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# Association between patients' chief complaints and their compliance with periodontal therapy

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#### Abstract

**Aim:** To evaluate the association between patients' chief complaints (CCs) and their compliance with basic periodontal therapy.

**Materials and Methods:** Data on CCs and periodontal diseases were obtained from patients attending a periodontal clinic. Patient compliance with basic periodontal therapy was studied in relation to their CCs.

**Results:** The mean age of the 1196 subjects was  $47.7 \pm 11.6$  years. Among them, 36.9% of the subjects had chronic symptomatic CCs; 22.4%, acute symptomatic CCs; and 40.7%, asymptomatic CCs. Four hundred eighty subjects completed basic periodontal therapy; 209, incomplete treatment; and 507, no treatment. The subjects with acute symptomatic CCs were 60% more likely to receive periodontal treatment [odds ratio (OR) = 1.661; 95% confidence interval (CI): 1.203–2.293] than chronic symptomatic subjects, as did the asymptomatic subjects (OR = 1.669; 95% CI: 1.252–2.223). However, subjects with acute symptomatic CCs were 60% less likely to complete periodontal treatment (OR = 0.420; 95% CI: 0.267–0.660). The OR of completing treatment for the copayment requirement was 1.944, while that for being treated by an experienced periodontist was 1.695.

**Conclusions:** Patients' CCs were associated with their compliance to basic periodontal therapy. Acute symptomatic CCs may be a positive predictor to initiate periodontal treatment but a negative predictor to complete the treatment.

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Chronic periodontitis is a common form of destructive oral disease in adults. The goal of periodontal treatment is to prevent further periodontal attachment loss and to restore periodontal health. It is well known that untreated periodontitis leads to loss of teeth, function, and aesthetics (Hujoel et al. 1997, Blicher et al. 2005), and it adversely affects

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one's systemic health, quality of life, and economic productivity as do other untreated chronic oral diseases (Gift et al. 1992, Hollister & Weintraub 1993, Hyde et al. 2006). However, despite advances in technology, knowledge, and skills over the last few decades, epidemiological studies have indicated that prevalence rates are not reflective of the periodontal care delivered. In other words, most existing disease is left untreated (Loe et al. 1992, Albandar 2002, Cobb et al. 2003, Dye & Thornton-Evans 2007).

Studies have suggested that early detection and treatment of periodontitis

via screening is badly needed to improve periodontal health (Burt et al. 2005, Hyde et al. 2006, Lai et al. 2007). Audits of referral have shown that referral plays an important role in initiating periodontal therapy, as evidenced by the high completion rates of periodontal treatment, ranging from 80% to 97% in periodontal offices (Anneken et al. 2001, Konig et al. 2001, Fardal et al. 2003, Snoad 2005, Dockter et al. 2006). These studies were carried out mostly in well-established periodontal clinics, and thus provide little information on patients who lack opportunity of or decline referral.

Compared with studies carried out in Western countries, clinical observations in Taiwan suggest relatively fewer referrals and a lower rate of compliance with periodontal therapy, while communitybased screening studies demonstrate a high prevalence of periodontal disease (Lai et al. 2007). The concept of referral is still developing and vague for Taiwanese patients. Many do not rely on their general dentists for periodontal information and lack professional assurance of periodontal treatment needs. Factors other than referral that could affect patients' decisions for periodontal treatment should be investigated.

In clinical practice, defining the objectives of therapy is a pivotal step in managing the patient. The objectives of treatment are determined on the basis of the patient's demands and profile (Baehni & Giovannoli 2004). Patients' chief complaints (CCs) and reasons for seeking care can be valuable sources of information for clinicians. Compared with other presenting symptoms, attention to the CC can guide admitting triage, diagnosis, and early treatment. As a quiescent disease most of the time, periodontal disease presents mainly a chronic or asymptomatic CC (Demetriou et al. 1990, Brunsvold et al. 1999). Patients' CCs represent their immediate demands and may implicate their attitude towards periodontal treatment.

Many papers have discussed patient compliance with supportive periodontal therapy (Konig et al. 2001, Ojima et al. 2005, Fardal 2006, Lorentz et al. 2009, Matuliene et al. 2010), but only limited studies have addressed basic periodontal therapy (Kakudate et al. 2008). As is known, basic, or non-surgical periodontal therapy including plaque control, scaling, and root planing, is the initial step in periodontal therapy (Badersten et al. 1987a, Lowenguth & Greenstein 1995). It remains the foundation of periodontal treatment, and it stands for the long-term test of surrogate measurements such as tooth mortality and successful management of periodontal disease (Isidor & Karring 1986, Badersten et al. 1987b, Hujoel et al. 2000).

This study was intended to evaluate the association between the patient's CC at the first periodontal visit and compliance with subsequent basic periodontal therapy. We compared the general profiles between treated and untreated patients, as well as between completely and incompletely treated patients, to determine whether the CC affects the patient's motivation towards periodontal treatment.

# Materials and Methods

### Study population

The study was conducted in the Periodontal Outpatient Clinic of Chang Gung Memorial Hospital (CGMH) Linkou Medical Center, one of the major teaching hospitals and a main tertiary care hospital for the area in Taiwan. This dental clinic, including general dentistry and all major specialties, is open to the public. Patients can register in any one of the specialty clinics by self-judgment or by referral from health-care givers. Visits to the general dentistry department are referred by the staffs at registration desk when patients address a non-specific dental problem or request help in selecting an outpatient clinic.

All enrolled patients underwent a standardized procedure that included a questionnaire survey on medical and dental history, personal habits, and CC. Intra-oral examination and radiographs were based first on patients' CC. Dental diseases were diagnosed and emergency treatments were provided as needed. Referral to other specialists was arranged when interdisciplinary treatment was required. Consultations with physicians were also arranged if any systemic disease was related to dental treatment. Patients were then appointed for further therapy.

### Demographic survey

According to the principles outlined in the Declaration of Helsinki on experimentation involving human subjects, this study was independently reviewed and exempted from approval by Institutional Review Board of Chang Gung Medical Foundation (No. 99-3666B). All electronic dental records from consecutive patients who visited one periodontist's (H.Y.) outpatient clinic from 2003 to 2005 were collected and analysed. Included were new patients who (1) visited the periodontal department of CGMH for the first time, (2) had a periodontal CC (as listed in Table 1), and (3) were diagnosed with periodontal disease. Excluded were patients who (1) had incomplete records, (2) were resuming periodontal treatment, (3) had a CC not related to the periodontal symptoms, and (4) were diagnosed with non-periodontal disease based on their CC. Patients who had gingivitis, developmental or acquired deformities and conditions (Armitage 1999), or who would become edentulous after tooth extraction were also excluded.

Patient's age and gender were recorded as in the treatment records. His or her systemic health condition was classified according to the American Society of Anesthesiologists Physical Status (ASA-PS) classification system and modified by dental considerations (ASA 2008, Malonev & Weinberg 2008). In brief, a systemically healthy patient was defined as P1, a patient with mild systemic disease as P2, one with moderate systemic disease as P3, and one with severe systemic disease that is a constant threat to life as P4. Moribund or declared brain-dead patients as P5 and P6 were not shown in this clinic.

On the basis of smoking, a subject who smoked at least one cigarette daily was classified as a current smoker, and one who used to or never smoked as a non-smoker. Periodontal referral was defined when the patient presented with a written referral sheet, or described verbally that he or she was referred by a dentist, a physician, a friend, or a family member. Non-referral was defined as a patient who disclaimed any referral, or who declined referral or had been advised by the dentist long before this instance.

The patient's periodontal CC on the questionnaire was reconfirmed by the periodontist (H.Y.). Symptoms causing discomfort for a prolonged period were classified as chronic symptomatic CCs. Symptoms such as toothache, gum boils, or spontaneous bleeding, occurring within a few days and constantly interfering with daily oral functions were classified as acute symptomatic CCs. Other reasons for the periodontal visit were classified as asymptomatic CCs (Table 1). Intra-examiner reliability analysis was performed to determine the consistency of CC identification (Landis & Koch 1977). The tested kappa value was 0.933 [95% confidence interval (CI): 0.927–0.939, *p* < 0.0001].

#### Diagnosis of periodontal disease

Periodontal diagnosis was based on probing depths and intra-oral radiographs of sites related to the CC. Periodontal disease was classified as advanced periodontitis wherein at least

Table 1. Classification and distribution of periodontal chief complaints

| Classification                            | No. | Chief complaint                           | Untreated | Incomplete | Complete | Total |
|---|-----|---|-----------|------------|----------|-------|
| Chronic symptomatic ( $n = 441, 36.9\%$ ) |     | My teeth are loose                        | 74        | 20         | 44       | 138   |
| v i v i v                                 | 2   | My gums bleed when I brush                | 43        | 12         | 28       | 83    |
|   | 3   | My teeth are sensitive                    | 19        | 5          | 22       | 46    |
|   | 4   | My gums are enlarged                      | 20        | 7          | 18       | 45    |
|   | 5   | My teeth hurt when I chew                 | 22        | 5          | 17       | 44    |
|   | 6   | My gums are uncomfortable/painful         | 18        | 2          | 9        | 29    |
|   | 7   | My teeth have moved position              | 8         | 0          | 10       | 18    |
|   | 8   | My gums are receding                      | 9         | 3          | 6        | 18    |
|   | 9   | I have bad breath                         | 6         | 1          | 3        | 10    |
|   | 10  | There is pus coming out of my gum         | 3         | 0          | 3        | 6     |
|   | 11  | Teeth are plugged when I eat              | 2         | 0          | 2        | 4     |
| Acute symptomatic ( $n = 268, 22.4\%$ )   | 12  | My tooth hurts                            | 59        | 40         | 53       | 152   |
| • •                                       | 13  | I have a hurting gum boil                 | 37        | 29         | 36       | 102   |
|   | 14  | My gums keep bleeding                     | 5         | 1          | 2        | 8     |
|   | 15  | My face swells out                        | 3         | 2          | 1        | 6     |
| Asymptomatic ( $n = 487, 40.7\%$ )        | 16  | I need gum treatment                      | 96        | 46         | 132      | 274   |
|   | 17  | I have gum disease                        | 61        | 26         | 70       | 157   |
|   | 18  | I need gum treatment to make new teeth    | 8         | 6          | 6        | 20    |
|   | 19  | I need gum exam before wearing braces     | 4         | 0          | 8        | 12    |
|   | 20  | I want to save my tooth                   | 2         | 0          | 4        | 6     |
|   | 21  | I want to know whether I have gum disease | 1         | 1          | 3        | 5     |
|   | 22  | I need gum surgery                        | 3         | 1          | 1        | 5     |
|   | 23  | I need bone graft                         | 2         | 1          | 1        | 4     |
|   | 24  | I have pockets                            | 2         | 1          | 1        | 4     |
| Total                                     |     | -   | 507       | 209        | 480      | 1196  |

one true pocket depth (PD) was  $> 7 \,\mathrm{mm}$ , moderate periodontitis when the PD ranged from 5 to 6 mm, and mild periodontitis when the PD was  $\leq$  4 mm, with evidence of radiographic bone loss. For those patients presenting with an asymptomatic CC or without site-specific symptoms, a generalized periodontal status was diagnosed. The extent of periodontal disease was characterized as generalized if more than 30% of the sites were involved (Armitage 1999). When different degrees of severity were found within one dentition, periodontal disease was categorized into a more advanced classification.

#### Periodontal treatment

According to the severity of the disease, patients were assigned to one of the following staffs: interns, residents in training for advanced general dentistry or periodontics, or certified periodontists whose practice was limited to periodontics. Patients may not have been aware of the level of the appointed dentist, but they were informed of copayment, if needed, before the appointment. The periodontal treatment was covered mostly by the National Health Insurance of Taiwan (NHIT), which is an unimposed but highly contracted managed care system run by the government. NHIT has a reduced feefor-service based on a fee schedule

without an individual maximum or preapproval requirement, but with limited resources for dental expenditures.

Patients who did not receive periodontal treatment were considered untreated. Patients complying with at least one appointment of periodontal therapy were considered treated. These treated patients were further divided into two subcategories: complete treatment if they complied with all appointments of basic periodontal therapy, including oral hygiene instructions, scaling, and root planing, and periodontal re-evaluation 4–8 weeks afterwards; or incomplete treatment, if they did not complete the above appointments.

#### Statistical analysis

All descriptive data were analysed using frequency distributions, measures of central tendency, and measures of dispersion. The independent *t*-test and  $\chi^2$ -test, for continuous and categorical variables, respectively, were used to compare basic characteristics and periodontal status between treated and untreated groups, as well as between complete and incomplete treatment groups. Multivariate logistic regression was performed to calculate the odds ratio (OR) and 95% CI for evaluating the association between the CC and patient behaviour towards treatment. All tests appear as two-sided *p* values, and they were declared statistically significant at p < 0.05. All analyses were conducted with a statistical SAS software package (SAS System for Windows Version 9.0, SAS Institute, Cary, NC, USA).

#### Results

#### Characteristics of study subjects

A sample of 1196 subjects was included in this study: 617 (51.6%) males and 579 (48.4%) females. The average age at assessment was  $47.7 \pm 11.6$  years, ranging from 11 to 86 years. Five hundred twelve (42.8%) subjects were nonreferred and 684 (57.2%) were referred, including 578 (48.3%) by local dentists, 103 (8.6%) by intra-mural dentists or physicians, and three (0.3%) by laypersons. The frequency and distribution of CCs, as listed in Table 1, were 441 (36.9%) subjects having chronic symptomatic CCs, 268 (22.4%) having acute symptomatic CCs, and 487 (40.7%) having asymptomatic CCs. There were 765 (64.0%) non-smokers, 135 (11.2%) current smokers, and 266 (22.2%) lacking smoking information. For systemic health conditions, 877 (73.3%) subjects were P1, and subsequently 238 (19.9%). 60 (5.0%), and 21 (1.8%) were P2, P3, and P4, respectively.

Overall, 829 (69.3%) subjects suffered advanced periodontitis, 218 (18.2%) moderate periodontitis, and 149 (12.4%) mild periodontitis. Five hundred seven (42.4%) subjects were not treated. Four hundred eighty (40.1%) subjects completed basic periodontal therapy, whereas 209 (17.5%) subjects did not. Interestingly, during the subsequent 5 years, 30 of the incompletely treated subjects (14.4%) resumed periodontal therapy. However, only 42 of the 507 untreated subjects (8.3%) returned for treatment.

# Comparison between treated and untreated subjects

The treated subjects exhibited a younger mean age (46.9  $\pm$  11.3 versus 48.7  $\pm$ 12.0, p < 0.05), a higher percentage in ASA-PS P1 classification (75.9% versus 69.5%, p < 0.05), and a higher referral rate (59.8% versus 53.7%, p < 0.05) than untreated subjects. They were dominant in asymptomatic CCs (44.7%), followed by chronic and acute symptomatic CCs (31.5%) and 23.8%, respectively), whereas the untreated subjects were dominant in chronic symptomatic CCs (44.2%), followed by asymptomatic and acute symptomatic CCs (35.3% and 20.5%, respectively). Although the study subjects comprised mostly advanced cases, the treated subjects had a lower percentage of advanced periodontitis than did the untreated ones (65.9% versus 74.0%, p < 0.05). There was no significant difference in gender, smoking status, or copayment requirement between treated and untreated subjects (Table 2).

The multivariate logistic regression analysis showed that CC was a significant predictor of initiation to periodontal treatment (Table 3). Compared with subjects with chronic symptomatic CCs (reference), those with acute symptomatic CCs were 60% more likely to receive periodontal treatment (OR = 1.661; 95% CI: 1.203–2.293), as were the asymptomatic subjects (OR = 1.669; 95% CI: 1.252–2.223). Patient's age, systemic health condition, referral status, and periodontal disease severity were not related to treatment status.

# Comparison between complete and incomplete treatment subjects

The completely treated subjects were less likely to be male (47.7% *versus* 56.5%, p < 0.05), but more often referred (60.8% *versus* 57.4%, p < 0.001), than the incompletely treated ones. Completely treated

Table 2. Differences in basic characteristics and periodontal diseases between treated and untreated groups (n = 1196)

| Characteristic                  | Untreated $(n = 507)$ | Treated $(n = 689)$ | p value* |
|---------------------------------|-----------------------|---------------------|----------|
| Age (years, SD)                 | 48.7 (12.0)           | 46.9 (11.3)         | 0.008    |
| Male (%)                        | 270 (53.3)            | 347 (50.4)          | 0.323    |
| Current smoker (%) <sup>†</sup> | 61 (16.2)             | 74 (13.4)           | 0.223    |
| ASA-PS classification (%)       |                       |                     |          |
| P1                              | 354 (69.8)            | 523 (75.9)          | 0.029    |
| P2                              | 107 (21.1)            | 131 (19.0)          |          |
| P3                              | 34 (6.7)              | 26 (3.8)            |          |
| P4                              | 12 (2.4)              | 9 (1.3)             |          |
| Referred (%)                    | 272 (53.7)            | 412 (59.8)          | 0.034    |
| Chief complaint                 |                       |                     |          |
| Chronic symptomatic (%)         | 224 (44.2)            | 217 (31.5)          | < 0.001  |
| Acute symptomatic (%)           | 104 (20.5)            | 164 (23.8)          |          |
| Asymptomatic (%)                | 179 (35.3)            | 308 (44.7)          |          |
| Disease severity                |                       |                     |          |
| Mild (%)                        | 57 (11.2)             | 92 (13.4)           | 0.009    |
| Moderate (%)                    | 75 (14.8)             | 143 (20.8)          |          |
| Advanced (%)                    | 375 (74.0)            | 454 (65.9)          |          |
| Copayment requirement (%)       | 323 (63.7)            | 462 (67.1)          | 0.229    |

 $\chi^{2}$ -test for categorical variables and test or *t*-test for continuous variables.

<sup>†</sup>One hundred and thirty-one missing values for untreated group and 135 for treated group. ASA-PS, American Society of Anesthesiologists Physical Status.

| Table 3. Multivariate | logistic | regression | model | in t | the | analysis | of | basic | periodontal | therapy |
|-----------------------|----------|------------|-------|------|-----|----------|----|-------|-------------|---------|
| (n = 1196)            |          |            |       |      |     |          |    |       |             |         |

| Variable                  | OR    | p value | 95% CI       |
|---------------------------|-------|---------|--------------|
| Age (years)               | 0.990 | 0.078   | 0.980, 1.001 |
| ASA-PS classification (%) |       |         |              |
| P1                        | 1.000 |         |              |
| P2                        | 0.958 | 0.784   | 0.704, 1.313 |
| P3                        | 0.606 | 0.075   | 0.349, 1.051 |
| P4                        | 0.630 | 0.315   | 0.256, 1.550 |
| Referred (%)              |       |         |              |
| No                        | 1.000 |         |              |
| Yes                       | 1.058 | 0.668   | 0.818, 1.369 |
| Chief complaint           |       |         |              |
| Chronic symptomatic       | 1.000 |         |              |
| Acute symptomatic         | 1.661 | 0.002   | 1.203, 2.293 |
| Asymptomatic              | 1.669 | 0.001   | 1.252, 2.223 |
| Disease severity          |       |         |              |
| Mild periodontitis        | 1.000 |         |              |
| Moderate periodontitis    | 1.408 | 0.197   | 0.818, 2.682 |
| Advanced periodontitis    | 0.676 | 0.060   | 0.450, 1.061 |

ASA-PS, American Society of Anesthesiologists Physical Status; CI, confidence interval; OR, odds ratio.

subjects were dominant in having asymptomatic CCs (47.1%), followed by chronic and acute symptomatic CCs (33.8%) and 19.2%, respectively), whereas the incompletely treated subjects were also dominant in having asymptomatic CCs but to a lesser extent (39.2%), followed by acute and chronic symptomatic CCs (34.5% and 26.3%, respectively). Interestingly, the completely treated subjects had a much higher percentage of copayment requirement  $(72.7\% \ versus \ 54.1\%, \ p < 0.001)$  and of treatment by an experienced periodontist (59.0% versus 41.0%, p < 0.001), than the incompletely treated subjects. There was no difference between the completely and incompletely treated subjects in age, smoking status, ASA-PS classification, or disease severity (Table 4).

The multivariate logistic regression analysis showed that acute chronic symptomatic CC was a significant negative predictor of complete treatment, while copayment requirement and treatment by an experienced periodontist were significant positive predictors of completing treatment (Table 5). Compared with the subjects having chronic symptomatic CCs, the acute sympto-

Table 4. Differences in basic characteristics and periodontal diseases between completely and incompletely treated patients (n = 689)

| Characteristic   | Incomplete $(n = 209)$ | Complete $(n = 480)$    | p value* |
|--|------------------------|-------------------------|----------|
| Aga (vaars SD)   | 47.0 (12.4)            | 46.5 (10.7)             | 0.143    |
| Age (years, SD)  | 47.9 (12.4)            | 40.3(10.7)              | 0.143    |
| $C_{\text{rement enclose}} \left( \mathcal{O} \right)^{\dagger}$ | 110(30.3)              | 229 (47.7)<br>52 (12.0) | 0.055    |
| ASA-PS classification (%)  | 21 (14.3)              | 55 (15.0)               | 0.045    |
| P1   | 165 (78.0)             | 358 (74.7)              | 0.241    |
| P2   | 31 (14.8)              | 100 (20.8)              |          |
| P3   | 9 (4.3)                | 17 (3.5)                |          |
| P4   | 4 (1.9)                | 5 (1.0)                 |          |
| Referred (%)   | 120 (57.4)             | 292 (60.8)              | < 0.001  |
| Chief complaint  |                        |                         |          |
| Chronic symptomatic (%)  | 55 (26.3)              | 162 (33.8)              | < 0.001  |
| Acute symptomatic (%)  | 72 (34.5)              | 92 (19.2)               |          |
| Asymptomatic (%)   | 82 (39.2)              | 226 (47.1)              |          |
| Disease severity   |                        |                         |          |
| Mild (%)   | 22 (10.5)              | 70 (14.6)               | 0.284    |
| Moderate (%)   | 48 (23.0)              | 95 (19.8)               |          |
| Advanced (%)   | 139 (66.5)             | 315 (65.6)              |          |
| Copayment requirement (%)  | 113 (54.1)             | 349 (72.7)              | < 0.001  |
| Treatment by experienced periodontist (%)                        | 197 (41.0)             | 283 (59.0)              | < 0.001  |

 $\chi^{2}$ -test for categorical variables and test or *t*-test for continuous variables.

<sup>†</sup>Sixty-four missing values for untreated group and 71 for treated group.

ASA-PS, American Society of Anesthesiologists Physical Status.

*Table 5.* Multivariate logistic regression model in the analysis of complete periodontal treatment (n = 689)

| Variable                                  | OR    | p value | 95% CI       |
|---|-------|---------|--------------|
| Male                                      | 0.759 | 0.115   | 0.539, 1.069 |
| Referred (%)                              |       |         |              |
| No  | 1.000 |         |              |
| Yes                                       | 0.983 | 0.927   | 0.674, 1.431 |
| Chief complaint                           |       |         |              |
| Chronic symptomatic                       | 1.000 |         |              |
| Acute symptomatic                         | 0.420 | < 0.001 | 0.267, 0.660 |
| Asymptomatic                              | 0.873 | 0.545   | 0.561, 1.357 |
| Need copayment                            | 1.944 | 0.001   | 1.299, 2.910 |
| Treatment by experienced periodontist (%) | 1.695 | 0.008   | 1.147, 2.505 |

CI, confidence interval; OR, odds ratio.

matic subjects were 60% less likely to complete periodontal treatment (OR = 0.420; 95% CI: 0.267-0.660). The OR of complete treatment for copayment requirement was 1.944 (95% CI: 1.30-2.91), while that for being treated by an experienced periodontist was 1.695 (95% CI: 1.15-2.50). There was a correlation between patient's copayment requirement and treatment by an experienced periodontist (p < 0.001). However, when the interaction term of these two factors was included in the regression model, it was statistically insignificant (OR = 0.829, p = 0.6486). Patient's gender and referral were not related to complete treatment.

# Discussion

In this study, we found an association between patients' CCs at the first perio-

dontal visit and their subsequent compliance with basic periodontal therapy. Our results suggest a higher motivation to initiate periodontal therapy in patients with acute symptomatic or asymptomatic CCs than those with chronic symptomatic CCs. However, such a motivation does not last long, as acute symptomatic patients are less likely to complete basic periodontal therapy. Other factors might also affect their long-term motivation for periodontal treatment such as whether a copayment is required or whether they are treated by an experienced periodontist.

Periodontitis is a slow progressive, chronic inflammatory disease characterized by bursts of disease activity separated by quiescent periods of varying duration (Albandar 1990, Flemmig 1999). In this study, the most dominant chronic symptomatic CC was loose teeth, followed by gum bleeding when brushing, sensitive teeth, enlarged gums, and tender teeth when chewing. These symptoms do not hamper daily functions but can last for a long time if left untreated. In addition, chronic symptoms are most common in periodontal disease and are a constant reminder to the patient. Therefore, we used chronic symptomatic CC as the reference for comparison.

In some circumstances, patients experienced an acute exacerbation of the disease. In our study, toothache was the most common acute symptomatic CC, followed by gum boils, in terms of acute periodontal abscess, which is the result of an extension of the infection into the still-intact periodontal tissues (Sanz et al. 2008). Toothache is a vague subjective description. It is often a mixed sensation of a floating tooth, biting discomfort, gingival pain, or significant swelling. These acute lesions are usually painful and hard to bear. We found patients with an acute symptomatic CC to be 60% more motivated to initiate periodontal therapy than those with chronic symptomatic CC. However, they were 60% less likely to complete periodontal therapy.

The preconception before periodontal treatment is often subjective. Apprehension, anxiety, and fear of dental treatment may compromise patients' compliance with treatment (Rizzardo et al. 1991), and usually end up with untreated or burst activity of periodontal disease. Studies have reported that most of patients had anxieties about pending treatment, with the main concern being pain (Fardal et al. 2001). This could explain the consequence that fear remains as an obstacle to further periodontal treatment for patients with acute symptomatic CCs, once their acute symptoms are resolved. On the other hand, awareness is one of the key processes that must be activated before people reach a sufficient motivational stage to change behaviour and accept treatment (Prochaska & Velicer 1997). It is interesting to note that patients with less severe periodontal disease had a higher tendency to initiate periodontal therapy than did those with advanced periodontitis. It seems that patients who were more aware of their periodontal disease visited a periodontist earlier and were more easily motivated for therapy.

We also found that 40% of the study subjects were free of symptoms at the

time of visit. The most common CC was "I need gum treatment," which addressed clearly their demands for periodontal therapy. Some others stated, 'I have gum disease," instead, to expect more help from the periodontist. Asymptomatic patients appeared to be 60% more motivated than those having chronic symptomatic CCs in initiating periodontal therapy, and almost comparable in completing treatment. According to the literature, patients who had agreed to a periodontal referral opted to accept no or a very low risk of periodontal problems, and they were much more supportive of treatment (Fardal et al. 2001). Our results seem to corroborate their findings in that 80% of the asymptomatic patients were referred (see Appendix A). However, referral was no longer a key predictor in motivating periodontal treatment after considering other factors. CC becomes the only significant predictor to initiate periodontal therapy.

As periodontists, our goal is not only to spur patient's motivation but also to complete the therapy to prevent further periodontal deterioration. Our results suggest two more significant predicators, other than CC, to be associated with patients' completion of basic periodontal therapy: copayment requirement and treatment provided by an experienced periodontist. We found that twice as many patients complete periodontal therapy when copayment is required than when none is required. In most managed care systems, the health benefit of the purchaser is insured and balanced between the premium, copayment, yearly maximum, and restricted as to type, level, and frequency of treatment (Zickert et al. 2000, Cobb et al. 2003, Darby et al. 2005), whereas in NHIT, patients and their employers pay only a limited premium according to their personal or household income. In this case, the impact of the copayment requirement on patient's dedication to periodontal therapy becomes apparent. Such a relation was not found at the initiation of treatment, implicating the causative effect of a copayment requirement on the completion of treatment in this study.

We also found that patients tend to complete basic periodontal treatment when the service is provided by an experienced periodontist rather than by various residents. The clinician's ability and experience are important in influencing periodontal treatment. Studies have shown that more-experienced operators produced a significantly greater number

of calculus-free root surfaces in periodontal pockets with moderate-to-deep probing depths than did less-experienced operators (Braver et al. 1989. Fleischer et al. 1989, Ruhling et al. 2002). Although the prevalence of periodontal disease is ubiquitously high, most general dentists were less confident in treating advanced or aggressive periodontitis, spending only 12-18% of their time on periodontal therapy (Buckley 1993, Croxson 1993, Trovato 2003, Darby et al. 2005). It cannot be overemphasized that clinicians should continuously improve their knowledge and skills to provide their patients with appropriate periodontal treatment.

This study emphasized patient compliance with basic periodontal therapy, which is different from other studies focusing on compliance with supportive periodontal therapy. It also provides a new look at the patient's CC for its strong relation to his or her compliance. In addition, the heterogeneity of the referral status, patient CC, and a systemically compromised condition in our study cohort provide a unique opportunity to evaluate the predictors that might be difficult to achieve in the periodontist's private office where patients usually have more homogenous characteristics. All these study subjects came from one periodontal clinic in a medical centre, which might introduce selection bias, so caution must be exercised in generalizing these results to other studies.

There were other limitations in this retrospective study. Data collected in this study were from records taken when the hospital initiated digital system. Dental radiographs and periodontal charts were not completely digitalized in a long transition period. It limited the access and standardization to evaluate more clinical relevance by reviewing radiographs, probing depths, and other periodontal parameters. In addition, we were unable to recall the educational level, travel distance, and smoking status of some of the study patients. Researchers have observed a relationship between socioeconomic levels and periodontal health. People with higher education had more positive attitudes towards oral hygiene and the frequency of dental visits (Burt et al. 2005). The socioeconomic level might impact the intensity of the result, and it should be considered in future research. In addition, smoking status was retained as a variable in the analysis, inasmuch as smoking was related to patient compliance in Jansson & Hagstrom's (2002) study. Our study cohort had a lower percentage of smokers (14.5%) than did the study of Cobb et al. (2003) (19–31%) or Jansson & Hagstrom (2002) (52–60%). It was our clinical impression that this rate might be even lower if the missing data were replaced and calculated, because the unmarked records belonged mainly to non-smokers. Because of a relatively lower proportion of smokers, our results did not show as significant an impact of smoking on patient compliance as that from Jansson and Hagstrom's study.

There are three clinical implications that come from this study. First, an emphasis on the chronic nature of periodontal disease through public education might improve patients' perceptions. Second, clinicians should select their patients carefully so that a higher rate of treatment completion can be achieved. Ideally, general dentists should refer patients to periodontists for advanced management. Third, incorporation of copayment into dental insurance is recommended to increase the patient's dedication to periodontal treatment.

# Conclusions

Patients' CC at their first periodontal visit was associated with their ultimate compliance with basic periodontal therapy, overriding other factors. The acute symptomatic CC could be a positive predictor to initiate periodontal treatment, but a negative predictor to complete the treatment. Studies on the influence of various CCs, especially chronic symptomatic ones, on patient compliance should be further conducted to improve periodontal treatment outcomes.

# Appendix A

Table A1. Cross table of referral and chief complaint

| Chief<br>complaint              | Non-<br>referred<br>n (%) | Referred <i>n</i> (%) | Total<br><i>n</i> |
|---------------------------------|---------------------------|-----------------------|-------------------|
| Chronic<br>symptomatic          | 272 (61.7)                | 169 (38.3)            | 441               |
| CC<br>Acute sympto-<br>matic CC | 142 (53.0)                | 126 (47.0)            | 268               |
| Asymptomatic CC                 | 98 (20.1)                 | 389 (80.9)            | 487               |
| Total                           | 512 (42.8)                | 684 (57.2)            | 1196              |

CC, chief complaints.

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# **Clinical Relevance**

*Scientific rationale for the study*: Patients' CCs can be valuable sources of information and be related to their compliance with basic periodontal therapy.

*Principal findings*: Patients with acute symptomatic or asymptomatic CCs have a higher motivation to

initiate periodontal therapy, but the former are less likely to complete basic periodontal therapy. Copayment requirement and whether treated by an experienced periodontist are other factors affecting likelihood of treatment completion.

*Practical implications*: Improving patient perception and dedication to

treatment should be achieved by emphasizing the chronic nature of periodontal disease through public education, referral of patients to periodontists for advanced management, and incorporation of copayments into the insurance plan. This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.