutting costs so as to win price competition with insured medical care [1]. However, since some medical fees have recently been revised downward, it is considered desirable to manage medical care based on cost accounting [1].

Around 1950, medical fees for insured treatment in Japan were determined according to cost accounting at medical institutions. However, the points for each medical treatment do not reflect costs because the Ministry of Health, Labour and Welfare (MHLW) later revised medical fee points according to its policies rather than cost accounting [2]. Therefore, for the management of dental clinics in Japan, it is important to reconsider these medical fee points so as to improve the entire balance of dental clinics [2].

The statutory health insurance coverage guarantees dental care with the inclusion of prosthetics (except orthodontics, cast/baked porcelain crowns, implants, etc.). Recipients are required to pay 30% of the dental care costs. The co-payment rate for people 70 years of age or older is reduced to 10%, and most municipalities provide medical assistance for infants and children to subsidize the co-payment rate [3]. Moreover, there has been non-insured in addition to insured dental treatment in Japan. Non-insured dental treatment, which includes orthodontics, hybrid ceramic inlay restoration, and cast/baked porcelain crowns, is paid in full by patients. However, it has not been clarified how dental practice income and expenses differ between insured and non-insured treatment.

In Japan, there have been some time studies on dental treatment, but there has been no report on a comparison of dental practice income and expenses according to treatment types. We have carried out a series of preliminary surveys [4–7] to compare dental practice income and expenses according to the types of dental treatment in order to obtain essential information for cost accounting of dental treat-

ments at three dental clinics in Hokkaido, Japan. The present study was carried out to answer the following five clinical questions.

- (1) Which dental practice income and expenses are higher, composite resin (CR) filling or inlay restoration for class I cavities in the occlusal surface of the molars?

CR filling and inlay restoration are common restorative methods for class I cavities in molar teeth in insured treatment in Japan. It has been reported that inlay restoration is better than CR filling in terms of durability in Japan [8]. The restoration method selected should be based on informed consent by the patient; however, it remains unclear which is better from the viewpoint of dental clinic management.

- (2) How are dental practice income and expenses of regular dental check-ups compared with crown restoration treatment and initial periodontal treatment?

The effectiveness of regular dental check-ups has been reported [9,10]; however, consulting a dental clinic for regular dental check-ups depends on positive efforts by the individual and individual dental offices in Japan. The authors considered that regular dental check-ups would lead to a positive appeal from the dentist to patients if regular dental check-ups did not become a “negative factor” in the balance of dental clinic management. Therefore, dental practice income and expenses were compared among regular dental check-ups for adults, crown restoration (CR filling, inlay restoration, cast crown restoration after pulpectomy), and initial periodontal treatment.

- (3) Are medical fee points for oral hygiene instruction valid?

Oral hygiene instruction is one of the main jobs of the dental hygienist in the dental clinic and is important for the patient acquiring appropriate oral self-care. The medical practice income is set to 10.29 US dollars in the Japanese insured system, which we thought to be poorly evaluated. We compared the dental practice income and expenses for oral hygiene instruction with regular dental check-ups for adults, crown restoration (CR filling, inlay restoration, cast crown restoration after pulpectomy), and initial periodontal treatment.

- (4) Are medical fee points for root canal treatment valid?

The difficulty of root canal treatment differs in each part. Generally, treating molar teeth is more difficult than anterior teeth. Whether medical fee points for root canal treatment are appropriate according to treatment time and amount of material used for each tooth has not been examined. We therefore calculated and compared the dental practice income and expenses of root canal treatment among anterior teeth, premolar teeth and molar teeth to determine whether the medical fee points for root canal treatment are appropriate.

- (5) Which dental practice income and expenses are higher, insured or non-insured dental treatment?

Material and labor costs of non-insured treatment are generally higher than those of insured treatment. However, dental practice income for non-insured treatment is also higher than that for insured treatment. Therefore, we examined the difference between dental practice income and expenses for non-insured treatment and those for insured treatment. Dental practice income and expenses for insured treatment and those for non-insured treatment were compared for class I cavities and crown restorations.

In this article, the results of surveys are summarized and management concepts of treatment that are considered to be effective for improving the balance of dental clinics are discussed.

## 2. Procedure

Results of four studies [4–7] at three representative dental clinics in Hokkaido, Japan are reported in this manuscript. The scales of the three dental clinics surveyed were as follows: Clinic A had five full-time dentists and six full-time dental hygienists with 11 dental chairs, Clinic B had one full-time dentist and two full-time dental hygienists with 4 dental chairs, and Clinic C had one full-time dentist and one full-time dental hygienist with 3 dental chairs.

The dental practice income and expenses for each type of treatment were calculated by the following methods [4–7,11]:

- (1) *Balance (US dollars)*: Dental practice income – medical costs

The balance was calculated by subtracting medical costs from dental practice income.

- (2) *Dental practice income (US dollars)*: For insured dental treatment for which the fee is publicly determined, dental practice income was calculated using the Table of Medical Fee Points for Social Insurance Dental Care made by the Ministry of Health, Labour and Welfare [12].

For non-insured dental care paid by the patient, the fee for restoration with hybrid ceramic inlay restoration was set at 261.64 US dollars (including sales tax) and that for restoration with cast/baked porcelain crowns was set at 697.72 US dollars (including sales tax) by reference to the prices at the three (A, B and C) dental clinics.

- (3) *Medical costs*:

- (1) *Material costs (US dollars)*: The quantity of materials used for each treatment was measured three times and the mean value was calculated. The

material costs were determined according to the measured quantity and list prices of the materials used.

- (2) *Costs for dental technicians (US dollars)*: These costs were calculated by referring to the price lists of six dental technician's offices in Hokkaido.
- (3) *Labor costs (US dollars)*: There are two types of labor costs: the dentist's labor costs and the dental hygienist's costs [4,5]. In this study, the labor cost of the dentist, who is the manager of the dental clinic, were excluded so as to make the survey results more practical for individual dental practitioners. The results described in this article were therefore based on labor costs focusing only on dental hygienists [6,7]. These costs were calculated by multiplying the hourly wage of a dental hygienist by chair time. The hourly wage of dental hygienists was calculated on the basis of the Survey on Wage Structure Statistics in 2006 [13]. According to this survey, the average wage for dental hygienists in 2006 was 2627.20 US dollars per month, including bonuses and taxes in Japan. Assuming that the dental hygienist worked 8 h a day, the hourly wage for June with 22 working days was set at 14.93 US dollars.
- (4) *Chair time (minutes)*: The time actually spent on treatment at the chair side (chair time) was determined by discussion with dentists and dental hygienists who had more than 5 years of clinical experience and two dental hygienist who had more than ten years of clinical experience at the three clinics (A, B and C) after the time for each treatment was measured once.
- (5) *Balance per minute (US dollars/minute)*: Balance/Chair time.

This was calculated to examine managerial efficiency per minute by dividing the balance by chair time.

This calculation is reported to two decimal places. One US dollar was calculated as 114.66 yen by referring to the value in June 2006.

## 3. Comparison of dental practice income and expenses of CR filling and inlay restoration for class I cavities in the occlusal surfaces of molars

*Subjects*: (1) CR filling, (2) Inlay restoration.

Dental practice income and expenses for both treatments were compared to clarify which treatment should be given priority by the management.

As shown in Table 1, dental practice income, material costs and costs for dental technicians, and labor costs for inlay restoration were higher than those for CR filling. Chair time for inlay restoration was longer than CR filling. Therefore, the balance of inlay restoration was higher than that of CR filling, while the balance per minute for CR filling was higher than that for inlay restoration. These results suggested that inlay restoration would be more profitable for a dental clinic with a relatively small number of patients, whereas for a clinic with many patients without sufficient chair time, it would be better to choose CR filling to increase income.

**Table 1** Comparison of dental practice income and expenses for inlay restoration and CR filling for class I cavities in molars.

	Inlay restoration	CR filling
Dental practice income (US dollars)	49.19	24.24
Material costs and costs for dental technicians (US dollars)	18.50	1.19
Labor costs (US dollars)	10.37	3.81
Balance (US dollars)	20.32	19.24
Chair time (minutes)	41.70	15.30
Balance per minute (US dollars/minute)	0.49	1.25

Source: Refs. [6].

Thus, Table 1 suggests that the dentist has to base his/her decision of which treatment type (CR filling or inlay restoration) is better for management of the dental clinic on the number of patients visiting the dentist’s office to effectively maximize income for the dental office.

#### 4. Comparison of the dental practice income and expenses for regular dental check-ups with those for crown restoration treatment and initial periodontal treatment

*Subjects:* (1) regular dental check-ups for adults, (2) inlay restoration, (3) CR filling, (4) cast crown restoration after pulpectomy, (5) oral hygiene instruction, (6) scaling, (7) scaling and root planing (SRP).

Dental practice income and expenses were compared for regular dental check-ups for adults, crown restoration (CR filling, inlay restoration, cast crown restoration after pulpectomy), and initial periodontal treatment (oral hygiene

instruction, scaling and SRP) to justify regular dental check-ups based on the business model.

In this manuscript, regular dental check-ups are treated to be covered by insurance, since patients visiting dental clinics for regular dental check-ups are diagnosed as having slight gingivitis and undergone periodontal tissue examination, oral hygiene instruction and scaling.

As shown in Table 2, the balance per minute was large in order of CR filling, regular dental check-ups for adults, cast crown restoration after pulpectomy, scaling, inlay restoration, SRP and oral hygiene instruction. The balance per minute for regular dental check-ups for adults was greater than the balances per minute for inlay restoration, cast crown restoration after pulpectomy and three initial periodontal treatments.

It can be noticed that the balance per minute of regular dental check-ups for adults is higher than that of initial periodontal treatment such as oral hygiene instruction, scaling and SRP because dental practice income from regular dental check-ups for adults was higher than that of initial periodontal treatment. It was also shown that the balance per minute of regular dental check-ups was higher than that of cast crown restoration after pulpectomy, although dental practice income from regular dental check-ups was lower than that of cast crown restoration after pulpectomy.

One reason for this is that the material cost of regular dental check-ups is low because the main materials used are plaque-disclosing solutions and tooth polishing pastes, without the gypsum, metals and dental technicians’ fees needed for cast crowns and inlays. In addition, regular dental check-ups can be conducted mainly by a dental hygienist, while the other three crown restoration procedures (inlay restoration, CR filling, cast crown restoration after pulpectomy) are performed mainly by the dentist. In other words, the dentist has more time to treat other patients when dental hygienists perform regular dental check-ups. This indicated that if the dentist can secure a dental hygienist and a dental chair for regular dental check-ups for

**Table 2** Comparison of dental practice income and expenses among regular dental check-ups for adults, crown restoration, and initial periodontal treatment.

	Regular dental check-ups for adults	CR filling	Cast crown restoration after pulpectomy	Inlay restoration
Dental practice income (US dollars)	60.00	24.24	216.19	49.19
Material costs and costs for dental technicians (US dollars)	0.45	1.19	52.09	18.50
Labor costs (US dollars)	12.85	3.81	45.94	10.37
Balance (US dollars)	46.70	19.24	118.17	20.32
Chair time (minutes)	51.70	15.30	184.70	41.70
Balance per minute (US dollars/minute)	0.90	1.25	0.64	0.49
	Scaling	SRP	Oral hygiene instruction	
Dental practice income (US dollars)	19.88	26.69	10.29	
Material costs and costs for dental technicians (US dollars)	0.40	1.67	0.046	
Labor costs (US dollars)	5.56	10.11	7.13	
Balance (US dollars)	13.92	14.90	3.11	
Chair time (minutes)	22.30	40.70	28.70	
Balance per minute (US dollars/minute)	0.62	0.37	0.11	

Source: Refs. [6,7] modified.

adults, it will be possible to improve the entire management balance of the dental clinic by increasing the number of patients who visit the clinic for regular dental check-ups.

However, this result does not apply to all dental clinics. There is a possibility that income will decrease in the dentist's office if one of the dental chairs is used for regular dental check-ups. For instance, it is assumed that the balance decreases by performing regular dental check-ups when the balance per minute of other dental treatments is higher than that of regular dental check-ups. Therefore, it is thought that regular dental check-ups will improve the balance of the dental clinic for the following cases: (1) when one dental chair is always empty and can be used for only regular dental check-ups or if the dental office can obtain a dental chair without charge and (2) when there is an adequate number of dental hygienists who are well-trained and can take charge of regular dental check-ups for patients.

Although it is possible to improve the entire balance of a dental clinic by increasing the number of patients who visit the dental clinic for regular dental check-ups, it is necessary to make an effort to maintain and increase the number of patients who visit the dental clinic for regular dental check-ups. The authors considered the possibility that the key to continuing regular dental check-ups is rooted in patient satisfaction. The authors performed a survey on patient satisfaction with tooth cleaning in regular dental check-ups after periodontal treatment. The results showed that feeling refreshed and receiving sufficient explanation significantly improved patient satisfaction [14].

Thus, there is a need to train dental hygienists to carry out regular dental check-ups and provide patients with a refreshed feeling and sufficient explanation.

## 5. Validity of medical fee points for oral hygiene instruction

*Subjects:* (1) regular dental check-ups for adults, (2) inlay restoration, (3) CR filling, (4) cast crown restoration after pulpectomy, (5) oral hygiene instruction, (6) scaling, (7) scaling and root planing (SRP).

Dental practice income and expenses for oral hygiene instruction were compared with those for other initial periodontal treatment, crown restorations and regular dental check-ups for adults to determine whether the medical fee points for oral hygiene instruction are appropriate.

As Table 2 shows, the balance per minute was large in the order of CR filling, regular dental check-ups for adults, cast crown restoration after pulpectomy, scaling, inlay restoration, SRP and oral hygiene instruction. The balance per minute of oral hygiene instruction was the lowest of the seven procedures, only about one third to one eleventh, and

the chair time for oral hygiene was 28.7 min. Even so, actual chair time that can be used for instruction was less than 28.7 min, because the time for examination by the dentist, clean-up time and time required for preparation for the next treatment are included in the 28.7 min.

Oral hygiene instruction is an important procedure prior to periodontal treatment [15]; however, in the present system of insured treatment in Japan, it is difficult for dental hygienists to provide effective oral hygiene instruction to encourage patients to change their lifestyle habits. Therefore, dental hygienists have to provide effective instruction in a short time, and there is a need to reconsider the present medical fee points for oral hygiene instruction.

## 6. Validity of medical fee points for root canal treatment

*Subjects:* Root canal treatment (anterior teeth, premolar teeth and molar teeth).

Dental practice income and expenses for root canal treatments were calculated and, compared among anterior teeth, premolar teeth and molar teeth. Table 3 shows that the balances per minute were 0.18 US dollars for anterior teeth, -0.05 US dollars for premolar teeth and -0.86 US dollars for molar teeth. These results indicate that the balance for root canal treatment of premolar and molar teeth would surely be negative at the dental clinic. In addition, medical costs also include various other costs, such as costs of drugs, costs of supplies, depreciation expenses, rent, and lease fees for medical equipment [16,17]. Therefore, the negative balances in this study suggest that dental clinics are actually suffering a large deficit from root canal treatment. In insured medical treatment, minimizing the frequency and chair time for root canal treatment may lead to an improved balance for dental clinics. Dentists must be more conscious of the costs for root canal treatment under the Japanese insured dental care system. However, considering that root canal treatment of a molar tooth is difficult and often requires several visits, the present medical fee points for root canal treatment need to be reconsidered.

## 7. Comparison of dental practice income and expenses for insured dental treatment and non-insured dental treatment

*Subjects:* (1) insured 12% gold-silver-palladium alloy inlay restoration, (2) non-insured hybrid ceramic inlay restoration, (3) insured hard resin facing cast crown restoration after pulpectomy, (4) non-insured cast/baked porcelain crowns after pulpectomy.

**Table 3** Comparison of dental practice income and expenses for root canal treatment by each type of tooth.

	Anterior teeth	Premolar teeth	Molar teeth
Dental practice income (US dollars)	4.53	5.23	5.76
Material costs (US dollars)	0.55	0.66	1.16
Labor costs (US dollars)	3.80	4.62	5.45
Balance (US dollars)	0.18	-0.05	-0.86

Source: Refs. [5] modified.

**Table 4** Comparison of balances for insured and non-insured dental treatments by each type of tooth.

		Balance		
		Anterior teeth	Premolar teeth	Molar teeth
Inlay restoration	Insured treatment (US dollars)		19.22	18.40
	Non-insured treatment (US dollars)		211.12	210.38
Cast crown restoration after pulpectomy	Insured treatment (US dollars)	142.47	91.00	106.04
	Non-insured treatment (US dollars)	576.13	593.75	605.61

Source: Refs. [4,5] modified.

Dental practice income and expenses for the two types of treatment were compared in clinic A. We compared non-insured hybrid ceramic inlay restoration with insured 12% gold–silver–palladium alloy inlay restoration for molar teeth with class I cavities. As for crown restorations for anterior teeth, hard resin facing cast crown restoration after pulpectomy in insured cases and restorations made with cast/baked porcelain crowns after pulpectomy in non-insured cases were examined.

As for crown restorations for molar teeth, restorations with 12% gold–silver–palladium alloy cast crowns after pulpectomy for insured cases and restorations made with cast/baked porcelain crowns after pulpectomy for non-insured cases were examined.

As shown in Table 4, it was found that the balance of non-insured hybrid ceramic inlay restoration was greater than that of insured 12% gold–silver–palladium alloy inlay restoration by about 11.0 times for premolar teeth and 11.4 times for molar teeth.

The balance of non-insured restoration with cast/baked porcelain crowns was greater than that of insured cast crown restoration by about 4 times for anterior teeth, 6.5 times for premolar teeth and 5.7 times for molar teeth. These results suggest that the entire management balance of dental clinics will improve if the number of patients selecting non-insured treatment for crown restorations increases. It is important to establish a system in which the advantages of the materials used in non-insured treatment are explained sufficiently in order to increase the number of patients who choose non-insured treatment for crown restorations over insured treatment.

## 8. Limitations

The results of our studies apply to dental clinics on similar scales to A, B and C dental clinics, but the results cannot be applied to dental clinics of other sizes in Japan. Moreover, dental practice income and medical costs depend on many factors other than those examined in our survey. Other factors that influence medical income and medical costs are utility expenses (gas, water, electricity, drugs, supplies, depreciation expenses, rent, lease fees for medical equipment, etc.) and the lease and payment to use dental facilities. We examined only some elements that are common to most dental clinics and that have direct effects on the balance of all treatments. However, results of further studies that are conducted in more detail and at many more dental clinics in consideration of different scales and regions will provide accurate information that would be

helpful for determining medical fee points according to cost accounting.

## 9. Conclusions

The results of our studies suggest that the following would be effective for improving the entire management balance of dental clinics in Japan:

- (1) For class I restoration for molars, the balance of inlay restoration was higher than that of CR filling, while the balance per minute for CR filling was higher than that for inlay restoration.
- (2) There is a need to create a system to increase the number of patients receiving regular dental check-ups.
- (3) It is important to train dental hygienists to take charge of regular dental check-ups for adults.
- (4) There is a need to reconsider the present medical fee points for oral hygiene instruction and root canal treatment.
- (5) In insured dental treatment, minimizing the frequency and chair time for root canal treatment may lead to improved management balance of the dental clinic.
- (6) It is important to establish a system to increase the number of patients who choose non-insured treatment for crown restorations in order to increase the management balance of dental clinics in Japan.

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