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# Periodontal Maintenance – Overcoming the Barriers

**Abstract:** Periodontal maintenance therapy is the most important stage of periodontal treatment, yet compliance is low. Overcoming the barriers associated with the low compliance involves a complex set of problems relating to the patient, the clinician and the interactions between them. It is therefore important to create a periodontal maintenance treatment programme which takes into consideration the needs of each individual patient. In addition, regional variations and differences in practice profiles are also factors to be accommodated in a maintenance programme.

**Clinical Relevance:** Good co-operation between the referring dentist and the specialist is required when recommendations are made to the patient regarding maintenance therapy.

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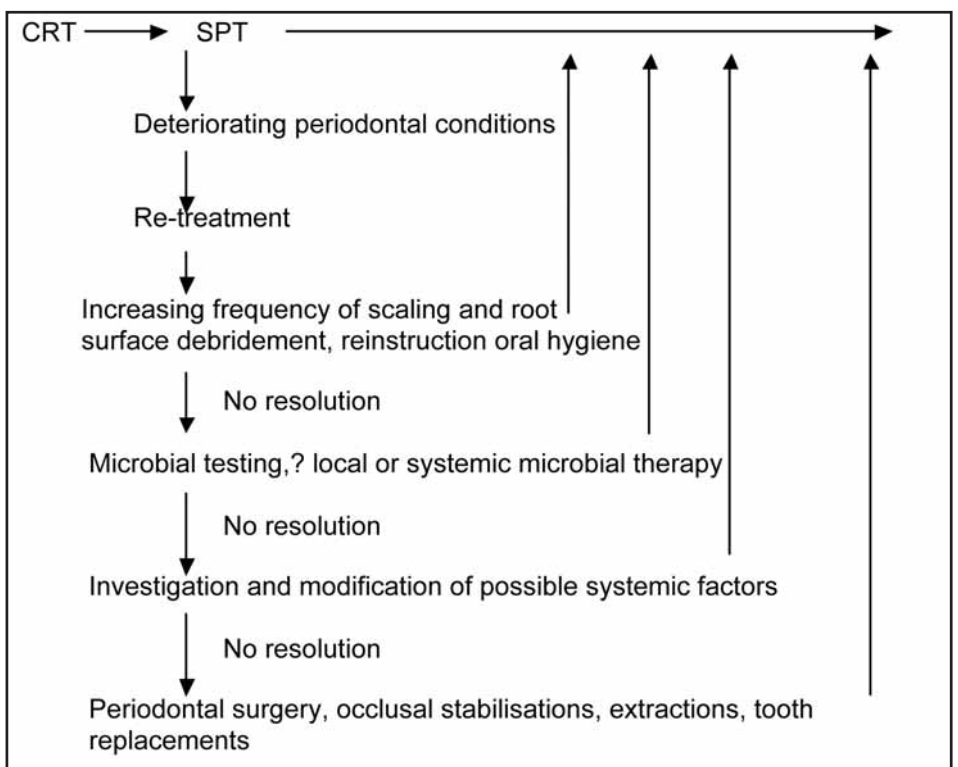
Chronic periodontal disease is a microbial disease that triggers the host's inflammatory responses, resulting in the destruction of tooth-supporting structures.

The initial definitive periodontal treatment or cause related therapy (CRT) aims to control the infection. The treatment consists initially of oral hygiene instruction and the non-surgical removal of sub- and supra-gingival calculus and bacterial deposits. Periodontal surgery may be required to access areas beyond the reach of non-surgical treatment. Surgery may also be used in attempting to regenerate lost tissue.

Owing to the chronic nature of periodontal disease, continuous monitoring and therapy are required to prevent recurrence. The follow-up treatment is usually life-long and referred to as supportive periodontal therapy (SPT) or periodontal maintenance treatment (PM). The frequency of SPT visits may be from one to six times per year. SPT includes the following:

■ Updating the medical and dental histories;

■ Extra- and intra-oral examination with screening and perhaps periodontal



**Figure 1.** Flow diagram of initial definitive periodontal therapy/cause related therapy (CRT), periodontal maintenance treatment/supportive therapy (SPT) and the various re-treatment options during SPT.

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pocket measurement;

- Oral hygiene assessment;
- Removing the dental biofilm by means of sub- and supra-gingival scaling and root surface debridement;
- Re-assessing the frequency of SPT visits; and
- Providing any necessary re-treatment.

Re-treatment usually includes some stages of the initial periodontal therapy. Strategic extraction(s), root resection, stabilization of the occlusion, antibiotic therapy and modification of systemic factors are sometimes carried out during CRT, but are usually parts of the SPT.

A flow chart indicating the relationship between CRT, SPT and re-treatment is shown in Figure 1.

Periodontal therapy has been shown to be successful in maintaining patients' teeth over time.<sup>1,2</sup> However, periodontal therapy without compliance to a maintenance regimen is of doubtful value.<sup>3-6</sup> Most reports show low levels of compliance varying from 11–45%.<sup>7-15</sup> More recently, the word adherence has also been used in connection with SPT. It denotes a more active participation on the patients' part.

### Why do patients who undergo periodontal therapy, choose not to accept the recommended SPT?

Especially considering that:

- Most patients do comply with the suggested periodontal therapy, which is usually lengthy and may include surgery;
- The patients are informed of the importance of maintenance therapy.

It has been suggested that non-compliance with recommended health care practices represents an indirect self-destructive behaviour. The behaviour of non-complying patients is characterized by denial and the adoption of negligent attitudes towards their disease. The non-compliers seem to want the dental profession to take responsibility for, and treat, their problems with minimal self participation.<sup>16</sup>

Another study relevant to non-compliance indicated that the average dental practice has a 50% turnover in patients every five years.<sup>17</sup> It was suggested that approximately half of the turnover

can be attributed to lack of satisfaction on the patients' part. Other factors which have been blamed for non-compliance with dental health recommendations include fear of dental treatment and socio-economic status.<sup>16,18-22</sup>

Age, gender, type of periodontal therapy, cultural and geographic differences have also been shown to be factors which affect compliance with maintenance therapy.<sup>10-13</sup>

It has been shown that pre-treatment apprehension and anxiety levels are high in patients referred to a specialist practice for periodontal therapy.<sup>23</sup> It was suggested that patients' input from pre-treatment assessments could be useful in designing individual treatment plans which would include suitable maintenance programmes. Another study<sup>24</sup> from the same practice setting showed that the majority of patients experienced low levels of discomfort during and after periodontal therapy. Virtually all (97%) of the patients rated the discomfort associated with periodontal therapy as being equal to, or less than, what is associated with conventional dental therapy (fillings or crown preparation).<sup>24</sup> A high level of compliance with SPT (87% over 10 years) has been reported from the same practice.<sup>25</sup> If the positive assessment of treatment delivery contributed to a reduction in patient anxiety, this may partly explain the high compliance rate. In this compliance study, there were no differences between the compliant and non-compliant groups in terms of age, fee and National Health contributions. This is in contrast to the study of Demetriou *et al*, who reported that younger patients had a significantly lower tendency to drop out of maintenance therapy.<sup>10</sup> In addition, they also reported a lower drop out rate in females, patients from socio-economic class I and patients who had received non-surgical therapy. However, in their study, Demetriou *et al* reported a compliance rate of only 27.4% after 14 years of therapy.<sup>10</sup> Novaes and Novaes also reported that gender, age and type of therapy were significant independent risk factors for non-compliance.<sup>12</sup> They suggested that males, those under the age of 40 years, and those who underwent non-surgical therapy were the most likely not to comply with supportive periodontal therapy.

Novaes *et al* reported a substantial variation in the behaviour of patients from different practices in four South American countries.<sup>13</sup> They suggested that studies on compliance should not be generalized because of differences in culture, economic conditions, knowledge of oral hygiene measures and differences in dentists' treatment philosophies. The study by Fardal *et al* reported a high compliance rate in a specialist practice in rural Norway.<sup>25</sup> It is possible that the patient population tended to remain living in the area compared with more mobile populations in urban areas. As many of the comparable studies were either based in universities or in specialist practices in larger urban centres, population mobility could account for some of the differences reported. In addition, most of the patients in the Norwegian study were from similar cultural and socio-economic backgrounds and this could also play a part in the high compliance rate reported.

Most of the above studies report on external factors and not directly with individual patient behaviour. Changes in behavioural pattern would presumably also be of importance for the understanding of non-compliance.

### Can psychological behaviour models explain non-compliance?

Non-compliance on the patients' part is not only observed in periodontal maintenance patients. In a number of medical and dental situations, where patients' compliance is important to the treatment outcome, the same phenomenon is seen. Numerous health behaviour models have been developed to explain compliance (adherence) with therapy. Some of these models have been applied to oral health behaviour.

The Health Belief Model<sup>26</sup> proposes the following requirements for behaviour change:

- A perception of susceptibility to disease;
- A belief that the impact of this disease will affect him/her biologically and/or psychosocially;
- A belief that the potential benefits of the treatment outweighs the risks of the disease and its treatment;
- An ability to surmount barriers to

treatment.

The Transtheoretical Model of Health Behaviour Change<sup>27</sup> suggests that six stages of changes are involved in health behaviour:

- Pre-contemplation;
- Contemplation;
- Preparation;
- Action;
- Maintenance; and
- Termination.

The Protection Motivation Theory<sup>28</sup> proposes that fear is a driving force that motivates changes in behaviour in order to avoid negative consequences.

The Health Locus of Control theory suggests that there is a difference between:

- Internal locus (believing that consequences are a result of their own action); and
- External locus (those who feel that events are unrelated to their actions and steered by external factors instead).

Rotter developed the internal-external scale, which is the standard measure for assessing the generalized locus of control beliefs.<sup>29</sup> Leventhal *et al* have postulated that people's behaviour in response to an illness is determined by their representation of that illness.<sup>30</sup> Illness representation has a cognitive and an emotional aspect and they are constructed through direct or vicarious experiences, as well as information received from the social environment and health professionals. They propose that patients will only adhere to treatment if they believe that the treatment will have a positive effect on their health and that they have the capacity to act as required effectively.

An extensive review of behaviour models and how they relate to oral health behaviour has been published by Renz and Newton.<sup>31</sup> However, from this review it seems clear that no single behavioural model has been constructed to explain non-compliance with SPT.

### Why can't we just ask the patients why they do not attend for SPT?

It is difficult to do this owing to the very nature of non-compliance. The patients are usually not present to be interviewed about their reason(s) for

Reasons for non-compliance	Numbers of patients
General dentist maintenance care	37
Health reasons	8
Lack of motivation	7
Financial reasons	3
Fear	2
Not satisfied with treatment	2
Failed to perceive the need for ongoing treatment	1
Faulty recall procedure	1

**Table 1.** Reasons for non-compliance with periodontal maintenance therapy.<sup>32</sup>

non-compliance. If they can be contacted for interviews, the obvious loss of rapport between patient and the clinician may not produce reliable responses. Very little information exists on the reasons for non-compliance based on patients' interviews. However, Fardal<sup>32</sup> interviewed 61 non-compliant patients returning for SPT. The interviews revealed that 37 patients attended their own dentist exclusively for maintenance therapy, 8 patients gave health reasons and 7 patients expressed lack of motivation for failure to co-operate (Table 1). Thirty six patients were re-referred by their own dentist, 13 changed dentist and were referred by this dentist, while 12 patients contacted the specialist office directly. Fifty three patients claimed to have been fully compliant with their own dentist while non-compliant with the specialist office.

### Does this mean that the referring dentists will not share SPT with the specialist clinic?

It has been reported that some referring dentists choose not to adhere to the maintenance schedule suggested by the specialist, but instead inform their patients that they alone are capable of maintaining the patients' periodontal health. Some referring dentists choose to do this with only some of their patients, while others seem to do it with nearly all patients referred for periodontal therapy.<sup>32</sup>

One could also envisage that the referring dentists are pressurized by the patients to carry out all of the maintenance therapy. This could be due to the inconvenience of having to attend two

separate offices.

The reasons why some dentists refer patients to specialists but choose not to co-operate in maintenance programmes are not clear. Fardal<sup>32</sup> has suggested that some general dentists may be particularly interested in periodontal maintenance therapy; some dentists may be financially dependant on this type of treatment. In addition, if periodontists employ hygienists to help with the maintenance therapy, referring dentists may feel that they can perform this type of treatment equally well or better. Furthermore, if the referring dentists also employ hygienists, they may feel that their own hygienist can do the maintenance therapy equally well.

### What do we know about SPT carried out purely in a general dental office?

Nearly all the studies on patients' compliance with SPT are carried out either in specialist practices or university clinics. It is therefore difficult to assess how SPT functions purely in general dental practice. It has, however, been shown that patients who return to their own dentist do less well than patients who remain with the specialist clinic for SPT.<sup>33</sup>

### How can the referring dentist and specialist work together to motivate patients for SPT?

The referring dentist spends considerable time and effort motivating the patients to accept specialist therapy. It is therefore important to obtain a high acceptance rate for the specialist to

	Compliant	Non-compliant	Total
High referring dentists (≥ 8 referrals) n = 6	80	18	98
Low referring dentists (≤7 referral) n = 12	52	2	54
Total	132	20	152

**Table 2.** Showing dentists with a high and low referral rate and the resulting non-compliance of patients, from the article by Fardal *et al.*<sup>25</sup>

support the general dental practitioner. Furthermore, the specialist should reinforce information given by the referring dentist and stress the need for compliance with SPT. If the general dentist does not reinforce the importance of SPT, or gives conflicting information to the patients, there may be a higher risk of non-compliance.<sup>32</sup>

There is also some support for the view that the patients from dentists with high referral rates are more likely to be non compliant.<sup>25</sup> Perhaps the dentists with high referral rates are less rigorous in selecting who to refer. It is important to discuss with general dentists not only when to refer patients for specialist therapy, but also to highlight the extreme importance of maintenance therapy. Table 2 shows the relationship between the numbers of patients referred and non-compliance from the study by Fardal *et al.*<sup>25</sup>

Practice set-up may also influence the ability of the clinicians to carry out maintenance therapy. For example, a dentist in a single-handed general practice may find it difficult to motivate patients to attend four or more times a year. If the recall appointments are combined with visits to a specialist clinic, it may be easier to motivate the patients.

### Compliance with good oral hygiene procedures is absolutely essential for the outcome of SPT, or is it?

It is assumed that good oral hygiene is a pre-requisite for a successful outcome of SPT. However, a number of conflicting reports can be

found in the literature. Hirschfeld and Wasserman reported that patients in the well maintained patient group kept their teeth, in spite of inadequate brushing.<sup>2</sup> Bakdash could not find that self reported oral hygiene and plaque scores were risk factors in periodontal disease.<sup>34</sup> Fardal *et al* reported that oral hygiene was not related to long term tooth retention in maintenance patients.<sup>1</sup> However, Axelsson and Lindhe did show a long-term beneficial effect of a plaque control programme on caries and periodontal disease in adults.<sup>35</sup> Needleman *et al* have suggested that repeated oral hygiene instructions may have a similar effect to that of professional mechanical plaque removal.<sup>36</sup> At the same time, it has been shown that patients only remove 60% of plaque when cleaning their teeth.<sup>37</sup> Johansson reported that three years after intensive oral hygiene instructions, only half used interproximal aids and only seven out of 39 patients used floss.<sup>38</sup> McGuire *et al* studied two groups of patients where one group received oral hygiene instructions and the other group no instructions.<sup>39</sup> After intervals of 2 to 24 months, there were no differences in plaque scores between the two groups. Patients' knowledge of the causes of disease did not seem to have any effect on plaque levels. On the other hand, Lindhe and Nyman reported that patients complied well with recommended oral hygiene instructions over a 14-year period.<sup>40</sup> In addition, Hugoson *et al* evaluated three different dental health preventive programmes and reported good effects on plaque levels and gingivitis.<sup>41</sup>

A number of the above studies

record plaque levels at maintenance visits. One may question this approach due to the possibility that patients may increase their oral hygiene efforts immediately prior to their appointments.

### Why do so many patients who diligently turn up for their maintenance appointments not comply with oral hygiene measures?

It is a complex problem with many similarities to the problem of non-compliance with SPT visits. In addition, a number of other factors can be identified:

- Lack of manual dexterity;
- Lack of motivation;
- A belief that by turning up for their recall appointments this will transfer the cleaning responsibility on to the clinician.<sup>36</sup>
- Poor communication/educational skills on the part of the clinician.

In spite of the apparent controversy regarding the importance of oral hygiene, it is imperative to continue reinforcements of hygiene instruction as part of SPT. Even if frequent professional cleaning may be sufficient in controlling the microbial challenge, poor oral hygiene may result in a number of other complications that will jeopardize the outcome of SPT.

### What complications can be encountered during SPT?

#### Caries

It has been reported that the prevalence of root caries is high in patients treated for periodontal disease.<sup>42</sup> It is thought that intact root dentine is protective against root caries.<sup>43</sup> Removal of root dentine during initial periodontal treatment and maintenance therapy may make patients more prone to caries. Also, molar teeth treated with root resection have a higher risk of root caries.<sup>44</sup> It is therefore important to provide repeated oral hygiene instructions and adjunctive preventive measures, including diet counselling and the use of fluoride rinses or tablets. In addition, the clinician may need to apply fluoride and/or chlorhexidine varnishes.

#### Root sensitivity

Root sensitivity is common

	Coefficient	SE	$\chi^2$	p	Odds ratio	Confidence interval
Sex (Male/Female)	-0.36	0.54	0.43	0.51	0.70	0.24–2.03
Smoking (Smoker/Non smoker)	-0.57	0.56	1.05	0.31	0.57	0.19–1.68
Prognosis (Uncertain or Poor/Moderate or Good)	2.15	0.63	11.75	0.0006	8.61	2.51–29.51
Compliance (Erratic or Poor/Good)	2.06	0.77	7.13	0.008	7.82	1.73–35.43
Family history (Yes/No)	1.75	0.60	8.49	0.004	5.75	1.77–1.64
Tooth loss (Lost teeth/No tooth loss)	-0.82	0.61	1.82	0.18	0.44	0.14–1.45
Practice location (Egersund/Flekk)	1.02	0.55	3.3	0.07	2.77	0.94–8.19

**Table 3.** Predictors of periodontal surgery as re-treatment: results of logistic regression analysis. The risk surgical re-treatment was associated with uncertain/poor initial prognosis, erratic compliance and a family history of periodontal disease.<sup>52</sup>

following initial periodontal therapy. However, in most cases the sensitivity decreases rapidly over time. Reports on root sensitivity during PM vary from 15–98% and are often associated with root surface exposure and gingival recession.<sup>45–47</sup> Meticulous plaque control will diminish root sensitivity.<sup>48</sup> In addition, there are a number of products and techniques available to the clinician to help reduce root sensitivity.

#### Periodontal abscess

A greater risk of periodontal abscesses has been reported in patients treated with non-surgical periodontal therapy than in patients treated with surgery.<sup>49</sup> Patients identified as rapid downhill/refractory cases also seem to be more prone to periodontal abscesses.<sup>50</sup>

Presumably, it is important to keep periodontal pockets shallow and the root surfaces clean. In addition, microbial testing and antibiotic therapy either locally or systemically may help to reduce the frequency of periodontal abscesses.

#### Endodontic lesions

Up to 30% of all extractions during maintenance therapy are due to endodontic complications.<sup>51</sup> It is therefore important to monitor teeth for caries, especially root caries, to reduce this type

of complication. Periapical x-rays should be recorded at regular intervals to reveal early apical changes.

#### Re-treatment

It has been reported that up to 50% of patients need some sort of re-treatment after five years of SPT.<sup>52</sup> Patients should be informed of this at the early stages of periodontal therapy to prevent any misunderstandings. Table 3 shows risk factors involved in being in the re-treatment group of patients as reported by Fardal and Linden.<sup>52</sup>

#### If patients adhere to SPT, do they keep most of their teeth in the long term?

Most patients do,<sup>1</sup> however, about 2% of all periodontal maintenance patients continue to lose a substantial number of teeth, in spite of adequate treatment.<sup>53</sup> It has been shown that heavy smoking, stress and a family history of periodontal disease are risk factors for being refractory to periodontal disease. It has also been suggested that these refractory patients encounter more complications associated with implant therapy than stable SPT patients.<sup>53</sup> Table 4 shows a comparison between refractory and stable SPT patients from the study by Fardal and Linden.<sup>53</sup>

#### What about the use of systemic antibiotics during SPT?

This has become an increasingly difficult question since we do not know enough about the target group, what agents to prescribe and the seriousness of possible side-effects.

van Winkelhoff and Winkel have suggested that patients with periodontitis who do not respond to mechanical treatment and have systemic factors such as smoking, stress, reduced immunocompetence and systemic diseases are prime candidates for systemic antibiotics.<sup>54</sup> Furthermore, they reported that metronidazole is more effective than azithromycin, clindamycin and tetracycline. At the same time, it is accepted that the main choice of antibiotic treatment for patients with periodontitis is a combination of amoxicillin and metronidazole.<sup>55</sup> However, this combination only produces a moderate response for patients without *Porphyromonas gingivalis* at the baseline.<sup>54</sup> It is therefore important to do microbial testing to identify the pathogens and use the correct agent(s) and dosages. This will reduce the risk of inducing bacterial resistance.

Side-effects to systemic antibiotics range from minor and transient complaints, such as nausea, headache and altered taste, to serious medical conditions, such as pseudomembranous colitis. It is

	Refractory	Control	P
Age initial assessment Mean (SD)	48.5 (10.0)	48.1 (10.2)	0.86
Years in maintenance since treatment started Mean (SD)	13.4 (3.3)	13.9 (3.2)	0.50
Teeth present at start of treatment Mean (SD)	20.6 (4.6)	25.8 (2.6)	<0.0001
Number of teeth lost during monitoring period Mean (SD)	10.4 (3.75)	0.3 (0.57)	<0.0001
Smoking Non Light Heavy n (%)	11 (40.7) 5 (18.5) 11 (40.7)	39 (72.2) 10 (18.5) 5 (9.3)	0.0026
Systemic disease n (%)	8 (29.6)	17 (31.5)	0.86
Hygiene Good Moderate Poor n (%)	11 (40.7) 11 (40.7) 5 (18.5)	22 (40.7) 31 (57.4) 1 (1.9)	0.02
Stress n (%)	11 (40.7)	1 (1.9)	<0.0001
Family history of periodontitis n (%)	19 (70.4)	13 (24.1)	<0.0001

**Table 4.** Comparison between refractory and control subjects. The risk of being in the refractory group is associated with heavy smoking, poor oral hygiene, stress and family history of periodontal disease.<sup>48</sup>

of concern that the latter seems to occur more frequently for clindamycin and the amoxicillin/metronidazole combination.

**Are there any specific recommendations on how to reduce non-compliance during SPT?**

Wilson made a number of suggestions aimed at improving compliance.<sup>6</sup> These included:

- Simplification of required behaviour;
- Accommodating the patient’s needs;
- Reminding patients of appointments;
- Keeping records of compliance to avoid patients getting lost in the system;
- Giving thorough information to the patient;
- Providing positive reinforcement;
- Identifying potential non-compliers; and
- Ensuring the involvement of both the referring dentist and the periodontist.

Another set of recommendations

were provided from a specialist practice with an 87% compliance rate.<sup>25</sup> Periodontal therapy was completed following a standard sequence of examination, diagnosis, hygiene phase, surgical corrections if required and placement on a maintenance programme.

In addition, the treatment regimen was structured so that each patient received the following:

- Pre-treatment assessment by the clinician to determine anxiety levels, periodontal knowledge and expectation of treatment outcome.
- A pre-treatment explanation by the clinician of periodontal anatomy and the disease process, with possible sequelae. The planned treatment was outlined with emphasis on the importance of maintenance therapy.
- A specific case presentation.
- A discussion of the cost of therapy, possible insurance cover, various payment plans and the cost of periodontal maintenance therapy.
- Relatively short (25–30 min) maintenance appointments.
- Co-ordinated and alternating maintenance appointments with the referring dentist.
- Active feedback to patients during maintenance therapy giving information about their condition.
- Feedback to the referring dentist, during maintenance therapy regarding any restorative or prosthetic work needed or any changes in the periodontal condition which required further attention by the periodontist.
- A continuous re-assessment of the frequency of PM visits and adjustments were made according to the needs of each patient.

**Discussion**

The aim of this paper was to discuss problems associated with periodontal maintenance therapy and to offer suggestions as to how they may be overcome.

It is known that patients’ compliance is the most important factor determining the outcome of SPT, yet most studies show a low compliance. The proliferation of theories, suggestions and recommendations are likely to reflect a

great variation in the reasons for non-compliance. The reasons are likely to include both inter-patient variations, as well as variations between therapeutic situations. However, other factors, such as the education and practice profile of the dentist and the personal relationship between the patient and the dentist/specialist are probably also important.

A number of behaviour models have been used to improve patients' compliance/adherence. Renz and Newton have suggested that it is important for the clinician to distinguish between individuals who lack the motivation to change their oral hygiene behaviour, and those who are motivated but require support in planning and maintaining behaviour change.<sup>31</sup>

The behaviour models seem to explain the mechanisms behind the motivation and referral of patients to the periodontal specialists. In addition, they explain the reasons for compliance/non-compliance with periodontal therapy and oral hygiene measures. However, the theories do not seem to explain clearly the reasons why some patients stay compliant with their general dentist and not with the periodontal specialist. It is possible that more external factors, such as the profile of the referring dentist, should be added to the psychological models to explain non-compliance with periodontal maintenance.

A similar pattern of non-compliance can be seen in the maintenance therapy for diabetes. A study by Varroud-Vial *et al* showed that utilizing a behaviour model for promoting co-operation between the practitioner and diabetologist in the maintenance of type 2 diabetes statistically improved quality of care, standardization of HbA1c measurements and control of blood pressure and blood lipids.<sup>56</sup> Also, the number of early interventions in cases of inadequate glucose control increased significantly.

It is important for the referring dentist to be well informed and educated about SPT. The dental curriculum should include a strong emphasis on the therapy. A well organized SPT programme in dental school clinics will give the students adequate experience and a model to build on for treating patients suffering from periodontitis. In addition, adequate literature and courses on SPT should be made available to the practising

dentist. These need to emphasize the diagnostic tools available, clinical skills, non-compliance, re-treatment, as well as motivational and communication skills.

Finally, the economic side of SPT is also important for the patient and the dentist. SPT needs to be remunerated on equal terms with other dental treatment. Where dental treatment is fully or partially covered by fees from the National Health Service or insurance companies, the SPT should be recognized as an entity and adequately remunerated.

## Conclusion

Non-compliance/adherence on the patient's part is the most important aspect of periodontal maintenance therapy. The reasons for non-compliance are not well understood. It is, however, important to consider individual variations, as well as the relationships and interactions in the triangle between the patient, the referring dentist and the specialist.

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