Clinical Quality Assurance Surveillance and Targeted Interventions: Managing Unfavorable Trends in a Dental School Clinic


Abstract: Dental schools establish quality assurance (QA) programs that are intended to improve patient care, comply with requirements of liability carriers and regulatory agencies, and maintain accreditation. Data collection, trend analysis, and interventions are typically used in QA programs to monitor and improve compliance. The purpose of this article is to discuss unfavorable trends and examine the effect of targeted interventions in three clinical operations: infection control, removable prosthodontics, and case reviews of students' patient care in progress (interim case reviews) at a U.S. dental school. Infection control compliance was evaluated and interventions were implemented beginning in 2002 to correct unfavorable trends in two protocols: placement of students' mobile supply cart and the use of overgloves. A predelivery esthetic consent was introduced in spring 2004 to decrease esthetic failures in removable prosthodontics. For interim case reviews, two areas received interventions going back to 2003: reevaluation following initial periodontal therapy and orthodontic screening. The data presented are not meant to show conclusive success of particular interventions, but to display broad trends and suggest methods to manage quality assurance parameters. These trends suggest we had better success with the interventions that were simple, valuable, measurable, and repeatable than with interventions that less fit these criteria.

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Key words: quality assurance, dental school clinics, patient care, removable prosthetic failures, infection control, dental records, clinical interventions

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Quality assurance (QA) is an integral part of dental school operations. It is intended to improve patient care, comply with requirements of liability carriers and regulatory agencies, and maintain accreditation. The Commission on Dental Accreditation Standard 5-1 requires that each “dental school conduct a formal system of quality assurance for the patient care program that demonstrates evidence of: standards of care . . . ; ongoing review of a representative sample of patients . . . ; mechanisms to determine the causes of treatment deficiencies; and patient review policies, procedures, outcomes, and corrective measures.”

Effective QA programs use targeted interventions inserted into measured work processes to produce these improvements. The programs are typically managed by a committee that works with individuals in the institution to take periodic process measurements, plan and implement interventions, and inform constituencies of the results.

Our institution has a long-standing QA program that was formalized in 1999. It has a seven-member Clinical Quality Assurance (CQA) Committee comprised of clinic managers, department chairpersons, and clinic administrators that evaluates compliance with the many policies and procedures governing activities in the clinics. The committee employs the GEAR model to identify noncompliance points in these policies and procedures and then introduces actions intended to improve clinic activities and bring them into compliance.

The GEAR model uses four principles to drive improvement:

Step 1: establish goals (G) for the program, such as the improvement in the quality or compliance of various clinical activities;

Step 2: execute or experience (E) the clinical activity and monitor with QA tools such as report forms;
Step 3: assess (A) that program (analyze trends in compiled data); and

Step 4: insert responses (R) or intervention procedures to improve program sections with unacceptable outcomes.

When appropriate outcomes are not achieved, steps two, three, and four are repeated until acceptable outcomes are reached that are consistent with our goals.

Three QA activities were selected for discussion in this article for their value in patient care or compliance with outside agency protocols (Dental Board): infection control compliance, failures in removable prosthodontics, and interim case reviews. Our purpose is to describe our experiences with these selected activities and make recommendations to other institutions that have similar QA programs. This project received exempt status from the Institutional Review Board (IRB Assurance No. FWA 00000921).

Infection Control Compliance

Our infection control program is a broad system of policies and procedures, of which two parts are reported here: use of overgloves and proper storage cart placement. These are important because they are effective precautions for reducing cross-contamination. Overgloves are placed over the procedure gloves when retrieving supplies, charting, and touching non-patient care items. The student storage cart is a mobile storage container that holds certain supplies and equipment owned by the students. By our protocol, the cart is to be placed on the opposite side of the dental chair from the student operator. With the cart in this position, the student operator is not able to access it while actively treating the patient. Having to move from the operator’s working position requires the student to follow overglove or glove removal protocol prior to accessing the mobile cart. These two infection control management activities were selected for monitoring and interventions since students’ adherence to policy was comparatively low and we felt compliance for these two activities could be improved given proper attention.

Two designated full-time faculty (group practice administrators or GPAs) were responsible for routine distribution, completion, and collection of infection control rounds forms (Figure 1). These two GPAs work together closely and are calibrated with each other in their monitoring procedures. They record whether infection control procedures are properly followed by students in operatory preparation and patient treatment. Compliance with our selected protocol (use of overgloves and proper placement of mobile storage carts) has been compiled in a database. Compliance is the percentage of the number of properly completed procedures out of total number of evaluation forms. The results are displayed in line graphs (Table 1) over the four academic years July 2002-June 2006. An academic year at this institution begins on July 1 and ends on June 30. Trends noted from these graphs were used to create interventions.

Our monitoring process indicated the following trends shown in Table 1. Use of overgloves varied between 70 and 90 percent over the three years 2002-03, 2003-04, and 2004-05. Compliance for the proper placement of storage carts was 86 percent in 2002-03 and 94 percent in 2003-04, but in 2004-05 compliance fell to 75 percent, which prompted us to intervene. Our goal was to improve and maintain students’ compliance with both of the selected protocols. We suspected that compliance had fallen especially for cart placement since, as Table 1 illustrates, there had been little effort at intervention or reinforcement of infection control protocols in the 2002-03 and 2003-04 academic years.

The interventions employed were educational and informational for students and faculty, respectively. In meetings with our students and faculty, group practice administrators reviewed infection control techniques and discussed their importance. In July 2005, infection control became a regular part of our quarterly faculty orientations. These orientations are routinely held from 12:00 noon to 2:00 p.m. Monday through Friday of the first week of each quarter, so every faculty member can attend one session. All of our interventions are displayed in the legend in Table 1. Prior to this time, no systematic efforts at educational reinforcement of infection control protocol had been attempted once students entered their clinical years.

With the continued training interventions as described, the latest data (2005-06) suggested a modest trend in improvement for both overglove usage and storage cart placement protocol (Table 1).
Figure 1. Form for infection control rounds

Date: ______________________ Cubicle #: ______________________
Student Name: ___________________________ Class: __________

Personal Protective Barriers

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th>No</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gloves</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mask</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goggles/face shield</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long hair pulled back</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overgloves</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinic gown</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient goggles</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Preparation Prior to Treatment:

Barriers:

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th>No</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headrest cover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laptop barriers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light handles &amp; switches</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other:

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th>No</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trashbag on hand-piece cart</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Clean and Properly Stored:

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th>No</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handpieces</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clamps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand instruments</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reminded student of surface disinfection of patient chair, handpiece cart, operator stool, x-ray viewbox, and counter tops. Also reminded student to purge waterlines and run cleaner through vacuum lines prior to treating patient.

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th>No</th>
<th>NA</th>
</tr>
</thead>
</table>
|表面消毒，包括患者椅、手柄车、操作台等。还提醒学生清理水路，并将清洁剂通过真空线路在治疗患者前运行。

Student signature: _____________________________________________
Faculty/staff signature: _________________________________________

Figure 1. Form for infection control rounds
Removable Prosthodontic Failures

There are failures in every system, and removable prosthodontics is no exception. A clinical failure of a removable prosthesis occurs when a prosthesis requiring refabrication is discovered. Four general types of failures are tracked in our system: esthetic dissatisfaction by the patient, breakage of the prosthesis within twelve months of delivery, inability to acceptably reline the prosthesis, and a removable prosthesis judged not to be serviceable (that is, of substandard quality).

Unacceptable removable prostheses were identified by the patient who returned for adjustments. Once it was determined by a Removable Prosthodontics faculty member that a prosthesis could not be modified to acceptability and prosthesis refabrication was required, the student completed a redo authorization form (Figure 2). The student submitted this form to his or her GPA, so that the patient would not be charged for a new prosthesis. (Note that our institution uses the term “redo” on our tracking form to mean “refabrication.” In this article, however, we use the term “refabrication” unless referring to the redo authorization form specifically.) The completed redo authorization forms were compiled and tracked beginning in 2001-02. The cumulative data were used to produce line graphs (Tables 2 and 3) for analysis and creation of an appropriate intervention.

Results of our monitoring process (Table 2) demonstrate that the percentages of removable appliances requiring refabrication for esthetic reasons relative to other reasons were measured at 30 percent, 45 percent, and 44 percent for the 2001-02, 2002-03, and 2003-04 academic years, respectively.

Noting an increasing trend in refabrications for esthetic reasons, a written removable predelivery approval requirement was added in spring 2004 with the collaboration of the removable department and clinic administration. The approval was in the form of an adhesive sticker dispensed to students with their laboratory cases prior to final try-in (Figure 3). The
<table>
<thead>
<tr>
<th>UOR Number:</th>
<th>Procedure Code:</th>
<th>Redo Code: ARED</th>
</tr>
</thead>
</table>

Original Date of Procedure Completion:  

Patient Name and Number:  

Name and Number of Faculty Involved in Original Procedure:  

Student Name and Number:  

GPA Authorization:  

Authorization Date:  

- **1) Endodontics**  
  - a) Cleaning, shaping or obturation can be improved  
  - b) Lesion size or symptoms persist  
  - c) Missed canals  
  - d) Contaminated root canal system  

- **2) Fixed Prosthodontics**  
  - a) Porcelain fracture  
  - b) Cement failure  
  - c) Recurrent caries  
  - d) Unacceptable esthetics  
  - e) Unacceptable periodontal contours  
  - f) Unacceptable marginal integrity  
  - g) Tooth fracture  
  - h) Large endodontic access through prostheses  
  - i) Hole ground through prostheses during occlusal adjustment  
  - j) Require new contours for new RPD abutment

- **3) Operative Dentistry**  
  - a) Lost restoration  
  - b) Incorrect color match  
  - c) Fractured restoration  
  - d) Patient dissatisfied with esthetics  
  - e) Undercontoured restoration  
  - f) Overcontoured restoration  
  - g) Sustained postoperative sensitivity  
  - h) Inadequate interproximal contact  
  - i) Recurrent decay

- **4) Oral Surgery**  
  - a) Root tip  
  - b) Bone spicule

- **5) Periodontics**  
  - a) Crown lengthening  
  - b) Root planing  
  - c) Soft tissue grafting procedure

- **6) Removable Prosthodontics**  
  - a) Prosthesis made at UOP does not satisfy standards of care (of substandard quality)  
  - b) Patient not satisfied with esthetics, form, or function  
  - c) Prosthesis broke soon after it was made (12 months)  
  - d) Immediate denture cannot be relined to acceptable fit/function

**If this is an Esthetic Redo, is there a signed Dental Esthetics - Patient Approval sticker in the patient’s chart?**  

- **YES**  
- **NO**

**Additional Information (if you just checked one of the discipline boxes please fill in justification below)**

---

**Please return to Group Practice Administrator along with UOR**

---

**Figure 2. Redo procedure authorization form**
Table 2. Removable refabrications by reason

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Percentage Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/01-7/02</td>
<td></td>
</tr>
<tr>
<td>7/02-7/03</td>
<td></td>
</tr>
<tr>
<td>7/03-7/04</td>
<td></td>
</tr>
<tr>
<td>7/04-7/05</td>
<td></td>
</tr>
<tr>
<td>7/05-7/06</td>
<td></td>
</tr>
</tbody>
</table>

- Esthetics
- Breakage
- Can't Reline
- Substandard Quality

Table 3. All removable refabrications as percentage of total removable units completed

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Percentage Refabrications</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/01-7/02</td>
<td></td>
</tr>
<tr>
<td>7/02-7/03</td>
<td></td>
</tr>
<tr>
<td>7/03-7/04</td>
<td></td>
</tr>
<tr>
<td>7/04-7/05</td>
<td></td>
</tr>
<tr>
<td>7/05-7/06</td>
<td></td>
</tr>
</tbody>
</table>

- Percentage Refabrications
The patient was then asked to sign and date the sticker, accepting the appearance of the removable prosthesis. The patient was informed that it may be impossible to make changes following the final processing of the prosthesis. After signing, the approval sticker was placed in the patient’s chart.

In the first full year after implementing the predelivery consent sticker (2004-05), the percentage of cases needing refabrication for esthetic reasons dropped to 31 percent. In 2005-06, it decreased further to 28 percent. The number of all removable refabrications as a percentage of total prostheses delivered decreased as well. Table 3 for 2003-04 illustrates that removable refabrications for all reasons stood at 3.4 percent. With the addition of the predelivery consent, the removable refabrications for all reasons dropped to 1.6 percent of all removable protheses delivered for 2005-06. This is the same removable refabrication percentage recorded in 2001-02 before we noted an increase in the percentage in the following two years, which prompted our decision to intervene.

Interim Case Reviews

Previous reports have connected surveillance of dental records as a measure of quality of care. For example, dental education facilities set charting guidelines for what they consider measurable clinical quality. In our institution, clinical faculty review dental records of patients in treatment (interim case reviews) for criteria such as timeliness of treatment, preventive services, and informed consent. Two criteria from these interim case reviews were selected for report here based on data obtained for the time period studied, 2002-06. The two items were periodontal reevaluation and orthodontic screening of the patient. Periodontal reevaluation or ITE (initial therapy evaluation) is the clinical review of a patient’s periodontal status after initial scaling and root planing to assess the results of this therapy and determine future periodontal treatment. This appointment is completed four to six weeks after the initial therapy and noted by the student in the patient’s chart.

Orthodontic screening includes a clinical evaluation by the student and completion of the orthodontic screening form (Figure 4). It is intended as an educational experience for the student, a part of our comprehensive dental examination, and an opportunity for patients to consider orthodontic therapy in their treatment plan. All dentate patients must have an orthodontic screening completed during their initial oral diagnosis and treatment planning (ODTP) at the dental school. Clinical faculty review the accuracy of the information on the screening form during the ODTP process.

The interim case review form (Figure 5) is completed by clinical faculty to monitor ongoing care of patients. Cases are selected randomly during regular clinic sessions while both the student and patient are present. The completion of periodontal reevaluation and orthodontic screening is noted.

Dental Esthetics Patient Approval Form

My signature below indicates that I have looked at my new dental work and that I approve its appearance. (Please note that it may be impossible to make changes in the dental work after it has been approved.)

Patient Signature _____________________________

Date _____________________________

Figure 3. Dental esthetics patient approval form
Patient ID _______________________________  Date __________________
Patient Name _______________________________  Birthdate ________________

**CHECK APPROPRIATE BOX**

**Overjet:**
- □ 1-4 mm
- □ >4 mm
- □ edge to edge
- □ negative

**Overbite:**
- □ 0-25 %
- □ 25-50 %
- □ 50-100 %
- □ open
- □ impinging

**Molar Classification:**
- □ Class I
- □ Class II Division 1 □ 2 □ Subdivision R □ L □
- □ Class III Subdivision R □ L □

**Canine Classification:**
- □ Class I
- □ Class II Subdivision R □ L □
- □ Class III Subdivision R □ L □

**Crowding:**
- □ none
- □ mild 1-2 mm
- □ moderate 3-4 mm
- □ severe >5 mm

**Spacing:**
- □ none
- □ mild 1-2 mm
- □ moderate 3-4 mm
- □ severe >5 mm

**Crossbite:**
- □ no
- □ yes
  □ anterior
  □ posterior  R □ L □
  □ result of slide
- □ no
- □ yes  anterior □ lateral □

Patient has concerns regarding occlusion or appearance?  Yes □ No □
Would tooth movement optimize restorative dentistry or periodontal treatment?  Yes □ No □
Orthodontic consultation required?  Yes □ No □

Faculty Signature _______________________________  Date __________________
Faculty ID# _________________________________

(estimated total time 2-4 mins)

Figure 4. Orthodontic screening form
<table>
<thead>
<tr>
<th>Quality Assurance</th>
<th>University of the Pacific</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review Date</td>
<td>Student #</td>
</tr>
<tr>
<td>Patient #</td>
<td>Faculty #</td>
</tr>
</tbody>
</table>

**Oral Exam / Oral Diagnosis**

<table>
<thead>
<tr>
<th>A</th>
<th>U</th>
<th>N</th>
<th>Treatment provided was necessary and appropriate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Treatment provided in timely manner</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Preventive services provided in timely manner</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Treatment progressing in a timely manner</td>
</tr>
</tbody>
</table>

**Preventive Service**

<table>
<thead>
<tr>
<th>A</th>
<th>U</th>
<th>N</th>
<th>Treatment provided was necessary and appropriate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Treatment provided in timely manner</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Preventive services provided in timely manner</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Treatment progressing in a timely manner</td>
</tr>
</tbody>
</table>

**Periodontics**

<table>
<thead>
<tr>
<th>A</th>
<th>U</th>
<th>N</th>
<th>Initial therapy completed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reevaluation completed</td>
</tr>
</tbody>
</table>

**Endodontics**

<table>
<thead>
<tr>
<th>A</th>
<th>U</th>
<th>N</th>
<th>Initial therapy completed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reevaluation completed</td>
</tr>
</tbody>
</table>

**Prosthodontics/Restorative**

<table>
<thead>
<tr>
<th>A</th>
<th>U</th>
<th>N</th>
<th>Contact, contours, embrasures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Margins</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Esthetics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Occlusion/Vertical dimension</td>
</tr>
</tbody>
</table>

**Oral Surgery**

<table>
<thead>
<tr>
<th>A</th>
<th>U</th>
<th>N</th>
<th>No postsurgical complication</th>
</tr>
</thead>
</table>

*see key below

A = Acceptable
U = Unacceptable
N = Not Applicable (no procedure necessary or performed)

Comment if “U”

Figure 5. Interim case review form
on the case review form. The cumulative data for periodontal reevaluation and orthodontic screening from the interim case review forms were compiled and displayed in line graphs (Table 4). Trends discovered were used to plan interventions to manage these trends.

Table 4 demonstrates case review compliance rates. The periodontal reevaluation completion rate was 80 percent in 2002-03 and then dropped to 73 percent for 2003-04 and 2004-05. For orthodontic screenings, in 2002-03, 2003-04, and 2004-05, the compliance levels varied between 62 and 69 percent.

Several types of interventions were implemented for both periodontal reevaluation and orthodontic screening. The primary reevaluation intervention added was a requirement by the periodontal department to improve compliance in completing reevaluations. Specifically, students were required to have completed at least one periodontal reevaluation (ITE) for every eight quadrants of root planing. This requirement was instituted in July 2003. The second intervention was the implementation of a new clinical teaching model in July 2004 providing better supervision of students. This model, called the group practice mentor (GPM) model, organized clinical restorative faculty into small teaching teams of three instructors assigned to one of four clinical group practices. Each team supervised its group in the entire diagnostic process, restorative dentistry, and periodontal reevaluation and recall as a general dentist would in private practice.

The interventions employed to improve compliance with the orthodontic screening process were the GPM model and meetings for faculty and students that specifically targeted orthodontic screening. These meetings were educational in nature, stressing the importance of orthodontic screening in a comprehensive exam, demonstrating the efficient completion of the screening (it takes only two to four minutes including filling out the form), and emphasizing the tracking of screening completions in our QA program. The legend in Table 4 shows the interventions employed for interim case reviews.

### Table 4. Interim case reviews

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Ortho Screening</th>
<th>Periodontal Re-Eva (ITE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/02-7/03</td>
<td>90%</td>
<td>80%</td>
</tr>
<tr>
<td>7/03-7/04</td>
<td>80%</td>
<td>70%</td>
</tr>
<tr>
<td>7/04-7/05</td>
<td>70%</td>
<td>60%</td>
</tr>
<tr>
<td>7/05-7/06</td>
<td>60%</td>
<td>50%</td>
</tr>
</tbody>
</table>

* ITE/RP* = Ratio of Initial (Periodontal) Treatment Evaluations and Quadrants of Root Planing

1. ITE/RP* ratio of 1/8 becomes requirement July ’03
2. Group Practice Mentor model begins July ’04
3. Oct ’05 Faculty orientation—interim case reviews to commence
4. Jan ’06 Faculty orientation—stress completing ortho screening forms
5. April ’06 Faculty orientation—discuss importance of reevaluations and ortho screenings
Our latest data for 2005-06 indicate that the periodontal reevaluation completion rate is now at 77 percent, up from 73 percent two years prior. The orthodontic screening compliance level is 64 percent for 2005-06, little improvement over previous years, and we are currently planning future interventions to improve the frequency of screenings completed.

Discussion

Because unfavorable trends were discovered in infection control compliance, removable prosthetic failures, and case reviews, interventions were implemented to bring about improvement. Our data suggest trends in improving infection control compliance and in reducing esthetic removable failures. Results of our intervention efforts for interim case reviews were less impressive. There are obstacles unique to teaching clinics that pose challenges to the QA process: student graduation; transfer of patients; student rotations; the academic calendar with breaks and exams; the mixture of new, full-, and part-time faculty; and calibration of our clinical faculty. However, a strong clinical quality assurance surveillance process has significant rewards both in improved patient care and in demonstrating to our students a commitment to maintaining a high level of quality care. Improving unfavorable trends is dependent on a number of factors related to both the clinical activity being monitored and the intervention targeting the activity, which we will now discuss.

Infection Control Compliance

An improving trend in infection control compliance was achieved because the clinical activities (wearing overgloves and proper positioning of the cart) were easy to observe and monitor and were of obvious value (avoiding cross-contamination), plus interventions were relatively simple to reinforce with faculty and students. The process of monitoring infection control compliance was repeatable because the same two group practice administrators were responsible for routine distribution, completion, and collection of infection control rounds forms. Since a student was notified of noncompliance at the time of inspection (for example, that the storage cart was on the wrong side of the patient chair), this became an individual intervention and a “teaching moment” that reinforced the behavior or compliance desired.

Removable Prosthodontic Failures

Likewise, removable esthetic refabrications decreased for similar reasons, we believe. The pre-delivery consent process is a simple intervention in which the university’s dental lab manager places an esthetic approval sticker in every lab pan at the wax try-in stage; this prompts the student to place it in the chart, discuss esthetics with the patient, and have the patient sign it. It is easily observable since esthetic approval must be completed with the patient’s signature before faculty can authorize final laboratory processing. The intervention is valuable because it may prevent students from remaking prostheses after they are fully processed. Also, this intervention is repeatable because placing the sticker in the lab pan was made an important responsibility and a routine part of the lab manager’s job.

Interim Case Reviews

Improving compliance in the two selected activities of focus in our interim case reviews is more difficult because of the complexity of the system. It is clear that both the periodontal reevaluation process and orthodontic screening are valuable in the care of our patients. However, it is more difficult to observe and monitor compliance because both require a detailed examination of the patient’s chart by a trained evaluator. The interventions are also complex and time-consuming, requiring multiple interactions among various participants (patients, students, many faculty, and quality assurance individuals). Furthermore, value may be less obvious to students and patients since both activities may be viewed as delaying treatment progress. With encouragement from patients, students may want to do restorative procedures as quickly as possible, and the periodontal reevaluation process slows this down. Sometimes reevaluation identifies the need for periodontal surgery, which will delay restorative procedures many weeks. The same conflict may prevent orthodontic screenings from being completed since identification of an orthodontic need may lead to orthodontic care and delay restorative treatment. When these two powerful forces—complexity and lack of perceived value to the student and patient—are balanced against proper care for the patients, students are placed in an ethical dilemma: good patient care or completion of technical experiences. To achieve better compliance in periodontal reevaluation and orthodontic screening, we are redesigning interventions (R part of the GEAR cycle) to increase the perceived value of these
Orthodontic screenings are a part of a comprehensive exam, yet our compliance level was only 64 percent. An analysis of those cases in which orthodontic screening was not done revealed two reasons why this often occurred. First, some patients began treatment at the school before the use of orthodontic screening forms was instituted. These patients sometimes were not included when a new procedure was initiated (such as the use of the orthodontic screening form). Second, we found that students did not routinely screen patients in the over-forty age group. Of the twenty-three interim case reviews without orthodontic screenings during the winter quarter of 2006, eighteen of these patients were over forty years of age. We must continually train faculty and students on the importance of orthodontic screening as a valuable part of a clinical examination for all dentate patients, emphasizing how it can be done quickly and easily. For orthodontic screening, we increased the perceived value to the student for this procedure. We recently made Invisalign® technology available to our undergraduate dental students. Students are interested in learning procedures that are perceived as contemporary. Students now realize that orthodontic screening that can be done quickly and easily is a valuable part of a clinical examination for all dentate patients. There were also presentations in July 2006 by the GPAs in which they focused on orthodontic evaluations being an important part of baseline information collected on all patients. The timing of this presentation coincided with the influx of new patients at the commencement of our 2006-07 academic year. Preliminary results in orthodontic screening for the first six months of the academic year 2006-07 (Table 5) suggest an improving trend in compliance (now at 75 percent).

For periodontal reevaluations, we noted that students typically did not appoint patients for the reevaluation specifically but planned to complete it during other procedures. For periodontal reevaluation to be accepted as having been done, it must be completed four to six weeks following the root planing. In a dental school, issues such as student vacation breaks and extramural rotations, chair availability, and patient compliance make it difficult for all patients to be seen during the four to six week timeframe. In other words, control of scheduling is more difficult for students in a dental school setting than

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**Table 5. Interim case reviews**

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Ortho Screening</th>
<th>ReEval</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/02-7/03</td>
<td>60%</td>
<td>70%</td>
</tr>
<tr>
<td>7/03-7/04</td>
<td>70%</td>
<td>80%</td>
</tr>
<tr>
<td>7/04-7/05</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>7/05-7/06</td>
<td>90%</td>
<td></td>
</tr>
<tr>
<td>7/06-1/07</td>
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</table>
for a practitioner in a private practice environment. A potentially effective response is to take appointing away from students and provide credit for completion of the periodontal reevaluation. We are currently working on a system for automatically appointing patients for recall, and we are discussing with department chairs making reevaluation completion a significant part of a clinical grade in periodontics or patient management.

Recommendations

From our experience, interventions are most successful when both the clinical activity being monitored and the interventions themselves are:

- **simple** and easy to understand and complete;
- **valuable** in a way that is evident to all health care workers and patients. The value should also be of significant quality and quantity to stimulate the health care worker to make appropriate decisions and actions;
- **measurable** and **observable** with clear, objective, quantifiable criteria; and
- **repeatable** in a pattern. This often means reducing direct student involvement in the process as the students turn over every year and have difficulty handling ethical dilemmas that affect them. Instead, the process can be managed in two ways. First, involving more staff and faculty will make processes more repeatable because these individuals are more likely to be here in the longer term and have more experience managing ethical dilemmas. Second, system controls establish limitations that cannot be manipulated and lead to more consistent performance. While rules and reward controls (rewarding students for certain behaviors) are helpful in meeting compliance standards, they allow behaviors outside of the pattern needed to achieve full compliance.

Our infection control and removable prosthetic interventions fit these four criteria more closely than our interim case review interventions. Both the monitoring and intervention processes for periodontal reevaluation and orthodontic screening are more complex. Our recommendation to other institutions with similar programs is to consider interventions that fit the criteria of **simple**, **valuable**, **measurable**, and **repeatable**. It is also important that the Quality Assurance process and GEAR cycle be well understood and valued as an opportunity to educate faculty, staff, and students. This education will not only provide better patient care and student education; it will assist the institution in meeting the requirements of accreditation standard 5-1.

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REFERENCES