

January 2003

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Recommended Citation

Stephen J. Morewitz and G. Shaw. "Behavioral Sciences Training Applications of a Computerized Student-Patient Encounter Log System" *Annals of Behavioral Sciences and Medical Education* (2003): 82-86.

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Behavioral Sciences Training Applications of a Computerized Student-Patient Encounter Log System

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This article reviews the implementation of the web-based Computerized Student-Patient Encounter Log (CSPEL) system and its usefulness in behavioral sciences medical education. The CSPEL represents a considerable improvement in terms of efficiency and accuracy over traditional paper-based reporting systems. This system not only facilitates faculty monitoring of students' assessment and management of psychosocial problems at geographically disparate locations, it also provides a rich repository of data for the design of innovative behavioral science-oriented patient management problems, objective structured clinical examinations, simulated patient situations, and other training opportunities. Moreover, the CSPEL provides a mechanism for evaluating the impact of behavioral sciences training on students' acquisition of essential skills, knowledge, and attitudes.

Key words: medical education, web, computers, databases, psychosocial

Introduction

The California College of Podiatric Medicine is a private, non-profit organization that was established in 1914. The College closed in 2002 and reorganized as the California School of Podiatric Medicine (CSPM) at Samuel Merritt College in Oakland, California. At present, 248 students attend the school.

Students are introduced to clinical rotations in the second year with two days a week reserved exclusively for clinic. The third year has four days of clinical rotations and one day for didactic courses each week. Fourth year students have the option of training at the VA Medical Center in San Francisco or being part of one of our core sites at five other teaching hospitals and universities located throughout the western U.S. (Arizona, University of Texas, VA Albuquerque, VA Salt Lake City, or VA Tacoma), gaining valuable experience in diabetes, emergency medicine, geriatrics, and other areas of medicine.

Rationale for Implementation of a Computerized Student-Patient Encounter Log System

In recent years, there has been a rapid increase in web-based teaching and learning materials. The first Podiatry Medical Student Research Web Site for all podiatry colleges was established at CSPM. The neuroscience program was supported by a dedicated Intranet site, and the biochemistry program was supported by an asynchronous discussion group.¹ At other institutions, web-based interactive student advisement systems have been designed to improve the effectiveness and efficiency

of student academic advisement.²

Present day systems for recording student-patient interactions have trailed behind other academic areas in the appropriate use of technology. Prior to the implementation of our computerized student-patient encounter log system, students were required to submit handwritten sheets with information describing patient contacts in an effort to document and improve their training experiences during clinical rotations. The handwritten student-patient encounter logs that were collected were often difficult to analyze since the form was frequently incomplete and the writing illegible. In fact, many institutions employ multiple clerks to decipher and enter patient information into a variety of applications, though this is associated with a significant cost. The old system also suffered from lack of common methodology for describing diagnoses and treatments.

The reliability of medical student-patient encounter logs has been evaluated. Patricoski et al.³ argues that medical students underreport patient encounters in their clerkship logbooks. Thus, in order to enhance the reliability and efficiency of the recording process, a one-page patient encounter log form was developed⁴ that enabled students to record demographic and diagnostic data on a single page.

Medical students' use of handheld computers to record student-patient encounters in family practice and emergency medicine clerkships was assessed by Sumner⁵ and Lee, et al.⁶ In their research, medical students at the Washington University School of Medicine used a Palm computer log that was created with PumaTech's Satellite forms. Students use patient demographic variables to select a diagnosis entry screen that displays many likely diagnoses as checkboxes. Students have

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access to less likely diagnoses through additional drop-down lists and combinations of drop lists. According to Sumner,⁵ students in the family practice clerkship documented an average of 2.4 problems per patient and a maximum of 14 problems per patient with the handheld Palm computer log system. Sumner⁵ suggests that the Palm computer log system helps to identify gaps in medical students' knowledge.

Description of the Computerized Student-Patient Encounter Log

The Computerized Student-Patient Encounter Log (CSPEL) system, which was implemented at CSPM in 2001-2002, is an important component of the students' podiatric medical education, and implementation of the system has been described previously.⁷ Though the CSPEL system does require a certain amount of effort on the part of students to complete, it allows faculty to monitor the students' clinical experiences to identify deficits in students knowledge so that remedial measures can be taken. In fact, implementation of the CSPEL system was driven by the need for faculty to obtain student data from geographically disparate clinical rotations more accurately and effectively rather than the application of technology "because it's there."

The CSPEL system captures the following data for each student-patient encounter using either a drop down menu or text:

1. Date of patient contact
2. Patient number or abbreviated name
3. Patient's age
4. Attending clinician's name
5. Student's participation level during the patient contact (Observation, < 50% participation, ≥50% participation)
6. Student's department rotation
7. Location of rotation
8. Primary diagnosis (available from a drop-down menu, examples shown in Table 1)
9. Any secondary diagnosis
10. Treatments (up to five treatments from a drop-down menu, examples shown in Table 2)

In order to resolve issues of confidentiality, faculty access, and security, students and faculty are required to use a password login to gain access to stored information. Patient information is limited to a name or tracking code number acquired during the student contact. Only one report contains the patient's name in conjunction with the diagnosis and treatments. This report is attached to the student's department evaluation. Any other reports are general quantitative summaries of the contact. The faculty has access to the information via the student-patient log website. They can view reports by student, class location, or rotation. This is considered a considerable advantage given the decentralized nature of the

**Table 1
SELECTED DIAGNOSES AND
ASSOCIATED CODES**

<i>Diagnosis</i>	<i>Code</i>
Anxiety	100.00
Depression	200.00
Family Problems	210.00
Relationship Problems	220.00
Arterial Insufficiency, Feet	447.10
Arthritis, Rheumatoid	714.00
Blister	917.20
Dermatitis/Eczema	692.90
Diabetes Mellitus w/Prf Cir Dis	250.70
Dislocated MTPJ	838.05
Fracture, Tarsus	825.20
Ganglion of Joint	727.43
Verruca Plantaris	078.19

**Table 2
SELECTED TREATMENT OPTIONS AND
ASSOCIATED CODES**

<i>Diagnosis</i>	<i>Code</i>
Supportive Counseling	10000
Referral to Social Worker/ Therapist	20000
Anti-Anxiety Medication	30000
Anti-Depressant Medication	40000
Psychosocial Follow-Up Consultation	50000
Arthroplasty Digit	28285
Excision of Ganglion	28090
Excision, Lesion, Benign	11420
Flexor, Tenotomy	28272
Trimming, Callus	11057
Xray, Ankle, 2 views	73600

clinical rotations at CSPM.

In 2000, the College's CSPEL System was placed on Microsoft's SQL Server.⁷ After extensive testing of the new SQL Server using a variety of computers and browsers (e.g., Apple and Windows platforms using Netscape and Internet Explorer), the system was beta tested with 10 students and feedback from focus groups was used to inform site development. Slight modifications were made to the site based on the information obtained from these focus group meetings. Specifically, on the Student Log Entry Page, links were added to the diagnosis and treatment entries. These buttons display a

full screen menu with all of the available choices. This allows the student to see more than the 10 items that was a default on the original page.

The System combines several ICD-9 codes under such categories as forefoot surgery and rearfoot surgery, thereby creating ICD-9 codes specific to podiatric medicine. In addition, the system is shortly to be extended to include vascular surgery, general orthopedic surgery, and general surgery.

Evaluation of the CSPEL System

Student and faculty use of the CSPEL system is currently being evaluated using the action research method.⁸ The approach requires that formative evaluation take place in the context of current applications. In 2002, a 31-item voluntary questionnaire was administered to a sample of 66 podiatry students in the 2002, 2003, and 2004 class years to assess their prior experiences with computers as well as their experiences with the CSPEL. In addition, students and faculty have been interviewed to obtain their feedback about using the CSPEL system. Evaluation data have revealed that faculty and students presently using the system have reported several benefits.

1. Improved accessibility. The student log website can be accessed from any networked computer using standard browser technology "anytime anywhere."
2. Student-patient encounter data can be recorded synchronously or asynchronously as convenient.
3. Improved accuracy of data reporting. All critical information is collected from predetermined drop down lists rather than free form data entry. This effectively limits user expressiveness and eliminates transcription errors. In this way, the accuracy of data recording is considerably enhanced over the traditional paper-based system. All required data are validated before entry into the database and log deletions are not permitted.
4. Improved ease of report generation. All data are stored in a relational database to facilitate report generation. Both student and faculty reports are available online.
5. Improved reliability. Maintenance can be performed online using a Web browser interface.
6. Enhanced security and privacy. The computerized patient log uses three levels of password protected access: student, faculty, and administrator. Students only have access to their own personal information. Cookies are required for user authentication as they move from page to page. The session also times out after a specific amount of time and the user must login again.
7. Scalability. The CSPEL System may be customized for other medical teaching institutions. It can be used to track student-patient encounters wherever they occur during the training of any health professional. In the near future, the site will be able to support multiple locations simultaneously.

The authors expect that the implementation of a student-patient encounter log system will be subject to a degree of user or institutional resistance as with any new technology.⁹ However, we believe that once the inherent benefits of the system are demonstrated to stakeholders, this resistance will fade away.

In addition to the classical "resistance to technology syndrome," the only perceived disadvantage of the CSPEL is that, at present, users of the system still need to return to their desktop PC to input data. Though this does add another step to the data recording process, it has the advantage of making students responsible for their own learning and gives them a sense of ownership of the data.

Behavioral Sciences Training Applications of the CSPEL System

The CSPEL system is ideal for enhancing behavioral sciences training. The system provides a rich database for designing innovative behavioral sciences curricula and program evaluation tools. With its implementation, faculty are now able to develop simulated patient scenarios, patient management problems, case studies, lectures, and other curricular components that reflect the students' on-going clinical experiences. Podiatric medical students, like other medical students, must learn to assess and manage a wide variety of psychosocial problems and difficulties associated with lower extremity diseases and injuries.¹⁰⁻¹⁷ The CSPEL system allows faculty to identify these psychosocial problems at geographically disparate clinical training sites and design appropriate behavioral sciences training experiences. For example, diabetic patients who are facing the amputation of their lower limb may become very anxious and depressed over the loss of normal functioning, disfigurement, and decreased life expectancy.¹⁷ Monitoring the number of planned and completed lower limb amputations will give faculty a chance to design simulated patient scenarios that allow students to identify diabetic patients' psychosocial stresses related to planned and completed amputations.

Given the poor prognosis for patients with bilateral lower extremity amputations, data on the incidence of bilateral lower limb amputation codes also can be used to develop training exercises that deal with death and dying issues, such as the stages of denial and acceptance of death among terminally ill patients.^{13, 14}

The CSPEL's ease of data access and retrieval allows faculty to routinely monitor and identify a wide range of other possible psychosocial problems related to diseases and injuries. For instance, patients who have sustained lower limb fractures may be unable to provide needed financial and social support for their family members. The CSPEL system allows easy access and monitoring of lower limb fractures. Faculty can use the system data to design appropriate behavioral training

tools and curricula that demonstrate the impact of fractures on quality of life and social, occupational/educational, and family functioning.

Moreover, the CSPEL system provides easy access to data on various chronic and acute lower extremity health problems, such as ankle osteoarthritis and peripheral vascular disease. Faculty can ascertain the number of these cases and develop meaningful training exercises to help students learn the impact of these diseases on the quality of life and rehabilitation of affected patients.^{15, 16} Faculty can also develop patient management problems using the CSPEL data to test the students' knowledge of how to manage the psychosocial problems of patients with ankle arthritis and peripheral vascular disease. For example, the diagnostic and treatment codes from the CSPEL system can be reviewed to determine when referrals should be made to social workers, psychologists, and other providers. Moreover, the CSPEL data can be used to help students assess their patients' ability to ambulate and engage in activities of daily living, which are important indicators of whether individuals require home care, a nursing home, or other forms of medical and social assistance.

In addition, diagnostic and treatment codes in the CSPEL system can be used to develop cases studies, lectures, and objective structured clinical examinations that assess the students' knowledge of patients' understanding and compliance with treatment regimens. A review of diagnostic and treatment data from the CSPEL system could reveal a high rate of return patient visits following diagnosis and treatment. This high rate may reflect the patients' lack of understanding of the disease, medical regimen, and self-care practices that can be remedied with enhanced patient education.¹⁸ Analysis of the CSPEL data may reveal that older patients have more difficulty than younger patients in following regimens.¹⁹ Thus, geriatric issues related to patient knowledge, understanding, and readiness can be addressed using case studies, simulated patient exercises, and other protocols. Ethnic/cultural, educational, and socioeconomic status factors also may influence patient knowledge, understanding, and readiness to follow regimens, and these factors can be included in simulated patient exercises, patient management problems, and other training instruments.

Another benefit of using the CSPEL system is that monitoring student diagnostic and treatment data can lead to the inclusion of other protocols in the students' assessment and treatment of patients. For instance, if faculty find a high number of anxiety and depression diagnoses during a given period, anxiety and depression screening scales can be included in the students' assessment protocol. This can be very useful because studies have shown that use of screening questionnaires and scales improves the assessment and management of psychosocial problems.^{20, 21}

Besides enhancing the students' behavioral sciences assessment and treatment skills, the CSPEL also can be used to improve program and student evaluation. One important program evaluation question is whether students are exposed to a sufficient patient population with diverse health problems. Monitoring the system provides faculty with a comprehensive view of precisely these data. For example, the number of patients with diabetes, arthritis, and other diseases can be easily obtained for disparate geographic clinical training sites. Moreover, the number of procedures, such as amputations, can be retrieved for each site. Training sites that have an insufficient number of patients with certain diseases can be re-organized to rectify this problem. In addition, new training sites can be developed to correct these deficiencies. Thus, the CSPEL system can be employed to evaluate the on-going process of training programs.

Moreover, the CSPEL system provides a rich source of data for conducting chart audits of behavioral sciences assessment and management practices.^{21, 22} Traditionally, medical students and health care professionals have under-recognized the incidence of psychosocial problems.^{20, 22} The ease in accessing and retrieving data from the CSPEL system makes it possible to audit charts to determine the rate at which students appropriately recognize and manage psychosocial problems. These chart audits assist in training students to better assess and manage traditionally overlooked problems.

Finally, summative evaluation of training programs can be enhanced using the CSPEL system. Faculty can correlate the students' diagnostic and treatment procedures with various student performance outcome measures, such as clinical rotation evaluations, objective structured clinical examination results, and National Board Examination scores. In this way, deficiencies in student performance can be addressed and experiences at clinical training sites can be modified to improve student performance.

Acknowledgments

The authors wish to thank Dr. Joel R. Clark, Department of Surgery, California School of Podiatric Medicine at Samuel Merritt College, who originated the concept of the CSPEL system. The authors also wish to thank William F. Matheny of William F. Matheny and Associates, Castro Valley, CA, who designed and implemented the CSPEL system at the California School of Podiatric Medicine.

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