Development and Implementation of an Online Screening Application at the University of Texas Health Science Center at San Antonio Dental School


Abstract: This article describes a quality improvement (QI) initiative that is in process at the University of Texas Health Science Center at San Antonio (UTHSCSA) Dental School and the website that grew out of this effort. The process of screening and assignment of patients was selected for improvement in 2006. QI methods were used to develop a website that improves access to care for patients and assists in the matching of patients and students. The website (www.dentalscreening.com) has received more than 15,000 screening applications in the period from May 2007 to January 2010 and has provided unprecedented insight into the needs of our patients. This article outlines the process by which the website was created, the rationale for the design, and the benefits of establishing a screening website for any dental school. The program was developed entirely at UTHSCSA, but it addresses a problem that may affect many dental schools.

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Keywords: quality improvement, online screening, dental care access, information technology, dental school clinic

Submitted for publication 4/2/10; accepted 6/7/10

The term “quality improvement” (QI) has come to refer to a variety of systematic efforts to improve the process or outcomes of a business or clinical practice. This brief review of the QI literature is designed to provide historical context and to stimulate interest in QI as a tool for dental educators and administrators.

Three individuals are recognized for their contribution to quality improvement in manufacturing. Walter Shewhart was the first to describe the systematic process of quality improvement in The Economic Control of the Quality of the Manufactured Product published in 1931. Shewhart introduced the Plan, Do, Check, Act (PDCA) formula that is still a major part of quality improvement initiatives. W. Edwards Deming and Joseph Juran expanded on Shewhart’s work and developed methods that they taught in Japan after World War II. Deming and Juran have been given credit for the transformation of Japan into an industrial powerhouse whose manufactured goods defined quality for a generation.

While Deming focused on statistical process control, Juran focused on managing for quality. Deming’s 1982 book, Out of Crisis, outlines his fourteen points for the creation of a quality improvement culture.2 Juran’s Quality Handbook describes his quality improvement trilogy: quality planning seeks to identify the needs of customers; quality control is used to develop a process that will achieve the desired result; and quality improvement transfers the process into operation.3

Donald Berwick was among the first authors to translate QI from manufacturing to the health care sector of the economy. In his 1991 book, Curing Health Care, he outlines how QI strategies can be applied in hospitals, clinics, and other health care organizations.4 More recently, Crossing the Quality Chasm by the Committee on Quality of Health Care in America5 and Applying Quality Management in Healthcare: A Systems Approach by Dianne Kelly6 emphasize that QI is an important part of any medical system.

Websites have been used in dentistry to inform health care consumers and to train dental students. In 2004, Kim et al. reviewed fifty-six dental websites that contained oral health resources.7 These authors
wrote that “the Internet has become a convenient channel for quickly disseminating information from the oral health community and for training primary care providers in this new content area.” They also noted that “materials on risk assessment and oral screening were lacking in these websites.” Bufano et al. have described an online Treatment Planning Data Acquisition Tool that has proved to facilitate learning and standardization of gathering and recording clinical data. The use of a screening application website for a dental school has not been described in the literature.

This article will outline the quality improvement initiative that is in process at the University of Texas Health Science Center at San Antonio (UTHSCSA) Dental School, describe the development and implementation of our online screening application, and explain the benefits that have derived from its use.

The QI Initiative

Dental students must demonstrate competence in many aspects of patient care before they can be recommended for graduation. Students need clinical learning experiences in the various areas of dental care that comprise the entry-level skill set of a general dentist. Matching a student who needs specific clinical education experience with a patient who has a specific need for treatment is a core element of the clinical education program and has proven to be a long-standing problem at UTHSCSA. Conversations with dental professors and administrators from other dental schools have shown that many other schools have similar problems with patient recruitment and assignment. Our goal was to create a system that would improve access to care for patients, assist in the matching of patient and students, and minimize the time-consuming and stressful patient-search process.

Where Were We in 2006?

Prior to 2006, the only access point for screening (aside from direct referrals by relatives or patients) was a single telephone operator working at the front desk of the Dental School. The schedule for screening appointments was released to the operator one month in advance of the scheduled screening examination. The operator would receive eighty or more calls for screening appointments each day, and all available appointments would normally be filled within a matter of a few days. After all appointments were given out, the operator or a telephone message would advise the patient to call back. This process led to dissatisfaction among patients who tried to access the telephone system for weeks or even months before they were given an appointment.

Patients who received appointments over the phone were screened by faculty members from the Department of Dental Diagnostic Science in our screening clinic. At that appointment, the faculty member formulated a problem list for the patient and ordered a panoramic radiograph if necessary. If the faculty member determined that the patient was appropriate for treatment in the predoctoral clinic, the problem list and the radiograph were forwarded to the patient care coordinator (PCC) of one of our eight General Practice Groups (GPGs). (Each GPG is comprised of up to twenty-four junior and senior students supervised by four core instructors.) The PCC would call the patient for a comprehensive examination if he or she could be matched to a student. A patient who was not assigned to a student within thirty days would be returned to the general patient pool where the odds of being called for an appointment decreased significantly.
Where Did We Want to Be?

The following goals were established for the optimal process:
• Remove the bottleneck created by the telephone system;
• Expand the number of screening appointments;
• Make efficient use of clinic time;
• Match the needs of patients and students;
• Identify patients who could pay for procedures; and
• Empower students to solve their own problems.

How Did We Get There?

The suggestion that we create a website for online screening application came up in an early brainstorming session. At first, it was felt that the type of patients typically treated at the school either did not have access to the Internet or would not use the Internet to submit an online application for dental screening. We challenged that assumption and divided the project into three parts: a front end, middle, and back end.

The website itself was considered the front end. It was designed by the clinical faculty to disseminate information about the school including information on clinic fees, provide health care information, and solicit applications from potential patients. The school’s web developer and an experienced faculty member were responsible for the middle of the project. They wrote the code, created the database, and established Internet security protocols. The back end was designed by school administrators to get patients from the database and into the chair. The entire process crossed boundaries between departments and required close cooperation among the clinical faculty, information technology experts, and school administrators. All three phases were indispensable to the creation of a successful product.

The domain for the online application (www.dentalscreening.com) was registered to the Dental School in 2007. When the program was activated in May of that year, patients were directed to the website by the recorded phone message that they would hear only if the appointment line was busy. The number of applications increased to over 600 per month when the website was linked with the UTHSCSA website in July 2008. In September 2009, just under 1,000 applications were received at the school.

As of February 2010, 15,558 patients have submitted an electronic request for screening and are on the database of available patients. Figure 1 shows the number of applications by month since the program was introduced in May 2007. No patient requests were processed in November and December 2007 due to a computer malfunction.

From the start, this process was intended to augment screening done in our screening clinic and to fill appointment time in the clinic that otherwise would go unfilled. Paper copies of patient screening requests are now given to treatment coordinators who allow students to view the information on the application. By request, students may be given contact information for a patient that allows them to schedule a screening appointment. All individuals in the chain have Health Insurance Portability and Accountability Act (HIPAA) level 3 training.

The process that has been put in place expands the number of screening appointments available and makes efficient use of student time. Some GPGs have planned for patient failures or cancellation by overbooking of patients for screening. Students who have finished their own patients early or who have open time in their schedule screen these unassigned patients.

Figure 2 shows an increase of 451 patients screened by students on the bays from 2008 to 2009, an increase of 45 percent from one year to the next. These individuals are in addition to the patients screened by faculty members from the Department of Dental Diagnostic Science.

Normally, core faculty members from the Departments of General Dentistry, Restorative Dentistry, or Prosthodontics supervise their students during the screening of online applicants. A faculty member will order a panoramic radiograph if necessary. The problem list is made up in the same way as in the faculty-screening clinic. Attending faculty members, along with their students, can determine on the spot whether the patient is appropriate for the predoctoral program, is aware of associated expenses, is motivated to complete the treatment, and is healthy enough to be treated at the Dental School. Many of the patients who are screened by students are assigned to that student (or another student in the group) on the day they are screened.

The website was designed to increase the likelihood of matching a patient with a student by asking patients to assess their own need for dental treatment. A unique system was developed to accomplish this goal. The website contains links to dental information that we developed to assist the patient in recognizing conditions that may apply to them. The links, which open when a dialog box is checked, contain informa-
Figure 1. Number of applications submitted online for dental care at the UTHSCSA Dental School by month for May 2007 through January 2010

Figure 2. Number of patients screened by students in General Practice Groups at UTHSCSA Dental School during 2007–08 and 2008–09
tion on treatments and the rationale for preventive care. When applicants check a box indicating a type of care that they may need, it is annotated on the form that is seen by the student. If the patient indicates having cavities, gingivitis, or a tooth that needs to be replaced, he or she may be called by a student who needs this experience. Figure 3 shows an example of one of these patient education links. Patients can access links to nine common dental disorders that are normally treated by predoctoral students.

We have designed a study to determine if the self-assessment done by patients correlates with their actual needs. At this time, the project remains in the design stage. While we do not have the data to prove this correlation, anecdotal evidence seems to support a positive association particularly among patients who indicate that they need tooth replacement or other specific services.

Students have commented that web patients appeared to know what they need and are prepared to pay the cost of dental services. Some students commented that their patients had seen a dentist in private practice and were happy to find a less expensive source of treatment at the dental school. Further research is needed to substantiate a difference between patients who request appointments by telephone and those who request screening appointments using the website.

The final goal of the program was to empower students to solve their own problems. Experience has shown that self-interest provides the most consistent motivation. By making available a list of patients who have assessed their own needs, and understand the cost of treatment, we have provided a mechanism for students to help themselves. The list of patients is also available to patient care coordinators and group practice leaders. Overall, the website has provided a tool that enables faculty members, clinic staff, and students to match patients and students to the benefit of both parties.

Analysis of Online Applications for Dental Care

The website has been updated, revised, and improved several times over the last three years to refine the data that allow us to improve service to patients and students. The database of patient applications is now a rich source of information about our patients. This information allows us to refine our business processes in ways that will improve our service to the community. Perhaps for the first time, we have information that tells us what our patients want from their Dental School.

Information from the “Current Dental Conditions” section of the online screening application is particularly valuable. The dental conditions that were self-identified by 15,558 applicants as of February 2010 are shown in Table 1. Dental caries was the condition most often identified by our applicants. It was annotated 9,574 times by a total of 61.4 percent of all applicants. In addition, 42.3 percent of applicants indicated that they needed a crown, 31.1 percent indicated that they needed root canal treatment, and 13.4 percent requested replacement of a missing tooth (this percentage combines those interested in implants with those interested in fixed partial dentures).

The “Current Dental Conditions” section also includes a textbox where patients are encouraged to submit comments that help us to meet their needs as a patient at the Dental School. The applicants use this section to state their chief complaint. This information is used by students to determine which patients may match their educational needs.

As of March 2010, 8,227 patients had submitted comments along with their application. All comments were imported into a PDF file, where a word search was performed to observe trends and identify items of interest. The results of a key word search performed on the database are represented on Figure 4.

We combined words that seemed roughly equivalent such as money, cost, and afford into one search. Discussion among faculty members concluded that these words were mentioned fewer times than was anticipated. In this group, only 711 or 8.6 percent of applicants used any of those words. The use of the words “pain,” “hurt,” or “broken” provided insight into the incidence of urgent dental problems in our group of potential patients. As is shown by percent in Figure 4, a total of 20.4 percent of patients who made comments used the word “pain” or “hurt.” An additional 9 percent used the term “broken.” This information is useful to health care planners at all levels within the school. It is important to note, however, that individuals with urgent dental problems may be more likely to make comments than others. That fact may skew the response frequencies; therefore, patient self-identification of urgent dental care needs will need to be analyzed further.
Cavities

What are they?
Cavities are caused by specific types of harmful germs that live in your mouth. These bacteria produce a strong acid when you eat sugary foods. The acid removes minerals from the tooth surface. The progressive loss of minerals will eventually produce a hole in your tooth.

Early Cavities
Some cavities that are just starting can be reversed without placing fillings. If the damage to the tooth is irreversible, the dentist must place a filling in order to replace the diseased or weakened tooth structure.

It is important to understand that fillings are not a "cure" for cavities. Without proper home care, the same bacteria that produced the cavity in the first place may affect the tooth after a filling is placed. The goal of modern dentistry is to reduce the number of harmful bacteria in your mouth so that cavities will not occur.

Large Cavities
Your tooth may become painful during the later stages of the decay process. That is why it is important to get regular dental check-ups and treatment. Preventing cavities and taking care of small ones before they become large will help to preserve your dental health for your whole life.

Figure 3. Screen capture from an education link on dental caries
The use of Google Analytics allows the school to track the number of visits to the website and to record the amount of time that our patients spend on our health education pages. This provides unique feedback into whether we have designed a website that will help patients to make good decisions about their own health care. It also helps to validate the role of the university as a center for the dissemination of knowledge.

The website was improved in October 2009 to recruit patients for research studies that are ongoing at the Dental School. This, for the first time, offered the ability to recruit patients outside of the UTHSCSA at no cost to the university. The principal investigators for individual research studies received Institutional Review Board approval for recruitment using the website. In just three months, over 600 prospective patients indicated that they would like to be contacted for participation in research.

The development and implementation of the website were done at virtually no cost to the university aside from the salaries of full-time employees. The only associated expense was a work-for-hire contract paid to a student who assisted in the improvement of the website as a web developer. The participation of a student in the process brought the students’ perspective into the design of the site to help meet their needs.

An abstract describing this process was presented at the TechExpo at the American Dental Education Association (ADEA) Annual Session & Exhibition in New Orleans in 2007. The website was presented in October 2009 at the ADEA Sections on Business and Financial Administration and Clinic Administration Mid-Year Meeting in Santa Fe. “Research and Public Health Education Opportunities from the UTHSCSA

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Table 1. Dental conditions self-identified by 15,558 applicants for screening appointments at UTHSCSA Dental School

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dentures</td>
<td>964</td>
<td>6.2%</td>
</tr>
<tr>
<td>Single tooth replacement</td>
<td>2,092</td>
<td>13.4%</td>
</tr>
<tr>
<td>Orthodontics</td>
<td>2,390</td>
<td>15.3%</td>
</tr>
<tr>
<td>Periodontics</td>
<td>2,745</td>
<td>17.6%</td>
</tr>
<tr>
<td>Removable partial denture</td>
<td>3,973</td>
<td>25.0%</td>
</tr>
<tr>
<td>Root canal</td>
<td>4,850</td>
<td>31.1%</td>
</tr>
<tr>
<td>Gingivitis</td>
<td>5,191</td>
<td>33.3%</td>
</tr>
<tr>
<td>Oral surgery</td>
<td>6,587</td>
<td>42.3%</td>
</tr>
<tr>
<td>Crown</td>
<td>6,591</td>
<td>42.3%</td>
</tr>
<tr>
<td>Caries</td>
<td>9,574</td>
<td>61.4%</td>
</tr>
</tbody>
</table>

Note: Applicants were asked to check all that applied.
Online Patient Screening Website” was presented as a part of the New Ideas segment of the ADEA Annual Session & Exhibition in Washington, DC, in March 2010. In February 2010, the project was awarded second place in the Innovations in Health Science Education competition among all six medical centers in the state of Texas. Two other dental schools have established similar websites based on the work accomplished at UTHSCSA Dental School.

Summary

The quality improvement effort described in this article is an ongoing process and is therefore presented as an unfinished work. The article is meant to describe and explain a method that has been successful at UTHSCSA Dental School. Some of the methods described here may not work at other schools. That fact should not prevent exploration of what benefits may come with creation of an online screening website. The assumption that our patients do not have or will not use the Internet to request appointments was incorrect.

The website has provided a number of opportunities for research to assist in the quality improvement process and to advance our understanding of our patients. Questions for further research have been mentioned above. Other questions include these: Where do our patients get health care information? and Do patients place a higher value on information from a university website than on other information available on the web? We will continue to refine our business process by analyzing data obtained from the website as we look for opportunities for further improvement.

Acknowledgment

We are grateful to Dr. Rodney D. Phoenix for providing the illustrations for this article.

REFERENCES