Creating a Searchable Digital Dental Radiograph Repository for Patient Care, Teaching and Research Using an Online Photo Management and Sharing Application

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Abstract

With the advent of digital dental radiographs, dentistry is amassing an unprecedented volume of images as electronic patient records (EPR) and dental PACS (picture archive and communication system) become more commonplace. While radiographic findings and diagnostic information are visually discerned from images, this information is not digitally associated with the images. This project will explore the formation of an online, searchable data repository of dental radiographs and associated meta information.

Introduction

Currently DICOM-compliant dental images contain defined meta information (limited to patient and exposure) and visual information, but unlike medicine, no diagnostic or textual descriptions. Dental images generally display one or more findings and/or diagnoses, and are linked to a unique set of patient demographics, medical history, treatment history and other findings not represented by the image. This information is not associated with images in any type of meta format, and images are not searchable based on any clinical criteria. As a result, the knowledge base available for patient care, teaching and research is limited. By creating stronger and more granular associations between radiographic data and patient data, a new type of dental image repository is possible. Furthermore, metadata may be applied to images and identified to clinicians based on a variety of informational elements, providing a new opportunity for dialogue and learning among educators, students, patients, providers and investigators.

Methods

This project involves a pilot study in which diagnostic and other medical and dental meta data is applied to a select group of dental images. Each image and its associated patient information will be de-identified. An emerging technology, online photo management and sharing, will serve as the pilot database, whereby clinicians from other institutions will also be able to search and post to the database. Image “tags” analogous to meta data fields will be created in the online application using a standardized format (such as, SNOMED, SNODENT). The tags used in the pilot will include information related to image findings and diagnoses, and a small subset of patient information, such as age, sex, race, ethnicity, medical history, dental history, dental findings and clinical diagnoses. The online application will then be populated with images and associated meta tag information, automatically creating a searchable database. Following completion of the project, evaluation will be conducted by surveying users at both the host and contributing institutions. In a future full-scale version of the project, a more powerful enterprise database engine, such as ORACLE or MS SQL Server, would be used with a web interface. Ultimately, a content-based image retrieval (CBIR) could also be integrated into this system, providing an even greater level of standardization and utilization of dental radiographs and their diagnostic information.

Conclusion

The digital age of dental radiography provides a unique opportunity to combine the visual information of the image with various patient and clinical data. An online, searchable dental image repository which associates unique informational elements to each image and organizes them in a searchable format enables providers to utilize a new and innovative technology tool for patient care, teaching and discovery. After the successful piloting of this project, an application or combination of applications that automate the retrieval of images and associated information from an institution’s EPR and/or PACS into a data repository could also be developed.

References