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TITLE: Works for mapping and viewing solution of intraoral radiography

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Purpose: Intra-oral radiography has been specifically mentioned in the DICOM Standard since Supplement 32 introduced the intraoral radiograph Io subtype of Dx. Both “Anatomic Region Sequence for Intra-oral Image” and “Anatomic Region Modifier Sequence for Intraoral Image” are defined in the Standard. Also both “Permanent Dentition (32 teeth)” and “Deciduous Dentition (20 teeth)” are defined for each tooth as “Primary Anatomic Sequence.”

Intra-oral radiography is the examination of teeth and their supporting alveolar bone. Multiple teeth, usually from one to four teeth, are depicted on each periapical image, while six to eight tooth crowns are present on most bitewing radiographs. Impacted, or supernumerary teeth are sometimes found, and teeth may be missing congenitally or due to extraction. Hence, there is not a one to one relationship between each tooth and each intra-oral radiographic image.

Now Japanese Task Force works on the project of “Dental Mapping and Query-Retrieve.” This is an approved work item of DICOM Working Group 22 (Dentistry). The task force are led by Dr. T. Okano, Chair of Dental Hospital, Showa University, Tokyo, and the Japanese Society for Oral and Maxillofacial Radiology. There is support from several dental companies in Japan and discussions have been made with JIRA (Japan Industries Association of Radiological Systems) and JAMI (Japan Association for Medical Informatics). They have committed to contribute to this standardization actively.

The project would utilize the coding of teeth to create x-ray charts for mapping and viewing intra-oral radiographs on display. Full mouth series of intra-oral radiography have a limited number of variations among and within diverse countries. Such a representative series is shown on Page 4, DICOM Suppl. 123: Structured Display, “Figure Use Case-1 Intra-oral Full Mouth Series Structured Display” is but one of many possible image-series for the adult full–mouth survey, and others, such as 1, 2, 4, 6, 8, 10, 12, 14, 20, and 21 image-series as well as the 18 image-series that was shown as but one example. Further there are also series designed for the child dentition and for the edentulous adult. Specific series are ordinarily reflected in a display format solution. The DICOM definition of the relationship between each display disposition and the tooth/teeth group is of value for dental professionals.

An interoperable solution based on the DICOM Standard is necessitated in dental practice. The solution

to differentiate parallel, bisecting, bitewing, occlusal, periapical projection and de-centering techniques for intra-oral radiography is necessary. It's also necessary to develop the method to denote which teeth are present in a given intra-oral radiograph on a given position within a structured display. The procedure for the query-retrieve of images containing specific teeth would be developed.

The present progress of the solution by Japanese Task Group would be shown in the presentation.

Methods: The Task Group sent questionnaires on display formats on full-mouth series, bitewing and occlusal radiographs, which are practically used at dental school hospitals in Japan, in Dec. 2010. Now we make the summary table.

Results: Our proposal is to define specific examination codes as DICOM tags for intra-oral radiography techniques and the relationship between tooth/teeth group and display disposition, and to provide a solution for the query-retrieve for intra-oral radiographic images. Developing a new examination code is thought to be convenient to differentiate various techniques in the intra-oral radiography examination.

A means to specify specific display format templates within DICOM Structured Display is proposed. Apparently a finite number of templates are required by certain users in dental clinical practice and might be achieved by adding DICOM tags for designation of specific displaying templates.

A means of defining the relationship between tooth/teeth group and the disposition in templates would be sought. This would be a basis for achieving dental query-retrieve for intraoral radiographic images within any given template. This solution would be primarily for intraoral radiographic images, but could also be used for dental photographs, and all other images including teeth and tooth sequence.

Conclusion: The Japanese Task Force develops the solution of the mapping, viewing and query-retrieve procedures. We will make clear our proposal contents as the new work item around June 2011.