Analysis of Dental Workflow with an Integrated Medical-Dental Electronic Health Record: A Time and Motion Study

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Purpose

To analyze the workflow and interaction of the dentists and dental staff with a recently implemented integrated medical-dental electronic health record (iEHR) and identify breakdowns when interacting with the current system.

Background

Oral health has recently gained much attention regarding the correlation it shares with systemic health. Many systemic diseases such as coronary heart disease (CHD), diabetes mellitus and Alzheimer's disease have been associated with periodontal disease. Based on these latest understanding of the correlation between oral and systemic health, it seems apparent for a need to integrate medical and dental health records in order to provide the greatest quality of care possible for patients. Dentists and physicians are beginning to treat the oral cavity and the rest of the body as a single entity.

Marshfield Clinic, founded in 1916 in Marshfield, WI, is one of the largest comprehensive medical systems in the nation. With 775 clinicians and more than 6,500 staff, this multispecialty group practice provides patient care, research and education in 50 locations in central, northern and western Wisconsin. CattailsMD, the internally developed Electronic Health Record (EHR) developed by Marshfield Clinic, is one of the oldest electronic medical records systems in the country. Marshfield Clinic recently developed an integrated medical-dental electronic health record (iEHR) environment to further advocate this new idea of practicing the integrated approach to medicine and dentistry. This new technological advancement provided an excellent opportunity to study the human-computer interaction with the iEHR environment at the Marshfield Clinic's dental centers.

Methods

A data collection tool was used to capture the dental workflow. Two researchers first tested and modified the tool during pilot observations in dental clinics. Both researchers then collected final data by observing the workflow of dentists, dental hygienists, dental assistants and appointment coordinators at four Marshfield Clinic dental centers. Patient encounters observed included initial visits, planned visits, emergency visits and front desk interactions. Researchers documented the entire workflow of each role with a primary focus on their interaction with the iEHR. The time and motion tool allowed the researchers to record all aspects of the encounter including medium, activity and information. Types of medium recorded were paper, computer, and tray sheet. Activities included five main areas of tasks: data related, patient related, talking, walking and miscellaneous with minor tasks.

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listed under it. Information items allowed researchers to record detail about tasks. Examples of the Information items include: scheduling info, extraoral exam, intraoral-soft and hard tissue, intraoral and extraoral imaging, chief complaint, problem list, medication, medical and dental history, treatment plan, prescription, progress notes and social conversation. Also, researchers conducted brief exit interviews and focus groups to collect participants’ opinions and experiences about working with the iEHR and other workflow issues within the dental centers. Focus groups were audio and video taped to allow for later, detailed analysis to identify themes.

The study protocol was submitted to the Institutional Review Board and approved under 45 CFR 46, 21 CFR 50 and 21 CFR 56 (Marshfield Clinic Research Foundation IRB number ACH10110).

**Results**

Researchers observed 143 encounters between the four dental centers during July 2010. These encounters included 14 initial visits, 104 planned visits, 16 emergencies, and 19 front desk encounters. Focus groups were conducted at two dental centers over the lunch hour and lunch was provided.

Dentists in particular found that posting charges significantly interrupted their workflow. It was not easy to see at a glance which charges had been posted or not. Also posting charges was inconvenient because dentists needed to go to their office computer after every patient to post charges. The operatory was often far away from their office and they had multiple patients waiting. The ASAP list is a list appointment coordinators use to call patients to come in on short notice to fill in cancelled appointments. The ASAP list took too long to load and there was no way to minimize the list once it was open. The patient’s phone number was available, but not the specific patient’s name in the case of families. The provider drop-down selects the staff entering certain actions on the iEHR and this selection often changes throughout an encounter. If a staff member forgets to check that the proper staff is selected and enters information and tries to submit, the system alerts the user that a different staff member must be selected. The problem arises when the proper staff is then selected, all of the information previously entered is deleted. Dentists found that ordering prescriptions took too many clicks. Also the default setting for ordering prescriptions is to send order electronically to a Marshfield Clinic pharmacy. Prescriptions were often sent electronically when the dentist intended to print them out.

**Conclusion**

Often the clinical information systems are designed without efficient workflow and end user’s contextual environment in mind. This forces the users of the system to adapt to the inefficiencies of the system design which could sometimes be time consuming and lead to complicated work arounds. The information gained from this study will be shared with the development team and allow for future enhancements to improve the iEHR.

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