Testing Pediatric Oral Health Performance Measures: Emergency Room Use and General Anesthesia for Caries-Related Reasons

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Contents

Purpose

The purpose of this report is to summarize the goals, methodology, high-level results, and key outcomes of the validation testing conducted for the following pediatric oral health performance measures:

(1) Use of Emergency Room (ER) for Caries-Related Reasons,
(2) Follow-up after Emergency Room (ER) Visit, and
(3) Use of General Anesthesia (GA) for Caries-Related Treatment.

A University of Florida research team(UF Team) was selected though a competitive Request for Proposal (RFP) process to conduct feasibility, reliability and validity testing using both medical and dental administrative enrollment and claims data.   The first two measures were approved by the DQA membership at its October 24, 2014 meeting. The third measure, Use of General Anesthesia for Caries-Related Treatment, is undergoing continued review at the recommendation of the DQA Executive Committee.

Background

In 2012, the DQA approved its first fully tested measure set *Dental Caries in Children: Prevention and Disease Management* (Starter Set). In 2013, the Measure Development and Maintenance Committee (MDMC) developed three additional pediatric measures addressing emergency room use and general anesthesia use for caries-related reasons.

The Starter Set includes several process and related health care delivery measures to assess whether children are receiving evidence-based care associated with early detection and prevention of dental caries. The new measures complement the Starter Set and focus on outcomes and care processes associated with untreated dental decay. All measures were designed for reporting using administrative enrollment and claims data.

"Caries-Related" Focus

There was a consensus among the MDMC to focus on "caries-related" outcomes specifically rather than a broader and less well-defined category of "potentially preventable" outcomes because of the central role that dental caries (tooth decay) plays in dental disease among children. The existing literature and measures of "potentially preventable" dental-related ER visits encompass a variety of different diagnosis code sets that vary in breadth. The concept of "potentially preventable" is often not well-defined in terms of providing a clear evidence-based linkage to the clinical processes of care that could reduce ER visit rates. Dental caries is a leading reason for dental-related ER visits.[1] A study using data from the Nationwide Emergency Department Sample of the Healthcare Cost and Utilization Project for 2006, found that there were 24,982 emergency department visits among children for dental caries-

related reasons. Medicaid-enrolled children accounted for 53% of these visits.[2] The mean charge for an ER visit by a child was $667.48 with total U.S. charges of $14.33 million.[2] Moreover, ER care for caries-related problems is generally not definitive compared to that provided in primary care dental settings and often results in referral to primary care dental sites.[3]   ER visits for caries-related reasons also can be directly influenced by evidenced-based processes of care, such as application of professionally-applied topical fluoride and sealants for children at increased caries risk.

Data Sources

Medical claims data are required for all three measures; integrated medical and dental claims are required for Follow-Up after ER Visit and Use of General Anesthesia for Caries-Related Treatment. Administrative enrollment and claims data from the following programs for calendar year (CY) 2011 were used:

- Texas Medicaid,
- Texas CHIP,
- Florida Medicaid, and
- Florida CHIP.

The Institute for Child Health Policy (ICHP) at the University of Florida has been the external evaluator for the Florida and Texas Medicaid and CHIP programs since 2000 and houses more than 10 years of administrative enrollment, claims, and encounter data (both medical and dental).   These rich datasets provided the opportunity to test the proposed measure set for Medicaid and CHIP at the program level in two of the largest and most diverse states in the United States.[4, 5] Florida and Texas account for 15% of all children enrolled in Medicaid nationally.[6] Moreover, these states have significant representation of African-American and Hispanic populations, which disproportionately experience low access to dental care.[7] These programs also represent different delivery system models and different forms of provider reimbursement (Table 1). All data sources and testing methodologies were approved by the University of Florida Institutional Review Board.

Process

Throughout testing, the UF Team engaged in an iterative and integrated process that involved providing regular and detailed feedback to the MDMC during bi-weekly calls. For each bi-weekly call, the project PI (Herndon) prepared an agenda with focused questions, summary data reports, and proposed methodology for the next testing phase. We maintained detailed logs of all of the major issues discussed, decisions made, and action items. Throughout the iterative testing process, the UF Team assisted with refining the measure specifications, prepared additional data summaries requested by the MDMC, and adapted the methodological approaches as needed.

Table 1. Summary of Data Sources, CY 2011

	FL Medicaid	Florida CHIP	Texas Medicaid	Texas CHIP
Medical Delivery Models	Fee-For-Service (FFS), Primary Care Case Management (PCCM), Provider Service Network (PSN), Managed Care (MC)	MC	FFS, PCCM, MC	MC
Age Range	0-20 years	5-18 years	0-20 years	0-18 years
# Unique Enrollees, CY2011	2,195,170	331,285	3,556,915	889,501
Dental Delivery Models	FFS; Prepaid Dental plan – single county	Dental MCOs	FFS	Dental MCO - Single Dental Benefit Contractor
Payment from Program (e.g., Medicaid/CHIP) to Dental Managed Care Organization (D-MCO)	Prepaid dental plan – PMPM capitation adjusted for eligibility category and age bands	PMPM Premium Rate – based on competitive bidding and legislated maximum	N/A	PMPM Premium based on historical claims experience and age bands
Payment from Program or D-MCO to Dental Provider	FFS based on fee schedule; Prepaid dental – primary care dentists, capitation; specialists, FFS	Negotiated FFS except for one plan that pays capitation to primary care dentists in two counties	FFS based on fee schedule	FFS

Methodology

A. Finalize Measure Specifications

The RFP for each measure identified specific areas where testing was needed to finalize the measure specifications. Iterative testing was conducted with data and recommendations provided to the MDMC during the bi-weekly calls. A summary of the key decisions made for each measure is provided in the Results section below.

B. Feasibility Testing

The National Quality Forum (NQF) defines feasibility as the "extent to which the required data are readily available, retrievable without undue burden, and can be implemented for performance measurement."[8]

During the measurement development process, the MDMC undertook a comprehensive environmental scan of existing pediatric oral health performance measure concepts in 2012. This scan was further updated in 2013. A work group focused on "Advanced Caries Management" ranked measure concepts and identified measurement gaps to identify a short list of measures for testing. ER Visits for Dental Caries was among this short list. Draft specifications were prepared and sent out for public comment. The MDMC reviewed and addressed the public comments, which were used to refine the proposed measure specifications. Based on the public comments and MDMC recommendation, the DQA Executive Committee determined there were sufficient measure importance, feasibility and face validity to move forward with formal feasibility, reliability and validity testing and released the competitive Request for Proposals to conduct the measure testing. The UF Team conducted further feasibility testing through several approaches.

1. Evaluation of Availability of Critical Data Elements in Administrative Databases

The UF Team identified which data elements were "critical" for calculating each measure and which elements were needed for the proposed stratifications. Critical and stratification data elements were mapped to each measure. The UF Team calculated for each of the four data sources the percentage of missing and invalid data for each data element. Critical data elements typically had missing/invalid rates of <1% (detailed reports are on file with the DQA). These rates are consistent with guidance from the Centers for Medicare and Medicaid services regarding acceptable error rates.[9] Low rates of missing and invalid data for critical data elements also are important for establishing measure reliability and validity. Stratification data elements, such as race and ethnicity, were more variable in terms of data availability and completeness, which is consistent with the experience in health care quality measurement in general.[10]

2. Evaluation of Measurement Burden

Another consideration when assessing feasibility is the complexity of the measures. The UF Team took into account the personnel and system resources required to calculate the measures and provided feedback to the MDMC. The UF Team also assessed and provided feedback on the measure data element requirements and specification logic flow with respect to complexity and reporting burden.

C. Reliability and Validity Testing

Reliability refers to the precision of measurement and allows for meaningful comparisons between states and programs. Validity refers to the correctness of

measurement and indicates the degree to which a measure truly measures what it is intended to measure. Reliability and validity were assessed through the following:

- evaluation of the clarity and completeness of the measure specifications;

- validation of the critical data elements in administrative data used to calculate the measures score compared to an authoritative source (patient health records); and

- face validity assessment by experts that the calculated measure scores represent what they are designed to measure and can be used to distinguish differences in quality.

In addition, as noted above, throughout the testing process, specific aspects of each measure underwent iterative sensitivity testing with data and recommendations provided to the MDMC during the bi-weekly calls. This iterative testing was an important aspect of ensuring the reliability and validity of the measure specifications.

1. Evaluation of Clarity and Completeness of Measure Specifications

For a measure to be reliable – to allow for meaningful comparisons across entities – it is essential that the measure specifications are unambiguous: the denominator criteria, numerator criteria, exclusions, and scoring need to be clearly specified. The UF Team carefully evaluated whether the measure specifications identified all necessary data elements to calculate the numerators and denominators for each measure. In addition, the team carefully reviewed the logic flow and made revision recommendations to improve the reliability of the resulting calculations. The DQA also solicited public comment through the release of an Interim Report and posted the measurement specifications online for a one-month public comment period. The UF Team worked with the DQA to evaluate and address all comments provided. Throughout the eight-month testing period, there were numerous reviews and revisions of the specifications conducted jointly by the UF Team and the DQA. Appendices 1-3 provide the specifications for the two ER-related measures approved by the DQA on October 24, 2014 and the most recent version of the GA measure, which is undergoing continued review.

2. Critical Data Element Validation

Because newly developed measures often do not have numerous testing sites, it is common for reliability and validity testing to be focused on critical data element validation – i.e., the "correctness of the data elements as compared to an authoritative source."[8]   Thus, assessing critical data element validity was a key aspect of testing.

The critical data elements for the three measures include: (1) member ID (to link between claims and enrollment data), (2) date of birth, (3) monthly enrollment indicator, (4) date of service, (5) place of service (identified through CMS place of service and revenue codes), (6) ICD-9 diagnosis codes, and (7) dental procedure

codes (CDT codes). The first five items are standard data elements used routinely for reporting or billing purposes. Thus, it was determined that these fields have established reliability and validity. Dental procedure codes, which are included in the Follow-Up and GA measure specifications, were previously validated during testing of the DQA's starter set of measures, Dental Caries in Children: Prevention and Disease Management.[11]

Thus, critical data element validation focused on assessing the accuracy of the proposed diagnosis codeset to identify caries-related ER visits. Validation of clinical codes in administrative claims data are most often conducted using manual abstraction from the patient's health record as the authoritative source.   Data element validation of ICD-9 diagnosis codes was conducted using ER record reviews of patients enrolled in Florida Medicaid. Due to the cost of these activities and challenges in obtaining records from hospital emergency departments, chart reviews were conducted using records from a tertiary-care, academic health center hospital emergency department in Florida that allowed for data linkages to the Florida Medicaid administrative program data. As described in detail below, we evaluated agreement between the claims data and ER records to evaluate the accuracy of diagnosis codes in identifying caries-related visits.

Validation of Diagnosis Codes to Identify Caries-Related ED Visits
Diagnosis codes were validated against emergency record reviews for pediatric patients who presented to the ER for dental-related conditions. The methodology involved the following key steps:

a) development of the diagnosis codeset;
b) sample selection;
c) record reviews; and
d) statistical analyses of agreement between administrative data and record reviews.

The methodology used for each of these steps is described below.

Development of Diagnosis Codeset. To identify the caries-related diagnosis code set, a PubMed search including the terms "emergency" and "ICD" and "dent*" was conducted to identify specific International Classification of Diseases (ICD) diagnosis codes used in the peer-reviewed literature. Additional state reports and studies also were obtained. An Excel file was created to map the diagnosis codes to the articles and reports to evaluate variation by study purpose and to identify the diagnosis codes most frequently used in studies examining dental-related ER use.

The research team used a consensus review process to develop the proposed code set. A pediatric dentist, public health dentist and emergency medicine physician independently evaluated each diagnosis code (among all codes identified through the literature search) for whether the code was indicative of an emergency room visit associated with dental caries. A consensus process was used for codes for which there was not unanimous agreement among the individual ratings. The code set was then presented to the MDMC along with administrative data summaries of the frequency

distributions of all of the listed diagnoses for non-traumatic dental-related ER visits broadly defined and for the subset of caries-related ER visits. The code set was further refined based on MDMC review. The resulting code set was included in two presentations (interim and final) to the full DQA membership and in the Interim Report that was widely disseminated to a broad range of stakeholders and posted online for a one-month public comment period. No additional modifications to the code set were recommended during these multiple reviews.

There also was significant consideration about whether to restrict the diagnoses to first-listed diagnosis or include all-listed diagnoses. For inpatient care, the principal diagnosis is defined in the CMS ICD-9-CM Official Guidelines as "that condition established after study to be chiefly responsible for occasioning the admission of the patient to the hospital for care." Secondary diagnoses, or other diagnoses, are defined as "all conditions that coexist at the time of admission, that develop subsequently, or that affect the treatment received and/or the length of stay."[12] However, there is not similar guidance for ER visit diagnosis coding. The Guidelines indicate that outpatient services generally should use the term first-listed diagnosis rather than principal diagnosis. The Guidelines further note that for outpatient services: [i]n some cases the first-listed diagnosis may be a symptom when a diagnosis has not been established (confirmed) by the physicians".[12] Therefore, in addition to evaluating the code set through the record reviews, we also used the record reviews to evaluate whether to base inclusion on first-listed diagnosis or all-listed diagnoses.

Sample Selection. The caries-related diagnosis code set is a subset of all non-traumatic oral cavity related ER visits. Because we wanted to evaluate sensitivity and specificity as well as overall agreement, the sample included non-traumatic oral cavity visits broadly to ensure that we would capture both caries and non-caries related visits. Specifically, 320 records were randomly selected for abstraction for patients 0-20 years old, with Medicaid payer type, who had a non-traumatic ER visit related to the oral cavity (identified using ICD-9 codes 520.0-529.9, excluding 525.11 which is a trauma-related code): 160 were randomly selected from those identified with an any-listed ICD diagnosis codes in the caries-related code set and 160 were randomly selected from those with a non-traumatic oral cavity related ER visit and not in the caries-related code set.

Review Process. The records were reviewed by two emergency medicine physicians (one of whom was also trained as a pediatrician) with prior record review experience. The record reviewers were provided only with the patient's medical record identifier and ER date of service; they were not given any information about the assigned ICD-9 diagnosis codes. Twenty of the 320 sampled charts were used to test the testing protocol itself and make modifications to the abstraction form or review process as needed. These 20 charts were not included in the final results analysis. For the 300 charts used in the final analyses, 50 were reviewed by both reviewers to assess inter-rater reliability and the remaining 250 charts were split equally (125 per reviewer). Inter-rater reliability was assessed using the kappa statistic.

The record reviewers followed a detailed protocol and used the same abstraction form. An anonymous identifier, the patient's ED visit date(s), and patient age were recorded.

For each date of service, the record reviewers documented whether the patient's main reason for the visit:

- was related to the oral cavity;
- if related to the oral cavity, was it trauma related;
- if related to the oral cavity, was it caries related; and
- if not caries-related, were caries documented in the chart as an incidental finding.

Independently, the programming team produced a report that included the anonymous patient identifier, ER date of service, patient age, and all-listed diagnosis codes listed in the order in which they appeared in the claims data. We also compared the agreement between the Medicaid program claims data and the local hospital billing data since some Medicaid programs truncate the number of diagnosis codes included in their stored administrative claims data. Thus, the hospital's IS specialist independently produced a report that included an anonymous patient identifier, ER date of service, patient age, and all-listed diagnosis codes listed in their ordered positions.

Statistical Analyses. To assess validity, we calculated simple agreement as well as the kappa statistic. The kappa statistic takes into account agreement observed by chance and provides a more conservative estimate of agreement. A kappa statistic value of 0 reflects the amount of agreement that would be expected to be observed by chance. A kappa statistic value of 1 indicates perfect agreement. Guidance on interpreting the kappa statistic is: 0.01-0.20 (slight agreement); 0.21-0.40 (fair agreement); 0.41-0.60 (moderate agreement); 0.61-0.80 (substantial agreement); 0.81-0.99 (almost perfect agreement).[13]

We also calculated sensitivity (accuracy of administrative diagnosis code set to identify a caries-related ER visit when it is documented in the patient's medical record), specificity (accuracy of administrative diagnosis code set to accurately exclude an ER visit as not caries-related when a caries-related ER visit is not documented in the patient's medical record), positive predictive value (extent to which an indication of a caries-related ER visit identified by the administrative diagnosis code set is also supported by the patient's medical record), and negative predictive value (extent to which an ER visit is identified as being not caries-related by the administrative diagnosis codes is supported by the patient's medical record). Positive and negative predictive values are influenced by sensitivity and specificity as well as the prevalence of caries-related ER visits. Thus, interpretation of "high" and "low" values for PPV and NPV is not straightforward.

The manual abstraction report and the reports from Medicaid program and local IS specialist were provided to the research team PI. The kappa statistic, sensitivity, specificity, positive predictive value, and negative predictive value were used to assess the ability of the ICD-9 diagnosis code set to accurately identify caries-related ER visits using first-listed diagnosis only and all-listed diagnoses. Identified discrepancies were reviewed by the record reviewers to better understand the sources of the discrepancies.

3. Evaluation of Measure Score Face Validity

As described above, during the measurement development process, the DQA determined that there were sufficient measure importance, feasibility and face validity to move forward with formal feasibility, reliability and validity testing for the three measures. The research team and the MDMC assessed face validity throughout the testing process. In August 2014, an Interim Report that included the detailed measure specifications and described the measures, testing process, and preliminary results was sent to a broad range of stakeholders, including representatives of federal agencies, dental professionals/professional associations, state Medicaid and CHIP programs, community health centers, and pediatric medical professionals/professional associations. Each comment received was carefully reviewed and addressed by the research team and MDMC, which entailed additional sensitivity testing and refinement of the measure specifications.   Based on the comprehensive testing results, the two measures related to ER use for dental caries-related conditions were approved by the DQA membership at its October 24, 2014 meeting. The third measure, Use of General Anesthesia for Caries-Related Treatment, is undergoing continued review at the recommendation of the DQA Executive Committee.

For the two measures, Emergency Room Use for Caries-Related Reasons and Follow-Up after Emergency Room Visit, the final face validity assessment was conducted at the October 24, 2014 Dental Alliance Quality meeting. A final presentation of the final and fully specified measures, testing methodology, and results was made to the DQA membership expert group. The presentation addressed the NQF criteria for scientific acceptability of measures. Using the NQF criteria, the 24 representatives of the DQA membership who attended the face-to-face meeting voted by secret ballot on a total of 15 criteria address each measure's importance, feasibility, reliability, validity, and usability as well as overall approval of the measure. Specifically each individual voted on:

1. the level of confidence for each criterion using the categories of

   - **High:** Based on the information submitted, there is high confidence (or certainty) that the criterion is met;
   - **Moderate:** Based on the information submitted, there is moderate confidence (or certainty) that the criterion is met;
   - **Low:** Based on the information submitted, there is low confidence (or certainty) that the criterion is met; or
   - **Insufficient:** There is insufficient information submitted to evaluate whether the criterion is met (e.g., blank, incomplete, or not relevant, responsive, or specific to the particular question).

and

2. an overall vote of whether to (a) approve or (b) disapprove the measure as specified.

Results

The testing results and key decisions made regarding each measure's specifications are summarized by measure below.

Measure 1: Use of Emergency Room for Caries-Related Reasons

Based on data provided by the research team, and consistent with other measures of emergency and inpatient care, the measure is reported as a rate based on member months of enrollment.

Description: Number of emergency room visits for caries-related reasons per 100,000 member months for all enrolled children
Numerator: Number of ER visits with caries-related diagnosis code among all enrolled children
Denominator: All member months for enrollees 0 through 20 years during the reporting year
Rate: (NUM/DEN) x 100,000

The detailed measure specifications are contained in Appendix 1.

A. Critical Data Element Validation - Validation of Accuracy of ICD-9 Diagnosis Code Set to Identify Caries-Related Visits

In addition to the literature review and consensus process described above to develop the code set, we also conducted analyses of the frequencies of non-traumatic oral cavity diagnosis codes associated with ER visits in the administrative data for three programs. Tables 2 and 3 provide the ten most frequently occurring non-traumatic dental-related diagnoses associated with ER visits in each of the three programs. The complete set of frequencies is on file with the DQA. Non-traumatic oral cavity-related diagnoses were identified using the ICD-9 diagnosis code range of 520.0-529.9, excluding 525.11. Table 2 provides the frequencies when the codes appeared as first-listed diagnosis codes, and Table 3 provides the frequencies when the codes appeared as all-listed diagnoses.

Table 2: Ten Most Frequent Non-Traumatic First-Listed Oral Cavity Diagnoses, CY 2011

Florida CHIP				Texas CHIP				Texas Medicaid			
First-Listed Diagnosis	#	%	Cumulative %	First-Listed Diagnosis	#	%	Cumulative %	First-Listed Diagnosis	#	%	Cumulative %
UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES	91	27.25	27.25	UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES	112	16.05	16.05	STOMATITIS/ MUCOSITIS UNSP	1,440	15.66	15.66
PERIAPICAL ABSCESS	65	19.46	46.71	PERIAPICAL ABSCESS	104	14.90	30.95	UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES	1,184	12.87	28.53
UNSP DENTAL CARIES	38	11.38	58.08	UNSP DENTAL CARIES	85	12.18	43.12	PERIAPICAL ABSCESS	1,068	11.61	40.14
DISEASES OF LIPS	22	6.59	64.67	STOMATITIS/ MUCOSITIS UNSP	66	9.46	52.58	ORAL SOFT TISSUE DIS OT	895	9.73	49.87
ORAL SOFT TISSUE DIS OT	19	5.69	70.36	ORAL SOFT TISSUE DIS OT	54	7.74	60.32	CHRONIC GINGIVITIS PLAQUE	769	8.36	58.24
STOMATITIS/ MUCOSITIS UNSP	18	5.39	75.75	CHRONIC GINGIVITIS PLAQUE	51	7.31	67.62	TEETHING SYNDROME	750	8.15	66.39
ORAL APHTHAE	16	4.79	80.54	ORAL APHTHAE	49	7.02	74.64	UNSP DENTAL CARIES	726	7.89	74.29
CHRONIC GINGIVITIS PLAQUE	15	4.49	85.03	DISEASES OF LIPS	36	5.16	79.80	ORAL APHTHAE	698	7.59	81.87
OTHER DENTAL CARIES	6	1.80	86.83	DENTAL DISORDER OT	18	2.58	82.38	DISEASES OF LIPS	392	4.26	86.14
ACUTE APICAL PERIODONTITIS	6	1.80	88.62	CELLULITIS/ ABSCESS MOUTH	18	2.58	84.96	STOMATITIS/ MUCOSITIS OTH	147	1.60	87.74

Table 3: Ten Most Frequent Non-Traumatic Dental Diagnoses by All-Listed Diagnoses, CY 2011

Florida CHIP				Texas CHIP				Texas Medicaid			
All-Listed Diagnoses	#	%	Cumula-tive %	All-Listed Diagnoses	#	%	Cumula-tive %	All-Listed Diagnoses	#	%	Cumula-tive %
UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES	174	27.49	27.49	UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES	291	19.32	19.32	UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES	3,104	15.05	15.05
PERIAPICAL ABSCESS	87	13.74	41.23	UNSP DENTAL CARIES	182	12.08	31.41	STOMATITIS/ MUCOSITIS UNSP	2,565	12.44	27.49
UNSP DENTAL CARIES	83	13.11	54.34	PERIAPICAL ABSCESS	159	10.56	41.97	TEETHING SYNDROME	2,429	11.78	39.26
ORAL SOFT TISSUE DIS OT	43	6.79	61.14	ORAL SOFT TISSUE DIS OT	157	10.42	52.39	ORAL SOFT TISSUE DIS OT	2,372	11.50	50.76
STOMATITIS/ MUCOSITIS UNSP	34	5.37	66.51	STOMATITIS/ MUCOSITIS UNSP	138	9.16	61.55	UNSP DENTAL CARIES	1,919	9.30	60.07
DISEASES OF LIPS	29	4.58	71.09	CHRONIC GINGIVITIS PLAQUE	98	6.51	68.06	PERIAPICAL ABSCESS	1,695	8.22	68.29
CHRONIC GINGIVITIS PLAQUE	28	4.42	75.51	ORAL APHTHAE	78	5.18	73.24	CHRONIC GINGIVITIS PLAQUE	1,408	6.83	75.11
ORAL APHTHAE	26	4.11	79.62	DENTAL DISORDER OT	63	4.18	77.42	ORAL APHTHAE	1,330	6.45	81.56
DENTAL DISORDER OT	13	2.05	81.67	DISEASES OF LIPS	55	3.65	81.08	DISEASES OF LIPS	578	2.80	84.36
JAW DISEASE UNSPEC	11	1.74	83.41	TEETHING SYNDROME	29	1.93	83.00	DENTAL DISORDER OT	472	2.29	86.65

1. Finalized Code Set to Identify Caries-Related ER Visits

The finalized code set to identify caries-related diagnoses is presented in Table 4. All codes are based on first-listed diagnosis only. Because the codes indicated in red font (682.0, 682.1, 682.9, 782.3, 784.2) can be associated with a broad range of underlying reasons, we evaluated the frequency distribution of co-occurring diagnosis codes and found that many of the visits associated with these codes are not related to dental caries. Therefore, to be included in the measure, these five codes must have a co-occurring diagnosis code from those indicated in black font (5xx codes in Table 4).

Table 4: ICD-9-CM Diagnosis Codes Used to Identify Caries-Related ER Visits

521.00	UNSPECIFIED DENTAL CARIES	**525.3**	RETAINED DENTAL ROOT
521.01	DENTAL CARIES LIMITED TO ENAMEL	525.60	UNSPECIFIED UNSATISFACTORY RESTORATION OF TOOTH
521.02	DENTAL CARIES EXTENDING INTO DENTINE	525.61	OPEN RESTORATION MARGINS
521.03	DENTAL CARIES EXTENDING INTO PULP	525.63	FRACTURED DENTAL RESTORATIVE MATERIAL WITHOUT LOSS OF MATERIAL
521.04	ARRESTED DENTAL CARIES	525.64	FRACTURED DENTAL RESTORATIVE MATERIAL WITH LOSS OF MATERIAL
521.05	ODONTOCLASIA	525.8	OTHER SPECIFIED DISORDERS OF THE TEETH AND SUPPORTING STRUCTURES
521.06	DENTAL CARIES PIT AND FISSURE	525.9	UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES
521.07	DENTAL CARIES OF SMOOTH SURFACE	526.4	INFLAMMATORY CONDITIONS OF JAW
521.08	DENTAL CARIES OF ROOT SURFACE	526.5	ALVEOLITIS OF JAW
521.09	OTHER DENTAL CARIES	526.61	PERFORATION OF ROOT CANAL SPACE
522.0	PULPITIS	526.62	ENDODONTIC OVERFILL
522.1	NECROSIS OF THE PULP	526.63	ENDODONTIC UNDERFILL
522.2	PULP DEGENERATION	526.69	OTHER PERIRADICULAR PATHOLOGY ASSOCIATED WITH PREVIOUS ENDODONTIC TREATMENT
522.3	ABNORMAL HARD TISSUE FORMATION IN PULP	528.3	CELLULITIS AND ABSCESS OF ORAL SOFT TISSUES
522.4	ACUTE APICAL PERIODONTITIS OF PULPAL ORIGIN	682.0	CELLULITIS AND ABSCESS OF FACE (paired with one of the above 5XX codes)
522.5	PERIAPICAL ABSCESS WITHOUT SINUS	682.1	CELLULITIS AND ABSCESS OF NECK (paired with one of the above 5XX codes)
522.6	CHRONIC APICAL PERIODONTITIS	682.9	CELLULITIS AND ABSCESS OF UNSPECIFIED SITES (paired with one of the above 5XX codes)
522.7	PERIAPICAL ABSCESS WITH SINUS	782.3	EDEMA (paired with one of the above 5XX codes)
522.8	RADICULAR CYST	784.2	SWELLING MASS OR LUMP IN HEAD AND NECK (paired with one of the above 5XX codes)
522.9	OTHER AND UNSPECIFIED DISEASES OF PULP AND PERIAPICAL TISSUES		

2. First-Listed and All-Listed Diagnoses to Identify Caries-Related ER Visits

Tables 5 and 6 provide the ten most frequently occurring ICD-9-CM diagnosis codes among the code set used to identify caries-related diagnoses specifically. Table 5 indicates the frequencies for the codes when listed as first-listed diagnosis, and Table 6 indicates the code frequencies based on all-listed diagnoses. These ten codes account for 99% of caries-related ER visits. The complete set of frequencies is on file with the DQA.

Table 5: Ten Most Frequent Caries-Related ICD-9-CM First-Listed Diagnoses, CY 2011

Florida CHIP				Texas CHIP				Texas Medicaid			
First-Listed Diagnosis	#	%	Cumula-tive %	First-Listed Diagnosis	#	%	Cumula-tive %	First-Listed Diagnosis	#	%	Cumula-tive %
UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES	102	41.13	41.13	UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES	125	28.47	28.47	UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES	2,047	40.61	40.61
PERIAPICAL ABSCESS WITHOUT SINUS	69	27.82	68.95	PERIAPICAL ABSCESS WITHOUT SINUS	116	26.42	54.9	PERIAPICAL ABSCESS WITHOUT SINUS	1,223	24.26	64.87
UNSPECIFIED DENTAL CARIES	43	17.34	86.29	UNSPECIFIED DENTAL CARIES	97	22.1	76.99	UNSPECIFIED DENTAL CARIES	880	17.46	82.32
ACUTE APICAL PERIODONTITIS OF PULPAL ORIGIN	8	3.23	89.52	CELLULITIS AND ABSCESS OF ORAL SOFT TISSUES	22	5.01	82	OTHER SPECIFIED DISORDERS OF THE TEETH AND SUPPORTING STRUCTURES	170	3.37	85.7
OTHER DENTAL CARIES	5	2.02	91.53	OTHER SPECIFIED DISORDERS OF THE TEETH AND SUPPORTING STRUCTURES	19	4.33	86.33	CELLULITIS AND ABSCESS OF ORAL SOFT TISSUES	150	2.98	88.67
OTHER SPECIFIED DISORDERS OF THE TEETH AND SUPPORTING STRUCTURES	5	2.02	93.55	ACUTE APICAL PERIODONTITIS OF PULPAL ORIGIN	15	3.42	89.75	ACUTE APICAL PERIODONTITIS OF PULPAL ORIGIN	140	2.78	91.45
INFLAMMATORY CONDITIONS OF JAW	4	1.61	95.16	CELLULITIS AND ABSCESS OF FACE	15	3.42	93.17	CELLULITIS AND ABSCESS OF FACE	134	2.66	94.11
CELLULITIS AND ABSCESS OF ORAL SOFT TISSUES	3	1.21	96.37	SWELLING MASS OR LUMP IN HEAD AND NECK	11	2.51	95.67	SWELLING MASS OR LUMP IN HEAD AND NECK	125	2.48	96.59
CELLULITIS AND ABSCESS OF FACE	3	1.21	97.58	OTHER DENTAL CARIES	8	1.82	97.49	OTHER DENTAL CARIES	64	1.27	97.86
SWELLING MASS OR LUMP IN HEAD AND NECK	3	1.21	98.79	INFLAMMATORY CONDITIONS OF JAW	6	1.37	98.86	INFLAMMATORY CONDITIONS OF JAW	53	1.05	98.91

Table 6: Ten Most Frequent Caries-Related ICD-9-CM Diagnoses using All-Listed Diagnoses, CY 2011

Florida CHIP				Texas CHIP				Texas Medicaid			
All-Listed Diagnoses	#	%	Cumula-tive %	All-Listed Diagnoses	#	%	Cumula-tive %	All-Listed Diagnoses	#	%	Cumula-tive %
UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES	179	43.45	43.45	UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES	309	37.45	37.45	UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES	3,849	42.55	42.55
UNSPECIFIED DENTAL CARIES	92	22.33	65.78	UNSPECIFIED DENTAL CARIES	192	23.27	60.73	UNSPECIFIED DENTAL CARIES	2,031	22.45	65
PERIAPICAL ABSCESS WITHOUT SINUS	92	22.33	88.11	PERIAPICAL ABSCESS WITHOUT SINUS	165	20	80.73	PERIAPICAL ABSCESS WITHOUT SINUS	1,773	19.6	84.6
OTHER SPECIFIED DISORDERS OF THE TEETH AND SUPPORTING	13	3.16	91.26	OTHER SPECIFIED DISORDERS OF THE TEETH AND SUPPORTING	64	7.76	88.48	OTHER SPECIFIED DISORDERS OF THE TEETH AND SUPPORTING	542	5.99	90.59
OTHER DENTAL CARIES	10	2.43	93.69	CELLULITIS AND ABSCESS OF ORAL SOFT TISSUES	32	3.88	92.36	ACUTE APICAL PERIODONTITIS OF PULPAL ORIGIN	245	2.71	93.3
ACUTE APICAL PERIODONTITIS OF PULPAL ORIGIN	10	2.43	96.12	ACUTE APICAL PERIODONTITIS OF PULPAL ORIGIN	29	3.52	95.88	CELLULITIS AND ABSCESS OF ORAL SOFT TISSUES	233	2.58	95.88
CELLULITIS AND ABSCESS OF ORAL SOFT TISSUES	6	1.46	97.57	OTHER DENTAL CARIES	16	1.94	97.82	OTHER DENTAL CARIES	184	2.03	97.91
INFLAMMATORY CONDITIONS OF JAW	5	1.21	98.79	INFLAMMATORY CONDITIONS OF JAW	9	1.09	98.91	INFLAMMATORY CONDITIONS OF JAW	107	1.18	99.09
PERIAPICAL ABSCESS WITH SINUS	2	0.49	99.27	ALVEOLITIS OF JAW	3	0.36	99.27	ALVEOLITIS OF JAW	21	0.23	99.33
FRACTURED DENTAL RESTORATIVE MATERIAL WITH LOSS OF MATERIAL	2	0.49	99.76	DENTAL CARIES LIMITED TO ENAMEL	2	0.24	99.52	PULPITIS	17	0.19	99.51

Table 7 illustrates the impact of including all-listed diagnoses compared with the first-listed diagnosis only. Approximately 18% (Florida CHIP) to 31% (Texas Medicaid) of visits when all-listed diagnoses are included are attributable to visits that were included due to the inclusion of the additionally-listed diagnosis codes.

Table 7: First-Listed versus All-Listed Diagnosis Codes to Identify Caries-Related ER Visits, CY 2011

Caries-Related ER Visits Per 100,000 Member Months	Florida CHIP			Texas CHIP			Texas Medicaid		
	Den	Num	Rate	Den	Num	Rate	Den	Num	Rate
First-Listed & Additional Diagnoses	25.49	290	11.38	63.67	588	9.24	336.77	6,090	18.08
First-Listed Diagnosis Only	25.49	237	9.30	63.67	419	6.58	336.77	4,230	12.56

Note: First-Listed Diagnosis rates reported in this table are the rates that were generated during testing prior to finalization of the specifications and, therefore, reflect modest differences from the final reported rates in Table 11.

The inclusion of all-listed diagnoses identifies caries-related ER visits that may not be identified through first-listed diagnoses only. For example, the first-listed diagnosis code may be fever, unspecified accompanied by an additional diagnosis code of unspecified dental caries. Therefore, inclusion of all-listed diagnoses can reduce the percentage of false negatives. However, the inclusion of all-listed diagnoses also has the potential to increase the percentage of false positives – i.e., identifying a visit as caries related, but dental caries was not actually the main reason for a visit. For example, an emergency physician may document a finding of dental caries as an addition-listed diagnosis even when the patient is presenting for a complaint that is completely unrelated to dental caries.

3. Results of Diagnosis Code Set Validation Testing

To assess whether caries-related ER visits were accurately identified by the administrative diagnosis codes in the measure specifications and to evaluate the validity of including first-listed versus all-listed diagnosis codes, the 300 randomly selected ER records were reviewed. Table 8 below summarizes the agreement between the ER records and the administrative diagnosis codes comparing all-listed and first-listed diagnoses. Two results are reported:

> **(1) Initial:** Results of the independent reviews.

> **(2) After discrepancy review:** Each discrepancy (e.g., the 15 Y/N records and the 22 N/Y records for first-listed diagnoses) between the manual record review

assessing whether the visit was caries-related and the administrative diagnosis code set was re-reviewed by both record reviewers. Of the 37 records, the record review determination was changed for six records: two cases were due to data miscoding during abstraction (e.g., data entered in wrong column), and the reviewers reversed the original decisions for the other four records after an additional review of those charts. For the remaining 31 charts, the reviewers re-confirmed their original determinations. The overall effect on the reliability/ validity statistics was minimal. Overall agreement for caries-related ER visits using first-listed diagnoses did not change based on the discrepancy review, and the kappa statistic changed by only 0.004.

The reliability/validity of using all-listed diagnoses was lower compared with using first-listed diagnoses. Overall agreement using all-listed diagnoses was 80.3% compared with 87.7% for first-listed. The kappa statistic value for all-listed diagnoses was 0.61 compared with 0.71 using first-listed diagnoses. Specificity was lower with all-listed diagnoses (72% compared with 90%) and sensitivity was higher (99% compared with 82%).

The lower reliability/validity of all-listed diagnoses was due to the inclusion of a significantly greater number of non-caries related visits being classified as caries-related (58 instead of 20). In addition, feedback from key stakeholders indicated that some state Medicaid programs truncate the number of listed diagnosis codes in their stored claims data used for reporting purposes. Differences in the number of listed diagnoses permitted across databases could potentially threaten the reliability of cross-state comparisons when using all-listed diagnoses.

The diagnosis code set when using first-listed diagnoses was deemed to have good overall reliability and validity in identifying caries-related ER visits. Overall agreement was 87.7%, indicating high overall concordance between the administrative claims and ER records. The kappa statistic was 0.71, which is in the middle of the "substantial agreement" range. Sensitivity was 82%, and specificity was 90%. The positive predictive value was 79%, and negative predictive value was 92%. Collectively, these findings support the reliability and validity of the diagnosis code set in identifying caries-related visits.

Table 8: Agreement between Patient ER Record and Administrative Data for Specific Care Domains

	Agreement between Record Abstraction and Administrative Data				Agree-ment	Kappa Statistic (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	Positive Predictive Value (95% CI)	Negative Predictive Value (95% CI)
	Y/Y	Y/N	N/Y	N/N						
Caries-Related Visit All-Listed Diagnosis										
Initial	87	1	62	150	79.00%	0.579 (0.494-0.663)	98.90% (93.8%-100%)	70.80% (64.1%-76.8%)	58.40% (50.0%-66.4%)	99.30% (96.4%-100%)
After Discrepancy Review	91	1	58	150	80.33%	0.606 (0.522-0.689)	98.90% (94.1%-100%)	72.10% (65.5%-78.1%)	61.10% (52.8%-68.9%)	99.30% (96.4%-100%)
Caries-Related Visit First-Listed Diagnosis										
Initial	73	15	22	190	87.67%	0.709 (0.622-0.796)	83.00% (73.4%-90.1%)	89.60% (84.7%-93.4%)	76.80% (67.1%-84.9%)	92.70% (88.2%-95.8%)
After Discrepancy Review	75	17	20	188	87.67%	0.713 (0.626-0.799)	81.50% (72.1%-88.9%)	90.40% (85.5%-94.0%)	78.90% (69.4%-86.6%)	91.70% (87.1%-95.1%)

Inter-rater Agreement. Inter-rater agreement between the two record reviewers on the identification of caries-related visits was high (prior to doing any discrepancy analyses) at 93% (kappa=0.857; "almost perfect" agreement).

Agreement between Medicaid Program Administrative Data & ED Information Systems Data. There was 100% agreement between the hospital's local EHR/billing data and the Medicaid program administrative for identifying caries-related visits.

B. Denominator Determination

The MDMC evaluated data presented for measure rates reported as (1) a rate based on the number of enrolled children for both 30-day and 180-day enrollment intervals (Table 9) and (2) as a rate based on member months of enrollment (Table 10). Based on these data, and consistent with other measures of emergency room use and inpatient care, the measure is reported as a rate per 100,000 member months, which is consistent with how the AHRQ Prevention Quality Indicators (reporting hospitalization rates for ambulatory care sensitive conditions) are reported in the Medicaid Adult Health Care Quality Measures.[14]

Table 9. Caries-Related ER Visits by Enrollment Length, CY 2011

Denominator: Unduplicated Number of Enrolled Children	Enrolled at Least 30 Days			Enrolled at Least 180 Days		
	Den	Num	Rate	Den	Num	Rate
FL CHIP	317,146	278	0.09%	208,307	222	0.11%
TX CHIP	842,454	559	0.07%	537,368	463	0.09%
TX Medicaid	3,544,247	6,301	0.18%	2,880,544	5,667	0.20%

Table 10. Caries-Related ER Visits per 100,000 Member Months, CY 2011

Denominator: 100,000 MM (Total Enrollment Months of All Members/100,000)	Den	Num	Rate
FL CHIP	25.49	290	11.38
TX CHIP	63.67	588	9.24
TX Medicaid	336.77	6,090	18.08

Note: Measure rates reported in this table are the rates that were generated during testing prior to finalization of the specifications and, therefore, reflect modest differences from the final reported rates in Table 11.

C. Other Determinations

Paid versus Paid & Unpaid Claims. Paid claims only were included in the final measure specifications. The exclusion of unpaid claims is consistent with other "event-based" quality measures (e.g., ER visits and inpatient admissions). The decision was made to avoid inflating the measure score by including ER visits that occurred when the member was not eligible for program benefits and duplicate claims.

Exclusions. Quality measure exclusions should be supported by clinical evidence and have sufficient frequency such that the measure rates would be distorted without the exclusion. The only exclusions applied to the measure are Medicaid-enrolled individuals who were not eligible for Medicaid EPSDT benefits and, therefore, would not have access to preventive dental services. No other clinically relevant exclusions were identified.

Risk Adjustment. Risk adjustment is commonly used for outcome and resource measures that are used in pay-for-performance programs. This measure is not intended for pay for performance or other payment-based models. Rather, the purpose of this measure is to be used for quality improvement purposes. Moreover, stratification rather than risk adjustment was preferred in order to avoid masking disparities. Age stratification is included in the measure specifications. Programs may additionally elect to stratify by race, ethnicity, and geographic location (e.g., urban, suburban, rural) when there are sufficient data.

D. Measure Rates Overall and by ER Discharge Status

Table 11 summarizes caries-related ER visit rates by discharge status: discharged and inpatient admissions with 95% confidence intervals.

Overall Rates: Between Program Comparisons

There was more than four-fold variation between the program with the lowest caries-related ER visit rate (6.90/100,000 MM) and the program with the highest rate (30.68/100,000 MM), indicating significant variation in performance between programs. The non-overlapping 95% confidence intervals between the programs indicate that the between-program differences were statistically significant at the 0.05 level.

Rates Reported by Visit Disposition: Discharged and Inpatient Admissions

All ER visits are included in the measure specifications, including those that result in an inpatient admission. The percentage of caries-related ER visits that resulted in an inpatient stay ranged from 3-6% among the four programs. Stakeholder feedback consistently supported the inclusion of ER visits that resulted in an inpatient admission.

Table 11. Caries-Related ER Visits per 100,000 Member Months by Discharge Status, CY 2011

Denominator: 100,000 MM (Total Enrollment Months of All Members/100,000)	Den	Num	Rate	95% Confidence Interval
FL Medicaid				
Overall	214.76	6,590	30.68	(29.83, 31.54)
Visits Discharged	214.76	6,383	29.72	(28.88, 30.56)
Visits Resulting in Inpatient Stay	214.76	207	0.96	(0.81, 1.12)
FL CHIP				
Overall	26.14	258	9.87	(8.54, 11.20)
Visits Discharged	26.14	243	9.30	(8.00, 10.58)
Visits Resulting in Inpatient Stay	26.14	15	0.57	(0.26, 0.88)
TX CHIP				
Overall	65.08	449	6.90	(6.20, 7.60)
Visits Discharged	65.08	427	6.56	(5.88, 7.24)
Visits Resulting in Inpatient Stay	65.08	22	0.34	(0.17, 0.50)
TX Medicaid				
Overall	337.66	4,409	13.06	(12.63, 13.49)
Visits Discharged	337.66	4,196	12.43	(12.01, 12.85)
Visits Resulting in Inpatient Stay	337.66	213	0.63	(0.54, 0.73)

Note: Rates based on finalized specifications.

Rates Reported by Age Strata

Figure 1 summarizes caries-related ER visits per 100,000 member months by age group. There was variation in the caries-related ER visit rates between age strata with particularly high rates of visits among members 15 years and older.

Figure 1. Caries-Related ER Visits per 100,000 Member Months by Age Group, CY 2011
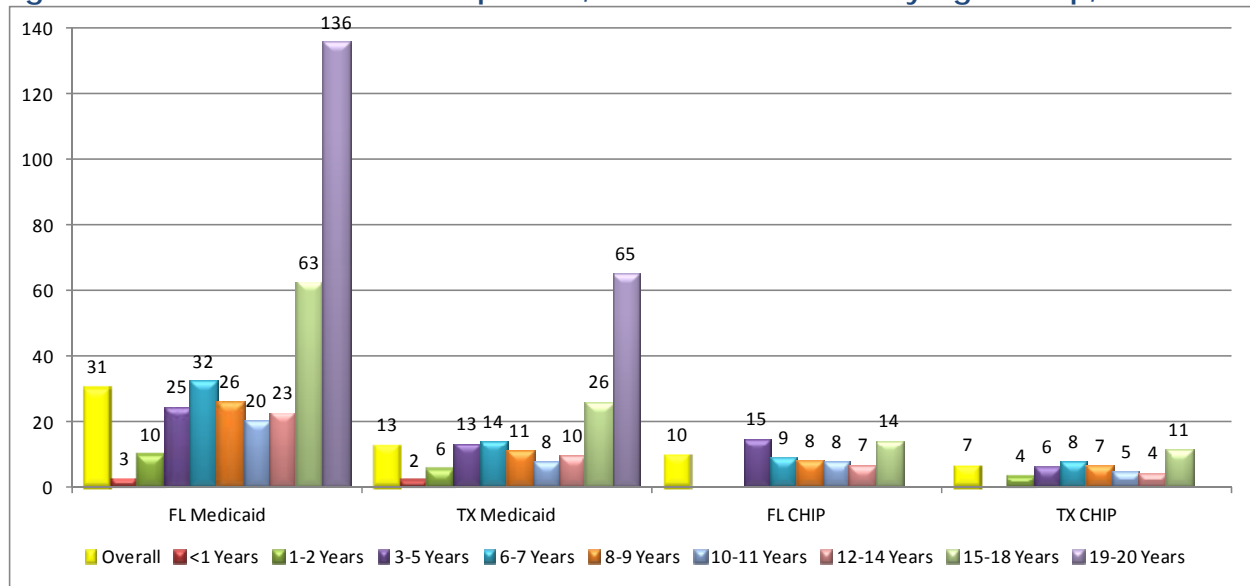
E. Face Validity of Fully-Specified Final Measure

The results of the systematic face validity assessment demonstrate that the expert group had moderate or high confidence in the measure's importance, feasibility, reliability, validity and usability. 100% of the voting members voted to approve the measure as specified.

Based on the results of the expert ratings, the 15 criterion regarding the measure's importance, feasibility, reliability, validity, and usability were met with moderate to high confidence by 96-100% of the voting participants. 14 of the 15 criteria were rated as being met with high or moderate confidence by 100% of the 23 voting members (1 individual did not complete the ballot), and the remaining two measures were voted as being met with high or moderate confidence by 95.65% of the voting members.

Specifically, 100% of participants indicated moderate to high confidence that: (1) "Validity testing demonstrates that the measure data elements are correct and/or the measure score correctly reflects the quality of care provided, adequately identifying differences in quality" and (2) "Analysis of the computed measure scores demonstrate that methods for scoring and analysis of the specified measure allow for identification of statistically significant and practically/clinically meaningful differences in performance OR there is evidence of overall less-than-optimal performance."

100% of participants voted to approve the measure as specified based on the testing results. Thus, the measure score has strong face validity.

Measure 2: Follow-Up after Emergency Room Visit

Consistent with the approach used for Measure 1, the measure denominator is based on number of ER visits instead of number of unique children:

Description: The percentage of caries-related emergency room visits among children 0 through 20 years in the reporting year for which the member visited a dentist within (a) 7 days and (b) 30 days of the ER visit.
Numerator: Number of caries-related ER visits in the reporting year for which the member visited a dentist within (a) 7 days (NUM1) and (b) 30 days (NUM2) of the ER visit
Denominator: Number of caries-related ER visits in the reporting year
Rate: NUM1/DEN and NUM2/DEN

The detailed measure specifications are contained in Appendix 2.

A. Critical Data Element Validation

Diagnosis Codes

The results of the validation of the diagnosis codes used to identify caries-related ER visits were reported above in the results for Use of Emergency Room Visits for Caries-Related Reasons. As noted, these codes demonstrate good reliability/validity (kappa statistic=0.71).

Dental Procedure Codes

CDT codes are used to identify whether an ER visit was followed up with a dental visit. Dental procedure codes were previously validated during testing of the DQA's Starter Set of measures, Dental Caries in Children: Prevention and Disease Management.[11] Review of 1,135 procedure codes found 94% agreement between the administrative claims data and dental records. The kappa statistic for specific domains of care ranged from 0.64 – 0.88 ("substantial" or "almost perfect" agreement"), supporting the reliability/validity of dental procedure codes.

B. Follow-Up Period

During testing, several follow-up periods were examined for three of the four programs, including 7 days, 30 days and 60 days (Table 12). A follow-up period of 60 days met with face validity concerns as it was viewed as too long for urgent health care needs addressed in emergency settings where care for dental-related conditions is generally focused on symptom relief and is not definitive;[15, 16] patients are usually referred to dentists to obtain definitive care.[3, 15] Testing data for these three programs indicated that approximately one-third of children have a follow-up visit with a dentist within 7 days of an ER visit and approximately one-half receive follow-up care within 30 days.

There were modest increases in follow-up when the follow-up time frame increased from 30 days to 60 days. Thus, it was determined that shorter follow-up periods are both appropriate and feasible. Because ER care generally focuses on symptom relief and not treatment, there was a general agreement among dental experts that a 7-day follow-up period is ideal. However, there also was recognition of the difficulties encountered in seeking, scheduling and obtaining a visit within 7 days. Therefore, 30-day follow up was identified as a reasonable goal. Follow-up periods of both 7 days and 30 days allow for assessments of the timeliness of follow-up with a dentist for definitive care.

Table 12: Percentage of ER Visits with Dental Provider Follow-Up by Follow-Up Period, CY 2011

	7-Day Follow-Up	30-Day Follow-Up	60-Day Follow-Up
Texas Medicaid	36%	50%	58%
Texas CHIP	38%	48%	53%
Florida CHIP	33%	52%	64%

Note: This testing was conducted prior to the finalized version of the specifications. The measure scores for the finalized measures may be modestly different; however, the qualitative findings remain the same.

During the record reviews to validate the diagnosis codes, we also examined whether recommended follow-up care was documented in the patient's ER record and, if so, the recommended time frame. Recommended follow up was documented for 96% of the 72 caries-related ER visits that were discharged. Figure 2 shows the recommended time frame for follow up. In more than 58% of these cases, follow-up was recommended within 7 days. The remaining cases were recommended to see a dentist "as soon as possible" or did not have a time frame specified. The ER's standard policy is "as soon as possible" if a specific time frame is not indicated.

Figure 2. Recommended Time Frame for Follow-Up Documented in ER Record
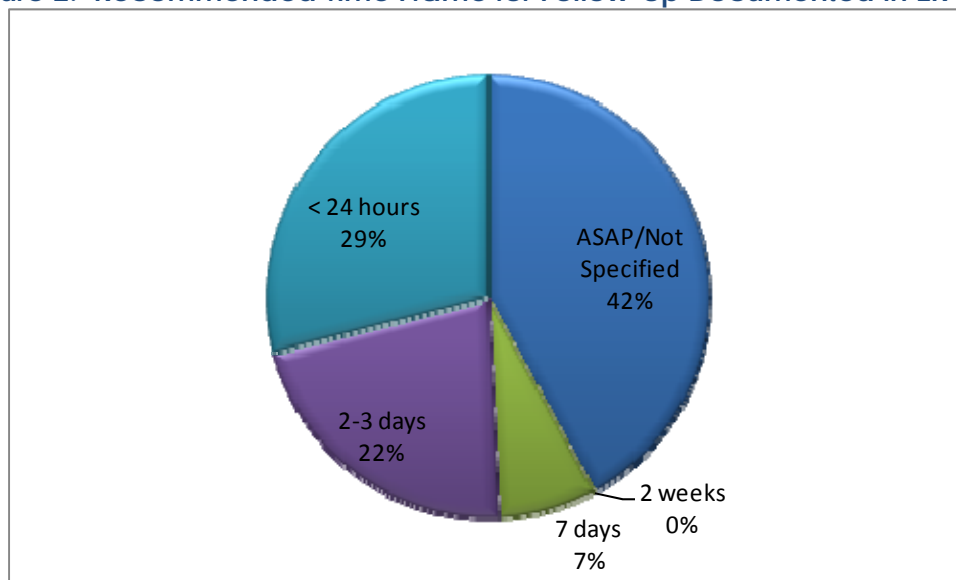
C. Multiple ER Visits

The MDMC also evaluated how to address the situation of two or more caries-related ER visits that occur for the same child within 30 days of one another. The test data indicated that this situation involves approximately 10% of caries-related ER visits. There was consensus among the MDMC to count both of the ER visits in the denominator. The first ER visit serves as the index date for the follow-up period, and a follow-up dental visit within 30 days of the first ER visit is counted once in the numerator.

D. Same-Day ER Visit and Dental Visit

The test data indicated that approximately 5% of ER visits are associated with an outpatient dental visit on the same day. Administrative data do not allow for the identification of the relative timing of these visits. The MDMC evaluated whether to include or exclude same-day visits after reviewing the specific diagnosis and procedure codes for these visits. The determination was made to include same-day visits based on several considerations.   There was a consensus, based on expert opinion, that the majority of cases would involve the ER visit preceding the outpatient dental visit, and that it would less commonly be the case that a child would go to the ER after being seen by a dental provider on the same day. In addition, there was concern that excluding these visits would potentially create a disincentive for same-day follow-up, which would be in direct contrast to the intent of the measure (i.e., measure scores are higher when there are fewer same-day follow-up visits when those visits are excluded). Thus, the MDMC elected to err on the side of potential modest inflation of the measure rate.

We further explored same-day visits through evaluation of the administrative claims data and ER record reviews. We used the administrative claims data to identify the number of children within the record review sample (used to evaluate the diagnosis codes) who had outpatient dental visits that occurred on the same day of the ER visits. During the record review abstractions, the reviewers noted whether there was any documentation in the ER record that a child had seen a dentist prior to coming to the ER. Among the children who presented to the ER for caries-related visits based on first-listed diagnosis, 8 had outpatient dental visits on the same day.   Among these 8 visits, there was documentation in the ER record that 3 saw the dentist prior to going to the ER. The MDMC did not view these findings to counter-indicate the inclusion of same-day ER visits.

E. Measure Rates

Table 13 summarizes the overall program rates for 7-day and 30-day follow up. Figures 3 and 4 present the scores with age stratifications.

Table 13. 7-Day and 30-Day Follow-Up after ER Visit, CY 2011

Program	Follow-Up within 7 Days of ER Visit			Follow-Up within 30 Days of ER Visit		
	Den	Num	Rate	Den	Num	Rate
FL Medicaid	5,564	1,204	21.6%	5,564	1,893	34.0%
TX Medicaid	3,696	1,329	36.0%	3,696	1,807	48.9%
FL CHIP	200	64	32.0%	200	93	46.5%
TX CHIP	372	145	39.0%	372	179	48.1%

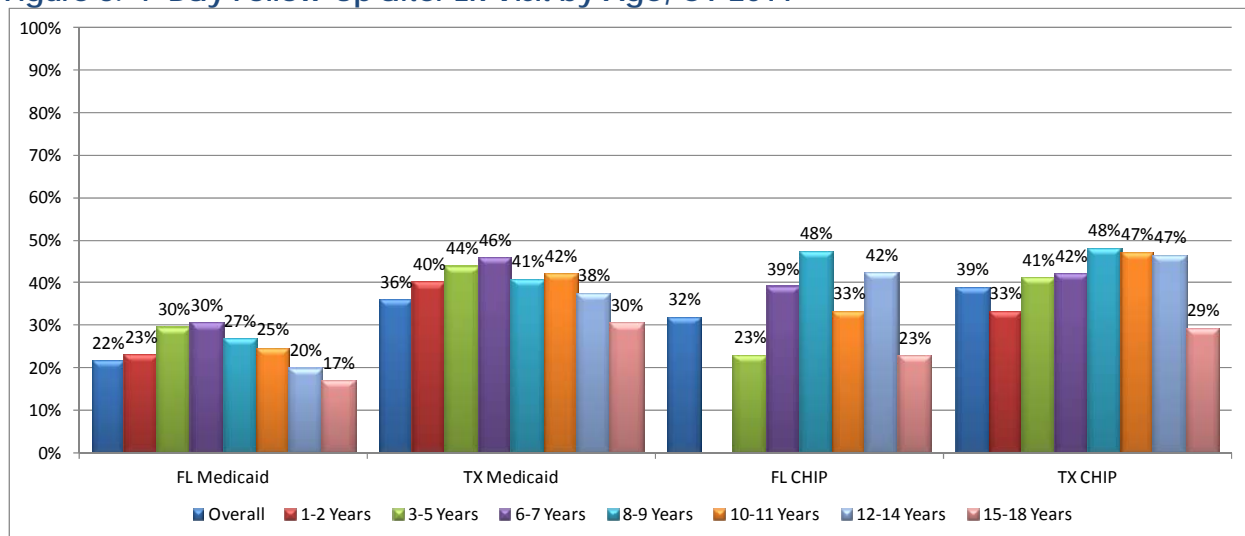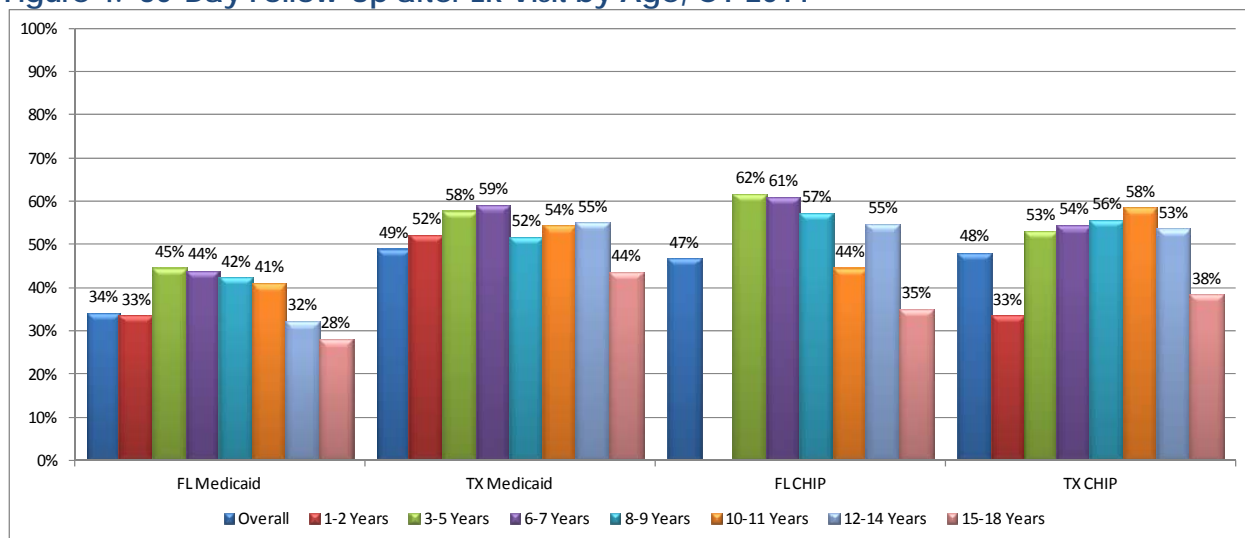**Figure 3. 7-Day Follow-Up after ER Visit by Age, CY 2011**

Figure 4. 30-Day Follow-Up after ER Visit by Age, CY 2011

F. Face Validity of Fully-Specified Final Measure

The results of the face validity assessment demonstrate that the expert group had moderate or high confidence in the measure's importance, feasibility, reliability, validity and usability. 96% of the voting members (all but one member) voted to approve the measure as specified.

Based on the results of the expert ratings, the 15 criterion regarding the measure's importance, feasibility, reliability, validity, and usability were met with moderate to high confidence by 91-100% of the participants. 4 of the 15 criteria were rated as being met with high or moderate confidence by 100% of the voting members, 10 of 15 criteria were voted as being met with high or moderate confidence by >95% of the voting members, and the remaining measure was voted as being met with high or moderate confidence by 91% of voting members.

Specifically 95% of participants indicated moderate to high confidence that: (1) "Validity testing demonstrates that the measure data elements are correct and/or the measure score correctly reflects the quality of care provided, adequately identifying differences in quality" and (2) "Analysis of the computed measure scores demonstrate that methods for scoring and analysis of the specified measure allow for identification of statistically significant and practically/clinically meaningful differences in performance OR there is evidence of overall less-than-optimal performance."

96% of participants voted to approve the measure as specified based on the testing results. Thus, the measure score has strong face validity.

Measure 3: General Anesthesia Use for Caries-Related Reasons

The measure description is:

> **Description:** Percentage of all enrolled children who received caries-related treatment under general anesthesia (GA) within the reporting year
> **Numerator:** Unduplicated number of children who received caries-related treatment under GA
> **Denominators:**
> **DEN 1:** Unduplicated number of all enrolled children
> **DEN 2:** Unduplicated number of all enrolled children who received caries-related treatment
> **Rates:** NUM/DEN1; NUM/DEN2

The detailed measure specifications are contained in Appendix 3.

A. Identification of Caries-Related Treatment

Table 14 provides the Current Dental Terminology (CDT) codes used to identify caries-related treatment.

Table 14. CDT Codes to Identify Caries-Related Treatment

D2140	D2410	D2643	D2740	D2930	D3240
D2150	D2420	D2644	D2750	D2931	D3310
D2160	D2430	D2650	D2751	D2932	D3320
D2161	D2510	D2651	D2752	D2933	D3330
D2330	D2520	D2652	D2780	D2934	D7111
D2331	D2530	D2662	D2781	D2940	D7140
D2332	D2542	D2663	D2782	D2950	D7210
D2335	D2543	D2664	D2783	D3110	D7250
D2390	D2544	D2710	D2790	D3120	
D2391	D2610	D2712	D2791	D3220	
D2392	D2620	D2720	D2792	D3221	
D2393	D2630	D2721	D2794	D3222	
D2394	D2642	D2722	D2799	D3230	

B. Identification of GA Use

GA use is identified using two CDT codes specifically for general anesthesia, D9220 or D9221, as well as Current Procedural Terminology (CPT) code 00170 (Anesthesia for intraoral procedures), which is commonly used when general anesthesia for dental procedures is billed through medical claims. In addition, CDT code D9420 ("hospital or ambulatory surgical center call") was proposed as a code that may be indicative of GA use. Testing data from two programs indicated that 78% and 88%, respectively, of visits with caries-related treatment and CDT code 9420 also had a GA code (CDT D9920/D9921 or CPT 00170). Thus, approximately 12-22% of caries-related visits with CDT code 9420 did not have a co-occurring GA code. Comments on the Interim Report indicated face validity concerns with the reliability of 9420 as an indicator of GA use. Therefore, this code was not included in the proposed measure specifications.

C. Critical Data Element Validation

As noted above, dental procedure codes were previously validated during testing of the DQA's starter set of measures, Dental Caries in Children: Prevention and Disease Management.[11]   Review of 1,135 procedure codes found 94% agreement between the administrative claims data and dental records. The kappa statistic for specific domains of care ranged from 0.64 – 0.88 ("substantial" or "almost perfect" agreement"). Restorations, in particular, had 95.54% agreement and a kappa statistic=0.863, providing support for the reliability/validity of dental procedure codes.

D. Enrollment Length for Denominator Inclusion

Initial testing calculated rates for denominators using 30-day or 180-day continuous enrollment criteria (Table 15). The enrollment duration did not have a large impact on the measure rates. A 180-day enrollment requirement was selected because it is consistent with the enrollment requirement for most of the Pediatric Starter Set measures, which allows for examination of this measure in the context of the overall dental service utilization and caries-prevention measures. In addition, the longer enrollment period allows for sufficient time to seek, schedule, and obtain treatment for dental caries.

Table 15. Percentage of Children with GA for Caries Related Treatment for 30-Day and 180-Day Enrollment Criteria, CY 2011

Denominator 1: Unduplicated Number of all Enrolled Children <21 Years	Enrolled at Least 30 Days/ 1 Month			Enrolled at Least 180 Days/ 6 Months		
	Den	Num	Rate	Den	Num	Rate
FL CHIP	317,146	87	0.03%	208,307	76	0.04%
TX Medicaid	3,544,247	41,864	1.18%	2,880,544	36,637	1.38%

Denominator 2: Unduplicated Number of all Enrolled Children <21 Years who received caries-related treatment	Enrolled at Least 30 Days/ 1 Month			Enrolled at Least 180 Days/ 6 Months		
	Den	Num	Rate	Den	Num	Rate
FL CHIP	39,151	87	0.22%	34,004	76	0.22%
TX Medicaid	887,397	41,864	4.72%	819,899	39,637	4.83%

Note: This testing was conducted prior to finalization of the specifications and, therefore, reflect modest differences from the reported rates in Table 17.

E. Measure Denominator

Two denominators for this measure were evaluated. Denominator 1 includes all children enrolled for at least six months, including those who have not had any dental visits. Denominator 2 restricts the measure to the subset of children enrolled at least six months who also have received caries-related treatment. The MDMC determined that both denominators are meaningful for quality improvement purposes, and there were no concerns raised by stakeholders with either denominator during the one-month public comment period on the Interim Report.

F. Exclusions Considerations

The MDMC reviewed whether to apply exclusions to this measure. In general, the purpose of exclusions would be to exclude from the measure children who present with medical necessity for treatment under GA. However, reimbursement for GA use for dental- related conditions is often conditioned on these same medical necessity criteria. Therefore, the exclusion criteria may significantly overlap with benefits coverage criteria. In addition, medical necessity based on any developmental disorders or other health conditions often is based on the severity of the condition, which is not readily ascertained through administrative claims data without complex algorithms specific to each condition. Table 16 indicates the 20 most frequently first-listed diagnoses codes present on claims with CPT code 00170 that co-occur with caries-related treatment for one of the programs. (The complete set of frequencies is on file with the DQA.) Based on a review of these data, there was a consensus among the MDMC that non-caries related diagnoses are infrequent and would not distort the measure scores. In addition, there was consensus among that as a system-level measure, these exclusions would not be as important as they would be if this measure were intended for provider-level measurement. There also was consensus that caries-related GA use signifies treatment that could have been avoided had appropriate prevention been in place. Prevention may be particularly important for vulnerable populations who are indicated for GA use, which presents its own risks and costs.   Thus, no exclusions were proposed for the measure. This is under continuing review, however.

Table 16. Example of First-Listed Diagnoses on Claims with CPT Code 00170 (GA) Co-Occurring with Caries-Related Treatment

Texas Medicaid			
First Listed Diagnosis	#	%	Cumulative %
UNSP DENTAL CARIES	30832	94.3	94.3
TOOTH ERUPTION DISTURB	616	1.88	96.18
CARIES OF ROOT SURFACE	542	1.66	97.84
OTHER DENTAL CARIES	221	0.68	98.52
PERIAPICAL ABSCESS	74	0.23	98.74
DENTAL CARIES LTD TO ENAMEL	66	0.2	98.94
PREOP EXAMINATION OT	66	0.2	99.15
UNSP ACQ ABSENCE OF TEETH	39	0.12	99.27
ASTHMA UNSPECIFIED	22	0.07	99.33
DENTAL CARIES INTO DENTINE	17	0.05	99.39
SUPERNUMERARY TEETH	14	0.04	99.43
CROWDING OF TEETH	11	0.03	99.46
HYPERTROPHY TONSILS/ADENOIDS	10	0.03	99.49
AUTISTIC DISORDER ACTIVE	9	0.03	99.52
DENTAL DISORDER UNSPEC	9	0.03	99.55
BROKEN TOOTH WO COMPL	9	0.03	99.57
PULPITIS	7	0.02	99.6
UNS ANOMALY TOOTH POSITION	7	0.02	99.62
DISEASES OF LIPS	7	0.02	99.64
PREOP EXAMINATION UNSPEC	7	0.02	99.66

G. Measure Rates

Table 17 reports the measure rates for both denominators by age group. Children <5 years of age are most likely to have GA for caries-related treatment. Among children with caries-related treatment (denominator 2), GA use is highest among children in the age group of 1-2 years old.

Table 17. Percentage of Children with GA for Caries Related Treatment by Age Group

Age Group	Program	Denominator 1: Unduplicated Number of all Enrolled Children <21 Years			Denominator 2: Unduplicated Number of all Enrolled Children <21 Years who received caries-related treatment		
		Den	Num	Rate	Den	Num	Rate
Overall	FL Medicaid	1,807,202	5,266	0.29%	142,507	5,266	3.70%
	TX Medicaid	2,880,544	38,987	1.35%	907,883	38,987	4.29%
	FL CHIP	208,307	93	0.04%	39,291	93	0.24%
	TX CHIP	518,162	601	0.12%	134,580	601	0.45%
<1 Yr	FL Medicaid	72,645	0	0.00%	15	0	0.00%
	TX Medicaid	135,295	1	0.00%	55	1	1.82%
	FL CHIP	N/A	N/A	N/A	N/A	N/A	N/A
	TX CHIP	247	0	0.00%	0	0	.
1-2 Yrs	FL Medicaid	254,682	314	0.12%	1,556	314	20.18%
	TX Medicaid	436,210	4,918	1.13%	17,893	4,918	27.49%
	FL CHIP	N/A	N/A	N/A	N/A	N/A	N/A
	TX CHIP	22,997	54	0.23%	525	54	10.29%
3-5 Yrs*	FL Medicaid	376,131	2,624	0.70%	24,628	2,624	10.65%
	TX Medicaid	596,730	22,687	3.80%	177,738	22,687	12.76%
	FL CHIP	4,021	3	0.07%	511	3	0.59%
	TX CHIP	55,918	327	0.58%	9,189	327	3.56%
6-7 Yrs	FL Medicaid	205,880	1,085	0.53%	23,826	1,085	4.55%
	TX Medicaid	336,657	5,509	1.64%	152,704	5,509	3.61%
	FL CHIP	25,428	39	0.15%	5,292	39	0.74%
	TX CHIP	58,852	115	0.20%	18,342	115	0.63%
8-9 Yrs	FL Medicaid	171,573	453	0.26%	22,171	453	2.04%
	TX Medicaid	294,522	2,101	0.71%	139,694	2,101	1.50%
	FL CHIP	31,136	23	0.07%	7,189	23	0.32%
	TX CHIP	76,413	58	0.08%	25,572	58	0.23%
10-11 Yrs	FL Medicaid	164,130	200	0.12%	18,313	200	1.09%
	TX Medicaid	268,908	977	0.36%	120,817	977	0.81%
	FL CHIP	33,227	7	0.02%	6,455	7	0.11%
	TX CHIP	75,107	29	0.04%	22,968	29	0.13%
12-14 Yrs	FL Medicaid	222,845	181	0.08%	22,305	181	0.81%
	TX Medicaid	344,044	1,148	0.33%	142,760	1,148	0.80%
	FL CHIP	51,350	6	0.01%	9,158	6	0.07%
	TX CHIP	105,461	12	0.01%	28,756	12	0.04%
15-18 Yrs	FL Medicaid	262,431	294	0.11%	25,057	294	1.17%
	TX Medicaid	375,929	1,298	0.35%	136,163	1,298	0.95%
	FL CHIP	63,145	15	0.02%	10,686	15	0.14%
	TX CHIP	123,167	6	0.00%	29,228	6	0.02%
19-20 Yrs	FL Medicaid	76,885	115	0.15%	4,636	115	2.48%
	TX Medicaid	92,249	348	0.38%	20,059	348	1.73%
	FL CHIP	N/A	N/A	N/A	N/A	N/A	N/A
	TX CHIP	N/A	N/A	N/A	N/A	N/A	N/A

*FL CHIP age eligibility begins at age 5 years.

Summary

Use of Emergency Room for Caries-Related Reasons and Follow-Up after Emergency Room Visit were approved by the DQA membership at its October 24, 2014 meeting. The third measure, Use of General Anesthesia for Caries-Related Treatment, is undergoing continued review at the recommendation of the DQA Executive Committee.

Concluding Remarks

The UF Team greatly appreciates the opportunity to have been involved in this important initiative and looks forward to continued collaboration and engagement with the Dental Quality Alliance.

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End Notes

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Appendix 1: DQA Measure Specification Sheet: Use of Emergency Room for Caries-Related Reasons

Description: Number of emergency room visits for caries-related reasons per 100,000 member months for all enrolled children
Numerator: Number of ER visits with caries-related diagnosis code among all enrolled children
Denominator: All member months for enrollees 0 through 20 years during the reporting year.
Rate: (NUM/DEN)x100,000

Rationale: An estimated 4.1 million ED visits received an International Classification of Diseases, Ninth Edition, Clinical Modification (ICD-9-CM) discharge diagnosis related to dental disease.(1) Dental conditions, primarily from untreated dental caries (tooth decay), are responsible for 35% to 96% of dental ER visits. (2, 3) Dental caries is preventable, and treating the sequelae of dental caries can be time-consuming, costly, and stressful for the child, family, and the dentist. (2, 4) Moreover, ER care for caries-related problems is generally not definitive compared to that provided in primary care dental settings and often results in referral to primary care dental sites. (5)

1. Lewis C, Lynch H, Johnston B. Dental complaints in emergency departments: A national perspective. Ann Emerg Med. 2003;42(1):93-99.
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AHRQ Domain: Use of Services[1] AND Health State[2]

IOM Aim: Equity, Safety, Timeliness

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[1] **Use of Services (Related Healthcare Delivery Measure):** Use of services is the provision of a service to, on behalf of, or by a group of persons identified by enrollment in a health plan or through use of clinical services. Use of service measures can assess encounters, tests, or interventions that are not supported by evidence for the appropriateness of the service for the specified individuals. National Quality Measures Clearinghouse: http://www.qualitymeasures.ahrq.gov/about/domain-definitions.aspx. Accessed April 2013.

[2] **User-Enrollee Health State (Related Healthcare Delivery Measure**): A user-enrollee health state is the health status of a group of persons identified by enrollment in a health plan or through use of clinical services. A user-enrollee health state is not known to be the result of antecedent health care. National Quality Measures Clearinghouse: http://www.qualitymeasures.ahrq.gov/about/domain-definitions.aspx. Accessed April 2013.

Level of Aggregation: Program *(NOTE: This measure only applies to programs such as Medicaid that provide both medical insurance and dental benefit. Use of this measure as a requirement for stand-alone dental benefit plans will result in feasibility issues due to lack of access to appropriate data. Use by health plans that provide both medical insurance and dental benefit to a population may be considered after assessment of data element feasibility within the plans' databases).*

Improvement Noted As: Lower the better

Data Required: Single year (Medical)

Measure Purpose: Examples of questions that can be answered through this measure at each level of aggregation:

1. What is the rate of emergency room use for caries-related reasons in the enrolled population during the measurement period?
2. Does the rate of emergency room use for caries-related reasons vary by any of the stratification variables?
3. Are there disparities in the use of emergency rooms for caries-related problems based on the stratification variables?

Primary Stratification Variables
1. Age: <1; 1-2; 3-5; 6-7; 8-9; 10-11; 12-14; 15-18; 19-20

Additional Stratification Variables (Optional: Contact Program Official to determine reporting requirement)
1. Geographic Location (e.g., rural; suburban; urban)
2. Race
3. Ethnicity

_____

Use of Emergency Room for Caries-Related Reasons Calculation

1. Run records for one reporting year for paid claims[3]

2. Calculate total eligible member months as the sum of all member months for enrollees age 0 through 20 years (<21 years) as of the 15th or 30th day of the month as appropriate for when eligibility determinations are made. Either the 15th or the 30th should be selected and used consistently across all member months during the reporting period.

   ### Reporting note for age stratifications:
   - Member months will be attributed to each age stratum based on the member's age as of the 15th or 30th day of the month. Either the 15th or the 30th should be selected and used consistently across all member months during the reporting period.
   - One member can contribute member months to more than one age stratum.

   YOU NOW HAVE DENOMINATOR COUNT: Total member months

3. Identify all emergency room visits for caries-related reasons occurring during eligible member months:

   a. Identify a health care encounter as an ER visit if any of the following are met:

      - CPT codes 99281-99285 (ER visit for patient evaluation/management); **OR**
      - Revenue code 0450-0459 (Emergency Room) or 0981 (professional fees for ER services); **OR**
      - CMS place of service code for professional claims - 23 (Emergency Room)

   b. Count only one visit per member per day

   c. Child must be <21 years on date of visit

   d. Identify an ER visit as being caries related if:

      i. any of the ICD-9-CM diagnosis codes in Table 1 is listed as a FIRST-LISTED diagnosis code associated with the visit

      OR

      ii. (a) any of the ICD-9-CM diagnosis codes in Table 2 is listed as a FIRST-LISTED diagnosis **AND** (b) any of the ICD-9-CM diagnosis codes in Table 1 is listed as an ADDITIONAL LISTED diagnosis. (Codes from Table 2 must be accompanied by a code from Table 1 to qualify.)

   e. Sum the number of ER visits for caries-related reasons.

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[3] **Medicaid/CHIP programs may want to apply these overall exclusions before the case finding process:**
- Exclude those individuals who do not qualify for EPSDT benefits
- If exclusions are applied, the exclusion criterion should be reported along with the number and percentage of members excluded.

Reporting note for age stratifications: Numerator cases are stratified based on age on date of ER visit.

YOU NOW HAVE NUMERATOR (NUM) COUNT: Number of ER visits for caries-related reasons

4. Stratify the numerator by whether visit resulted in an inpatient admission or did not result in an inpatient admission:

    a. Identify a caries-related ER visit as resulting in an inpatient admission if:

    (i) the patient has an inpatient admission defined by UB Type of Bill = 11x OR 12x OR 41x

    AND

    (ii) that admission occurred within 48 hours:

    [inpatient admit date] – [ER admit date] >= 0 days AND <= 2 days

    You now have the numerator stratum: caries-related ER visits that resulted in an inpatient stay.

    b. If subject does not meet inpatient criterion, then:

    You have the numerator stratum: caries-related ER visits that did not result in an inpatient stay.

5. Report
    a. Unduplicated number of ER visits in the numerator
    b. Unduplicated number of member months in denominator
    c. Rate per 100,000 member months: (NUM/DEN) x 100,000
    d. Rates for ER visits resulting in an inpatient stay and those not resulting in an inpatient stay

*** Note: Reliability of the measure score depends on quality of the data that is used to calculate the measures. Flow rates (% of missing or invalid data) for these data elements must be investigated prior to measurement. Data elements with high rates of missing or invalid data will adversely affect the accuracy and reliability of the measure rate.***

Table 1. Caries-Related ICD-9-CM Diagnosis Codes

521.00	UNSPECIFIED DENTAL CARIES
521.01	DENTAL CARIES LIMITED TO ENAMEL
521.02	DENTAL CARIES EXTENDING INTO DENTINE
521.03	DENTAL CARIES EXTENDING INTO PULP
521.04	ARRESTED DENTAL CARIES
521.05	ODONTOCLASIA
521.06	DENTAL CARIES PIT AND FISSURE
521.07	DENTAL CARIES OF SMOOTH SURFACE
521.08	DENTAL CARIES OF ROOT SURFACE
521.09	OTHER DENTAL CARIES
522.0	PULPITIS
522.1	NECROSIS OF THE PULP
522.2	PULP DEGENERATION
522.3	ABNORMAL HARD TISSUE FORMATION IN PULP
522.4	ACUTE APICAL PERIODONTITIS OF PULPAL ORIGIN
522.5	PERIAPICAL ABSCESS WITHOUT SINUS
522.6	CHRONIC APICAL PERIODONTITIS
522.7	PERIAPICAL ABSCESS WITH SINUS
522.8	RADICULAR CYST
522.9	OTHER AND UNSPECIFIED DISEASES OF PULP AND PERIAPICAL TISSUES
525.3	RETAINED DENTAL ROOT
525.60	UNSPECIFIED UNSATISFACTORY RESTORATION OF TOOTH
525.61	OPEN RESTORATION MARGINS
525.63	FRACTURED DENTAL RESTORATIVE MATERIAL WITHOUT LOSS OF MATERIAL
525.64	FRACTURED DENTAL RESTORATIVE MATERIAL WITH LOSS OF MATERIAL
525.8	OTHER SPECIFIED DISORDERS OF THE TEETH AND SUPPORTING STRUCTURES
525.9	UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES
526.4	INFLAMMATORY CONDITIONS OF JAW
526.5	ALVEOLITIS OF JAW
526.61	PERFORATION OF ROOT CANAL SPACE
526.62	ENDODONTIC OVERFILL
526.63	ENDODONTIC UNDERFILL
526.69	OTHER PERIRADICULAR PATHOLOGY ASSOCIATED WITH PREVIOUS ENDODONTIC TREATMENT
528.3	CELLULITIS AND ABSCESS OF ORAL SOFT TISSUES

Table 2. Additional First-Listed ICD-9-CM Diagnosis Codes to Identify Caries-Related Visits when Paired with an Additional Listed Diagnosis Code from the Caries-Related ICD-9-CM Codes in Table 1

682.0	CELLULITIS AND ABSCESS OF FACE • must be paired with additional diagnosis code from Table 1
682.1	CELLULITIS AND ABSCESS OF NECK • must be paired with additional diagnosis code from Table 1
682.9	CELLULITIS AND ABSCESS OF UNSPECIFIED SITES • must be paired with additional diagnosis code from Table 1
782.3	EDEMA • must be paired with additional diagnosis code from Table 1
784.2	SWELLING MASS OR LUMP IN HEAD AND NECK • must be paired with additional diagnosis code from Table 1

Appendix 2: DQA Measure Specification Sheet: Follow-up after Emergency Room Visit

Description: The percentage of caries-related emergency room visits among children 0 through 20 years in the reporting year for which the member visited a dentist within (a) 7 days and (b) 30 days of the ER visit.
Numerators: Number of caries-related ER visits in the reporting year for which the member visited a dentist within (a) 7 days (NUM1) and (b) 30 days (NUM2) of the ER visit.
Denominator: Number of caries-related ER visits in the reporting year
Rates: NUM1/DEN and NUM2/DEN

Rationale: An estimated 4.1 million ED visits received an International Classification of Diseases, Ninth Edition, Clinical Modification (ICD-9-CM) discharge diagnosis related to dental disease.(1) Dental conditions, primarily from untreated dental caries (tooth decay), are responsible for 35% to 96% of dental ER visits. (2, 3) Dental caries is preventable, and treating the sequelae of dental caries can be time-consuming, costly, and stressful for the child, family, and the dentist. (2, 4) Moreover, ER care for caries-related problems is generally not definitive compared to that provided in primary care dental settings and often results in referral to primary care dental sites. (5) This process measure can be used to assess if the patient had timely follow-up with a dentist for more definitive care.

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AHRQ Domain: PROCESS[4]

IOM Aim: Equity, Safety, Timeliness

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[4] **Process (Clinical Quality Measure):** A process of care is a health care-related activity performed for, on behalf of, or by a patient. Process measures are supported by evidence that the clinical process—that is the focus of the measure—has led to improved outcomes. National Quality Measures Clearinghouse: http://www.qualitymeasures.ahrq.gov/about/domain-definitions.aspx. Accessed April 2013.

Testing Pediatric Oral Health Performance Measures: ER & GA Use
(Herndon, PI)

Level of Aggregation: Program *(NOTE: This measure only applies to programs such as Medicaid that provide both medical insurance and dental benefit. Use of this measure as a requirement for stand-alone dental benefit plans will result in feasibility issues due to lack of access to appropriate data. Use by health plans that provide both medical insurance and dental benefit to a population may be considered after assessment of data element feasibility within the plans databases)*

Improvement Noted As: Higher the better

Data Required: Single year (Medical/Dental administrative i.e. enrollment and claims)

Measure Purpose: Examples of questions that can be answered through this measure at each level of aggregation:

1. What is the percentage of ER visits for caries-related reasons for which children see a dentist for follow-up within 7 days and 30 days, respectively?
2. Does the percentage caries-related ER visits that are followed up by visit with a dentist within 7 days and 30 days, respectively, vary by any of the stratification variables?
3. Are there disparities in follow-up based on the stratification variables?

Primary Stratification Variables
2. Age: <1; 1-2; 3-5; 6-7; 8-9; 10-11; 12-14; 15-18; 19-20

Additional Stratification Variables (Optional: Contact Program Official to determine reporting requirement)
4. Geographic Location (e.g., rural; suburban; urban)
5. Race
6. Ethnicity

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Follow-up after ER Visit Calculation

1. Run records for one reporting year for paid claims[5]

2. Identify all emergency room visits for caries-related reasons occurring during eligible member months <u>between January 1 and December 1</u> of the reporting year:

   a. Identify a health care encounter as an ER visit if any of the following are met:

      • CPT codes 99281-99285 (ER visit for patient evaluation/management); **OR**
      • Revenue code 0450-0459 (Emergency Room) or 0981 (professional fees for ER services); **OR**
      • CMS place of service code for professional claims - 23 (Emergency Room)

   b. Exclude visits that result in inpatient admissions where inpatient admissions are identified as:

      (i) the patient has an inpatient admission defined by UB Type of Bill = 11x OR 12x OR 41x

      AND

      (ii) that admission occurred within 48 hours:

      [inpatient admit date] – [ER admit date] >= 0 days AND <= 2 days.

   c. Count only one visit per member per day

   d. Member must be <21 years on date of visit

      Reporting note: Age stratifications will be based on subject's age on date of ER visit.

   e. Identify an ER visit as being caries related if:

      iii. any of the ICD-9-CM diagnosis codes in Table 1 is listed as a FIRST-LISTED diagnosis code associated with the visit

      OR

      iv. (a) any of the ICD-9-CM diagnosis codes in Table 2 is listed as a FIRST-LISTED diagnosis **AND** (b) any of the ICD-9-CM diagnosis codes in Table 1 is listed as an ADDITIONAL LISTED diagnosis. (Codes from Table 2 must be accompanied by a code from Table 1 to qualify.)

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[5] **Medicaid/CHIP programs may want to apply these overall exclusions before the case finding process:**
  - Exclude those individuals who do not qualify for EPSDT benefits.
  - If exclusions are applied, the exclusion criterion should be reported along with the number and percentage of members excluded.

    f.   Member must be enrolled on date of ER visit and through 30 days following the visit.

    g.   Sum the number of ER visits for caries-related reasons

YOU NOW HAVE THE DENOMINATOR: Number of ER Visits for caries-related reasons

Table 1. Caries-Related ICD-9_CM Diagnosis Codes

521.00	UNSPECIFIED DENTAL CARIES
521.01	DENTAL CARIES LIMITED TO ENAMEL
521.02	DENTAL CARIES EXTENDING INTO DENTINE
521.03	DENTAL CARIES EXTENDING INTO PULP
521.04	ARRESTED DENTAL CARIES
521.05	ODONTOCLASIA
521.06	DENTAL CARIES PIT AND FISSURE
521.07	DENTAL CARIES OF SMOOTH SURFACE
521.08	DENTAL CARIES OF ROOT SURFACE
521.09	OTHER DENTAL CARIES
522.0	PULPITIS
522.1	NECROSIS OF THE PULP
522.2	PULP DEGENERATION
522.3	ABNORMAL HARD TISSUE FORMATION IN PULP
522.4	ACUTE APICAL PERIODONTITIS OF PULPAL ORIGIN
522.5	PERIAPICAL ABSCESS WITHOUT SINUS
522.6	CHRONIC APICAL PERIODONTITIS
522.7	PERIAPICAL ABSCESS WITH SINUS
522.8	RADICULAR CYST
522.9	OTHER AND UNSPECIFIED DISEASES OF PULP AND PERIAPICAL TISSUES
525.3	RETAINED DENTAL ROOT
525.60	UNSPECIFIED UNSATISFACTORY RESTORATION OF TOOTH
525.61	OPEN RESTORATION MARGINS
525.63	FRACTURED DENTAL RESTORATIVE MATERIAL WITHOUT LOSS OF MATERIAL
525.64	FRACTURED DENTAL RESTORATIVE MATERIAL WITH LOSS OF MATERIAL
525.8	OTHER SPECIFIED DISORDERS OF THE TEETH AND SUPPORTING STRUCTURES
525.9	UNSPECIFIED DISORDER OF THE TEETH AND SUPPORTING STRUCTURES
526.4	INFLAMMATORY CONDITIONS OF JAW
526.5	ALVEOLITIS OF JAW
526.61	PERFORATION OF ROOT CANAL SPACE
526.62	ENDODONTIC OVERFILL
526.63	ENDODONTIC UNDERFILL
526.69	OTHER PERIRADICULAR PATHOLOGY ASSOCIATED WITH PREVIOUS ENDODONTIC TREATMENT
528.3	CELLULITIS AND ABSCESS OF ORAL SOFT TISSUES

Table 2. Additional First-Listed ICD-9-CM Diagnosis Codes to Identify Caries-Related Visits when Paired with an Additional Listed Diagnosis Code from the ICD-9-CM Codes in Table 1

682.0	CELLULITIS AND ABSCESS OF FACE • must be paired with additional diagnosis code from Table 1
682.1	CELLULITIS AND ABSCESS OF NECK • must be paired with additional diagnosis code from Table 1
682.9	CELLULITIS AND ABSCESS OF UNSPECIFIED SITES • must be paired with additional diagnosis code from Table 1
782.3	EDEMA • must be paired with additional diagnosis code from Table 1
784.2	SWELLING MASS OR LUMP IN HEAD AND NECK • must be paired with additional diagnosis code from Table 1

3. Check if subject had a visit with a dentist (dental service) within 30 days of the ER visit:

   a. If [SERVICE-CODE] = D0100 – D9999, AND;

   b. [DATE OF ER VISIT]-[DATE OF DENTAL VISIT] <=30 days;

      Note: If two or more caries-related ER visits occur for same child within 30 days of one another, then use the first ER visit as the index date for follow-up. Both ER visits will count in the denominator. A follow-up dental visit within 30 days of the first ER visit will be counted once in the numerator.

      AND;

   c. If [RENDERING PROVIDER TAXONOMY] code = any of the NUCC maintained Provider Taxonomy Codes in Table 3 below[6], then proceed to next step (#4).

   d. If a AND b AND c are not met, then the service was not a "follow-up dental service" STOP processing. This ER visit is already included in the denominator but will not be included in the subsequent counts.

      Note: In this step, all **claims** with missing or invalid SERVICE-CODE, missing or invalid NUCC maintained Provider Taxonomy Codes, or NUCC maintained Provider Taxonomy Codes that do not appear in Table 3 should be excluded.

   YOU NOW HAVE NUMERATOR 1 (NUM1): ER visits for caries-related reasons for which the child had a visit with a dentist within 30 days

4. Among the ER visits identified in Step 3, check if the subject had a visit with a dentist (dental service) within 7 days of the ER visit: [DATE OF ER VISIT]-[DATE OF DENTAL VISIT] <=7 days

YOU NOW HAVE NUMERATOR 2 (NUM2): ER visits for caries-related reasons for which the child had a visit with a dentist within 7 days

5. Report
    a. Unduplicated count of caries-related ER visits with 30-day dentist visit follow-up in numerator
    b. Unduplicated count of caries-related ER visits with 7-day dentist visit follow-up in numerator
    c. Unduplicated count of caries-related ER visits in denominator
    d. Rates: (NUM1/DEN), (NUM2/DEN)

Table 3: NUCC maintained Provider Taxonomy Codes classified as dentist*

122300000X	1223P0106X	1223X0008X	261QF0400X
1223D0001X	1223P0221X	1223X0400X	261QR1300X
1223D0004X	1223P0300X	124Q00000X+	
1223E0200X	1223P0700X	125J00000X	
1223G0001X	1223S0112X	125K00000X	

*Services provided by County Health Department dental clinics may also be included as "dental" services.
+Only dental hygienists who provide services under the supervision of a dentist should be classified as "dental" services.

*** Note: Reliability of the measure score depends on quality of the data that is used to calculate the measures. Flow rates (% of missing or invalid data) for these data elements must be investigated prior to measurement. Data elements with high rates of missing or invalid data will adversely affect the subsequent counts that are recorded. For example, records with missing or invalid SERVICE-CODE will be counted in the "all enrollees" but not in "all enrollees who received service". These records are assumed to not have had a visit. In this case, a low quality data set will result in a low utilization score and will not be reliable.***

Appendix 3: DQA Measure Specification Sheet: Use of General Anesthesia for Caries-Related Treatment

Description: Percentage of all enrolled children who received caries-related treatment under general anesthesia (GA) within the reporting year
Numerator: Unduplicated number of children who received caries-related treatment under GA
Denominators:
DEN 1: Unduplicated number of all enrolled children
DEN 2: Unduplicated number of all enrolled children who received caries-related treatment
Rates: NUM/DEN1; NUM/DEN2

Rationale: For pre-cooperative children with early childhood caries, sedation and general anesthesia (GA) are the 2 most popular care modalities for delivering safe and needed dental care. (1) Lee and colleagues have shown that—for those children requiring more than 3 sedation appointments—dental treatment under GA can provide cost savings. (2) Studies by Acs et al and White et al, however, found that parents of children who undergo GA dental rehabilitation express significant satisfaction with their children's care in the operating room. (3, 4) Additionally, parents perceive an increased quality of life for their children after dental treatment under GA. (4) White and Colleagues examined trends in use of general anesthesia for healthy children and found that it has been increasing significantly. (5) Studies also report significant expenditures for children requiring advanced treatment for decay in ambulatory surgical facilities. (6, 7, 8)   This measure, in conjunction with other indicators, will assist in evaluating the extent of caries-related dental disease in the population. When coupled with preventive measures, this measure can also serve to understand whether improvement in preventive service utilization results in a concomitant decrease in the number of children requiring treatment under general anesthesia.

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3. Acs G, Pretzer S, Foley M, Ng MW. Perceived outcomes and parental satisfaction following dental rehabilitation under general anesthesia. Pediatr Dent 2001;23:419-23.
4. White H, Lee JY, Vann WF. Parental evaluation of quality of life measures following pediatric dental treatment using general anesthesia. Anesth Prog 2003;50:105-10.
5. White H, Lee JY, Rozier RG. The effects of general anesthesia legislation on operating room visits by preschool children undergoing dental treatment. Pediatr Dent 2008;30(1):70-75.
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8. Kanellis MJ, Damiano PC, Momany ET. Medicaid costs associated with the hospitalization of young children for restorative dental treatment under general anesthesia. J Public Health Dent. 2000 Winter;60(1):28-32.

Testing Pediatric Oral Health Performance Measures: ER & GA Use
(Herndon, PI)

AHRQ Domain: Use of Services[7] AND Health State[8]

IOM Aim: Safety, Timeliness

Level of Aggregation: Program *(NOTE: This measure only applies to programs such as Medicaid that provide both medical insurance and dental benefit. Use of this measure as a requirement for stand-alone dental benefit plans will result in feasibility issues due to lack of access to appropriate data. Use by health plans that provide both medical insurance and dental benefit to a population may be considered after assessment of data element feasibility within the plans' databases)*

Improvement Noted As: This is a related health care delivery measure that should be interpreted in the context of other performance measures. This measure, in conjunction with other indicators, will assist in evaluating the extent of caries-related dental disease in the population and monitoring changes over time. When coupled with preventive measures, this measure can also serve to understand whether improvement in preventive service utilization results in a concomitant decrease in the number of children requiring treatment under general anesthesia.

Data Required: Single year (Medical/Dental administrative i.e. enrollment and claims)

Measure Purpose: Examples of questions that can be answered through this measure at each level of aggregation
1. What is the percentage of children who receive general anesthesia for caries-related treatment during the measurement period?
2. Does the percentage of children who receive general anesthesia for caries-related treatment vary by any of the stratification variables?
3. Are there disparities in use of general anesthesia for caries-related treatment based on the stratification variables?

Primary Stratification Variables
3. Age: e.g. <1; 1-2; 3-5; 6-7; 8-9; 10-11; 12-14; 15-18; 19-20

Additional Stratification Variables (Optional: Contact Program Official to determine reporting requirement)
1. Geographic Location (e.g., rural; suburban; urban)

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[7] **Use of Services (Related Healthcare Delivery Measure):** Use of services is the provision of a service to, on behalf of, or by a group of persons identified by enrollment in a health plan or through use of clinical services. Use of service measures can assess encounters, tests, or interventions that are not supported by evidence for the appropriateness of the service for the specified individuals. National Quality Measures Clearinghouse: http://www.qualitymeasures.ahrq.gov/about/domain-definitions.aspx. Accessed April 2013.

[8] **User-Enrollee Health State (Related Healthcare Delivery Measure**): A user-enrollee health state is the health status of a group of persons identified by enrollment in a health plan or through use of clinical services. A user-enrollee health state is not known to be the result of antecedent health care. National Quality Measures Clearinghouse: http://www.qualitymeasures.ahrq.gov/about/domain-definitions.aspx. Accessed April 2013.

Testing Pediatric Oral Health Performance Measures: ER & GA Use
(Herndon, PI)
2. Race
3. Ethnicity
_____

Use of GA for Caries-Related Treatment Calculation

1. Run records for one reporting year for paid claims[9]
2. Check if the enrollee meets age criteria[10] on the last day of the reporting year:
   a. If age criterion is met then proceed to next step.
   b. If age criterion is not met or there are missing or invalid field codes then STOP processing. This enrollee does not get counted in the denominator.
   c. Check if subject is continuously enrolled for at least 180 days
   d. If subject meets continuous enrollment criterion then include in **denominator 1**, proceed to next step.
   e. If subject does not meet enrollment criterion, then STOP processing. This enrollee does not get counted in the denominator.

   YOU NOW HAVE DENOMINATOR 1 (DEN1) COUNT: Enrollees who meet the age and enrollment criteria

3. Check if subject received caries-related treatment:
   a. If [SERVICE-CODE] = any Code in Table 1, and;
   b. If [RENDERING PROVIDER TAXONOMY] code = any of the NUCC maintained Provider Taxonomy Codes in Table 2 below[11], then include in **denominator 2**, proceed to next step.
   c. If both a AND b are not met, then the service was not a "caries-related treatment service provided by a dentist" STOP processing. This enrollee is already included in the denominator 1 but will not be included in the subsequent counts.

   Note: In this step, all **claims** with missing or invalid SERVICE-CODE, missing or invalid NUCC maintained Provider Taxonomy Codes, or NUCC maintained Provider Taxonomy Codes that do not appear in Table 2 should be excluded.

   YOU NOW HAVE DENOMINATOR 2 (DEN 2) COUNT: Enrollees who had caries-related treatment by a dentist

4. Check if subject received general anesthesia (GA)

   a. If [CDT SERVICE-CODE] = D9220 OR D9221 **OR** if [CPT SERVICE-CODE]=00170 on the same date of service as the caries-related treatment then include in **numerator**.
   b. If not, then service was not provided under general anesthesia, STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

   YOU NOW HAVE NUMERATOR (NUM) COUNT: Enrollees who received treatment for caries-related reasons under GA

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[9] **Medicaid/CHIP programs may want to apply these overall exclusions before the case finding process:**
- Exclude those individuals who do not qualify for EPSDT benefits
- If exclusions are applied, the exclusion criterion should be reported along with the number and percentage of members excluded.

[10] **Age**: Medicaid/CHIP programs use under age 21 (< 21); Exchange quality reporting use under age 19 (<19); other programs check with program officials. This criterion should be reported with the measurement score.

[11] **Provider taxonomy**: Some States may use different file types or custom codes to classify dental and oral health services.

5. Report
    a. Unduplicated count of enrollees in numerator
    b. Unduplicated count of enrollees in denominator(s)
    c. Rates of measures (NUM/DEN1) and (NUM/DEN2)

Table 1: CDT Codes to identify caries related treatment

D2140	D2410	D2643	D2740	D2930	D3240
D2150	D2420	D2644	D2750	D2931	D3310
D2160	D2430	D2650	D2751	D2932	D3320
D2161	D2510	D2651	D2752	D2933	D3330
D2330	D2520	D2652	D2780	D2934	D7111
D2331	D2530	D2662	D2781	D2940	D7140
D2332	D2542	D2663	D2782	D2950	D7210
D2335	D2543	D2664	D2783	D3110	D7250
D2390	D2544	D2710	D2790	D3120	
D2391	D2610	D2712	D2791	D3220	
D2392	D2620	D2720	D2792	D3221	
D2393	D2630	D2721	D2794	D3222	
D2394	D2642	D2722	D2799	D3230	

Table 2: NUCC maintained Provider Taxonomy Codes classified as dentist*

122300000X	1223P0106X	1223X0008X	261QF0400X
1223D0001X	1223P0221X	1223X0400X	261QR1300X
1223D0004X	1223P0300X	124Q00000X+	
1223E0200X	1223P0700X	125J00000X	
1223G0001X	1223S0112X	125K00000X	

*Services provided by County Health Department dental clinics may also be included as "dental" services.
+Only dental hygienists who provide services under the supervision of a dentist should be classified as "dental" services.

*** Note: Reliability of the measure score depends on quality of the data that is used to calculate the measures. Flow rates (% of missing or invalid data) for these data

elements must be investigated prior to measurement. Data elements with high rates of missing or invalid data will adversely affect the subsequent counts that are recorded. For example, records with missing or invalid SERVICE-CODE will be counted in the "all enrollees" but not in "all enrollees who received service". These records are assumed to not have had a visit. In this case, a low quality data set will result in a low utilization score and will not be reliable.***