

Evaluating quality of dental care among patients with diabetes

Adaptation and testing of a dental quality measure in electronic health records

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Despite continuous improvement in the general and oral health of Americans, there is limited information about the quality of oral health care delivered. In 2001, in response to growing awareness of quality deficiencies in the American health care system, the Institute of Medicine published *Crossing the Quality Chasm*,¹ highlighting the need for change in systems of care and quality improvement.

Consequently, in 2008, with burgeoning national interest in quality improvement, the Centers for Medicare & Medicaid Services proposed the establishment of a Dental Quality Alliance (DQA) as a collaborative approach to developing oral health quality measures with the mission “to advance performance measurement as a means to improve oral health, patient care, and safety through a consensus-building process.”² As part of the collaborative effort to develop dental quality measures (DQMs), the DQA published several documents, including *Adult Measures Under Consideration*,³ in which they proposed 13 high-priority adult measures, and the starter set of



Supplemental material is available online.

ABSTRACT

Background. Patients with diabetes are at increased risk of developing oral complications, and annual dental examinations are an endorsed preventive strategy. The authors evaluated the feasibility and validity of implementing an automated electronic health record (EHR)-based dental quality measure to determine whether patients with diabetes received such evaluations.

Methods. The authors selected a Dental Quality Alliance measure developed for claims data and adapted the specifications for EHRs. Automated queries identified patients with diabetes across 4 dental institutions, and the authors manually reviewed a subsample of charts to evaluate query performance. After assessing the initial EHR measure, the authors defined and tested a revised EHR measure to capture better the oral care received by patients with diabetes.

Results. In the initial and revised measures, the authors used EHR automated queries to identify 12,960 and 13,221 patients with diabetes, respectively, in the reporting year. Variations in the measure scores across sites were greater with the initial measure (range, 36.4-71.3%) than with the revised measure (range, 78.8-88.1%). The automated query performed well (93% or higher) for sensitivity, specificity, and positive and negative predictive values for both measures.

Conclusions. The results suggest that an automated EHR-based query can be used successfully to measure the quality of oral health care delivered to patients with diabetes. The authors also found that using the rich data available in EHRs may help estimate the quality of care better than can relying on claims data.

Practical Implications. Detailed clinical patient-level data in dental EHRs may be useful to dentists in evaluating the quality of dental care provided to patients with diabetes.

Key Words. Informatics; quality of care; dental public health; diabetes mellitus.

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pediatric measures,⁴ with 6 pediatric electronic measures validated for electronic health records (EHRs).

Investigators in most reports in the literature evaluate DQMs by using administrative claims data,⁵⁻⁷ which consists of treatment codes that health care providers submit to payers for billing.^{8,9} Herndon and colleagues⁵ evaluated 3 DQMs with a caries preventive focus by using administrative claims data and attested to their validity and feasibility. Although the results are encouraging, the authors noted the limitations of relying on administrative claims data and suggested these may be addressed by leveraging EHRs, which contain more detailed and longitudinal clinical data that better reflect patient oral health status. EHRs have become the standard for dental care documentation in most US dental schools and are increasingly common in community health centers, group practices, and private clinics.¹⁰ Because structured data are increasingly available in dental EHRs,^{4,11} our group in 2016 defined the steps for the implementation of automated DQM queries by using EHRs and demonstrated the feasibility of a meaningful use measure.¹²

In our study, we evaluated 1 of the DQA-proposed adult, high-priority measures—*People With Diabetes: Oral Evaluation*³—developed to evaluate “the percentage of adults identified as people with diabetes who received a comprehensive or periodic oral examination or a comprehensive periodontal examination at least once within the reporting year.” Diabetes is a chronic and progressive disease affecting 29 million people in the United States, or 9.3% of the US population.¹³ In 1995, the Centers for Medicare & Medicaid Services, American Diabetes Association, and National Committee on Quality Assurance set forth performance measures to evaluate the quality of medical care provided to people with diabetes, with a focus on routine testing for indicators such as low-density lipoprotein cholesterol level, eye examination results, and hemoglobin A_{1c} level. Although integrated health care systems, including the Veterans Health Administration, adopted performance and outcome measures, they did not include oral health care quality evaluations.¹⁴ People with diabetes are at increased risk of developing oral health complications that include periodontal disease, xerostomia, and burning mouth syndrome.¹⁵ To manage this elevated risk and maintain quality of life, annual dental examinations are a preventive strategy endorsed by the American Dental Association,¹⁶ American Diabetes Association,¹⁷ and Healthy People 2020.¹⁵ Despite evidence-based recommendations, only 54.5% of people with diabetes reported having an annual dental examination in 2013,¹⁵ with marked disparities according to sex, race, and place of residence (rural versus urban).¹⁸

With the adoption of EHRs in dental offices and academic institutions, patient dental care can be documented and stored in a structured data format, allowing

for secondary analyses and quality measurement.¹⁹ We conducted our study at 4 institutions that use the axiUm (Exan Group, Henry Schein) EHR platform. We had the following research objectives: adapt the proposed DQA DQM *People With Diabetes: Oral Evaluation*³ originally designed for administrative claims data to be used in EHRs, determine the validity of the DQM in terms of measuring what it was intended to measure, and develop and test a refined EHR-based DQM that can be used in the dental office setting to assess the quality of care provided to patients with diabetes diagnosed.

METHODS

We developed and assessed the feasibility of the DQM in 3 academic institutions and a large multispecialty group dental practice. The participating sites in this study have a previous and established collaboration,^{20,21} use the same EHR, and are early adaptors in using a standardized dental diagnostic terminology.²² The 4 institutions are also members of the Consortium for Oral Health Research and Informatics.²³ In this study, we included all patients with a self-reported diagnosis of diabetes identified via EHRs with no stratification according to diabetes type or severity. All 4 dental institutions received institutional review board approval for the study. In the following paragraphs, we describe the methods we used to adapt the measure to the EHR, evaluate the measure's validity, and develop and validate the revised measure.

People with diabetes: oral evaluation—measure description (original measure). As described in the DQA measure specification sheet,³ this measure is used to evaluate oral health care received by adults (18 years or older) with diabetes following the specifications designed for administrative claims data.

Denominator. The patient population met the criteria for 2 denominators. Denominator 1 was the unduplicated number of all adults continuously enrolled for 180 days identified as people with diabetes within the reporting year. Denominator 2 was the unduplicated number of all adults with diabetes continuously enrolled for 180 days who received at least 1 dental service within the reporting year with a code between D0100 and D9999 from the Code on Dental Procedures and Nomenclature (CDT).²⁴

Numerator. The numerator was the unduplicated number of adults with diabetes who were part of a denominator who received a comprehensive evaluation (D0150), periodic oral evaluation (D0120), or comprehensive periodontal evaluation (D0180) within the

ABBREVIATION KEY. CDT: Code on Dental Procedures and Nomenclature. DDS: Dental Diagnostic System. Den: Denominator. DQA: Dental Quality Alliance. DQM: Dental quality measure. EHR: Electronic health record. MS: Measure score. NPV: Negative predictive value. Num: Numerator. PPV: Positive predictive value.

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