Taking a Quality Assurance Program From Paper to Electronic Health Records: One Dental School’s Experience


Abstract: The Obama administration is seeking to increase access to and improve the efficiency of the health care system in the United States. One aspect of those efforts is a push towards the utilization of electronic health records (EHRs) by health care providers. Nova Southeastern University College of Dental Medicine (NSU-CDM) opened its doors in 1997 and began its evolution from paper charts to EHRs in 2006. AxiUm, a computer-run patient record and clinical management system, has become an integral part of the college’s quality assurance program and its students’ clinical education. Since the introduction of axiUm, the school has already noticed an increase in the quality of patient care due to improved oversight of patient management and the ability to more efficiently track treatment outcomes. Over time, the system will enable data collected by students providing care in the clinics to be quantified. Opposition to EHRs tends to stem primarily from the amount of time required for users to gain proficiency in the new technology, as well as from the initial cost to the provider. But there is no better place to begin this learning process regarding the importance and utilization of EHR systems than universities, where health professions students can acquire a comfort level with EHRs in an academic environment that they may then implement in their future practice.

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The United States is known for having some of the best health care in the world, but the health care system is expensive and often inefficient and many are not receiving the care they need. The Agency for Healthcare Research and Quality (AHRQ), which (along with its predecessor agencies) has conducted research on health care quality for more than two decades, has reported that “quality problems are reflected in a wide variation in the use of health care services, underuse of some services, overuse of other services, and misuse of services, including an unacceptable level of errors.” In recognition of the many problems with this system, health care reform is a priority of the new Obama administration.

Quality health care is also a challenge to be addressed at local levels. To ensure the quality of oral health care delivered at Nova Southeastern University College of Dental Medicine (NSU-CDM), the school instituted a quality assurance (QA) program. NSU-CDM has been in existence for twelve years, graduating its tenth class in May 2009. The QA program was initiated when the school was established during the 1997–98 academic year with an approach that remains in effect today: a patient-centered focus on comprehensive care. The QA program is overseen by a committee that meets monthly and is chaired by the College of Dental Medicine’s director of quality assurance. Because of an internal focus in the early 2000s on the assessment of quality within NSU-CDM, the QA committee prioritized the review and revision of the college’s existing core standards of care document. This review resulted in the implementation of a revised core document in September 2005 and led to the development and implementation in December 2005 of discipline-specific predoctoral standards of care that, as specified in the Commission on Dental Accreditation’s Accreditation Standards for Dental Education Programs (Standard 5-1), are patient-centered, focused on comprehensive care, and...
written in a format that facilitates assessment with measurable criteria. Each dental discipline at the college has incorporated indicators of quality into its specific standards, and these parameters are used by NSU-CDM faculty members and students in the assessment of treatment outcomes. This article will describe the QA system at NSU-CDM and explore the impact the introduction of electronic health records has had.

The Quality Assurance Program at NSU-CDM

A primary issue in ensuring the quality of health care is its safety—specifically, the proper use of services. Safety in health care has been defined as “freedom from potentially preventable complications, iatrogenic events, accidental injury, or illness resulting from the processes of care.” A current problem for assessing safety measures in the United States is the lack of national data systems to report information on safety at the state or local level. During the period from 1983 to 1993, for example, deaths due to medication errors more than doubled. But because adverse effects and medical errors are statistically rare, it is hard to get a handle on the scope of such problems by comparing trends across time or patient groups. A 2007 AHRQ report found that only twenty-five of the forty-one standard safety measures have data available for tracking recent trends.

The QA program at NSU-CDM has implemented safety measures to manage risk by ensuring that appropriate patient consent is obtained and that treatment is delivered in an environment that protects the patient and provider in compliance with state and federal regulations. Data are gathered in a systematic, continuous manner and provided to the QA committee for assessment; subsequent recommendations for improvement in the quality of patient care are made to the appropriate NSU-CDM dean. Data are gathered via chart audits, patient assessments, clinical rounds, and patient surveys, with a goal of providing measurable data to the QA committee that can be evaluated and used to improve quality and decrease patient risk. The chart audit process is quantified by the use of a form with specific criteria. However, there were problems with the paper charts; for example:

- Paper charts were on occasion misplaced or misfiled.
- Handwritten treatment notes took additional time to decipher and were occasionally unreadable.
- Faculty signatures, when present, were difficult to identify.
- There was no easy way to monitor that treatment notes were actually entered and approved by faculty at the completion of the visit.

In comparison to paper charts, the use of an electronic health record (EHR, described in the next section) has greatly facilitated the process of chart audits. The use of an EHR greatly simplifies the QA process since reports can be easily generated that monitor provider compliance with school protocols (every patient visit requires a checked-in appointment, a faculty-approved treatment note, and a code). Charts that do not meet these criteria are flagged, providers and faculty are notified, and deficiencies are tracked so that providers and/or faculty can be targeted for additional training.

Another major element of the QA Program is the Predoctoral Re-Care Clinic, a rotation for second-year dental students. Upon completion of comprehensive care, active NSU-CDM patients are referred to this clinic for their treatment completion examinations. Faculty members from the college’s sections of restorative dentistry and periodontology are appointed to oversee these exams. At the treatment completion exam appointment, a re-care team specialist verifies every aspect of dental treatment performed on the patient. Then, in periodontics, for example, the periodontal faculty member confirms that the periodontal treatment was delivered, the patient’s condition is stable, and the additional recommended treatment is at an appropriate level for the patient to receive a prophylaxis or periodontal maintenance procedure delivered by a second-year (D2) predoctoral student. If the patient meets these requirements, a treatment completion form documenting “outcomes of care” is completed and signed by the attending restorative dentistry and periodontal faculty members. A patient care coordinator (PCC) then places the patient in the Predoctoral Re-Care Clinic pool. In order to be selected for treatment by D2 students in this clinic, patients must generally have 1–3 mm sulcus depths with only a few isolated 4 mm areas. Patients with deeper pockets who do not meet the periodontal requirements to be placed in the Predoctoral Re-Care Clinic or medically complex patients remain in their assigned student dentist’s patient family to receive periodontal recalls until
their student graduates. At that time, these patients are transferred to a new predoctoral student.

**The EHR System at NSU-CDM**

In October 2006, NSU-CDM underwent a major change related to information technology in patient records and reporting of the implementation of patient treatment plans and outcomes when the entire teaching institution’s patient record system was changed from a paper-driven process to one utilizing electronic health records (EHRs). This was accomplished by incorporating axiUm, a computer-run patient record system that operates with standardized software, into all clinical activities.

As defined by the AHRQ, an electronic medical/health record is the “set of databases (or repositories) that contains the health information for patients within a given institution or organization.” EHRs are provider-focused and augment the storage of information for clinicians and administrators. According to the Health Information Management Systems Society, an electronic health record is “a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. . . . The EHR automates and streamlines the clinician’s workflow. The EHR has the ability to generate a complete record of a clinical patient encounter, as well as supporting other care-related activities directly or indirectly via interface—including evidence-based decision support, quality management, and outcomes reporting.”

In just two years, switching from NSU-CDM’s previous system of paper records to EHRs has already had a significant impact in improving the quality of patient care. A patient record can now be easily accessed from any of the college’s predoctoral, postdoctoral, or faculty practice clinics, as well as from its satellite clinics. The chart is accessible to the patient’s assigned provider at any time while on the NSU campus via computer stations in the dental school or through the student’s hard-wired laptop. Due to HIPAA privacy concerns, NSU-CDM does not allow students to access patient records via wireless or remote access. Under this system, no longer does a patient have several charts located in different clinics within the college. In addition, each health care provider working in NSU-CDM has access to the same EHR, which allows for a more accurate diagnosis and better continuity of care.

Judith R. Sands, risk management specialist for Nova Southeastern University’s Health Professions Division, commented in an interview on the positive results of using EHRs that have already been seen from a risk perspective: “The EHR has provided us with a mechanism to track unusual or problematic events, address continuity of care concerns and alert providers that a case needs to be handled cautiously. The notes are now more legible and organized, and forms are no longer missing from the chart.” Sands also noted that NSU-CDM’s utilization of EHRs has made it quicker and easier to locate clinical information and enables multiple parties to review a patient’s record at the same time. In addition, she emphasized that the EHR can be modified to a read-only format, minimizing inappropriate alterations of the record.

**Potential Advantages of a National Use of EHRs**

It is apparent that a nationwide switch to EHRs would have numerous additional positive effects. Health care today is very fragmented, with patients often visiting several health care providers, whether for similar or entirely unrelated problems. A change to EHRs by the majority of health care providers would enable them to coordinate treatment without losing precious time pursuing contact with individual providers. In addition, by giving all health care providers the advantage of a complete medical record, EHRs could improve patient safety by reducing errors.

Adverse reactions from combined drugs or allergies would be significantly decreased with the use of EHRs, which could be programmed to show warnings if dangerous combinations of drugs were prescribed. Using EHRs nationwide would also combat the duplication of laboratory tests, increasing efficiency along with quality. One doctor described his experience using EHRs with the Chicago Alliance of Community Health Centers, which pioneered the integration of EHRs into its health care system: “Right away, we got an alert for a drug-drug interaction,’ Dr. Bechara Choucair said. ‘The drug that the psychiatrist was giving [the patient] was interacting...
with a drug that his cardiologist was giving him. ’ But until the EHRs made the link, no one knew.”

EHRs could also be paired with programs showing evidence-based practice guidelines, thereby increasing the opportunity for health care providers to follow these guidelines. As Lohr explained in an article on EHRs in the New York Times: “The widespread adoption of electronic health records might also greatly increase evidence-based medicine. Each patient’s records add to a real-time, ever-growing database of evidence showing what works and what does not. The goal is to harness health information from individuals and populations, share it across networks, sift it and analyze it to make the practice of medicine more of a science and less an art.”

It is important to note that simply having all health care providers use their own electronic systems will not solve the problem with EHRs. The systems used must be compatible with each other, so that patients at any office, clinic, or hospital can access their EHRs. Currently, even progressive EHR systems are not compatible and therefore are no longer effective when the patient leaves that particular office or hospital network. For example, in Nashville, Tennessee, two very effective EHR operating systems have been implemented: the Department of Veterans Affairs (VA) Hospital’s VistA and Vanderbilt University’s StarPanel. However, the two systems cannot share information with each other, so a patient coming from the VA Hospital cannot access those records in Vanderbilt’s hospital.9,10 It is noteworthy that utilizing only one operating system for the entire nation would not be ideal either, since a monopoly by one system could result in lower levels of innovation and efficiency. This is an area in which government regulation can help—by managing competition while mandating that all systems are compatible.

In addition, regional variations in nomenclature and abbreviations appear in EHRs, so that providers in different areas have different “dialects” in their EHR language.9 An ideal way to solve this “language barrier” would be to standardize abbreviations and terms nationally. However, while this change can be made at the school level so that students and new graduates all use the same vocabulary, health care providers already in practice may be reluctant to change a way of functioning that they found comfortable for years.

There are several potential ways to rectify this situation. Forty-five dental schools currently use the clinic management program axiUm. These institutions are in a unique position to promote information-sharing. A consortium of faculty members from axiUm schools is already in place and has begun to investigate methods for data mining across a standard platform for research and educational purposes, while at the same time protecting the privacy of patient information. One method would be to develop a glossary of codes and terms for health care providers. Another option would be to have built into the software operating system a “translator” that would recognize the terminology used in different regions—a type of medical Rosetta Stone.

A combination of standardization at the school level with either a glossary or internal translator program would be the most practical approach. As time passed and graduates from health care programs taught on the new standardized system came to represent a larger percentage of the provider population, the translator program would no longer be needed and a simpler system could be utilized. One of our long-term goals at NSU-CDM is to have an impact on oral health care by providing our students with the foundation to utilize EHRs properly and thus assist with the transition into routine EHR use in private dental practice.

Challenges in the Transition to an EHR System

Progress in a particular area often carries a new set of issues, and the transition to a national EHR system may face opposition from at least a couple of perspectives. First, EHRs may raise patient concerns about loss of privacy. If EHRs are implemented for the greatest efficiency, they will have to be compatible across multiple institutions. This sharing of information clearly concerns patients who worry that the wider availability of their records could be exploited by insurance companies, employers, or others. To ease this fear, patients should have control over their health records comparable to the control customers have with online banking, in which individuals have their own usernames and passwords and can access their records from any online computer. If electronic health records were structured in a similar manner,
health care providers would have access to the health records of only those patients who were under their care. Such restrictions would result in patients having the same amount of privacy they have in the current paper system, but health care providers would have the advantage of access to a complete record rather than a record at only one office. It should be explained to patients who say they prefer that their health care providers not know their pre-existing conditions that providers must know any and all information regarding their health care status to protect both the patient and themselves.

Second, advances in information technology, such as the use of EHRs, may raise concerns at the institutional or practitioner level about the steep learning curve and an initial decrease in clinical productivity during the change from paper to electronic records. Any loss in productivity is directly related to the time it takes to learn the new software and the effectiveness of systems put into place for training and retraining providers and staff. As Dr. Fred Rachman described the transition at the Chicago Alliance of Community Health Centers, “Implementation challenges included recruiting proper IT expertise, analyzing and redesigning hundreds of clinical workflow patterns in busy health centers, and developing the right strategies for training staff. Lack of standardization for quality measures and data specifications made some of these tasks even more difficult.”

The transition at NSU-CDM from paper records to axiUm was as painful as Rachman suggested. Many of the problems were not identified until the system was up and running. Existing network infrastructure had to be totally reworked as higher usage placed increased demands on the data highways. The dental school had to hire additional personnel to staff an internal, newly established Information Technology Office to oversee and train faculty, students, and staff. In addition, this office became responsible for generating reports, as well as continued implementation of new technologies.

Some of the issues regarding the transition are still being resolved, and as others are identified, the NSU-CDM information technology team continues to address them on an ongoing basis. These challenges are part of the changeover from paper to electronic records and would have existed regardless of the electronic system used. One unforeseen challenge was the casual attitude some students initially had regarding electronic records. In an age in which students have grown up on a steady diet of email, text messaging, and Twitter, we learned that efforts must be made to ensure they understand the gravity and permanence of the patient EHR as both a health and a legal document.

Another lesson we learned is the importance of an extensive planning and design process prior to implementing a new EHR system in order to minimize the potential negative effects on productivity and ensure that glitches do not adversely affect quality of care in the EHR’s earliest stages of use. EHR consultants Ursula Pennell and Eric Fishman have said that “EMR adoption should be an evolution not a revolution. . . . with proper planning you can get your [system] up and running smoothly with a minimal amount of staff frustration and loss of productivity.”

The Future of the EHR at NSU-CDM

By using the EHR with its re-care program, NSU-CDM will be able to accurately and efficiently track outcomes of procedures performed in its clinics. Results of the re-care program will be reportable from axiUm, and the system will collect and assess the data through the use of customized Crystal reports. The time required to review the patient’s record during the treatment completion exam has already been reduced through use of a report that outlines treatments performed at NSU-CDM and those completed elsewhere. In each group, treatments are evaluated as “within normal limits” or “not within normal limits.” Currently, these data are input manually into Excel spreadsheets and formulated into graphs. The data display patients’ names and treatment needs, which are subdivided into new pathology, defective work not performed at NSU-CDM, and defective work performed at NSU-CDM. A description of the problem is included under each of these categories. Data acquired and analyzed during the last six months revealed that 78 percent of patients needed to return to our clinics for dental treatment. Quality of care issues with work completed at NSU-CDM, and defective work performed at NSU-CDM accounted for 32 percent of this group. This percentage is skewed because a patient may be returning for only one restoration but has had several successfully completed. As such, we
are currently revising our reporting format to show the total number of restorations completed on each patient. This is easily accomplished through the EHR by accessing completed discipline-specific codes.

Additionally, NSU-CDM plans to develop forms and reports that will evaluate data according to the following metrics. Using a 1–4 scale (high to low), the change in a patient’s caries risk assessment over a one-year period will be quantified. Ratios of acceptable work completed at NSU-CDM to work found to be unacceptable will also be evaluated. Our goal is to increase this ratio; by using EHRs, we will be able to easily track and investigate the reasons for any poor outcomes. For example, we may find that poor outcomes are a result of a specific product used or work completed at a particular laboratory. In addition, this data will be much easier to correlate since the information is already in electronic form. Even without a standardized lexicon, the use of Structured Query Language (SQL, a computer language designed for retrieval and management of data) makes it possible to search for text within notes and forms. This allows for easy identification of providers and faculty who may require additional training or standardization. For example, NSU-CDM’s Department of Cariology and Restorative Dentistry has implemented standards and protocols for the techniques of direct and indirect pulp capping since the use of calcium hydroxide is now discouraged in favor of alternative evidence-based methods. Through the use of SQL, we were able to identify certain faculty members who continued to promote the use of calcium hydroxide and help to transition them to current practices.

As we found in our case, EHRs provide a systematic and continuous mechanism for collecting data that helps to improve the quality of dental practice. Access to and analysis of such data can help dentists more easily base their treatment planning on current evidence-based research. When evaluating treatment options, dentists would have a large database of information and outcomes at their fingertips. With more data on treatment flow, patient outcomes, and complications, dentists could then make better-informed decisions on specific treatment options that are best for their patients.

To fully detail how such a database could be designed is beyond the scope of this article. However, as the national EHR database matures, we envision that the data collected by EHRs could be accessed through a series of queries. For example, for a particular diagnosis, a dentist could access all procedures performed at that facility and the treatment results for that specific diagnosis.

Many dentists are already using some form of electronic billing with a standardized code set (e.g., the American Dental Association’s CDT codes). However, at the present time there is no standardized set of diagnostic codes that could be used to gather a large amount of data to assess the validity of various treatments, so it is difficult to relate treatments to diagnoses. This is one of the projects that the Consortium of Health Related Informatics (COHIR) is working on. Even without a complete standardized set of diagnostic codes, it is currently possible to query the axiUm EHR. One study, for example, identified patients receiving a particular class of medication (bisphosphonates) and looked at the incidence of a treatment complication (osteonecrosis of the jaw). The incidence was discovered to be higher than what has been previously reported.13

Quality assurance at NSU-CDM is a continuous and systematic program that includes every facet of patient care. The introduction of the EHR system has improved the quality of patient care by making it easier to collate data to assess treatment outcomes and identify trends. By decreasing the time it takes to review the patient record, we can devote our resources to providing quality patient care. Based on what we have seen thus far at the institutional level, we believe that utilization of EHRs as a tool for improved patient care has great promise.

REFERENCES