A Model Training Program for Dental Hygienists

by Shirley E. Williams, Horace M. Whitt, William J. Niendorff, and William J. Harvey

Introduction

In clinics and hospitals, a great portion of information is computerized daily. The delivery of health-care services today routinely involves entering, retrieving, and interpreting patient data. Trident Technical College acknowledges the importance of realistic computer experiences in its health-sciences technology programs, and the faculty and administration foresee an integration of hospital information-system access in classroom, laboratory, and clinic environments. In 1992, Trident Technical College began using the Indian Health Service (IHS) dental package to run the college's dental clinic.

Trident intends to have the learning situation resemble the work place with respect to handling patient data through use of clinical data management systems. More than 2,200 patients have been registered in the system at Trident's Dental Hygiene Clinic since June 1992.

The desired outcome of the program is for dental-hygiene students to be more effective in a real dental office. Familiarizing the students with specialized online computer software for the dental clinic is essential. Use of the IHS Dental Data System (DDS) makes it possible for instructors to integrate computer data collection into the curriculum and gives the students a basic foundation on how to input and retrieve data from a health-care database. In this dental-hygiene setting, the software "enhances how students use knowledge, information management tools and resources to solve real problems" in the sense envisioned by Louis Abbey for dental education.[1]

The IHS software at Trident supports the dental clinic's operation. As John Eisner states, "the most obvious, and most successful, application of computer technology to dental education has been in the dental clinic."[2] In routine operation of the clinic, staff needs to display patient information (i.e., current address, gender, age, appointment scheduling). Clinic staff also must generate appointment notices and use the accounting system to maintain accounting records and issue receipts.

This package is not only used to run the clinic, but also to teach dental hygiene and dental assistant front-office skills for a dental practice. Activities now include appointment scheduling and recall. Accounting and billing will be added later. Students learn to maintain a patient's records of previous treatments and prescribed treatments (management of treatment data).

The Computer in a Technical Training College

Trident faculty in health-sciences technology is redesigning curriculum to use the new information-system resources. Students currently are expected to complete the following tasks by using the computer program:

- Design a treatment plan for patients;
- Learn to chart American Dental Association codes;
- Identify patients by classifications such as level of difficulty, gender, age, and level of risk; and
- Develop a report that will show what level of competency they have met during a given semester.

In general, the program prepares students for entry into practice and future technology and provides hands-on experience, of which information-system use is an integral part. Brian Monteith asserts that in using computers in dental education, "the educational objective is to engender a philosophy of dental care that encompasses all aspects of patient evaluation, diagnosis, care, treatment planning and treatment" and that "equally important is that the problem-solving protocol find practical expression in the field of real-time patient care and services."[3]

The students initially enter patient data and thus develop a database from which to make assessments. Faculty provides students with data to make assessments and develop patient-care plans. Through such activity, students enhance skills in manipulating and synthesizing data. Eisner has emphasized how important it is for the acceptance of clinical databases

that "those practitioners who use them" appreciate "the critical importance of complete and accurate data entry" and have been "trained to do data collection" as well as gain skills at interpreting the data.[4]

Students must produce a recall list to plan their patient-care visits on a weekly, monthly, or semester basis. This allows students to participate in their learning by identifying the skills they need to meet the learning objectives. Students gain experience in developing and using a patient's record in an information system.[5]

Student Management and Performance

The software also permits faculty to evaluate students' patient loads and determine student progress. Faculty can identify specific procedures that have been performed on patients by individual students (patient classification, patient education, fluoride treatment, periodontal probe and charting, use of ultrasonic and air-polishing treatment, calculus charting, amalgam polishing, X-rays, and assignment of ADA code). Instructors can evaluate a student's proficiency based on the patient's classification and the number of times a patient returns to be completed. Flexibility to coordinate high-risk patient care with curriculum is gained. Data from the information system also help faculty in assigning course grades.

Plans for the software include generating reports for the clinic to identify numbers of patients seen per semester, per student, and type of patients/treatments. These reports will help to schedule patients based on what has been emphasized in teaching dental hygiene, such that treatments and procedures can be coordinated with the curriculum. Reports also can be used for evaluation, such as during accreditation visits.

Upcoming versions of the IHS dental software will enhance the capability of students to query the clinical database. For example, students will be able to search for patients who received various combinations of dental procedures over time, or for patients who failed to appear for important follow-up visits. These query tools will help students learn how to use information in the computer-stored patient record to manage patients and monitor the quality of care provided at the clinic.

The following information on instruction in the Trident clinic was obtained from system reports of the IHS software. These reports illustrate how data derived from clinical records can help track general levels of student performance and progress. Such information could be obtained previously only with great difficulty and it was usually not practical to sort through records manually to gain such perspectives. Among the concerns that can be addressed:

- Can we learn whether requirements have been set properly by examining rates of student progress toward meeting requirements?
- Are students developing patient pools successfully?
- Are there sufficient numbers of patients at the different levels of difficulty for students to be able to gain the needed ranges of experience?

For example, during the spring semester 1993, twenty first-year students saw patients in the clinic for the first time. Trident uses a four-level patient classification system (I, II, III, IV) with these classes corresponding to ADA codes 9710 through 9740.[6] In this system, patients classified at level I (ADA code 9710) are the easiest to treat and those classified at level IV (ADA code 9740) are the most difficult. The IHS software helps Trident students, faculty, and staff track progress in terms of patient classifications seen by a given student by midsemester. Such progress information helps in planning for effective use of the second half of the semester. By the middle of the 1993 spring semester, student progress could be summarized as follows:

- 50 percent of the students had seen levels I and II patients by midsemester.
- 25 percent had met the requirements for levels I and II by midsemester. This allowed them to continue work on those skills needed for levels I and II or focus on meeting the requirements for levels III and IV. Since these are first year students, however, the focus is more on levels I and II.
- 17 percent had seen levels III and IV patients by midsemester.

No one had difficulty meeting the patient classification for treatment requirement, which counted for 45 percent of the clinical grade. The majority of first-year students met all their clinical requirements by the end of the semester. The senior students met all their clinical requirements for the fall 1992 and spring 1993 semesters.

There were sufficient patients in classifications for all dental hygiene students in both semesters. Figure 1 shows adequate numbers of level II (ADA code 9720) and level III (ADA code 9730) classifications of clients for the students to develop and enhance their dental-hygiene skills.

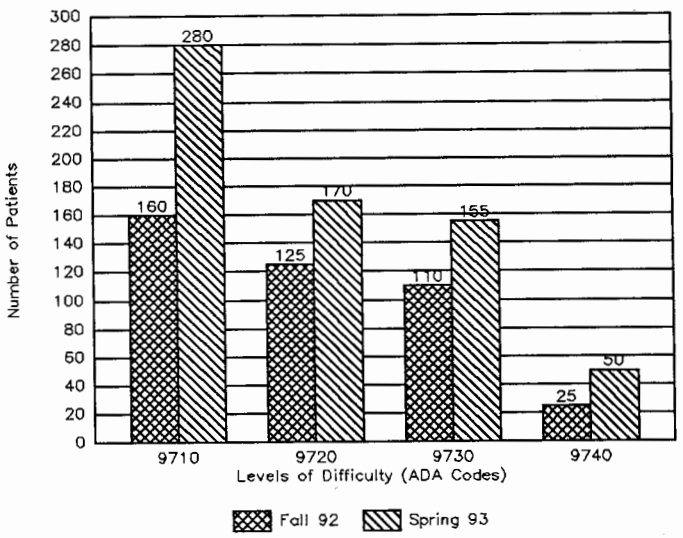

Figure 1. Patient classification by level of treatment difficulty.

System reports indicated an increase in the number of new patients per semester. Data on new patients were helpful to new students as they began to build their patient pools. Data showing an increase in the number of visits to the clinic per semester indicate that the capacity of the clinic is being used. System reports also provide information on patient demographics and show that the largest age group is in the range 22 to 41 years of age (inclusive). A review of reports found that there were sufficient people in different age groups to give students a variety.

Program Components

This program is part of a project to set up a model using components of the U.S. Department of Veterans Affairs (VA) Decentralized Hospital Computer Program (DHCP) hospital information system and the Patient Care Component (PCC) of the IHS Resource and Patient Management System (RPMS) in two-year health-sciences technology programs. Adopting existing public-domain clinical software will help meet needs for increased health-sciences technology computerization at modest cost.

As demonstrated at Trident, VA and IHS software can support information systems in clinics operated as part of college instructional programs. By adding instructional features to existing systems and packages, the project intends to make instructor-controlled databases routinely available for teaching dental hygienists, nurses, radiology technologists, and other categories of health-care personnel. Among the Trident programs being considered for later participation in this project are: medical laboratory technology, nursing, radiologic technology, respiratory care, medical assisting, and pharmacy technician.

The Software Configuration

The Dental Data System (DDS) of the IHS Resource Patient Management System (RPMS) was selected for Trident's clinic. The DDS package has been designed to meet common data-processing needs of facility-based dental program operations as well as those of central management. The package includes numerous applications grouped under the VA Kernel and File Manager, and M programs that have been created to support some menu options. The DDS package can operate as an integrated module of the Patient Care Component (PCC) or as an independent package linked with the IHS Patient Registration System. The Patient Registration System package of the IHS is an integrated group of automated data systems containing patient demographic information.

The DHCP and RPMS software is written in M (MUMPS), an ANSI (X11.1-1990), FIPS (125), and ISO (11756) standard programming language and data management system.

At Trident and Robert Morris colleges, the DHCP/RPMS test and production configurations are installed on IBM 9370 systems, using MUMPS/VM. Other system configurations used by VA, IHS, or state agency sites include PS/2 or PC networks running under MS-DOS, Digital Equipment Corporation (DEC) VAX systems using Digital Standard MUMPS or InterSystems M/VX running under the DEC VMS operating system, or computers using versions of M running under UNIX or UNIX-compatible operating systems.

The Computer Center at Trident has installed and customized the software for teaching use. The Robert Morris College Institute for Information Management, supported by the college computer center, lends technical assistance to the Trident Health Sciences Technology Division and Computer Center. The VA and the IHS, as well as IBM Academic Information Systems, IBM Glendale Laboratories, and Tulip Systems, Inc., have given technical guidance and recommendations for this program.

Continuing this project, Trident and Robert Morris colleges hope to extend implementation, document the curriculum impact, and help replicate it at other institutions with similar needs and goals. Trident and Robert Morris colleges are looking into practical means of making appropriate DHCP and RPMS modules accessible for classrooms, computer laboratories, and bedside laboratories. A support structure for two-year college faculty and computer-resource personnel also will be established.

The Needs Survey

Trident and Robert Morris colleges recently conducted a survey of 199 dental-hygiene programs to determine the extent and kind of information-system use in such programs and to gather information that would help assess the need for replicating the model developed at Trident.[7] There were 72 programs responding and all but one agreed or strongly agreed that dental-hygiene students "need to acquire computer data-entry skills"; 51 said that they "need to monitor and assess patient-health status based on clinical data retrieved from a computer system." But only 5 agreed or strongly agreed that dental-hygiene students "currently monitor and assess patient-health status based on computer data in a clinical setting." Forty-five indicated interest in being considered as a model site.

The strong, positive results of the Trident Technical College experience in computerized tracking of student progress and educational management, coupled with the practical and applied learning on computers, indicate that there is a basis for replicating this program elsewhere. M

Shirley E. Williams, B.S.N., is associate dean for academic computing in the health sciences at Trident Technical College in Charleston, South Carolina. Prior to holding this position, she headed the Department of Nursing.

Horace M. Whitt, DDS, has been the director of dental information development for the Indian Health Service since 1991.

William J. Niendorff, DDS, has been the director of dental information standards at the Indian Health Service headquarters since 1984.

William J. Harvey, Ph.D., is the director of the Institute for Information Management and professor of computer and information systems at Robert Morris College in Pittsburgh, Pennsylvania.

Endnotes

1. L.M. Abbey, "Mastering Change," *Dental Informatics: Integrating Technology into the Dental Environment,* L.M. Abbey and J.L. Zimmerman, eds. (Springer-Verlag, 1992), 10.
2. J.E. Eisner, "Informatics in Dental Education," *Dental Informatics,* 132.
3. B.D. Monteith, "Nosology: A Critical Link Between Computers and Dental Education," *Dental Informatics,* 125.
4. Eisner, 144.
5. "The most obvious impact of the increasing use of an electronic patient record in dental practice will be the value of teaching students how to use such a 'chart'," Eisner, 141.
6. The ADA codes are copyrighted by the American Dental Association.
7. W.J. Harvey, S.E. Williams, and J.F. Constable, *Survey on Information System Use in Dental Hygiene Programs* (Pittsburgh: Robert Morris College, 1993).