

**MEDICAID FUNDING APPROVAL RATE VARIANCES FOR
COMPREHENSIVE TREATMENT AMONG THE
ORTHODONTIC CRITERIA INDEX AUTOMATIC
QUALIFIERS AND THE SALZMANN
EVALUATION INDEX**

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ABSTRACT

Introduction: Historically, in Pennsylvania, the Salzmann Evaluation Index (SEI) (Figure 2) was used to evaluate the medical necessity of orthodontic care and whether the government will cover costs for low-income patients. Approval discrepancies occur between doctor index scoring and insurance funding with the SEI, leading to questions about how indices determine funding. Each state and insurance administrator decides which if any, medically necessary malocclusions to include that automatically qualify for treatment coverage. As of 2022, a major insurance administrator in the state of Pennsylvania added an additional qualifying criterion: the orthodontic criteria index (OCI), ten occlusal characteristics that lead to an automatic qualification (Figure 3). This leaves the possibility that a patient may qualify on one or both indices. This study is the first to evaluate the frequency of approvals between SEI and OCI in Pennsylvania. The secondary objectives for this investigation are to evaluate the OCI criteria insurance administrator approval rate compared to the doctors' scoring and to evaluate if sex, age, race/ethnicity, and submission year impact insurance funding decisions and to evaluate the OCI criteria insurance administrator approval rate compared to the doctors' scoring. The results of this study may promote standardization for the state of Pennsylvania to readily adopt a list of Automatic Qualifiers for all Medicaid insurance administrators.

Materials and Methods: All subjects had no orthodontic treatment and underwent routine screening and record-taking through the Temple University Kornberg School of Dentistry Orthodontic Screening Clinic from November 1, 2022, to March 31, 2023 (n = 171). For all orthodontic providers, scoring SEI and OCI was calibrated in September 2022. Malocclusion characteristics of 171 subjects between the ages of 9-20 were characterized

for treatment need with standardized SEI and OCI criteria. SEI gives a numeric score of treatment need by accessing intra-arch and inter-arch tooth position relationships. OCI is a binary list for the presence of specific severe malocclusion criteria, which leads to automatic qualification for treatment. Approval thresholds were at least one OCI AQ or a $SEI \geq 25$. Patient data, including age, date of initial submission, sex, race and ethnicity, date of submission, insurance response, and orthodontist scoring, was recorded. Insurance submission records were analyzed, and funding decisions based on the Salzmann Evaluation Index (SEI) and the Orthodontic Criteria Index (OCI) were recorded. Malocclusion severity evaluation had an inter-examiner reliability of $\geq 90\%$, using the Salzmann Evaluation Index, with a score of ≥ 25 determining treatment need or one of the ten automatic qualifiers from the Orthodontic Criteria Index form was perceived regardless of the Salzmann Evaluation Index score. Both indices scored, along with intraoral and extraoral photographs, a cephalogram, a panoramic radiograph, and an intraoral impression, were sent to Insurance Administrator A, a primary Medicaid company for patients at TUKSoD. An employee of the insurance administrator received the records submitted and made a funding decision.

Results: Overall insurance approval was 38.6%. Doctor approval rates were 42.7% for OCI and 24.6% for SEI. The overall doctor versus approval discrepancy was 39.7% for both SEI and OCI combined. Patients who qualified for treatment with one or more OCI had an average SEI of 18. Only 24.6% of SEI scores ≥ 25 were approved. The greatest agreement between insurance and doctor approvals was for the OCI category: impacted of canines or incisors. There was no statistically significant difference in the approval rate

between the OCI and SEI for gender, ethnicity, or submission year. Age groups have a statistically significant discrepancy ($P < 0.01$).

Conclusion: There is a moderate level of agreement between insurance approval and doctor-determined scores. There is greater agreement between OCI doctor scores, and insurance approval compared to SEI. A significant approval rate variance occurs with age for SEI. Age group and % SEI Variance have an inversely proportional relationship, possibly due to differences in opinion about what constitutes a permanent dentition (impacted permanent or over-retained primary teeth). The newly implemented OCI criteria have less funding variance and produce greater agreement between insurance and clinician assessment than SEI.

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CHAPTER 1

INTRODUCTION

A handicapping malocclusion is not just a dental problem; it is detrimental to a patient's oral health maintenance and negatively affects the patient's overall well-being. The latter includes mastication, speech, and self-esteem (Salzmann, 1968). These patients need comprehensive orthodontic treatment to improve their quality of life; however, the high cost of this treatment is a significant hurdle that many of these patients cannot overcome.

Indexes play a crucial role in the orthodontic field, guiding decisions on whether government funding will cover the costs of comprehensive orthodontic treatment. Each orthodontic index, with its unique considerations, assesses malocclusion. Some indexes factor in esthetics, while others incorporate a psychosocial element in the total scoring. Beyond the varied factors in scoring, the cut-off points can be arbitrary. A cut-off point is a predetermined assessment score that authorizes a patient's treatment by a state-licensed doctor and allocates funds for orthodontics within a specific budget. The basis of the cut-off is the overall amount of total funding. However, the total aid for orthodontic coverage is less than other medical specialties, as malocclusion is not classified as a disease but rather a 'variation of normal' (Grewe & Hagan, 1972). This results in orthodontic treatment being considered elective and receiving less funding compared to other medical fields. These public programs (ex: Medicaid) have limited funds, with only 5-15% of patients' cases being deemed medically necessary for orthodontic treatment (Patel et al., 2021).

The American Association of Orthodontics, AAO, clearly defined what criteria constitute handicapping malocclusion. The AAO thus created a "Medically Necessary Orthodontic Care" policy list of ten specific factors that standardized what makes a patient

medically essential. Medically necessary cases are those that “represent the highest level of orthodontic complexity and severity in which a trained orthodontist is needed to provide the highest level of care” (American Association of Orthodontists, 2019). This list of factors was supposed to help establish consistency for orthodontists and insurance companies to approve patients for coverage; however, most states do not use the AAO Automatic Qualifiers to determine insurance coverage.

Each state government chooses its preferred index to evaluate the patient’s orthodontic treatment needs. This is because Medicaid is half federal and half state funding (Minick et al., 2017). Pennsylvania has been one of forty-one states to use the Salzman Evaluation Index (SEI), also known as the Handicapping Malocclusion Assessment Record, since 2015 (Salzman, 1968). This simple and quick index, seen in Figure 2, has two sections for malocclusion evaluation— intra-arch and inter-arch deviation (Salzman, 1967). These are further broken down into two subsections— anterior and posterior segments. If the Salzman score is 25 or above, the child is eligible for orthodontic treatment. If the Salzman score is below 25, the patient is not eligible for treatment. Recently, a Medicaid Insurance Administrator A, in addition to the SEI, implemented the use of an Automatic Qualifier form called Orthodontic Criteria Index (OCI), seen in Figure 3 (DentaQuest LLC, 2023). This binomial index considers overbite, open bite, anterior-posterior discrepancies, crossbite, impacted teeth, overjet, congenital or developmental disorders, and facial asymmetries. If a patient has one of these automatic qualifiers, the patient is considered to have the most severe malocclusion and should subsequently be approved for treatment through the insurance administrator. Together, these indexes

determine whether a patient under 21 will be approved or denied coverage of comprehensive orthodontic treatment in Pennsylvania (El-Gheriani et al., 2008).

Once sent for a funding decision, the insurance company has an employee review the records submitted and complete their SEI and OCI, which ultimately determines the funding. The employee's decision is made on the records taken without clinically seeing the patient. Thus, inadequate records are the number one reason for denial based on insurance companies (El-Gheriani et al., 2008). There are frequent inconsistencies in the doctor's scoring and insurance decisions. Patients with SEI scores over 25 are not covered; conversely, patients with lower scores get approved. There have been no studies evaluating the OCI funding variances. However, as with all indices, it is hard to believe that there would be no variances between an insurance company and provider approval rates. Many factors can lead to approval or denial, making it beneficial to analyze further what impacts the scoring and whether patients with coverage will receive it. Furthermore, knowing if certain malocclusions are more likely to be approved or denied is helpful. These inconsistencies in funding decisions negatively affect the health of patients with the most severe malocclusions who also do not have the financial resources to pay for treatment. The cause of this variation between provider scores and insurance administrator approval is unknown; however, it could be due to the insurance administrator scoring SEI or OCI, poor records, constraints for additional funding that month or year, or perhaps other requirements for distribution of approvals by geography or demography across Pennsylvania.

This pilot retrospective study is the first to compare the insurance approval rate variances for the newly implemented OCI and the historically used SEI to determine

treatment needs and, thus, Medicaid funding for orthodontic treatment. The secondary aims of the study will not only shed light on whether patient demographics or funding year impact the decision-making process but also offer a deeper understanding of which OCI criteria malocclusions are more or less likely to be approved. This study's results may pave the way for standardization across Pennsylvania, ensuring all Medicaid insurance administrators can adopt a list of Automatic Qualifiers.

CHAPTER 2

REVIEW OF THE LITERATURE

2.1 How is Malocclusion Evaluated?

Orthodontic treatment planning requires a precise diagnosis of the malocclusion. A clinician should have a complete understanding of what an ideal occlusion is prior to treatment planning. In the paper "*The 6 keys to normal occlusion*," Dr. Andrews developed a set of characteristics that can be used to assess a normal occlusion (Andrews, 1972). This article defines the proper molar relationship, crown angulation, crown inclination, no rotations, no spaces, and proper occlusion plane that coincide with proper esthetic and functional occlusion.

On the other hand, diagnosing a malocclusion is complex due to many severity variations. Angle's method is one method that has been widely accepted since 1899. It evaluates the molar relationship in a sagittal plane and the anterior and posterior deviations of the teeth and jaw. Angle's classification states that the mesiobuccal cusp of the maxillary first molar lies in the buccal groove of the mandibular first molar (Angle, 1899). This classification further has subdivisions to examine the inclination of the maxillary incisors. A more complete and three-dimensional method for defining malocclusion was created by Proffit & Ackerman in 1973. This method included alignment of teeth, the profile, crossbites, Angle's sagittal classification, and bite depth, representing a more comprehensive approach to defining malocclusion.

Most insurance companies use orthodontic treatment need indices to diagnose malocclusion severity and prioritize funding for individuals seeking orthodontic care (Järvinen, 2001). Standard criteria in indices are molar relationship, overjet, overbite,

rotations, spacing, and crowding, similar to how Dr. Andrew defined normal occlusion. The clinician obtains a score with a cut-off representing the lowest value that allows treatment to be funded (Ackerman & Proffit, 1969). These scores from these indices allow clinicians and insurance administrators to allocate funds to patients with the highest need.

2.2 Different Treatment Need Indices

Various indices have been created to evaluate patients' need for orthodontic treatment and subsequent funding and have gained popularity in different states since the 1960s (Grippaudo et al., 2008). Numerous treatment need indices have been developed, with the most popular indices including the Occlusal Index by Summers, The Treatment Priority Index (TPI) developed by Grainger, The Index of Orthodontic Treatment Need (IOTN) developed by Brooke and Shaw, and the Handicapping Malocclusion Assessment Record (HMAR) now known as the Salzmann, developed by Salzmann (Grippaudo et al., 2008). Since 2015, forty-one states have reported using an index to determine treatment to prioritize disbursement funds for Medicaid patients undergoing treatment (Minick et al., 2017).

To ensure the development of fair indices, the World Health Organization (WHO) 1966 created a report of ten characteristics of an ideal index. This global perspective and the standards set by WHO are crucial in the field of orthodontics. Table 1 shows the ten criteria listed. Additionally, existing indices for determining treatment needs are classified as qualitative or quantitative, and the correct application of an index depends on the operator's capability. Qualitative methods use descriptions to define treatment needs, whereas quantitative methods apply numerical values. A list of qualitative and quantitative indices for determining treatment needs is shown in Table 2 (Grippaudo et al., 2008).

Qualitative Indexes use descriptions to score, such as extreme, excess, and severe (Grippaudo et al., 2008). This leads to a high risk of bias. Quantitative Indices allow the clinician to obtain and use measurements to develop a score. Individuals with the most severe malocclusions obtain the highest scores, and individuals with the least severe obtain the lowest scores.

Table 1. *Requirements of an Ideal Index World Health Organization (Grippaudo, 2008)*

1	Classification is expressed by a finite scale with definite upper and lower limits; running by progressive gradation from zero (absence of disease), to the ultimate point (disease in its terminal stage).
2	The index should be equally sensitive throughout the scale.
3	The score should correspond closely with the clinical importance of the disease stage it represents.
4	Index value should be amendable to statistical analysis.
5	The classification must be reproducible.
6	The index should also be simple, accurate and yield itself to modification for the collection of data.
7	The examination procedure should require a minimum of judgement.
8	The index should be simple enough to permit the study of a large population without undue cost in time or energy
9	The examination required should be performed quickly, to evidence a group variation.
10	The index should be valid during time.

Table 2. *Indices for Determining Orthodontic Treatment Need (Grippaudo, 2008)*

INDEX	AUTHOR	YEAR	METHOD
Handicapping Labiolingual Deviation Index (HLDI)	Draker HL	1960	quantitative
Grade Index Scale For Assessment of Treatment Need (GISATN)	Salonen L, Mohlin B, Gotzlinger B	1966	qualitative
Dental Aesthetic Index (DAI)	Cons NC, Jenny J	1966	quantitative
Treatment Priority Index (TPI)	Grainger RM	1967	quantitative
Handicapping Malocclusion Assessment Record (HMAR)	Salzmann JA	1968	quantitative
Occlusal index (OI)	Summers CJ	1971	quantitative
Eismann index	Eismann D.	1974	quantitative
Index of Orthodontic Treatment Need (IOTN)	Brook PH, Shaw WC	1989	quantitative
Risk of Malocclusion Assessment Index (ROMA index)	Grippaudo C, Russo E, Marchionni P, Deli R,	1998	quantitative
Memorandum of Orthodontic Screening and Indications for Orthodontic Treatment	Danish National Board of Health	1990	qualitative
Need for Orthodontic Treatment Index (NOTI)	Espeland LV, Ivarson K, Stenvik	1992	quantitative

CONDITIONS #1 – #6A ARE AUTOMATIC QUALIFYING CONDITIONS	HLD Score
1. Cleft palate deformity (See scoring instructions for types of acceptable documentation) Indicate an 'X' if present and score no further	_____
2. Cranio-facial anomaly (Attach description of condition from a credentialed specialist) Indicate an 'X' if present and score no further	_____
3. Deep impinging overbite WHEN LOWER INCISORS ARE DESTROYING THE SOFT TISSUE OF THE PALATE. TISSUE LACERATION AND/OR CLINICAL ATTACHMENT LOSS MUST BE PRESENT. Indicate an 'X' if present and score no further	_____
4. Crossbite of individual anterior teeth WHEN CLINICAL ATTACHMENT LOSS AND RECESSON OF THE GINGIVAL MARGIN ARE PRESENT Indicate an 'X' if present and score no further	_____
5. Severe traumatic deviation. (Attach description of condition. For example: loss of a premaxilla segment by burns or by accident, the result of osteomyelitis, or other gross pathology.) Indicate an 'X' if present and score no further	_____
6A. Overjet greater than 9mm <u>with incompetent lips</u> or mandibular protrusion (reverse overjet) greater than 3.5mm <u>with masticatory and speech difficulties</u> . Indicate an 'X' if present and score no further.....	_____

Figure 1. The Handicapping Labiolingual Deviation Index Automatic Qualifying Conditions (Younis et al., 1997)

The Handicapping Labiolingual Deviation Index (HLD) is a quantitative index with an automatic qualifying conditions section, as seen in Figure 1. It is one of the first indices to have both numerical and automatic qualifying conditions, which allows for patient coverage (Younis et al., 1997). Although the HLD is considered a quantitative index, this section is qualitative, and no further scoring is needed if these specific severe conditions are present.

2.3 Scoring a Salzmann Evaluation Index

The Salzmann Evaluation Index offers a method for establishing a cut-off point for what is considered a Handicapping Malocclusion. Below is an outline of appropriately completing a Salzmann Evaluation Index on an eligible child.

1. 2 points given to the maxillary anterior teeth and 1 point given to the mandibular anterior teeth and all posterior teeth based on the following:
 - a. *Missing teeth* – count the teeth: severely carious nonfunctioning tooth or a tooth with only the roots remaining.
 - b. *Rotated Teeth* – an angled tooth mesial or distal of 45 degrees or more in the dental arch
 - c. *Crowded Teeth* – overlap mesial or distal contacts between teeth or a blocked-out tooth.
 - d. *Spaces* –
 - i. *Open Spacing* – count the papillae visible in the anterior tooth (maximum 5 papillae); both interproximal surfaces and papillae are visible in a posterior tooth.

- ii. *Closed Spacing* – space is not sufficient to permit the eruption of a tooth that is partially erupted.

2. Interarch Deviation

- a. *Overjet* – refers to the labiolingual inclination of the maxillary incisors in relation to the mandibular incisors; a difference between the lingual surface of the maxillary incisor and labial surface mandibular incisor greater than 9mm is 2 points.
- b. *Overbite* – Maxillary incisors occluding on the mandibular mucosa or the mandibular incisors occluding on the palate.
- c. *Crossbite of the incisors* – maxillary incisors are in a lingual relation to the opposing mandibular tooth when a patient is biting in occlusion.
- d. *Crossbite of the posterior teeth* - teeth in the buccal segments are positioned lingually or buccally and are out of contact with opposing teeth.
- e. *Open bite of the incisors* – vertical interarch dental separation between the maxillary and the mandibular incisors when posterior teeth are in occlusion. Teeth slightly out of occlusion or not fully erupted are not considered true open bites.
- f. *Open bite of posterior teeth* – vertical interdental separation between upper and lower canines, premolars, and first molars when the rest of the teeth in dental arches are in occlusion. Teeth slightly out of occlusion or not fully erupted are not considered true open bites.

g. *Anterior-Posterior deviation of posterior teeth* – occlusion in a forward or rearward direction of a full cusp to the accepted normal Angle’s Classification of the mandibular canine, first and second premolars, and first molar in relation to the maxillary teeth. One point is scored for each deviated tooth of a full cusp.

**ORTHODONTIC SERVICE
SALZMANN EVALUATION INDEX**

PATIENT’S NAME – LAST, FIRST, MIDDLE INITIAL	Member #	Date of Birth
REFERRING DENTIST		
ORTHODONTIST’S NAME	Tax ID	DATE OF ASSESSMENT

HANDICAPPING MALOCCLUSION ASSESSMENT RECORD

A. Intra-Arch Deviation

SCORE TEETH AFFECTED ONLY	MISSING	CROWDED	ROTATED	SPACING		NO.	POINT VALUE	SCORE
				Open	Closed			
MAXILLA	ANT.						X2	
	POST.						X1	
MANDIBLE	ANT.						X1	
	POST.						X1	
TOTAL SCORE								

ANT = Anterior Teeth (4 incisors)
 POST = Posterior Teeth (include canine, premolars and first molars)
 NO. = Number of teeth affected

B. Inter-Arch Deviation

1. Anterior Segment

SCORE MAXILLARY TEETH AFFECTED ONLY EXCEPT OVERBITE*	OVERJET	OVERBITE	CROSSBITE	OPENBITE	NO.	POINT VALUE	SCORE
						X2	
TOTAL SCORE							

*Score Maxillary or Mandibular incisors
 No. = Number of teeth affected

2. Posterior Segment

SCORE AFFECTED TEETH ONLY	RELATE MANDIBULAR TO MAXILLARY TEETH				SCORE AFFECTED ONLY MAXILLARY TEETH				NO.	POINT VALUE	SCORE
	DISTAL		MESIAL		CROSSBITE		OPENBITE				
	Right	Left	Right	Left	Right	Left	Right	Left			
CANINE										X1	
1 ST PREMOLAR										X1	
2 ND PREMOLAR										X1	
1 ST MOLAR											
TOTAL SCORE											

GRAND TOTAL

Figure 2. The Salzmann Evaluation Index (SEI)

After completing the SEI, all the points are added to determine a total score. Individuals with higher scores have more severe malocclusion than individuals with lower scores. In Pennsylvania, a score of 25 or higher on the SEI determines Medicaid funding eligibility for comprehensive orthodontic treatment.

2.4 Scoring an Orthodontic Criteria Index

The Orthodontic Criteria Index is a binomial index that establishes a list of ten automatic qualifiers for what is quantified as Handicapped Malocclusion. If a patient presents with one of these malocclusion characteristics, the patient will automatically qualify for funding due to the severity of the malocclusion. These ten characteristics listed in Figure 3 include overbite (*DO*), open bite (*AO*), anterior-posterior discrepancy (*AP*), anterior crossbite (*AX*), posterior crossbite (*PX*), impacted teeth (*IMP*), overjet (*OJ*), congenital or developmental disorder (*CDD*), and facial asymmetry (*FAS*), which require orthodontic treatment. This binomial index needs a patient to have just one criterion to qualify (DentaQuest LLC, 2023.)

Presented below in Figure 3 is an outline of how to appropriately complete an Orthodontic Criteria Index Form on an eligible child. Patient examples, distinguished by the different colored stars, are discussed later in Figures 7-15 in the discussion section.

ORTHODONTIC CRITERIA INDEX FORM – COMPREHENSIVE D8080

Patient Name: _____ D.O.B. _____

ABBREVIATIONS	CRITERIA	YES	NO
DO	Deep impinging overbite that shows palatal impingement of the majority of lower incisors		
AO	True anterior open bite (not including one or two teeth slightly out occlusion or where the incisors have not fully erupted).		
AP	Demonstrates a large anterior-posterior discrepancy (Class II and Class III malocclusions that are virtually a full tooth Class II or Class III).		
AX	Anterior crossbite (involves more than two teeth in crossbite or in cases where gingival stripping from the crossbite is demonstrated).		
PX	Posterior transverse discrepancies (involves several posterior teeth in crossbite, one of which must be a molar).		
PO	Significant posterior open bites (not involving partially erupted teeth or one of the two teeth slightly out of occlusion).		
IMP	Impacted incisor or canines that will not erupt into the arches without orthodontic or surgical intervention (does not include cases where incisors or canines are going to erupt ectopically).	 	
OJ	Overjet in excess of 9 mm.		
CDD	Dentition exhibits a profound impact from a congenital or developmental disorder.		
FAS	Significant asymmetry requiring a combination Orthodontic and orthognathic surgery for correction.		

Approved

When all are answered "NO", please review to the Salzmann

Figure 3. The Orthodontic Criteria Index Automatic Qualifiers (OCI)

The colored stars represent individual visual patient representations in Figures 7-15.

2.5 The Reliability of Pennsylvania Indices

It is necessary to evaluate the reliability of the Salzman Index because funding for Medicaid patients in Pennsylvania depends on its score. The reproducibility, one or more operators would get the same result for a clinical case, and validity, measuring what it is supposed to measure, are two characteristics of a reliable index. (Grippaudo et al. 2008). Because the Salzman Index is quantitative, it has a lower risk of bias than qualitative measurements (Grippaudo et al., 2008).

Otuyemi and Noar (1996) evaluated the Salzman Index, Occlusal Index (OI), and Dental Aesthetic Index (DAI) for reliability and inter-index correlation. Pre-treatment records from 30 subjects were studied. The study found that the highest correlation was between SEI and OI regarding inter-index variability. This was believed to be due to their similar criteria for grading. All indices correlated well with each other, with a p -value < 0.001, and high levels of reliability were found for all three indices.

Younis et al. (1997) compared the reliability and validity of three indices in predicting the opinion of treatment need of a panel of 18 orthodontists. This study used 160 casts of various malocclusions that were evaluated based on the SEI, HLD, and Index of Orthodontic Treatment Need (IOTN). Accuracy or validity was calculated by comparing it to the mean opinion of orthodontic raters. The study found that diagnostic accuracy for each of the three indices was similar, with SEI calculated to be 96.6%, representing the high accuracy of the panel of orthodontists.

Lindauer et al. (1998) gauged orthodontic treatment based on the SEI compared to the Index of Orthodontic Treatment Need (IOTN). 40 subjects whose records were submitted for Medicaid approval were assessed, and comparisons were made between

Medicaid administrator and study examiner Salzmann scores and subsequently funding decision. A high correlation was found between insurance administrators and the study examiner's Salzmann scores, demonstrating its high reproducibility. However, this paper concluded that each method is a unique assessment and that different patients were identified for treatment approval based on different characteristics related to the index.

A recent master's thesis from an orthodontic resident at TUKSoD studied the discrepancy in Medicaid funding decisions between residents' Salzmann Index scores compared to insurance administrators over a two-year period from January 2018 to December 2019 (Moran et al., 2021). After screening over 1500 patients, the agreement percentages between residents' Salzmann Index scoring compared to the final funding decision from the insurance provider was 53%. The highest Medicaid company agreement percentage was the highest at 69.7% (Moran et al., 2021). This demonstrates the low reproducibility of the SEI among insurance companies and doctor scorers. It is interesting to observe the varying percentages of agreements for the same indices and doctors across different insurance administrators. This raises the question of how other influencing factors affect the final funding decision of insurance administrators.

A recent master's thesis by an orthodontic resident at TUKSoD compared the American Association of Orthodontics (AAO) Automatic qualifiers to the Salzmann Evaluation Index (DiSpirito et al., 2021). The study found a moderate level of agreement between the SEI and the AAO automatic qualifiers for determining treatment need. It was concluded that the AAO Automatic qualifiers may result in a greater number of patients being approved for Medicaid funding in states that use only the Salzmann Evaluation Index. Although the Orthodontic Criteria Index is not identical to the AAO auto-qualifier

list, there are many overlapping criteria. This leads to the belief that adopting and implementing the Orthodontic Criteria Index in the TUKSoD screening clinic will allow more patients to be covered for comprehensive orthodontic treatment.

Although the Salzmann Index has traditionally been seen as highly reliable and consistent, recently, there have been discrepancies in Medicaid funding decisions compared to clinician scores. This raises questions about why clinicians and insurance administrators have differing views on what constitutes severe handicapping malocclusion, or if there are other factors leading to the denial of treatment for patients in need. With the introduction of the new Orthodontic Criteria Index, there is now speculation about whether this index will expand coverage for more patients and align more closely with clinician assessments compared to the Salzmann Index.

CHAPTER 3

AIMS OF THE INVESTIGATION

3.1 Specific Aims

The purpose of this pilot retrospective study is to compare the Salzmann Evaluation Index to the Orthodontic Criteria Index Automatic Qualifiers in terms of insurance approval rate variances between orthodontic providers and Insurance Administrator A.

The secondary aims are:

- To evaluate the ten OCI criteria insurance administrator approval rate compared to the doctors' scoring.
- To evaluate if sex, age, race/ethnicity, and submission date impact insurance funding decisions.

3.2 Significance

The importance of this study is to evaluate the similarities or differences, which can lead to a better understanding of insurance approval or denial, which helps patients in need know if they will receive coverage for comprehensive orthodontic treatment. The results of this study may allow Pennsylvania to readily adopt a list of Automatic Qualifiers for all Medicaid insurance administrators.

CHAPTER 4

MATERIALS AND METHODS

4.1 Resources and Setting

The patients used in this study came from the screening clinic run by Temple University's Orthodontic Residency Program. The majority of the patients screened in this clinic have Medicaid insurance. Each Medicaid patient screened in the clinic, from the first stage of full permanent dentition until age 21, has a Salzmann Evaluation Index and Orthodontic Criteria Index completed and submitted to their respective Medicaid Insurance administrator to determine the need for orthodontic treatment. After scoring the SEI and OCI, clinical records are taken to be submitted with the scores. These clinical records include the SEI, OCI, American Dental Association treatment plan form, intraoral and extraoral photographs, panoramic radiograph, and lateral Cephalometric radiograph. While multiple Medicaid insurance plans are accepted in the Orthodontic clinic, one insurance administrator, Insurance Administrator A, is the only one who requires an intraoral scan; for this reason, this study is choosing to examine just this one. This intraoral scan includes the frontal, sagittal, occlusal, and lingual views of the patient's dentition. Visual representation of records submitted can be seen in Figures 7-15. Once the records are received, the insurance administrators respond with the final decision to approve or deny funding within a few weeks. An orthodontic resident completes both indices. All the residents are calibrated each year; these residents were calibrated in September 2023.

4.2 Inclusion and Exclusion Criteria

The Inclusion Criteria for this study are patients under the age of 21, with one type of Medicaid Insurance, and who had a Salzman Index Evaluation and Orthodontic Criteria Index scored by a Temple Orthodontic resident from November 1, 2022, to March 31, 2023. Patients must present with permanent dentition, no over-retained primary teeth, and complete diagnostic records. The Exclusion Criteria are any patient 21 or older, has a Medicaid Insurance administrator who does not use intraoral scans for records, has private or no insurance, and any patient with records that are not of diagnostic quality. Sex, race/ethnicity, age, and time of submission will be considered to compare if demographics are considered when deciding on funding.

4.3 Data Collection Protocol

This study does not require additional recruitment of patients; it is a retrospective study of previously screened patients. No additional patient appointments or evaluations will be required during this study. All data will have been collected prior.

Salzman Evaluation Indexes and Orthodontic Criteria Indexes for Medicaid Patients screened between November 1, 2022, and March 31, 2023, will be selected. The data will be obtained from a depository at the TUKSoD orthodontic clinic. Nonidentifying information for each patient in this study was collected from Axium. This information was entered into an Excel sheet. The student investigator evaluated the Excel sheet and eliminated individuals not meeting the inclusion criteria. The information collected will include the patient's age during initial records, ethnicity, gender, submission date,

insurance response, the resident Salzman Evaluation Index score, and the OCI AQ decision.

The Orthodontic Criteria Index Form will be reviewed and used as a criterion for evaluating each subject's records to determine if the patient would be approved or denied via the OCI AQ protocol, as seen in Figure 3. If any ten criteria are met for the patient, it will be recorded as approved based on the OCI AQ. If no criteria are met, it will be recorded as denied.

The health history form will be evaluated based on patient ethnicity. Figure 4 is the checklist the patient or parent/guardian completes before each screening visit. Patients, parents, or guardians who did not fill out this form portion were excluded from the study.

The School of Dentistry applies for grants from federal, state, and local agencies. While answering this is optional, we appreciate if you would assist us by identifying yourself.

<input type="checkbox"/> African American or Black	<input type="checkbox"/> Caucasian or White	<input type="checkbox"/> Other
<input type="checkbox"/> American Indian/Alaska Native	<input type="checkbox"/> Hispanic or Latino	
<input type="checkbox"/> Asian	<input type="checkbox"/> Native Hawaiian or Pacific Islander	

Figure 4. Patient Health History Questionnaire for Ethnicity

4.4 Statistical Analysis

The study involves several independent variables including gender, ethnicity, age, and time of submission. The dependent variables are the Medicaid acceptance rates from SEI and OCI AQ. Descriptive statistics were conducted for all the variables in the study, including mean, median, and mode. Bivariate analyses were carried out using a chi-squared test to assess the relationship between various pairs of binary variables. These included acceptance rates of SEI decision versus OCI decision, acceptance rates of OCI submitted

versus OCI decision, acceptance rates of OCI decision versus gender, acceptance rates of SEI versus gender, acceptance rates of SEI versus ethnicity, and acceptance rates of OCI decision versus ethnicity.

Lastly, logistic regression will be employed to evaluate the association between the acceptance rate of each type of Medicaid and multiple independent variables such as age group, sex, Salzmann Score, and ethnicity. Probability values less than 0.05 will be considered significant.

CHAPTER 5

RESULTS

5.1 Patient Demographics

The total number of individuals screened at Temple Orthodontic Department with one Medicaid Insurance plan between November 1, 2022, and March 31, 2023, was 286. After eliminating all individuals who did not meet the inclusion criteria, the total sample was 171.

Table 3. Ethnicity

Ethnicity	Total Number of Patients
Hispanic or Latino	90
African American or Black	68
Caucasian or White	5
Native Hawaiian or Pacific Islander	2
Biracial – African American or Black and Hispanic or Latino	8
Biracial – Caucasian or White and Hispanic or Latino	1

The majority of patients were Hispanic or Latino, accounting for 57.3% of the total (Table 3). The second largest ethnic group was African American or Black, representing 49.1% of the patients. The smallest number of patients were Native Hawaiian or Pacific Islanders (NHPI), with only 2 individuals making up 0.01% of the total. 3.0% of the patients were Caucasian or White. Nine patients were biracial, divided into two multiracial ethnicities: African American/Black and Hispanic/Latino, and Caucasian/White and Hispanic/Latino. As shown in Table 4, 56.7% of the subjects were female and 43.2% were

male. The patients' ages ranged from 9 to 20, with the average and median age being 14 (Table 5). The largest number of patients were 12 years old, totaling 30, while the smallest number were 9 years old, with a total of 2. According to Table 3, 33.9% of the patients were in the 9-12 age group, 52.0% were in the 13-17 age group, and 29.2% were 18 years or older.

Table 4. *Sex*

Sex	Total Number of Patients
Male	74
Female	97

Table 5. *Age*

Age	Total Number of Patients
9	2
10	8
11	18
12	30
13	16
14	24
15	29
16	10
17	10
18	11
19	19
20	20

A chi-square test showed that approval rate variances between doctors and insurance administrators were not statistically significant with sex. The thresholds for discrepancy were:

- SEI<25 and approved or SEI \geq 25 and denied.
- OCI present but denied by the administrator.

The OCI and SEI approval rate variance for females was 11% and 29%, respectively, and with males was 14% and 27%, respectively (p-value= 0.93, p-value=0.85).

Table 6. Percentages of Approval Discrepancies Based on SEI and OCI by Demographic Characteristics

	% SEI discrepancy		p-value	% OCI discrepancy	p-value
Sex					
Female	29%		0.93	11%	0.85
Male	27%			14%	
Age Groups					
9-12 years old	36%		0.01	9%	0.61
13-17 years old	30%			14%	
18+ years old	4%			12%	
Ethnicity					
White					
Yes	40%		0.92	0%	0.87
No	28%			13%	
Black					
Yes	31%		0.62	13%	0.89
No	26%			12%	
Hispanic/Latino					
Yes	27%		0.73	12%	1.00
No	30%			12%	
NHPI					
Yes	100%		0.14	0%	1.00
No	45%			12%	
Screening Year					
2023	29%		0.97	13%	1.00
2022	27%			12%	
<p><i>*P-values are derived from chi-squared tests.</i> <i>**SEI<25 and approved or SEI≥25 and denied.</i> <i>***OCI present but denied by the administrator</i></p>					

The percent SEI discrepancy for the age group 9-12 was 36%, for the age group 13-17 was 30%, and for the 18+ age group was 4% (p value=0.01). On the other hand, the OCI percent approval rate discrepancy was 9% for the 9-12 age group, 14% for the 13-17 age group, and 12% for the 18+ age group (p value= 0.61).

5.2 Doctor vs. Insurance Administrator Approval Rate Variances between the Orthodontic Criteria Index and Salzmann Evaluation Index

Overall insurance approval was 38.6%, as seen in Figure 5. The insurance denied 105 patients out of the 171, totaling 61.4%. Doctor approval rates were 42.7% for OCI and 24.6% for SEI (Table 5). The overall doctor versus insurance approval discrepancy was 39.7%. 42.7% of the total subjects had OCI from doctor approval. Only 42.7% of patients had one or more OCI; moreover, those who qualified for treatment with one or more OCI had an average SEI of 16. Only 25% of SEI scores ≥ 25 were approved, while 74.0% of the Doctor scores of one or more OCIs were approved. 28.6% of the SEI < 25 was approved, and 7.3% of the no OCI was approved. 72.9% of the SEI < 25 was denied, while 87.8% of the no OCI was denied.

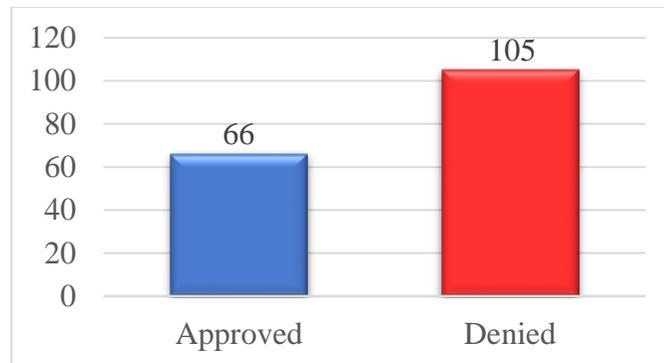


Figure 5. Insurance Administrator Overall Approval Rate

Table 7. Variance in Approval Rate: OCI and SEI

	Total	Approved	Denied
SEI <25	129	37	94
SEI ≥25	42	29	11
One or more	73	54	19
None	98	12	86

5.3 Orthodontic Criteria Index Categories

Ten orthodontic criteria index criteria lead to automatic qualification. A patient only needs one to qualify for coverage of comprehensive care. 7.02% of the total subjects had more than one OCI category submitted with an average SEI of 30.61 ± 7.90 (Figure 6). Patients who qualified for treatment with one or more OCI had an average SEI of 21; 83.3% of these subjects were approved for funding. The most patients accepted between insurance and doctor approval rate (81%) was with the OCI IMP category (impacted canines or incisors), as seen in Figure 6.

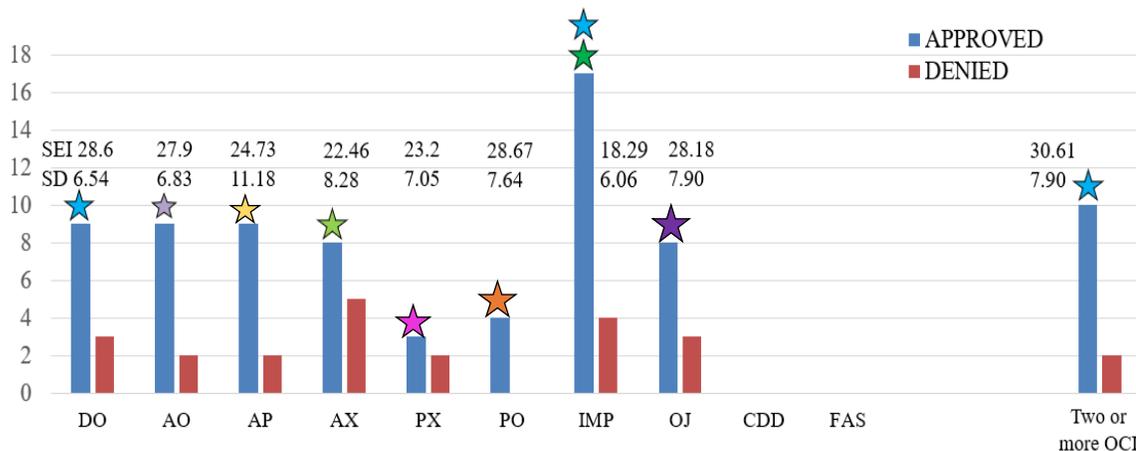


Figure 6. OCI Category Insurance Administrator Approval Rate Compared to Average SEI Score

Patients who qualified for treatment with OCI=IMP had an average SEI of 18.29 ± 6.06 (Figure 6). Only 4 out of the 21 total IMP OCI submitted patients were denied funding. Overjet of 9mm had an average SEI of 28.18 ± 7.90 . Posterior open bite (PO) had 4 subjects, all approved with an average Salzmann score of 28.67 ± 7.64 . The two OCI categories, Congenital or Developmental Disorders (CDD) and Facial Asymmetry (FAS) had no patients in this study.

CHAPTER 6

DISCUSSION

6.1. Correlation of Orthodontic Criteria Index Categories

The Orthodontic Criteria Index is a pivotal tool in the qualification process for Handicapped Malocclusion funding. It sets forth a binomial list of ten automatic qualifiers, including overbite (DO), open bite (AO), anterior-posterior discrepancy (AP), anterior crossbite (AX), posterior crossbite (PX), impacted teeth (IMP), overjet (OJ), congenital or developmental disorder (CDD), and facial asymmetry (FAS). These indicators, each requiring orthodontic treatment, ensure that a patient needs only one criterion to qualify for funding.

6.1a Provider and Insurance Administrator Agreement of OCIs/SEI<25

There were 129 patients for whom the doctor scored a SEI<25. The doctor and the insurance administrator had 37 SEI<25 approved, according to Table 5. This was considered a SEI discrepancy, as shown in Table 4. These 37 approved for funding patients would not have been approved before the Orthodontic Criteria Index implementation. Figures 7-14 below are visual representations of different malocclusion criteria that allowed an SEI score below 25 to be approved due to having one automatic qualifying malocclusion to score for the OCI.

The OCI malocclusion criteria are further explained below with a visual representation:

1. *AX* = anterior crossbite (involves more than two teeth in a crossbite or where gingival stripping from the crossbite is demonstrated).



Figure 7. Visual representation of OCI Automatic Qualifier Anterior Crossbite (*AX*) with SEI < 25.

2. *IMP* = impacted incisors or canines that will not erupt into the arches without orthodontic or surgical intervention (does not include cases where incisors or canines will erupt ectopically).

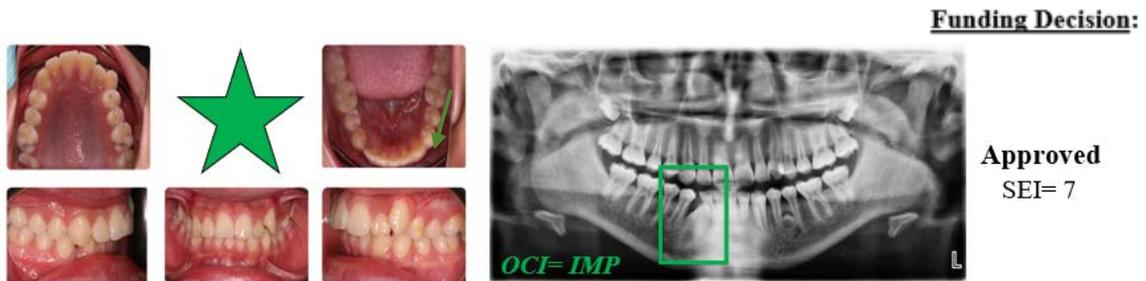


Figure 8. Visual Representation of OCI Automatic Qualifier Impaction (*IMP*) with SEI < 25.

- AO* = true anterior open bite (not including one or two teeth slightly out occlusion or where the incisors have not fully erupted).

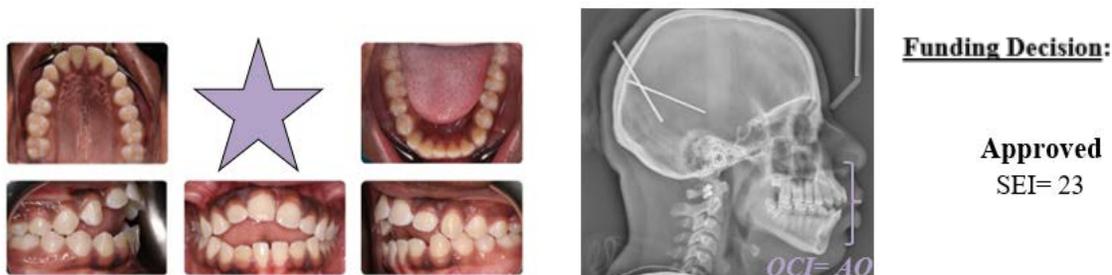


Figure 9. Visual Representation of OCI Automatic Qualifier Anterior Open Bite (*AO*) with $SEI < 25$.

- DO* = deep impinging overbite that shows palatal impingement of the majority of lower incisors



Figure 10. Visual representation of two or more OCI Automatic Qualifiers: Deep Overbite (*DO*) and Impacted (*IMP*) with $SEI < 25$.

- AP* = demonstrates a large anterior-posterior discrepancy (Class II and Class III malocclusions that are virtually a full tooth Class II or Class III).



Figure 11. Visual representation of OCI Automatic Qualifiers: Anterior-Posterior (*AP*) with $SEI < 25$.

6. *OJ* = overjet in excess of 9 mm.

Funding Decision:

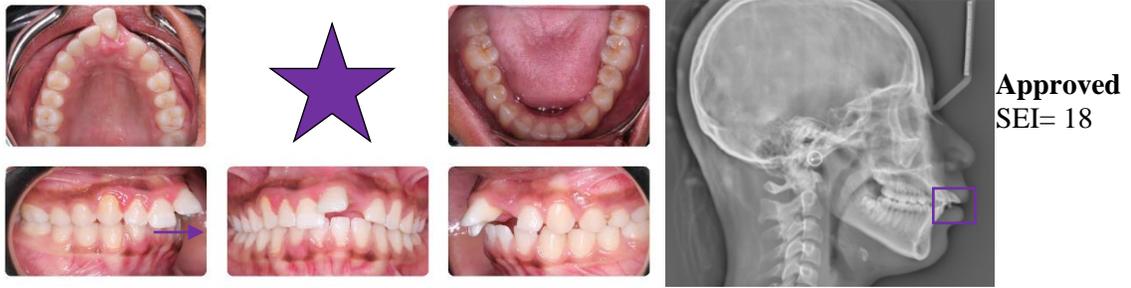


Figure 12. Visual representation of OCI Automatic Qualifiers: Overjet (*OJ*) with SEI<25.

7. *PX* = posterior transverse discrepancies (involves several posterior teeth in crossbite, one of which must be a molar)

Funding Decision:



Figure 13. Visual representation of OCI Automatic Qualifiers: Posterior Crossbite (*PX*) with SEI<25.

8. *PO* = significant posterior open bites (not involving partially erupted teeth or one of the two teeth slightly out of occlusion).

Funding Decision:

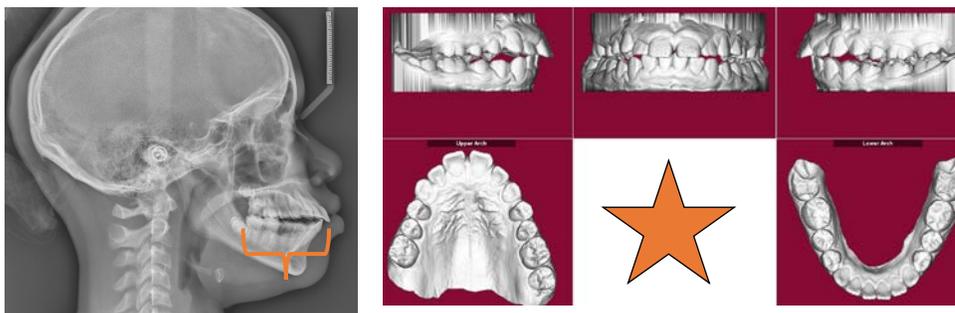


Figure 14. Visual representation of OCI Automatic Qualifiers: Posterior Open Bite (*PO*) with SEI<25.

9. *CDD* = dentition exhibits a profound impact from a congenital or developmental disorder.
10. *FAS* = significant asymmetry requiring a combination of Orthodontic and orthognathic surgery for correction.

No patients in this study had OCI criteria 9 or 10 from above. These two criteria often coincide; if a patient has one, he or she normally has both. These patients usually have SEI greater than 25 and will qualify for funding with both SEI and OCI. Figure 10 shows a patient with two OCIs, which qualified the patient with a Salzman score of 24. This patient had an impacted upper left canine and a deep palatal impinging overbite of all lower incisors. The intraoral scan shows the lingual view of the occlusion well and allows for true verification of the palatal impingement. The average SEI for these patients with more than one OCI is 30.6. Similar to OCI criteria *CDD* and *FAS*, patients with more than one OCI are usually the more complicated examples, with higher SEI scores and more agreement with acceptance for both SEI and OCI. Lastly, it is extremely important that records of the patient's malocclusion are clearly taken, or they will not be accepted for funding.

6.2 Correlation of Patient Demographics

This study evaluated age, sex, race, and screening year to see if any patterns led to funding approval with the orthodontic criteria index and/or the Salzman Evaluation index. According to Chi-squared tests, there was no statistically significant difference in the approval rate between the OCI and SEI for gender, ethnicity, or submission year. Patient literacy is essential when filling out the Health History form. In the clinic, we provide the other in English or Spanish. The health history forms are all completely filled out before

patient evaluation and record-taking. There is no way to monitor whether the health history information is correct. Some patients or parents/guardians may quickly fill it out to be seen by the doctor sooner. In the questionnaire, the patient evaluates their race/ethnicity in a checklist, as seen in Figure 4. Multiracial patients may select as many races as they desire and even can write in the “other” category if none apply.

The screening year was evaluated for 2022 and 2023. Three months in 2023 and two months in 2022 were evaluated. More data from a longer time period is necessary in this study for all fiscal periods to evaluate whether the time of year impacts insurance funding decisions.

Only age groups were seen to have a statistically significant discrepancy ($P < 0.01$), as seen in Table 4. Figure 15 below is a visual representation of the age group from 9-12 years old with a doctor scored SEI=25 and not accepted for coverage by the Insurance Administrator. Table 3 compares patient ages. It is interesting to see that most patients are between the ages of 11 and 15. This makes sense, though, as these patients are all in the early permanent dentition stage and ready to start comprehensive care. Even though there is significant data, the age groups were not distributed evenly based on number of patients, and this suggests that the number of patients in each age group can skew the data.

6.2a Provider and Insurance Administrator Variance of No OCI/SEI \geq 25

On the other hand, compared to the patient examples in Section 6.1, the example below in Figure 15 (Red Star) differs in that this patient did not have one Orthodontic Criteria Index automatic qualifier and had a doctor-scored Salzmann Evaluation equal to 25, leading to the belief that the patient will qualify for coverage. Imagine a 10-year-old patient, hopeful and anxious, sitting in the dental chair with a mix of spacing, rotations,

deep bite, and over-retained lower right primary second molar. After evaluating the photos and the patient clinically, the panoramic radiograph shows a congenitally missing lower left second premolar and an impacted lower right second premolar; this unique combination led to a doctor's score that qualified for funding, painting a picture of hope for treatment. However, the insurance administrator's final funding decision was denied.



Figure 15. Visual Representation of Age Group 9-12 years old with SEI Variance

In this instance, the patient under consideration falls within the 9–12-year-old age bracket and the records include a panoramic radiograph and intraoral photographs. As per Table 4, this age group exhibited a 36% SEI variance (P value= 0.01) and a 9% OCI variance (P value= 0.61). The statistically significant SEI variance was most pronounced in the 9-12 age group and showed a notable decrease in the other age groups. The relationship between age group and % SEI Variance is inversely proportional, possibly due to differing opinions on what constitutes a permanent dentition (impacted permanent or over-retained primary teeth).

6.3 Correlation of Doctor vs. Insurance Administrator Approval Rate Variances

between the Orthodontic Criteria Index and the Salzmann Evaluation Index

The overall insurance approval from November 1, 2022, to March 31, 2023, was 38.6%, as seen in Figure 5. Moran et al., in 2021, compared the same insurance administrator's overall approval rate for the Salzmann Evaluation Index at 39.8%. This

study further compared six different insurance administrators, and this company had the second lowest approval rate from January 1st, 2018, to December 31st, 2019. During this two-year study, the next largest insurance administrator at TUKSoD had the highest approval rate of 69.7%. The approval rate did not increase for this Insurance company with the addition of the Orthodontic Criteria Index.

The implementation of the Orthodontic Criteria Index (OCI) did not lead to an overall increase in this insurance provider's approval rate but rather a decrease of 1.2%. This decrease could be from population bias and the small sample size. However, it did result in increased agreement with doctor scoring. Being able to confidently inform patients about whether their treatment will be covered or not is crucial for building a strong doctor-patient relationship. It is also important to educate patients about the medically necessary malocclusion in order to help them decide whether to seek orthodontic care (Chambers & Zitterkopf, 2019). The new index is easier to follow and serves as a helpful checklist for referring dentists to determine which cases they can handle themselves and which require the expertise of a specialist. Patients are more inclined to visit an orthodontist when they know that their treatment is more complex (Chambers & Zitterkopf, 2019). The addition of the Orthodontic Criteria Index could lead to higher agreement levels, potentially encouraging more orthodontists to provide care to underserved populations, as it is a more accurate and straightforward index.

6.4 Limitations

One limitation of this study was the small sample size due to the short time range for the data collection. This pilot study was limited to a five-month time span due to the integration and training of the orthodontic criteria index into the screening clinic. A larger,

diverse population will allow for more correlations and descriptive statistics, which could lead to power for descriptive statistics.

Furthermore, the geographic population of the subject pool was limited to North Philadelphia, considering the patient demographic in the Medicaid population as well. Greater than ninety-five percent of the patients were Hispanic/Latino or African American/Black. Many families come together for their initial screening appointments in the clinic. A parent or guardian will bring all his or her children to get screened. One family with four kids would consist of 2.34% of the data collection. This would add bias and skew the data; a longer date range could give more insightful and varied data on these indices used in the clinic.

Another limitation of the study is inter-rater reliability. Different trained assistants and residents take the records. The angle at which an intraoral photograph was taken can impact insurance qualification. Insurance Administrator A uses an intraoral scanner; however, we do not know if all insurance scorers look at that. These patients would have impacted the overall approval rate. Overall, taking appropriate diagnostic records when submitting to insurance and training the staff correctly is imperative when submitting for funding.

6.5 Future Discussion

As this study was a pilot, further research with a longer duration and a larger sample size will establish greater scientific validity. Additional research can evaluate how the timing of the fiscal year contributes to funding differences between insurance administrators and doctors. Furthermore, this study should involve other Medicaid

insurance administrators who use different evaluation methods, including automatic qualifiers.

Finally, future research should take this study to the next level. Artificial Intelligence (AI) should be used to assess these evaluation methods and compare their results with those of doctors and insurance approval processes. As AI technology becomes more prevalent, I anticipate that it may eventually replace the role of insurance administrators, and this research will demonstrate that possibility.

CHAPTER 7

CONCLUSION

The conclusions of the retrospective pilot study are:

- There is a moderate level of agreement between insurance approval and doctor-determined scores.
- All Medicaid insurance administrators should utilize the Orthodontic Criteria Index Automatic Qualifiers as a method for evaluating treatment need as there is greater agreement between Orthodontic Criteria Index Automatic Qualifiers doctor scores and insurance approval, compared to the Salzmann Evaluation Index.
- The newly implemented Orthodontic Criteria Index Automatic Qualifiers criteria have less funding variance and produce greater agreement between insurance and clinician assessment than the Salzmann Evaluation Index.
- Age group and % SEI Variance have an inversely proportional relationship; this may be due to differences in opinion on what constitutes a permanent dentition (impacted permanent or over-retained primary teeth).
- Further research should compare Artificial Intelligence scoring on the Salzmann Evaluation Index and Orthodontic Criteria Index Automatic Qualifiers to doctor and insurance scoring.

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APPENDIX A

INSTITUTION REVIEW BOARD HIPAA WAIVER & APPROVAL (Protocol Number: 30455)



Research Integrity & Compliance
Student Faculty Center
3340 N. Broad Street, Suite 304
Philadelphia PA 19140

Institutional Review Board
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e-mail: irb@temple.edu



Approval of the waiver of HIPAA authorization

Date: 09-May-2023

Protocol Number: 30455

PI: JEFFREY H. GODEL

Committee: A1

Project Title: Medicaid Funding Approval Rate Variances for Comprehensive Orthodontic Treatment among the Orthodontic Criteria Index Automatic Qualifiers and the Salzmann Evaluation Index

On 09-May-2023, the Temple IRB approved the waiver or alteration of HIPAA authorization for the protocol approved with submission # **30455-0003**. The waiver or alteration was reviewed and approved under expedited review procedures.

If this is an alteration of HIPAA authorization, additional information regarding the alteration will be provided below or in a separate manual letter.

The IRB has determined that all the specified criteria for a waiver of HIPAA authorization were met:

The description of the Protected Health Information (PHI), for which use or access is being requested, is included in the protocol summary or a separate data collection document and is necessary for the research.

The use or disclosure of protected health information involves no more than a minimal risk to the privacy of individuals, based on, at least, the presence of the following elements: an adequate plan to protect the identifiers from improper use and disclosure; an adequate plan to destroy the identifiers at the earliest opportunity consistent with conduct of the research, unless there is a health or research justification for retaining the identifiers or such retention is otherwise required by law; and adequate written assurances that the protected health information will not be reused or disclosed to any other person or entity, except as required by law, for authorized oversight of the research study, or for other research for which the use or disclosure of protected health information for which an authorization or opportunity to agree or object is not required by 45 CFR 164.512.

The research could not practicably be conducted without the waiver or alteration.

The research could not practicably be conducted without access to and use of the protected health information.

Please contact the IRB at (215) 707-3390 if you have any questions.

Yuri C. Pillai

Yuri C. Pillai



Approval for a Project Involving Human Subjects Research that is Approved as Exempt

Date: 09-May-2023

Protocol Number: 30455
PI: JEFFREY H. GODEL
Review Type: EXEMPT
Approved On: 09-May-2023
Risk: Minimal risk
Committee: A1
Sponsor: NO EXTERNAL SPONSOR
Project Title: Medicaid Funding Approval Rate Variances for Comprehensive Orthodontic Treatment among the Orthodontic Criteria Index Automatic Qualifiers and the Salzmann Evaluation Index

The IRB approved the protocol 30455.

The study was approved under Exempt review. The IRB determined that the research **does not require a continuing review**, consequently there is not an IRB approval period.

As this research was approved as Exempt, the IRB will not stamp the consent or assent form(s).

Note that all applicable Institutional approvals must also be secured before study implementation. These approvals include, but are not limited to, Medical Radiation Committee ("MRC"); Radiation Safety Committee ("RSC"); Institutional Biosafety Committee ("IBC"); and Temple University Survey Coordinating Committee ("TUSCC"). Please visit these Committees' websites for further information.

Finally, in conducting this research, you are obligated to submit the following:

- **Amendments - Any changes to the research that may change the Exempt status of this study must be reviewed and approved by the IRB prior to implementation.** Examples of such changes are: including new, sensitive questions to a survey or interview, changing data collection such that de-identified data will now be identifiable, including an intervention in the methods, changing variables to be collected from medical charts, decreasing confidentiality measures, including minors or adults lacking capacity to consent as subjects when previously only adults with capacity to consent were to be enrolled, no longer collecting signed HIPAA Authorization, etc. Please reach out to the IRB Staff with any questions about if a change to the study warrants an Amendment.
- **Reportable New Information** - Using the Reportable New Information e-form, report new information items such as those described in HRP-071 Policy - Prompt Reporting Requirements to the IRB **within 5 days**.
- **Closure report** - Using a closure e-form, submit when the study is permanently closed to enrollment; all subjects have completed all protocol related interventions and interactions; collection of private identifiable information is complete; and analysis of private identifiable information is complete.

APPENDIX B

SUMMARY OF SUBJECTS & RAW DATA COLLECTION (Sex, Ethnicity, Screening Date, Age at Records)

Table 8. *Summary of Subjects & Raw Data (Sex, Ethnicity, Screening Date, Age at Records)*

Subject	Sex	Ethnicity	Screening Date	Age at Records
1	F	Hispanic or Latino	11/2/2022	15
2	F	African American or Black	12/12/2022	12
3	F	African American or Black	1/31/2023	13
4	M	African American or Black	2/22/2023	19
5	F	African American or Black	11/22/2022	10
6	F	African American or Black	3/16/2023	14
7	M	African American or Black	10/20/2022	10
8	F	African American or Black	1/31/2023	12
9	M	African American or Black; Hispanic or Latino	2/15/2023	15
10	F	African American or Black	11/3/2022	15
11	M	African American or Black	4/12/2023	9
12	M	African American or Black	4/3/2023	10
13	F	African American or Black	4/5/2023	17
14	F	African American or Black	1/12/2023	16
15	F	African American or Black	11/18/2022	17
17	M	Hispanic or Latino	12/7/2022	14
18	M	Hispanic or Latino	12/14/2022	14
19	M	Hispanic or Latino	1/16/2023	17
20	F	African American or Black	2/16/2023	14
21	F	Hispanic or Latino	2/15/2023	11
22	M	Hispanic or Latino	1/11/2023	12
23	F	Hispanic or Latino	3/6/2023	20
24	F	Hispanic or Latino	11/3/2022	18
25	M	Hispanic or Latino	4/11/2023	13
26	M	Hispanic or Latino	2/16/2023	15
27	F	African American or Black	4/12/2023	11
28	F	African American or Black	12/1/2022	16
29	M	African American or Black	1/24/2023	10
30	M	African American or Black	2/9/2023	14
31	M	Hispanic or Latino	11/28/2022	12
32	F	Hispanic or Latino	4/3/2023	16
33	F	African American or Black	1/4/2023	10
34	F	Hispanic or Latino	1/16/2023	15

Table 8. (continued)

35	F	African American or Black	3/6/2023	20
36	F	Hispanic or Latino	4/18/2023	14
37	M	African American or Black	2/13/2023	18
38	M	Hispanic or Latino	3/6/2023	14
39	F	Hispanic or Latino	1/17/2023	12
40	F	African American or Black	2/22/2023	18
41	F	African American or Black	1/12/2023	20
42	F	African American or Black	1/18/2023	14
44	M	African American or Black	3/21/2023	12
45	F	African American or Black	2/1/2023	11
46	F	Hispanic or Latino	12/2/2022	11
47	M	Hispanic or Latino	11/30/2022	12
48	F	African American or Black	11/18/2022	11
49	M	Hispanic or Latino	1/6/2023	12
50	F	Hispanic or Latino	3/23/2023	12
51	M	Hispanic or Latino	2/8/2023	13
52	M	Hispanic or Latino	2/15/2023	10
53	M	Hispanic or Latino	11/9/2022	13
54	F	Caucasian or White	1/11/2023	13
55	F	Hispanic or Latino	11/9/2022	17
56	F	African American or Black	11/3/2022	19
57	M	African American or Black	11/1/2022	14
58	F	Hispanic or Latino	11/2/2022	16
60	M	African American or Black	3/15/2023	15
61	F	Hispanic or Latino	2/10/2023	18
63	M	Hispanic or Latino	11/11/2022	11
64	F	Hispanic or Latino	12/2/2022	20
65	F	Hispanic or Latino	11/2/2022	19
67	F	African American or Black	1/11/2023	19
68	M	African American or Black	11/17/2022	13
69	M	Hispanic or Latino	11/2/2022	12
70	F	African American or Black	11/2/2022	12
72	M	Hispanic or Latino	11/3/2022	11
73	M	Hispanic or Latino	11/3/2022	15
74	F	African American or Black	11/30/2022	12
75	M	Hispanic or Latino	11/9/2022	13
76	F	African American or Black	11/9/2022	14
77	F	Hispanic or Latino	11/9/2022	18
78	M	African American or Black	1/11/2023	18
79	M	Hispanic or Latino	11/10/2022	11
80	F	Hispanic or Latino	11/10/2022	18

Table 8. (continued)

81	F	African American or Black	2/21/2023	12
83	M	Hispanic or Latino	12/7/2022	14
84	F	Hispanic or Latino	12/7/2022	12
88	F	Hispanic or Latino	12/9/2022	15
91	M	Caucasian or White	1/19/2023	12
92	F	African American or Black	12/2/2022	11
94	F	African American or Black	11/30/2022	13
95	F	African American or Black	11/30/2022	19
96	F	Hispanic or Latino	11/30/2022	13
98	M	Hispanic or Latino	12/5/2022	12
99	F	African American or Black; Hispanic or latino	12/1/2022	13
101	M	Hispanic or Latino	12/1/2022	16
102	M	African American or Black; Hispanic or latino	1/20/2023	11
103	F	African American or Black; Hispanic or latino	1/11/2023	15
104	M	Hispanic or Latino	12/7/2022	15
105	F	African American or Black; Hispanic or latino	12/7/2022	12
106	M	Hispanic or Latino	12/7/2022	12
107	M	African American or Black; Hispanic or latino	12/8/2022	12
108	M	African American or Black; Hispanic or latino	1/12/2023	15
109	F	Hispanic or Latino	12/14/2022	19
110	F	Hispanic or Latino	12/14/2022	12
111	M	African American or Black	2/1/2023	15
112	M	Caucasian or White; Hispanic or Latino	12/14/2022	15
114	M	African American or Black	12/15/2022	12
115	F	Hispanic or Latino	1/5/2023	13
116	F	Hispanic or Latino	1/26/2023	14
117	F	Hispanic or Latino	1/4/2023	12
118	M	Hispanic or Latino	1/4/2023	11
119	M	African American or Black; Hispanic or latino; American Indian/Alaska Native	4/19/2023	13
120	M	Hispanic or Latino	1/26/2023	11
121	F	Hispanic or Latino	3/13/2023	11
122	F	Hispanic or Latino	2/8/2023	14

Table 8. (continued)

123	F	Hispanic or Latino	1/11/2023	20
125	M	Hispanic or Latino	2/8/2023	10
126	F	African American or Black	1/11/2023	18
127	F	Hispanic or Latino	2/2/2023	15
129	F	African American or Black	1/12/2023	11
130	M	Native Hawaiian or Pacific Islander	2/15/2023	17
131	M	Hispanic or Latino	1/19/2023	15
135	M	African American or Black	1/19/2023	17
136	F	Hispanic or Latino	1/20/2023	12
137	M	Hispanic or Latino	4/6/2023	17
138	M	Hispanic or Latino	4/6/2023	16
139	M	Hispanic or Latino	4/6/2023	14
141	M	Hispanic or Latino	2/23/2023	14
142	M	Hispanic or Latino	4/19/2023	15
143	F	African American or Black	1/25/2023	18
144	F	African American or Black	1/25/2023	20
145	M	African American or Black	2/8/2023	18
146	M	African American or Black	2/1/2023	13
148	F	African American or Black	2/1/2023	19
149	F	Hispanic or Latino	2/1/2023	19
153	M	African American or Black	2/8/2023	16
154	F	Hispanic or Latino	2/8/2023	14
155	F	African American or Black	2/8/2023	16
156	F	African American or Black	2/8/2023	18
160	M	Hispanic or Latino	2/9/2023	12
161	F	African American or Black	3/23/2023	15
163	F	Hispanic or Latino	3/23/2023	12
167	F	Hispanic or Latino	2/14/2023	15
168	F	Hispanic or Latino	2/14/2023	15
169	M	Hispanic or Latino	3/16/2023	14
170	F	Hispanic or Latino	3/16/2023	11
171	F	Hispanic or Latino	2/15/2023	11
172	F	African American or Black	4/5/2023	16
174	M	Caucasian or White	2/16/2023	15
175	F	Hispanic or Latino	2/16/2023	14
176	M	African American or Black	4/5/2023	12
177	F	Hispanic or Latino	4/5/2023	15
178	M	African American or Black	11/22/2022	16
179	F	Hispanic or Latino	2/21/2023	14
181	F	Caucasian or White	2/22/2023	15
183	M	Hispanic or Latino	4/12/2023	11

Table 8. (continued)

184	F	Hispanic or Latino	2/22/2023	17
185	M	Hispanic or Latino	2/22/2023	12
188	F	Hispanic or Latino	4/13/2023	13
189	F	African American or Black	4/13/2023	12
191	F	African American or Black	4/19/2023	12
192	F	Hispanic or Latino	4/3/2023	15
193	F	Hispanic or Latino	4/18/2023	15
194	M	African American of Black	4/20/2023	11
195	F	Hispanic or Latino	3/7/2023	15
196	F	African American of Black	4/27/2023	14
199	M	African American of Black	4/27/2023	13
202	M	Hispanic or Latino	3/15/2023	14
204	F	African American of Black	3/16/2023	15
205	M	African American of Black	3/16/2023	15
206	M	African American of Black	3/16/2023	15
207	F	African American of Black	3/16/2023	15
209	M	Hispanic or Latino	4/26/2023	15
210	F	African American of Black	4/20/2023	14
211	M	Hispanic or Latino	3/22/2023	13
212	F	African American of Black	4/5/2023	14
213	F	Hispanic or Latino	4/5/2023	12
214	M	Hispanic or Latino	4/5/2023	17
215	F	Hispanic or Latino	4/5/2023	17
219	F	Hispanic or Latino	4/27/2023	14

APPENDIX C

SUMMARY OF SUBJECTS & RAW DATA COLLECTION (Doctor SEI Score, SEI Insurance Decision, OCI Doctor Submission, OCI Insurance Decision)

Table 9. Summary of Subjects & Raw Data (Doctor SEI Score, SEI Insurance Decision, OCI Doctor Submission, OCI Insurance Decision)

Subject	Doctor SEI Score	SEI Insurance Decision	OCI Doctor Submission	OCI Insurance Decision
1	27	Denied	none	N/A
2	16	Denied	PX- posterior transverse	Denied
3	21	Denied	none	N/A
4	15	Denied	none	N/A
5	22	Approved	AX-anterior crossbite	Approved
6	9	Denied	none	N/A
7	4	Denied	none	N/A
8	22	Approved	PO-posterior open bite	Approved
9	29	Denied	AP-anterior-posterior discrepancy; OJ-overjet	Denied
10	18	Approved	AP-anterior-posterior discrepancy	Approved
11	22	Approved	none	N/A
12	29	Approved	AO-anterior open bite	Approved
13	13	Denied	none	N/A
14	19	Approved	AX-anterior crossbite; IMP-impacted	Approved
15	28	Denied	none	N/A
17	7	Approved	IMP-impacted	Approved
18	10	Denied	none	N/A
19	11	Denied	none	N/A
20	14	Denied	IMP-impacted	Denied
21	22	Approved	AX-anterior crossbite	Approved
22	19	Approved	IMP-impacted	Approved
23	22	Denied	AP- anterior-posterior discrepancy	Denied
24	22	Denied	AO-anterior open bite	Denied
25	19	Denied	AX-anterior crossbite	Denied
26	17	Denied	none	N/A
27	17	Denied	none	N/A
28	16	Approved	none	N/A
29	22	Denied	none	N/A
30	20	Denied	none	N/A
31	26	Approved	none	N/A
32	32	Approved	DO-overbite; IMP-impacted; OJ-overjet	Approved

33	30	Denied	none	N/A
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Table 9. (continued)

34	12	Approved	AP- anterior-posterior discrepancy	Approved
35	11	Denied	none	N/A
36	22	Denied	OJ-overjet	Denied
37	34	Approved	DO-overbite; OJ-overjet	Approved
38	25	Denied	none	N/A
39	10	Denied	none	N/A
40	12	Denied	none	Denied
41	18	Approved	AP-anterior-posterior discrepancy	Approved
42	25	Denied	OJ-overjet	Denied
44	43	Denied	none	N/A
45	28	Approved	none	N/A
46	16	Denied	none	N/A
47	27	Approved	PO-posterior open bite	Approved
48	23	Denied	AX-anterior crossbite; IMP-impacted	Denied
49	30	Approved	OJ-overjet	Approved
50	23	Denied	DO-overbite	Denied
51	9	Denied	none	N/A
52	7	Approved	IMP-impacted	Approved
53	30	Approved	AO-anterior open bite	Approved
54	25	Approved	DO-overbite; IMP-impacted	Approved
55	39	Approved	AP-anterior-posterior discrepancy	Approved
56	9	Denied	none	N/A
57	34	Denied	none	Denied
58	7	Denied	none	N/A
60	12	Denied	IMP-impacted	Denied
61	26	Approved	PO-posterior open bite	Approved
63	13	Denied	AX- anterior crossbite	Denied
64	12	Denied	none	N/A
65	16	Denied	none	N/A
67	10	Denied	none	N/A
68	14	Denied	none	N/A
69	36	Approved	OJ-overjet	Approved
70	29	Approved	AO-anterior open bite	Approved
72	27	Approved	none	N/A
73	20	Approved	AP-anterior-posterior discrepancy	Approved
74	19	Denied	none	N/A
75	17	Denied	AO-anterior open bite	Denied
76	23	Approved	AO-anterior open bite; OJ-overjet	Approved
77	15	Denied	none	N/A
78	41	Approved	AO-anterior open bite; AP-anterior-posterior discrepancy	Approved

79	15	Denied	none	N/A
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Table 9. (continued)

80	22	Denied	none	N/A
81	11	Approved	OJ-overjet	Approved
83	11	Denied	none	N/A
84	9	Denied	none	N/A
88	13	Denied	none	N/A
91	19	Approved	IMP-impacted	Approved
92	24	Approved	none	N/A
94	15	Denied	none	N/A
95	21	Denied	none	N/A
96	22	Approved	IMP-impacted	Approved
98	18	Denied	none	N/A
99	10	Denied	none	N/A
101	31	Approved	AX-anterior crossbite	N/A
102	28	Approved	OJ-overjet	Approved
103	21	Denied	none	N/A
104	19	Denied	none	N/A
105	15	Approved	IMP-impacted	Approved
106	40	Approved	DO-overbite; OJ-overjet; AP-anterior-posterior discrepancy	Approved
107	30	Approved	AO-anterior open bite	Approved
108	15	Denied	none	N/A
109	6	Denied	none	N/A
110	24	Approved	AO-anterior open bite	Approved
111	30	Approved	none	N/A
112	17	Approved	IMP-impacted	Approved
114	20	Denied	none	N/A
115	21	Denied	none	N/A
116	11	Denied	none	N/A
117	29	Denied	none	N/A
118	36	Approved	DO-overbite	Approved
119	22	Approved	none	N/A
120	15	Approved	IMP-impacted	Approved
121	13	Approved	IMP-impacted	Approved
122	17	Denied	none	N/A
123	22	Denied	PX- posterior transverse	Denied
125	16	Denied	none	N/A
126	6	Denied	none	N/A
127	10	Denied	none	N/A
129	13	Denied	none	N/A
130	22	Approved	IMP-impacted	Approved

131	23	Denied	none	N/A
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Table 9. (continued)

135	30	Approved	none	N/A
136	10	Denied	none	N/A
137	25	Approved	AO-anterior open bite	Approved
138	19	Denied	none	N/A
139	17	Denied	none	N/A
141	25	Denied	IMP-impacted	Denied
142	11	Denied	none	N/A
143	8	Denied	none	N/A
144	17	Denied	none	N/A
145	15	Denied	none	N/A
146	7	Denied	none	N/A
148	13	Denied	none	N/A
149	10	Denied	none	N/A
153	21	Approved	AX-anterior crossbite	Approved
154	15	Denied	none	N/A
155	7	Denied	none	N/A
156	17	Denied	none	N/A
160	17	Denied	none	N/A
161	32	Denied	DO-overbite	Denied
163	10	Denied	none	N/A
167	19	Denied	none	N/A
168	26	Approved	DO-overbite	Approved
169	18	Denied	None	N/A
170	24	Approved	DO-overbite; IMP-impacted	Approved
171	20	Approved	IMP-impacted	Approved
172	10	Denied	none	N/A
174	31	Approved	DO-overbite	Approved
175	16	Approved	IMP-impacted	Approved
176	24	Denied	none	N/A
177	13	Denied	none	N/A
178	37	Approved	AO-anterior open bite; AX-anterior crossbite; PO-posterior open bite	Approved
179	19	Denied	none	N/A
181	20	Denied	none	N/A
183	18	Denied	DO-overbite	Denied
184	18	Denied	none	N/A
185	22	Approved	DO-overbite	Approved
188	13	Denied	none	N/A
189	11	Denied	none	N/A

191	17	Denied	None	N/A
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Table 9. (continued)

192	35	Approved	PX- posterior transverse; AX- anterior transverse	Approved
193	19	Approved	IMP-impacted	Approved
194	21	Approved	PX- posterior transverse	Approved
195	25	Approved	none	N/A
196	18	Denied	none	N/A
199	17	Approved	AX- anterior crossbite	Approved
202	11	Denied	none	N/A
204	28	Approved	none	N/A
205	11	Denied	AX- anterior crossbite	Denied
206	9	Denied	AX- anterior crossbite	Denied
207	14	Denied	none	N/A
209	27	Approved	none	N/A
210	12	Denied	none	N/A
211	12	Denied	none	N/A
212	22	Approved	PX- posterior transverse	N/A
213	12	Denied	none	Denied
214	24	Approved	AP-anterior-posterior discrepancy	Approved
215	9	Approved	AP-anterior-posterior discrepancy	Approved
219	28	Denied	none	N/A