Linking Research to Clinical Practice

Is Non–Surgical Periodontal Therapy Cost Effective?

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The purpose of Linking Research to Clinical Practice is to present evidence based information to clinical dental hygienists so that they can make informed decisions regarding patient treatment and recommendations. Each issue will feature a different topic area of importance to clinical dental hygienists with a Conclusion to translate the research findings into clinical application.

Introduction

There has been interest recently in the cost effectiveness of various health care treatment options, including non–surgical periodontal therapy (NSPT) and periodontal surgery. Cost effectiveness is determined by the outcomes of a treatment option and its relative cost. Also, a recent review was conducted as an economic analysis of the U.S. periodontal service market with services being delivered by general dentists, dental hygienists and periodontists. An economic analysis is a systematic approach used to estimate the most appropriate use of resources and may also be used to compare 2 different business approaches to delivery of services to consumers. Most dental hygienists likely perceive the NSPT care they provide to be economical and cost effective for their patients, but very few studies have analyzed this notion.

Based on the findings of these 2 studies, the following conclusions can be drawn:

- An economic analysis using data from 2000 to 2009 found that dental hygienists in the U.S. provide almost all NSPT. The vast majority of NSPT also is being delivered in general dental practice settings. Additionally, 95% of all adult oral prophylaxes, the most common procedure delivered in the U.S., were rendered in general dental practices. ADHA policy has defined the discipline of dental hygiene as ”the art and science of preventive oral health care including the management of behaviors to prevent oral disease and promote health.” These data provide evidence to support that definition of the discipline.
- Clinical outcomes have been shown to be equal when periodontal surgery is compared to NSPT, especially in periodontal pockets of 4 to 6 mm.
- The increase in demand for NSPT services over the past 20 years provides evidence for the strength of the market. There is virtually no alternative to NSPT for patients with periodontitis, other than surgery or extraction of teeth. These alternatives are relevant when teeth are affected by severe periodontitis.
- Estimated hourly earnings in a dental practice from scaling and root planing are estimated at 6 to 9–times greater compared with oral prophylaxis.
- NSPT costs significantly less than periodontal surgery over 12 months, including maintenance therapy. Although significant money could be saved on average by performing NSPT instead of surgery, surgery reduced the need for supportive care and systemic antibiotics.
- At 12 months, both nonsurgical and surgical periodontal treatment modalities have been shown to be equally effective with <1% of all subjects having periodontal probing depths ≥3 mm.

The following 2 abstracts provide evidence for the economics and cost effectiveness of NSPT, the majority of which is provided by dental hygienists.

Flemming T, Beikler T. Economics of periodontal care: market trends, competitive forces and incentives. *Periodontol 2000*. 2013;62(1):287-304.

Abstract: The adoption of new technologies for the treatment of periodontitis and the replacement of teeth has changed the delivery of periodontal care. The objective of this review was to conduct an economic analysis of a mature periodontal service market with a well-developed workforce, includ-

ing general dentists, dental hygienists and periodontists. Publicly available information about the delivery of periodontal care in the USA was used. A strong trend toward increased utilization of nonsurgical therapy and decreased utilization of surgical periodontal therapy was observed. Although periodontal surgery remained the domain of periodontists, general dentists had taken over most of the nonsurgical periodontal care. The decline in surgical periodontal therapy was associated with an increased utilization of implant-supported prosthesis. Approximately equal numbers of implants were surgically placed by periodontists, oral and maxillofacial surgeons, and general dentists. Porter's framework of the forces driving industry competition was used to analyze the role of patients, dental insurances, general dentists, competitors, entrants, substitutes and suppliers in the periodontal service market. Estimates of out-of-pocket payments of self-pay and insured patients, reimbursement by dental insurances and providers' earnings for various periodontal procedures and alternative treatments were calculated. Economic incentives for providers may explain some of the observed shifts in the periodontal service market. Given the inherent uncertainty about treatment outcomes in dentistry, which makes clinical judgment critical, providers may yield to economic incentives without jeopardizing their ethical standards and professional norms. Although the economic analysis pertains to the USA, some considerations may also apply to other periodontal service markets.

Commentary

This article reported the results of an economic analysis of periodontal services provided in the U.S. Although the data used is from 2000 to 2009, the analysis was completed in 2014 and trends reported seem to remain relevant today. As indicated in the abstract, the analysis showed a shift of the type of periodontal care from periodontal surgeries to nonsurgical periodontal therapy. This Journal of Dental Hygiene commentary focuses on the portions of the economic analysis that are related to NSPT and periodontal maintenance procedures delivered by dental hygienists. Flemming and Beikler noted that periodontal care is provided by dental hygienists, general dentists and periodontists. In 1990, 3 out of 4 scaling and root planing procedures were delivered by periodontists, and in 2005 to 2006, 9 out of 10 of these procedures were rendered in general dental practices. The authors further stated that dental hygienists in the U.S. "provided almost all nonsurgical periodontal therapy." Additionally, the economic analysis indicated that 95% of all adult oral prophylaxis, the most common single procedure delivered in dentistry in the U.S., were rendered in general dental practices.

A 2009 survey of general dentists in Michigan with similar findings, cited by Flemming and Beikler, indicated that dental hygienists provided most of the periodontal care in general dental practices.[1] When asked who provided periodontal care in their practices, the majority of respondents (59%) indicated that they did not personally treat periodontal disease in a typical week, whereas only 7% reported treating more than 5 patients per week. Conversely, 14% of dental hygienists were reported to not treat periodontal cases in a typical week, and 59% treated over 5 patients. These general dentists also reported that 80% of their dental hygienists often provide NSPT, 15% sometimes delivered it, and only 5% never provided NSPT.[1]

Factors influencing the shift from surgical to nonsurgical periodontal services included increased placement of implants, a larger percentage of services being delivered in general dental practices versus periodontal specialty practices, and a decline in prevalence of periodontitis. Characteristics of patients referred from the general dentist to the periodontist also changed from patients with moderate and severe periodontitis to patients with severe periodontitis and fewer teeth. This trend may be related to the fact that patients see the general dental care providers first, and patients rely on the information and referrals provided by their primary care provider. Providers should keep in mind the comparative results of each type of periodontal therapy in moderate periodontal pockets versus deeper periodontal pockets. A previous systematic review indicated that, 12 months following treatment, surgical therapy results in 0.6 mm more probing depth reduction and 0.2 mm more attachment level gain than NSPT in deep periodontal pockets (>6 mm), whereas NSPT resulted in 0.4 mm more attachment gain and 0.4 mm less probing depth reduction than surgical therapy in 4 to 6 mm pockets.[2] Another systematic review showed, for periodontal pockets initially measuring 4 to 6 mm, the mean reduction in probing depth was 1.29 mm with a net gain in clinical attachment levels of 0.55 mm following scaling and root planing.[3] A 2012 systematic review, to be discussed next, showed a pronounced chance of pocket closure at 3 and 6 months following scaling and root planing (NSPT) with or without adjunctive antibiotics, although the addition of antibiotics showed additional benefits.[4] This study also concluded that there was no difference in treatment outcomes between surgery and NSPT.

Although the economic analysis by Flemming and Beikler assessed the administration of both local and systemic antibiotics, that discussion falls outside of the purview of this paper. Nonetheless, the clinical and economic benefits of mechanical therapy alone are clear, and this procedure is primarily performed by dental hygienists according to this analysis.

Further examination of the periodontal services market indicated that 3 out of 4 general dentists employed 1 or more dental hygienists in 2009, and as described previously, dental hygienists provided most of the preventive and non-surgical periodontal services. The predicted increase of numbers of dental hygiene graduates through 2020, and the fact that most of them will be employed by general dentists, further increases competition between general dentists and periodontists for the periodontal service market. The increase in demand for NSPT services over the past 20 years provides evidence for the strength of the market. There is virtually no alternative to NSPT other than surgery or extraction of teeth, and the latter 2 options are primarily directed at teeth affected by severe periodontitis. Implants are substitutes for both periodontal surgery and fixed partial dentures, and the demand for dental implants has also increased. The economic analysis indicated that implant services are delivered equally by general dentists, periodontists and oral surgeons. Training in dental curriculum for new dental graduates is increasing.

Factors included in the analysis that impacted providers' earnings before income taxes and interest were average fixed costs such as employee wages, fringe benefits, and rent or lease of space, as well as average variable costs such as supplies and laboratory fees. Wages of dental hygienists were considered as variable because they provide care largely independently of dentists, albeit most frequently under their supervision. Fees varied considerably for NSPT services as providers set their own fees. Patients who self-paid, estimated at 28%, provided larger profit margins than those with dental insurance, although a current and future decline in percentages of insured patients was recognized.

Scaling and root planing fees for 1 quadrant with 4 or more affected teeth ranged from $149 to $294 for general dentists and $220 to $400 for periodontists. The average fee for prophylaxis was $78, and professionally-administered fluoride applications added an estimated $31. Assuming 1 hour per quadrant for NSPT provided by dental hygienists, the estimated earning per hour was $158 for general dentists and $238 for periodontists for self-pay patients and slightly lower for insured patients, estimated at $122 and $187, respectively. Flemming and Beikler estimated hourly earnings from scaling and root planing at 6 to 9–times greater compared with oral prophylaxis. Further, periodontal maintenance therapy performed in 1 hour by a dental hygienist was estimated to result in hourly earnings of $52 for self-pay patients and $44 for insured patients in general dental practices and $74 and $63, respectively, in periodontal specialty practices.

When both specialist and general practitioners delegate these preventive and nonsurgical periodontal services to dental hygienists, the patient may not perceive any difference. Although U.S.–educated dental hygienists are taught to practice the entire scope of dental hygiene services, this economic analysis reports that dental hygienists working with periodontists generally see more patients with severe periodontitis and provide more NSPT than their counterparts working in general dental practices. It is estimated that dental hygienists working in periodontal practices rendered an average of 4 times as many scaling and root planing services than those working with general dentists, and 21 times more periodontal maintenance therapies. The increase in non–surgical periodontal care in general dental offices will likely impact these differences in the future.

The authors concluded that competitive forces will continue to increase and influence periodontal services markets in the U.S. New technologies and innovative deliveries of periodontal care will continue to affect existing dental practice business models and provide additional options and value for patients. They did not discuss changing models of delivery of dental hygiene services, including direct access and mid-level providers, as potential influencing factors. These changes are likely to impact the market. Future studies of the economic impact of dental hygiene services is needed.

Miremadi SR, De Bruyn H, Steyaert H, Princen K, Sabzevar MM, Cosyn J. A randomized controlled trial on immediate surgery versus root planing in patients with advanced periodontal disease: a cost-effectiveness analysis. *J Clin Periodontol*. 2014;41:164–171.

Abstract:

Aim: To compare immediate surgery to scaling and root planing (SRP) in the treatment of advanced periodontal disease focusing on the preva-

lence of residual sites and cost-effectiveness (1); to evaluate the adjunctive effects of azithromycin in a second treatment phase (2).

Materials and Methods: Thirty-nine patients (18 males, 21 females; mean age: 54.6) received oral hygiene instructions and were randomly allocated to surgery (n = 19) or SRP (n = 20). Patients with residual pockets (≥6 mm) at 6 months received re-debridement of these sites and systemic azithromycin. Treatment groups were followed up to 12 months and evaluated in terms of clinical response parameters and cost-effectiveness. Chair-time was used to assess the financial impact of treatment.

Results: Both treatment arms were equally effective in terms of clinical outcome demonstrating less than 1% residual pockets at 12 months. Surgery imposed an extra 746 Euro on the patient up to 6 months when compared to SRP. At 12 months, 46 Euro of this amount could be offset as a result of a reduced need for supportive care. Only 6 patients in the surgery group needed systemic antibiotics, whereas 14 patients in the SRP needed such additional treatment.

Conclusions: Although 700 Euro could be saved on average by performing SRP instead of surgery, the latter significantly reduced the need for supportive care and systemic antibiotics.

Commentary

This study was a well-designed randomized clinical trial with multiple purposes. In addition to measuring clinical outcomes, the researchers also assessed cost effectiveness of immediate surgery versus NSPT in patients with advanced periodontitis. In addition, the same outcome measures were assessed for treatment of residual pockets in both groups with a systemic antibiotic, azithromycin. The traditional treatment approach begins with biofilm control and nonsurgical periodontal therapy (NSPT) followed by surgical therapy in areas indicated to allow for reevaluation, reduced marginal gingival inflammation and an environment more favorable to periodontal surgery. For patients with advanced periodontitis, surgical procedures generally are needed; therefore, there may be some advantage to immediate surgery, without phase I NSPT, in these cases. For residual periodontal pockets following either or both modalities, local or systemic antibiotics may be indicated. Miremadi et al designed this study to test the hypothesis that periodontal surgery would result in less residual sites when compared to NSPT, albeit at a higher cost. The secondary aim was to assess the clinical outcome of re-debridement of residual sites, ≥6 mm, 6 months post-treatment, with adjunctive use of 500 mg azithromycin once daily for 3 weeks.

All patients in both groups received oral hygiene instruction at baseline including tooth brushing and interdental brush use with reinforcement at 2 weeks and 3, 6, and 12 months following treatment. Pre– and post–assessment of clinical parameters included probing depths, measurement of clinical attachment loss, plaque and bleeding on probing. Cost was based upon chair–time, a measure which apparently can be associated to estimate cost effectiveness. The authors discuss the limitation that chair-time may be influenced by operator skill and variable charges for particular procedures performed.

The trial had many design strengths including random group assignment of patients, blinding of treatment provided to the periodontist performing all pre– and post–assessments, performance of all NSPT by 1 periodontist, and provision of all surgical procedures by 2 periodontists who were supervised by the same periodontist-observer. Patients in the NSPT group received scaling and root planing, using both ultrasonic instrumentation and hand curettes, under local anesthesia, in 2 appointments with no time limitations. Treatment was concluded when the clinician determined the root surfaces were smooth and calculus–free.

The surgery group received open flap debridement with osseous and soft tissue surgical procedures as indicated. Surgery was performed at 4 appointments using a quadrant approach. All patients in both groups were prescribed an analgesic post–treatment, and post–operative pain was measured by a visual analog scale 1 week after treatment without clinicians present. Patients in both groups with residual periodontal pockets ≥6 mm, after 6 months, were prescribed the antibiotic regimen with re-debridement of indicated areas.

The groups were remarkably similar with no significant differences at the start of the study related to gender, age, smoking habits, number of teeth present or severity of periodontal destruction. Neither group had significantly more drop outs. Results indicated that both the NSPT and the surgery were effective in significantly reducing PPD, CAL and BOP at 6 months. The average visual analog scale for pain and number of analgesics taken were also similar.

At 6 months, the reduction in full-mouth prob-

ing depths was not significantly different (2.9 to 0.6 mm for NSPT, 2.7 to 0.3 mm for surgery). Full-mouth clinical attachment loss was also reduced similarly in both groups (4.9 to 0.2 mm for NSPT, 4.4 to 0.1 for surgery). At this time interval, however, the percentage of residual pockets was 8.6±9.4% in the NSPT group and 1.0±1.8% in the surgery group, indicating significantly less surgery patients than NSPT patients (7.6% more) requiring antibiotics.

Chair-time was significantly longer for surgery than for SRP (5.25 hours versus 7.35 hours). Chair-time required for maintenance therapy between 6 and 12 months differed significantly in favor of the surgery group, requiring an average of 27 less minutes and associated with a cost savings of 45 euros. Nonetheless, the total 12 month treatment time could be translated into a cost of 745 euros for NSPT and 1,445 euros for surgery. The non–surgical option was delivered at significantly lower cost as measured by currency. This cost savings was considered particularly significant due to the equivalence of treatment outcomes at 12 months. At 12 months, both treatment modalities were equally effective with <1% of all subjects having probing depths ≥3 mm. This finding was true regardless of whether the patients were prescribed adjunctive antibiotics or not.

The cost for some patients in both groups, with 7.6% more in the NSPT group, however, was the need for systemic antibiotics which present risks for side–effects for the patient and antibiotic resistance for society. It seems that a similar study using locally-delivered antibiotics or a collagenase inhibitor such as 50 mg doxycycline hyclate may be beneficial to ameliorate these concerns. Also, a future study in the U.S. with NSPT performed by dental hygienists is indicated based on the fact that the vast majority of these services are delivered by dental hygienists in general practices rather than by periodontists.

Conclusion

Dental hygienists are preventive professionals responsible for providing NSPT to address periodontal treatment needs in the U.S. In fact, dental hygienists provide an estimated 90% of the non–surgical periodontal care delivered in general dental practices. The delivery of these services in general dental practice has increased significantly over the past 20 years and that trend is expected to continue. NSPT and surgical periodontal therapy has been shown to have equal clinical outcomes in terms of probing depth reduction, clinical attachment levels, and less bleeding, especially in patients with 4 to 6 mm pockets and moderate periodontitis. The studies discussed in this article provide some evidence that NSPT is also economical and cost effective. Further study of these important outcomes, as well as patient satisfaction, is needed.

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