DALHOUSIE UNIVERSITY | FACULTY OF DENTISTRY

Faculty of Dentistry Focus on Research Day

November 5, 2025
Student Union Building

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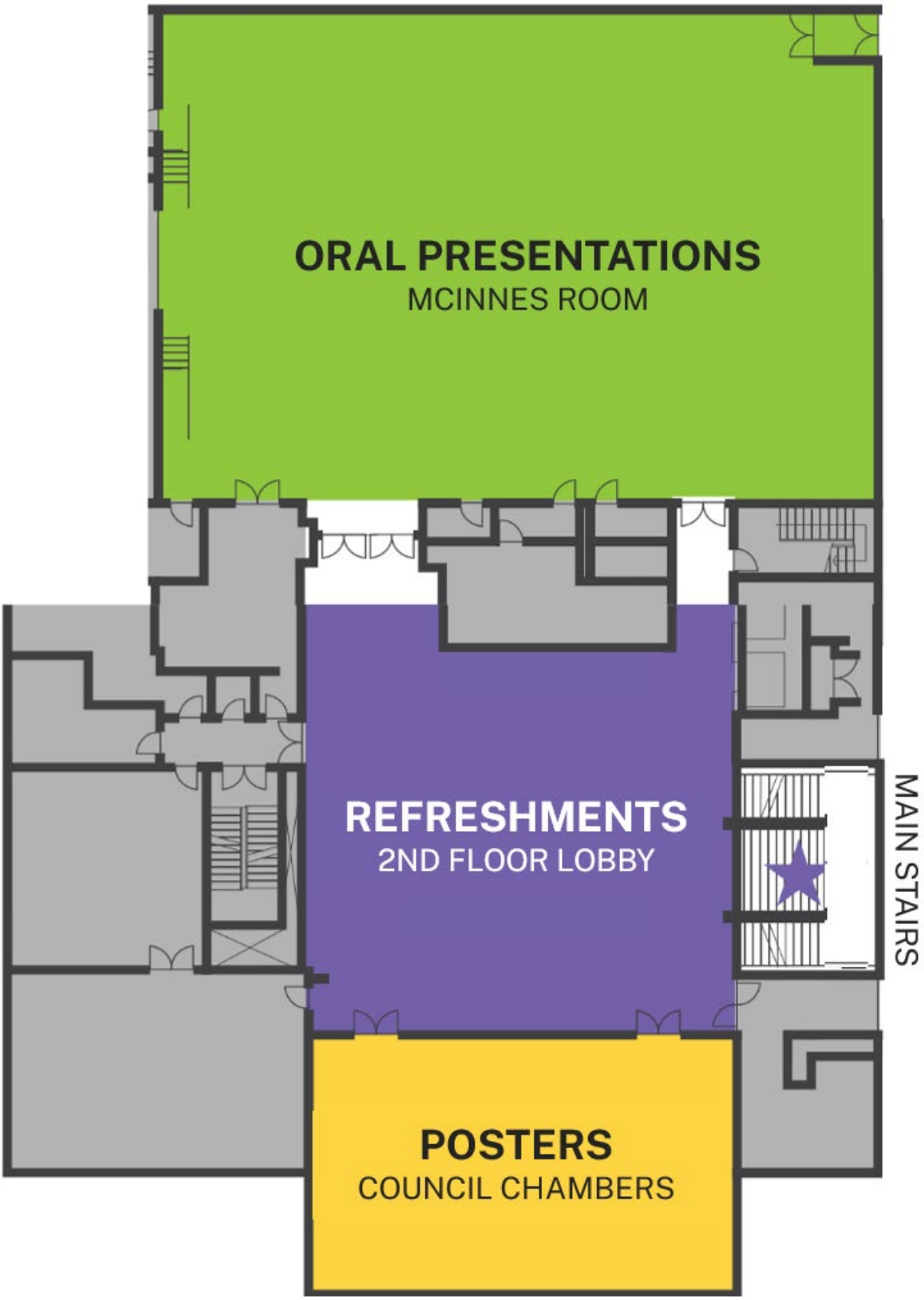
Schedule at a Glance

Time	Event	Presenter
1:00 p.m.	**Venue Opens**	
1:30 p.m.	**Opening Remarks**	
	Opening remarks and event introduction	Mark Filiaggi Ben Davis
1:45 p.m.	**Session 1: Oral Presentations**	
	Polymeric biomaterials: From idea to innovation	Vahid Adibnia
	Real-time thermal profiling of light-and self-cured composites	Cristiane Maucoski
	Platforms for wearable/implantable electronics in healthcare	Yunyun Wu
2:30 p.m.	**Session 2: Keynote**	
	Generating a new generation of biostable restoratives - Towards a more sustainable adhesive interface bonding system and its implications for clinical use	J. Paul Santerre University of Toronto
3:30 p.m.	**Session 3: Posters Presentations & Refreshments**	
	Break for posters and refreshments	
4:30 p.m.	**Session 4: Oral Presentations - Trainees**	
	Development of itaconate polymer microparticles for intracellular regulation of pro-inflammatory macrophage activation	Kaitlyn Woodworth
	Interpenetrating network of macromolecules for the fabrication of a drug carrier with controlled degradability	Namita Bhasin
	Impact of nasogastric decompression on postoperative nausea and vomiting in orthognathic surgery	Katherine Curry
	Evaluation of the stability of maxillary expansion after segmental LeFort I osteotomies using cone beam computed tomography	Erik Tamberg
	An interactive web-based application for the 2017 Periodontal Disease Classification: A proof-of-concept in dental education	Mohammad Abu-Samak
5:30 p.m.	**Closing Remarks and Awards**	
	Closing remarks and poster awards	Mark Filiaggi

Student Union Building – 6136 University Ave

2nd Floor Event Map



1:30 p.m. – Opening Remarks

Ben Davis
Dean, Faculty of Dentistry

Mark Filiaggi
Associate Dean, Research & Graduate Studies, Faculty of Dentistry

1:45 p.m. – Oral Presentations — Moderator: Leigha Rock

Polymeric Biomaterials: From Idea to Innovation

Vahid Adibnia

Assistant Professor, Department of Biomaterials & Applied Oral Sciences

Real-Time Thermal Profiling of Light and Self-Cured Composites

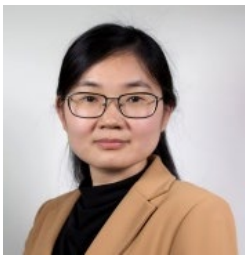
Cristiane Maucoski

Postdoctoral Fellow, Department of Dental Clinical Sciences, Faculty of Dentistry

Platforms for Wearable/Implantable Electronics in Healthcare

Yunyun Wu

Assistant Professor, Department of Biomaterials & Applied Oral Sciences



2:30 p.m. – Keynote Presentation Moderator: Mark Filiaggi

Generating a New Generation of Biostable Restoratives-Towards a More Sustainable Adhesive Interface Bonding System and its Implications for Clinical Use

Paul Santerre

Director of the Health Innovation Hub (H2i- Faculty of Medicine)
Baxter Chair for Health Technology and Commercialization, UHN
Ted Rogers Centre for Heart Research Translational Biology and Engineering Program Institute of Biomaterials and Biomedical Engineering Faculty of Dentistry, University of Toronto

Abstract:
Methacrylate (MA) resin-based restoratives (MA-RBRs) are used extensively in dentistry for their clinically good aesthetics, handling, adhesiveness, and curing properties. Despite their ubiquity, MA-RBRs are susceptible to esterolytic-hydrolysis shown to be enabled by oral salivary, bacterial, and host-immune system derived enzymes. This hydrolysis / biodegradation shortens the clinical service-lives of MA-RBRs, which have been shown, on average, to fail after <10 years. Currently, no alternative resin chemistry can match the functional properties and clinical workflow considerations of MA-RBRs while addressing their limited service-lives. Objective: To develop hydrolytically-stable monomers (HSMs) and prototype restoratives that can maintain or exceed the mechanical, safety, and workflow standards of contemporary MA-RBRs, while eliminating or retarding hydrolytic biodegradation and retaining clinical suitability. The patented resin systems, their design, biological and physical characterization, and clinical formulation and workflow will be discussed with an eye to commercial translation.

Biography:
Professor J. Paul Santerre has published >235 peer reviewed publications and is a listed inventor on >70 patents in the area of medical polymers. He has trained over 80 graduate students and generated over $61M in grant funding. He is co-founder and current director of the Health Innovation Hub at the University of Toronto (a student focused entrepreneur training co-curricular program that has trained > 850 client health science companies which have generated > $650M Cdn). He was also the inaugural chair of the Health Entrepreneurship Pillar for the African Higher Education Health Collaborative supported by the Mastercard Foundation (2021-2024). He is a co-founder of Interface Biologics, along with having spun-out five other start-up companies from his lab, and has won multiple national awards for his achievements in enabling entrepreneurship, including Canada's Governor General award for Innovation (2017), and the Professional Engineers of Ontario Entrepreneurship Award (2017), among others. He has received multiple awards for his community activity including the 2018 President's Impact Award from the University of Toronto, and in 2018 and 2020 he was recognized for his research in the field of Biomaterials, respectively by the US Society for Biomaterials and the Canadian Biomaterials Society for lifetime contributions to the scientific literature. In June 2025 he received an honorary doctorate degree from McMaster University for impact in science and society.

3:30 p.m. – Posters and Refreshments

Light refreshments will be served in the second-floor lobby, with poster presentations held in Room 270 (Council Chambers). See page **9** for poster titles and page **10 - 23** for poster abstracts.

4:30 p.m. – Trainee Presentations — Moderator: Haider Al-Waeli

Development of Itaconate Polymer Microparticles for Intracellular Regulation of Pro-Inflammatory Macrophage activation

Woodworth, K.E.[1], Zachary, F.[1], Osborne, N.D.[2], Rempe, C.[2], Wheeler, B.[1], Medd, K.[1], Callaghan, N.[3], Qian, H.[4], Archarya, A. P.[4], Charron, C.[5], Davenport Huyer, L.[1, 2, 6, 7]

[1]School of Biomedical Engineering, Faculties of Medicine and Engineering, Dalhousie University, [2]Department of Microbiology & Immunology, Faculty of Medicine, Dalhousie University, [3]Faculty of Medicine, Dalhousie University, [4]Department of Biomedical Engineering, Case Western University, [5]Department of Chemistry, Faculty of Science, Dalhousie University, [6]Department of Biomaterials & Applied Oral Sciences, Faculty of Dentistry, Dalhousie University, [7]Nova Scotia Health

Interpenetrating Network of Macromolecules for the Fabrication of a Drug Carrier with Controlled Degradability

Bhasin, N.[1], Adibnia, V.[2, 3], Sheikh, Z.[2, 3, 4]

[1] PhD Student, Biomedical Engineering, Dalhousie University, [2] School of Biomedical Engineering, Faculty of Medicine, Dalhousie University, [3] Department of Biomaterials & Applied Oral Sciences, Faculty of Dentistry, Dalhousie University, [4] Department of Dental Clinical Sciences, Faculty of Dentistry, Dalhousie University

Impact of Nasogastric Decompression on Postoperative Nausea and Vomiting in Orthognathic Surgery

Curry, K., Brady, J., Middleton, S.

Department of Oral and Maxillofacial Surgery, Victoria General Hospital, QEII Health Sciences Center, Halifax, NS, & Faculty of Dentistry, Dalhousie University, Halifax, NS

Trainee Presentations cont'd

Evaluation of the Stability of Maxillary Expansion After Segmental LeFort I Osteotomies Using Cone Beam Computed Tomography

Tamberg, E.[1,2], El, N.[1], Robertson, C.[1,2]

[1]Faculty of Dentistry, Dalhousie University, [2]Department of Oral and Maxillofacial Surgery, Victoria General Hospital, QEII Health Sciences Center

An Interactive Web-Based Application for the 2017 Periodontal Disease Classification: A Proof-of-Concept in Dental Education

Abu-Samak, M., Al-Waeli, H.

Faculty of Dentistry, Dalhousie University

5:30 p.m. – Closing Remarks

Closing remarks and awards.

#	Poster Presenter	Poster Title
1	Ahmed Al-Kayyli	Evaluation of Fibroblast and Osteoblast Responses to Collagen Membranes with Defined Physico-Chemical Properties
2	Natalie Liza Bart	Oral Health and Access to Care for Visible Minorities in Canada: A Scoping Review
3	Nir El	Preliminary Evaluation of the Stability of Maxillary Expansion One Year After Segmental LeFort I Osteotomies Using Cone Beam Computed Tomography
4	Aish Jayashankar	The Effect of Single Dose vs Short Term Peri-Operative Cefazolin on Rates of Reoperation and Re-Admission Following Orthognathic Surgery
5	Briley Hillyard	Clinical and Microbiological Impacts of Long-Term Modulator Therapy in Cystic Fibrosis: A Registry-Based Analysis
6	Yeni Kim	Development and Characterization of a Novel Brushite-Shell/Monetite-Core Biomaterial
7	Ella Lawrence	Evaluating Attachment of hFOB 1.19 Human Fetal Osteoblastic Cell Line Cultured on Collagen-Based Barrier Membranes of Varying Cross-Linking Techniques and Collagen Sources
8	Gabrielle Levesque	Suppression of Osteoclast Activity Through Localized Therapeutic Delivery
9	Sormeh Mehrabi	Making Saliva Substitute Gels Relevant: Matching Ex Vivo–Characterized Mechanical Properties to Patient Reported Outcomes
10	Mohammadjavad Ranjbar	Ex-vivo Evaluation of Lubrication and Adhesion for Saliva Substitute Gels on Oral Surfaces
11	Olivia Richer	The Impact of Community Water Fluoridation Cessation on the Emergency Department Visits of Pediatric Patients for Non-Traumatic Dental Emergencies at the IWK Health Centre
12	Jessica Stamps	Which Kinematics Works Best for Undergraduate Dental Students Endodontic Preclinical Training — Rotary or Reciprocation?
13	Jonathan Taylor	Characterizing Pain Perception, Expression, and Management Among Children with and without Neurodevelopmental Disorders
14	Xiaoyu Zhong	Costs of Pediatric Emergency Visits for Non-Traumatic Dental Conditions Before and After Fluoridation Cessation at the Lake Major Water Supply in Halifax

Evaluation of Fibroblast and Osteoblast Responses to Collagen Membranes with Defined Physico-Chemical Properties

Al-Kayyali, A[1], Lawrence, E.[2], Froom, Z.[3,4,6], Davenport Huyer, L.[3,4,6], Sheikh, Z.[1,2,3,4,5]

[1]Faculty of Dentistry, [2]Faculty of Science, [3]School of Biomedical Engineering, [4]Department of Biomaterials & Applied Oral Sciences, [5]Department of Dental Clinical Sciences, [6]Department of Microbiology & Immunology, Dalhousie University, Halifax, Canada

Introduction: Guided Bone Regeneration is a surgical technique to promote the growth of new bone in areas where it has been damaged or resorbed. The main challenge in Guided Bone Regeneration (GBR) is gingival epithelial cell migration into the defect space and thus they occupy the space hindering bone regeneration.(Wessing et al., 2018). Barrier membranes are used to help maintain the defect space for regenerating bone that would otherwise be occupied by epithelial cells. The surface chemistry of the membrane, where protein adsorption occurs before cell recruitment and adhesion, critically influence the recruitment, adhesion, and behavior of cells such as fibroblasts and osteoblasts. In this study, we aim to characterize the physico-chemical properties of three commercially available membranes and how they influence fibroblast and osteoblast cell behaviour.

Methods: Three collagen based membranes: Agile +, OsteoShield Collagen and Jason membrane were subjected to in depth material characterization: Scanning Electron Microscopy (SEM), Energy-Dispersive X-ray Spectroscopy (EDS) to determine the elemental composition, X-Ray Diffraction (XRD) and Fourier Transform Infrared Spectroscopy (FTIR) to identify materials based on the arrangement of atoms and molecular vibrations respectively, Confocal Laser Scanning Microscopy (CLSM) to determine the roughness of materials and Contact Angle Analysis to measure wettability using ImageJ. Collagen membranes were secured in PDMS-coated 24-well plates, seeded primary human gingival fibroblasts (PCS-201-018) and human fetal osteoblasts (CRL-3602) at 20,000 cells per well. After 48 hours of culture, samples were fixed and stained with DAPI (nuclei) and Phalloidin-647 (F-actin) for confocal imaging using Leica SP8 to assess morphology and cytoskeletal organization. Gene expression of ALP and RUNX2 (osteogenic markers), and MMP1, FN1, and COL1A1 (fibroblast markers) were analyzed via qPCR using RNA extracted from each membrane type.

Results: Collagen based membranes were determined to have similar elemental composition using EDS. Jason membrane had XRD peaks at lower 2θ angles indicating that the collagen fibrils are more widely spaced compared to the other membranes. Wettability analysis was 100% in Jason and OsteoShield Collagen while Agile + had a contact angle of 73°, making it relatively less hydrophilic. SEM images showcased qualitative evidence of different fibrillar arrangements between the membranes. Cellular behaviour of osteoblasts and fibroblasts in response to the collagen membranes is yet to be quantified.

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Oral Health and Access to Care for Visible Minorities in Canada: A Scoping Review

Barte, N. L.[1, 4], Hillyard, B.[2], Van Dam, L.[3,4], Rodriguez, Y.[4], Bhagirath, A.[4]

[1]MI Student, Faculty of Management, Dalhousie University, [2]Faculty of Science, Dalhousie University, [3]Faculty of Health, Dalhousie University, [4]Faculty of Dentistry, Dalhousie University

Introduction: While visible minorities often experience lower oral health status and a lack of access to oral health care, no review to date has focused exclusively on Canada's visible minorities. Prior studies have combined Canadian and American literature, despite distinct historical and cultural contexts that shape oral health outcomes. As such, this scoping review aims to examine Canadian research on 1) the oral health status and prevalence of oral diseases among visible minorities, and 2) access and utilization of dental care services.

Methods: Using the JBI scoping review methodology, we used the Population, Concept, and Context framework to develop our search strategy. The search strategy included keywords and controlled vocabulary around key concepts: 1) visible minorities, 2) oral health, and 3) Canadian literature. We searched through CINAHL, PsycINFO, MEDLINE (OVID), Dentistry & Oral Sciences Sources, Scopus and Web of Science and identified 5,330 records after removing duplicate records.

Results: This scoping review identified 60 articles that met the inclusion criteria. Oral health status and diseases such as dental caries, periodontal conditions, and oral cavity cancers were included. The findings were categorized into three overarching themes that describe their influence: individual factors, sociocultural determinants, and systems and structures external to the individual. The results outline the diverse and often interconnected factors that affect oral health and access to care, while revealing a significant gap in the existing research.

Conclusion: This review maps the current literature and identifies the individual and external factors that affect the oral health and access to care among visible minority populations. Despite persistent oral health inequities, research in this area is disparate, indicating a need for further research.

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Preliminary Evaluation of the Stability of Maxillary Expansion One Year After Segmental LeFort I Osteotomies Using Cone Beam Computed Tomography

El, N.[1], Tamberg, E.[2], Robertson, C.[2]

[1]DDS3 Student, Faculty of Dentistry, Dalhousie University, [2]Faculty of Dentistry, Dalhousie University

Introduction: In orthognathic surgery, transverse maxillary deficiency is typically addressed using surgically assisted rapid palatal expansion (SARPE) or segmental LeFort I osteotomy (SLF1O). SLF1Os are often preferred due to their ability to address anterior-posterior, vertical, and transverse deformities of the maxilla simultaneously. SARPEs require additional procedures to address maxillary anterior-posterior and vertical repositioning. However, the utility and long-term stability of SLF1Os have been questioned, as they are considered highly prone to relapse and physiologically limited to 6-7 mm of expansion. Most studies indirectly determined this via dental relapse, which may not accurately represent transverse skeletal changes. This novel preliminary prospective cohort study aims to evaluate the stability of SLF1Os in three dimensions using serial cone-beam computed tomography (CBCT).

Methods: Twenty patients (12M:8F; mean age: 28.7 ± 9.8 years) who underwent SLF1O for transverse maxillary deficiency were analyzed using CBCT at three time points: preoperatively (T1), at splint removal approximately four weeks postoperatively (T2), and at completion of orthodontic treatment approximately one year postoperatively (T3). Skeletal expansion was measured between the medial aspects of the greater palatine foramina, and dental expansion was measured between the maxillary canine cusp tips and the distobuccal cusps of the maxillary first molars.

Results: Mean skeletal expansion of 4.24 ± 1.47 mm was achieved postoperatively (T1 to T2). A skeletal relapse of 0.04 ± 0.53 mm was observed at the time of orthodontic treatment completion (T2 to T3). Mean dental expansion measured 0.02 ± 1.03 mm at the canines and 2.76 ± 1.66 mm at the first molars, with subsequent constriction of 1.98 ± 1.44 mm and 0.75 ± 1.10 mm, respectively, at T3. Age, sex, BMI, tooth extractions, and anterior-posterior or vertical maxillary movements at the time of surgery had no significant effect on skeletal relapse.

Conclusion: Our findings suggest minimal skeletal relapse for SLF1Os one year postoperatively, suggesting good long-term stability of SLF1Os and supporting their reliability as a treatment modality for maxillary constriction. Future studies with longer follow-up and expansions of >7 mm would provide additional insight into the utility of SLF1Os.

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The Effect of Single Dose vs Short Term Peri- Operative Cefazolin on Rates of Reoperation and Re Admission Following Orthognathic Surgery

Jay, A.[1], El-Rabbany, A.[2], Gregoire, C.[2]

[1]DDS Student, Faculty of Dentistry, Dalhousie University, [2]Dept of Oral and Maxillofacial Surgery, Faculty of Dentistry, Dalhousie University

Malocclusion is defined as the irregularity of the dentition or the malrelationship of the dental arch (1). Orthognathic surgery is performed to improve the dental occlusion and stability, while also improving the airway space as well as the patient's facial proportions (2). As these procedures are performed intraorally, they are considered clean-contaminated procedures and are associated with an infection rate of 10-15%, which is attributed to the high bacterial load in the oral cavity. Reoperation may be required in cases of chronic infection, skeletal relapse or hardware-related complications. One of the most common reasons for plate removal is infection (3), and these can be reduced with the help of prophylactic antibiotics, like cefazolin, which are given prior to surgery (4). This case series aims to balance the benefits of antibiotic prophylaxis while minimizing the risks of antibiotic administration and contribution to resistance.

Patients in group A received a single preoperative dose of 2g of intravenous Cefazolin. Patients in group B received a 24 hour peri-operative course of Cefazolin consisting of a single preoperative dose in addition to 3 postoperative doses every 8 hours, for 24 hours. Data were obtained from patients that underwent orthognathic surgery and enrolled in a clinical trial titled – 'The Use of Single Dose vs Short Term Peri Operative Cefazolin in the Prevention of Surgical Site Infection Following Orthognathic Surgery'. All patients analysed were above 16 years and ASA I or ASA II. Information regarding smoking history, osteotomies completed, procedure time, adverse reaction to any medication (such as allergy, toxicity, or side effects) were identified and recorded. Follow-ups were completed at 2 weeks, 4 weeks and 6 weeks post-surgery to assess for presence of surgical site infection (SSI).

The initial study enrolled 110 patients, 52 of which were in group A, and 58 in group B. Among this population, six patients required reoperation. Out of the six cases that required reoperation, five patients were assigned to the Group A antibiotic protocol, while one patient was in Group B. Among the Group A patients, three underwent hardware removal due to postoperative infection, one required reoperation for maxillary relapse, and one had the maxillary plates removed due to persistent discomfort. The single Group B patient underwent removal of the left BSSO plate for a chronic infection. Of the five patients in Group A, three had a history of smoking. The mean operative time for Group A was 145.2 minutes, while the procedure for the Group B patient lasted 94 minutes. After complete data collection, chi square tests can be done to determine statistical significance and possible correlations.

The initial results indicate that a majority of the patients that required reoperation were in Group A, suggesting a peri-operative course of IV cefazolin may have a role in decreasing rates of reoperation. This study has the potential to enhance clinical guidelines and improve postoperative care in orthognathic surgery by decreasing rates of reoperation and/or minimizing unnecessary antibiotic exposure. More research must be done to achieve a definitive conclusion.

1. Bondioni, E. (2020). Malocclusion in orthodontics and oral health: Adopted by the General Assembly: September 2019, San Francisco, United States of America. International Dental Journal, 70(1), 11–12. https://doi.org/10.1111/idj.12554
2. Robinson, R. C., & Holm, R. L. (2010). Orthognathic surgery for patients with maxillofacial deformities. AORN Journal, 92(1), 28–49. https://doi.org/10.1016/j.aorn.2009.12.030
3. Soylu, E., Kılavuz, M. S., Eren, C., Demirbaş, A. E., Kaba, Y. N., Kütük, N., Kılıç, E., Etöz, O. A., & Alkan, A. (2025). Understanding reoperation in orthognathic surgery: A 17year retrospective study analyzing causes and rates. Journal of CranioMaxilloFacial Surgery. https://doi.org/10.1016/j.jcms.2025.03.010
4. Davis, C. M., Gregoire, C. E., Steeves, T. W., & Demsey, A. (2016). Prevalence of surgical site infections following orthognathic surgery: A retrospective cohort analysis. Journal of Oral and Maxillofacial Surgery, 74(6), 1199–1206. https://doi.org/10.1016/j.joms.2016.01.040

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Clinical and Microbiological Impacts of Long-Term Modulator Therapy in Cystic Fibrosis: A Registry-Based Analysis

Hillyard, B.[1], Barte, N.L.[2], Martin, I.[3], Bhagirath, A.[4]

[1]Medical Sciences, Dalhousie University, [2]Master of Information, Faculty of Management, Dalhousie University, [3]Sick Kids, University of Toronto, [4]Department of Dental Clinical Sciences, Dalhousie University

Background: As modulators become lifelong therapy for cystic fibrosis (CF), including increasingly younger patients, their long-term effects on pulmonary function and airway microbiology remain uncharacterized. While modulators improve clinical outcomes, persistent colonization with pathogens and structural lung damage continue to be reported, often resembling age-matched controls. This raises critical questions about the disease progression in the modulator era, particularly given limited longitudinal data.

Aims: This study evaluates the long-term clinical and microbial impacts of CF modulators through a registry-based cohort analysis using data from the Canadian and U.S. CF registries (2019–2023). We focus on patients with >12 months of continuous modulator use. Primary outcomes include lung function (FEV_1) changes and trends in key pathogens: P. aeruginosa, S. maltophilia, and nontuberculous mycobacteria (NTM).

Results: Initial analysis shows a notable rise in reported NTM detections in non-hospitalized adults on modulators, from 22 to 88 cases from 2019 to 2023. While this 300% relative increase will be adjusted in final models, it aligns with emerging concerns that microbial adaptation may persist despite clinical gains. Ongoing analysis will examine duration-dependent microbial trends, FEV_1 sustainability, and predictors of persistent or emerging infections. To our knowledge, this is the first multinational registry study to longitudinally track pathogen-specific trends in long-term modulator use. Results will provide urgent insights into microbial surveillance, infection risk stratification, and long-term evolution of CF airway disease in the modulator era.

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Development and Characterization of a Novel Brushite-Shell/Monetite-Core Biomaterial

Kim, Y. [1], MacIntyre, A.[2], Poureslami, H.[2], Parsons, E.[3], Sheikh, Z.[2, 3, 4]

[1]BDH2 Student, Faculty of Dentistry, Dalhousie University, [2]Department of Dental Clinical Sciences, Faculty of Dentistry, Dalhousie University, [3]School of Biomedical Engineering, Faculty of Medicine, Dalhousie University, [4]Department of Biomaterials & Applied Oral Sciences, Faculty of Dentistry, Dalhousie University

Introduction: Bone grafting procedures are intended to reconstruct fractured, damaged, or unhealed bone by introducing grafting materials to support new bone growth. However, the clinical application of current grafting materials remains challenging due to the limited clinical success rate. In recent years, calcium phosphate-based biomaterials, particularly dicalcium phosphate dihydrate (CaHPO4 · 2H2O), known as brushite, and dicalcium phosphate anhydrous (CaHPO4), known as monetite, have demonstrated potential with favourable biomimetic and osteoconductive properties in clinical use. This study evaluates and compares five different materials: brushite and monetite prepared at a power-to-liquid (P/L) ratio of 1.5 and 2, along with the hybrid Toffee model, by characterizing and comparing their structural and chemical properties. The novel hybrid biomaterial was developed by combining P/L 2 monetite-core and P/L 1.5 brushite-shell to enhance bone regeneration and material integration.

Methods: Brushite and monetite cylinders were composed of Calcium phosphate monohydrate and β-tri-Calcium phosphate, combined with distilled water. Samples were moulded into a cylindrical shape and placed in the vacuum oven. Then, half of the brushite was converted to monetite via autoclave. For each sample group, physical and structural properties were assessed. Density (g/cm3), porosity (%), and compressive strength (MPa) were evaluated. Surface morphology was examined using scanning electron microscopy (SEM), while high-resolution 3D internal structures of the Toffee model were visualized using micro-computed tomography (Micro-CT). Energy-dispersive X-ray spectroscopy (EDS) was used to determine the chemical elements composition, and X-ray diffraction (XRD) identified the material purity and crystalline composition.

Results: SEM analysis revealed distinct crystal morphologies, while EDS confirmed the presence of oxygen, phosphorus, and calcium across all materials. XRD results showed a characteristic peak for brushite at approximately 12 degrees with an intensity of around 135 a.u. and for monetite at approximately 30 degrees with an intensity of around 60 a.u., consistent with previously reported literature. Among the samples, P/L 2 brushite exhibited the lowest porosity at 52%, whereas P/L 2 monetite had the highest at 70%. Density and compressive strength resulted in minimal differences between materials, aligning well with existing data. Notably, the Toffee withstood a compressive strength of 2.79 MPa. The proof of concept of the Toffee was confirmed through Micro-CT imaging, revealing a division between the monetite core and brushite shell, along with visible internal structural features. All samples demonstrated densities ranging from 2.85 to 2.95 g/cm3, with no significant impact from the ratio.

Conclusion: Overall, discernible differences were demonstrated through characterizations of the four different P/L, and a novel hybrid Toffee was successfully fabricated. These findings will provide valuable insight for use in various clinical applications. Further in vitro degradation and dissolution studies are required to elucidate their physicochemical profile. Future research may focus on varying the P/L of brushite and monetite within the Toffee model to optimize physiochemical properties for specific clinical applications.

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Evaluating Attachment of hFOB 1.19 Human Fetal Osteoblastic Cell Line Cultured on Collagen-Based Barrier Membranes of Varying Cross-Linking Techniques and Collagen Sources

Lawrence, E.[1], Froom, Z.[2], Sheikh, Z.[3], Davenport Huyer, L.[3]

[1]Faculty of Science, Dalhousie University, [2]School of Biomedical Engineering, Faculty of Medicine, Dalhousie University, [3]Faculty of Dentistry, Dalhousie University

Introduction: Adult tooth loss is typically accompanied by resorption of the surrounding alveolar bone, complicating later dental implant placement through the creation of a defect site, or empty space where there was once bone. Guided bone regeneration (GBR) using a barrier membrane to block colonization of the defect space by faster-growing soft tissue is the current gold-standard technique in promoting bone regrowth for future placement of dental implants. Collagen-based resorbable membranes are widely used in GBR due to their biocompatibility and ability to resorb into the body, removing the need for a second surgery for retrieval. Different commercially available membranes have been optimized in unique ways to offer varying degrees of cross linking of the collagen, and varying collagen sources. Although these membranes are widely used in clinical practice, with clinicians selecting a specific membrane on a case-by-case basis, we aim to examine the interaction of each membrane at a cellular level to observe how differences in membrane optimizations used between suppliers impacts the attachment of human osteoblastic cells. This study aims to achieve attachment of human fetal osteoblastic cell line, hFOB 1.19, on three collagen-based membranes, comparing cellular attachment on membranes utilizing novel optimization technologies, Dentsply Ossix Agile Plus and Straumann Jason, with market standard Dentsply Symbios Collagen Slow-Resorbable.

Methods: Physicochemical membrane characterization was conducted using scanning electron microscopy, energy-dispersive spectroscopy, X-ray diffraction, and confocal laser scanning microscopy to obtain a surface roughness and composition profile for each membrane prior to cell trials. hFOB 1.19 cells were seeded on membrane segments and maintained for forty-eight hours. Membrane segments were fixed and imaged using confocal laser scanning microscopy to assess cell attachment, affinity, and morphology.

Results: Physicochemical characterizations confirmed the nature of membrane structures, revealing differences in surface roughness and composition and confirming collagen make-up. Osteoblastic cell attachment was observed on all membrane surfaces. An increased number of adhered cells was observed on Dentsply Ossix Agile Plus and Dentsply Symbios Collagen Slow Resorbable, with cellular infiltration confirmed using Z-stack imaging. Cell morphology differed on rough membrane surfaces as compared to controls, with less cell spreading on rough surfaces.

Conclusions: Confocal images of all three membrane types supports the ability of each membrane to permit osteoblastic cell attachment without eliciting cytotoxicity. Preferential cell attachment according to roughness profile was not observed as expected; increased cell attachment was observed on the least and most rough membrane surfaces. Future work will utilize qPCR to determine if the selected membranes affected differentiation of the osteoblastic cells towards a mature osteoblast phenotype. Understanding how different collagen-based barrier membranes support osteoblastic cell attachment may aid clinicians in selecting membranes for guided bone regeneration within a defect site for later placement of a dental implant.

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Suppression of Osteoclast Activity Through Localized Therapeutic Delivery

Levesque, G.[1], Woodworth, K.[2], Davenport Huyer, L.,[2-4], Callaghan, N[5]

[1]DDS3 Student, Faculty of Dentistry, Dalhousie University, [2]School of Biomedical Engineering, Faculties of Medicine and Engineering, Dalhousie University, [3]Department of Biomaterials & Applied Oral Sciences, Faculty of Dentistry, Dalhousie University, [4]Department of Microbiology & Immunology, Faculty of Medicine, Dalhousie University, [5]Faculty of Medicine, Dalhousie University

Abstract Intentionally Omitted

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Making Saliva Substitute Gels Relevant: Matching Ex Vivo–Characterized Mechanical Properties to Patient Reported Outcomes

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Introduction: Xerostomia, or dry mouth, can be associated with reduced secretion or altered composition of saliva. lack of hydration and lubrication is a main symptom of this condition and it can make it uncomfortable to speaking, chewing, and swallowing. A 2018 systematic review summarized by the ADA estimates global xerostomia prevalence at ~22%, with higher rates in older adults and polypharmacy. Saliva substitutes(SS) gels are lipid-and polymer-based lubricants aimed to restore comfort and function. However, their clinical efficacy remains limited, as many provide only short-term relief; in one study, a popular spray demonstrated a mean effect of ~27 minutes, comparable to water, highlighting the need for improved formulations.

Objectives: This study aimed to (1) **quantify** ex vivo the spreadability, film formation, and surface retention of representative saliva substitute gels, and (2) **correlate** these mechanical findings with patient-reported outcomes to inform next-generation formulation design.

Methods: **Rheological testing** was performed using a Discovery HR-10 rheometer at 37 °C with a 40 mm parallel-plate geometry and 1000 μm gap to assess spreadability and yield behavior. Three tests — including oscillation-amplitude sweeps — were conducted on Biotène®, coconut oil, and Biotène–coconut oil blends (25:75, 50:50, 75:25 w/w). **Film formation and retention** were quantified using Quartz Crystal Microbalance with Dissipation (QCM-D; QSense Omni) at 37 °C and 50 μL/min flow rate, monitoring frequency (Δf) and dissipation (ΔD) shifts over time. Evaluated formulations included 1% Biotène® in 0.5× PBS, coconut oil, and 1% artificial saliva in 0.5× PBS. Interaction pairs tested included saliva or gels on gold, Biotène-preconditioned, and coconut-preconditioned surfaces. Patient testing is underway through a randomized crossover trial (n = 20), where each participant evaluates all gels over six weeks, with outcomes measured using validated dry-mouth questionnaires.

Results: Rheology: Increasing the proportion of coconut oil raised the yield strain and broadened the elastic response range, indicating enhanced deformability and resilience. **QCM-D**: Biotène® and saliva produced comparable films on gold surfaces, while coconut oil alone generated minimal coating. Coconut oil preconditioning enhanced subsequent saliva adsorption and energy dissipation, whereas Biotène® preconditioning reduced both film adherence ($p < 0.001$) and dissipation energy.

Conclusion: Higher coconut-oil content improved film flexibility and resistance to mechanical breakdown under oral-like deformation. Lipid lubricant showed synergistic hydrating effect while polymeric lubricants were sufficient in producing the same surface characteristics on their own, but forming a stiffer layer with saliva present. These findings suggest that the lipid-polymer balance strongly influences elasticity, film integrity, and surface interactions. Future work will expand to include friction testing using ex vivo modeling with the bovine specimens. This will provide insights into the gel's performance in terms of adhesion to oral surfaces and their effectiveness of lubrication. Ongoing patient-reported comfort and lubrication assessments will guide the design of next-generation saliva substitutes that better replicate the rheological and adhesive behavior of natural saliva — ultimately enhancing comfort for xerostomic patients.

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Ex-vivo Evaluation of Lubrication and Adhesion for Saliva Substitute Gels on Oral Surfaces

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Introduction: Saliva plays a critical role in oral health by providing essential lubrication that reduces friction between oral tissues and teeth during speech, swallowing, and mastication. Effective lubrication is quantified by the coefficient of friction (COF) — the ratio of friction force to normal force. Xerostomia (dry mouth), prevalent in up to 20% of the general population and nearly half of elderly adults, significantly elevates COF, causing discomfort, impaired oral function, and increased risks for dental caries, enamel erosion, and tooth loss. While artificial saliva substitutes are commonly utilized, their comparative lubricating efficacy remains poorly defined. This study evaluates and compares the friction-reducing properties of commercially available artificial saliva substitutes categorized by their lubricating components.

Methods: Commercial saliva substitutes including mixed formulation Xerostom ®, polymeric based Biotene ®, and lipid-based coconut oil were compared against control conditions consisting of phosphate-buffered saline and mucin-containing artificial saliva. COF was initially assessed using a PDMS-tongue friction model on a MACH-1TM Mechanical Testing System, with PDMS (a type of silicone polymer) mounted vertically (indenter) and bovine tongue samples rotating horizontally at various speeds to simulate oral shear. Experiments systematically varied saliva substitutes, sliding speeds (10, 20, 40, 60 °/s), and normal pressure (21 kPa), maintaining constant conditions otherwise. Each experimental condition was repeated five times, and COF data were recorded and exported individually into Excel for analysis.

Results: One-way Anova indicated distinct COF profiles across the tested conditions. ($p < 0.0001$). Bonferroni post-hoc comparisons confirmed that all pairwise differences were statistically significant ($p < 0.001$). Xerostom® exhibited the highest COF (1.2–2.2) across sliding speeds, while mucin containing artificial saliva had the lowest (approximately 0.25–0.35). Coconut oil (lipid-based) and Biotène® (polymeric-based) presented intermediate COF values (1.0–1.2 and 1.5–1.7, respectively), all differingsignificantly from each other.

Conclusion: Statistical analysis confirmed that saliva substitutes differ substantially in their lubrication effectiveness, with mucin-containing artificial saliva demonstrating superior friction reduction relative to the tested commercial substitutes. Among the tested commercial gels, lipid-based coconut oil exhibited lower friction compared to polymerbased Biotène® and mixed-formulation Xerostom®. These early results suggest that lipid-based lubricants might offer enhanced comfort and oral function for patients withxerostomia. Further analysis and clinical validation are needed to confirm these ex-vivo findings and their applicability to patient care.

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The Impact of Community Water Fluoridation Cessation on the Emergency Department Visits of Pediatric Patients for Non-Traumatic Dental Emergencies at the IWK Health Centre

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Dental caries remains the most common chronic disease worldwide, disproportionately burdening vulnerable groups and resulting in preventable strain on the healthcare system. Community water fluoridation (CWF) is a proven, cost effective and evidence-based public health intervention for reducing dental caries. A prior study from the IWK Health Centre showed that even before fluoridation cessation, hundreds of pediatric patients presented to the emergency room for dental emergencies, most of which were avoidable and involved children who already had primary dental care providers. In this cross-sectional study, we aimed to describe the characteristics and trends of pediatric patients presenting with non-traumatic dental conditions (NTDC) to the IWK, Nova Scotia, between April 2015-2025, and to compare ER visit rates before and during CWF cessation.

Data were collected by examining ten years' worth of patient charts retrospectively and included data on patients' age, sex, postal codes, visit year, number of visits, reasons for the visits, dental condition, treatment, referrals and prescriptions.

It was found that a total of 769 children aged 1.5-17.5 years visited the ER at the IWK between 2015 and 2025. The mean age was 7.2 years (SD=3.0), and this did not vary by sex. Most (65%) were from Halifax, 18% from Dartmouth, and 17% from other regions. Across all years, caries with facial swelling was the most frequent cause of ER visits in both fluoridated and non-fluoridated regions. During 2015-2019, while water was fluoridated, ER visits for NTDC were comparable between Dartmouth and Halifax children (OR=1.15; 95% CI: 0.87-1.52, p=0.32). In 2020-2025, following cessation of CWF in Dartmouth, the odds of an ER visit for NTDC were significantly higher among Dartmouth children compared with those from Halifax (OR = 1.30; 95% CI: 1.01-1.69, p=0.045).

These findings emphasize the potential impact of CWF on pediatric dental emergencies and the importance of continued CWF to reduce preventable healthcare burden. Conducted in the only pediatric hospital in Nova Scotia, this is the first study to link ER visit trends to CWF status and provides significant population level insight, particularly relevant following the 2020 cessation of fluoridation at Lake Major in Nova Scotia.

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Which Kinematics Works Best for Undergraduate Dental Students Endodontic Preclinical Training — Rotary or Reciprocation?

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Introduction: Endodontic treatment is a dental procedure carried out to address irreversible damage to the pulp tissue. The intricacies involved in this treatment necessitate a high level of skill and precision, particularly during the instrumentation phase, where the root canal system is shaped and disinfected by a combination of instruments and irrigants. Shaping with mechanical instruments can be carried out with two different types of kinematics: a) rotary-based instruments that spin in a 360-degree motion or b) reciprocation-based instruments where the file oscillates rapidly, counterclockwise and clockwise. Several challenges can be encountered during the cleaning and shaping process, that can lead to procedural errors. Two common errors are canal transportation where the file leaves the canal space in a curved root and creates a ledge in the root canal, and instrument separation where the file breaks in the canal space.

Learning how to perform endodontic treatment is an important part of the dental school curriculum. Students that are learning endodontic treatment practice on artificial and extracted donor teeth using either rotary or reciprocation cleaning methods. These teeth can be straight rooted or curved rooted.

The objective of this study was to see whether errors were more common with rotary or reciprocation endodontic instrumentation and to see what tooth attributes lead to more student success.

Methods: 249 preclinical records from Dalhousie 3rd year dental students were collected from the 2023-2024 school year when rotary instruments were taught and 267 preclinical records from Dalhousie 3rd year dental students were collected from the 2024-2025 school year when reciprocation instruments were taught. Data collected included: the type of tooth (artificial or natural) a student practiced on, the order in which tooth was performed by the student (whether it was the students first, second, third, etc. root canal practice), if an error was present, and the type of error (canal transportation and instrument separation) if applicable. Descriptive analyses were performed on the collected data to characterize error profiles against instrument and practice tooth types.

Results: There were 5 main findings. Students who performed root canals with rotary systems made errors at a higher percentage (14.1%) than students who used reciprocating systems (6.0%). Students made canal transportation errors a similar amount between rotary (2.0%) and reciprocation (1.8%). Students made instrument separation errors more than 3 times the number with rotary systems (14.5%) than reciprocation systems (4.5%). Root canals on teeth with curved roots had more than 5 times the number of errors (17.0%) when compared to straight rooted teeth (3.5%). Errors occurred in natural teeth almost 3 times less (4.9%) than artificial teeth (12.0%).

Conclusion: Reciprocation based endodontic systems were characterized by less student procedural errors during preclinical endodontic training than rotary-based systems. Additionally, whether using rotary or reciprocation instruments, practicing on straight rooted teeth led to less student errors. This highlights that reciprocation-based instrument training starting on straight rooted teeth in dental school might lead to better experiences for students and potentially, their future patients.

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Characterizing Pain Perception, Expression, and Management among Children with and without Neurodevelopmental Disorders

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Introduction: Dental pain in children is a prevalent global health issue with significant developmental, psychological, and economic impacts. Pain in children is often underrecognized and undertreated, partly due to communication barriers and reliance on parental reporting. Children with neurodevelopmental disorders (NDD) are at a greater risk for the development of dental pain due to sensory abnormalities, behavioural challenges, dietary preferences, and difficulties with routine oral care practices. Early diagnosis and effective clinical management rely upon timely and accurate assessment, which can be complex in children with NDD. This project aims to characterize pain perception, pain behaviours, and pain management practices of children with and without NDDs presenting for dental care at the IWK Health Centre.

Methods: Children aged 0-18 years who presented for new patient examinations at the dentistry department of the IWK Children's Hospital were recruited from May to August in 2021 and 2025. Typically developing (TD) healthy (ASA I or II) participants were recruited in 2021, whereas any patients presenting to their appointment with an abscess were recruited in 2025 (including both TD and NDD individuals). The data collection consisted of a caregiver-reported questionnaire, including a modified Dental Discomfort Questionnaire (DDQ), a patient-reported Bieri Child Pain Scale, a caregiver-rated pain scale, and data extracted from patient dental charts.

Results: The 125 children in the 2021 sample (n = 68 males, 57 females; $\bar{x}$ = 5.5 years old, SD = 2.80) showed a high prevalence (~70%) of caregiver-reported dental pain. Only 50% of patients experiencing oral discomfort were being administered over-the-counter medication to manage pain. However, patients receiving medication reported significantly higher DDQ scores ($U = 581.50$, $z = -3.58$, $p < 0.001$) and pain scale scores ($U = 510.00$, $z = -2.41$, $p = 0.016$). Preliminary 2025 findings (n = 14 males, 13 females; $\bar{x}$ = 5.7 years old, SD = 2.31) show that children with NDD reported higher self-rated pain than TD peers. DDQ scores were also higher in the NDD group compared to TD children. Child-caregiver comparisons revealed that TD caregivers tended to report higher pain levels than their children (mean difference = 1.11, SD = 2.11), whereas NDD caregiver ratings aligned with their child's self-reported pain (mean difference = ~ 0, SD = 1.58).

Discussion: A large proportion of children were found to present to the IWK with unmanaged dental pain, indicating that oral discomfort often goes unnoticed or undertreated by caregivers. Gaps were identified in the recognition and management of mild-to-moderate dental pain. Resources must be allocated to advocate for children with dental pain to help caregivers identify common behavioural pain indicators and promote safe pain management practices. The preliminary data indicates that there are differences in the way children with NDD perceive and express dental pain, emphasizing the need for modified or enhanced pain assessment and management strategies specifically targeted towards this vulnerable population. The closer alignment between caregiver and child pain ratings in the NDD group highlights the value of caregiver insight to contribute meaningfully to pain evaluation in NDD populations. Ongoing research into how children with NDD experience and express dental pain will be important for guiding tailored pain management approaches and improving equity in pediatric dental care.

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Costs of Pediatric Emergency Visits for Non-Traumatic Dental Conditions Before and After Fluoridation Cessation at the Lake Major Water Supply in Halifax

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Introduction: Early childhood caries (ECC) is the most common chronic disease among Canadian children and often leads to emergency department (ED) visits for non-traumatic dental conditions (NTDCs). These visits impose significant burdens on families through lost time and costs, and on the healthcare system through inefficient use of resources. Community water fluoridation (CWF) is a proven, cost-effective preventive measure that reduces caries prevalence and treatment costs. In April 2020, Halifax Water ceased fluoridation at the Lake Major (LM) supply, leaving more than 120,000 residents without fluoridated water. This study examined the costs of NTDC-related ED visits at the IWK Health Centre, a pediatric tertiary hospital, and compared costs before and after cessation of fluoridation at two Halifax water sources — LM and Pockwock Lake (PL).

Methods: Charts of pediatric patients (0–18 years) who presented to the IWK ED with NTDCs between April 2015 and March 2025 were retrospectively reviewed. Demographics, wait times, prescriptions, and postal codes were extracted. Visits from LM- and PL-supplied communities were identified using Halifax Water supply maps. ED visit–associated costs were estimated and adjusted for inflation. Direct costs included ED overhead and antibiotics, valued using 2020 Canadian Institute of Health Information (CIHI) data and the IWK Firstline app. Indirect costs included family travel and opportunity costs, valued using Nova Scotia minimum wage and Canada Revenue Agency (CRA) vehicle rates. All costs are reported in 2025 CAD.

Results: A total of 769 visits were identified, 761 from NS, including 138 from LM and 379 from PL. NS visits generated an average annual burden of CAD 36,016, with 78.4% of costs direct and 21.6% indirect. Comparing the five years before and after April 2020, mean per-visit costs rose slightly in LM (+1.5%) and PL (+1.0%), while annual totals increased more in LM (+19.0%) than in PL (+9.3%). Travel expenses declined in PL (–11.3% per visit; –4.1% total) but increased in LM (+4.3% per visit; +20.6% total). Opportunity costs rose in both regions, with per-visit costs increasing similarly in PL (+9.5%) and LM (+10.9%), while total costs grew more sharply in LM (+28.3%) than in PL (+18.5%).

Conclusions: NTDC-related pediatric ED visits impose substantial costs. Urban and suburban Halifax communities supplied by LM and PL showed rising ED-related costs post-cessation, with steeper increases in LM-supplied communities.

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