Relationship Between Broken Appointments and Dental Students’ Clinical Experience Level


Abstract: As more dental schools adopt a comprehensive care model focused on patients’ needs rather than a certain number of required procedures, clinic time utilization by students is coming under increasingly close scrutiny. This article presents an analysis of the influence of broken appointment rates on dental students’ clinical experience levels. The total percentage of broken appointments experienced by each student from the classes of 2010 and 2011 at Case Western Reserve University School of Dental Medicine during his or her clinical education in the junior and senior years was determined, and the impact of the broken appointment rate on students’ clinical experience levels was analyzed. The results show a statistically significant difference regarding the percentage of broken appointments between the classes of 2010 and 2011: 18.64 percent and 14.44 percent, respectively. When the rate of no-shows was compared to the students’ clinical experience level, a weak but significant negative correlation was determined for the class of 2010 but not for the class of 2011. It is concluded that the rate of broken appointments accounts for a small part of the variability observed in the number of clinical procedures performed in the predoctoral clinic. When this rate is lowered below a threshold of 14.5 percent, broken appointments seem to have no influence on students’ clinical experience level.

Keywords: dental education, dental students, clinical education, dental school clinic, broken appointments

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Broken appointments and no-shows are familiar problems in all types of health care facilities and may have a broad impact on institutional productivity, access to care, and health care costs.\(^1\) The effect on access to care for underserved populations is of particular concern: the American Dental Association reported that, nationwide, the average broken appointment rate in Medicaid dental clinics is 30 percent.\(^2\)

Three major factors are claimed to influence appointment-keeping behavior: physician continuity, communication systems, and type of appointment system.\(^3\) Demographics, as well as socioeconomic and insurance status, have also been linked to patients’ appointment-keeping compliance; however, the results are not conclusive. According to some studies, for example, Medicaid coverage is related to the rate of broken appointments,\(^4,6\) whereas other studies question the validity of this relationship.\(^3,7\) Other demographic and socioeconomic factors such as age, ethnicity, education level, and family size have been mentioned in relation to appointment-keeping behavior, but there is mixed evidence regarding the predictive value of these factors in the context of broken appointment rates.\(^3,9-15\) Other frequent reasons for patient no-shows are ready forgiveness,\(^5,12\) administrative errors,\(^5,12\) poor communication,\(^3,5,6,9\) longer intervals between appointments,\(^16\) geographic separation,\(^5\) illness,\(^5,17\) bad weather,\(^14\) fear,\(^18,19\) and transportation difficulties.\(^5,6,16,17,20\)

In order to improve the utilization rate and reduce the rate of no-shows, health care providers have tried various improvements in clinic management: design of better confirmation and recall systems, improved communication, and customized scheduling systems for patients are some of the methods mentioned in the literature.\(^2,9,13,15,21,22\) Other reports have analyzed the impact of positive and negative incentives for reducing broken appointment rates.\(^1,23-26\) The costs of implementing new technologies and procedures have been reported to be offset by financial gains in overall productivity.\(^9,22\) However, it seems that ongoing monitoring of the effectiveness of any method is necessary because the positive impact of newly implemented techniques may fade over time.\(^15\)

Dental schools are a special case of health care providers because, in addition to services provided, the educational component is part of the institutional
mission. Students’ clinical experience level is an important component of the educational process, so dental schools have an additional reason to improve efficiency in the clinical setting. Because schools are increasingly adopting a comprehensive care model focused on patients’ needs rather than a certain number of required procedures, a clinic time utilization method is coming under closer scrutiny to ensure the clinics are maximizing students’ educational opportunities.

Patients’ no-show rates would seem to have an obvious impact on students’ clinic time utilization, but to the best of our knowledge, no research that analyzes the influence of those rates on students’ clinical experience level has been published. The research question for our study was therefore this: Is the level of broken appointments correlated with students’ clinical experience level? The null hypothesis to be tested assumes that a statistically significant negative relationship exists between the level of broken appointments and students’ clinical experience level.

**Methodology**

The Case Western Reserve University School of Dental Medicine (SODM) is located in the urban area of Cleveland, OH. Its predoctoral curriculum is based on developing competence, with special emphasis on patient comprehensive care during the last two (clinical) years. Students are assigned to a group practice that, as much as possible, emulates the private practice environment. Each student is assigned a cubicle for the duration of his or her tenure in the dental school. The students are organized into nine groups in the predoctoral clinic, each group consisting of junior and senior students. Each group is supervised by a preceptor, together with restorative faculty members who participate in clinical teaching. The preceptors are assigned permanently to the same group, so patient care continuity is ensured when students graduate and are replaced by the succeeding class. As a rule, patients are not transferred between groups. Each group is administered by a patient care coordinator (PCC) who is in charge (among other activities) of patient scheduling.

Students are not constrained by requirements and should demonstrate continuous competence that is evaluated through daily grading of procedures and periodic clinical exams in the various disciplines. Graduation is not contingent upon the number of experiences completed but on successful completion of all clinical exams.

In addition to scheduling patients, the PCCs at the SODM confirm patient appointments the day before the appointment is scheduled. Appointments scheduled for Monday are confirmed the previous Friday. A broken appointment (no-show) is defined at the SODM as an appointment for which the patient failed to appear or a cancellation that occurred less than twenty-four hours before the scheduled appointment. In case of severe weather, no-shows are not considered broken appointments. Such occurrences are documented in the electronic record. The school’s policy is that, following the first broken appointment, the patient receives a letter that reminds him or her that if three appointments are registered as no-shows in the electronic record, the patient will not be eligible for further treatment at the SODM. The patient information brochure distributed to all new patients also describes this policy.

Following the second broken appointment, an additional letter is sent, and if the patient breaks a third appointment, the chart is transferred to the Quality Assurance Department that assesses the status of the treatment and instructs the PCC to send a close-out letter. Every attempt is made to finish treatments that are in temporary stages, and the patient is informed regarding other venues for receiving dental care.

For this study, the total number of operative and restorative procedures (fillings, crowns and fixed partial denture [FPD] abutments, and removable restorations) performed during the junior and senior years in the comprehensive care courses by each student who graduated in 2010 and 2011 was determined. To evaluate an aggregate experience level, each procedure was given a relative value weight as follows: 1 point for an operative procedure; 5.5 points for a fixed restoration experience (crown or abutment prepared for an FPD); and 8.5 points for a removable experience (complete or partial denture). The cumulative number of points for all procedures is designated as the total Comprehensive Care Experience Level (CCEL). Relative value unit scales are used in educational institutions, the military, and the insurance industry as a standard tool to evaluate overall productivity. The electronic schedule was queried for the total percentage of broken appointments each student experienced during his or her clinical education in the junior and senior years. The statistical analysis was conducted with SPSS for Windows 16.0 (SPSS, Chicago, IL, USA) and Microsoft Excel (Microsoft, Redmond, WA).
Results

Seventy-one students graduated in the class of 2010, and eighty-two students graduated in the class of 2011. Figure 1 shows the distribution of broken appointments for both classes. Table 1 summarizes the experience levels and the percentage of broken appointments for the two classes. The Mann-Whitney U two-tailed test revealed no statistically significant difference between the CCEL for operative and fixed procedures performed by the class of 2010 when compared to that for the class of 2011 (p=0.15). The removable experience level was significantly higher for the class of 2011 (p<0.05). In contrast, the average percentage of broken appointments was significantly lower for the class of 2011 (p<0.0001).

The CCEL was plotted versus the percentage of broken appointments for each class. Linear regression applied to the data showed that the coefficients of determination ($r^2$) were 0.1583 for the class of 2010 and 0.0446 for the class of 2011 (Figures 2 and 3). The $r^2$ was also computed for the number of operative, removable, and fixed experiences versus the percentage of broken appointments (Table 2).

In a situation in which normality is not assumed, the correlation coefficient (r) statistical significance is tested by checking if the Spearman’s rank correlation coefficient (rho) is significantly different from zero. The Spearman’s rho is used to measure the monotonic relationship between two variables, i.e., whether one variable tends to take either a larger or smaller value by modifying the value of the other variable. If the Spearman’s rho equals zero, no such relationship exists. The results show that, for the class of 2010 (Table 3), a weakly negative but statistically significant correlation existed between the percentage of broken appointments and the experience levels in all disciplines (p<0.05), whereas for the class of 2011 (Table 4) no such significance was observed.
Discussion

To the best of our knowledge, the topic of the influence of broken appointments on students’ clinical experience level has not been reported in published studies. It seems intuitive that a practice as a whole has to strive to lower its percentage of broken appointments as much as possible because of the financial impact.\textsuperscript{1,9,22}

In our study, the percentage of broken appointments for the class of 2010 was 18.64 percent, whereas for the class of 2011 it was 14.44 percent. This difference is statistically significant and can be attributed to an intervention that occurred during the fourth quarter of 2009. At the end of 2009, the staff participated in a week-long customer service training that emphasized the topic of broken appointment reduction in the predoctoral clinic. Tighter implementation of the close-out policy for patients who are no-show recidivists, communication of the policy to the patients at an early stage after being admitted to the clinic, and student awareness regarding the policy were discussed. It seems plausible that the influence of the training had only a marginal influence on the class of 2010 who graduated in May 2010, whereas for the class of 2011 the no-show rate was signifi-
significantly reduced. It may be concluded that the longer exposure of the class of 2011 to the more rigorous implementation of the policy played a role in the reduced rate of no-shows for this class.

Interestingly, we found a statistically significant correlation between the percentages of broken appointments and clinical productivity for the class of 2010, but no such relation was found for the class of 2011. Therefore, the null hypothesis is accepted for the data from the class of 2010 and is rejected for the class of 2011. Taking into account that the difference in the total Comprehensive Care Experience Level (CCEL) between the two classes was not statistically significant, it seems that there is a critical threshold under which the rate of no-shows ceases to be significantly related to productivity.

The rate of broken appointments observed in the predoctoral clinic was of the same order of magnitude as reported by others in academic settings.9,22,35,36 It is worth mentioning that even when the results for the class of 2010 showed significance, the coefficient of determination $r^2$ that measures the degree of association and accounts for the percentage of variability in the dependent variable (in our case the CCEL) can explain only about 16 percent (see Table 2) of it. Therefore, about 84 percent of the variability in the CCEL is influenced by factors other than the broken appointments rate.

Although it has been shown that overall patient satisfaction with the clinic and services in general and the interpersonal skills of the health care provider are predictors of appointment-keeping rates,9,37 these

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**Table 2. Coefficient of determination ($r^2$) for clinical percentage of broken appointments (BA) versus various clinical procedures**

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<th>Class</th>
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<th>$r^2$ - % BA vs. Fixed</th>
<th>$r^2$ - % BA vs. CCEL</th>
</tr>
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<td>0.154782</td>
<td>0.047656</td>
<td>0.080415</td>
<td>0.1583</td>
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<td>2011</td>
<td>0.027735</td>
<td>0.013339</td>
<td>0.049740</td>
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**Figure 3. Plot of students’ Comprehensive Care Experience Level (CCEL) versus broken appointments percentage for the class of 2011 (third-year students)**

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Table 3. Correlation between percentage of broken appointments and experience levels for Class of 2010 (fourth-year students, N=71)

<table>
<thead>
<tr>
<th>Broken Appointment Percentage</th>
<th>Total (CCEL)</th>
<th>Operative</th>
<th>Removable</th>
<th>Fixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broken appointment percentage</td>
<td>1.00</td>
<td>$r=0.41$</td>
<td>$p=0.0003$</td>
<td>$r=-0.23$</td>
</tr>
<tr>
<td>Total (CCEL)</td>
<td>$r=0.41$</td>
<td>1.00</td>
<td>$r=0.77$</td>
<td>$r=0.63$</td>
</tr>
<tr>
<td>Operative</td>
<td>$r=0.40$</td>
<td>$p=0.0005$</td>
<td>1.00</td>
<td>$r=0.36$</td>
</tr>
<tr>
<td>Removable</td>
<td>$r=0.23$</td>
<td>$p=0.0494$</td>
<td>$r=0.63$</td>
<td>1.00</td>
</tr>
<tr>
<td>Fixed</td>
<td>$r=0.29$</td>
<td>$p=0.133$</td>
<td>$r=0.82$</td>
<td>$r=0.41$</td>
</tr>
</tbody>
</table>

Note: Pearson correlation coefficients: Prob $>|r|$ under H0: Rho=0.

Table 4. Correlation between percentage of broken appointments and experience levels for Class of 2011 (third-year students, N=82)

<table>
<thead>
<tr>
<th>Broken Appointment Percentage</th>
<th>Total (CCEL)</th>
<th>Operative</th>
<th>Removable</th>
<th>Fixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broken appointment percentage</td>
<td>1.00</td>
<td>$r=0.20$</td>
<td>$p=0.07$</td>
<td>$r=0.17$</td>
</tr>
<tr>
<td>Total (CCEL)</td>
<td>$r=0.20$</td>
<td>1.00</td>
<td>$r=0.86$</td>
<td>$r=0.73$</td>
</tr>
<tr>
<td>Operative</td>
<td>$r=0.17$</td>
<td>$p=0.13$</td>
<td>1.00</td>
<td>$r=0.54$</td>
</tr>
<tr>
<td>Removable</td>
<td>$r=0.11$</td>
<td>$p=0.32$</td>
<td>$r=0.73$</td>
<td>1.00</td>
</tr>
<tr>
<td>Fixed</td>
<td>$r=0.21$</td>
<td>$p=0.056$</td>
<td>$r=0.93$</td>
<td>$r=0.69$</td>
</tr>
</tbody>
</table>

Note: Pearson correlation coefficients: Prob $>|r|$ under H0: Rho=0.

Factors are only part of the overall operational picture of the clinic. Consistent policies and procedures, communication with patients, and implementation of technologies aimed to ease scheduling and patient compliance should be constantly monitored and evaluated. The fact that our results show that the rate of the broken appointments can explain only a small part of the variance in the overall student clinical experience should not be interpreted in such a way that the clinic administration should cease focusing on no-show rates. The desired interpretation is that reducing this rate will influence the overall results of the clinic, even though below a certain threshold the influence on individual performance will be not significant.

Other factors that might influence individual productivity are the capability of synchronizing or sequencing activities, setting explicit deadlines, and being challenged by effective goals that motivate by providing direction.38 These factors become very important in an environment in which students are not challenged by the number of procedures that should be completed but rather by having the goal of providing comprehensive care and demonstrating competence. Further research is necessary to determine which factor has the overall largest influence on students’ clinical experience levels.

Further research should also validate or challenge the cut-off points suggested in this study. One of the challenges should be to identify students at...
risk of not achieving competence and to determine whether the same percentage in broken appointments can be used for individual students and its possible correlation with the student’s clinical performance.

Conclusions

Within the limitations of this study, we can conclude the following. First, a broken appointment rate of ~19 percent was significantly related to lost productivity in our clinical educational setting. Second, a broken appointment rate of ~19 percent accounted for only about 15 percent of the variability in clinical productivity; therefore, most of this variability was driven by other factors. Third, students’ individual clinical experience level was not significantly influenced by the rate of broken appointments when this rate dropped below 14.5 percent.

REFERENCES