Access to deep sedation and general anaesthesia services for dental patients: A survey of Ontario dentists

By

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A thesis submitted in conformity with the requirements for the degree of Master of Science

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Abstract

**Background:** Many patients need deep sedation or general anaesthesia (DS/GA) to undergo dental treatment as a result of fear, anxiety, disability, invasive dentistry, medical illness, or age.

**Objective:** To assess barriers in accessing DS/GA as identified by dentists.

**Methods:** An electronic survey was distributed to Ontario dentists (n=5507). Descriptive and regression analyses were performed.

**Results:** With a response rate of 18.3%, one quarter (24.8%) of those surveyed report inadequate access to DS/GA. Those outside the Greater Toronto Area and in rural communities had higher odds of reporting this outcome. General dentists, part-time dentists, urban dentists, and dentists >64 years-old had higher odds of not utilizing DS/GA. Common reasons for not utilizing GA were lack of perceived need and additional costs. Dentists that utilize DS/GA indicate that additional patient costs represent the greatest barrier to care.

**Conclusion:** Access to DS/GA in Ontario is not uniform and major barriers to care exist.
Acknowledgments

This dissertation is the conclusion of research that has been carried out from 2013 to 2015 in fulfillment of a Masters of Science degree in the Graduate Department of Dentistry, University of Toronto, Canada. This thesis has been made possible with the help and support of many people, to whom I would now like to express my most sincere gratitude.

I would like to first and foremost thank my research supervisor, Dr. Amir Azarpazhooh. I cannot express enough appreciation for your advice and professional guidance. Your passion for research is only matched by your passion for inspiring your students. You taught me more about the scientific process than I could have imagined, and you always did it with a smile. I cannot thank you enough.

I would also like to express my most humble thanks to my advisory committee members: Dr. Carlos Quiñonez and Dr. Carilynne Yarascavitch. Your perspective on the big picture and willingness to lend support at every turn were inspiring. I am so appreciative of your expert advice and your encouragement. Your contribution has been invaluable – you are both true professionals.

I would like to acknowledge the support of a number of special individuals who helped professionally throughout this project. Dr. Daniel Haas, Rose Abate, Irwin Fefergrad, Peggi Mace, Angelo Avecillas & Diana Rickford. I would also like to express my gratitude to my dental anaesthesia co-residents, especially Dr. Jonathan Campbell for his friendship, advice and encouragement. This research was financially supported by the American Society of Dental Anaesthesiologists (ASDA), Education and Research Fund. I am grateful to the ASDA for supporting research projects by dental anaesthesia residents.

I would finally like to thank my wonderful immediate and extended family for their love
and encouragement: especially my ever-supportive and loving mother Joanna who taught me the meaning of hard work, my late father Drew who inspires me to this day, and my step-father Rob who is a role model and friend. I would also like to thank my amazing wife Laura – thank you for your patience, affection and sacrifices. During the time of this project we welcomed a daughter into our family, and I thank my baby Charlotte for keeping me motivated and smiling. Charlotte I dedicate this project to you.

Dr. Andrew-C. Adams – Toronto, Canada, July 2015
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Chapter 1

1.0 Introduction

Many patients cannot tolerate dentistry while awake for a variety of reasons, including fear, anxiety, disability, invasive dentistry, medical illness, or age. While conscious sedation is effective for some patients, deep sedation and general anaesthesia (DS/GA) are needed to facilitate dental treatment for others.¹ Even before the advent of local anaesthesia, dentists have been utilizing sedation and anaesthesia to perform dental procedures.² In fact, the first public display of general anaesthesia was by a dentist.² DS/GA hold a significant place in modern dental treatment, and can allow a patient to sleep without suffering or pain during dental procedures.²

1.1 Definition of DS/GA

Deep sedation is defined as “a controlled state of depressed consciousness, accompanied by partial loss of protective reflexes, including inability to respond purposefully to verbal command.”³ A patient who is deeply sedated may only respond to repeated or painful stimulation, and may lose the ability to maintain a patent airway. General anaesthesia is defined as “a controlled state of unconsciousness accompanied by partial or complete loss of protective reflexes, including the inability to maintain an airway independently and respond purposefully to physical stimulation or verbal command.”³ A patient who is under the influence of DS/GA requires an expert trained in anaesthesia to supervise their airway, breathing, circulation and autonomic functions.³
1.2 DS/GA providers in Ontario

Reflecting the skill and expertise required to administer DS/GA, the Royal College of Dental Surgeons of Ontario (RCDSO) mandates a DS/GA provider must possess specific training and credentials. In short, to provide DS/GA in Ontario, the dentist must: 1) have completed a post-graduate residency in dental anaesthesia of at least 24 months, 2) have successfully completed a post-graduate residency in oral & maxillofacial surgery incorporating adequate training in anaesthesia, or 3) be a physician anaesthesiologist and have hospital anaesthesia privileges.³

All other dentists in Ontario are not eligible to provide DS/GA on their own, but may utilize the services of a dental anaesthesiologist, oral & maxillofacial surgeon or medical anaesthesiologist.³ This may occur in one of several settings: 1) specially equipped and accredited dental offices, 2) private surgicentre facilities, or 3) within a hospital dental clinic or operating room (OR). However, not all settings are equally available to dentists – a limited number of dentists are able to obtain hospital privileges.⁴ Furthermore not all hospitals grant privileges to dentists, and those that do may only offer the OR on a part-time basis. In general, medical anaesthesiologists are the anaesthesia providers who deliver DS/GA services in hospital operating rooms. Dental anaesthesiologists can work within hospital dental clinics; however, most tend to work in private outpatient settings.

1.3 Need for DS/GA in the practice of dentistry

There are numerous groups of patients that either require or benefit from DS/GA for their dental care. In general, patients that require or benefit from DS/GA are: patients who have dental fear, anxiety or phobia; patients who require a large volume of dentistry or invasive
dentistry; children who are anxious, fearful, uncooperative or pre-cooperative; patients with intellectual or physical disabilities; patients for whom local anaesthesia is inadequate or contraindicated; patients with medical conditions requiring a reduction in physiological stress; and patients with a severe gag reflex.\textsuperscript{5–7}

1.3.1 DS/GA to manage dental fear, phobia and anxiety

Several studies to date provide some understanding of the role of dental fear/anxiety and its impact on seeking dental care. Dental fear/anxiety has been associated with patient’s preference for dental care utilizing DS/GA.\textsuperscript{7,8} Patients who elect to have dental anaesthesia are reportedly highly anxious with significant dental fear.\textsuperscript{7} They are affected by a wide range of stimuli that are fear/anxiety provoking, from the dental drill to dental injections.\textsuperscript{7} In fact, the dentist themself may be the most fear provoking, depending on how they conduct themself.\textsuperscript{9} Patients who prefer sedation and anaesthesia demand the service for restorative dental treatment as well as for complex and invasive dental care.\textsuperscript{7} Therefore, dental fear/anxiety is an indication for DS/GA for some dental patients, and this fear/anxiety can be triggered by many stimuli. It should be noted however that DS/GA is not the management strategy for all fearful or anxious patients. Non-pharmacological strategies such as distraction, hypnosis or breathing strategies also can be successful, and management should be based on the patient’s level of fear and their response to non-pharmacological strategies.\textsuperscript{10}

Several studies have sought to assess why dental patients develop fear and anxiety. The Cognitive Vulnerability Model suggests dental fear develops due to the patient perceiving a loss of control in a situation in which they feel vulnerable.\textsuperscript{11} This model predicts the etiology of fear, which results from the perceptions of uncontrollability, unpredictability and dangerousness.\textsuperscript{11}
Additional reasons for the development of dental fear/anxiety suggest that the phenomenon is multifactorial in nature. Multiple studies have reported an association between past dental pain and the development of dental fear/anxiety.\textsuperscript{12–14} In one study, while previous pain was noted as the cause of fear in 67% of patients, fear of needles was cited as a reason for fear in an additional 35% of patients.\textsuperscript{13} It would seem that dental fear/anxiety is indeed multifactorial in nature and unique for every affected patient.

Ultimately, the effect of dental fear/anxiety on patient’s patterns of dental attendance have a common result: fearful and anxious patients are less likely to seek preventative or regular dental treatments, instead presenting for emergency dental treatment only when needed.\textsuperscript{7} Adults and children who present for emergency dental treatment tend to be more fearful/anxious compared to average patients found within a general dental practice.\textsuperscript{15,16} These patients more commonly prefer sedation when given the option, however not all patients are aware that sedation is an option.\textsuperscript{15,16} It seems overall that dental fear/anxiety results in dental avoidance – delaying treatment or missing dental appointments.\textsuperscript{15,16} Furthermore, compared with the general population, higher levels of patient fear has been documented in patients surveyed in emergency rooms and emergency dental clinics.\textsuperscript{17,18} Oral health and dental fear have been documented as inversely but highly correlated, and those with high fear have more irregular patterns of attendance for dental appointments.\textsuperscript{19} Therefore, dental fear tends to lead to dental avoidance, the development of emergencies, and a patient preference for sedation and anaesthesia.

### 1.3.2 The prevalence of dental fear & anxiety in adult patients

Dental fear/anxiety is important to dental care providers because it requires patient management. Several studies have been undertaken to determine the true prevalence of dental
fear/anxiety in the general dental population. In the USA, studies suggest that 11.2-11.7% of the population has high dental fear, with an additional 17.5-17.7% having moderate dental fear. A review of the previous 50 years of research regarding the prevalence of dental fear/anxiety in the USA concluded that dental fear/anxiety scores have remained stable over time, and found no significant trends in self-reported anxiety levels. This suggests that despite advancements in preventative dentistry and an improved delivery of dental care, dental fear/anxiety has not decreased. On the other hand, despite an increase in the prevalence of general anxiety throughout the USA, dental anxiety has not increased proportionally. Dental anxiety seems to be very unique.

In Canada, Chanpong et al. studied the prevalence of dental fear nationally. The authors determined that 9.8% of the survey population were somewhat afraid, with an additional 5.5% having a high level of dental fear. The authors discovered that 7.6% of the total respondents had missed or cancelled a dental appointment due to fear or anxiety. Of the high fear group, 49.2% had missed or cancelled a dental appointment, contrasted with 5.2% from the low fear group. As adults age, their dental fear/anxiety changes related to their dental care changes. Studies have concluded that dental fear/anxiety declines with advancing age. Females were 2.5 times more likely to report a high level of dental fear. However, some have suggested that female dental patients are more willing to admit fear and anxiety. Overall, dental fear is present within the Canadian population, and it results in dental avoidance.

Dental fear/anxiety is relatively well documented throughout Canada and the USA. While the prevalence of dental fear/anxiety was once thought to be declining, it is now believed to have reached a steady state of prevalence. Dental fear/anxiety exists for a small but consistent proportion of dental patients, leading them to avoid conventional dental treatment. Many of these patients are unaware that there are treatment options available to help manage
their fear/anxiety.\textsuperscript{16} It has been suggested that the current dental care delivery model and the availability of sedation services is not matching the need within dentistry.\textsuperscript{16}

1.3.3 Prevalence of dental fear and anxiety in children, adolescents and teenagers

Dental fear and anxiety is one of the most commonly cited reasons for the requirement of sedation or anaesthesia as an adjunct for paediatric dentistry.\textsuperscript{24} In one study, 10% of children were found to be dentally anxious. Anxious children more commonly had active dental caries, a history of extractions, a pattern of irregular dental attendance, and parents with dental fear.\textsuperscript{25} Another study found the most common reason for children utilizing GA was dental fear.\textsuperscript{26} With respect to adolescent dental patients, in one study approximately 12% reported high dental fear with an additional 18% reporting moderate dental fear.\textsuperscript{27} In this study there was an increasing number of adolescents who were avoiding dental appointments.\textsuperscript{27} Teenagers also seem to suffer from dental fear with a prevalence of 6.5-12.5\% reported in past studies.\textsuperscript{14,28} Interestingly, research has observed dental anxiety increase as patients got older, increasing from 12.5-21.1\% over eight years.\textsuperscript{28} Teenagers with higher fear are more likely to have fewer dental visits and a greater incidence of tooth loss.\textsuperscript{28} Therefore, dental fear has been well established in both children, adolescents, and teenagers. This avoidance leads to more dental disease and a greater frequency of dental emergencies.

1.3.4 Dental fear and anxiety in rural communities

Previous research indicates that dental patients from rural communities have increased levels of dental fear and anxiety when compared with dental patients from urban
populations.\textsuperscript{12,29,30} Their level of fear/anxiety was inversely correlated with level of education in one study.\textsuperscript{12} Rural patients have reported existing dental pain and having unmet dental needs.\textsuperscript{30} Rural dental patients are less likely to have dental insurance and tend to delay regular dental treatment, seeking emergency dental treatment instead.

1.3.5 Need and demand for sedation and anaesthesia in the general adult dental population

In a study of Canadian dental patients, 12.4\% reported they were definitely interested in sedation or anaesthesia for their dental care, with an additional 42.3\% interested, depending on cost. Of the survey participants who reported having high levels of dental fear, one third were definitely interested in sedation or GA, while over half were interested depending on cost.\textsuperscript{8} When presented with hypothetical scenarios patients were asked to rate their level for fear as well as their desire for sedation or GA. Sedation or anaesthesia was preferred by patients at the following rates for the following hypothetical procedures: routine cleaning – 7.2\%; restorative dentistry or crown preparation – 18\%; root canal therapy – 54.7\%; periodontal surgery – 68.2\%, tooth extractions – 46.5\%.\textsuperscript{8} This indicates that Canadian’s have a strong desire for sedation and anaesthesia for all aspects of dental care.\textsuperscript{8}

A substantial proportion of the Canadian population experiences dental fear and anxiety, and these levels vary depending on the dental procedure being performed.\textsuperscript{8} A significant number of patients experience dental fear and prefer sedation and anaesthesia for routine or less invasive procedures such as cleanings and fillings.\textsuperscript{8} The profession of dentistry would ideally match this demand with appropriate supply and it has been suggested that increased access to dental anaesthesia would benefit patients.\textsuperscript{17}
1.3.6 Indicators of need for sedation and anaesthesia for paediatric dental patients

Understanding the need and utilization for DS/GA for children’s dental treatment is important as children have age-specific cognitive and social development that differs from adults. The underlying problem necessitating dental treatment is most often-early childhood caries (ECC). In Canada, children from Aboriginal communities, least affluent neighbourhoods and rural neighbourhoods were the most vulnerable populations for severe ECC requiring day surgery. While ECC are the reason why children require dental care, according to the American Association of Pediatric Dentistry (AAPD) indications for DS/GA are: extensive treatment needs, special needs patients, acute situational anxiety, uncooperative age-appropriate behavior, immature cognitive functioning, disabilities or medical conditions that require DS/GA to receive dental treatment in a safe and humane fashion.

1.3.7 Need and demand for sedation and anaesthesia in for paediatric dental patients

In Canada, paediatric dental rehabilitation with GA is the most common reason for children to have ambulatory day-surgery in hospital – required for 19,000 children under age six due to dental caries in 2012. Therefore about 12.5 in 1,000 Canadian children aged one through five years-old required GA in hospital for ECC, comprising 31% of all day surgeries for that age group. While significant, these numbers do not take into account dental day surgeries requiring GA outside of the hospital, or children on wait lists. The Canadian Dental Association states that this demand is “placing an unnecessary burden on an already stressed Canadian health care system.” To date, there has not been a study to quantify the number of out-of-hospital GA procedures for dentistry.
Trends regarding parental preference on behavior control suggests that parents prefer DS/GA only second to tell-show-do and conscious sedation, indicating it is currently desired more than passive or active restraint. Unfortunately, research suggests that a significant number of children who have GA to treat dental caries ultimately need an additional or even multiple GAs to treat recurrent dental decay. One UK study reported 26.6% of children required additional GA for dental treatment, and that if they adjusted for the number of children who required multiple GAs, the true rate was 31.8%. In British Columbia, an overall relapse rate of 22% was observed in children under age six. Overall, a small but significant proportion of the paediatric population requires GA in order to facilitate their dental care. The substantial proportion of repeat GAs highlights the need for prevention to decrease ECC in children. Increased exposure to DS/GA increase risk of an adverse event, and early evidence has demonstrated potential neurotoxic effects on young children’s developing brains, especially with repeated exposures to GA. It is also important to note that DS/GA does not cure dental fear, and that behavior management with or without conscious sedation ultimately helps to reduce children’s levels of fear and anxiety.

1.3.8 Dental patients with special needs and the demand for sedation and anaesthesia

It is important for the profession of dentistry to look after the oral health of all patients, including patients with special needs. Special needs patients can be defined as “those whose dental care is complicated by a physical, mental or social disability.” Another important group of special needs patients are those who are medically compromised. These patients have been described in the dental literature as a “high vulnerability” group. Research from Ontario suggests that barriers to dental care for special needs patients included: fear of the dentist
(17.5%), an inability to cooperate with treatment (18.9%), cost (16.4%), and transportation difficulties (10.7%).

Although people with disabilities in Ontario are able to obtain dental coverage through the Ontario Disability Support Program (ODSP), the limited nature of the services covered by this plan were identified as part of the “cost” barrier.

In the US, 27.9% of people with special needs identified themselves as having fear and anxiety about dental visits, with half of that group reporting that they were “terrified” of the dentist. Only 44.8% of dental patients with special needs reported that they had no dental fear. When offered the possibility of sedation and anaesthesia for dental visits, 40% of the age group <30, 24% in the 31-59 age group, and 8% of the >60 age wanted sedation or anaesthesia for dentistry. Past research suggests that 20% of special needs patients can only be managed through the use of GA.

Sedation and GA have been well documented treatment modalities for patients with special needs, providing optimal treatment conditions for suitable patients. GA has been used to overcome some of the challenges associated with the treatment of certain special needs patients, including: lack of cooperation, fear and anxiety, inability to remain still with an open mouth for extended periods of time, cognitive impairment, and multiple comorbidities. Past research has also concluded that the need for GA increases proportionally with the severity of intellectual disability. There is generally a high degree of patient and caregiver satisfaction after general anaesthesia has been utilized for dental treatment for disabled patients.

Patients with special needs and disabilities comprise a unique and important subset of the dental population. These patients have similarly unique dental treatment needs and indications for sedation and anaesthesia care. Expert anaesthesia providers can deliver sedation and anaesthesia safely and effectively to these patients.
1.3.9 Dentists’ ability to evaluate the need for sedation and anaesthesia

The attitudes of dentists towards sedation and anaesthesia, as well as their ability to evaluate which patients would benefit from these services, are important aspects of a patient’s access to DS/GA. Two recent Canadian studies have concluded that dentists underestimate which of their patients require dental sedation and anaesthesia. While the reasons for this disconnect is unknown, it maybe related to dentist’s education. Research has demonstrated that dental students are unsatisfied with the level of sedation training they receive. In another study, 65% of dentists surveyed reported that they were not fully trained to deal with fearful and anxious patients, and 91% reported that they were themselves stressed when treating anxious dental patients. Research has also demonstrated that attitudes towards sedation vary based on a dentist’s individual and personal experience, or their own training with sedation. A variation in anaesthesia education in dental school has been suggested to impact dentists’ views on sedation dentistry. Further research is needed to establish why dentists underestimate patient desire for sedation dentistry.

1.4 Sedation and anaesthesia practices in dentistry

Sedation and anaesthesia practices vary by country and by type of dental practice. In one US study, 76% of respondents reported that they used some form of sedation modality. General dentists accounted for 73% of the sedationists. The most common modalities utilized were nitrous oxide (77%), oral moderate sedation (40%), IV moderate sedation (22%), deep sedation (13%) and general anaesthesia (10%). In that study, 6.1% of general dentists utilized
DS and 3.8% utilized GA.\textsuperscript{54} This was contrasted to oral surgeons who used DS and GA 80.4% and 69.6%, respectively; and dental anaesthesiologists who used DS and GA 40% and 60% respectively.\textsuperscript{54} Periodontists used DS/GA 16.1 and 3.2% respectively, endodontists 5% and 0% respectively, prosthodontists 25% and 0% respectively, and paediatric dentists used DS/GA 10% and 17.5% respectively.\textsuperscript{54} In Ontario, 60.2% of dentists surveyed reported the use of some form of sedation or anaesthesia in their office.\textsuperscript{48}

With respect to children, the AAPD reports that 63% of members were currently performing conscious sedation.\textsuperscript{53} Eighty percent of respondents treated children under GA by utilizing an anaesthesiologist, with the majority of those spending four or fewer days in the operating room per month.\textsuperscript{53} US pediatric dentists reported that 27% percent currently use a dentist anaesthesiologist, and an additional 65% would use a dentist anaesthesiologist if one were available.\textsuperscript{55} These results demonstrate that US pediatric dentists are interested in providing more general anaesthesia in the office with dental anaesthesiologists.\textsuperscript{55}

Overall, while sedation practices vary, in general a majority of dental offices offer some form of sedation. DS/GA is most commonly used by oral maxillofacial surgeons, dentist anaesthesiologists and paediatric dentists.\textsuperscript{54} Further research in Ontario is required to establish the sedation practices of dentists.

\textbf{1.5 Access to sedation and anaesthesia in dentistry}

Access to DS/GA for dental patients in Ontario has not been formally studied and quantified. Evidence exists to suggest that access is sub-optimal, and geographically access is likely not uniform. Rural patients are reported to have less access to DS/GA.\textsuperscript{35} Wait times of 40-60 weeks have been reported for children.\textsuperscript{56} Adult special needs patients can wait 12 months or
longer for dental GA in hospital.\textsuperscript{57} Newspaper articles have reported wait times for general anaesthesia for dentistry in hospital ranging from 1-2 years.\textsuperscript{58–61} A Canadian report on children receiving dental GA states that the use of less costly and more accessible community-based surgicentres could improve access and decrease wait times for dental GA.\textsuperscript{62}

The Canadian government has acknowledged that providing timely access to general anaesthesia for children’s dentistry is a government priority.\textsuperscript{63} The 2007 Wait Times Guarantee project identified pediatric dental GA as one of six paediatric areas identified as needing improvement in wait times.\textsuperscript{63} According to the Pediatric Oral Health Research and Policy Centre, the availability of general anaesthesia for dental rehabilitation has a positive impact on dental access, and they have labeled it an essential service.\textsuperscript{64} In Ontario, access to DS/GA for dentistry has not been quantified. However, anecdotal data such as long wait times suggests access may be insufficient given the reported need and demand for DS/GA.

1.6 Barriers to sedation and anaesthesia in dentistry

The framework for access to DS/GA in Ontario (Chapter 3, Figure 1) highlights the impact of barriers to care on true access. With respect to dental anaesthesia, there has not been a comprehensive study that has focused on these barriers to care. Nor is there a single source that summarizes all of these barriers. A literature review was undertaken to summarize potential barriers to DS/GA.

1.6.1 Costs to the dentist as a barrier to DS/GA

In Ontario there are significant costs associated with hiring an anaesthesia provider, a qualified nurse, and purchasing the necessary anaesthesia monitors, equipment and drugs.\textsuperscript{3}
Dentists are required to pay $750 for an initial office (facility) inspection and subsequent facility permit, and then pay for periodic inspections thereafter. Anaesthesia providers are required to pay between $150 to $600 to obtain a sedation permit which must be renewed annually. Some dentists report that they are not willing to provide take on the risks associated with sedation at the current rate of remuneration. An indirect cost associated with DS/GA relates to a dental practice’s hygiene program. If a dentist is providing DS/GA or working on an anesthetized patient, they may not able to leave the anesthetized patient to perform recall examinations on their hygiene patients. Similarly, if a dentist leaves their office to work in a hospital or surgicentre, they cannot be in their office overseeing recall or hygiene patients. For all the aforementioned reasons, direct and indirect costs to the dentist interested in integrating DS/GA might be seen as prohibitive to making the service available to their patients.

1.6.2 Costs to the patient as a barrier to DS/GA

The cost of DS/GA might not be covered or only partly covered by private insurance and the added expense might fall directly on the patient. In Canada, a random sample of dental patients indicated 12.4% were definitely interested in sedation or anaesthesia with an additional 42.3% interested, depending on cost. Even within the high fear cohort, 31.1% were definitely interested with an additional 54.1% interested depending on cost. The full price to the patient includes the indirect costs of travel, time off work and requiring an escort to take the patient home after their DS/GA appointment.

1.6.3 Provider and patient attitudes as a barrier to DS/GA

As indicated in the theoretical framework for access to dental anaesthesia in Ontario
Chapter 3, Figure 1), the attitudes of dental patients and dental providers can influence availability of DS/GA as well as patient’s utilization of the service. Previous research has concluded that the decision to utilize DS/GA is based on a dentist’s clinical judgement. This judgment was based on the norms of the dentist, their overall attitudes towards general anaesthesia and the local structure by which DS/GA is organized locally. These attitudes are a product of the dentist’s own experiences with general anaesthesia, which leads them to make conclusions regarding the benefits and drawbacks of DS/GA. In Canada, dentists have been reported to underestimate patient’s level of demand for sedation and anaesthesia.

1.6.4 Wait times as a barrier to DS/GA

Evidence from a variety of sources suggests that patients face long wait times for dental DS/GA appointments. The Wait Time Alliance Report Card has assigned wait times for paediatric dental rehabilitation its lowest grade of D since just over half of Canadian children are treated in an acceptable timeframe. In British Columbia, long wait times for paediatric dental GA have led to the suggestion that healthy children could be treated in more cost effective, community-based outpatient dental centres. Another national study found that long wait times for paediatric dental GA were leading to prolonged wait times for other paediatric surgeries.

Evidence suggests that some adults have difficulty obtaining access to hospital operating rooms for dentistry, although not studied in detail like paediatric access. Wait times for private and community-based anaesthesia facilities remain unknown because they are not reported. However, community offices may be one avenue to help decrease the burden from hospital ORs.
1.6.5 Perception of risk as a barrier to DS/GA

The perception that deep sedation or general anaesthesia is dangerous or confers an unnecessary risk can influence the attitude of a dentist who may be or may not decide to refer a patient for DS/GA. One study has suggested that sedation and anaesthesia may be more or less palatable to dentists or parents based on their perception of the risk associated with general anaesthesia. Risk has been identified as a major barrier to offering sedation by paediatric dentists. Dentists have also reported concerns over litigation by offering sedation. Past research has demonstrated that dental anaesthesia is relatively safe for adult, paediatric and special needs patients with a risk profile of about 1.4 in 1,000,000 mortality rate.

1.7 Summary

DS/GA have deep roots in dentistry, from their origin to their advancement and use in office-based ambulatory techniques. Dental anaesthesia is a safe and effective tool to help alleviate dental fear, phobia and anxiety as well as a number of other indications, and is in significant demand in adult and paediatric populations. Patients desire dental anaesthesia for a variety of dental procedures including restorative, endodontic, periodontal, surgical and routine sanative treatment. Unfortunately, dentists have a difficult time ascertaining which patients are candidates for DS/GA, and therefore many do not offer the service to their patients. Cost, attitudes of the primary dentist, lack of hospital privileges, long wait times, lack of nearby anaesthesia provider and perceived risk comprise a number of other possible barriers that the healthcare delivery system can impose on a patient’s access to DS/GA.

The purpose of this study is to assess dentists’ perceptions of barriers to DS/GA for dental patients in Ontario. A secondary objective is to determine the utilization and accessibility
of DS/GA throughout Ontario for comprehensive dentistry, including restorative, endodontic, periodontal, prosthodontic and surgical treatment excluding exodontia. This will allow us to determine dental practice characteristics and social demographic factors associated with DS/GA access and utilization. Barriers to DS/GA are important because it is the presence or absence of barriers that allow dental patients (the users) to utilize available DS/GA services from the dental health care system.\textsuperscript{71,72}
Chapter 2

2.1 Methodology

The survey and research design used was approved by the University of Toronto Research Ethics Board (Protocol ID 30192). The survey population was all dentists practicing in Ontario. The source of the sampling frame was the RCDSO computerized database of email addresses. All dentists (general practitioners and specialists) licensed to practice dentistry in Ontario according to the 2015 RCDSO registry, and with an email address on file were contacted to participate in this study. Dentists who did not have an office email address, were retired for more than one year, were unlicensed, had only an academic license, did not practice dentistry, or were dental residents/students were excluded from the study. Furthermore, dentists who practiced only in the specialties of Orthodontics, Dental Public Health or Dental Radiology were excluded from the study, as we assume they have very limited indication to utilize DS/GA with regular frequency.

An email invitation to a web-based survey (Survey Gizmo™, Boulder, CO) was sent to recruit dentists along with a letter of information. The recruitment email described the aim of the survey, the reason why dentists were contacted, why their opinions were requested, the voluntary nature of the survey, the importance of confidentiality and consent, and the ability to opt out. Only submitted surveys were considered for data analysis, as a survey exited early was interpreted as a withdrawal of consent.

Over a period of two months, two additional reminder emails were sent following the recommendations of Dillman, Smyth and Christian. A web-based format was utilized due to the need for a dynamic survey that could ask questions based on previous answers, as well as due to a limited budget. The survey was accessible by computer, tablet or smartphone. The
survey could be completed in multiple sessions from the same device. The RCDSO distributed the survey link on behalf of the authors to preserve the privacy of dentist’s contact information, and for this reason proposed fax reminders by the authors were not possible. For the purposes of this research, access was defined having the ability to refer any patient for any procedure under DS/GA within a reasonable time and distance. Utilization was defined as having either referred for or provided DS/GA within the past year.

2.2.0 A theoretical framework on access to deep sedation and general anaesthesia in dentistry

Access to health care has been a topic studied at great length. However, there has never been a published framework specific for access to DS/GA in dentistry. In the absence of a theoretical framework on access to DS/GA in dentistry, previously published and validated frameworks can be used to inform understanding of the factors that influence access. Anderson & Aday’s framework for the study of access established an interconnected model with the overriding importance of health policy influencing two main features of access: the characteristics of the health delivery system, and the characteristics of the patient population. The authors further postulated that the healthcare system and patient characteristics would establish the utilization of health services, and this would be modified by consumer satisfaction. An important concept of this model is that each domain of the model is linked, acknowledging that access is a dynamic process, and that changes in one characteristic of the system have far reaching effects on overall access.\(^\text{74}\)

Khan & Bhardwaj attempted to refine and expand previous models, and added the idea that characteristics of the health care system established potential access, while the
characteristics of the users determine realized access. Importantly, Khan & Bhardwaj added the category of facilitators and barriers to their model, which link potential access with realized access. Together, these factors influence one another to determine present access, or true access.71

2.2.1 A novel framework for access to deep sedation and general anaesthesia for dental patients in Ontario

Figure 1 (Chapter 3) displays a theoretical framework for access to dental anaesthesia in Ontario. The key domains of this framework are: 1) the overriding determinant of access is health care policy and health planning, which directly influence: 2) the healthcare delivery system as well as 3) the end consumers; the patients.

2.2.2 Health care policy and planning

The first major domain of the framework is the health care policy and planning characteristics. This includes regulatory bodies, funding organizations, educational institutions for dental professionals, and dental professional trade organizations and lobby groups. In Canada’s publicly funded health care system, dentistry is not an included benefit, however, certain groups have access to government-funded dental services. Nationally, these include eligible First Nations and Inuit people in Canada. Provincially limited care is provided by: the Ontario Works program (based on financial need); the Ontario Disability Support Program (for disabled individuals and their families under certain conditions), Children in Need of Treatment and Healthy Smiles Ontario (children under the age of 18).75

Education is important both at the level of undergraduate dental training as well as
continuing dental education. The inclusion of sedation training impacts access to conscious sedation.\textsuperscript{50} For example, one of the two dental schools in Ontario teaches all dental students nitrous oxide conscious sedation.\textsuperscript{76} The exposure to sedation dentistry and the attitude of the dental faculty members influence students’ perceptions of the need and availability of dental anaesthesia.\textsuperscript{50} A concrete example of this would be a dental school choosing to teach dental anxiety scales or questionnaires to their students.\textsuperscript{77} The integration of DS/GA into dental curriculum allows future dentists to learn about DS/GA in their core dental training.

Another aspect of health care planning is the influence of dental trade organizations such as the Ontario Dental Association and Canadian Dental Association. The Canadian Association of Dentist Anaesthesiologists represents dentist anaesthesiologists throughout Canada. All together the aforementioned groups comprise the major assemblies that influence the health care policy and planning for sedation and anaesthesia as it relates to dentistry.

\subsection*{2.2.3 Characteristics of the dental health care system}

The second major domain of the framework for access to dental anaesthesia in Ontario is the characteristics of the health care system. These are made up of the health care providers and institutions that deliver dental anaesthesia care. The relative quantity and geographic distribution of dentists and anaesthesia providers are important in establishing spatial access. The anaesthesia delivery setting is significant since it can be offered in publicly funded hospitals or private dental clinics, each with varying access.\textsuperscript{4} The costs to set up and to deliver DS/GA are significant, and along with reimbursement either influences financial access.\textsuperscript{57} Although most general dentists do not provide DS/GA, they are an important factor in establishing access since they refer patients for anaesthesia when necessary. Previous
frameworks have established that access is influenced by the primary care provider’s age and education.\textsuperscript{71} Research has also demonstrated that the anaesthesia experiences and attitudes of the primary care dentist, their perceived assessment of need for DS/GA, and their perceived risk or liability related to DS/GA contribute to their overall attitude towards dental anaesthesia.\textsuperscript{48,50,53} Access to continuing dental education related to sedation and anaesthesia has been shown to influence overall attitudes towards this treatment modality.\textsuperscript{78}

### 2.2.4 Characteristics of potential users

The last major domain in a theoretical framework for access to dental anaesthesia in Ontario is the characteristics of the potential users. Research is needed to study all of the factors that influence a patient’s utilization and satisfaction with dental anaesthesia services. However, previous models on access to care emphasize the number and demand of patients, their relevant socioeconomic and demographic factors, their health status and the burden of their dental disease.\textsuperscript{71} Patient and parental preferences and attitudes are an important factor also.\textsuperscript{36} Patient values are often influenced by cultural background, further influencing attitudes towards dentistry and dental anaesthesia.\textsuperscript{71} This is further impacted by their health knowledge: a combination of a patient’s health literacy, their knowledge of the risks and benefits of sedation and anaesthesia compared with the risks, benefits, and quality of life changes associated with dental treatment or non-treatment.\textsuperscript{79} There is abundant evidence to suggest that psychological variables such as fear, phobia and anxiety are important factors when it comes to dental attendance rates, burden of disease and the need for sedation and anaesthesia.\textsuperscript{8,20,80}
2.2.5 Overview of access to DS/GA

The aforementioned three major domains of the framework establish the main factors that influence access. In the model of access to dental anaesthesia in Ontario, the characteristics of the health care system establish potential access. This access is modified by barriers and facilitators, which can be financial, geographic, or socioeconomic. Furthermore, utilization is a product of the characteristics of the patient population, and is continually modified by consumer experiences and levels of satisfaction with care. Together, all these aforementioned factors contribute to the total picture of access to DS/GA for dentistry. This creates a feedback loop within the framework, influencing health policy and planning and continually and dynamically influencing access. This theoretical framework, as well as a detailed literature review, was utilized to establish the factors that act as barriers or facilitators to dental anaesthesia, the core question of this research study.
Access to deep sedation and general anaesthesia services for dental patients: A survey of Ontario dentists

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This study was funded by the American Society of Dental Anesthesiologists Education and Research Fund
ABSTRACT

Background: Many patients prefer or require deep sedation or general anaesthesia (DS/GA) for dental treatment. Indications for DS/GA include: fear and anxiety, intellectual or physical disabilities, invasive dental procedures, complex medical status, and children who are difficult to manage. Currently, there is no knowledge of the factors that negatively impact access to DS/GA.

Objective: This study aims to assess the barriers to DS/GA as identified by dentists in Ontario.

Methods: An email invitation to a web-based survey was distributed to all licensed dentists and specialists who have registered an email address with the provincial regulator (n=5507). Descriptive and regression analyses were performed.

Results: Approximately one in five dentists responded (18.3%). A quarter (24.8%) of those surveyed report inadequate access to DS/GA. Multivariate analysis predicted poorest access in rural communities, and all regions outside the Greater Toronto Area (GTA). Overall, 74.5% of dentists indicated they had utilized DS/GA in the past 12 months. Non-utilization was predicted for: general dentists, part time dentists, dentists older than 64 years old, and dentists in urban locations. Wait times and travel distances were reported as longer for medically complex patients. The most common reasons for DS/GA non-utilization were due to a lack of perceived demand, and additional costs to patients. DS/GA utilizers indicated the greatest barriers as additional costs to patients.

Conclusion: Access to DS/GA in Ontario is not uniform, and remains a challenge in rural communities, and in regions outside the GTA, especially in the north. Utilization is lowest amongst general dentists and urban dentists despite adequate access, with dentist’s perception of need for DS/GA and costs to the patient acting as major barriers. Education for dentists and better insurance coverage for patients may improve access for these patients.
INTRODUCTION

About 12% of Canadians prefer deep sedation/general anaesthesia (DS/GA) as an adjunct to their dental care, with an additional 42.3% interested depending on cost.\textsuperscript{1} Patients want DS/GA for a wide scope of dental care, including routine cleaning (7.2%), restorative dentistry (18%), root canal therapy (54.7%), periodontal surgery (68.2%), and tooth extractions (46.5%).\textsuperscript{1} In general, patient groups that require or benefit from DS/GA are: patients who have dental fear or anxiety, who require complex treatment; children who are fearful, uncooperative or pre-cooperative; those with intellectual or physical disabilities, allergy or a contraindication to local anaesthesia, medical conditions requiring a reduction in physiological stress, or with severe gag reflex.\textsuperscript{2–6}

Dental fear and anxiety are common reasons for why patient’s prefer DS/GA.\textsuperscript{5} In Canada, it has been reported that 9.8% of adults are somewhat afraid of dental treatment, with an additional 5.5% having a high level of dental fear.\textsuperscript{1} Dental fear is also well established in children, adolescents, and teenagers.\textsuperscript{7,8} Nearly 28% of people with special needs identify themselves as having fear and anxiety about dental visits, with half of that group reporting that they are “terrified” of the dentist.\textsuperscript{4} When offered the possibility of sedation, a substantial portion of special needs patients prefer dental anaesthesia.\textsuperscript{4} Dental fear/anxiety also creates dental avoidance in both adults,\textsuperscript{9,10} and children,\textsuperscript{11} and fearful/anxious patients are less likely to seek preventative or regular dental treatments, instead presenting for emergency dental treatment only when needed.\textsuperscript{5} For Canadian adults with high fear, 49.2% reported missing or cancelling a dental appointment.\textsuperscript{1}

Paediatric dental rehabilitation is the most common reason for children to have ambulatory day-surgery in hospital in Canada, comprising 31% of all surgical day cases nationally. GA was required in hospital for 19,000 children under age six due to dental caries in
2012 (about 12.5 in 1,000). These data do not take into account dental rehabilitation under GA performed outside of the hospital, or children currently on wait lists and likely represent a fraction of the total problem. Parents have reported a high degree of satisfaction with dental care performed under GA (76-100%).

In this context, access to DS/GA for dental patients in Ontario has not been formally studied or quantified. Evidence suggests that access is sub-optimal, with long wait times reported for adults and children. A Canadian report on children receiving dental GA states that the use of less costly and more accessible community-based surgicentres could improve access and decrease wait times for this care. While there has been minimal research on the barriers to DS/GA care in dentistry, past research indicates many factors that could create obstacles to DS/GA care (See Table 1). Among these factors, dentists themselves can act as a facilitator or barrier to DS/GA, depending on their ability to determine who would benefit from DS/GA, and their own individual personal and professional experiences. Previous research in Canada has found that dentists feel inadequately trained with sedation and anaesthesia, feel stressed dealing with anxious patients, and underestimate patients’ desire for sedation or anaesthesia. All these factors may act as significant barriers to obtaining access to DS/GA. Therefore, the purpose of this study was to evaluate Ontario dentists’ utilization, perceived access and barriers to DS/GA.

**METHODODOLOGY**

The survey and research design was approved by the University of Toronto Health Sciences Research Ethics Board (protocol No 30192). A web-based survey of Ontario practicing dentists (general practitioners and specialists) was conducted. Potential participants were approached by e-mail, sent by the provincial regulator on the authors’ behalf, and directed by
link to an online interface (Survey Gizmo™, Boulder, CO) displaying the survey instrument. Similar e-mails were repeated twice during the period of two months (Aug. 14 and Sept. 18, 2014) following the recommendations of Dilman, Smyth and Christian.²⁷ No gift or remuneration was provided to study participants. Dentists who did not have an office email address, did not practice dentistry or were retired for more than one year, or had only an academic or student license were excluded from the study. Dentists who practiced only in the specialties of Orthodontics, Dental Public Health or Dental Radiology were also excluded from the study, as we assumed they have limited indication to utilize DS/GA with regular frequency.

**Sample size calculation**

The study sample (n) was calculated on the basis of the size of the population (N), the proportion of the population expected to choose one of two responses (P = .5 to allow for the maximum variance), the assumed sampling error (C = 0.05), and the Z-statistic of 1.96 for the 95% confidence interval (CI): \( n = \frac{[(N)(P)(1-P)]}{[(N-1)(C/Z)^2 + (P)(1-P)]} \).³⁰ For this web-based survey, the sampling frame is all general dentists and specialists that fit the inclusion criteria since the difference between the calculated sample size by the above method and the total population for each group of specialists is small. For general practitioners, from the ~8,700 general dentists and included specialists in Ontario, the required sample size would be 951. However, because it was not possible to draw a truly random sample by obtaining email addresses and we anticipated only a partial response rate, the sample size included all general dentists in Ontario with an email address.³¹

**Survey instrument**

We utilized previously published and validated frameworks on access to health care²⁸,²⁹
to design a theoretical framework for access to dental anaesthesia in Ontario (Figure 1). The key domains of this framework are: 1) the overriding determinant of access is health care policy and health planning, which directly influence, 2) the healthcare delivery system, as well as 3) the end consumers (the patients). The survey instrument was pilot tested amongst 15 specialists and 15 general dentists from the Faculty of Dentistry, University of Toronto. Pilot testing aimed to evaluate and validate the design, burden on the survey respondent (time needed to respond and level of complexity), response rate, face validity and feasibility of the planned data analysis. Follow up was completed with the pilot group to ensure the questionnaire was clear to understand and easy to complete. After revisions, the survey was finalized on the basis of two principal domains:

- **Domain 1** included questions based on the measurable factors established in the theoretical framework of access to dental anaesthesia in Ontario. By creating an organized approach to studying access to care, factors that influence access to DS/GA have been appropriately organized within the model. This study focused on characteristics of the healthcare delivery system. This included questions establishing access, utilization, referral patterns, and barriers encountered with utilizing DS/GA. Access was defined having the ability to refer any patient for any procedure under DS/GA within a reasonable time and distance. Utilization was defined as having either referred for or provided DS/GA within the past year.

- **Domain 2** included questions that established a responding dentist’s practice characteristics and social demographic information. This included registration status, field of practice, age, years experience, city population and geographic classification. Dynamic tailoring was used in order to reduce unnecessary questions and make the
survey process more efficient to maximize survey completion and submission.

Data analysis

Data from Survey Gizmo (Boulder, CO) was downloaded as a Microsoft Excel (Microsoft Corp, Redmond, WA) file. After recoding the variables, the database was exported into the Statistical Package for Social Sciences software 22.0 (Armonk, NY: IBM Corp.). Descriptive statistical analyses of the data were undertaken to summarize the results by using frequencies (counts) and percentages. Cramer’s V effect size was conducted to compare the sample demographic characteristics with Ontario-level data. The ranking order to barriers to utilizing DS/GA (Table 3) were compared between two groups of participants – DS/GA utilizers non-utilizers using non-parametric Wilcoxon Signed Ranks Test. Logistic regression analyses were conducted to explore factors associated with non-utilization of, or inadequate access, long waiting time and travelling distance to, DS/GA. All inferential statistical analyses were two-tailed and interpreted at 5% level of significance.

RESULTS

Descriptive results

The survey was successfully distributed to 5,207 dentists, of whom, 1,228 began the survey, 95 were disqualified and an additional 179 did not complete the survey. In total, 954 out of 5,207 eligible dentists completed the web-based survey, yielding a response rate of 18.3%. The demographic characteristics of the survey participants are summarized in Table 2. Almost all of respondents (98.7%) were active practicing dentists, with the remaining 1.3% being retired for less than 12 months. The majority of responding dentists were general practitioners (80.2%), between 45-64 years old (54%), with more than 10 years of experience (74.3%), practicing full time (76.4%), in urban centers (91.5%), with population of > 500,000 (41.2%) or 100,000-
500,000 (31.2%). Overall, dentists replied from all regions throughout Ontario, with the majority (41.8%) responding from the Greater Toronto Area (GTA).

**Provision of DS/GA and referral patterns**

Overall, 19.0% of all dentists sampled reported DS/GA as the deepest level of anaesthesia in their practice (Table 2). One quarter of this group offers the service within their office, and the remaining refer externally. Overall, only a minority of the responding general dentists (~10%), yet the majority of the specialists [~60% of all specialists (mostly dental anaesthesiologists (100%), oral maxillofacial surgeons (97.9%), and paediatric dentists (45.2%)]) offer DS/GA in their own respective offices. Only one-third of endodontists, periodontists, prosthodontists and oral medicine specialists offer DS/GA in their offices. Of the dentists that utilize an itinerant anaesthesiologist, the DS/GA providers are dentist anaesthesiologists (43.1%), medical anaesthesiologists (30.9%), or oral maxillofacial surgeons (28.7%). Of all dentists that utilize DS/GA, 41.4% were general dentists who brought in an itinerant anaesthesia provider. However, the majority (86.5%) of general dentists that utilize DS/GA refer (Table 4).

The majority of medically healthy patients (85.7%) were referred to community-based dental offices, while the majority of medically complex patients (59.3%) were referred to hospital-based dental clinics for DS/GA (Table 4). Overall, dentists report that healthy children and adults had to wait less (wait times >3 months occurred in 27.0% and 22.4%, respectively) and travel shorter (travel distances >50km occurred in 16.4% and 17.7%, respectively) as compared to medically compromised patients. For the latter groups, dentists report that wait times > 3 months occurred for paediatric and adult medically complex (48.3% and 43.5% respectively). Similarly, dentists report that travel >50km occurred among 25.7% and 24.5% of these populations, respectively (data not shown).
Utilization and access to DS/GA

More than three quarters of the responding dentists reported adequate access to DS/GA and three quarters utilized DS/GA: that is they either referred for DS/GA within the past year (55.6%) or offered the service in their office (19.0%). Access and utilization by region are mapped in Figures 2 and 3, and graphically display the varying rates of access as opposed to utilization. Access was reported highest in the GTA (89.4%) and lowest in Northern Ontario (34.2%). In contrast, utilization was reported highest in Northern Ontario (82.3%) and lowest in the GTA (69.4%).

In a multivariate regression model (Table 6), DS/GA non-utilizers are most likely to be general dentists (OR 2.1, 95% CI 1.4-3.3; P= 0.001), in part-time practice (OR 2.3, 95% CI 1.6-3.3; P< 0.001), >64 years old (OR 2.1, 95% CI 1.2-3.8; P= 0.014), and practicing in urban centers (OR 2.1, 95% CI 1.0-4.1, P= 0.039). Similarly, inadequate access was greatest for dentists from rural towns (OR 1.9, 95% CI 1.1-3.2; P= 0.017). Moreover, as compared to dentists from GTA, those from Hamilton and Niagara, (OR 2.9, 95% CI 1.7-5.2, P<0.001), Eastern Ontario (OR 2.9, 95% CI 1.7-4.7; P<0.001), Central Ontario (OR 3.5, 95% CI 1.9-6.8; P<0.001), Southwestern Ontario (OR 3.8; 95% OR 2.4-6.1; P<0.001), and Northern Ontario (OR 14.4 95% CI 7.9-26.1; P<0.001) are more likely to have lower access.

Predictors of wait times and travel distances for DS/GA

Table 5 expresses predictors of wait times for DS/GA greater than 3 months, and wait times greater than 50km. Overall, referring to dental anaesthesia (DA) or oral maxillofacial surgery (OMFS) predicted shorter wait times (OR 2.5, 95% CI 1.8-3.5; P< 0.001) but further travel distances (OR 1.7, 95% CI 1.3-2.5; P< 0.001), compared to an office that brings in a travelling anaesthesiologist. As reported by dentists, medically complex patients have higher
odds of both longer wait times and travel distances in order to obtain DS/GA care. Compared to dentists reporting of healthy children, medically complex children were more likely to experience wait times >3 months (OR 2.5, 95% CI 2.0-3.2; P<0.001), as were medically complex adults (OR 2.1, 95% CI 1.7-2.7; P<0.001) (Table 5).

**Perceived barriers of access to DS/GA**

Dentists who utilized DS/GA (n=711, 74.5% of total) reported the following barriers as most important: additional costs to patients (66.2%), inadequate coverage from social assistance programs (56.8%), lack of third party insurance coverage (47.9%), lack of patient/parental acceptance (24.8%), and too time consuming/costly to incorporate sedation into practice (23.8%). Conversely, dentists who did not utilize DS/GA (n=243, 25.5% of the total) responded that the most important barriers to dental anaesthesia were: no need in my patient base (68.3%), sufficiency of conscious sedation (45.3%), additional costs to patients (28%), unnecessary risk to patients (18.1%) and inadequate coverage from social assistance programs (16.5%). The difference in ranking the importance of the barriers between the two groups was significantly different (Wilcoxon Signed Rank Test z=3.52, p<0.001). Overall, 26.1% of responding dentists reported that they had inadequate access to dental anaesthesia-related continuing education (CE)(Table 3), 73.3% of whom believed that access to dental anaesthesia-related CE would better help them care for their patients (data not shown).

**DISCUSSION**

The purpose of this survey was to assess dentist’s perceptions of barriers to DS/GA for dental patients in Ontario. A secondary purpose was to explore the extent of these barriers on utilization and accessibility of DS/GA throughout Ontario, as these barriers are known to impact
access to DS/GA. Overall, dentists’ attitudes regarding the perceived need for DS/GA are a
underlying construct that act as a barrier to DS/GA for Ontario dental patients. Dentists also
report that the additional costs of DS/GA limit patient ability to utilize the service despite
patient demand and availability of dental anaesthesia services.

Limitations

Our response of 18.3%, although small, was within the range of 14% to 30% reported in other
recent surveys of dentists in Ontario. Despite this low response rate, the achieved sample
of 954 participants matched our a priori sample size calculation of 951. In particular, it needs to
be noted that a survey’s response rate is at best an indirect indication of the extent of non-
response bias and attention should be devoted to assessments of potential bias. In this regard,
the participants’ demographics were compared with the available census data from dentists in
Ontario or Canada (Table 7). The results revealed that for those demographics that could
be compared, differences between the participants and their Ontario or Canadian counterparts
were small. The interpretation of results must also be done with caution since access, utilization
and barriers were based on dentists’ perceptions and not patient experience.

Referral patterns, access and utilization of DS/GA

In Ontario, only DAs, OMFSs and medical anaesthesiologists can provide DS/GA in
dental offices. In general dental anaesthesia providers administer anaesthesia services mostly in
community-based clinics, while medical anaesthetists work in hospitals and private clinics.
The majority (78%) of referrals for DS/GA were made by general dentists, supporting the notion
that they influence a patient’s ability to obtain referral for DS/GA. Since 25.5% of dentists never
utilize DS/GA, it appears not all patients who would benefit from DS/GA are being offered this
treatment modality. The majority of medically healthy patients (85.7%) are referred to community-based dental offices, while medically compromised patients (59.3%) are more often referred for hospital-based anaesthesia, suggesting that dentists appropriately use hospital ORs for medically complex patients. This is important considering dental OR privileges are declining and wait times for hospital dental departments are reported to exceed 12 months. Furthermore, with nearly one-fifth of all dentists surveyed indicating that they offer DS/GA within their practice, private dental offices contribute significantly to the total provision of DS/GA.

The two main predictors of inadequate access to DS/GA associated with our sample were rural location and practicing outside of the GTA. In general, in rural areas (in particular, Northern Ontario) there is a lower density and availability of dental/medical anaesthesia specialists, as well as hospitals accepting dental referrals as compared to a dense demographic of both dentists and hospitals in major urban centres. Moreover, lack of access to anaesthesia-related continuing education (CE) courses can pose an important barrier. Our results showed that such access is lowest in Northern Ontario and highest in the GTA. Increasing access to CE would enable dentists to better understand anaesthesia options, patient screening and selection; and the majority of dentists sampled believed it would allow them to better care for their patients. This could be of interest to dental educators as well as dental regulators that create CE standards and recertification for dentists.

Utilization followed an inverse pattern to access, with the lowest reported in the GTA and highest in Northern Ontario. The full reasons for non-utilization are likely multifactorial in nature since those that avoid DS/GA did not perceive poor access. Non-utilization was greater for general dentists, part-time dentists, dentist’s >64 years-old, and dentists who practice in an urban location. Since patient demand for DS/GA includes general dental procedures, a variation
in dentist’s attitudes towards DS/GA could explain lower utilization. Part-time dentists are known to have unique practice patterns and older dentists more often work in rural settings, which may confound results.

Urban dentists might have unique practice profiles, influenced in part by the ratio of dentists to patients in urban areas such as the GTA (1:1,053) which is greater than in rural areas such as Northern Ontario (1:7,500). The patient density might influence: how busy the dentist is, time available per patient, emphasis on prevention, invasiveness of dentistry required, and availability of local specialists. Differences in water fluoridation might impact rates of dental caries. Furthermore, the density of patients per dentist might influence economic pressures that impact referral patterns.

**Travel Distance & Wait Times**

Research from Ontario has demonstrated that barriers such as wait times and travel distances are most likely to hinder access to dental care, especially for vulnerable populations. We found that compared with DA/OMFS offices, patients who are referred for DS/GA in offices that utilize an itinerant anaesthesiologist are two and a half times as likely to experience a waiting time >3 months, indicating DA/OMFS offices are able to screen and treat patients more quickly than offices that offer DS/GA part-time. However, patients are also more likely to travel >50km to DA/OMFS offices, since there are few specialty dental anaesthesia offices for comprehensive dentistry. Longer wait times and travel distances found for medically complex patients could be related to need for the hospital OR, since our results determined these patients are more likely to be referred to hospital dental clinics, known to have longer wait times.
**Barriers to DS/GA**

DS/GA utilizers indicated that the most important barriers related to patients is the cost for DS/GA services and the lack of private or public insurance coverage to fund DS/GA treatment, as has been corroborated previously. The second high ranked barrier for access to DS/GA perceived by this group was lack of patient/parental acceptance. This finding is contrary to past research that has demonstrated that parents prefer DS/GA compared with many other methods of behavior control. Perhaps, this perception in lack of acceptance may be confounded by the patient’s concern over cost. The third high ranked barrier for access to DS/GA by this group was their perceived cost to the provider (i.e. establishing and maintaining an anaesthesia practice, as well as indirect costs associated with dedicated treatment days to DS/GA) to be too great and hence, a significant barrier. Overall, these barriers relate mostly to the financial burden of DS/GA, but not to the dentist’s lack of faith in DS/GA as a treatment modality, since few dentists who utilize DS/GA cited risk as a barrier. In comparison, DS/GA non-utilizers overwhelmingly believed that these modalities were not needed or requested within their practice, although they did not perceive the service as more risky than other dentists. The underestimation of patient need has been previously demonstrated by both Ontario and Manitoba dentists. With an increasing demand for sedation and anaesthesia in dentistry within the Canadian population, dentist attitudes towards DS/GA seem to influence utilization. Cost to the patient was also a significant perceived barrier by DS/GA non-utilizers

**Implications and application**

The results of this study, similar to other research from Ontario, suggest that dentists’ attitudes and preferences toward DS/GA are a major barrier in the non-utilization of DS/GA.
Education opportunities for dentists in undergraduate training or CE courses, provided online for access to remote areas, could improve their understanding of the needs, demands, supplies, risks and benefits of dental care under DS/GA, and facilitate more meaningful discussions with patients and collaborative decision making.

As costs to patients appear to be the major barrier, these results need to be communicated to private and public dental insurance providers, who should consider DS/GA an essential service in dentistry. With a significant quantity of DS/GA occurring outside hospitals, cost and access information can benefit the Ministry of Health and Long Term Care and local administrators, especially since previous research has demonstrated that the total costs of DS/GA care in community-based clinics is much less than hospital ORs.\textsuperscript{54,60} Community-based treatment may reduce burden on the healthcare system, but increases costs to patients as facility and anaesthesia fees are not covered in community dental offices. While access to DS/GA is important, ultimately, most dental disease is avoidable and the principal goal of the dental profession should focus on prevention. Future research should be directed towards Ontario dental patient’s perceptions of utilization, access and barriers as described in the theoretical framework.
A Theoretical Framework for Access to Dental Anaesthesia in Ontario

Characteristics of Healthcare System
(Personnel & Facilities)
- Number of general dentists and anaesthesia providers
- Distribution/location:
  - Dental anaesthesiologists, medical anaesthesiologists, hospital OR facilities
- Organization
  - Hospital
  - Private practice or operator/anaesthesia
  - Itinerant anaesthesia
  - Surgicentre
- Preferences or prejudices of referring dentist
  - Age, education, and anaesthesia experience of primary dentist
  - Perceived need for anaesthesia and acceptance of GA from referring dentist
- Access to continuing dental education
- Referral process
- Availability of DS/GA in primary dental office
- Cost to setup anaesthesia practice, obtain permitting & insurance
- Reimbursement of provider and financial incentives

Characteristics of Potential Users
(Individuals & Communities – “the population at risk”)
- Number of potential patients and their age, sex, demographic factors, health status, burden of oral disease
- Socioeconomic status (income, employment, insurance/benefits)
- Geographic distribution and location
- Need/Demand in region
- Preferences and prejudices
  - Preference amongst parents
  - Preference amongst patients
- Attitudes and values
- Psychological variables:
  - Fear, phobia, anxiety
- Health knowledge:
  - Health literacy
  - Knowledge of sedation anaesthesia and risks/benefits
  - Fear of safety, death, brain damage, neurodevelopmental damage

Utilization
(Realized access)
- Geographic and Socioeconomic
- Type
- Consult
- Treatment planning
- Treatment
- Site
- Time between referral and appt.

Consumer Satisfaction
- Convenience
- Internal/External costs
- Satisfaction with experience
- Patient education
- Quality and perceived health benefit from encounter

Present Access
- Degree of access for each subgroup of patient
- Geographic access
- Socioeconomic determinants

Improved Future Access

Inadequate Access

Adequate access

Feedback

Health Care Policy & Planning
Regulatory:
- Ontario Government & Ministry of Health and Long Term Care
- RCDSO Standards of Practice & Regulated Health Professionals Act
Financing:
- Insurance companies
- Government
  - Social assistance programs (OW, ODSP, CINOT, HSO, NIHB)
  - Grants/Funding
Education:
- Continuing dental education
- Undergraduate dental programs
- Graduate dental specialty programs
Organization
- CADA, ODA

Availability
(Potential Access)
- Geographic and Socioeconomic Factors

Barriers & Facilitators
- Geographic and Socioeconomic factors
- Internal Economy (direct costs of treatment and travel/accommodation)
- External economy (travel time, accompaniment, lost wages)
Figure 2: Access to DS/GA by region in Ontario
Figure 3: Utilization of DS/GA in Ontario by region

Utilization of Deep Sedation & General Anaesthesia in Ontario

Legend
- <80%
- 80-82%
- >82%

Northern (82.3%)
Central (80.6%)
Southwestern (81.8%)
GTA (69.4%)
Eastern (70.2%)
Hamilton & Niagara (81.3%)

Note: Utilization was defined as either having referred for or provided DS/GA in the past year.
Table 1: Summary of barriers associated with access to deep sedation and general anaesthesia

<table>
<thead>
<tr>
<th>Reference</th>
<th>Possible Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chanpong, 2005&lt;sup&gt;1&lt;/sup&gt;, Johnson, 2012&lt;sup&gt;22&lt;/sup&gt;, Thompson, 2012&lt;sup&gt;61&lt;/sup&gt;</td>
<td>Additional costs to patients</td>
</tr>
<tr>
<td>Johnson, 2012&lt;sup&gt;22&lt;/sup&gt;, Thompson, 2012&lt;sup&gt;61&lt;/sup&gt;</td>
<td>Lack of third party insurance coverage</td>
</tr>
<tr>
<td>Johnson, 2012&lt;sup&gt;22&lt;/sup&gt;, Koneru, 2008&lt;sup&gt;22&lt;/sup&gt;, Quiñonez, 2006&lt;sup&gt;62&lt;/sup&gt;</td>
<td>Inadequate coverage from social assistance programs (ie CINOT, HSO, ODSP, OW)</td>
</tr>
<tr>
<td>Johnson, 2012&lt;sup&gt;22&lt;/sup&gt;</td>
<td>Providing or referring dental anaesthesia jeopardizes overall practice profitability</td>
</tr>
<tr>
<td>Johnson, 2012&lt;sup&gt;22&lt;/sup&gt;</td>
<td>Too time consuming or costly to incorporate anaesthesia into my practice</td>
</tr>
<tr>
<td>Johnson, 2012&lt;sup&gt;22&lt;/sup&gt;, Patodia, 2013&lt;sup&gt;25&lt;/sup&gt;</td>
<td>Cost or availability of malpractice insurance</td>
</tr>
<tr>
<td>Patodia, 2013&lt;sup&gt;25&lt;/sup&gt;</td>
<td>Sedation and anaesthesia do not remunerate well considering their complexity and risk</td>
</tr>
<tr>
<td>Johnson, 2012&lt;sup&gt;22&lt;/sup&gt;, Patodia, 2013&lt;sup&gt;25&lt;/sup&gt;</td>
<td>Unnecessary risk to patients</td>
</tr>
<tr>
<td>Johnson, 2012&lt;sup&gt;22&lt;/sup&gt;, Patodia, 2013&lt;sup&gt;25&lt;/sup&gt;, Eaton, 2005&lt;sup&gt;63&lt;/sup&gt;</td>
<td>Lack of patient or parental acceptance for anaesthesia</td>
</tr>
<tr>
<td>Johnson, 2012&lt;sup&gt;22&lt;/sup&gt;</td>
<td>Unnecessary liability or hassle in providing anaesthesia</td>
</tr>
<tr>
<td>Johnson, 2012&lt;sup&gt;22&lt;/sup&gt;, RCDSO, 2012&lt;sup&gt;25&lt;/sup&gt;</td>
<td>Rigorous standards of practice</td>
</tr>
<tr>
<td>Hicks, 2012&lt;sup&gt;25&lt;/sup&gt;</td>
<td>No available anaesthesia provider in my region</td>
</tr>
<tr>
<td>Baird, 2000&lt;sup&gt;40&lt;/sup&gt;</td>
<td>Lack of hospital privileges</td>
</tr>
<tr>
<td>CIHI, 2013&lt;sup&gt;13&lt;/sup&gt;, Ogilvie, 2009, Weeks, 2010, Winston 2011&lt;sup&gt;17–19&lt;/sup&gt;</td>
<td>Wait times are too long for anaesthesia appointments</td>
</tr>
<tr>
<td>Johnson, 2012&lt;sup&gt;22&lt;/sup&gt;, Boynes, 2006&lt;sup&gt;22&lt;/sup&gt;, Patodia, 2013&lt;sup&gt;25&lt;/sup&gt;, Curran, 2006&lt;sup&gt;45&lt;/sup&gt;</td>
<td>Lack of anaesthesia-related continuing education in my region</td>
</tr>
<tr>
<td>Hastings, 1994&lt;sup&gt;28&lt;/sup&gt;</td>
<td>I didn’t know anaesthesia was available</td>
</tr>
<tr>
<td>Patodia, 2013&lt;sup&gt;25&lt;/sup&gt;, Campbell, 2015&lt;sup&gt;26&lt;/sup&gt;</td>
<td>Difficult to identify which patients would benefit from dental anaesthesia</td>
</tr>
<tr>
<td>Johnson, 2012&lt;sup&gt;22&lt;/sup&gt;, Patodia, 2013&lt;sup&gt;25&lt;/sup&gt;, Campbell, 2015&lt;sup&gt;26&lt;/sup&gt;</td>
<td>No need in my patient base</td>
</tr>
<tr>
<td>Johnson, 2012&lt;sup&gt;22&lt;/sup&gt;</td>
<td>Conscious sedation is sufficient and general anaesthesia is unnecessary</td>
</tr>
<tr>
<td>Practice Characteristics</td>
<td>Number n(%)</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Registration Status</td>
<td></td>
</tr>
<tr>
<td>Active Practicing</td>
<td>98.7%</td>
</tr>
<tr>
<td>Retired &lt;12 months ago</td>
<td>1.3%</td>
</tr>
<tr>
<td>Field of Practice</td>
<td></td>
</tr>
<tr>
<td>General Dentist</td>
<td>80.2%</td>
</tr>
<tr>
<td>Dental Anaesthesiologist</td>
<td>2.8%</td>
</tr>
<tr>
<td>Oral &amp; Maxillofacial Surgeon</td>
<td>5.6%</td>
</tr>
<tr>
<td>Paediatric Dentist</td>
<td>4.5%</td>
</tr>
<tr>
<td>Other</td>
<td>6.9%</td>
</tr>
<tr>
<td>Hrs/Week</td>
<td></td>
</tr>
<tr>
<td>Part time</td>
<td>22.4%</td>
</tr>
<tr>
<td>Full time</td>
<td>76.4%</td>
</tr>
<tr>
<td>Years of Practice</td>
<td></td>
</tr>
<tr>
<td>&lt; 1 yr</td>
<td>3.2%</td>
</tr>
<tr>
<td>1-5 yrs</td>
<td>12.1%</td>
</tr>
<tr>
<td>5-10 yrs</td>
<td>9.0%</td>
</tr>
<tr>
<td>&gt; 10 yrs</td>
<td>74.3%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>&lt; 35 yrs</td>
<td>12.9%</td>
</tr>
<tr>
<td>35-44 yrs</td>
<td>19.6%</td>
</tr>
<tr>
<td>45-54 yrs</td>
<td>26.5%</td>
</tr>
<tr>
<td>55-64 yrs</td>
<td>27.6%</td>
</tr>
<tr>
<td>&gt; 64 yrs</td>
<td>12.4%</td>
</tr>
<tr>
<td>Population of Primary Practice</td>
<td></td>
</tr>
<tr>
<td>&lt; 5,000</td>
<td>4.0%</td>
</tr>
<tr>
<td>5,000-30,000</td>
<td>11.9%</td>
</tr>
<tr>
<td>30,000-100,000</td>
<td>10.7%</td>
</tr>
<tr>
<td>100,000-500,000</td>
<td>31.2%</td>
</tr>
<tr>
<td>&gt;500,000</td>
<td>41.2%</td>
</tr>
<tr>
<td>City Classification</td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>8.5%</td>
</tr>
<tr>
<td>Urban</td>
<td>91.5%</td>
</tr>
<tr>
<td>Region</td>
<td></td>
</tr>
<tr>
<td>Northern Ontario</td>
<td>8.3%</td>
</tr>
<tr>
<td>Eastern Ontario</td>
<td>14.8%</td>
</tr>
<tr>
<td>Central Ontario</td>
<td>6.5%</td>
</tr>
<tr>
<td>Southwestern Ontario</td>
<td>17.3%</td>
</tr>
<tr>
<td>Hamilton &amp; Niagara</td>
<td>10.1%</td>
</tr>
<tr>
<td>Greater Toronto Area</td>
<td>41.8%</td>
</tr>
<tr>
<td>Access</td>
<td></td>
</tr>
<tr>
<td>Adequate Access</td>
<td>75.2%</td>
</tr>
<tr>
<td>Yes Group</td>
<td></td>
</tr>
<tr>
<td>Refers for DS/GA</td>
<td>55.6%</td>
</tr>
<tr>
<td>Provides DS/GA</td>
<td>19.0%</td>
</tr>
<tr>
<td>Total Yes</td>
<td>74.5%</td>
</tr>
<tr>
<td>No group</td>
<td></td>
</tr>
<tr>
<td>Does not refer/provide DS/GA</td>
<td>25.5%</td>
</tr>
</tbody>
</table>

Values presented in table represent frequency (%)

*Other refers to periodontists, endodontists, prosthodontists, oral medicine/oral pathologists
Table 3: Barriers to DS/GA

<table>
<thead>
<tr>
<th>Barriers that hinder dentist's ability to utilize deep sedation and general anaesthesia:</th>
<th>Yes - has utilized DS/GA in past 12 months</th>
<th>Rank (Yes group)</th>
<th>No utilization of DS/GA in past 12 months</th>
<th>Rank (No group)</th>
<th>Total</th>
<th>P-Value (difference between Yes/No groups in frequency)</th>
<th>Rank (Difference)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number n (%)</td>
<td>Provides DS/GA</td>
<td>Refers to DS/GA</td>
<td>Total</td>
<td>Provides DS/GA</td>
<td>Refers to DS/GA</td>
<td>Total</td>
<td>Provides DS/GA</td>
</tr>
<tr>
<td>Additional costs to patients</td>
<td>60.8% 530 711</td>
<td>243</td>
<td>66.2% 1</td>
<td>28.0% 3</td>
<td>56.4% &lt; 0.001 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inadequate coverage from social assistance programs (i.e., CINOT, ODSP, OW, HSO)</td>
<td>51.9% 58.3% 56.8%</td>
<td>16.5% 5</td>
<td>46.4% &lt; 0.001 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of third party insurance coverage</td>
<td>49.7% 47.2% 47.9%</td>
<td>11.9% 7</td>
<td>38.7% &lt; 0.001 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of patient/parental acceptance</td>
<td>19.9% 26.4% 24.8%</td>
<td>6.6% 12</td>
<td>20.1% &lt; 0.001 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too time consuming/costly to incorporate sedation into my practice</td>
<td>2.7% 30.9% 23.8%</td>
<td>12.3% 6</td>
<td>20.9% &lt; 0.001 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of hospital privileges in my city/town</td>
<td>19.3% 22.5% 21.7%</td>
<td>6.2% 13</td>
<td>17.7% &lt; 0.001 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unnecessary liability or hassle of providing anaesthesia</td>
<td>4.4% 24.9% 19.7%</td>
<td>11.9% 7</td>
<td>17.7% 0.006 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wait times are too long for anaesthesia appointments</td>
<td>13.3% 17.2% 16.2%</td>
<td>8.2% 11</td>
<td>14.2% 0.002 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unnecessary risk to patients</td>
<td>8.3% 18.1% 15.6%</td>
<td>18.1% 4</td>
<td>16.2% 0.363 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rigorous standards of practice for sedation/anaesthesia</td>
<td>4.4% 17.2% 13.9%</td>
<td>8.6% 10</td>
<td>12.6% 0.032 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedation and anaesthesia do not remunerate well considering their complexity and risk</td>
<td>7.7% 10.6% 9.9%</td>
<td>3.7% 16</td>
<td>8.3% 0.003 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No available anaesthesia provider in my region</td>
<td>1.7% 10.4% 8.2%</td>
<td>9.1% 9</td>
<td>8.4% 0.664 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of anaesthesia-related continuing education in my region</td>
<td>1.7% 7.9% 6.3%</td>
<td>5.3% 14</td>
<td>6.1% 0.581 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost or availability of malpractice insurance</td>
<td>2.7% 6.2% 5.4%</td>
<td>4.1% 15</td>
<td>5.0% 0.449 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficult to identify which patients would benefit from dental anaesthesia</td>
<td>1.1% 4.9% 3.9%</td>
<td>15</td>
<td>2.9% N/A 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Providing/referring for sedation/anaesthesia jeopardizes overall practice profitability</td>
<td>0.5% 3.6% 2.8%</td>
<td>16</td>
<td>1.6% 17</td>
<td>2.5% 0.316 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I didn’t know deep sedation/anaesthesia are available</td>
<td>0.0% 0.9% 0.7%</td>
<td>17</td>
<td>1.6% 17</td>
<td>0.9% 0.189 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conscious sedation is sufficient</td>
<td></td>
<td></td>
<td>45.3% 2</td>
<td>11.5% N/A 16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No need in my patient base</td>
<td></td>
<td></td>
<td>68.3% 1</td>
<td>17.4% N/A 17</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Values represented in table represent frequency (%)

Note: Wilcoxon Signed Ranks Test shows statistically significant difference between the ranking of Yes and No groups, z=3.52, P<0.001
Table 4: Provision of DS/GA and referral patterns

<table>
<thead>
<tr>
<th>Provides DS/GA in their office</th>
<th>Only refers for DS/GA</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number n(%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Highest level of sedation offered in office</th>
<th>Yes - utilizes DS/GA in past 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>102 (14.3%)</td>
</tr>
<tr>
<td>N2O or oral minimal sedation</td>
<td>283 (39.8%)</td>
</tr>
<tr>
<td>Oral moderate Sedation</td>
<td>89 (12.5%)</td>
</tr>
<tr>
<td>IV moderate sedation</td>
<td>56 (7.9%)</td>
</tr>
<tr>
<td>Deep sedation/General Anaesthesia DMZ</td>
<td>78 (43.1%)</td>
</tr>
<tr>
<td>Dentist Anaesthesiologist</td>
<td>56 (30.9%)</td>
</tr>
<tr>
<td>Medical Anaesthesiologist</td>
<td>52 (28.7%)</td>
</tr>
<tr>
<td>Oral &amp; Maxillofacial Surgeon</td>
<td>181 (25.5%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source of referrals</th>
<th>Yes - utilizes DS/GA in past 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Dentist</td>
<td>75 (13.5%)</td>
</tr>
<tr>
<td>Dentist Anaesthesiologist</td>
<td>27 (100%)</td>
</tr>
<tr>
<td>Oral &amp; Maxillofacial Surgeon</td>
<td>47 (97.9%)</td>
</tr>
<tr>
<td>Paediatric Dentist</td>
<td>19 (45.2%)</td>
</tr>
<tr>
<td>Other</td>
<td>13 (33.3%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Destination of Referrals</th>
<th>Yes - utilizes DS/GA in past 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy Patients</td>
<td></td>
</tr>
<tr>
<td>Community-based dentist anaesthesia office</td>
<td>40 (37.7%)</td>
</tr>
<tr>
<td>Other community dental office</td>
<td>27 (25.5%)</td>
</tr>
<tr>
<td>Hospital-based practice</td>
<td>39 (36.8%)</td>
</tr>
<tr>
<td>Medically Complex Patients</td>
<td></td>
</tr>
<tr>
<td>Community-based dentist anaesthesia office</td>
<td>32 (21.0%)</td>
</tr>
<tr>
<td>Other community dental office</td>
<td>21 (13.8%)</td>
</tr>
<tr>
<td>Hospital-based practice</td>
<td>99 (65.1%)</td>
</tr>
</tbody>
</table>

Values represented in the table represent frequency (%) 
Other refers to periodontists, endodontists, prosthodontists, oral medicine/oral pathologists
Table 5: Multivariate Analysis with Odds of wait times and travel distances related to patient health characteristics according to providers

<table>
<thead>
<tr>
<th>Variables</th>
<th>Wait times &gt;3 months for DS/GA Appointment</th>
<th>Distance &gt;50km to Dental Anaesthesia Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unadjusted Bivariate OR (95% CI)</td>
<td>P Value</td>
<td>Unadjusted Bivariate OR (95% CI)</td>
</tr>
<tr>
<td>P Value</td>
<td>P Value</td>
<td>P Value</td>
</tr>
<tr>
<td>Anaesthesia Specialty Practice (Dental Anaesthesia or Oral &amp; Maxillofacial Surgery) Reference</td>
<td>Reference</td>
<td>1.7 (1.3-2.5)</td>
</tr>
<tr>
<td>General Dentistry, Paediatric Dentist, or Other dental office</td>
<td>2.5 (1.8-3.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Paediatric healthy (ASA 1 or 2) patient</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Paediatric medically complex (ASA 3 or 4) patient</td>
<td>2.5 (2.0-3.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Adult healthy (ASA 1 or 2) patient</td>
<td>0.9 (0.7-1.1)</td>
<td>0.252</td>
</tr>
<tr>
<td>Adult medically complex (ASA 3 or 4) patient</td>
<td>2.1 (1.7-2.7)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Other refers to periodontists, endodontists, prosthodontists, oral medicine/oral pathologists.
Table 6 Summary of Multivariate Analysis with Odds of Utilization of DS/GA and Odds to Access to DS/GA

<table>
<thead>
<tr>
<th>Variables</th>
<th>Non-Utilization of Deep Sedation &amp; General Anaesthesia</th>
<th>Inadequate Access to Deep Sedation &amp; General Anaesthesia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted Bivariate OR (95% CI)</td>
<td>P Value</td>
</tr>
<tr>
<td>Field of Practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Dentist</td>
<td>1.79 (1.19-2.69)</td>
<td>0.005</td>
</tr>
<tr>
<td>Specialist</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hrs/Week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part time</td>
<td>2.5 (1.8-3.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Full time</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years in Practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤10 yrs</td>
<td>1.0 (0.7-1.5)</td>
<td>0.818</td>
</tr>
<tr>
<td>&gt;10 yrs</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;35 yrs</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>35-44 yrs</td>
<td>1.1 (0.7-1.9)</td>
<td>0.634</td>
</tr>
<tr>
<td>45-54 yrs</td>
<td>0.9 (0.5-1.5)</td>
<td>0.623</td>
</tr>
<tr>
<td>55-64 yrs</td>
<td>1.1 (0.7-1.9)</td>
<td>0.619</td>
</tr>
<tr>
<td>&gt;64 yrs</td>
<td>2.3 (1.3-4.1)</td>
<td>0.003</td>
</tr>
<tr>
<td>Population of Primary Practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;30,000</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>30,000-100,000</td>
<td>1.3 (0.6-2.5)</td>
<td>0.497</td>
</tr>
<tr>
<td>100,000-500,000</td>
<td>2.2 (1.3-3.8)</td>
<td>0.002</td>
</tr>
<tr>
<td>&gt;500,000</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>nearest city</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤100 km</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>≤50 km</td>
<td>1.9 (0.7-4.9)</td>
<td>0.195</td>
</tr>
<tr>
<td>&gt;50 km</td>
<td>2.1 (0.7-6.0)</td>
<td>0.185</td>
</tr>
<tr>
<td>City Classification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>2.1 (1.1-3.9)</td>
<td>0.024</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Ontario</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Eastern Ontario</td>
<td>2.0 (1.0-3.9)</td>
<td>0.051</td>
</tr>
<tr>
<td>Central Ontario</td>
<td>1.1 (0.5-2.6)</td>
<td>0.804</td>
</tr>
<tr>
<td>Southwestern Ontario</td>
<td>1.0 (0.5-2.1)</td>
<td>0.930</td>
</tr>
<tr>
<td>Hamilton &amp; Niagara</td>
<td>1.1 (0.5-2.3)</td>
<td>0.861</td>
</tr>
<tr>
<td>Greater Toronto Area</td>
<td>2.0 (1.1-3.8)</td>
<td>0.023</td>
</tr>
</tbody>
</table>
## Table 7: Comparison of the demographics of the study participants and census data of dentists in Ontario

<table>
<thead>
<tr>
<th>Variable</th>
<th>Study Sample</th>
<th>Available Ontario or Canada Statistics</th>
<th>Effect size (Cramer’s V)</th>
<th>P Value ((\chi^2) test)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field of Practice</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Dentist</td>
<td>769 (80.6%)</td>
<td>7861 (85.8%)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental Anaesthesiologist</td>
<td>27 (2.8%)</td>
<td>35 (0.4%)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral &amp; Maxillofacial Surgeon</td>
<td>54 (5.7%)</td>
<td>219 (2.4%)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paediatric Dentist</td>
<td>43 (4.5%)</td>
<td>141 (1.5%)†</td>
<td>0.17</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>Endodontist</td>
<td>22 (2.3%)</td>
<td>151 (1.6%)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Periodontist</td>
<td>34 (3.6%)</td>
<td>211 (2.3%)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prosthodontist</td>
<td>13 (1.4%)</td>
<td>87 (0.9%)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Medicine/Oral Pathology</td>
<td>1 (0.1%)</td>
<td>14 (0.15%)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Practice Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hrs/Week</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part time</td>
<td>214 (22.7%)</td>
<td>17% †</td>
<td>0.05</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>Full time</td>
<td>729 (77.3%)</td>
<td>83% †</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Years in Practice</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 10 yrs</td>
<td>232 (24.7%)</td>
<td>28%◊</td>
<td>0.02</td>
<td>P=0.02</td>
</tr>
<tr>
<td>&gt; 10 yrs</td>
<td>709 (75.3%)</td>
<td>72%◊</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age of Dentist</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 35 yrs</td>
<td>123 (13.0%)</td>
<td>14%◊</td>
<td>0.05</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>35-44 yrs</td>
<td>187 (19.8%)</td>
<td>24%◊</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-54 yrs</td>
<td>253 (26.8%)</td>
<td>26%◊</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55-64 yrs</td>
<td>263 (27.9%)</td>
<td>22%◊</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 65 yrs</td>
<td>118 (12.5%)</td>
<td>14%◊</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Social Demographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City Classification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>81 (8.5%)</td>
<td>11%*</td>
<td>0.04</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>Urban</td>
<td>873 (91.5%)</td>
<td>89%*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Ontario</td>
<td>79 (8.4%)</td>
<td>375 (4.2%)◊</td>
<td>0.11</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>Eastern Ontario</td>
<td>141 (15.0%)</td>
<td>1095 (12.2%)◊</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Ontario</td>
<td>62 (6.6%)</td>
<td>937 (10.5%)◊</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southwestern Ontario</td>
<td>165 (17.5%)</td>
<td>954 (10.7%)◊</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hamilton &amp; Niagara</td>
<td>96 (10.2%)</td>
<td>559 (6.2%)◊</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater Toronto Area</td>
<td>399 (42.4%)</td>
<td>5031 (56.2%)◊</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† From the 2015 registry list of the Royal College of Dental Surgeons of Ontario
‡ From the Canadian Institute for Health Information. Canada’s Health Care Providers 1997-2011 - A reference guide
◊ From the 2014 Registry of the Ontario Dental Association
Works Cited


61. Thompson B. Cost Barriers to Dental Care in Canada. 2012.


Chapter 4: Discussion

The purpose of this survey was to assess dentist’s perceptions of barriers to DS/GA for dental patients in Ontario. Accessibility and utilization of DS/GA throughout Ontario was assessed as a means of gauging barriers, which are known to impact access to DS/GA.\textsuperscript{71,72}

Overall, dentists’ attitudes regarding the perceived need for DS/GA are an underlying construct that acts as a barrier to DS/GA for Ontario dental patients. Dentists also report that the additional costs of DS/GA limit patient ability to utilize the service despite patient demand and availability of dental anaesthesia services.

4.1 Limitations

Our response of 18.3%, although small, was within the range of 14% to 30% reported in other recent surveys of dentists in Ontario.\textsuperscript{81–83} Despite this low response rate, the achieved sample of 954 participants matched our a priori sample size calculation of 951. In particular, it needs to be noted that a survey’s response rate is at best an indirect indication of the extent of non-response bias and attention should be devoted to assessments of potential bias.\textsuperscript{84} The use of follow up reminders is known to reduce bias,\textsuperscript{85} and the electronic survey was reasonable considering >90% of dentists are known to have computers.\textsuperscript{86} In this regard, the participants’ demographics were compared with the available census data from dentists in Ontario\textsuperscript{87,88} or Canada\textsuperscript{89,90} (Table 7). The results revealed that for those demographics that could be compared, differences between the participants and their Ontario or Canadian counterparts were small. The interpretation of results must also be done with caution since access, utilization and barriers were based on dentists’ perceptions and not patient experience.
While a mail or mixed-mode survey would have helped to increase response rate, the web-based survey allowed for a dynamic survey with logic that allowed questions to be tailored based on past responses, increasing face validity of the survey tool. Our original methodology included fax reminders to be utilized six weeks after survey distribution, however our request for dentists’ fax numbers was denied on the grounds of privacy. Similarly, the RCDSO distributed our survey link on behalf of the authors to preserve the privacy of dentist’s email addresses, however this limited our ability to target follow-up reminders to non-respondents only.

Statistically, most confidence intervals were narrow with significant P-values, however in one instance a wide CI was noted. This indicates a low precision for the variable: effect on region on non-utilization (see table 6). The study might not have been sufficiently powered for this variable, or the effect of the variable might be difficult to quantify.

### 4.2 Referral patterns, access and utilization of DS/GA

The majority (78%) of referrals for DS/GA were made by general dentists, supporting the notion that they influence a patient’s ability to obtain referral for DS/GA. Since 25.5% of dentists never utilize DS/GA, it is likely that not all patients who would benefit from DS/GA are being offered this treatment modality. The majority of medically healthy patients (85.7%) are referred to community-based dental offices, while medically compromised patients (59.3%) are more often referred for hospital-based anaesthesia, suggesting that dentists appropriately use hospital ORs for medically complex patients.\(^4,^{31}\) This is important considering dental OR privileges are declining\(^4\) and wait times for hospital dental departments are reported to exceed 12 months.\(^{31,57,60,68}\) Furthermore, with nearly one-fifth of all dentists surveyed indicating that
they offer DS/GA within their practice, private dental offices contribute significantly to the total provision of DS/GA.

The two main predictors of inadequate access to DS/GA associated with our sample were rural location and practicing outside of the GTA. In general, in rural areas (in particular, Northern Ontario) there is a lower density and availability of dental/medical anaesthesia specialists,\textsuperscript{91–93} as well as hospitals accepting dental referrals\textsuperscript{4} as compared to a dense demographic of both dentists and hospitals in major urban centres.\textsuperscript{91,93} Moreover, lack of access to anaesthesia-related continuing education (CE) courses can pose an important barrier.\textsuperscript{94} Our results showed that such access is lowest in Northern Ontario and highest in the GTA. Increasing access to CE would enable dentists to better understand anaesthesia options, patient screening and selection; and the majority of dentists sampled believed it would allow them to better care for their patients. This could be of interest to dental educators as well as dental regulators that create CE standards and recertification for dentists.

Utilization followed an inverse pattern to access, with the lowest reported in the GTA and highest in Northern Ontario. The full reasons for non-utilization are likely multifactorial in nature since those that avoid DS/GA did not perceive poor access. Non-utilization was greater for general dentists, part-time dentists, dentist’s >64 years-old, and dentists who practice in an urban location. Since patient demand for DS/GA includes general dental procedures, a variation in dentist’s attitudes towards DS/GA could explain lower utilization. Part-time dentists are known to have unique practice patterns\textsuperscript{95} and older dentists more often work in rural settings, which may confound results.\textsuperscript{96}

Urban dentists might have unique practice profiles, influenced in part by the ratio of dentists to patients in urban areas such as the GTA (1:1,053) which is greater than in rural areas
such as Northern Ontario (1:7,500). The patient density might influence: how busy the dentist is, time available per patient, emphasis on prevention, invasiveness of dentistry required, and availability of local specialists. Differences in water fluoridation might impact rates of dental caries. Furthermore, the density of patients per dentist might influence economic pressures that impact referral patterns.

4.3 Travel distances and wait times

Research from Ontario has demonstrated that barriers such as wait times and travel distances are most likely to hinder access to dental care, especially for vulnerable populations. We found that compared with DA/OMFS offices, patients who are referred for DS/GA in offices that utilize an itinerant anaesthesiologist are two and a half times as likely to experience a waiting time >3 months, indicating DA/OMFS offices are able to screen and treat patients more quickly than offices that offer DS/GA part-time. However, patients are also more likely to travel >50km to DA/OMFS offices, since there are few specialty dental anaesthesia offices for comprehensive dentistry. Longer wait times and travel distances found for medically complex patients could be related to need for the hospital OR, since our results determined these patients are more likely to be referred to hospital dental clinics, known to have longer wait times.

4.4 Barriers to DS/GA

DS/GA utilizers indicated that the most important barriers related to patients is the cost for DS/GA services and the lack of private or public insurance coverage to fund DS/GA treatment. Cost has been identified by Canadian dental patients as a barrier to DS/GA. The second high ranked barrier for access to DS/GA perceived by this group was lack of...
patient/parental acceptance. This finding is contrary to past research that has demonstrated that parents prefer DS/GA compared with many other methods of behavior control.\textsuperscript{98} Perhaps, this perception in lack of acceptance may be confounded by the patient’s concern over cost. The third high ranked barrier for access to DS/GA by this group was their perceived cost to the provider (i.e. establishing and maintaining an anaesthesia practice, as well as indirect costs associated with dedicated treatment days to DS/GA)\textsuperscript{3,65,66,99} to be too great and hence, a significant barrier. Overall, these barriers relate mostly to the financial burden of DS/GA, but not to the dentist’s lack of faith in DS/GA as a treatment modality, since few dentists who utilize DS/GA cited risk as a barrier. In comparison, DS/GA non-utilizers overwhelmingly believed that these modalities were not needed or requested within their practice, although they did not perceive the service as more risky than other dentists. The underestimation of patient need has been previously demonstrated by both Ontario and Manitoba dentists.\textsuperscript{48,49} With an increasing demand for sedation and anaesthesia in dentistry within the Canadian population,\textsuperscript{8} dentist attitudes towards DS/GA seem to influence utilization.\textsuperscript{53,55,100–103} Cost to the patient was also a significant perceived barrier by DS/GA non-utilizers

4.5 Implications and Application

The results of this study, similar to other research from Ontario,\textsuperscript{48,49} suggest that dentists’ attitudes and preferences toward DS/GA are a major barrier in the non-utilization of DS/GA. Education opportunities for dentists in undergraduate training or CE courses, provided online for access to remote areas, could improve their understanding of the needs, demands, supplies, risks and benefits of dental care under DS/GA, and facilitate more meaningful discussions with patients and collaborative decision making. Current patient preference for DS/GA further
highlights the importance of dentist education.\textsuperscript{36,49}

As costs to patients appear to be the major barrier, these results need to be communicated to private and public dental insurance providers, who should consider DS/GA an essential service in dentistry. With a significant quantity of DS/GA occurring outside hospitals, cost and access information can benefit the Ministry of Health and Long Term Care, Local Integrated Health Networks, and local administrators, especially since previous research has demonstrated that the total costs of DS/GA care in community-based clinics is much less than hospital ORs.\textsuperscript{99,104} Community-based treatment may reduce burden on the healthcare system, but increased costs to patients as facility and anaesthesia fees are not covered in community dental offices. Public Health Dentists might be interested in these findings, making the publication of our study important. They are in the position to disseminate this information to policy makers both provincially and at the local health unit, and can help organize prevention for vulnerable populations. While access to DS/GA is important, ultimately, most dental disease is avoidable and the principal goal of the dental profession should focus on prevention. Future research should be directed towards Ontario dental patient’s perceptions of utilization, access and barriers as described in the theoretical framework.
Appendix 1 – Survey Instrument

ACCESS TO DEEP SEDATION AND GENERAL ANAESTHESIA SERVICES FOR DENTAL PATIENTS: A SURVEY OF ONTARIO DENTISTS

Introduction & Consent to Participate

Dear Colleague,

My name is Dr. Andrew Adams and I am a MSc/Specialty resident in the Discipline of Dental Anaesthesia at the Faculty of Dentistry, University of Toronto. I am inviting you to participate in my Masters thesis research regarding accessibility and barriers to deep sedation and general anaesthesia in dental practices in Ontario. I would appreciate your help for our research by participating in this online questionnaire.

Little is known about the availability of sedation and anaesthesia for dental patients in Ontario. Your participation will help us to assess accessibility to deep sedation and general anaesthesia throughout Ontario, as well as identify factors that enable or inhibit access to sedation dentistry. Furthermore, it will help us understand the ease or difficulty that various patient populations face when seeking dental anaesthesia, but not your knowledge of sedation or anaesthesia. There are no right or wrong answers.

The survey will take less than 10 minutes of your time to complete. There is neither cost nor reimbursement for your participation in the survey. For this study, you have been selected from the pool of all dentists in Ontario. Your participation is completely voluntary.

Your privacy is important to us. Please be assured of complete confidentiality and anonymity in completing this survey. No information that discloses personal identity will be collected, released, or printed. Your responses will not be linked to your name in any way and will not be used in any future publishing or presenting of the data received in this study. Please do not include any identifying information in any of your responses. You are free to withdraw from the study at any time by closing your Internet browser. Your withdrawal will not have any effect
on your present or future relationship with the Faculty of Dentistry, University of Toronto. Answers to frequently asked questions can be found by clicking here.

By clicking the "yes" button, you give your consent and will enter the survey, thereby giving permission for the contents of the survey to be used for this research. This study has been approved by the Research Ethics Board at the University of Toronto. If you have any questions about your rights as a participant, you may contact the ethics office at ethics.review@utoronto.ca or (416) 946-3273. In regards to the survey itself, you can contact me at andrew.adams@mail.utoronto.ca. Kindly ensure that your responses are received no later than September 17, 2014.

Thank you for your time. It is only with the generous help of people like you that our research can be successful.

Sincerely,

Andrew Adams, BHSc, DDS
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Dr. Carilynne Yarascavitch, Assistant Professor and Head, Discipline of Dental Anaesthesia
Dr. Carlos R. Quiñonez, Associate Professor and Program Director, Discipline of Dental Public Health

1) Do you agree to participate in this study?*

( ) Yes
( ) No

2) Please select from one of the following:
( ) I wish to end now and do not wish to participate.
( ) I wish for the investigator of this study to contact me in order to discuss this survey before I consent to proceed.

3) Please enter your email address in the box provided and we will contact you.

_________________________________________________

Disqualify Email Page

Thank you. The principal investigator will contact you shortly to address your questions or concerns.

4) Please select what best applies to your current practice status?

*  
( ) Active practicing dentist (General or Specialty Practice)
( ) Retired within the past 12 months
( ) Retired for more than 12 months
( ) Graduate Student/Resident
( ) Academic Dental Licence

5) You are a(n)...(please check all that apply):*

[ ] General Practitioner
[ ] Dental Anaesthesiologist
[ ] Dental Public Health Specialist
6) Have you either referred for or provided deep sedation or general anaesthesia within the past 12 months for any indication other than dental extractions?*

( ) Yes
( ) No

7) Please provide your opinion regarding why you have been unable or chosen not to refer or provide deep sedation/general anaesthesia in the past year.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Select all that apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>No need in my patient base</td>
<td>[ ]</td>
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<tr>
<td>Conscious sedation is sufficient</td>
<td>[ ]</td>
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<tr>
<td>Lack of third party insurance coverage</td>
<td>[ ]</td>
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<tr>
<td>Inadequate coverage from social assistance programs (i.e., CINOT, ODSP, OW, HSO)</td>
<td>[ ]</td>
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<tr>
<td>Lack of patient/parental acceptance</td>
<td>[ ]</td>
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<tr>
<td>Unnecessary risk to patients</td>
<td>[ ]</td>
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<tr>
<td>Additional costs to patients</td>
<td>[ ]</td>
</tr>
<tr>
<td>Lack of hospital privileges in my city/town</td>
<td>[ ]</td>
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<tr>
<td>Reason</td>
<td>[ ]</td>
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<td>------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Too time consuming/costly to incorporate sedation into my practice</td>
<td></td>
</tr>
<tr>
<td>Providing anaesthesia or referring for anaesthesia jeopardizes overall practice profitability</td>
<td></td>
</tr>
<tr>
<td>Sedation and anaesthesia do not remunerate well considering their complexity and risk</td>
<td></td>
</tr>
<tr>
<td>I didn't know deep sedation/anaesthesia are available</td>
<td></td>
</tr>
<tr>
<td>Rigorous standards of practice for sedation/anaesthesia</td>
<td></td>
</tr>
<tr>
<td>Lack of anaesthesia-related continuing education in my region</td>
<td></td>
</tr>
<tr>
<td>Unnecessary liability or hassle of providing anaesthesia</td>
<td></td>
</tr>
<tr>
<td>No available anaesthesia provider in my region</td>
<td></td>
</tr>
<tr>
<td>Wait times are too long for anaesthesia appointments</td>
<td></td>
</tr>
<tr>
<td>Cost or lack of additional malpractice insurance</td>
<td></td>
</tr>
</tbody>
</table>

8) Are there any other reasons why you have not referred for or provided deep sedation/general anaesthesia for your patients?

_________________________________________________

Dentist Preferences

Definitions:

- **Moderate Conscious Sedation**: a patient who responds purposefully to verbal commands with light tactile stimulation and maintains a patent airway
• **Deep Sedation:** a controlled state of depressed consciousness, inability to respond purposefully to verbal commands or light tactile stimulation, partial ability to maintain a patent airway
• **General Anaesthesia:** a controlled state of unconsciousness, inability to respond purposefully to verbal commands or physical stimulation, inability to maintain a patent airway
• **Route of anaesthesia:** any of the above levels of anaesthesia can be accomplished through IV, oral, inhalational or combined modalities. The route of anesthesia (e.g., "IV sedation") does not directly correspond with the depth of sedation/anaesthesia.
• **Depth of Anaesthesia by provider:** In Ontario, deep sedation and general anaesthesia can only be administered by a dentist anaesthesiologist, oral and maxillofacial surgeon or medical anaesthesia provider. Most general dentists and other specialists are limited to minimal or moderate conscious sedation, regardless of the route of anaesthesia. Therefore, "IV sedation" provided by a general dentist often refers to moderate conscious sedation. For the purposes of this study, we are interested in deep sedation and general anaesthesia only.

ASA Classification System: A risk index developed by the American Society of Anesthesiologists

• ASA Class 1: A normal healthy patient
• ASA Class 2: A patient with mild systemic disease
• ASA Class 3: A patient with severe systemic disease
• ASA Class 4: A patient with severe systemic disease that is a constant threat to life

9) Please indicate any form of sedation that is offered in your own practice(s). (Please indicate all that apply, or leave blank if you do not provide any sedation)

[ ] Nitrous Oxide or Oral Minimal Conscious Sedation
[ ] Oral Moderate Conscious Sedation
[ ] IV Moderate Sedation
[ ] Deep Sedation or General Anaesthesia

10) Who provides deep sedation or general anaesthesia in your office for procedures other than dental extractions? (Please select all that apply)

[ ] Myself
[ ] A dental anaesthesia provider
11) What types of patients do you see in your office for treatment under deep sedation/general anaesthesia? (Please select all that apply)

[ ] Paediatric healthy patients (ASA 1 or 2) with fear, anxiety, or pre-cooperative; or with mild mental or physical disability

[ ] Paediatric medically complex patients (ASA 3) or with complex mental or physical disability

[ ] Adult healthy patients (ASA 1 or 2) with fear, anxiety, gag reflex; or with mild mental or physical disability

[ ] Adult medically complex patients (ASA 3) or with complex mental or physical disability

12) What is the waiting time in months that patients must wait in order to obtain deep sedation/general anaesthesia in your office for comprehensive treatment; including preventative, restorative, endodontic or periodontal treatment?

<table>
<thead>
<tr>
<th>Patient Type</th>
<th>&lt; 3 months</th>
<th>3-6 months</th>
<th>6-9 months</th>
<th>&gt; 9 months</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paediatric healthy patients (ASA 1 or 2) with fear, anxiety, or pre-cooperative; or with mild mental or physical disability</td>
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<tr>
<td>Paediatric medically complex patients (ASA 3) or with complex mental or physical disability</td>
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<td>( )</td>
</tr>
<tr>
<td>Adult healthy patients (ASA 1 or 2) with fear, anxiety, gag reflex; or with mild mental or physical disability</td>
<td>( )</td>
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<td>( )</td>
<td>( )</td>
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<tr>
<td>Adult medically complex</td>
<td>( )</td>
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<td>( )</td>
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</tr>
</tbody>
</table>
patients (ASA 3) or with complex mental or physical disability

13) The following question relates only to patients whom you refer for deep sedation/general anaesthesia to another office:

**Where do you refer** patients in your practice who require deep sedation/general anaesthesia for comprehensive treatment; including preventative, restorative, endodontic or periodontal treatment?

<table>
<thead>
<tr>
<th>Patient Type</th>
<th>Dentist anaesthesiologist in a community based practice</th>
<th>Another dental practice for office-based anaesthesia</th>
<th>Hospital-based dental practice</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paediatric healthy patients (ASA 1 or 2) with fear, anxiety, or pre-cooperative; or with mild mental or physical disability</td>
<td>( )</td>
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<td>( )</td>
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<tr>
<td>Paediatric medically complex patients (ASA 3) or with complex mental or physical disability</td>
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<td>( )</td>
</tr>
<tr>
<td>Adult healthy patients (ASA 1 or 2) with fear, anxiety, gag reflex; or with mild mental or physical disability</td>
<td>( )</td>
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<td>( )</td>
</tr>
<tr>
<td>Adult medically complex patients (ASA 3) or with complex mental or physical disability</td>
<td>( )</td>
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</tr>
</tbody>
</table>
14) What is the distance in kilometres that patients must travel in order to obtain *deep sedation/general anaesthesia* for comprehensive treatment; including preventative, restorative, endodontic or periodontal treatment?

<table>
<thead>
<tr>
<th>Patient Type</th>
<th>&lt;50 kms</th>
<th>50-100 kms</th>
<th>&gt;100kms</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paediatric healthy patients (ASA 1 or 2) with fear, anxiety, or pre-cooperative; or with mild mental or physical disability</td>
<td>( )</td>
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<td>( )</td>
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<tr>
<td>Paediatric medically complex patients (ASA 3) or with complex mental or physical disability</td>
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</tr>
<tr>
<td>Adult healthy patients (ASA 1 or 2) with fear, anxiety, gag reflex; or with mild mental or physical disability</td>
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<td>( )</td>
</tr>
<tr>
<td>Adult medically complex patients (ASA 3) or with complex mental or physical disability</td>
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</tbody>
</table>

15) What is the time in months that patient's must wait in order to obtain *deep sedation/general anaesthesia* for comprehensive treatment; including preventative, restorative, endodontic or periodontal treatment?

<table>
<thead>
<tr>
<th>Patient Type</th>
<th>&lt; 3 months</th>
<th>3-6 months</th>
<th>6-9 months</th>
<th>&gt; 9 months</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paediatric healthy patients (ASA 1 or 2) with fear, anxiety, or pre-cooperative; or with mild mental or physical disability</td>
<td>( )</td>
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<tr>
<td>physical disability</td>
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<tr>
<td>Paediatric medically complex patients (ASA 3) or with complex mental or physical</td>
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<tr>
<td>disability</td>
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<tr>
<td>Adult healthy patients (ASA 1 or 2) with fear, anxiety, gag reflex; or with mild</td>
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<td></td>
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<tr>
<td>mental or physical disability</td>
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<tr>
<td>Adult medically complex patients (ASA 3) or with complex mental or physical</td>
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<tr>
<td>disability</td>
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</tbody>
</table>

**Questions for Dentist Anaesthesiologists Only**

This page is for dentist anaesthesiologists only. It is included because you have identified yourself in an earlier question as a dental anaesthesia provider and we are interested in your unique viewpoints on accessibility to deep sedation and general anaesthesia for dental patients in Ontario.

16) Please indicate what type of anaesthesia practice you work in?  
(Please click all that apply)

[ ] Itinerant anaesthesia practice  
[ ] Fixed anaesthesia only practice  
[ ] Fixed operator/anaesthesia practice  
[ ] Hospital-based practice

17) In total, how many dental offices do you provide anaesthesia in a given month?
18) In the past year have you ever practiced in a town that is considered a small or rural town, or a northern community?
(Rural is defined as a town with a population of less than 10,000 that is a one hour or greater drive from the nearest town of greater than 100,000. Northern is defined as any community north of Orillia or Ottawa)

( ) Yes
( ) No

A small or rural town is defined as a community with a population of less than 10,000 that is a one hour or greater drive from the nearest town of >100,000. A northern town is defined as one that is north of the towns of Orillia or Ottawa.

19) How many days per month, averaged over the course of a year, do you practice in a town that would be considered:

<table>
<thead>
<tr>
<th>Community Type</th>
<th>None</th>
<th>1-3 days</th>
<th>3-6 days</th>
<th>6-9 days</th>
<th>10+ days</th>
</tr>
</thead>
<tbody>
<tr>
<td>A small or rural town</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>A northern community</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
</tbody>
</table>

20) In a given month how many patients would you treat according to the following categories?
<table>
<thead>
<tr>
<th>Patient Type</th>
<th>No</th>
<th>1-10</th>
<th>10-20</th>
<th>20-30</th>
<th>30-40</th>
<th>40-50</th>
<th>&gt;50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paediatric healthy patients (ASA 1 or 2) with fear, anxiety, or pre-cooperative; or with mild mental or physical disability</td>
<td>()</td>
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</tr>
<tr>
<td>Paediatric medically complex patients (ASA 3) or with complex mental or physical disability</td>
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<tr>
<td>Adult healthy patients (ASA 1 or 2) with fear, anxiety, gag reflex; or with mild mental or physical disability</td>
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<tr>
<td>Adult medically complex patients (ASA 3) or with complex mental or physical disability</td>
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</tr>
</tbody>
</table>

21) What is the **wait time in months** that the following types of patients must wait to have treatment in your practice from the time they are referred from their primary care dentist?

<table>
<thead>
<tr>
<th>Patient Type</th>
<th>&lt; 3 mths</th>
<th>3-6 mths</th>
<th>6-9 mths</th>
<th>9-12 mths</th>
<th>12-15 mths</th>
<th>15-18 mths</th>
<th>&gt;18 mths</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Status</td>
<td>Age Group</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
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<td>( )</td>
<td>( )</td>
<td>( )</td>
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<tr>
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</tr>
</tbody>
</table>

22) What is the farthest distance in kilometres that patients regularly travel to your office(s) in order to obtain deep sedation/general anaesthesia for comprehensive treatment; including preventative, restorative, endodontic or periodontal treatment?
<table>
<thead>
<tr>
<th>Patient Type</th>
<th>&lt;50 kms</th>
<th>50-100 kms</th>
<th>&gt;100kms</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paediatric healthy patients (ASA 1 or 2) with fear, anxiety, or pre-cooperative; or with mild mental or physical disability</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>Paediatric medically complex patients (ASA 3) or with complex mental or physical disability</td>
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<td>( )</td>
</tr>
<tr>
<td>Adult healthy patients (ASA 1 or 2) with fear, anxiety, gag reflex; or with mild mental or physical disability</td>
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<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>Adult medically complex patients (ASA 3) or with complex mental or physical disability</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
</tbody>
</table>

**Final page - Opinions & Demographics**

23) Please indicate *reasons that hinder your ability to utilize OR refer* for deep sedation and general anaesthesia for comprehensive dental treatment; including preventative, restorative, endodontic or periodontal treatment? (Please select all factors that you believe impact a patient's ability to access dental deep sedation/general anaesthesia)
<table>
<thead>
<tr>
<th>Reason</th>
<th>Select all that apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficult to identify which patients would benefit from dental anaesthesia</td>
<td>[ ]</td>
</tr>
<tr>
<td>Lack of third party insurance coverage</td>
<td>[ ]</td>
</tr>
<tr>
<td>Inadequate coverage from social assistance programs (i.e., CINOT, ODSP, OW, HSO)</td>
<td>[ ]</td>
</tr>
<tr>
<td>Lack of patient/parental acceptance</td>
<td>[ ]</td>
</tr>
<tr>
<td>Additional costs to patients</td>
<td>[ ]</td>
</tr>
<tr>
<td>Unnecessary risk to patients</td>
<td>[ ]</td>
</tr>
<tr>
<td>Lack of hospital privileges in my city/town</td>
<td>[ ]</td>
</tr>
<tr>
<td>Too time consuming/costly to incorporate sedation into my practice</td>
<td>[ ]</td>
</tr>
<tr>
<td>Providing/referring for sedation/anaesthesia jeopardizes overall practice profitability</td>
<td>[ ]</td>
</tr>
<tr>
<td>Sedation and anaesthesia do not remunerate well considering their complexity and risk</td>
<td>[ ]</td>
</tr>
<tr>
<td>I didn't know deep sedation/general anaesthesia are available</td>
<td>[ ]</td>
</tr>
<tr>
<td>Rigorous standards of practice of sedation/anaesthesia</td>
<td>[ ]</td>
</tr>
<tr>
<td>Lack of anaesthesia-related continuing education in my region</td>
<td>[ ]</td>
</tr>
<tr>
<td>Unnecessary liability or hassle of providing anaesthesia</td>
<td>[ ]</td>
</tr>
<tr>
<td>No available anaesthesia provider in my region</td>
<td>[ ]</td>
</tr>
<tr>
<td>Wait times are too long for anaesthesia appointments</td>
<td>[ ]</td>
</tr>
</tbody>
</table>
24) Are there any other reasons that hinder your ability to utilize deep sedation and general anaesthesia?

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

25) Please indicate how often you are involved in the clinical practice of dentistry?

( ) Full-Time (≥32 hours/week)
( ) Part-Time (>32 hours/week)

26) Which of the following categories does your age fall into?

( ) 25-34 years
( ) 35-44 years
( ) 45-54 years
( ) 55-64 years
( ) 65 years or greater

27) Please indicate the population of the town/city of your primary dental practice.

( ) Less than 5,000
( ) 5,000 - 30,000
( ) 30,000 - 100,000
( ) 100,000 - 500,000
( ) Greater than 500,000
28) How far from your practice is the nearest city with a population greater than 100,000?

( ) Less than 20km
( ) 20-50km
( ) 50-100km
( ) Greater than 100km

29) How many years have you been practicing dentistry in the province of Ontario?

( ) < 1 year
( ) 1-5 years
( ) 5-10 years
( ) >10 years

30) Please indicate in which region you primarily practice dentistry.
(If you practice in more than one region please indicate the region of your primary practice)

( ) Northern Ontario
( ) Eastern Ontario
( ) Central Ontario
( ) Hamilton & Niagara Region
( ) Greater Toronto Area
( ) Southwestern Ontario

31) In your opinion, do you have adequate access to dental deep sedation/general anaesthesia in your region for all types of patients and procedures?

( ) Yes
( ) No
32) Please explain why you believe there is inadequate access to dental deep sedation/anaesthesia in your region.

_________________________________________________

33) In your region, do you have adequate access to continuing dental education on the topics of sedation and anaesthesia?

( ) Yes
( ) No

34) Do you believe that improved access to continuing education topics related to sedation and anaesthesia would help you better care for your patients?

( ) Yes
( ) No

35) Optional response:
If there are any other comments regarding access to dental deep sedation or general anaesthesia in Ontario, please use the following text box to share your opinions.

_________________________________________________
_________________________________________________
_________________________________________________
_________________________________________________

Thank You!

Thank you for taking our survey. Your response is very important to us. Your responses have been submitted.

You may exit by closing your browser.
Appendix 2: INVITATION – EMAIL CORRESPONDANCE

Re: Assessing Access and Barriers to Deep Sedation & General Anaesthesia for Dental Patients in Ontario

Dear Colleague,

This letter is an invitation to participate in a brief survey on the availability of deep sedation and general anaesthesia for dentistry in Ontario. I am writing to request your help.

Little is known about the availability of sedation and anaesthesia for dental patients in Ontario. Our study at the University of Toronto is being conducted to learn more about this subject. Your participation will allow us to assess the accessibility to deep sedation and general anaesthesia throughout Ontario, as well as identify factors that enable or inhibit access to sedation dentistry. Furthermore, it will help us understand the ease or difficulty that various patient populations face when seeking dental anaesthesia, but not your knowledge of sedation or anaesthesia. There are no right or wrong answers.

The survey will take less than 10 minutes of your time to complete. There is neither cost nor reimbursement for your participation in the survey. For this study, you have been selected from the pool of all dentists in Ontario. Your participation is completely voluntary.

Your privacy is important to us. Please be assured of complete confidentiality and anonymity in completing this survey as the ID number will only be used to log respondents. No information that discloses personal identity will be released or printed. Your responses will not be linked to your name in any way and will not be used in any future publishing or presenting of the data received in this study. You are free to withdraw from the study at any time by clicking "exit survey." Your withdrawal will not have any effect on your present or future relationship with the Faculty of Dentistry, University of Toronto.

This study has been approved by the Research Ethics Board at the University of Toronto. If you have any questions about your rights as a participant, you may contact the ethics office at ethics.review@utoronto.ca or (416) 946-3273. In regards to the survey itself, you can contact me at andrew.adams@mail.utoronto.ca.

By clicking the enclosed link, your browser will transport you to the online survey tool, which is accessible on any computer, as well as smartphone or tablet. Your consent is assumed by proceeding to the survey, thereby giving permission for the contents of the survey to be used for research. Please click on the following link to begin: www.surveygizmo.com

Kindly ensure that your responses are received no later than June 30, 2014.

Thank you for your time. It is only with the generous help of people like you that our research can be successful.

Sincerely,

Andrew Adams, BHSc, DDS
MSc Candidate (Dental Anaesthesia)
University of Toronto, Faculty of Dentistry  
Room 129, 124 Edward Street, Toronto, ON, M5G 1G6  
Phone: (416) 979-4922, ext 15008  
Email: andrew.adams@mail.utoronto.ca

Co-Investigators at the Faculty of Dentistry, University of Toronto  
Dr. Amir Azarpazhooh, Assistant Professor, Discipline of Dental Public Health & Discipline of Endodontics  
Dr. Carilynne Yarascavitch, Assistant Professor and Head, Discipline of Dental Anaesthesia  
Dr. Carlos Quiñonez, Assistant Professor and Head, Discipline of Dental Public Health
Appendix 3: INVITATION – SURVEY INTRODUCTION

Re: Assessing Access and Barriers to Deep Sedation & General Anaesthesia for Dental Patients in Ontario

Dear Colleague,

My name is Dr. Andrew Adams and I am an MSc/Specialty resident in the Department of Dental Anaesthesia at the Faculty of Dentistry, University of Toronto.

I am inviting you to participate in my Masters thesis research regarding accessibility and barriers to deep sedation and general anaesthesia in Ontario dental practices. I would appreciate your help for our research by participating in this online questionnaire.

Little is known about the availability of sedation and anaesthesia for dental patients in Ontario. Your participation will help us to assess accessibility to deep sedation and general anaesthesia throughout Ontario, as well as identify factors that enable or inhibit access to sedation dentistry. Furthermore, it will help us understand the ease or difficulty that various patient populations face when seeking dental anaesthesia, but not your knowledge of sedation or anaesthesia. There are no right or wrong answers.

The survey will take less than 10 minutes of your time to complete. There is neither cost nor reimbursement for your participation in the survey. For this study, you have been selected from the pool of all dentists in Ontario. Your participation is completely voluntary.

Your privacy is important to us. Please be assured of complete confidentiality and anonymity in completing this survey as the ID number will only be used to log respondents. No information that discloses personal identity will be released or printed. Your responses will not be linked to your name in any way and will not be used in any future publishing or presenting of the data received in this study. Please do not include any identifying information in any of your responses. You are free to withdraw from the study at any time by clicking "exit survey." Your withdrawal will not have any effect on your present or future relationship with the Faculty of Dentistry, University of Toronto.

By clicking the "yes" button, you give your consent to participate and will enter the survey, thereby giving permission for the contents of the survey to be used for this research. This study has been approved by the Research Ethics Board at the University of Toronto. If you have any questions about your rights as a participant, you may contact the ethics office at ethics.review@utoronto.ca or (416) 946-3273. In regards to the survey itself, you can contact me at andrew.adams@mail.utoronto.ca. Kindly ensure that your responses are received no later than April 30, 2014.

Thank you for your time. It is only with the generous help of people like you that our research can be successful.

Sincerely,
Andrew Adams, BHSc, DDS
MSc Candidate (Dental Anaesthesia)
University of Toronto, Faculty of Dentistry
Room 129, 124 Edward Street, Toronto, ON, M5G 1G6
Phone: (416) 979-4922, ext 15008
Email: andrew.adams@mail.utoronto.ca

Co-Investigators at the Faculty of Dentistry, University of Toronto
Dr. Amir Azarpazhooh, Assistant Professor, Discipline of Dental Public Health & Discipline of Endodontics
Dr. Carilynne Yarascavitch, Assistant Professor and Head, Discipline of Dental Anaesthesia
Dr. Carlos Quiñonez, Assistant Professor and Head, Discipline of Dental Public Health
Appendix 4: THANK YOU/REMINDER

Re: Assessing Access and Barriers to Deep Sedation & General Anaesthesia for Dental Patients in Ontario

Dear Colleague,

A few weeks ago you were sent an email inviting you to participate in our survey that should take less than 10 minutes. If you have already completed the survey, thank you for your time and contribution to this study.

If you have not yet had time to complete the questionnaire, I would appreciate if you could kindly participate at your earliest convenience. Your answers are important to us and will help us to better understand the availability of sedation and anaesthesia to dental patients in Ontario.

To access the survey, please go to: www.surveygizmo.com. Once you log on, you will receive prompts to view the consent document and then to proceed if you so choose. For your convenience this survey is accessible by computer, as well as tablet or smartphone.

This survey is entirely voluntary and your answers will remain anonymous. If you have already completed the questionnaire or wish to opt out of the survey, you can be removed from the mailing list by contacting me directly at andrew.adams@mail.utoronto.ca.

Again, thank you for your time and participation.

Most sincerely,

Andrew Adams, BHSc, DDS  
MSc Candidate (Dental Anaesthesia)  
University of Toronto, Faculty of Dentistry  
Room 129, 124 Edward Street, Toronto, ON, M5G 1G6  
Phone: (416) 979-4922, ext 15008  
Email: andrew.adams@mail.utoronto.ca
Appendix 5: FINAL 48-HOUR NOTICE

RE: ASSESSING ACCESS AND BARRIERS TO DEEP SEDATION & GENERAL ANAESTHESIA FOR DENTAL PATIENTS IN ONTARIO

Dear Colleague,

Our survey study will close in 48 hours. This is a reminder that if you wish to participate in our survey time is running out.

To complete the online survey, please access the following URL: www.surveygizmo.com. Further instructions and prompts will follow. For your convenience this survey is accessible by computer, tablet or smartphone.

You participation is entirely anonymous and voluntary.

Thank you for your time.

Most sincerely,

Andrew Adams, BHSc, DDS
MSc Candidate (Dental Anaesthesia)
University of Toronto, Faculty of Dentistry
Room 129, 124 Edward Street, Toronto, ON, M5G 1G6
Phone: (416) 979-4922, ext 15008
Email: andrew.adams@mail.utoronto.ca
Appendix 6: LETTER OF INFORMATION

How was I selected to be in the sample? Who will see my answers? Will my answers be kept confidential?
Your contact information was obtained from the public register of all licensed dentists in Ontario, and will be used solely for the purposes of this important research. During the course of data collection, names and addresses of dentists selected to participate in this survey will be stored electronically on a secure and encrypted network, accessed via password-protected computer. Identifying information is used only for survey distribution, tracking responses and compiling the data file for analysis. Upon completion of all data collection, all contact information will be destroyed from the source.
Your responses are anonymous and confidential. Your name and any personal identification will not be stored with your answers nor will it be used in any reports or publications that result from the survey.

What happens if I do not answer?
The choice to answer is completely yours. It is your right to refuse to answer or participate and you may withdraw from the study at any time. There are no consequences to you if you do not decide to participate or if you withdraw.

Does my participation provide any benefits to myself?
There are no immediate benefits to you.

Does my participation incur any risks or harm to myself?
There are no risks or harm to you by your participation in this study.

How do you obtain my consent to participate?
Initiation and completion of the survey by web implies your consent to participate in this study.

Can I stop in the middle of a survey and come back to finish it later?
You can complete the survey in multiple sessions. To return to a survey that was already started, follow the original link to the survey and re-enter your respondent code. This will take you back to the survey where you left off.

How is this survey important? Why does my view matter? Will I be able to obtain the findings from this study?
Dentists’ perceptions of the access and barriers to deep sedation and general anaesthesia in Ontario have not been studied previously. It is important to understand the ease or difficulty that dentists like you experience when trying to arrange for sedation dentistry for their patients. Previous research has established that there is significant need for sedation dentistry in Canada; however we do not know how these needs are being met. Your opinion is critical to the accuracy and success of this project. The enclosed survey is part of a Master’s thesis. All participants are invited to review the graduate thesis published in the Harry R Abbot Dentistry Library in 2015.

Who can I contact for more information?
Further questions about this study can be answered by myself (the principal investigator) at any time. Kindly email me at: andrew.adams@mail.utoronto.ca.
Appendix 7: RCDSO INSTITUTIONAL APPROVAL FOR CONTACT INFORMATION OF DENTISTS IN ONTARIO

MR. IRWIN FEFERGRAD
REGISTRAR
ROYAL COLLEGE OF DENTAL SURGEONS OF ONTARIO
6 CRESCENT ROAD, TORONTO, ON M4W 1T1

Dear Mr. Fefergrad,

I am writing to request an electronic copy of Ontario dentists’ contact information, including email addresses. I am a second year dental anaesthesia resident at the Faculty of Dentistry, University of Toronto. For my Master’s project I intend to randomly survey Ontario dentists to assess the access and barriers to deep sedation and general anaesthesia (GA) for dental patients in Ontario. Previous research has demonstrated a significant need for deep sedation and GA in Canada; however, little is known regarding how well dentists throughout the province are able to access anaesthesia care for their patients. Furthermore, we are interested in assessing factors that act to either enable or hinder access to anaesthesia care.

- This study has already received ethics approval from the University of Toronto, Research Ethics Board
- Dentists’ contact information will be used solely for the purposes of this research project. Neither names nor any other personal identification information will be stored with any survey responses. Furthermore, no identifying information will be used in any reports or publications that result from this research. All data will be erased from computers and all paper shredded at the completion of this study. A copy of the survey has been included for your information. This survey will adapt based on a dentists’ response – for example, questions are added if the respondent identifies him or herself as a dentist anaesthesiologist or a deep sedation/GA provider. The survey is entirely voluntary. Questions will be removed if a provider has not referred for anaesthesia within the past year
- A copy of the study proposal is attached
- Additionally, here is the link to the University of Toronto’s privacy policy: http://www.governingcouncil.utoronto.ca/Assets/Governing+Council+Digital+Assets/Policies/PDF/ppmar2819911.pdf

If you would like any more information concerning the project objectives or the use of dentist contact information please do not hesitate to contact me. Thank you for your time.

Most sincerely,

Andrew Adams, BHSc, DDS
MSc Candidate (Dental Anaesthesia)
University of Toronto, Faculty of Dentistry
Room 129, 124 Edward Street, Toronto, ON, M5G 1G6
Phone: (416) 979-4922, ext 15008
Email: andrew.adams@mail.utoronto.ca
Appendix 8: PROPOSED SCHEDULE OF RECRUITMENT

<table>
<thead>
<tr>
<th>WEEK</th>
<th>RECRUITMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Appendices 2,3,6: Letter of Invitation, Letter of information, Survey Begins</td>
</tr>
<tr>
<td>1</td>
<td>Appendix 4: Thank you/Reminder Email</td>
</tr>
<tr>
<td>3</td>
<td>Appendix 4: Thank you/Reminder Email &amp; Fax (fax not possible)</td>
</tr>
<tr>
<td>5</td>
<td>Appendix 5: 48 Hour Reminder – Survey Closed</td>
</tr>
</tbody>
</table>
Appendix 9:

Map of Ontario Census Divisions

Appendix 10: Additional data & tables

Appendix 10.1 Wait times and travel distances for all dental offices

<table>
<thead>
<tr>
<th>Patient Health Classification</th>
<th>General, paediatric or other office</th>
<th>Specialist (DA or OMFS) Office</th>
<th>Total</th>
<th>Wait time (months) for offices that refer for DS/GA</th>
<th>Travel Distances (km) to referral clinic reported by referring dentist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paediatric healthy (ASA 1 or 2) patient</td>
<td>&gt;3 (27.7%)</td>
<td>&gt;3 (9.7%)</td>
<td>&gt;3 (19.4%)</td>
<td>134 (27.0%)</td>
<td>82 (16.4%)</td>
</tr>
<tr>
<td>Paediatric medically complex (ASA 3 or 4) patient</td>
<td>7 (29.2%)</td>
<td>15 (33.3%)</td>
<td>22 (31.9%)</td>
<td>201 (48.3)</td>
<td>110 (25.7%)</td>
</tr>
<tr>
<td>Adult healthy (ASA 1 or 2) patient</td>
<td>23 (26.7%)</td>
<td>9 (11.4%)</td>
<td>32 (19.4%)</td>
<td>103 (22.4%)</td>
<td>83 (17.7%)</td>
</tr>
<tr>
<td>Adult medically complex (ASA 3 or 4) patient</td>
<td>16 (47.1%)</td>
<td>13 (23.6%)</td>
<td>29 (32.6%)</td>
<td>170 (43.5%)</td>
<td>101 (24.5%)</td>
</tr>
</tbody>
</table>

Values presented in table represent frequency (%)
Other refers to Periodontists, Endodontists, Prosthodontists and Oral Medicine/Oral Pathology Specialists

Appendix 10.2 Dentist’s response regarding continuing dental education

<table>
<thead>
<tr>
<th>Adequate Access to CE related to DS/GA</th>
<th>Utilization of DS/GA</th>
<th>No utilization of DS/GA</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>72.3%</td>
<td>78.5%</td>
<td>73.90%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inadequate access to CE related to DS/GA</th>
<th>Utilization of DS/GA</th>
<th>No utilization of DS/GA</th>
<th>Improved CE access will help me better care for patients</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>27.7%</td>
<td>21.5%</td>
<td>26.10%</td>
<td>Yes</td>
<td>73.30%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>26.70%</td>
</tr>
</tbody>
</table>
Works Cited:


41. Johnson I. *Special Care Dentistry in Wales; an assessment of need*.; 2011.


60. Winston I. Dental care for people with special needs; Accessibility issues; Patients on wait lists are at risk of serious illness. National Post. February 22, 2011:AL8.


69. Winston I. Special needs patients at risk for poor oral care; “It is up to us to ensure equal and universal access.” *The Gazette (Montreal)*. February 24, 2011:C8.


