



# Need for diagnostic-centric care in dentistry

## A case study from the Marshfield Clinic Health System

Neel Shimpi, BDS, MM, PhD; Zhan Ye, PhD; Rajesh Koralkar, MPH, MSHI;  
Ingrid Glurich, PhD; Amit Acharya, BDS, MS, PhD

### ABSTRACT

**Background.** The study objective was to evaluate the workflow of dental providers who use the existing electronic dental record (EDR) system at a large regional health care system to establish a diagnostic-centric culture as part of their dental practice. A further goal focused on identifying when improvements to the workflow and design of the EDR may be indicated.

**Methods.** Dental procedures performed on patients and corresponding *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* diagnoses were retrospectively mined from Marshfield Clinic's enterprise data warehouse. All dental procedures performed were selected and paired with corresponding diagnostic codes documented by dental providers. Frequency of documented diagnosis was further analyzed by characterizing correspondence with their ranking order in the diagnosis column with and without a scroll bar within the EDR user interface (UI). Accuracy of selecting appropriate ICD-9-CM for the corresponding Code on Dental Procedure and Nomenclature (CDT) was checked for 10% ( $n = 6,187$ ) of the procedure-diagnosis pairs.

**Results.** Of the 61,511 unique procedures documented using 147 CDTs, 11% (6,914 procedures) had a corresponding "not available" option associated under the diagnoses column, whereas 89% (54,597) of dental procedures were associated with a corresponding ICD-9-CM diagnostic code. Overall tendency of dental providers to select the first or last options from the diagnostic list with a scroll bar was noted. Appropriateness of documenting corresponding ICD-9-CM to CDT procedures indicated 98% accuracy.

**Conclusion.** EDR UI design greatly affected documentation process. Redesigning the EDR UI from the results will increase both the quality and utility of clinical documentation.

**Key Words.** Code on Dental Procedure and Nomenclature; electronic dental record; electronic health record; International Classification of Disease; structured data documentation; user computer interface.

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Code on Dental Procedure and Nomenclature (CDT) has been integral to dentistry for several years as a standard lexicon of procedural codes used to report dental services as defined by the American Dental Association (ADA).<sup>1</sup> Developed by the ADA, CDT codes support efficient processing of dental claims and capture of dental procedural history in the electronic dental record (EDR).<sup>1</sup> An accurate recording of a treatment plan in an EDR requires not only the procedure that is planned, but also the associated diagnosis, as it is essential to capture the reason for the procedure being performed. The Health Information Technology for Economic and Clinical Health Act<sup>2</sup> and the emergence of multiple dental diagnostic vocabularies have placed additional emphasis on the need for capturing diagnoses in the EDR.<sup>3-6</sup>

In recent years, the growing recognition of integrating dental and medical electronic health records (EHRs) is considered a considerable opportunity to not only improve patient care and support quality of care initiatives but also to reduce the informational silos that exist between these 2 domains.<sup>7,8</sup> However, this exchange of information through the delivery of care process in an EHR is still identified as a barrier because of lack of standardization. Moreover, there is a different range of workflows associated with medical and dental documentation for treatment planning.<sup>7</sup>

The advent of different dental diagnostic vocabularies has highlighted that there is no mandated, standardized, dental diagnostic terminology for the field of dentistry. *International Classification of Diseases*, Tenth Edition, Clinical Modification (ICD-10-CM) codes are being used as a cornerstone and back end reference terminology for reporting standard completed treatment transactions for diagnosis, disease, and other health problems in medicine, which transitioned from ICD-9-CM to ICD-10-CM in the United States. Back end reference terminology is defined as “a terminology where each term has a codable, computer usable definition to support retrieval and data aggregation.”<sup>9</sup> Although ICD terminology is not as robust as the dental concepts detailed in Systematized Nomenclature of Medicine (SNOMED) International (formerly known as the International Health Terminology Standards Development Organization) and, although ICD-10 has greatly improved the level of granularity over ICD-9, ICD-10 still lacks the granularity needed to document detailed dental problems and findings. Efforts to create standardized dental diagnostic terminologies have resulted in Systematized Nomenclature of Dentistry (SNODENT),<sup>10</sup> developed by the ADA, and EZCodes, a standardized controlled terminology for dental diagnosis that was developed by a diagnostic terminology research work group and catalyzed by the Consortium for Oral Health Research and Informatics and is now known as Dental Diagnostic System (DDS).<sup>3</sup> SNODENT falls under the auspices of SNOMED International. The DDS was developed as an interface terminology. Accordingly, the interface terminology was defined as a group of terms that are designed in a manner that adapts to the user’s natural language and is easily mediated through the concept descriptions and underlying reference terminologies.<sup>9</sup> SNODENT (terminology subsets of SNOMED International concepts) was accredited as an American National Standard Institute–certified standard and supports sharing a structured dental diagnosis within HL7 Clinical Document templates such as Continuity of Care Document.<sup>10,11</sup> A recent harmonization effort between SNODENT and DDS resulted in 2 SNODENT subsets, SNO-DDS and SNO-DDS General Dentistry (a subset developed for general dentistry).<sup>12</sup> These codes are organized into subcategories and major headings with the use of the best terminology development practices.

Most current EDRs now have the functionality to store data in a structured format.<sup>13</sup> The user interface (UI) design of an EDR plays an important role in supporting documentation of structured information while keeping the contextual relevance between the procedures performed and the clinical indication for which the specific procedure was performed. Historical usability studies have focused on issues faced by clinicians in completing routine tasks, barriers to adopting EHRs, and ability to document or view clinical data efficiently.<sup>11-14</sup> Other studies have also explored the UI designs of EDRs.<sup>15-17</sup> A 2004 study that evaluated UI-related problems involved with structured data entry encountered by dental providers identified 24 high-level usability problems.<sup>16</sup> Unexpected approaches for displaying diagnoses, lack of visibility, and inconsistent use of the UI widgets were some of the high-level usability problems reported in the study.

The objective of this study was to evaluate and report on the workflow of dental providers who use the existing EDR system at a large, regional health care system to establish a diagnostic-centric culture as part of their dental practice. A further goal was also to identify where improvements to the workflow and design of the EDR may be indicated.

## METHODS

### Description of care setting

Founded in 1916, Marshfield Clinic is 1 of the largest comprehensive medical-dental health systems in the United States.<sup>14</sup> This multispecialty group practice with more than 700 physicians, more than 40 dentists, and more than 7,600 employees provides patient care, research, and medical education across 57 locations throughout its service area that spans central and northern Wisconsin. Family Health Center of Marshfield, a member of Marshfield Clinic Health System (MCHS) and a Federally Qualified Health Center, has been serving low-income, underinsured, and uninsured people since March 1974. Family Health Center of Marshfield has partnered with Marshfield Clinic in operationalizing onsite dental services since fall 2002 via 10 regional dental clinics integrated into MCHS and provided care to more than 50,000 unique patients annually in central, western, and northern Wisconsin.

## ABBREVIATION KEY

<b>ADA:</b>	American Dental Association.
<b>CDT:</b>	Code on Dental Procedure and Nomenclature.
<b>COS:</b>	Category of service.
<b>DDS:</b>	Dental Diagnostic System.
<b>EDR:</b>	Electronic dental record.
<b>EHR:</b>	Electronic health record.
<b>ICD-10-CM:</b>	<i>International Classification of Diseases</i> , Tenth Edition, Clinical Modification.
<b>iEHR:</b>	Integrated medical–dental electronic health record.
<b>MCHS:</b>	Marshfield Clinic Health System.
<b>SNODENT:</b>	Systematized Nomenclature of Dentistry.
<b>SNOMED:</b>	Systematized Nomenclature of Medicine.
<b>UI:</b>	User interface.

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