**Evaluation of Moderate Sedation Appointment Failures in an Urban Postgraduate
Pediatric Dentistry Clinic**

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LIST OF ABBREVIATIONS

AAO	American Academy of Otolaryngology
AAPD	American Academy of Pediatric Dentistry
AAP	American Association of Pediatrics
ADA	American Dental Association
ASA	American Society of Anesthesiologists
COI	Conflict of Interest
DMFS	Decayed, Missing, Filled Tooth Surfaces (Numeric Score)
DMFT	Decayed, Missing, Filled Teeth (Numeric Score)
DSM-V	Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
EHR	Electronic Health Records
ECC	Early Childhood Caries
GA	General Anesthesia
IRB	Institutional Review Board
NPO	Nil Per Os (Latin phrase for nothing through the mouth)
PG	Post Graduate
PI	Principal Investigator
S-ECC	Severe Early Childhood Caries
UIC	University of Illinois at Chicago
UIC COD	University of Illinois at Chicago College of Dentistry

SUMMARY

A retrospective cross-sectional study was conducted on patients scheduled for moderate sedation dental visits at the UIC COD between January 1, 2018 and November 1, 2019. Details regarding patients' first scheduled moderate sedation appointments across this timespan were recorded. Information on patient demographics, appointment characteristics, and clinic experience were collected. Information regarding whether the sedation was completed or not was recorded; and if the sedation was incomplete, the reasoning for why it did not get completed was documented. The goal of this study was to assess which factors are associated with failed moderate sedation appointments.

Over the course of twenty-two months, 618 patients were scheduled for moderate sedation appointments at UIC COD. In all, 1058 moderate sedation appointments were scheduled with each patient on average scheduling 1.72 sedation appointments. Of the first scheduled encounters, 512 patients (82.9 %) attended their appointment and 106 patients (17.1%) either canceled or failed the visit.

In total, of the 512 attended moderate sedation visits, 410 first-time sedations (80.1%) were completed and 102 appointments (19.9%) did not have a sedation go through. Among the reasons for attended sedation non-completion, airway (n = 33, 35.3%), illness (n = 29, 28.4%), and NPO violation (n=22, 21.5%) were the most common. This leads us to believe that airway assessment calibration could be improved across residents and staff at UIC COD. Additionally, we found several factors associated with an increased rate of patient attendance to their dental sedation appointment.

1. INTRODUCTION

1.1. Background

Moderate sedation is a pharmacological technique that minimizes the pediatric patient's discomfort, and controls anxiety and behavior to allow for the safe completion of a dental procedure. Moderate sedation visits can be done in the dental clinic under supervision of the pediatric dentist following a strict management protocol to maximize procedural and patient safety.[1,2] Patient evaluation at a treatment planning appointment, as well as on the day of surgery is essential for safe delivery of care. Protective airway reflexes may be impaired by the sedative medications, subsequently increasing the risk for airway compromise. In order to effectively mitigate the risk of airway compromise, providers must emphasize patient selection candidacy and emphasize an adherence to strict presurgical protocols. One of the requirements for performing moderate sedation is that the child must follow the standard NPO guidelines for general anesthesia (GA) to avoid the risk of aspiration. Additionally, on the day of treatment, should the child have any factors that may cause airway compromises including illness, enlarged tonsils, or constricted airway the appointment is recommended to be rescheduled. Consequently, many factors can result in a sedation appointment not going through, including the patient not attending the appointment; the patient is ill or experiencing tonsillar hypertrophy; the patient has a compromised airway; or the patient has violated NPO guidelines.

1.2. <u>Statement of the Problem</u>

Moderate sedation appointments require a longer time block to ensure the safety and recovery of the patient. Systemically, sedation appointments can be costly if they do not go through on the scheduled date of service. Scheduled sedation appointments are not being completed for a multitude of reasons. These reasons include the sedations being canceled in advance, patients no-showing their appointment, and patients attending the sedation appointment but the perceived risk precludes the sedation from going through. A better understanding of which factors impede scheduled moderate sedation appointments from being completed is much needed.

1.3. <u>Purpose of the Study</u>

The aim of this study was to identify factors that negatively impact moderate sedation appointment attendance and completion rate and to assess for associations with demographic, social, and health-care variables.

2. REVIEW OF THE LITERATURE

2.1. Early Childhood Caries (ECC)

Dental caries has been shown to be the "most common chronic infectious disease of childhood."[3] Within pre-school aged children in the United States, an estimated 23% have caries in their primary teeth, about half of which are left untreated.[4,5] Untreated dental caries poses a major public health concern in the United States. In the state of Illinois, over 75% of Illinois counties do not have a safety net dental clinic in their area and only 55% of safety net clinics are comfortable performing complex restorative care on children.[6] Consequently, in Illinois, many pediatric patients with complex behavioral and/or restorative needs require a specialty clinic to treat the dental disease. The University of Illinois at Chicago (UIC) Pediatric Dentistry program receives over 30 referrals for definitive restorative care every day. Accordingly, patients are required to commute and undergo lengthy wait-times in order to obtain necessary dental treatment.

According to the American Academy of Pediatric Dentistry (AAPD), the disease of ECC is defined by "the presence of one or more decayed (cavitated or non-cavitated), missing (due to caries), or filled tooth surfaces (dmfs) in any primary tooth before the age of 71 months old in a child.[7] In a child under the age of three years, the presence of "any smooth surface (carious) lesions" diagnoses a patient with Severe Early Childhood Caries (S-ECC).[7] Between the ages three through five years, S-ECC is defined by "the presence of one or more smooth surface lesions in primary maxillary anterior teeth."[7] Additionally, S-ECC may be defined by "DMFS ≥4 in a three year old, DMFS≥5 in a four year old, or DMFS ≥6 in a five year old."[7] ECC and dental caries are both multifactorial in origin. Among the risk factors for developing dental caries are sugar sweetened beverages, ad libitum breast-feeding, frequent snacking, baby bottle

usage beyond 12-18 months, poor fluoride exposure, and poor oral hygiene preventative measures.[7] If caries remain untreated, patients are at an elevated risk for the development of new dental caries. Patients may miss school time and face more challenges learning in the classroom. Additionally, patients with untreated decay are at an increased risk for visits to the emergency room and hospital admissions, which may place a substantial financial burden on families.[7]

2.2. Behavioral Guidance

Dental phobia is defined as "a persistent and excessive fear of dental stimuli and procedures that results in avoidance or significant distress for a patient."[8] Dental phobia is recognized under the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V) as a specific-type phobia, with estimates as high as 20% of children presenting to the dental clinic having with this condition.[9] Dental anxiety is defined as "a heightened fear of dental procedures that may or may not reach the full criteria for a phobia diagnosis."[8] Prevalence reports for children and adolescents who experience dental anxiety range from 5-20 percent.[8] Children with dental phobias and dental anxiety present a challenge to pediatric dental providers in the provision of dental care. Behavior guidance techniques are endorsed by the AAPD with the goal of "alleviating anxiety, fostering a positive dental attitude, and performing safe and quality oral health care."[10] Behavioral guidance techniques range in scope from basic to advanced, depending on the level of patient cooperation, in order to meet the specific treatment needs of each individual patient.

Most patients may be managed with basic techniques, such as tell-show-do, communication, distraction, and communicative guidance. Advanced behavioral guidance techniques include providing care under GA, protective stabilization or moderate sedation and

may need to be employed if the patient's level of cooperation does not permit dental treatment. It is important to note that each technique is not used in isolation, but rather in combination and synchronicity to best deliver care to the patient.

2.3. Oral Moderate Sedation for Dental Caries

Moderate sedation dental visits provide the goal of minimizing a pediatric patient's discomfort and controlling anxiety to allow for the safe completion of a dental procedure through the patient's ingestion of a pharmacologic agent. Indications for performing a sedation visit include patient fear or anxiety, patients who are minimally cooperative, and families who travel extensive distances. Contraindications to treatment planning moderate sedation include cooperative patients with minimal dental needs, predisposing medical conditions, or parental objection.[11]

A patient's depth of sedation operates within a continuum from minimal sedation to GA.[12] According to the American Society of Anesthesiologists (ASA), Oral Moderate Sedation aims to achieve a depth of sedation that maintains adequate spontaneous ventilation, maintains cardiovascular function, and continuously elicits a purposeful response to verbal or tactile stimulation.[12] While a provider may aim to provide up to a certain depth of sedation, patients may react more strongly to the dosing regimen and revert to a deeper state. Therefore, providers must be trained to rescue a patient from a sedation depth one deeper than the desired level. At the level of deep sedation, airway intervention may be required as spontaneous ventilation may be insufficient. Accordingly, the administration of oral moderate sedation requires oral health providers to be trained through the level of providing deep sedation and in the administration of

airway interventions in order to maintain mechanical ventilation. This training is an essential component of pediatric dental residency programs.

Some risks of moderate sedation administration include pulmonary aspiration, airway obstruction, laryngospasm, hypoxia, and other forms of airway compromise.[1] Even with strict patient screening and monitoring protocols in place, risk for adverse events remain. Through the administration of midazolam, adverse events such as hiccoughing, hypoxemia, nausea, and emesis were reported from midazolam dosages between .25 and 1.0 mg/kg.[13,14] According to the Pediatric Sedation Research Consortium who assessed moderate sedations performed in the oral surgery setting, they found that airway obstruction or hypoxemia occurred 575 times for every 10,000 sedations that were administered.[15] Due to the risk, airway evaluation and patient selection for the moderate sedation patient candidate are exceedingly important.

There are many factors that need to be taken into consideration before determining a patient's candidacy for oral moderate sedation. Before scheduling an appointment for sedation, patients are typically treatment planned for the procedure. At the treatment planning appointment candidacy is considered depending on the patient's age, weight, medical history, airway, amount of restorative work needed, and overall patient behavior. Strict safety guidelines are in place for proper monitoring and management of the pediatric patient during moderate sedation visits.[1] An accurate and detailed medical history for sedation visits is extremely important. Due to risk of airway compromise, the patient cannot have a history of airway disease or cardiovascular concerns. Additionally, a premature birth and history of snoring/obesity/sleep apnea increases the risk for subglottic stenosis and propensity to apnea, so this would preclude the patient's ability to undergo a safe moderate sedation in the dental chair. A comprehensive airway evaluation is required to ensure that a patent airway can be maintained for the duration of

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the procedure. The two methodologies for evaluating airway in pediatric dentistry include the Brodsky and Mallampati Classifications. In the Brodsky Classification, tonsils are graded on a scale of zero to four depending on the degree of tonsillar airway obstruction.[16] The Mallampati Classification characterizes the degree of throat visibility on a scale of one to four upon airway evaluation and classifies the risk for potential airway obstruction in sedation patients.[17]

There are very few literature reports that recommend a specific cutoff for Brodsky or Mallampati Classifications in order to perform a moderate sedation. Instead, organizations such as the ASA, AAPD, and the American Academy of Otolaryngology (AAO) provide clinical practice guidelines for performing moderate sedations.[1,18,19] The ASA guidelines state that visibility of the uvula should be used as an indicator of a difficult airway[19] and that tonsillar hypertrophy may be associated with a difficult to manage airway[20] The AAO defines tonsillar hypertrophy as a 3+ Brodsky classification if the tonsils fill >50% of transverse oropharyngeal space.[18] In the UIC post graduate (PG) pediatric dental clinic, a patient is classified as a candidate for oral sedation if their Mallampati and Brodsky Classification score is a two or below.

2.4. Sedation Appointment Failures

When performed well, moderate sedations limit the number of operative appointments for patients with dental anxiety and allow for a safer and more efficient delivery of treatment. Many factors can lead to a failed sedation appointment. Factors outside of no-shows or appointment cancellations include failure to comply with ASA NPO guidelines, constricted airway classification on the day of service compared to the pre-operative assessment, recent illness, delayed arrival, extreme un-cooperation, lack of consent, or concern with medical history.

Due to the risk of aspiration, patients must avoid eating or drinking liquids immediately preceding the sedation. NPO status is defined by the corresponding food group with a specific allotment of time that the child must abstain from ingesting prior to the moderate sedation appointment. The child may not drink clear liquids for 2 hours prior; may not ingest breast milk for 4 hours prior to surgery; for 6 hours prior to surgery, the child may not ingest infant formula, nonhuman milk nor a light meal; and fatty food meals must be avoided for 8 hours preceding the sedation treatment.[21] Adherence to these recommendations poses a challenge when scheduling moderate sedation appointments, and proceeding with the sedation will be aborted if patients fail to follow the guidelines.

Failure to attend a sedation appointments delays treatment times for families, leads to an added cost to healthcare systems due to misallocated use of resources, decreases clinic efficiency, and misuses the family's and clinic's time. University-based programs typically offer dental care to low income patients with public insurance. Public insurance patients have been shown to display a higher rate of no-shows for their dental appointments, with a no-show rate estimated to be as high as three-times that of privately insured patients.[22] Guzek et al. reported that Medicaid insurance, patient's distance from clinic (>50 miles), and the waiting period since the previous appointment were all related to appointment failures.[23] Decreased environmental temperature and certain racial groups have been associated with no-shows for GA procedures.[23] A retrospective study by Casaverde et al., investigating sedation visits reported that no-shows were most highly found among children with high caries scores, poor behavior, a long waiting time between appointments, multiple prior missed visits and a lack of serviceable phone.[24]

3. MATERIALS AND METHODS

This study was conducted as a retrospective cross-sectional study of a sample of patients with scheduled moderate sedation visits at the UIC COD PG Clinic between January 1, 2018 and November 1, 2019. The sampling frame included all patients with a scheduled moderate sedation visit during that time. Electronic health records (EHR) were reviewed individually to inspect if patients met the inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
Sedation was scheduled beforehand	Patient sedation without pre-scheduling
DMFT≥1	DMFT = 0
Only the first scheduled sedation for patients with multiple sedations	Patients locked out of AxiUm due to financial/administrative disputes

Figure 1 – Inclusion and Exclusion Criteria

The Institutional Review Board of the University of Illinois at Chicago on November 19th, 2019 granted permission (Protocol # 2019-1290) to conduct this research trial, which followed a retrospective cross-sectional study design. The study sample was obtained from the pool of patients attending the PG Pediatric Dentistry Clinic, COD, UIC. The system administrator of the electronic health record (EHR) system Axium used at the COD, generated a list of all pediatric dental patients who have had a scheduled moderate sedation appointment in the 22-month period between January 1, 2018 and November 1, 2019. The principal investigator (PI) reviewed the EHR notes of all patients from this list to identify those who met the inclusion and exclusion criteria. Patients fulfilling the study selection criteria were enrolled as subjects

and assigned a study number. For each subject the PI evaluated the respective EHR information

pertinent to the aims of the study and recorded all relevant findings into the study's data

collection sheet (**Appendix A)**, created in Microsoft® Excel 2018 (v18.0, Microsoft Inc.,

Redmond, Wash., USA). The data was de-identified as included subjects' demographic

information as well as items related to the study's aim. A letter from the Institutional Review

Board granting exemption status can be seen in **Appendix B**.

In an effort to understand the impact of patients' characteristic on attendance and

sedation completion, only the first sedation encounter was studied for each patient over the 22

month window. All procedural notes and contact notes were reviewed to assess the

appointment's nature.

Demographic information collected included patient's age on the day of the appointment

defined in years, sex (male or female), race (Caucasian, African-American, Asian, American

Indian or Alaskan Native, or "Not Reported"), and ethnicity (Hispanic, Non-Hispanic, or "Not

Reported), language (English or non-English), and patient's home distance from clinic. Distance

to clinic was calculated in miles through a Google Maps entry of patient's home address zip code

to the address of UIC COD. The zip code was not recorded directly, and distance was marked in

miles. Clinical data was obtained from the patient's electronic health record and included the

following: (1) patient's behavior rating at the treatment planning appointment and/or prior

operative visit,(2) dmft score, (3) time lapse between appointments,(4) previous sedations, (5)

appointment confirmation, and (6) number of prior no-shows. The time lapse between prior

appointment was determined through AxiUm by calculating the length of time between the date

of the sedation appointment and when the sedation appointment was scheduled.

The primary outcome variables included whether the patient attended the scheduled moderate sedation appointment, whether the sedation was completed, and if the sedation did not go through, the reason not going through.

Behavior was identified via the Frankl scale, which is a standardized behavioral scale that is done by each resident at every clinical encounter. Frankl scale ranges from F1 (definitely negative) to F4 (definitely positive).[10] The patient's Frankl score was recorded if the patient had a prior operative visit, and at the treatment planning visit when a periodic oral examination or comprehensive oral examination is performed. This visit typically presents with lower stimulus as no anesthesia is needed and only a routine dental cleaning is performed, so it provides a good baseline for the child's behavior.

Recording the patient's dmft score was performed by accessing the EHR's odontogram for the date of the patient's sedation treatment planning appointment. This appointment is typically an examination visit where sedation becomes the agreed upon treatment modality, instructions are reviewed, and the odontogram is brought up-to-date. An odontogram displays the patient's teeth on AxiUm through an illustration of all hard tissue findings. Dmft records teeth that have received prior fillings, currently contain decay and are missing teeth due to extraction. Dmft does not consider teeth that contain decalcified tooth surfaces, erosion, tooth agenesis, or teeth marked as 'to watch' in its numerical calculation.

Patient confirmation was determined via three methodologies. 1) The automated phone call confirmation system that calls the patient one to two days before each visit; 2) verbal phone call confirmation by the front desk staff a day or two before the sedation appointment; and, 3) verbal confirmation is attained via phone call by the resident a day or two before the sedation appointment. All patients received an automated confirmation using their registered preferred

contact phone number two days prior to their visit using the preferred contact phone number. If the patient stated that they would attend, this was marked as confirmed in the EHR and if not, this was marked as an unconfirmed through the automated system. Verbal confirmations were done by the front desk staff and/or by the resident provider. In the patient contact notes, staff and providers were instructed to insert a note if a patient was contacted, thus reviewing the AxiUm contact note will reveal whether the front desk staff and/or the provider had called to confirm the patient's appointment. All contact notes were reviewed in the patient's EHR to determine if the sedation appointment had been confirmed verbally, unconfirmed, or if a voicemail was left. For the purposes of data analysis, appointments were labeled as unconfirmed if a voicemail was left. If a family opted to reschedule or cancel their scheduled sedation visit, the appointment was marked as canceled. Patient's attendance was recorded as a yes/no/canceled basis.

Patient's attendance was recorded on a yes/no/canceled basis. If the patient did not attend the visit (no-shows) or cancels the scheduled appointment less than 24 hours prior to the scheduled appointment, the sedation appointment was considered a failure. If the patient canceled over 24 hours prior to the sedation appointment, the appointment was marked as canceled. The scope of the study investigated whether the sedation was attended or not, therefore, failed and canceled appointments were combined. Sedation completion was determined if the code D9248, the designated American Dental Association (ADA) billing code for moderate sedation was marked as complete.

Sedation appointment failure was defined as the unsuccessful completion of a sedation visit on the scheduled date of service. Additionally, if the patient did attend the scheduled appointment, but the risk was determined too high to proceed with the medicine delivery and the

code D9248 was not completed, the sedation was marked as attended but also as a failure to complete. The reason for an attended-sedation failure to complete was further ascertained from the patient's clinical note. The reasons were codified and categorized into the following categories: Illness, Airway Classification (Mallampati and Brodsky scores), NPO Violation, Delayed Arrival, Insurance, Medical Clearance, or Behavior. If multiple reasons were cited, the primary reason was deduced from the resident's note.

The data was compiled and analyzed using Statistical Package for the Social Sciences software (SPSS) version 25 (IBM, Armonnk, NY, USA). Frequencies of all patient demographics were run. Chi-square analysis was used to assess associations that existed between groups on an individual level (patients who showed vs. did not show; appointments where sedation was completed vs. non-completed sedation). Spearman's rho correlation tests were run to evaluate what patient factors correlated with patients' attendance or sedation completion. All variables that displayed a significant association were entered into logistic regression equation. A model was created that excluded non-significant predictors, and a final model was run to determine an odds ratio for patient attendance. Analyses were interpreted against a significance level of $p = .05$, C.I. 95%.

4. RESULTS

Over the course of twenty-two months, 1058 moderate sedation appointments were scheduled at UIC COD for a total of total of 618 patients. All of these patients fulfilled the inclusion criteria and were enrolled as subjects of the study. The distribution of the demographics of the study sample is presented in detail in Table I and Figures 2-6. The subjects' age ranged between 2 and 15 years with a mean age of 5.65 years (SD = 1.92). Out of the 618 subjects, 314 were males (50.8%) and 304 were females (49.2%). With respect to the race/ethnicity distribution of the study sample, the majority were White (63.4%) and identified as Hispanic or Latino (41.9%). The majority of subjects spoke English (75.1%).

All subjects received automatic appointment confirmation, and 20.4% (126 appointments) of these appointments were confirmed affirmatively by the parent/ guardian. In addition, 31.9% (197 appointments) of these appointments were confirmed by the front desk, and 27.2% (168 appointments) were confirmed by the resident. In total, a front desk staff and/or resident provider verbally confirmed 52.4 % of appointments (324 appointments).

Of the subjects scheduled for sedation, 512 (82.9%) attended their moderate sedation appointment, 64 (10%) did not show-up and 44 (7.1%) canceled in advance. The total non-attendance rate including both the canceled and the no-show appointments was 106 (17.1%) out of 618 (Figure 7).

Of the 512 subjects who attended their moderate sedation appointment, 410 sedations were completed (80.1%) and 102 sedations (19.9%) were not completed for various reasons. Among the reasons for attended sedation non-completion, illness (n = 29, 28.4%), airway (n = 33, 35.3%) and NPO violation (n=22, 21.5%) were the most common (Figure 8).

	Total	Showed	No-Showed
Characteristic	N (%)	n (%)	n (%)
Total	618 (100%)	512 (82.8%)	106 (17.2%)
Age			
0-2 y/o	2 (0.3%)	1 (0.2%)	1 (0.9%)
3-5 y/o	326 (52.8%)	268 (52.3%)	58 (54.7%)
6-11 y/o	282 (45.6%)	236 (46.1%)	46 (43.4%)
12-18 y/o	8 (1.3%)	7 (1.4%)	1 (0.9%)
Gender			
Male	314 (50.8%)	262 (51.2%)	52 (49.1%)
Female	304 (49.2%)	250 (48.8%)	54 (50.9%)
Race			
Asian	28 (4.5%)	26 (5.1%)	2 (1.9%)
African American	68 (11.0%)	51 (10.0%)	17 (16.0%)
American Indian or Alaskan Native	3 (0.5%)	2 (0.4%)	1 (0.9%)
White	392 (63.4)	323 (63.1%)	69 (65.1%)
Declined	127 (20.6%)	110 (21.5%)	17 (16.0%)
Ethnicity			
Hispanic or Latino	259 (41.9%)	213 (41.6%)	46 (43.4%)
Non-Hispanic or Latino	233 (37.7%)	189 (36.9%)	44 (41.5%)
Declined	126 (20.4%)	110 (21.5%)	16 (15.1%)
Language			
English	464 (75.1%)	379 (74.0%)	85 (80.2%)
Non-English	154 (24.9%)	133 (26.0%)	21 (19.8%)
dmft			
< 9	285 (46.1%)	227 (44.3%)	58 (54.7%)
≥ 9	333 (53.9%)	285 (55.7%)	48 (45.3%)

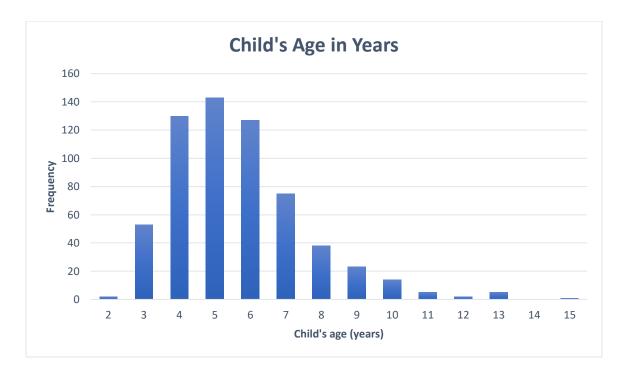Table I – Patient Demographics
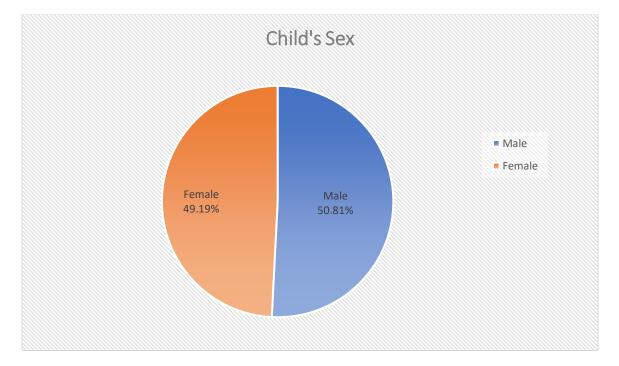
Figure 2 – Child's Age in Years
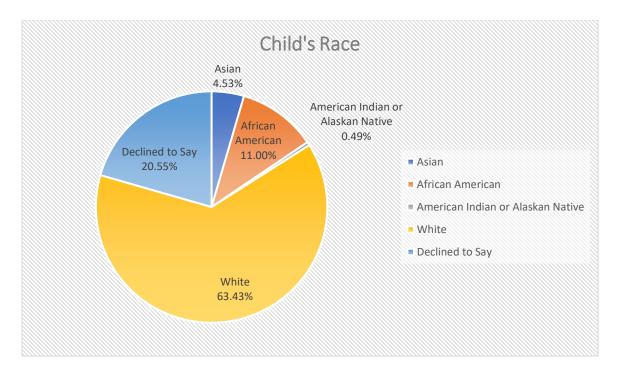

Figure 3 – Child's Sex

Figure 4 – Child's Race

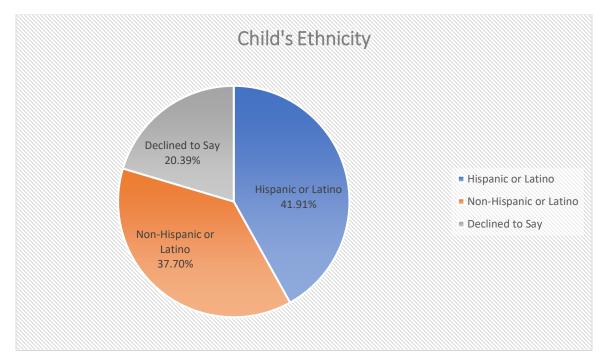*Figure 5* – Child's Ethnicity
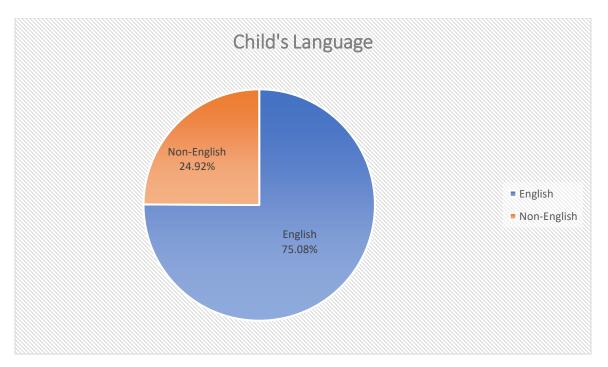
Figure 6 – Child's Language

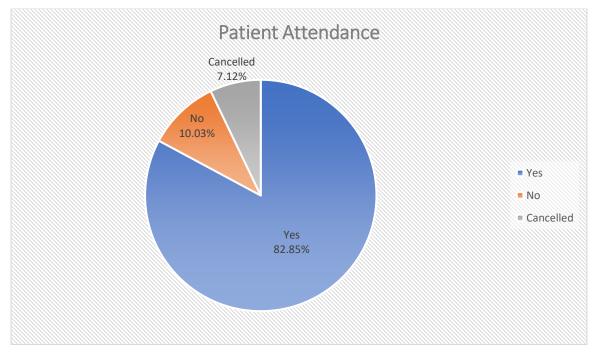Figure 7 – Moderate Sedation Appointment Attendance Rates.

Reasons for Attended Sedation Incompletion

- Medical 4.76%
- Behavior 3.81%
- Other 4.76%
- Insurance 2.86%
- Delayed Arrival 3.81%
- Illness 27.62%
- NPO 20.95%
- Airway 31.43%

Legend:
- Illness
- Airway
- NPO
- Delayed Arrival
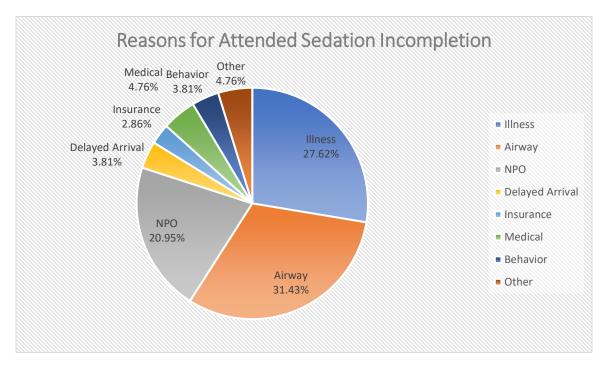- Insurance
- Medical
- Behavior
- Other

Figure 8 – Reasons for Attended Sedation Failure to complete.

The impact of several factors on patient's attendance and sedation completion was investigated. The number of previously failed, scheduled appointments ranged between 0 and 6 with a mean of 0.44 (SD 0.783). An inverse relationship was detected between the number of previously failed appointments and attendance rate (spearman's rho coeff = -.091 and p =.024).

The dmft score ranged between 1 and 18 with mean of 8.91 teeth (SD = 3.20), where patients with a higher dmft value were more likely to attend their sedation appointment (spearman's rho coeff = .107 and p = .008). However, when the data was dichotomized by dmft score of less than 9 vs. greater than or equal to 9, no significant association was detected with appointment attendance rate (χ^2 = 3.809, df = 1, p = .051). Patients with a dmft score $\geq$ 9 was associated with sedation completion (χ^2 = 4.254, df = 1, p = .039).

Lapsed time between the scheduling date and the sedation date also displayed a positive relationship with sedation appointment attendance (spearman's rho coeff = -.083 and p = .04). An increased length of time between appointments, however, was not correlated with a decreased rate of sedation completion (spearman's rho coeff = .078 and p = .053).

Any form of appointment confirmation showed a strong association with sedation appointment attendance (χ^2 = 10.24, df = 1, p = .001). Automated confirmation was associated with an increased rate of attendance (χ^2 = 6.48, df = 1, p = .011), and in person confirmation via resident and/or front desk staff displayed an association with appointment attendance (χ^2 = 6.18, df = 2, p = .046). There was no association found between verbal confirmation and non-completion of an attended sedation due to patient illness (p = .063) or NPO violation (p = .443).

There was no correlation found between the distance traveled to an appointment and the likelihood for a patient to attend their scheduled sedation visit (spearman's rho coeff = .048, p = .230). In addition, there was no correlation found between distance traveled and likelihood for a sedation to be completed (spearman's rho coeff = -.044, p = .280).

Lastly, race, ethnicity, behavior, and language spoken displayed no significant impact on appointment attendance or sedation completion (p >.05).

5. DISCUSSION

Missed appointments are a major problem in dentistry and medicine. Understanding the reason for missed appointments presents a special challenge within the pediatric population, as payment and attendance is the responsibility of the guardian. Under Medicaid coverage, Illinois reimburses 42.1% of fees charged by dentists. Medicaid also reimburses 52.5% as a percentage of what a dentist would be reimbursed through private dental insurance. Both of these numbers are below the national average and near the bottom quartile for state funded Medicaid reimbursement nationwide.[25] Illinois is also among the lowest in Medicaid state reimbursement for general anesthesia.[26] Consequently, limited access to GA becomes an obstacle for families with dental public aid and providers must look for other means such as moderate sedation to treat uncooperative children in the dental chair. Moderate sedation appointments need to be completed by a licensed provider and require a longer block of time. Hence, sedation visits are a costly endeavor for clinics and programs to administer.

Within the Medicaid population specifically, no-shows have been reported to occur at a higher rate. [23,27-29] Furthermore, patients with history of no show are more likely to fail future appointments.[23,29,30] No-shows in the pediatric dental setting serve as an additional barrier to providing restorative dental care to the Medicaid pediatric population which the UIC COD serves. Despite the relatively low no-show rate for patients scheduled for moderate sedation in the UIC COD pediatric dental clinic (17.1%), our findings detected a correlation between previously missed appointments and future appointment non-attendance. These results highlight some of the difficulties that exist in treatment planning Medicaid patients and patients who have previously missed scheduled visits at the systemic level.

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Several studies have investigated the impact of race and ethnicity on medical appointment attendance. African American race has been shown through multiple studies to be a predictor of appointment non-attendance.[28,31,32] Hispanic ethnicity has also been cited in the adult setting to be related to an increased likelihood to no-show.[33] Contrary to previous reports, we found no differences in patient behavior related to race or ethnicity. The UIC COD pediatric dental clinic's patient population is comprised of a diverse, predominately Medicaid urban patient pool. Only 11% of the studied patients identified themselves as African American, whereas 41.9% of the patients identified themselves as Hispanic or Latino. This retrospective study of moderate sedation visits at UIC showed that neither race nor ethnicity displayed an association with likelihood to attend scheduled sedation visits nor sedation completion. Often these patients have sought treatment at the private sector prior to being referred to the UIC COD for treatment due to the amount of work or behavior. Many of the referred young patients require pharmacological intervention such as moderate sedation.

Torres et al reported that patients who spoke English were more likely to miss their scheduled appointment.[30] The study was carried out at an academic outpatient internal medicine clinic that serves urban patients with Medicaid. Our study had conflicting findings where language had no impact on appointment attendance or sedation completion. This may be due to the fact that instructions are being given using the language that patients understand either through personnel or translation services.

Previous literature has suggested that distance travelled has a negative effect on appointment attendance;[34,35] whereas other studies have found distance travelled to not impact the likelihood of patients failing appointments.[36-38] Our findings are consistent with the latter where these families were willing to travel far distance in order to receive the dental care their

children need. Once again this may be explained by the limited number of dental providers who can serve this population. The calculated travel distance is a quantitative measure and does not reflect any qualitative information such as inconvenience of travel or actual travel time.

Several studies have purported a relationship between longer waiting times and appointment non-attendance in both medical and dental fields.[30,33,39,40] This relationship was corroborated in this study's results. Patients who have been waiting for a longer duration of time may gradually learn to devalue the appointment or forget the details. Despite the importance placed on appointment confirmation in our clinic for sedation visits, these results highlight the importance of limiting patient waiting time. If a clinic can lessen the wait-time for a sedation appointment, they may find an improved rate of patient attendance.

Several studies have reported on the association between appointment confirmation and attendance rate in the pediatric dental population.[41-43] Hashim et al showed that attendance improved if patients were reminded on the previous day, demonstrating an increase in attendance rate from seventy-four percent to eighty-one percent through implementing a reminder system.[44] In turn, this explains the strong association we found between appointment confirmation and appointment attendance.

The pediatric patient pool at UIC COD is comprised mainly of younger patients with a high dental disease burden and poor behavior. Consequently, these patients require advanced behavior guidance techniques in order to receive the dental care they need in a safe environment. A high dmft score is indicative of a greater burden of dental disease. Once parents recognize their children's increased oral health need, they may be more likely to attend their child's scheduled appointment and the sedation is more likely to be completed.

Airway evaluation is a key factor that gets assessed at the treatment planning sedation workup appointment by the resident provider and is then subsequently verified by the assigned attending. Our findings highlighted that airway issues was the largest limiting factor amongst patients who attended their sedation appointment, and the sedation was not completed on the day of service. Ideally, all sedations would be performed with the same resident and faculty member who evaluated the patient at the treatment planning sedation workup appointment, however, this is not always clinically feasible. On the day of sedation appointment, the dental resident and supervising attending once again evaluate the patient's airway. It is a prudent decision to not proceed if the airway is deemed markedly constricted. Discrepancy between original airway evaluation and evaluation on the day of the sedation appointment indicates that better calibration may be needed between the residents and attendings. Increased faculty calibration may help better align airway evaluations across multiple visits.

Illness and NPO violation were the second and third limiting factors to moderate sedation being completed on the day of service. It is critical that oral health providers discuss the risks and benefits of moderate sedation with the parents at the time of treatment planning. To ensure patient's safety, providers should discuss with the family that the sedation appointment will need to be rescheduled if the child falls ill or does not adhere to the NPO recommendation. Ensuring a standardized phone call by the resident and/or front desk member that confirms the patient's health with the family may limit the amount of sedations that do not go through. Verbal confirmation alone may not be enough to prevent sedations not being completed on the day of service. Detailed discussion and proper communication on the day of treatment planning and at the time of appointment's confirmation are necessary in order not to inconvenience families and use clinic time efficiently. Rescheduling appointments due to illness prior to the sedation

appointment will allow scheduling other children who are on the waitlist to receive treatment under sedation.

Early childhood caries is a disease that generally affects minority children from poor backgrounds. [45] Often, these patients have limited access to dental services and need behavioral guidance including moderate sedation in order to deliver the care in a safe and less traumatic environment. This study shines light on what factors affect the likelihood of patients and families attending a moderate sedation appointment, and what measures need to be taken to ensure a sedation procedure goes through on the day of service. This study unfolds the impact of several factors upon low SES urban patients attending their moderate sedation appointments. It reflects on a large patient pool within a racially diverse population.

Some limitations of our study include the retrospective nature of our results, where we were unable to assess factors such as socioeconomic level, disease/pain severity, level of education, and parent's employment. Our patients represent the urban Medicaid population of Illinois and is predominantly composed of patients from a low socioeconomic background. Therefore, our data is not representative of all socioeconomic backgrounds. Additionally, the study did test weather conditions or if appointment failure was more frequent in the wintertime.

Strengths of the study include a large patient population with a racially diverse group of patients. Data was gleaned effectively from a single source, so the entire data collection process was streamlined and standardized. The EHR system, AxiUm, has a large amount of data that was able to be collected and analyzed. Additionally, and this points to the justification for performing this study, limited previous studies have been conducted on factors related to no-shows and the completion of moderate sedations in the dental setting

Future studies should investigate barriers to patients attending their sedation appointments such as transportation, weather, social status or child/parent's anxiety level. Following up with no show patients to investigate reasoning/potential associations may elicit beneficial qualitative data. Additionally, future studies are needed to compare the no-show rate and barriers to moderate sedation appointments amongst high SES populations or within the private practice setting for low urban SES population.

6. CONCLUSION

Moderate sedation appointment attendance and completion rate were shown to display a relationship with demographic, social and health-care patient determinants. The data suggests that appointment confirmation systems are a cost-effective methodology in increasing the likelihood of patient attendance to their moderate sedation appointments. In addition, patients with disease burden are more likely to attend their sedation appointment. Additionally, pre-operative instructions need to be emphasized to ensure patients can successfully undergo the oral moderate sedation procedure on the day of service. The most common reason for sedations not going through on the day of service was due to airway assessment, which may be reduced through airway assessment calibration. Sedations not going through due to illness may be mitigated through the implementation of a conversational flow chart for front desk personnel and dental providers. Implementing these measures may allow for a reduction in the number of moderate sedations not going through on the day of service, result in a lesser inconvenience for families, and ensure a safe delivery of care.

Decreasing the rate of missed appointments would allow us to improve access to pediatric dental care and oral moderate sedations. This study suggests practical, clinical measures to ensure clinical efficiency in treating the urban population. Furthermore, the study suggests that special attention and interventions to decrease no-show rates should target patients who are unconfirmed, and display a greater history of appointment non-attendance.

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APPENDICES

APPENDIX A

DATA COLLECTION TABLE

	Patient 1	Patient 2, etc.
Date		
Age (in years)		
Sex (M/F)		
Race[1]		
Ethnicity[1]		
Language (English/Non-English)		
Distance to Clinic (miles)[2]		
Time Lapse (days)[3]		
Prior Evaluation Behavior (F1,2,3,4)		
Prior Operative Behavior (F1,2,3,4)		
dmft		
Previous sedation (#)		
# of No-Shows (#)		
Auto Confirm (Y/N)		
Front Desk Confirm (Y/N/VM) [4]		
Resident Confirm (Y/N/VM) [4]		
Patient Show (Y/N/Cancel)		
If patients attends appointment		
Sedation Complete (Y/N)		
Reason for incomplete[5]		

[1]Race and Ethnicity as defined by the U.S. Census Classification System. Race indicating if White, Black or African American, Asian, American Indian and Alaska Native, Native Hawaiian or other Pacific Islander, or Other. Ethnicity indicating if Hispanic or Non-Hispanic.

[2]Distance to clinic was calculated through a google maps route via entry of patient's home address zip code to UIC COD 801 South Paulina Chicago, Illinois 60612. De-identified data was used for analysis, and zip code was never recorded directly.

[3]Time lapse was calculated through AxiUm by looking at the time difference between when the appointment was put into the schedule and when the appointment occurred.

[4]Confirmation status was marked as yes or no if the front desk or resident entered a contact note that the patient was contacted. If voicemail was left only, box was marked as VM. If no contact note was entered, appointment was left as unconfirmed by this source.

[5]Reson for sedation incompletion was deduced from the patient's clinical note. The chief reason was cited and the following reasoning was codified and categorized into the following categories: Illness, Airway Classification (Mallampati and Brodsky scores), NPO Violation, Delayed Arrival, No Show, Insurance, Medical Clearance, Behavior, Cancellation or other.

APPENDIX B

IRB GRANT OF EXEMPTION

Dear Dr. Capezio:

Your application was reviewed on **November 19, 2019** and it was determined that your research meets the criteria for exemption as defined in the U.S. Department of Health and Human Services Regulations for the Protection of Human Subjects [45 CFR 46.104(d)]. You may now begin your research.

Exemption Granted Date: November 19, 2019
Sponsor: None

The specific exemption category under 45 CFR 46.104(d) is: (4)
A waiver of authorization has been granted for access and extraction of data from UIC medical records for this research.

You are reminded that investigators whose research involving human subjects is determined to

be exempt from the federal regulations for the protection of human subjects still have

responsibilities for the ethical conduct of the research under state law and UIC policy.

Please remember to:
→   Use your research protocol number (2019-1290) on any documents or correspondence with the IRB concerning your research protocol.
→   Review and comply with the `policies` of the UIC Human Subjects Protection Program (HSPP) and the guidance ***Investigator Responsibilities***.

We wish you the best as you conduct your research. If you have any questions or need further help, please contact me at (312) 996-2014 or the OPRS office at (312) 996-1711. Please send any correspondence about this protocol to OPRS via OPRS Live.

                   Sincerely,
                   Sandra Costello
                   Assistant Director, IRB #7
                   Office for the Protection of Research Subjects

VITA

NAME: Nicholas Eugene Capezio

EDUCATION
University of Illinois at Chicago College of Dentistry, Chicago, IL
Certificate of Advanced Graduate Study in Pediatric Dentistry   June 2020
Master's in Oral Health Sciences

Boston University Henry M. Goldman School of Dental Medicine (GSDM), Boston, MA
Doctor of Dental Medicine, *Cum Laude*   May 2018

Tulane University, New Orleans, LA
Bachelor of Science, *Cum Laude*   May 2013

PROFESSIONAL EXPERIENCE
University of Illinois at Chicago College of Dentistry, Chicago, IL   June 2018- Current
Pediatric Dental Resident
- Provided pediatric dentistry services such as sealants, stainless steel, strip, and zirconia crowns, pulpotomies and pulpal therapies, fluoride applications, and routine composite, amalgam, and glass ionomer restorations.
- Performed Moderate Oral Sedation dental cases for patients determined to be candidates using midazolam and diazepam medications.
- Performed full mouth rehabilitation cases for patients in the operating room at University of Illinois Hospital and St. Barnard Hospital
- Treated Early mixed dentition orthodontic cases in conjunction with orthodontic TA's and faculty

Good Neighbor Red Logan Dental Health Clinic, White River Junction, VT
July-October 2017
Ten Week Dental Care Provider Extern
- Treated the underserved population within the community health center free of charge.
- Provided adult dental care via endodontic procedures, operative dentistry, periodontal therapy and extractions.

GSDM Clinic, Boston, MA
August 2017-May 2018
Student Dentist
- Acted as the primary care dental provider to over 50 patients of all ages, ensuring maximum quality of care, comprehensive treatment planning and performing all dental work under GSDM faculty supervision.

TEACHING EXPERIENCE
Global Health Equity Elective, Boston University Medical Campus, Boston, MA
          August-December 2016
Elective Course Director
- Taught a class of 35 dental, medical and PA students on the values of global health ethics and program implementation adapted from Paul Farmer's 2013 text *Reimagining Global Health: An Introduction*.
- Enacted within the curriculum the first-ever global oral health class with positive classroom feedback.

Boston University Henry M Goldman School of Dental Medicine, Boston, MA
July 2015-May 2016
ADEA Academic Career Fellow
- Awarded ADEA fellowship to 1)incorporate teaching and leadership activities into the pre-doctoral DMD schedule 2) encourage the pursuit of a career in dental academia, and 3) promote dental research endeavors.
- Implemented BU's first-ever global health externship component into the first year of my dental education, funding travel to Estelí, Nicaragua, having since returned four times to continue building on the project.
- Guided teacher pre-/post- survey design; implemented guidelines to achieve varnish application competency; distributed peer-reviewed resources in Spanish and arranged for local Nicaraguan ministerial support.

Manna Project International, Sangolqui, Ecuador
August 2013-June 2014
Program Director
- Taught children's English and nutrition classes out of our rural library community center and local schools.
- Implemented a healthy diabetes support group at a local hospital to guide health decisions and support livelihood.

RESEARCH EXPERIENCE
University of Illinois at Chicago, Chicago, IL
June 2018- Current
Master's Thesis

Fluoride Varnish and Tooth-brushing Promotion Program, Estelí, Nicaragua
July 2015-February 2018
Secondary Investigator
- Implemented a five-year longitudinal cross-sectional study engaging preschool teachers in the ownership of their classroom's oral hygiene, affecting over 800 children enrolled through applying quadrennial fluoride varnish applications and instituting a daily tooth-brushing program in the classrooms with Ministry of Education support.

PUBLIC HEALTH EXPERIENCE
Centering Pregnancy Foundation at Boston Medical Center, Boston, MA
May 2016-May 2017
Boston Schweitzer Fellow
- Recruited to minimize the oral health knowledge gap during pregnancy for both staff and participants.

Fluoride Varnish and Tooth-brushing Promotion Program, Estelí, Nicaragua
July 2015-February 2018
Dental Volunteer
- Taught preschool teachers how to apply fluoride varnish and how to maintain an effective and clean daily toothbrushing program and coordinated public health efforts with the local government.

HONORS AWARDED
- **2018 Boston University GSDM Humanitarian Award**
- **2018 Boston University GSDM Quintessence Research Award**
- **2017 Schweitzer Fellow**
- **2016 AAPHD Small Grant Award Winner**
- **2015 ADEA Academic Dental Career Fellow**

PROFFESSIONAL MEMBERSHIPS
- **American Association of Pediatric Dentists**
- **Illinois Society of Pediatric Dentists**
- **American Dental Association**
- **Chicago Dental Society**
- **American Association of Public Health Dentistry**