VIRTUAL DENTAL CONSULTATION SERVICES DURING THE COVID-19 PANDEMIC: A REVIEW OF THE NON-INSURED HEALTH BENEFITS (NIHB) DENTAL CLAIMS DATABASE

by

Celeste Williams

A Thesis submitted to the Faculty of Graduate Studies of

The University of Manitoba

In partial fulfillment of the requirements for the degree

Master of Dentistry
(Pediatric Dentistry)

Department of Preventive Dental Science

Dr. Gerald Niznick College of Dentistry

Division of Pediatric Dentistry

University of Manitoba

Winnipeg, Manitoba

TABLE OF CONTENTS

ABSTRACT:

Introduction: The Covid-19 pandemic amplified access to care challenges faced by many priority populations, including First Nations and Inuit Peoples. During wave 1 of the pandemic in Canada, dental clinicians were mandated to postpone non-emergency dental services, and in many parts of the country, all dental operations ceased. Concerning this, the Non-Insured Health Benefits (NIHB) program approved "virtual dental consultation services" and decided to temporarily cover fees for consultation services by phone or other virtual methods to help assess clients' needs and facilitate access to emergency dental care. The purpose of this study was to investigate the utilization of the virtual code by Canadian dentists during the beginning of the Covid-19 pandemic for children 18 years of age or younger.

Methods: NIHB provided a secure data transfer portal for dental claims paid for the procedure "consultation with client for the emergency management and triage of client's acute oral health care needs by phone or other virtual methods" and follow-up treatment with a date of service from April 1, 2020 to August 31, 2021. Data were analyzed using NCSS 2022 Statistical Software. Statistical analyses included frequencies, descriptive statistics, analysis of variance (ANOVA), and Chi-squared test.

Results: Overall, 1040 patients 18 years of age or younger had a virtual visit with follow-up treatment between April 2020 and August 2021. The mean age was 10.5 ± 4.9 years and 54.3% were female. Most of the virtual consultations were completed by general practitioners 951 (91.4%) and pediatric dentists 86 (8.3%) and most initial virtual visits were completed in Quebec 358 (34.4%), Saskatchewan 266 (25.6%), Alberta 158 (15.2%), and Manitoba 120 (11.5%). More extractions were completed than any other type of dental treatment during the first visit following the initial consultation with a total of 417 extractions. The time between the initial consultation and the first follow-up visit was 0.9 ± 1.9 months.

Conclusions: Virtual visits were utilized during the Covid-19 pandemic for pediatric patients covered by NIHB and a greater uptake of virtual visits was seen in provinces with higher Registered First Nations and Inuit Peoples apart from Ontario. Teledentistry has the potential to be utilized for much more than dental emergencies to improve access to care, especially for

remote and rural communities. Moving forward additional studies are needed to obtain parent/patient feedback on virtual consultations.

Keywords: NIHB (Non-Insured Health Benefits), COVID-19, Teledentistry, Virtual Visits

INTRODUCTION:

Covid-19 is caused by the SARS-CoV-2 virus and is transmitted through aerosol droplets, fomite, and indirect and direct contact.[1,2,3,4] Dental clinicians are highly susceptible to Covid-19 infection since they work in close proximity to the nasopharyngeal region and many treatment modalities involve the production of aerosols.[3,4]

Long before the Covid-19 pandemic, many Canadians, more specifically, many First Nations, Inuit, and Métis Peoples faced challenges with accessing dental care.[5] Challenges faced by these populations include but are not limited to dental provider access, geographic location, and isolation.[6] The pandemic has impacted healthcare systems globally[7] and it further impacted the accessibility of dental care for Canadians.[8] The pandemic amplified access to care challenges faced by many underserved populations.[8]

Registered First Nations and Inuit populations in Canada have access to dental benefits through the Non-Insured Health Benefits (NIHB) program of the Department of Indigenous Services Canada.[9] During wave 1 of the pandemic in Canada, dental clinicians were mandated to postpone non-emergency dental services, and in many parts of the country, all dental operations ceased. In relation to this, NIHB approved “virtual dental consultation services” and decided to temporarily cover fees for consultation services by phone or other virtual methods to help assess clients’ needs and facilitate access to emergency dental care.

'Teledentistry' is a term used to describe the delivery of dental care, treatment and/or recommendations using technology rather than the standard in-person patient contact.[3] Teledentistry is not a new concept, and before the pandemic was more commonly used in public health compared to the private sector.[10] Teledentistry has been shown to be beneficial but also has some limitations.[10,11] Teledentistry has been shown to reduce costs for both the patient and provider by reducing travel time, reducing the turn-over time between patients, and decreasing the number of no-shows or cancellations.[10,12] There are limitations in what can be done virtually for patients and often times patients may need follow-up in-person care.[10] There are also privacy and security concerns.[4,10,11] Despite the limitations, teledentistry has been shown to be beneficial for diagnosis, consultations, remote dental screenings, treatment planning, and for assessing schools and long-term care facilities.[3,12] During the first wave of the pandemic when the dental profession was mandated to postpone elective treatment or when all operations ceased, many dental providers in Canada used teledentistry as a virtual means of triaging their patients, making referrals, phoning in prescriptions or providing their patients with recommendations.[10]

The purpose of this study was to investigate the utilization of "virtual dental consultation services" by Canadian dental providers for Registered First Nations and Inuit children 18 years of age or younger with dental benefits through the Non-Insured Health Benefits (NIHB) program during the beginning of the Covid-19 pandemic. The objectives were to determine the number of claims submitted to NIHB for "virtual consultation services" for children and identify the provider type, to determine whether there were provincial/territorial differences in claims for virtual consultation services and to determine whether virtual consultation services are associated with any follow-up urgent or emergency dental treatment.

METHODS

Ethics approval was obtained from the University of Manitoba Research Ethics Board prior to commencement. The Non-Insured Health Benefits (NIHB) program of the Department of Indigenous Services Canada provided a secure data transfer portal for dental claims paid by NIHB for the procedure "consultation with client for the emergency management and triage of client's acute oral health care needs by phone or other virtual methods" and follow-up treatment with a date of service from April 1, 2020, to August 31, 2021.

Data provided for each virtual consult claim and each follow-up procedure claim included the service date, patient birth year, patient sex, provider province/territory, provider type, and dental procedure codes and tooth code/surfaces if applicable. Patients and providers were de-identified by NIHB and assigned a unique identifier number. All data analysis and storage occurred at the Children's Hospital Research Institute of Manitoba, and all data were stored on a password-protected server. Patients' ages were calculated by subtracting their birth year from the service year.

Virtual consult claims were included if patients were 18 years of age or younger at the initial service date and their follow-up treatment claims were included until they turned 19 years of age. Virtual consult claims and follow-up treatment claims by dentists, dental specialists, and dental hygienists were included, however, it should be noted that no virtual consults were completed by dental hygienists. Procedure claims were included for complete exams, limited exams, recall exams, consultations, emergency exams, specific exams, intra-oral radiographs, extra-oral radiographs, scaling, prophy, fluoride, silver diamine fluoride (SDF), caries trauma pain control,

amalgam restorations, composite restorations (anterior/posterior), pulpotomies, stainless steel crowns (anterior/posterior), pulpectomies, sealants, extractions, root canal treatments, and dentures. Orthodontic exams and records claims were excluded since unrelated to the initial virtual visit. Subsequent follow-up visits were included if they occurred no more than 9 months after the initial virtual consultation (follow-up 1-10) and data were analyzed for each of the follow-up visits after the virtual consult. It was decided that 9 months would provide sufficient time for treatment to be obtained but exclude treatment that was irrelevant to the initial consultation. The 9-month period accounted for the approximate 3-month period that dental offices were closed and the potential wait time for specialist care.

The number of restorations, caries/trauma pain control, silver diamine fluoride (SDF) applications, pulp treatments, sealants, extractions, and dentures were recorded, whereas a '0 meaning no' or '1 meaning yes' was recorded for exams, intra-oral radiographs, extra-oral radiographs, scaling, prophy, and fluoride. For teeth where there were two separate distinct billing codes, both were counted. Data were analyzed using NCSS 2022 Statistical Software. Statistical analyses included descriptive statistics (frequencies, mean ± standard deviation (SD)), one-way analysis of variance (ANOVA), and Chi-squared tests. A p-value ≤ a critical value of 0.05 was considered significant.

RESULTS

Overall, 1227 patients had a virtual visit between April 2020 and August 2021. Of these, 147 had an initial virtual visit without any follow-up, and 40 had their first follow-up more than 9 months after the initial virtual consult. A total of 1040 patients 18 years of age or younger were included in the study after exclusions. The mean age was 10.5 ± 4.9 years, and 54.3% were female [Table

1]. Patients' initial virtual visits were completed by either general practitioners, pediatric dentists, oral surgeons, endodontists, or periodontists, with the majority being completed by general practitioners 951 (91.4%) and pediatric dentists 86 (8.3%) respectively [Table 1]. Most initial virtual visits were completed in Quebec 358 (34.4%), Saskatchewan 266 (25.6%), Alberta 158 (15.2%), and Manitoba 120 (11.5%) [Table 1, Figure 1].

While the study examined treatment performed within nine months of the initial exam (follow-up 1 to follow-up 10), most of the follow-up treatment was completed within the first four follow-up visits [Table 2]. The data from all follow-up visits during the nine-month period is displayed in Table 2. Table 3 shows the mean of each treatment type for follow-ups 1-4, and this table also includes the mean of each treatment type with respect to the overall number of patients seen during the respective follow-up visits.

A total of 1040 patients presented for a first follow-up visit after the initial virtual consultation with the mean time between these two visits being 0.9 ± 1.9 months [Table 2]. Dental examinations were completed for 72.4% of patients, 42.4% had at least one intra-oral radiograph, 7.9% had at least one extra-oral radiograph, 32.9% received scaling, 35.9% had prophy, and 40.4% received a fluoride application. A total of 417 extractions were completed in 186 patients during their first follow-up visit, and 92.5% of these patients had between 1 to 4 extractions [Table 2 & Table 3]. Each of these patients had a mean of 2.2 ± 1.8 extractions completed. A total of 341 composite restorations, 200 stainless steel crowns, 33 amalgam restorations, and 150 pulp therapy treatments (87 pulpotomies, 23 pulpectomies, and 40 root canals) were also

completed during this visit [Table 2, Figure 2]. See Table 3 for the number of patients who received these various treatments.

The mean time between the initial visit and the second follow-up was 3.1 ± 2.8 months. During follow-up two, examinations were completed on 61.0% of patients, with 24.5% having at least one intra-oral radiograph and 4.1% having at least one extra-oral radiograph. Scaling was performed on 22.7% of patients, 30.4% had prophy, and 32.0% had fluoride treatment. A total of 384 extractions in 135 patients were completed, with 83% of these patients having between 1 to 4 extractions with a maximum of 13 extractions being completed in one patient during this appointment. A total of 526 composite restorations, 328 stainless steel crowns, 22 amalgam restorations, and 138 pulp therapy treatments were completed during the second follow-up (84 pulpotomies, 10 pulpectomies, 44 root canals) [Table 2, Figure 3].

The mean time between the initial visit and the third follow-up was 4.0 ± 2.7 months. During the third follow-up, examinations were completed on 46.4% of patients, with 18.9% having at least one intra-oral radiograph and 3.3% having at least one extra-oral radiograph. Scaling was performed on 22.2% of patients, 28.4% had prophy, and 30.2% received a fluoride application. A total of 146 extractions in 51 patients were completed. 84.3% of these patients had between 1 to 4 extractions completed during this visit, with a maximum of 8 extractions being completed in one patient. A total of 364 composite restorations, 175 stainless steel crowns, 16 amalgam, and 60 pulp therapy treatments were completed during the third follow-up (37 pulpotomies, 6 pulpectomies, 17 root canals) [Table 2, Figure 4].

The mean time between the initial visit and the fourth follow-up was 5.1 ± 2.7 months. Examinations were completed on 42.1% of patients, with 20.1% having at least one intra-oral radiograph and 6.3% having at least one extra-oral radiograph during this fourth follow-up visit. Scaling was performed on 17.0% of patients, 23.4% had prophy, and 24.5% had fluoride applications. A total of 48 extractions in 19 patients were completed, with 89.5% of these patients having 1 to 4 extractions during their fourth follow-up appointment. A total of 186 composite restorations, 27 stainless steel crowns, 3 amalgams, and 16 pulp therapy treatments were also completed during the third follow-up visit (10 pulpotomies, 6 root canals) [Table 2, Figure 5].

The Chi-squared test identified that patient sex and provider province were not associated ($p=0.54$) whereas an association existed between the provider province and the provider type ($p=0.00$). From the one-way ANOVA test, the null hypothesis was rejected, and therefore, evidence existed to conclude that an association existed between the patient's age and the provider type ($p=0.00$). General dentists saw patients at a mean age of 10.7 years, whereas pediatric dentists saw patients at a mean age of 7.2 years. One-way ANOVA test identified that there was no significant variation in the age of the child presenting for a consultation and the province of the provider ($p=0.11$).

DISCUSSION

This present study highlights the uptake of virtual visits during the Covid-19 pandemic from April 2020 to August 2021. The study is of great importance to help identify the uptake of virtual

consults in Canada by Registered First Nations and Inuit children during the pandemic and help determine if virtual consults could be beneficial moving forward to help improve access to care.

Our results show that most virtual visits billed to the NIHB program during COVID-19 from the period of April 2020 to August 2021 were completed by general practitioners (91.4%) followed by pediatric dentists (8.3%). More extractions were completed than any other type of dental treatment during the first visit following the initial consultation, with a total of 417 extractions. When Covid-19 began to unfold, there was a push by dental and health authorities to limit the use of aerosol-generating procedures to reduce the risk of transmission in the dental office.[3] There was also a great deal of uncertainty surrounding Covid-19 in the initial days, and these are two reasons that may explain why there were initially more extractions completed than any other procedure.

A considerable amount of hygiene care including scaling, prophy, and fluoride applications was completed during the follow-up treatments, however, all were billed by dentists and dental specialists. Only one patient was treated by a dental hygienist which was during the third follow-up visit.

In this present study, we decided to exclude treatment data if it occurred nine months after the initial virtual consult date. It was decided that nine months would provide sufficient time for treatment to be obtained but, exclude treatment that was irrelevant to the initial consultation. This period considered that most dental offices were closed for a three-month period and the potential wait time for specialist care. During the study period, there were 147 patients who had an initial

virtual consultation without any follow-up. It is possible that teledentistry was able to manage their concerns without the need for further follow-up however an additional study design would be needed to draw that conclusion. Brecher *et al* investigated the use of teledentistry in a pediatric private practice setting during the Covid-19 pandemic and found that 48% of emergencies were managed with teledentistry with the emergencies varying from caries, ortho appliances, concerns about eruption, trauma, and others.[13] Although the results are limited to one private practice, the results are promising. The Covid-19 pandemic impacted the dental field globally[7], and as a result, antibiotics were prescribed more frequently and for longer durations due to a reduction in conventional in-person care.[7] One study in Alberta compared data from two public health dental clinics from March 2020 to October 2020 to data from the 2019 pre-Covid period.[14] Their results show that the use of teledentistry and antibiotics increased because of the Covid-19 pandemic with antibiotic usage being the highest during the months of April, May and June 2020 and increasing three-fold compared to before Covid.[14] Although our study, because of its design was unable to identify which virtual consultations resulted in prescriptions for antibiotics, it can only be assumed that many prescriptions were administered against antibiotic stewardship practice.

Teledentistry has been used successfully in consultations, remote screenings, diagnosis and treatment planning, and monitoring.[12] It has been shown to be beneficial in the community health setting, where photos can be taken and then sent to a dental clinician for review of treatment needs and triaging.[3,12] Teledentistry has also been successfully used for dental consultations in areas with limited access to care. [3] The use of teledentistry in rural, remote, and northern communities in Canada is unrepresented in the literature, however, telehealth is well represented.

When reviewing the literature, telehealth has been used in remote Canadian communities for services such as assessing concussion patients[15], rheumatology services, mental health assessments, pre-and post-operative surgery assessments, dietary consults, and daily hemodialysis consults.[16] Telehealth does pose some challenges in that the practitioner requires training, specialized equipment is required, and telehealth requires sufficient internet capability.[16] Despite the challenges, telehealth has resulted in a reduction in medical transport and accommodation costs.[16] Given the success that has been shown with the use of telehealth in accessing northern communities, there is a great possibility for teledentistry to follow this same path of success.

As per the Statistics Canada 2016 Census, the largest numbers of First Nations & Inuit Peoples live in Ontario, followed by British Columbia, Alberta, Manitoba, Saskatchewan, and Québec respectively.[17] The result of our study shows that the highest numbers of virtual consults were completed in these provinces apart from British Columbia and Ontario. It is important to note that most of the eligible population in British Columbia are clients of the First Nations Health Authority and are therefore not captured under the NIHB claims data and thus inadequately represented through this study. Since Ontario has many First Nations and Inuit Peoples, one would expect a higher representation in the number of virtual consults completed. One reason for this may be that dental clinicians were providing virtual consults but perhaps not billing for them. The Royal College of Dental Surgeons of Ontario (RCDSO) did publish guidelines for the use of teledentistry[10] and perhaps the meticulous details deterred dentists from performing virtual consults and this may be another reason for a low number of virtual consults.

The Province of Québec had the highest number of virtual visits. The two dental associations in Québec (Association des Chirurgiens dentistes du Québec (ACDQ) and Federation des dentistes specialists du Québec (FDSQ)) have unique codes which are typically different than the Canadian Dental Association (CDA) codes that are used in the rest of Canada. From March 15, 2020, until December 31, 2020, the 91120 code specific to the Québec dental associations, "treatment not otherwise specified in guide," was used for virtual visits and reimbursed by the NIHB program. Dentists were not given guidelines on how to code specifically for virtual visits. As of January 1, 2021, NIHB discontinued the 91120 code, and virtual codes started to be covered under the 01306 and 01350 codes for general dentists and specialists, respectively. The variations in codes for the province of Québec and the lack of specific guidelines could explain the large number of virtual consults completed compared to other provinces. Our study looked at the province/territory of the practitioner rather than the patient. The low number of virtual consults in the territories may be the result of these patients having virtual consults and treatment completed by practitioners in adjacent provinces.

Recently, Singhal *et al.* investigated how the government and other organizations in Canada promoted the use of teledentistry and virtual care since the Covid-19 pandemic and if there were barriers to its usage.[10] As part of their findings, Singhal *et al.* found that almost all jurisdictions promoted teledentistry, however, only some provincial and territorial jurisdictions developed teledentistry guidelines.[10] The results of our study were similar in that most jurisdictions utilized virtual consultations during the Covid-19 pandemic to facilitate care. It is unclear why only some provincial and territorial jurisdictions developed teledentistry guidelines however one hypothesis

is that perhaps there was insufficient time to fabricate quality guidelines to protect personal health information.

The American Academy of Pediatric Dentistry (AAPD) has adopted a policy on teledentistry as they recognize the importance of improving access to dental care for pediatric patients.[11] The AAPD agrees that teledentistry can help improve access to care for patients in remote and rural communities, aid in a multidisciplinary care approach, and support preventative education.[11] Teledentistry has been shown to be reliable for examinations and managing odontogenic infections, however, more research is needed to determine the potential for caries detection.[8,12]

A limitation of our study is that we investigated dental claims through NIHB, which captures only a portion of the Canadian population, and a review of dental claims is unable to provide information about the specific forms of technology used for virtual consultations. Identifying the forms of technology used for virtual consultations could help provide insight into if there are variations in efficiency and outcomes which can help to improve the delivery of care. Moving forward, additional studies could be done to 1. explore the variations in technology being utilized for virtual consultations, 2. determine what percentage of concerns are being managed virtually and 3. gather parent/patient feedback on virtual visits. Despite the limitations of our study, it helped explore teledentistry and the potential benefits of its use in Canada, it utilized NIHB data which is for Registered First Nations and Inuit Peoples and is an important group to study because they often experience significant acute care challenges[5,6], and the study considers dentistry and delivery of dental care outside of the conventional environment. Through the study, it is evident that virtual visits were utilized during the Covid-19 pandemic across the country.

Teledentistry has significant potential to expand its capacity; however, privacy and security surrounding patient information must be considered.[4,10,11] AAPD supports the use of teledentistry to supplement in-person care to improve care access.[11] Populations that reside in isolated northern communities in Canada face access to care challenges.[5] Although many Indigenous Peoples have dental coverage through NIHB, only 45% of the population in Nunavut and Northwest Territories visit the dentist annually.[19] Teledentistry has the potential to help significantly improve this access by providing these individuals with virtual timely access to dentists and dental specialists. In Canada, teledentistry could help with consultations, facilitating follow-ups, and triaging care. Moving forward, an additional follow-up study would be useful to gather parent and patient feedback on virtual consults.

CONCLUSIONS

Based on the findings of our study, the following conclusions have been made:

1. Virtual consultations were utilized during the Covid-19 pandemic for pediatric patients covered by NIHB.
2. A greater uptake of virtual visits was seen in provinces with higher Registered First Nation & Inuit Peoples apart from Ontario.
3. Common Follow-up Procedures were Extractions, Pulp Treatment (Pulpotomies, Pulpectomies & Root Canal Therapy), Restorations, and Hygiene Care.
4. Teledentistry has the potential to greatly improve access to care for the pediatric population. Based on the results of this study, we see the benefit of NIHB continuing to cover virtual consultations as it will help improve access to care, especially for patients in remote/rural communities.
5. Moving forward, additional studies are needed to obtain patient/parent feedback on virtual consultations.

REFERENCES

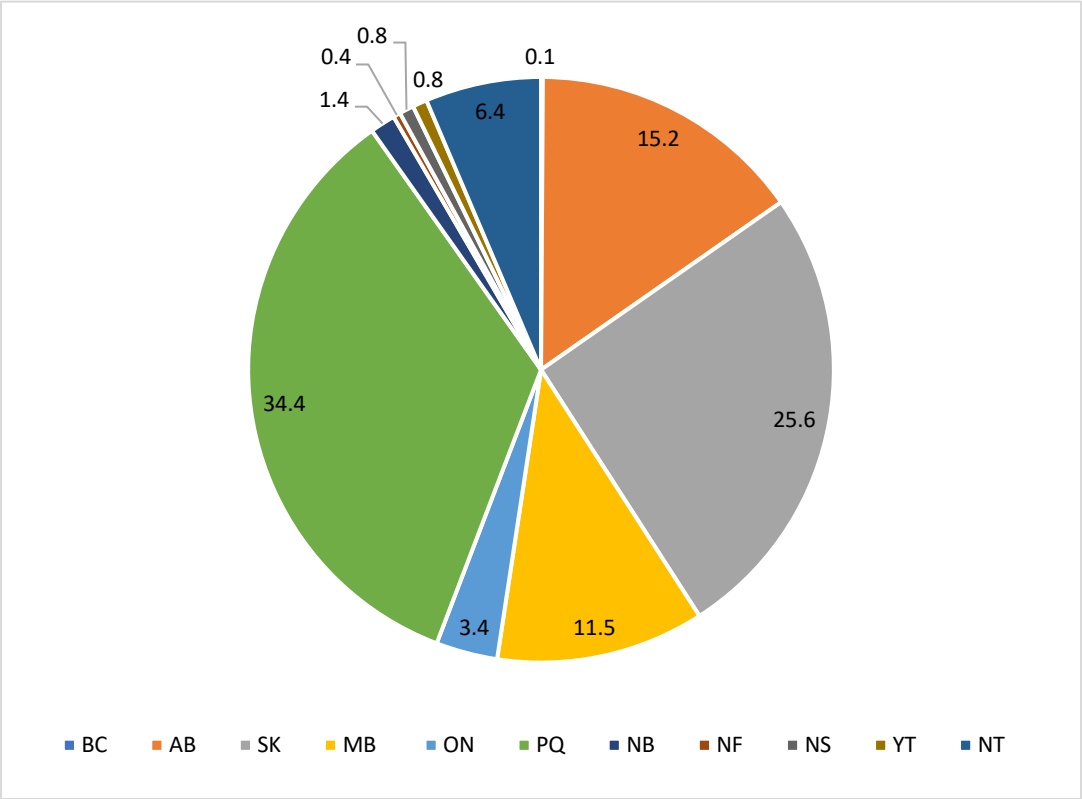
1. Public Health Agency of Canada. COVID-19: Main modes of transmission [Internet]. Government of Canada Web site. 2021. Available from:https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals/main-modes-transmission.html
2. World Health Organization (WHO). Coronavirus Disease (COVID-19) [Internet]. [place unknown]: World Health Organization; 2022. [cited 2022 October 19]. Available from: https://www.who.int/health-topics/coronavirus#tab=tab_1
3. Ghai S. Teledentistry during COVID-19 pandemic. Diabetes Metab Syndr Clin Res Rev [Internet]. 2020;14(5):933–5. Available from: https://doi.org/10.1016/j.dsx.2020.06.029
4. Hung M, Lipsky MS, Phuatrakoon TN, Nguyen M, Licari FW, Unni EJ. Teledentistry Implementation During the COVID-19 Pandemic: Scoping Review. Interact J Med Res. 2022;11(2):e39955.
5. Kyoon-Achan G, Schroth RJ, DeMaré D, Sturym M, Edwards JM, Sanguins J, et al. First Nations and Metis peoples' access and equity challenges with early childhood oral health: a qualitative study. Int J Equity Health. 2021;20(1):1–14.
6. Irvine JD, Holve S, Krol D, Schroth R, Wong S, Abelson W, et al. Early childhood caries in Indigenous communities: A joint statement with the American Academy of Pediatrics. Paediatr Child Health (Oxford). 2011;16(6):351–7.
7. Sutherland S, Born K, Singhal S. Moving the needle on dental antibiotic overuse in. 2022;48(11):502–5.
8. Johnson V, Brondani M, von Bergmann H, Grossman S, Donnelly L. Dental Service and Resource Needs during COVID-19 among Underserved Populations. JDR Clin Transl Res. 2022;7(3):315–25.
9. Schroth RJ, Harrison RL, Moffatt MEK. Oral Health of Indigenous Children and the Influence of Early Childhood Caries on Childhood Health and Well-being. Pediatr Clin North Am [Internet]. 2009 Dec;56(6):1481–99. Available from: https://www.sciencedirect.com/science/article/pii/S0031395509001242
10. Singhal S, Mohapatra S, Quiñonez C. Reviewing Teledentistry Usage in Canada during Covid-19 to Determine Possible Future Opportunities. Int J Environ Res Public Health. 2022;19(1).
11. American Academy of Pediatric Dentistry. Policy on Teledentistry. AAPD Reference Manual.
12. Irving M, Stewart R, Spallek H, Blinkhorn A. Using teledentistry in clinical practice as an enabler to improve access to clinical care: A qualitative systematic review. J Telemed Telecare. 2018;24(3):129–46.
13. Brecher EA, Keels MA, Carrico CK, Hamilton DS. Teledentistry Implementation in a Private Pediatric Dental Practice During the COVID-19 Pandemic. Pediatr Dent. 2021;43(6):463–7.
14. Rabie H, Figueiredo R. Provision of dental care by public health dental clinics during the COVID-19 pandemic in Alberta, Canada. Prim Dent J. 2021;10(3):47–54.
15. Ellis MJ, Boles S, Derksen V, Dawyduk B, Amadu A, Stelmack K, et al. Evaluation of a pilot paediatric concussion telemedicine programme for northern communities in

Manitoba. Int J Circumpolar Health [Internet]. 2019;78(1). Available from: https://doi.org/10.1080/22423982.2019.1573163
16. Jong M, Mendez I, Jong R. Enhancing access to care in northern rural communities via telehealth. Int J Circumpolar Health [Internet]. 2019;78(2). Available from: https://doi.org/10.1080/22423982.2018.1554174
17. Statistics Canada. Aboriginal Peoples Highlight Tables, 2016 Census [Internet]. Ottawa. 2017. p. Statistics Canada Catalogue no. 98-402-X2016009. Available from: https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/abo-aut/Table.cfm?Lang=Eng&T=101&S=99&O=A%0Ahttps://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/abo-aut/index-eng.cfm
18. Estai M, Bunt S, Kanagasingam Y, Kruger E, Tennant M. Diagnostic accuracy of teledentistry in the detection of dental caries: a systematic review. J Evid Based Dent Pract [Internet]. 2016;16(3):161–72. Available from: http://dx.doi.org/10.1016/j.jebdp.2016.08.003
19. Schroth RJ. The state of dental health in the north. Int J Circumpolar Health. 2006;65(2):98–100.

Table 1. Characteristics of Virtual Consult Claims

Patients (N= 1040)	N (%)
Sex	
Female	565 (54.3)
Male	475 (45.7)
Age	
Mean and Standard Deviation	10.5 ± 4.9
	Range: 1-18 years
Provider Province/Territory	
British Columbia (BC)	1 (0.1)
Alberta (AB)	158 (15.2)
Saskatchewan (SK)	266 (25.6)
Manitoba (MB)	120 (11.5)
Ontario (ON)	35 (3.4)
Quebec (PQ)	358 (34.4)
New Brunswick (NB)	15 (1.4)
Newfoundland (NF)	4 (0.4)
Nova Scotia (NS)	8 (0.8)
Yukon (YT)	8 (0.8)
Northwest Territories (NT)	67 (6.4)
Provider Type	
General Practitioner (GP)	951 (91.4)
Pediatric Dentist (PA)	86 (8.3)
Endodontist (EN)	1 (0.1)
Oral Surgeon (OS)	1 (0.1)
Periodontist (PE)	1 (0.1)

Figure 1: Percentage (%) of Virtual Consults by Province/Territory



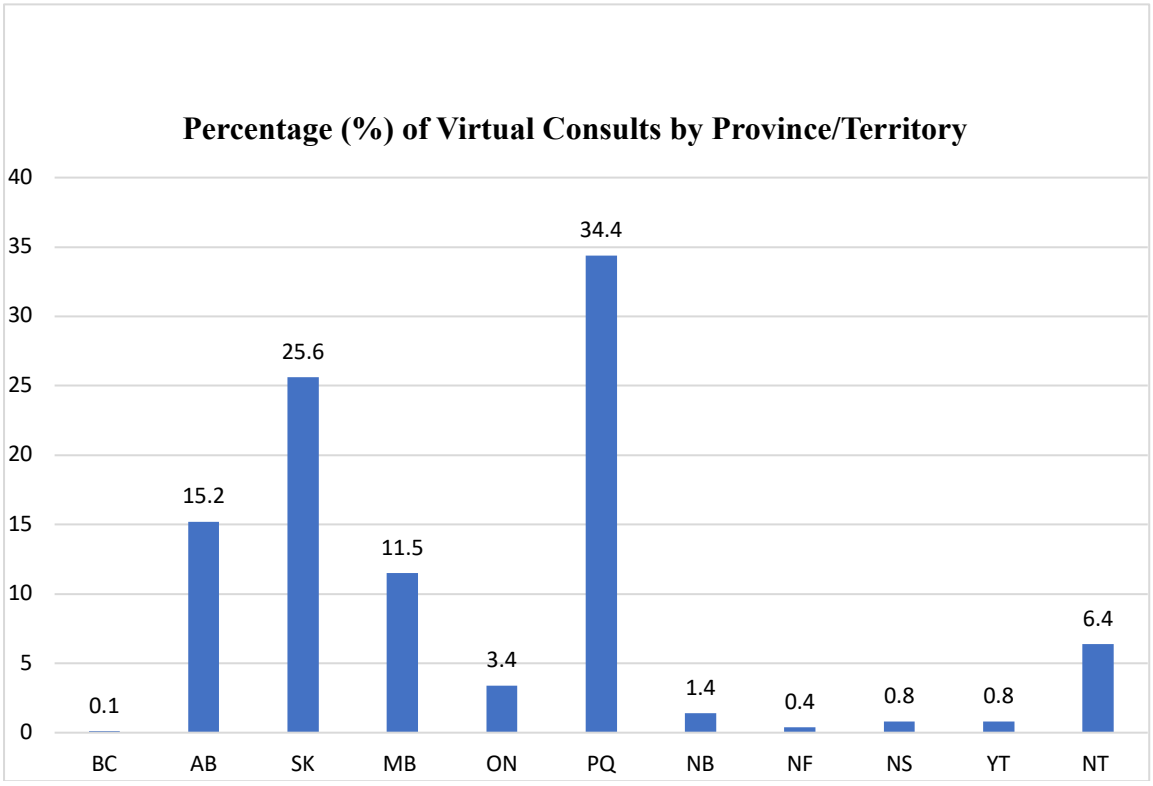


Table 2. Time Between Initial Consult & Follow-up Care Along with Treatment Types, Provider Type & Location Follow-up 1-10

Variable	FU 1 (N= 1040)	FU 2 (N= 662)	FU 3 (N=334)	FU 4 (N=159)	FU 5 (N=77)	FU 6 (N=35)	FU 7 (N= 12)	FU 8 (N=8)	FU 9 (N=5)	FU 10 (N=2)
Mean Time (months) Between Consult & Follow-Up Visit	0.88 ± 1.88	3.11 ± 2.82	4.0 ± 2.74	5.09 ± 2.65	5.61 ± 2.53	5.63 ± 2.47	5.75 ± 2.22	6.63 ± 1.60	7.4 ± 1.14	8.5 ± 0.71
Provider Province/Territory										
AB	165 (15.9)	105 (15.9)	56 (16.8)	34 (21.4)	18 (23.4)	10 (28.6)	2 (16.7)	1 (12.5)	1 (20.0)	1 (50.0)
BC	1 (0.1)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
MB	119 (11.4)	72 (10.9)	35 (10.5)	15 (9.4)	8 (10.4)	4 (11.4)	4 (33.3)	2 (25.0)	2 (40.0)	1 (50.0)
NB	15 (1.4)	10 (1.5)	3 (0.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
NF	4 (0.4)	1 (0.2)	1 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
NS	8 (0.8)	4 (0.6)	1 (0.3)	1 (0.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
NT	66 (6.4)	25 (3.8)	9 (2.7)	4 (2.5)	1 (1.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
NU	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
ON	35 (3.4)	22 (3.3)	16 (4.8)	9 (5.7)	2 (2.6)	2 (5.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
PQ	358 (34.4)	263 (39.7)	136 (40.7)	63 (39.6)	29 (37.7)	12 (34.3)	5 (41.7)	4 (50.0)	2 (40.0)	0 (0.0)
SK	259 (24.9)	154 (23.3)	74 (22.2)	32 (20.1)	18 (23.4)	7 (20.0)	1 (8.3)	1 (12.5)	0 (0.0)	0 (0.0)
YT	9 (0.9)	5 (0.8)	3 (0.9)	3 (0.6)	1 (1.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Provider Type										
General (GP)	930 (89.4)	562 (84.9)	278 (82.2)	135 (84.9)	64 (83.1)	32 (91.4)	11 (91.7)	7 (87.5)	4 (80.0)	2 (100.0)
Pedo (PA)	96 (9.2)	87 (13.1)	44 (13.2)	20 (12.6)	12 (15.6)	2 (5.7)	1 (8.3)	1 (12.5)	1 (20.0)	0 (0.0)
Endo (EN)	5 (0.5)	2 (0.3)	1 (0.3)	1 (0.6)	0 (0.0)	1 (2.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Hygiene (HY)	0 (0.0)	0 (0.0)	1 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Oral Surg (OS)	8 (0.8)	11 (1.7)	9 (2.7)	3 (1.9)	1 (1.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Perio (PE)	1 (0.1)	0 (0.0)	1 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Number of Exams										
Complete	54	25	8	1	3	1	1	0	0	0
Limited	41	17	5	5	3	0	0	0	0	0
Recalls	294	160	67	33	14	6	1	1	0	0
Consults	51	133	45	13	4	1	2	0	0	0
Emergency	191	18	6	5	1	1	1	1	0	0
Specific	122	51	24	10	2	2	1	1	2	0
Radiographs										
Intra-Oral	441 (42.4)	162 (24.5)	63 (18.9)	32 (20.1)	15 (19.5)	8 (22.9)	1 (8.3)	2 (25.0)	2 (40.0)	1 (50.0)
Extra-Oral	82 (7.9)	27 (4.1)	11 (3.3)	10 (6.3)	1 (1.3)	2 (5.7)	0 (0.0)	2 (25.0)	1 (20.0)	1 (50.0)
Hygiene										
Scaling	342 (38.9)	150 (22.7)	74 (22.2)	27 (16.9)	11 (14.3)	4 (11.4)	3 (25.0)	0 (0.0)	1 (20.0)	0 (0.0)
Prophy	373 (35.9)	201 (30.4)	95 (28.4)	37 (23.3)	16 (20.8)	8 (22.9)	3 (25.0)	1 (12.5)	2 (40.0)	0 (0.0)
Fluoride	420 (40.4)	212 (32.0)	101 (30.2)	39 (24.5)	15 (19.5)	8 (22.9)	2 (16.7)	1 (12.5)	2 (40.0)	0 (0.0)
Restorations/Preventative										
Number of Patients	21	5	3	1	1	0	0	0	0	0
Number of Caries/Trauma Pain Control	26	7	3	1	1	0	0	0	0	0
Number of Patients	15	13	8	2	3	0	1	0	1	0
Number of Amalgams	33	22	16	3	4	0	1	0	4	0
Total Number of Patients	178	267	168	91	51	25	6	4	3	1
Total Number of Composites	341	526	364	186	114	37	12	6	9	4
Number of Patients	55	64	49	20	16	5	2	0	0	0
Number of Anterior Composites	99	126	83	39	41	7	5	0	0	0
Number of Patients	123	203	119	71	35	20	4	4	3	1
Number of Posterior Composites	242	400	281	147	73	30	7	6	9	4
Total Number of Patients	44	74	38	9	2	1	0	0	0	0

Total Number of Stainless-Steel Crowns	200	327	175	27	3	5	0	0	0	0
Number of Patients	9	17	6	1	1	0	0	0	0	0
Number of Anterior Stainless-Steel Crowns	27	38	19	2	2	0	0	0	0	0
Number of Patients	35	57	32	8	1	1	0	0	0	0
Number of Posterior Stainless-Steel Crowns	173	289	156	25	1	5	0	0	0	0
Number of Patients	6	4	6	0	0	0	0	1	0	0
Number of SDF Applications	9	8	9	0	0	0	0	1	0	0
Number of Patients	21	48	14	6	2	1	0	0	0	0
Number of Sealants	59	136	17	12	10	1	0	0	0	0
Pulp Treatments										
Number of Patients	26	31	16	4	0	0	0	0	0	0
Number of Pulpotomies	87	84	37	10	0	0	0	0	0	0
Number of Patients	23	8	6	0	1	0	0	0	0	0
Number of Pulpectomies	23	10	6	0	1	0	0	0	0	0
Number of Patients	38	40	17	6	4	5	1	3	0	0
Number of Root Canals	40	44	17	6	4	5	1	3	0	0
Extractions										
Number of Patients	186	135	51	19	12	2	1	0	0	0
Number of Extractions	417	384	146	48	33	2	1	0	0	0
Dentures										
Number of Patients	0	0	1	1	0	0	0	0	0	0
Number of Dentures	0	0	1	1	0	0	0	0	0	0

Table 3. Number of Patients and Number of Procedures Performed Follow-up 1-10

Variable	FU 1 (N= 1040)	FU 2 (N= 662)	FU 3 (N= 334)	FU 4 (N= 159)	FU 5 (N= 77)	FU 6 (N= 35)	FU 7 (N= 12)	FU 8 (N= 8)	FU 9 (N= 5)	FU 10 (N= 2)
Amalgams										
Overall Mean	0.032 ± 0.32	0.033 ± 0.26	0.047 ± 0.35	0.019 ± 0.18	---	---	---	---	---	---
1	7	7	4	1	2	0	1	0	0	0
2	3	3	1	1	1	0	0	0	0	0
3	3	3	2	0	0	0	0	0	0	0
4	0	0	1	0	0	0	0	0	1	0
5	1	0	0	0	0	0	0	0	0	0
6	1	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
Total										
Patients	15	13	8	2	3	0	1	0	1	0
Restorations	33	22	16	3	4	0	1	0	4	0
Mean	2.2 ± 1.6	1.7 ± 0.9	2.0 ± 1.2	1.5 ± 0.7	---	---	---	---	---	---
Posterior Composites										
Overall Mean	0.23 ± 0.73	0.60 ± 1.16	0.74 ± 1.24	0.92 ± 1.29	---	---	---	---	---	---
1	49	95	50	30	15	8	3	3	0	0
2	49	61	35	17	10	5	0	0	1	0
3	13	26	19	16	4	5	0	1	1	0
4	9	12	10	6	5	1	1	0	1	1
5	1	3	2	1	0	0	0	0	0	0
6	2	2	2	1	1	1	0	0	0	0
7	0	2	1	0	0	0	0	0	0	0
8	0	2	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
Total										
Patients	123	203	119	71	35	20	4	4	3	1
Restorations	242	400	281	147	73	30	7	6	9	4
Mean	1.9 ± 1.1	2.0 ± 1.3	2.1 ± 1.2	2.1 ± 1.2	---	---	---	---	---	---
Anterior Composites										
Overall Mean	0.095 ± 0.49	0.19 ± 0.69	0.25 ± 0.72	0.25 ± 0.76	---	---	---	---	---	---
1	30	27	30	9	3	4	1	0	0	0
2	15	23	9	6	9	0	0	0	0	0
3	6	7	5	3	0	1	0	0	0	0
4	1	5	5	1	2	0	1	0	0	0
5	1	1	0	1	0	0	0	0	0	0
6	2	0	0	0	2	0	0	0	0	0
7	0	1	0	0	0	0	0	0	0	0
Total										
Patients	55	64	49	20	16	5	2	0	0	0
Restorations	99	126	83	39	41	7	5	0	0	0
Mean	1.8 ± 1.2	2.0 ± 1.2	1.7 ± 1.0	2.0 ± 1.1	---	---	---	---	---	---
Anterior Stainless-Steel Crowns										
Overall Mean	0.026 ± 0.31	0.057 ± 0.38	0.057 ± 0.44	0.013 ± 0.16	---	---	---	---	---	----
1	1	3	0	0	0	0	0	0	0	0
2	4	10	2	1	1	0	0	0	0	0
3	1	1	1	0	0	0	0	0	0	0
4	1	3	3	0	0	0	0	0	0	0
5	1	0	0	0	0	0	0	0	0	0

6	1	0	0	0	0	0	0	0	0	0
Total										
Patients	9	17	6	1	1	0	0	0	0	0
Restorations	27	38	19	2	2	0	0	0	0	0
Mean	3.0 ± 1.7	2.2 ± 1.0	3.2 ± 1.0	2.0 ± 0.0	---	---	---	---	---	---
Posterior Stainless-Steel Crowns										
Overall Mean	0.17 ± 0.98	0.44 ± 1.61	0.47 ± 1.70	0.16 ± 0.85	---	---	---	---	---	---
1	3	8	9	3	1	0	0	0	0	0
2	5	6	1	1	0	0	0	0	0	0
3	1	3	2	1	0	0	0	0	0	0
4	5	7	2	1	0	0	0	0	0	0
5	4	2	3	0	0	1	0	0	0	0
6	8	12	1	1	0	0	0	0	0	0
7	3	2	2	1	0	0	0	0	0	0
8	6	17	12	0	0	0	0	0	0	0
Total										
Patients	35	57	32	8	1	1	0	0	0	0
Restorations	173	289	156	25	1	5	0	0	0	0
Mean	4.9 ± 2.3	5.1 ± 2.6	4.9 ± 3.0	2.0 ± 1.3	---	---	---	---	---	---
Pulpotomies										
Overall Mean	0.083 ± 0.61	0.13 ± 0.70	0.11 ± 0.58	0.063 ± 0.47	---	---	---	---	---	---
1	8	8	6	2	0	0	0	0	0	0
2	4	13	4	0	0	0	0	0	0	0
3	1	1	3	1	0	0	0	0	0	0
4	6	5	2	0	0	0	0	0	0	0
5	2	0	0	1	0	0	0	0	0	0
6	3	3	1	0	0	0	0	0	0	0
7	1	0	0	0	0	0	0	0	0	0
8	1	0	0	0	0	0	0	0	0	0
9	0	1	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
Total										
Patients	26	31	16	4	0	0	0	0	0	0
Pulpotomies	87	84	37	10	0	0	0	0	0	0
Mean	3.3 ± 2.1	2.7 ± 1.9	2.3 ± 1.4	2.5 ± 1.9	---	---	---	---	---	---
Pulpectomies										
Overall Mean	0.022 ± 0.15	0.015 ± 0.15	0.018 ± 0.13	---	---	---	---	---	---	---
1	23	7	6	0	1	0	0	0	0	0
2	0	1	0	0	0	0	0	0	0	0
Total										
Patients	23	8	6	0	1	0	0	0	0	0
Pulpectomies	23	10	6	0	1	0	0	0	0	0
Mean	1.0 ± 0.0	1.1 ± 0.4	1.0 ± 0.0	---	---	---	---	---	---	---
Root Canals										
Overall Mean	0.038 ± 0.20	0.066 ± 0.27	0.051 ± 0.22	0.034 ± 0.19	---	---	---	---	---	---
1	36	36	17	6	4	5	1	3	0	0
2	2	4	0	0	0	0	0	0	0	0
Total										
Patients	38	40	17	6	4	5	1	3	0	0
Root Canals	40	44	17	6	4	5	1	3	0	0
Mean	1.1 ± 0.2	1.1 ± 0.3	1.0 ± 0.0	1.0 ± 0.0	---	---	---	---	---	---
Sealants										
Overall Mean	0.057 ± 0.55	0.21 ± 0.91	0.14 ± 0.72	0.075 ± 0.44	---	---	---	---	---	---
1	9	12	1	3	0	1	0	0	0	0
2	5	12	2	1	1	0	0	0	0	0

3	2	8	4	1	0	0	0	0	0	0
4	2	13	6	1	0	0	0	0	0	0
5	0	1	0	0	0	0	0	0	0	0
6	1	1	1	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	1	0	0	0	1	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	1	0	0	0	0	0	0	0	0	0
13	0	1	0	0	0	0	0	0	0	0
Total										
Patients	21	48	14	6	2	1	0	0	0	0
Sealants	59	136	47	12	10	1	0	0	0	0
Mean	2.8 ± 2.8	2.8 ± 2.0	3.4 ± 1.2	2.0 ± 1.3	---	---	---	---	---	---
Silver Diamine Fluoride (SDF)										
Overall Mean	0.0058 ± 0.08	0.0060 ± 0.078	0.018 ± 0.13	---	---	---	---	---	---	---
1	4	1	4	0	0	0	0	1	0	0
2	1	2	1	0	0	0	0	0	0	0
3	1	1	1	0	0	0	0	0	0	0
Total										
Patients	6	4	6	0	0	0	0	1	0	0
SDF Applications	9	8	9	0	0	0	0	1	0	0
Mean	1.5 ± 0.8	2.0 ± 0.8	1.5 ± 0.8	---	---	---	---	---	---	---
Extractions										
Overall Mean	0.40 ± 1.15	0.58 ± 1.61	0.44 ± 1.24	0.30 ± 1.14	---	---	---	---	---	---
1	99	63	16	10	6	2	1	0	0	0
2	29	17	10	3	1	0	0	0	0	0
3	8	12	5	0	0	0	0	0	0	0
4	36	20	12	4	4	0	0	0	0	0
5	6	4	3	0	0	0	0	0	0	0
6	3	6	4	1	0	0	0	0	0	0
7	1	4	0	0	0	0	0	0	0	0
8	3	3	1	0	0	0	0	0	0	0
9	0	3	0	0	1	0	0	0	0	0
10	0	0	0	1	0	0	0	0	0	0
11	0	1	0	0	0	0	0	0	0	0
12	0	1	0	0	0	0	0	0	0	0
13	1	1	0	0	0	0	0	0	0	0
Total										
Patients	186	135	51	19	12	2	1	0	0	0
Extractions	417	384	146	48	33	2	1	0	0	0
Mean	2.2 ± 1.8	2.8 ± 2.5	2.9 ± 1.8	2.5 ± 2.4	---	---	---	---	---	---
Dentures										
1	0	0	1	1	0	0	0	0	0	0
Total										
Patients	0	0	1	1	0	0	0	0	0	0
Dentures	0	0	1	1	0	0	0	0	0	0

Figures 2-5: Restorative Treatments for Follow-up 1-4

Figure 2: Follow-up 1 Restorative Treatments

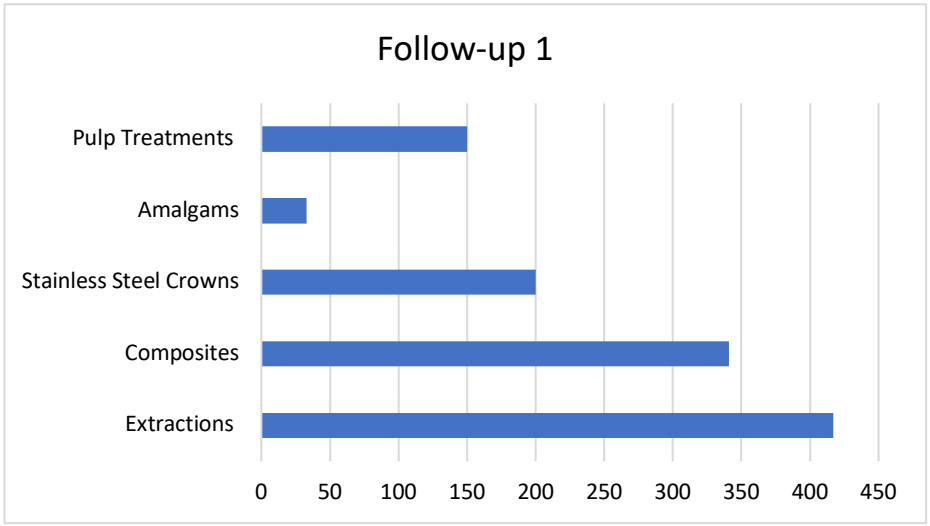


Figure 3: Follow-up 2 Restorative Treatments

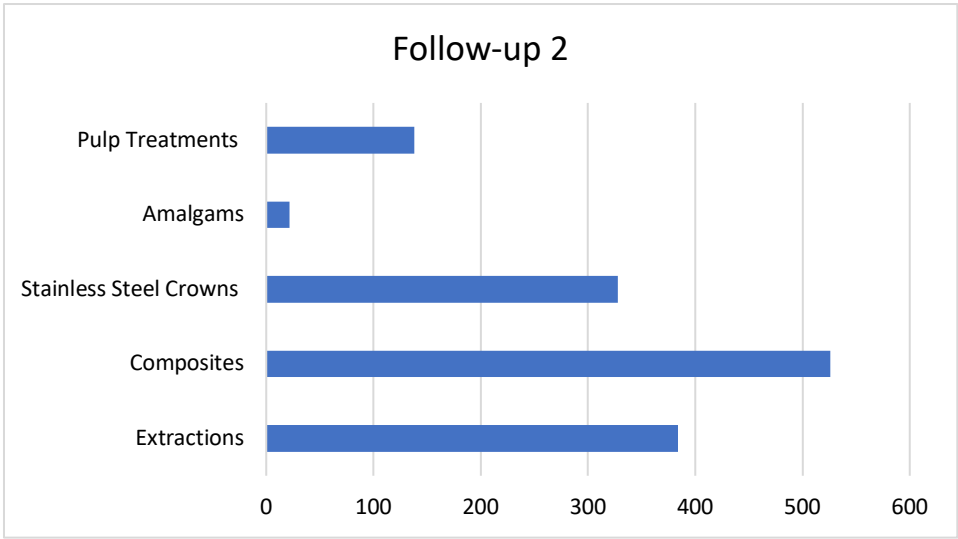


Figure 4: Follow-up 3 Restorative Treatments

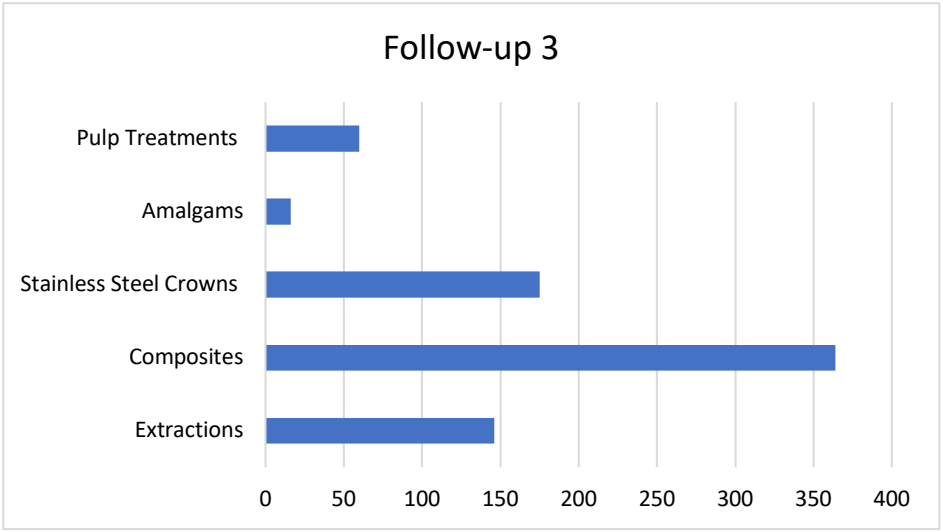


Figure 5: Follow-up 4 Restorative Treatments