



# Attitudes toward and beliefs about the use of a dental diagnostic terminology

## A survey of dental care providers in a dental practice

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### ABSTRACT

**Background.** Attitudes and views are critical to the adoption of innovation. Although there have been broadening calls for a standardized dental diagnostic terminology, little is known about the views of private practice dental team members regarding the adoption of such a terminology.

**Methods.** The authors developed a survey by using validated questions identified through literature review. Domain experts' input allowed for further modifications. The authors administered the final survey electronically to 814 team members at a multioffice practice based in the US Pacific Northwest.

**Results.** Response proportion was 92%. The survey had excellent reliability (Cronbach  $\alpha$  coefficient = 0.87). Results suggested that participants showed, in general, positive attitudes and beliefs about using a standardized diagnostic terminology in their practices. Additional written comments by participants highlighted the potential for improved communication with use of the terminology.

**Conclusions.** Dental care providers and staff in 1 multioffice practice showed positive attitudes about the use of a diagnostic terminology; specifically, they believed it would improve communication between the dentist and patient, as well as among providers, while expressing some concerns about whether using standardized dental diagnostic terms helps clinicians to deliver better dental care.

**Practical Implications.** As the dental profession is advancing toward the use of standardized diagnostic terminology, successful implementation will require that dental team leaders prepare their teams by gauging their attitude about the use of such a terminology.

**Key Words.** Dentistry; diagnostic terminology; attitudes and beliefs; electronic health record; International Classification of Diseases; Systematized Nomenclature of Medicine; Systematized Nomenclature of Dentistry; leadership; innovation; adoption.

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In medicine, use of clinical and health administrative data in health services research has been enabled by the use of a standard diagnostic terminology, the International Classification of Diseases, which the World Health Organization initially established in 1893 to categorize causes of death.<sup>1</sup> In contrast, the dental profession has not yet generally adopted a standardized diagnostic terminology either for clinical care or

administrative and billing purposes.<sup>2</sup> With the advent of electronic health records (EHRs)

in which secondary data use for research and quality improvement is becoming the norm, the need for standardized dental diagnostic terms has become a more pressing professional concern. Miller,<sup>2</sup> for example, has highlighted that tracking the relationships among diagnosis, treatment, and outcomes hinges on the use of standardized diagnostic terms. Others have commented that quality measurement in dentistry would benefit broadly from the adoption of standardized diagnostic terms.<sup>3-5</sup> We owe this to our patients and, ultimately, the question of whether dentists like it is becoming somewhat secondary.

During the past decades, there have been several starts at developing a standardized dental diagnostic terminology, including efforts by Orlowsky in North Carolina in 1970 as noted by Leake,<sup>6</sup> by the American Dental Association with the Systematized Nomenclature of Dentistry (SNODENT)<sup>7</sup> in the early 1990s, and by Leake<sup>8</sup> in the late 1990s. In 1998, the University of California,



Supplemental material is available online.

San Francisco developed the Z codes<sup>9</sup> based on Leake's terms to which Creighton University made modifications for use in 2007 (N Kimmes, DDS, oral communication, June 2008). Although useful within the local settings at which they were developed, these previous dental diagnostic terminologies have not been implemented widely by the larger dental community, limiting the broader-reaching benefits of a common diagnostic terminology. Some stated reasons for the lack of wider adoption have been a limited ability to report specific conditions (for example, incipient caries) for specific anatomic locations (for example, tooth no. 3 occlusal surface)<sup>8</sup> and not being freely available for integration into EHRs by general practitioners or dental schools.<sup>10</sup>

Currently, the Systematized Nomenclature of Medicine (SNOMED) contains the version SNODENT II diagnostic terms, as well as many other oral health terms, for a total of close to 8,000. The dental content of SNOMED, however, is not limited to just the scope of SNODENT by the International Health Terminology Standards Development Organisation, the license holder of SNOMED. When they receive requests for dentistry concepts, they forward them to their International Dentistry Special Interest Group for feedback on how to manage them (J. Millar, Head of Collaborations at International Health Terminology Standards Development Organisation, e-mail communication, July 2014). SNOMED has the qualities of a good reference terminology, which is a terminology designed to provide common semantics for diverse implementations. A *reference terminology* is defined as a collection of terms, similar to a dictionary, and the relationships linking them; it is organized by meaning rather than by alphabetical order.<sup>11</sup> However, a reference terminology such as SNOMED, which has been designed for data exchange and aggregation, may not be the best choice for direct implementation in the user interface<sup>12</sup> of the EHR.

Instead, what is needed for clinical deployment in the EHR user interface is a purpose-built interface terminology<sup>13</sup> that has a manageable number of terms, incorporates language with which clinicians are familiar, and can be linked back to a reference terminology (SNOMED, in this case). In response to this need, in 2009, a Harvard-led research team proposed a practical standardized dental diagnostic interface terminology<sup>10</sup> incorporating existing dental diagnostic concepts and terms such as the Z codes, oral health terms contained in the ninth and tenth editions of the International Classification of Diseases, and relevant SNOMED clinical terms. This terminology, originally called *EZCodes*, consisted of 13 major diagnostic categories, 80 subcategories, and 1,158 unique dental diagnostic terms and codes.<sup>14</sup> As of 2014, the *EZCodes* dental diagnostic terminology has been renamed *Dental Diagnostic System* (DDS) terminology and has evolved to include 16 categories, 100 subcategories, and 1,518 unique terms and now includes

a number of completely novel terms not previously available in SNOMED or the International Classification of Diseases.

The adoption of standardized dental diagnostic terms must be considered in a context larger than the purely technical. To achieve their promise, these terms must be entered consistently by dental clinical team members in the course of their practices, which a practitioner is less likely to do if he or she views standardized diagnostic terms as not useful. Our team's experiences at sites with existing deployments in the academic setting have highlighted that there may be work to do in the broader sociotechnical milieu in which these terms are being deployed: illogical placement of buttons, the need for a scroll bar to find a term in long list, and tabs to click through multiple screens as part of the treatment plan were all considered less useful and dampened enthusiasm to use the terminology.<sup>15</sup> Addressing these issues led to a substantial increase in use (M.F. Walji, PhD, unpublished data, 2015). We identified no work in the literature that would enlighten us in this respect, so we undertook to evaluate the attitudes and views of clinical team members in a large, multioffice practice based in the US Pacific Northwest that had not adopted a standardized dental diagnostic terminology.

## METHODS

**Survey instrument development.** Our work is grounded in the technology acceptance model (TAM), one of the most widely researched models for linking behavior with attitudes and beliefs in the context of technical innovations.<sup>16-18</sup> TAM<sup>17</sup> and its extended versions, TAM2<sup>19</sup> and TAM3,<sup>20</sup> are well established and are reliable and robust parsimonious models for predicting user acceptance.<sup>17,19-25</sup> The constructs covered by TAM, TAM2, and TAM3 started with perceived usefulness and perceived ease of use (TAM); added job relevance, output quality, and result demonstrability (TAM2); and finally included computer self-efficacy, computer anxiety, computer playfulness, perceptions of external control, perceived enjoyment, and objective usability (TAM3).<sup>20</sup>

We composed our survey from relevant items from the validated TAM,<sup>17,21</sup> TAM2,<sup>25</sup> and TAM3<sup>20</sup> surveys, as well as a task-technology fit survey.<sup>26</sup> We excluded items that did not apply to the dental setting (for example, "Display pages provide links to more detailed information,"<sup>21</sup> "To my knowledge, the hospital information system meets its production schedules, such as report delivery"<sup>26</sup>). In addition, the research team developed several task-fit questions specifically for the dental setting

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**ABBREVIATION KEY.** DDS: Dental Diagnostic System. EHR: Electronic health record. SNODENT: Systematized Nomenclature of Dentistry. SNOMED: Systematized Nomenclature of Medicine. TAM: Technology acceptance model.

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