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Original Research Article

Evaluation of voice-based data entry to an electronic health record system for dentistry



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ABSTRACT

This paper compares three methods of storage data of the patients in the field of dentistry: the paper dental card, a lifetime dental EHR controlled by keyboard and a lifetime dental EHR controlled by voice. The EuroMISE Center developed a pilot EHR application called MUDR Lite (multimedia distributed electronic health record). The study compares the elapsed time necessary to update/enter the information about the patient's dental status using the above mentioned three methods. The paper dental card is the most rapid method, but not the best for medical documentation and dentists.

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1. Introduction

Dentistry should be fully integrated into the health care system. One step toward the full integration is enabling the use of the electronic health record (EHR) in dental practice. The standardized EHR should include: the option to transfer data from an electronic health record to another physician for consultation of symptoms and/or treatment (consult with the reasons), the ability to transfer the documentation in the form of an electronic health record in cases when the patient is transferred to another physician to ensure the continuity of care and to transfer the X-ray scans (X-rays) and photographs

between health facilities. The access to the recent laboratory results is also beneficial. These features further improve the safety and protection of patient data and improve the quality of the care itself, on communication between dentists and general practitioners. Standardized medical documentation systems should facilitate interdisciplinary communication and clinical research.

In the 1990s, the ADA (American Dental Association) began to collaborate with other organizations to define a specific EOHR (electronic oral health record). The EOHR enables communication with EHR systems and, at the same time, meets the requirements for electronic communication with health insurance companies [1].

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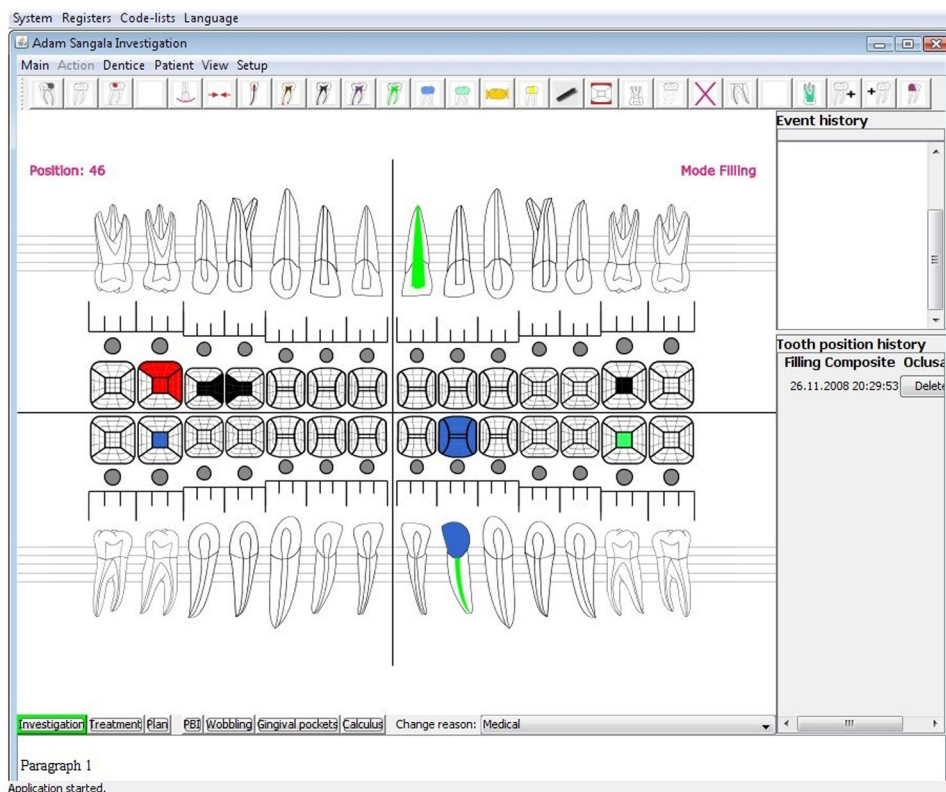


Fig. 1 – Interface to the dental electronic health system MUDR Lite.

The electronic health record is a computerized health information system where the health care providers record detailed encounter information such as patient demographics, encounter summaries, medical history allergies, intolerances, and lab test histories [2]. Some may support order entry, results management and decision support. Some may (Fig. 1) also implement advanced features, such as appointment scheduling, report generation, billing tasks management, or may support integration with a third-party software performing these tasks.

In 1991, the Institute of Medicine in the USA published a report called “The Computer-Based Patient Record: An Essential Technology for Health Care” [3], describing the requirements on an EHR, and making recommendations for the future. In the same year in Europe, the required functionality of a future EHR was formulated in the work-program of European Union R&D program called AIM – Advanced Informatics in Medicine [4]. Further recommendations were approved in the AIM: CEN workshop on medical record in 1993 [5] and its follow-up, the EU: CEN workshop, in 1997 [6]. The benefits of computerizing medical records have been reported in the literature [7]. One of the immediate benefits is that important information can be made available to the health professionals through automated reminders and alerts. This can reduce severe medication errors.

The voice controlled user–database interaction focuses on the voice recognition communication issues between users and database systems, from both a design and development viewpoint.

Voice commands usage has been experimented with since 1990 [8] as a convenient replacement of the conventional computer control using a keyboard and a mouse. The necessity of using the human voice to control a computer or other device arises in typical hands-busy environments such as surgery or dentistry [9]. The aim of this study is to compare three possibilities of management of the patient's data: a classical paper dental card and a lifetime dental EHR controlled using the keyboard or voice (Fig. 1) and to evaluate the ease (comfort) of the patient's data manipulation and storage. All these three tools use structured information stored either in a paper form (paper dental card) or in an electronic form (*Dent Cross*, *Lifetime Dent Cross*).

2. Materials and methods

2.1. Design of EHR system for dentistry

The development of an electronic health record (EHR) at the EuroMISE Center started in the year 2000 based on inspirations and experiences from existing CEN/TC251 standards and several other European projects, mostly the I4C and Triple C projects [10]. The main design requirement of the proposed system was the ability to store structured data together with free text. Moreover, dynamic extension and modification of the set of collected attributes without any change of the database scheme was mandatory. The research resulted in a pilot EHR application called MUDR (multimedia distributed

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