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ORIGINAL ARTICLE

Reimbursement systems influence prosthodontic treatment of adult patients

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Abstract

Objective. To evaluate the influence of reimbursement system and organizational structure on oral rehabilitation of adult patients with tooth loss. ***Materials and methods.*** Patient data were retrieved from the databases of the Swedish Social Insurance Agency. The data consisted of treatment records of patients aged 19 years and above claiming reimbursement for dental care from July 1, 2007 until June 30, 2009. Before July 1, 2008, a proportionately higher level of subsidy was available for dental care in patients 65 years and above, but thereafter the system was changed, so that the subsidy was the same, regardless of the patient's age. Prosthodontic treatment in patients 65 years and above was compared with that in younger patients before and after the change of the reimbursement system. Prosthodontic treatment carried out in the Public Dental Health Service and the private sector was also analyzed. ***Results.*** Data were retrieved for 722,842 adult patients, covering a total of 1,339,915 reimbursed treatment items. After the change of the reimbursement system, there was a decrease in the proportion of items in patients 65 years and above in relation to those under 65. Overall, there was a minimal change in the proportion of treatment items provided by the private sector compared to the public sector following the change of the reimbursement system. ***Conclusions.*** Irrespective of service provider, private or public, financial incentive such as the reimbursement system may influence the provision of prosthodontic treatment, in terms of volume of treatment.

Key Words: *insurance, financial incentives, prosthodontics*

Introduction

Compensation principles and financial incentives are intended to reward certain behaviors. Desirable behavior should be based on objectives that the individual or the organization wants to achieve, often in terms of efficiency, but it may also be concerned with such aspects as fairness and equality of distribution of a service. Theoretically, the performance-based principle offers a financial incentive to increase output. Advocates argue that, in healthcare, applying this principle will improve quality and safety, reduce costs and lead to improved population management compared to other compensation systems [1]. A disadvantage of an incentive program that addresses specific areas may be that it indirectly reduces the contribution to other important areas that may be more urgent.

Understanding how clinicians respond to incentives from payment schemes is a central concern in health economic research [2]. According to a recent Cochrane Review, financial incentives may be effective in changing professional healthcare practice [3]. Thus, there is evidence that financial incentives significantly influence the delivery of medical care [4–6]. The results of studies by Croxson et al. [7] and Devlin and Sarma [8] also support physicians' responsiveness

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to payment incentives. Gaynor and Pauly [9] found that payment incentives affected the 'produced' quantity of medical services. Not all studies, however, support the strong link between payment incentives and physicians' responses in the provision of care [10,11]. In a Norwegian study of general medical practitioners, it emerged, after controlling for characteristics of the patients and the doctors, that the payment system had only a minor impact on physicians' behavior [12]. A recent systematic review of economic evaluation of fee-for-service reimbursement systems disclosed inadequate and inconclusive evidence to support its efficiency in healthcare [13].

To our knowledge, there are few studies on the influence of financial incentives on the delivery of dental services. One such study, by Tickle et al. [14], showed that the changes in the incentive structure for dentists in England, introduced in 2006, led to major changes in the provision of dental treatment. Similar findings were presented by Woods et al. [15].

In Sweden, oral healthcare is provided either by the Swedish Public Dental Health Service (PDHS in *Swedish* Folktandvården) or by the private sector. In the PDHS, which was founded in 1938, dentists are paid a monthly salary, not directly related to performance. Private dental practitioners are independent contractors, free to set up their dental office wherever they choose, and their compensation is related to their performance. Regardless of organization, oral healthcare is financed by three parties: the state, through the National Dental Health Insurance Scheme of the Swedish Social Insurance Agency (*Swe.* Försäkringskassan), the county councils and the patients themselves.

All oral healthcare of patients under 19 years of age (including the full year in which they turn 19) is free of charge to the patient, funded by taxes with a capitated fee per patient. Adult care, of patients above 19 years, is financed partly by patient charges and partly by the Swedish Social Insurance Agency to different levels, depending on the treatment modality. A high-cost threshold applies, i.e. the National Dental Health Insurance Scheme finances a larger proportion of the cost of more expensive treatment. Briefly the system before July 2008 favored patients of 65 years and above through a reimbursement of all costs for prosthodontic measures exceeding SEK 7700 (≈ €815), while after July 2008 all patients, independent of age, had to pay the same amount of patient fee and the generous reimbursement for prosthodontic measures for the elderly decreased, regardless of care provider. After July 2008 all adult patients receive a minor annual financial support of ~ SEK 300 (≈ €32). Above a cost of SEK 3000 (≈ €320) this support increases to 50% and above a cost of SEK 15,000 (≈ €1600) to 85%.

During the period from 1989–2009, several reforms to the dental benefits scheme were introduced, with subsequent changes to the levels of reimbursement from the National Dental Health Insurance Scheme, which pays for items of service according to claim forms submitted by the dentists. These reforms present an opportunity to analyze the potential influence of two different subsidy schemes on the delivery of dental care.

Aims

To evaluate the influence of the reimbursement system and organizational structure on the provision of prosthodontic measures in the rehabilitation of adult patients with tooth loss. The specific aims were to test the following hypotheses:

- The design of the reimbursement system influences the volume and type of modality of prosthodontic treatment as financial incentives have previously been shown to affect the provision of medical care.
- The changes in the reimbursement system have a greater impact on the private sector than on the public sector as the private sector is more influenced by economic incentives and provides dental treatment primarily of adult patients.

Materials and methods

Context of the study

In 2003, the reimbursement system of the National Dental Health Insurance Scheme was—as mentioned above—changed so that a proportionately higher level of subsidy was available for dental care in patients aged 65 years and above. Older patients often exhibit some degree of tooth loss and, thus, have a greater need for prosthodontic procedures than younger patients. On July 1, 2008, a new system of reimbursement was introduced, under which patients aged 65 years and above were no longer entitled to preferential subsidies for treatment. The high-cost threshold, implying a proportionally higher subsidy for expensive procedures, such as tooth- or implant supported constructions, remained, but was proportionally less for patients of 65 years and above than it had been from 2003 to June 30, 2008. Another important change introduced on July 1, 2008 was that only treatment approved and listed by the Swedish Dental and Pharmaceutical Agency as relevant and cost-effective would be eligible for subsidy [16].

Until June 2009, subsidies for treatment initiated before June 30, 2008 were allowed under the old reimbursement system, even in cases where some of the treatment was provided after the change in the system. The two systems, thus, existed concurrently from July 1, 2008 to June 30, 2009.

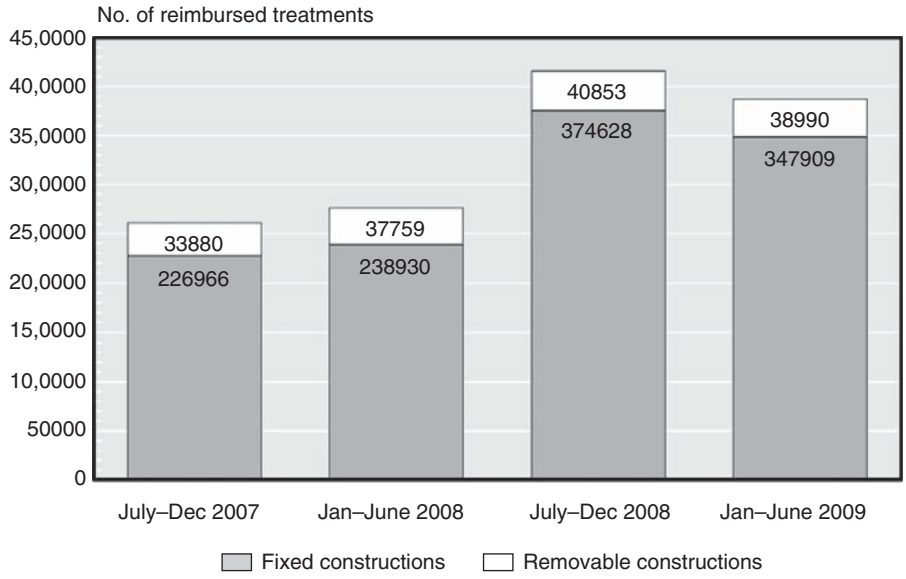

Figure 1. Number of reimbursed prosthodontic items from July 1, 2007 to June 30, 2009. The change of the reimbursement system occurred on July l, 2008.

The data

The data source comprised the payment claims submitted by dentists for reimbursement for prosthodontic treatment to the National Dental Health Insurance. The data analyzed consisted of records of patients 19 years and above with claims from July 1, 2007 to June 30, 2009. The reason for this is the following: First, the data from the National Dental Health Insurance was computerized, and this reduced the risk of missing data. Second, the change in the reimbursement system occurred in the middle of this period.

The retrieved data covered patient sex and age, county council where treatment was delivered, specific treatment codes ('reimbursement codes') and number of items, as well as whether the treatment was performed by a dentist working in the private or public sector. Information on individual patients was decoded in a manner that patients could be identified only as a number.

The retrieved data from the National Dental Health Insurance does not include any information about income, education or other socio-economic conditions.

Ethics

This study was approved by the local ethics committee at Karolinska Institutet, Stockholm, Sweden (Dnr 2010/641-31).

Statistics

Data are presented as frequencies and percentages. No statistical tests were performed since the data describe all patients in a large population, not a random sample, and the data are used descriptively. The eventual differences found are actual differences and a statistical test would always be significant due to the large number of observations.

Results

Data for 722,842 adult patients, covering a total of 1,339,915 treatment items, were obtained from the database over the 2 years. Figure 1 illustrates the total number of reimbursed prosthodontic items. Compared to the first half of 2008, the number of reimbursed treatments during the second half of 2008 increased by 138,792 (50%).

The hypothesis 'The design of the reimbursement system influences the volume and type of modality of prosthodontic treatment' was verified. After the change in the reimbursement system (July 1, 2008), there was a decrease in the proportion of

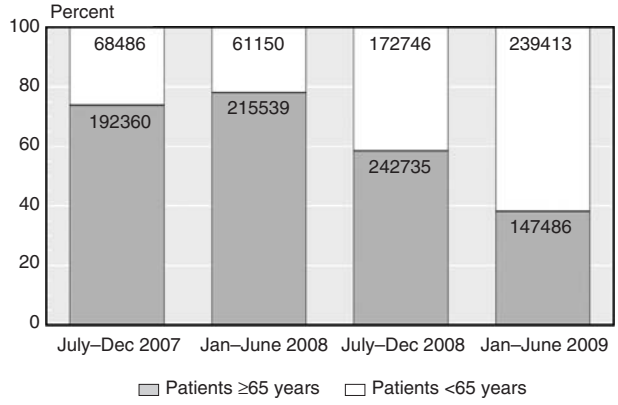

Figure 2. Number (*n*) and proportion of patients of 65 years and above in relation to patients below 65 years for all reimbursed prosthodontics treatment items. The change of the reimbursement system occurred on July 1, 2008.

Table I. Number of different reimbursed prosthodontics items from July 1, 2007 to June 30, 2009, the percentage performed in patients 65 years and above and the percentage performed in the private sector.

	Old reimbursement system		New reimbursement system	
Treatment	Jul–Dec 2007	Jan–June 2008	July–Dec 2008	Jan–June 2009
Pontic, tooth or implant (*n*)	42,391	45,112	69,321	64,314
Percentage of patients 65 years and above	81%	86%	62%	39%
Percentage treated in private sector	77%	79%	78%	78%
Crown, resin-bonded to tooth (*n*)	1,681	1,709	3,060	3,141
Percentage of patients 65 years and above	37%	41%	39%	38%
Percentage private sector	40%	47%	48%	55%
Implant-supported crown (*n*)	13,672	14,844	12,908	10,774
Percentage of patients 65 years and above	84%	87%	92%	94%
Percentage private sector	78%	80%	77%	87%
Tooth-supported crown (*n*)	169,011	177,053	289,095	269,567
Percentage of patients 65 years and above	72%	77%	54%	36%
Percentage private sector	78%	80%	81%	80%
Removable partial dental prosthesis (temporary) (*n*)	9,232	9,015	12,801	11,921
Percentage of patients 65 years and above	62%	66%	54%	45%
Percentage private sector	59%	60%	66%	62%
Removable partial dental prosthesis (with metal framework) (*n*)	8,423	9,448	11,892	12,821
Percentage of patients 65 years and above	58%	69%	60%	53%
Percentage private sector	46%	54%	54%	54%
Complete denture, maxilla or mandible (*n*)	11,904	15,066	11,817	12,075
Percentage of patients 65 years and above	80%	70%	92%	62%
Percentage private sector	59%	62%	65%	60%
Fixed prosthesis, maxilla or mandible (*n*)	4,321	4,230	4,343	2,173
Percentage of patients 65 years and above	95%	95%	93%	34%
Percentage private sector	82%	81%	80%	91%
Over-denture, edentulous jaw (*n*)	211	212	244	113
Percentage of patients 65 years and above	85%	90%	91%	62%
Percentage private sector	62%	65%	64%	70%
Total number of reimbursed items (*n*)	260,846	276,689	415,481	386,899
Percentage of patients 65 years and above	74%	78%	58%	38%
Percentage private sector	75%	77%	78%	78%

reimbursement for prosthodontic treatment in patients aged 65 and above in relation to those aged under 65 (Figure 2).

Table I presents the number of different reimbursed prosthodontic items, the proportion of prosthodontic items delivered to patients 65 years and above, and the proportion of items provided by the private sector. The proportion of elderly patients, who received fixed dental prostheses and tooth-supported single crowns, decreased after July 1, 2008.

As seen in Figure 3, ~80% of the reimbursed prosthodontic treatment was provided by the private sector. There was, however, a difference between the sectors with respect to the treatment modality provided. The private sector accounted for ~60% or less of the treatment with removable dental prostheses, but

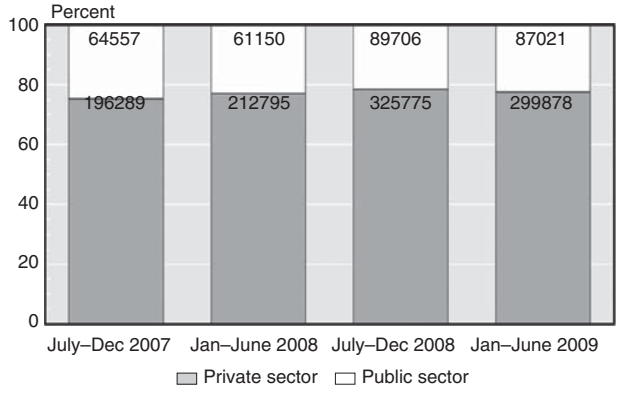

Figure 3. Number (*n*) and proportion of all reimbursed prosthodontic treatment items performed in the public and private sector. The change of the reimbursement system occurred on July 1, 2008.

~80% of fixed constructions. Overall, there was a minimal change in the proportion between the private and the public sectors following the change in the reimbursement system. Thus, the second hypothesis 'The changes in the reimbursement system have a greater impact on the private than on the public sector' was rejected. As shown in Table I, in 2009 there was an increase of the provision of implant-supported single crowns and fixed dental prostheses in the private sector.

Discussion

The volume and type of dental prosthodontic treatment changed following the change of the reimbursement system, indicating that reimbursement systems have an impact on the rehabilitation of adult patients with tooth loss. Our results are in accordance with earlier studies [14,17,18]. For example, Tickle et al. [14], found that changes in incentive structures had a substantial impact on dentists' behavior in England and Wales. When the incentive system changed from reimbursement per item of service delivered to providing a certain dental activity, treatment procedures that took relatively less time increased, while more time-consuming treatments decreased.

Voinea-Griffin et al. [19] have analyzed whether pay-for-performance would be appropriate for delivery of dental care and argue that research by the dental profession and health services is necessary to: (1) expand the knowledge base; (2) increase considerably evidence-based clinical guidelines; and (3) create evidence-based performance measures linked to existing clinical practice guidelines. While we agree in principle, it is important to note that, as there is insufficient evidence to support the effectiveness of most prosthodontic treatment modalities [20], the guidelines are not strictly evidence-based.

As prosthodontic treatment is expensive, the dentists are motivated to submit claims for reimbursement to the National Dental Health Insurance Scheme without delay. We therefore assume that the database of 1,339,915 reimbursed treatment items covered the vast majority of all prosthodontic care and allowed us to analyse the different treatment modalities. Although the data are of high quality, there is inevitably the potential for errors to occur in recording or transcription. Furthermore, the two reimbursement systems coexisted from July 1, 2008 to June 30, 2009. During this period, treatment initiated before July 1, 2008 (i.e. during the earlier reimbursement system, which subsidized patients 65 years and above) could be completed under the earlier reimbursement system until June 30, 2009. The consequences of the dual system were analyzed and presented in the SBU report 'Prosthetic rehabilitation of partially dentate or edentulous patients' [20]. It was found that much of the prosthodontic treatment for patients aged 65 years and above, registered between July–December 2008, was covered by the earlier reimbursement system. This implies that the effect of the change of reimbursement system was in fact more substantial than disclosed by our analysis and that our findings are, therefore, conservative. Although the number of reimbursed items is high, the time periods analyzed in our study were somewhat limited. A further analysis of the long-time effect of the reimbursement system on prosthodontic treatment would be useful.

Although the number of prosthodontic treatment items may be a fairly blunt instrument for presenting rehabilitation of patients with tooth loss, we conclude that the reimbursement system in effect from 2003–2008 seems to have achieved its purpose of facilitating dental care in the elderly. More patients aged 65 years and above were treated during this time. The cost threshold of complex dental procedures, such as dentures, implants and crowns, is high. Over a period from 1989–1999, there was a dramatic increase in the demand for implant treatment, but cost was the most commonly cited barrier to treatment [21]. The subsidies provided under the reimbursement system introduced in 2003 lowered the threshold, even though the patients still had to pay most of the costs. Since then, implant-supported reconstructions have gained increased acceptance for treatment of patients with tooth loss, although the designs vary somewhat from country to country [22]. Currently prosthodontic rehabilitation of Swedish patients with tooth loss is mainly in the form of tooth- and/or implant-supported fixed dental prostheses [20]. This tendency seems to be more pronounced in the private than in the public sector. Since no data are available about socioeconomic factor for the treated patients, we were not able to control for confounders in our data analysis.

Although more patients aged 65 years and above could, with subsidies, avail themselves of expensive dental care, one has to ask 'Will the patient or the dentist benefit from such a change in the reimbursement system?' Probably the aim of the state is that patients should be informed about their rights and, thus, about changes to subsidies for health and welfare. With respect to treatment of patients with tooth loss, the issues of both autonomy and the right to information are highly relevant. As there is only limited scientific evidence available about the expected benefits, in particular on outcomes at patient level (patient satisfaction, quality-of-life, etc.) [22–24], it may be difficult for the dentist to provide patients with reliable information on which they can make a decision. Furthermore, discrepancies have been reported between patients and caregivers with respect to the patients' oral quality-of-life, with caregivers over-estimating the burden of dental conditions, especially in older patients [25]. A higher subsidy to a special patient category, however laudable in terms of acknowledging their greater treatment need, may lead to an increased tendency to give preference to patients eligible for the higher subsidy, in order to maintain income (or

maximize profits). There may also be a risk, as shown in medical practice [9], of an increase in the quantity of non-indicated treatment items. In the analysis we had access only to the quantity of treatment units provided, not the quality. Incentive systems, which focus on quantity, may lead to lower quality, which may be more difficult to study.

These results did not show that, in general, the change of the reimbursement system had a greater impact on the private than on the public sector. As dentists in the public dental service are paid a monthly salary not directly related to performance, it was anticipated that they would be less influenced by a change of the reimbursement system. However, in recent years the public sector has also experienced economic constraints; as a result, there is heightened awareness of budget issues. Thus, in this context, the differences between the public and private sectors have diminished. Nevertheless, the precise nature and strength of the relationship between organization of oral healthcare and treatment patterns remains a source of contention among investigators.

Conclusion

The insurance system and the regulations governing dental care clearly influence demand for and delivery of prosthodontic treatment. In the context of this study, the organization, whether private or public, did not influence the proportion of care provided.

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