Effect of a Computer-Generated Telephone Reminder System on Appointment Attendance

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This was a prospective, longitudinal, randomized study designed to determine the effects of a computer-generated telephone reminder system, HouseCalls™, on the appointment attendance of patients undergoing active orthodontic treatment in a university orthodontic clinic. A total of 228 patients were randomly assigned to two groups. The patients in the call group (n = 114) with 495 scheduled appointments received a computer-generated reminder the night before their appointment. The no-call group containing 114 patients with 541 scheduled appointments received no reminder. The call group had 22 broken appointments (4.4% broken appointment rate) and the no-call group had 46 broken appointments (8.5% broken appointment rate). The call group had a significantly lower broken appointment rate (χ², P < 0.05).

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Failure of patients to appear for scheduled appointments and to notify their doctors is a chronic problem in health care. The broken appointment rate in private orthodontic practice is reported as 7.6%. The rate of broken appointments was almost twice as high in university orthodontic settings. The 1999 JCO Orthodontic Practice Study reported broken appointment rates ranging from 6% to 10%. Other areas of dentistry report rates as high as 29.7%.

Broken appointments could adversely affect treatment outcomes, practice income/staff management, and also damage patient/doctor relationships. Although extraction of premolars was considered to be the major reason for increasing orthodontic treatment time, the number of missed appointments was the second major reason. The increase in treatment time ranged from 0.8 months to a little over 1 month for each missed visit.

Forgetfulness, illness, emergencies, and other commitments are cited as possible reasons for broken appointments. Forgetfulness accounted for 56.2% of the missed appointments in one orthodontic clinic and 21.1% in another.

Appointment failures were reduced from 7.6% to 1.9% in an orthodontic practice when the use of a personal telephone reminder was instituted. A reduction from a 9.4% to a 3% broken appointment rate occurred in a general dental office when a personal telephone reminder was attempted. A telephone appointment reminder reduced the broken appointment rate of medical appointments by 10%. Thus, a simple reminder to the patient appeared to decrease broken appointments.

Studies comparing the cost effectiveness of telephone reminders versus letters are somewhat outdated but allow a comparison. Each call to a patient was estimated to cost $0.825 per patient; each manually generated letter was estimated to cost $0.83 per letter; and each computer-generated letter was estimated to cost $0.37. The call to a patient also included the cost of staff time. Although the current cost of postage alone is $0.37, this study allows some comparison. However, a problem with telephone reminders is that 15% of patients could not be reached between 9 AM and 5 PM, popular private practice times. More than 10% of patients could not be contacted with less than 5 attempted calls. Telephone reminders during practice hours appear to be time consuming and all patients cannot be reached.

There is limited research describing the efficacy of computer-generated reminder systems. One study reported a computer-generated telephone reminder significantly reduced the appointment failure rate in a university orthodontic clinic from 9.1% for patients who did not receive a reminder to 5.1% for those who did receive a reminder. Based on these results, the authors claimed the average practice could recapture approximately five and a half days of production a year, resulting in a substantial increase of $17,337 of production.

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The purpose of this prospective, longitudinal, randomized study in a university orthodontic clinic was to determine if there was a significant difference in the broken appointment rate between scheduled appointments of patients who receive a telephone reminder by the computer-generated calling system, HouseCalls™, and scheduled appointments of patients who did not receive a reminder.

Materials and Methods

This study used the HouseCalls™ Appointment Reminder System (Televox®, 1000 Hillcrest Rd, Ste 115, Mobile, AL 36695) to remind active orthodontic patients of their appointments on the evening before their scheduled appointments. The study was approximately 6 months in length. Patient attendance and broken appointments were recorded.

Before the study, an alphabetical list of active patients was generated in the Orthodontic Practice Management System (OPMSTM; PracticeWorks Inc, Atlanta, GA) for assignment. The active status in OPMS™ included all patients who were undergoing phase 1, phase 2, or comprehensive orthodontic treatments. This designation did not include screenings, records, consultations, or retention appointments. All active patients were assigned to the call or no-call group by using a random numbers table.11 The call group contained 114 patients and received a computer-generated reminder. The no-call group contained 114 patients and did not receive a call. Siblings who were treated at the clinic were assigned together to the same group. A different number was assigned to each group in Memo Field 1 of OPMS™ to distinguish each group.

Based on HouseCalls™ recommendation, form letters containing brief instructions on the use of the system were customized to the clinic and were generated to inform the call group patients of the service. The letter described the process and informed the patients of the response options contained in the reminder call. During the phone response system, patients were able to confirm their attendance by pressing “1,” repeat the message by pressing “2,” leave a message by pressing “3,” or cancel their appointment by pressing “5.”

Daily Operation

Daily operation to acquire appointment data included:

1. Before closing the clinic each night:
   a. an electronic appointment file of the next day’s appointments was generated from OPMS™ using DataMaster;
   b. after patients who had previously rescheduled and/or canceled their appointments for the next day were identified and deleted from the calling list, the appointment file was imported into HouseCalls™, and
   c. calls were placed to the designated patients.
2. On the morning of the appointments, a printed report and an electronic file were generated by HouseCalls™ regarding the results of the calls.
3. After the clinic closed on the appointment day, OPMS™ was updated regarding the broken/kept appointment status and an electronic file was generated from OPMS using DataMaster.

The data of the electronic files in items 2 and 3 were combined in an Access or an Excel database. Data were categorized and relevant computations were performed by using macros. A summary of the responses that were included or excluded in the study is shown in Table 1.

Statistical Analysis

Differences in the broken appointment rates were tested for significance by using a Chi-square, accepting \( P < 0.05 \) as significant. Separate \( \chi^2 \) analyses were performed for the total appointments and for each of the first three appointments.

Results

The total number \((n = 228)\) of patients in the study had 1036 scheduled appointments. The total number of patients in the call group was 114 with 495 scheduled appointments. The no-call group contained 114 patients with 541 scheduled appointments. The call group had 22 broken appointments (4.4% broken appointment rate) and the no-call group had 46 broken appointments (8.5% broken appointment rate) (Table 2). There was a significant difference in the total broken appointment rates \((\chi^2 = 6.94; \ P < 0.05)\). There were more than 7 total appointments with decreasing numbers of patients attending each; therefore, appointments 4 to 10 were grouped, but not compared statistically.

The rate of broken appointments for the call group at each of the first 3 appointments were statistically lower \((\chi^2; P < 0.05)\) (Table 2) when compared with the no-call group.

The breakdown of broken appointments by patient response (Table 3) showed that the patients whose calls were received by an answering machine had the most broken appointments. Patients who listened but did not respond also broke appointments and even patients who responded that they would keep their appointments also broke them.

Discussion

A computerized telephonic reminder significantly reduced the broken appointment rate at the university orthodontic clinic. Overall, broken appointments were reduced to almost half compared with those who did not receive a reminder.

### Table 1 Summary of Inclusion vs. Exclusion of Housecalls™

<table>
<thead>
<tr>
<th>Responses in Results</th>
<th>Included</th>
<th>Excluded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answered, left message</td>
<td>Out of order</td>
<td></td>
</tr>
<tr>
<td>Answered, no</td>
<td>Phone too busy</td>
<td></td>
</tr>
<tr>
<td>Answered, yes</td>
<td>Not called</td>
<td></td>
</tr>
<tr>
<td>Answering machine</td>
<td>Called, no answer</td>
<td></td>
</tr>
<tr>
<td>Answered, no response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Answered, repeated message</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name not recorded</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The greatest reduction in broken appointment rate was seen in the first 3 appointments of a patient’s history.

Assuming similar results in a private practice setting, this reduction in broken appointments would increase practice efficiency. The telephone reminder software is designed to give administrative staff feedback in a number of ways. The breadth of the call report allowed a standard operating procedure to be developed to initiate actions based on the responses to the calls. For example, if the call was answered and the “patient” left a message, the front desk personnel listened to the message left on HouseCalls™ and responded appropriately. In our study, most of the messages were probably miskeyed by the individual answering the phone since no message was actually left when the receptionist checked them. One message was an automated phone company response indicating that the phone number was no longer in service. Another message was a request to reschedule an appointment. When patients indicated they would not make their appointment, then another patient visit could be scheduled in that slot. When the report indicated that the phone was out of order after the call was attempted three times at a minimum of 20-second intervals and the phone was unavailable for all attempts, the receptionist attempted to call the number listed on the patient listing. If the telephone operator came on the line stating that this was a long distance call and a “1” should be dialed before the area code and number, then the receptionist redialed the number as a long distance call. If the party was reached, HouseCalls™ was programmed to make future long distance calls to that number. If an operator came on the line giving a change of number, the new number was written down and changed in the patient information in OPMS. This number was confirmed with the patient at the next appointment. If an operator came on the line and stated the number had changed or was no longer in service, the patient was asked to update their demographic information at the next appointment or the log sheet from their last appointment was checked to see if updated information was given.

Other benefits include minimal involvement by the staff each day in setting up the system to make the calls. Approximately 5 minutes a day was required to initiate the system for evening calls and to print the results the next day. The software instructions were simple. Patients volunteered to the front desk staff that they really liked the reminders.

Decreasing the number of broken appointments can also affect practice income. Gottlieb and colleagues reported the median practice in 2001 had 488 active cases with a median gross income of $713,000. A 50% reduction in broken appointment rates would have a direct effect on the gross income of that practice. In this study, reducing the broken appointment rate from 8.5% to 4.4% of patients undergoing active treatment would result in a gross income increase of approximately $30,000. Assuming a 52% overhead rate, this reduction in broken appointments would equate to a net increase of approximately $14,500. This amount would easily justify the cost of the software giving a payback period of a few months. Upgrades to the software over time and personnel training are minimal. Another consideration when justifying the telephone reminder system includes reallocation of duties. The number of hours the front desk staff spend confirming patient appointments can be spent on other tasks.

The use of the telephone reminder did not totally eliminate broken appointments. However, the report from the software allows a better understanding of scheduling problems. For example, the lack of response when the phone reminder was answered was much higher than expected. It was possible that the person who answered was a child or an adult who was not responsible for transporting the patient to the clinic and, therefore, could not answer. The clinic also treated a large number of patients who had family members who did not speak English. This could also explain why the second highest number of broken appointments occurred in this group. The highest number of broken appointments occurred in the group whose messages were received by answering machines and it is possible that the message was never played.

Since broken appointments also occurred in the group who responded that they were coming to the appointment,
there also appears to be a group for whom telephone reminders may not work. Interestingly, some patients who said that they were not coming to the appointment came anyway.

Accurate input of patient information into OPMS depended on front office staff to run the OPMS Daily Wizard that recorded the kept appointments for the day. Staff turnover at the university was high with inexperienced and often untrained personnel filling this position. The target population of the study included only patients in active treatment and did not include records and screening patients or retention patients. Our clinical impression was that broken appointment rates were greater in these groups when compared with patients in active treatment. Another study should consider examining these two groups.

**Conclusion**

This study indicates that use of a commercially available computer-generated telephone reminder system, HouseCalls\textsuperscript{TM}, the evening before a scheduled appointment significantly reduced the number of broken appointments at a university orthodontic clinic.

**Acknowledgment**

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**References**