Recall Interval and Caries in Patients Sedated for Preventative Care

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Abstract

For patients with special health care needs who require intravenous sedation or general anesthesia for preventative dental care, there are few guidelines regarding ideal recall intervals. A guideline for proper dental care for these patients has become a public health necessity as many patients with special health care needs are living longer, more independent lives. The purpose of this retrospective chart review was to investigate an association between caries incidence and length of recall interval to help determine guidelines for frequency of sedation for preventative care. A total of 375 recall visits were reviewed from 99 electronic medical records belonging to the University of Pittsburgh Center for Patients with Special Health Care Needs. The number of months between each recall visit was recorded as well as the number of carious lesions requiring treatment at each appointment. In addition, place of residence, history of caries within the past three years, and total number of carious lesions requiring treatment, were recorded from 87 patient charts. Linear regression was used to evaluate the primary outcome. The length of time between recall visits was found to be a predictor of carious teeth requiring treatment (P=0.027). Patients with a history of caries within the past three years were more likely to experience new carious lesions (P=0.048). There appears to be an association between length of recall interval and number of carious teeth requiring treatment in this specific patient population.

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1.0 Introduction

Patients with physical, developmental, mental, sensory, behavioral, cognitive, or emotional impairments often require specialized health care for preventative and restorative dentistry. Approximately 15.1% of children under 18 years of age in the US are estimated to have special health care needs, and 20% of adults age 16-64 suffer from a physical, mental, or emotional impairment.[22,34] Behavior guidance techniques may allow experienced providers to complete routine care for many patients with special health care needs. However, some patients may become resistant to treatment due to anxiety or a lack of understanding, and dental treatment may become unsafe for the patient, provider, and staff, in certain situations.[1] In these cases, sedation modalities must be considered.[1]

1.1 Anesthesia in Patients with Special Health Care Needs

Due to its predictability, general anesthesia is often used when other forms of behavior management fail.[1] General anesthesia is considered safe and effective in patients with special health care needs, and as dental anesthesia becomes more widespread, it may become more cost-efficient as well.[15,27] While most dental anesthesia is utilized for restorative and surgical procedures, it is also a necessity for preventative care in a subset of patients with special healthcare needs who are unable to tolerate a dental prophylaxis and exam due to emotional, cognitive, or physical disabilities. This need for preventative care under general anesthesia has been observed

in 22% of children with autism.[35] A thorough search of the literature did not produce any research regarding general anesthesia for preventative care in adults with special health care needs, however, one may postulate that this percentage may be larger in the adult population, as provider and staff safety become a concern as patient strength and size increase.

1.2 Caries in Patients with Special Health Care Needs

While conflicting research has been published regarding caries prevalence in patients with special health care needs, oral hygiene practices play a role in caries prevention.[1,4,7,16,29] Patients that are unable to tolerate a dental prophylaxis and thorough exam may suffer from poor home hygiene as well. Therefore, professional dental prophylaxis at specific recall intervals may play a greater role in caries prevention in this specific population compared to patients that are regularly performing good oral hygiene at home.

1.3 Purpose of Study

The Center for Patients with Special Needs (CPSN) within the University of Pittsburgh School of Dental Medicine is at a unique advantage to treat this population as the dental school also has a dental anesthesiology residency program. As part of their training, anesthesia residents sedate patients within the CPSN under direct supervision of attending dental anesthesiologists while dental students, pediatric residents, oral surgery residents, and general dentistry attending physicians, complete treatment using a multi-disciplinary approach. The availability of anesthesia

within the school of dental medicine has allowed the CPSN to become a dental home for patients that aged out of pediatric dental offices providing similar anesthesia services. Patients unable to tolerate a thorough examination and prophylaxis are placed on various recalls (months or years) for preventative dental care under general anesthesia/deep sedation.

The purpose of this study was to explore a relationship between the number of carious teeth requiring treatment at each visit and the number of months in between recall visits in adults with special health care needs who require general anesthesia or deep sedation for a dental prophylaxis and a periodic oral examination.

2.0 Retrospective Chart Review

2.1 Methods

The protocol for this study was approved by the University of Pittsburgh Institutional Review Board (approval no. 20010082). The IT department within the University of Pittsburgh School of Dental Medicine created an excel chart of active patients of the Center for Patients with Special Needs (within the University of Pittsburgh School of Dental Medicine), with record of the prophylaxis code D1110V, the periodic oral examination code D0120, and the general anesthesia code D9222, in a single visit between the years of 2012 and 2020. G*Power version 3.1.9.6 was used to calculate the desired sample size using an effect size of 0.15, alpha of 0.05, and power of 0.80. A minimum sample size of 43 was calculated. To be included in the retrospective chart review, patient charts must have record of the following: patients received preventative care within the CPSN, patients were 16 years or older for all recorded recall visits, patients were unable to tolerate thorough prophylaxis and examination without general anesthesia or deep sedation, and patients experienced at least two recall intervals after either completion of treatment or being considered free of carious disease (outside of lesions that were being monitored for remineralization).

A single chart reviewer looked through charts and excluded patient records that did not meet inclusion criteria. The same reviewer recorded the following into an Exel spreadsheet: number of months between each recall visit, number of carious teeth requiring treatment at each visit, type of residence (family home or group home), and history of caries requiring restorative treatment at the CPSN within the past three years. The year in the patient record in which recall

interval data collection began was also recorded. Charts were excluded if the patients did not have at least two recall visits after a stable dentition free of dental caries was established.

Stata/SE 15.1 was used for all statistical analyses. A *P*-value of <0.05 was used to determine statistical significance for all tests. Linear regression and correlation were used to determine an association between number of months between recall visits and number of carious teeth requiring restorative treatment at each visit. A two-sample t-test was used to look for an association between type of residence and total number of carious teeth requiring treatment over the four-recall period. A two-sample t-test (with unequal variance) was also used to evaluate an association between caries incidence over the four-recall period and caries experience within the past three years.

2.2 Results

This retrospective study reviewed 213 charts. Exclusion criteria eliminated 114 records from the study. Therefore, recall intervals from 99 patient charts were included, giving a total sample size of 375 recall intervals. Figure 1 outlines the number of charts used to investigate each research question.

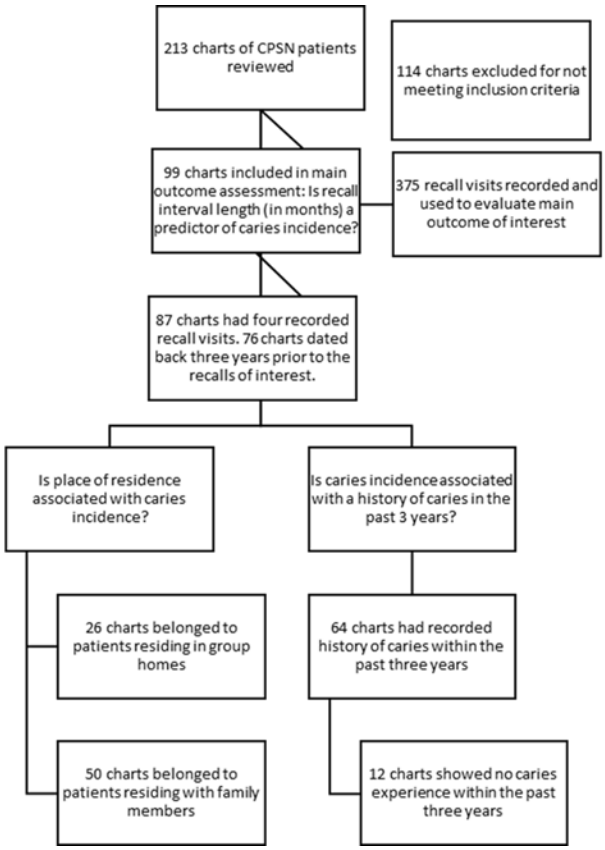

Figure 1 Flow chart describing patient records used

Linear regression analysis found that the length of time between recall visits is a weak predictor of carious teeth requiring treatment (P=0.027). However, the low coefficient of determination (r^2=0.013) means there is a lot of variability around our regression line and it is hard to predict precise predicative models. Pearson's correlation coefficient was also calculated to determine the strength of relationship between our two variables. A correlation coefficient of 0.1139 is in agreement with our regression analysis, also showing a weak positive relationship between the number of months between recall visits and the number of carious teeth requiring treatment. Figure 2 illustrates the relationship between caries incidence and recall interval length.

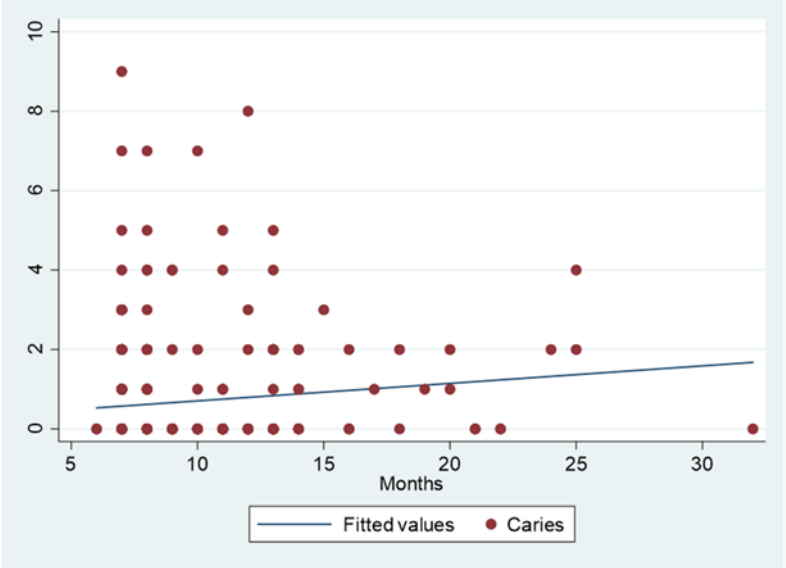

Figure 2 Scatter plot describing relationship between carious lesions and recall interval

Other research questions were answered using only data from patient charts with four recorded recall intervals (87/99 patient records). Of these records, a total of 76 patients had place of residence recorded in their chart. In our sample, 26/76 patient records belonged to patients residing in group homes, and 50/76 belonged to patients residing with family members. Figure 3 illustrates the number of charts used to investigate the association between place of residence and caries prevalence. There was no statistically significant difference between the mean number of carious teeth in patients residing in group homes and those residing in the family home (P=0.5728).

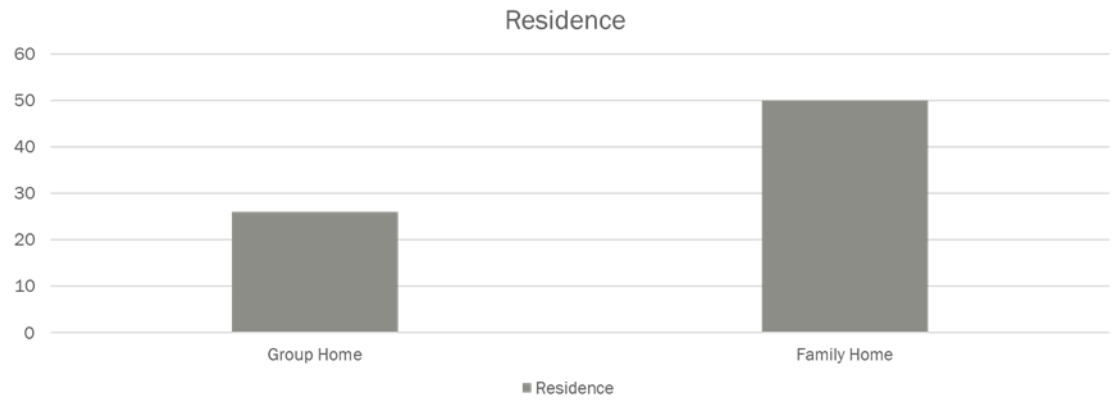

Figure 3 Distribution of patients living in group home versus family home

Another interest was an association between caries experience within the past three years and caries incidence, as the ADA considers patients with special health care needs to be at a high risk of new carious lesions if they have experienced caries in the past three years. We looked for an association between the total number of carious teeth needing treatment over the 4-recall period and whether or not the patient had experienced caries within the past three years. While previous caries experience within the past three years could not be recorded for every patient, 76/87 patient charts dated at least three years prior to the recalls of interest and allowed researchers to confirm previous caries experience to that date. 64/76 patients experienced caries within the past 3 years, while only 12/76 patients had no caries experience within the past three years. Figure 4 illustrates caries experience within the past three years in our sample population. A two-sample t-test with unequal variance was used to look for an association between the two variables. In our sample, there was a statistically significant difference between the mean number of treated caries in patients with caries experience in the last three years and those without caries experience in the last three years (P=0.0484).

Figure 4 Distribution of patients with caries experience within the past three years

3.0 Conclusions

Our study showed a weak, though statistically significant, association between number of months between recall visits and number of carious teeth requiring restorative treatment or extraction. The coefficient of determination for the linear regression model was very low meaning our linear regression model explained only a small portion of the variation in the dependent variable. From our results, we can conclude that shorter recall intervals for patients requiring general anesthesia/deep sedation, will likely result in fewer caries. This association may be greater in a study involving recall intervals of longer lengths. Most patients included in this study were seen at recall intervals between six and eighteen months.

In disagreement with previous research studies, this study did not find a statistically significant association between place of residence and number of carious teeth requiring treatment. This could be explained by differences in the group homes where patients reside. A greater caregiver-to-patient ratio may result in better home hygiene care. Diet likely varies greatly at each facility as well. A facility that does not condone refined carbohydrate snacking would likely lead to fewer cavities within its residents.

In agreement with previous research, this study found a statistically significant association between number of carious teeth requiring treatment and history of caries within the past three years.

3.1 Study Limitations

The most notable limitation of this study is variability among providers completing patient exams in the Center for Patients with Special Needs. While attending faculty members are trained in appropriate academic treatment planning, the determination of carious teeth that require restorations likely varies greatly between providers. The dental students, directly performing care, also contribute to this subjectivity of caries diagnosis. Therefore, we may have found a stronger relationship between recall interval and number of carious teeth requiring treatment if we had better inter-rater reliability. It would be best to include recall intervals from a single provider in future study designs.

Furthermore, the Center for Patients with Special Needs is a unique facility in its ability to provide general anesthesia to such a large number of patients. This allows many patients to have a thorough dental examination and prophylaxis every 6-12 months. Such availability of anesthesia may not be realistic at this time in most facilities. Studies involving longer recall intervals (in years) would likely produce results more generalizable to this specific population of patients.

Another limitation of our study is that only a single dependent variable was measured, carious teeth. Periodontal disease is equally important in oral and overall health, and studies show that patients with special health care needs have a higher prevalence of periodontal disease than the general population.[35] When considering frequency of thorough prophylaxis and examination for patients requiring general anesthesia or deep sedation for recall visits, the periodontal condition also plays a significant role. Future studies incorporating measures of periodontal health at various recall intervals would be insightful for the fabrication of guidelines in treating this subpopulation of patients with special health care needs.

Water fluoridation may have played a role in the results of the study as well, as patients in the sample traveled from vastly different geographical locations for treatment at the CPSN. 55% of Pennsylvanians receive fluoridated drinking water[11], so differences in exposure to fluoride could contribute to the lack of statistical association between patient place of residence and caries incidence. This may have also contributed to our main outcome of interest as well, the association between caries incidence and months between recall visits.

Lastly, this study did not measure the influence of non-surgical treatment of caries, SDF and fluoride varnish, that were implemented during recall visits. The frequency of fluoride or SDF application may have led to fewer teeth requiring restorative or surgical treatment (our dependent variable).

Bibliography

American Academy of Pediatric Dentistry. Guideline for Management of Dental Patients with Special Health Care Needs, Reference Manual. 2018-2019. 40(6):237-249.

American Academy of Pediatric Dentistry. Guideline for Prescribing Dental Radiographs for Infants, Children, Adolescents, and Individuals with Special Health Care Needs, Reference Manual. 2018-2019. 40(6):213-220.

Altun C, Guven G, Akgun OM, Akkurt MD, Basak F, Akbulut E: Oral health status of disabled individuals attending special schools. Eur J Dent 4(4):361-366, 2010.

Anders PL, Davis EL. Oral health of patients with intellectual disabilities: a systematic review. Spec Care Dentist 30(3):110-117, 2010.

Bernabé E, Sheiham A: Age, period and cohort trends in caries of permanent teeth in four developed countries. Am J Public Health 104(7):e115-121, 2014.

Casamassimo PS, Seale NS, Ruehs K. General dentists' perceptions of educational and treatment issues affecting access to care for children with special health care needs. J Dent Educ 68(1):23-28, 2004.

Chang J, Kim HY. Does caries risk assessment predict the incidence of caries for special needs patients requiring general anesthesia? Acta Odontol Scand 72(8):721-728, 2014.

Chang J, Patton LL, Kim HY: Impact of dental treatment under general anesthesia on the oral health-related quality of life of adolescents and adults with special needs. Eur J Oral Sci 122: 363-371, 2014.

Collado V, Faulks D, Hennequin M: A survey of the difficulties encountered during routine hygiene and health care by persons with special needs. Disabil Rehabil 30(14):1047-1054, 2008.

Dye BA, Thornton-Evans G, Li X, lafolla TJ: Dental caries and sealant prevalence in children and adolescents in the United States, 2011-2012. NCHS Data Brief (191):1-8, 2015.

Engvall, C. The issue: fluoridation of public drinking water. 2015. PDF file. http://jcc.legis.state.pa.us/resources/ftp/documents/reports/Green%20Paper%20-%20Summer%202015%20-%20Flouridation%20of%20Drinking%20Water.pdf

Hillebrecht A-L, Hrasky V, Anten C, Wiegand A: Changes in the oral health-related quality of life in adult patients with intellectual disabilities after dental treatment under general anesthesia. Clin Oral Investig 23(10): 3895-3903, 2019.

Ibricevic H, Honkala S, Honkala E, Al-Quraini W: A field trial on semi-annual fluoride varnish applications among the special needs schoolchildren. J Clin Pediatr Dent 30(2):135-138, 2005.

Lewis CW: Dental care and children with special health care needs: a population-based perspective. Academic Pediatrics 9(6):420-426, 2009.

Lim WA, Borromeo GL: The use of general anesthesia to facilitate dental treatment in adult patients with special needs. J Dent Anesth Pain Med 17(2):91-103, 2017.

Loo CY, Graham RM, Hughes CV: The caries experience and behavior of dental patients with autism spectrum disorder. JADA 139(11):1518-1524, 2008.

Loyola-Rodriguez JP, Zavala-Alonso V, Patiño-Marin N, Friedman C. A new classification system for dental treatment under general anesthesia. Spec Care Dentist 26(1):25-29, 2006.

Mallineni SK, Yiu CKY: Dental treatment under general anesthesia for special needs patients: analysis of the literature. Journal of Investigative and Clinical Dentistry 7(4):325-331, 2016.

Mallineni SK, Yiu CKY. A retrospective review of outcomes of dental treatment performed for special needs patients under general anaesthesia: 2-year follow –up. The Scientific World Journal 2014:748353.

Messieha Z, Ananda RC, Hoffman I, Hoffman W: Five year outcomes study of dental rehabilitation conducted under general anesthesia for special needs patients. Anesth Prog 54(4):170-174, 2007.

Morales-Chavez M: Oral health assessment of a group of children with autism disorder. J Clin Pediatr Dent 41(2):147-149, 2017.

Nowak A, Casamassimo P eds. The Handbook of Pediatric Dentistry. 5th ed. Chicago: American Academy of Pediatric Dentistry; 2018.

Nunes da Silva S, Gimenez T, Celestino Souza R, Mello-Moura ACV, Raggio DP, Morimoto S, Lara JS, Soares GC, Tedesco TK: Oral health status of children and young adults with autism spectrum disorders: systematic review and meta-analysis. Int J Paediatr Dent 27(5):388-398, 2017.

Oh TJ, Nam OH, Kim MS, Choi SC, Lee HS: Oral health of patients with special health care needs after general anesthesia: a 25-year retrospective study. Pediatr Dent 40(3):215-219, 2018.

Ohtawa Y, Yoshida M, Fukuda K: Parental satisfaction with ambulatory anesthesia during dental treatment for disabled individuals and their preference for same in future. Bull Tokyo Dent Coll 60(1):53-60, 2019.

Porterfield SL, McBride TD: The effect of poverty and caregiver education on perceived need and access to health services among children with special health care needs. Am J Public Health 97(2):323-329, 2007.

Rashewsky S, Parameswaran A, Sloane Carole, Ferguson F, Epstein R: Time and cost analysis: pediatric dental rehabilitation with general anesthesia in the office and the hospital settings. Anesth Prog. 59(4):147-163, 2012.

Reichard A, Turnbull HR, Turnbull AP: Perspectives of dentists, families, and case managers on dental care for individuals with developmental disabilities in Kansas. Ment Retard. 39(4):268-285, 2001.

Robertson MD, Schwendicke F, Pinheiro de Araujo M, Radford JR, Harris JC, McGregor S, Innes NPT: Dental caries experience, care index and restorative index in children with learning disabilities and children without learning disabilities; a systematic review and meta-analysis. BMC Oral Health 19(1):146, 2019.

Rothmaier K, Bucher K, Metz I, Pitchika V, Hickel R, Heinrich-Weltzien R, Kühnisch J: Preventative and invasive treatment in special needs patients: a German restrospective study. Clin Oral Investig 21(4):1343-1350, 2017.

Schnabl D, Guarda A, Guarda M, von Spreckelsen LM, Riedmann M, Steiner R, Dumfahrt H. Dental treatment under general anesthesia in adults with special needs at the University Hospital of Dental Prosthetics and Restorative Dentistry of Innsbruck, Austria: a retrospective study of 12 years. Clin Oral Investig 23(11):4157-4162, 2019.

Tesini DA, Fenton SJ: Oral health needs of persons with physical or mental disabilities. Dent Clin North Am 38(3):483-498, 1994.

Tickotsky N, Petel R, Araki R, Moskovitz M: Caries progression rate in primary teeth: a retrospective study. J Clin Pediatr Dent 41(5):358-361, 2017.

U.S. Census Bureau. (2012, July 25). *Nearly 1 in 5 People Have a Disability in the U.S., Census Bureau Reports.* (Report No. CB12-134). Retrieved from https://www.census.gov/newsroom/releases/archives/miscellaneous/cb12-134.html

U.S. Department of Health and Human Services. Oral Health in America: A Report of the Surgeon General. Rockville, MD: U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health; 2000.

Yost Q, Nelson T, Sheller B, McKinney CM, Tressel W, Chim AN: Children with autism spectrum disorder are able to maintain dental skills: a two-year case review of desensitization treatment. Pediatr Dent 41(5):397-403, 2019.

Zhou N, Wong Hm, McGrath C: Oral health and associated factors among preschool children with special healthcare needs. Oral Dis 25(4):1221-1228, 2019.