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Administration of caries-related grievances at a children's hospital

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Abstract— P_{URPOSE}: To determine the diagnoses and causative teeth of caries-related emergency complaints that presented to children's hospital and the treatment provided over a ten-year period.

M_{ETHODS}: A retrospective review of the health records of all children who presented to The Hospital for Sick Children (SickKids) with caries-related emergency complaints from January 1, 2003 to December 31, 2012 was completed. A caries-related complaint was defined as a chief complaint of pain and/or swelling due to the sequelae of health decay as recorded in the chart by the treating physician or dentist.

R_{ESULTS}: The study included 2,032 caries-related visits over ten-years. The most common presenting complaint was pain (51 percent) and the most common diagnosis abscess (40 percent). The primary maxillary central incisors (22 percent) were the most common causative teeth. health treatment within the ED was provided for 22 percent of patients. Thirty-eight percent of those triaged received a prescription for antibiotics and/or analgesics. Overall, 44 percent of children received definitive surgical treatment within the hospital to resolve the primary cause of the visit.

$C_{ONCLUSIONS}$: Children's hospital EDs should be prepared to manage the emergent sequelae of health caries.

KEYWORDS: pediatric health services, trends, caries, emergency department

1. Introduction

In children's hospitals with a health service, it is commonly thought that the role of a children's health service in the ED is to administer treatment for patients with trauma to the cavity.

However, the number of visits related to health caries in children's hospitals appears to be increasing.[3,4] Caries-related complaints include health decay and associated pain, diseases of the pulp and periapical tissues, health abscesses and cellulitis of odontogenic origin. The Hospital for Sick Children (SickKids) in Toronto, Canada's most populated city, reported a ten-year increase of 48 percent in caries-related emergency department visits from 2003 to 2012.[5]

Caries-related emergencies and associated sequelae can be managed in a variety of ways depending on the specific diagnosis. Symptoms such as swelling and pain can be managed with antibiotics and analgesics but ultimately surgical intervention is required to definitively address the source of the health emergency. Primary teeth with large carious lesions and reversible pulpitis may be managed with a sedative, temporary restoration to provide pain relief. When the infection is more advanced then management of the pulp or extraction may be necessary. For permanent teeth, temporary restorations, pulpectomy and when absolutely necessary extraction is recommended.[6]

Although caries-related emergencies in children are an important public health concern, no study at a Canadian hospital has investigated the nature of presentation and treatment provided. As a result, this study aims to determine the chief complaint, associated teeth and diagnoses of caries-related emergency complaints that presented to a tertiary care children's hospital (SickKids) over a ten-year period, and determine the treatment provided to resolve the entire emergency episode over the same timeframe.

METHODS

This study consisted of a retrospective review of the health records of all children who presented to the SickKids ED with caries-related emergency complaints from January 1, 2003 to December 31, 2012 inclusive. A visit for an emergency caries-related complaint seen within the ED was identified as a registration where the principal diagnosis at discharge was coded using the International Classification of Disease (ICD-10) block code equal to K00-K14 (diseases of cavity, salivary glands and jaws). The health records department populated a list of children seen within the specified dates with the applicable ICD-10 codes. Once the children were identified, final eligibility was determined by reviewing the corresponding health records in the electronic patient chart. A caries-related emergency complaint was defined as a chief complaint due to the sequelae of health decay including caries, reversible pulpitis, irreversible pulpitis, abscess or cellulitis as recorded in the chart by either the treating physician or dentist.

Complaints related to trauma, salivary glands, cysts and tumors of the jaws, temporomandibular joint, teething, gingival stomatitis or causes undetermined were excluded from the study.

Incomplete chart entries were also excluded.

RESULTS

During the ten-year study period, 2,032 children presented to the ED with a caries-related complaint. Over the course of the study the number of visits for a caries-related complaint increased 48 percent.[5] Table 1 presents the visits by chief complaint. Over 50 percent of patients presented to the ED due to pain. Chief complaints of loss of appetite, not sleeping and bleeding comprised the two percent noted as "other."

Table 1: Chief complaint of visits presenting to the ED with caries-related complaints

Chief Complaint	Number	Percent
Pain	999	49
Swelling	872	43
Cavities	122	6
Other	39	2
Total	2,032	100

Table 2 is a summary of prevalence of health diagnoses for children discharged from the ED. The most frequent (36 percent) diagnosis made was abscess, but when abscess and cellulitis were combined, over fifty percent of children presented with some sort of swelling. Early childhood caries (ECC) was identified in 10 percent of children, indicating that multiple teeth were involved in the emergency.

Table 2 Diagnosis on discharge of visits presenting to the ED with caries-related complaints

Diagnosis	Frequency	Percent
Abscess	812	40
Caries	754	37
Cellulitis	359	18
Pulpitis	107	5
Total	2,032	100

The causative teeth are presented in Table 3. The specific tooth was unknown or a diagnosis of ECC was recorded for 758 children (37 percent.) This left 1,274 children with 1,996 identified teeth associated with the caries-related visit. Of those with an identified causative tooth, over 90 percent of visits involved a primary tooth with the maxillary primary centrals as the most commonly associated teeth. The maxillary primary first molar was also the most commonly involved tooth with a diagnosis of cellulitis and the most commonly associated with an admission. When a permanent tooth was reported the most frequently involved was the mandibular permanent first molar at three percent.

Table 3a: Presentation by causative primary tooth

Tooth	Number	Percent
MaxillaryPrimaryCentral	447	22
MaxillaryPrimaryLateral	269	14
MaxillaryPrimaryCanine	43	2
Maxillary Primary1stMolar	350	18
Maxillary Primary2ndMolar	153	8
MandibularPrimaryCentral	11	0.5
MandibularPrimaryLateral	8	0.4
MandibularPrimaryCanine	2	0.1
Mandibular Primary1stMolar	270	13
Mandibular Primary2ndMolar	273	14
TotalPrimaryTeeth	1826	92*

*As a percent of the overall total (primary + permanent teeth)

Table 3b: Presentation by causative permanent tooth

Tooth	Number	Percent
Maxillary Permanent Central	27	1
Maxillary Permanent Lateral	9	0.5
Maxillary Permanent Canine	1	0.1
Maxillary Permanent 2nd Premolar	2	0.2
Maxillary Permanent 1st Molar	38	2
Maxillary Permanent 2nd Molar	3	0.2
Mandibular Permanent Central	3	0.2
Mandibular Permanent Lateral	1	0.1
Mandibular Permanent 2nd Premolar	3	0.2
Mandibular Permanent 1st Molar	67	3
Mandibular Permanent 2nd Molar	16	1
Total Permanent Teeth	170	8**
Total Identified Teeth	1996	100

**As a percent of the overall total (primary + permanent teeth)

Families presenting to the ED were triaged by a nurse who ascertained that the chief complaint was in nature. An ED

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physician then either managed the complaint or requested consultation with the on-call dentist who then saw the patient. The patient flow until resolution

of the entire episode of care is presented in Figure 1. The majority of children (60 percent) received a health consultation within the ED. Overall, 868 children received a prescription for antibiotics and/ or analgesics, the majority of which was prescribed by the ED physician without a health consult (65 percent of the prescriptions provided).

In total, 22 percent of children received definitive health care within the ED. When consulted, dentists performed definitive health treatment (n=450) over a prescription of antibiotics (n =302). The most frequent treatment provided within the ED was extraction (n=402). The most commonly extracted teeth were the maxillary primary incisors (n=102) and maxillary primary first molar (n= 101). Permanent tooth extraction was rarely performed in the ED (n = 8) with maxillary permanent first molar being most common (n=5), followed by mandibular permanent first molar (n=4) and a single case of the maxillary central incisor.

The majority of treatment was carried out in the ED using local anesthetic and parent support to help stabilize the child. Of those children that had treatment performed in the ED, nine percent received sedation. The most common modality of sedation used was nasal midazolam.

Two children received intravenous ketamine. The number of sedations performed increased over time with the majority (85 percent) being performed in the last five years of the study period.

Over the ten years, four percent of children required immediate treatment under general anesthesia and a further nine percent of children were admitted to manage their symptoms.

Ultimately, 44 percent of patients received care either within the ED, the operating room or in the health clinic at SickKids.

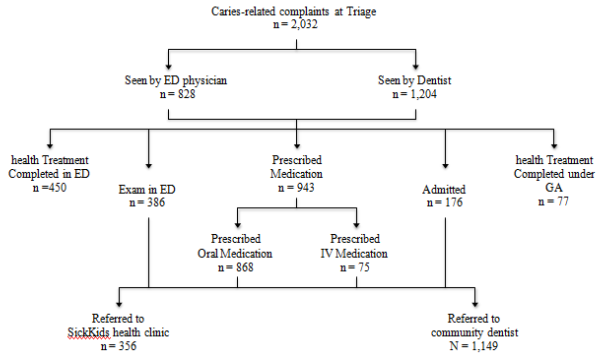

Figure 1: Disposition of caries-related complaints to the SickKids ED

DISCUSSION

The results of this study provide insight into the needs of children presenting to a major children's hospital ED with caries-related complaints and the treatment provided over a ten-year period. Pain caused by health caries was the most common reason for seeking care at the hospital ED, a finding supported by earlier studies.[7,9-11] Diagnosis of abscess and caries were almost equal, but when cellulitis and abscess were combined, over 50 percent of patients presented with peri swelling. It is not surprising that parents of children with facial or swellings would seek emergency care. Children with caries-related complaints in our sample presented with fever, irritability, decreased appetite and sleep disturbance. Parents of children with these signs and symptoms that arguably interfered with daily activities likely felt that immediate attention was needed and helps to explain why families sought care in a hospital ED.

Over 90 percent of visits involved primary teeth. The most common teeth were the maxillary primary central incisors at 22 percent followed by the maxillary primary first molar at 18 percent. This is in keeping with the pattern of severe ECC (S-ECC) whereby the maxillary anterior teeth are affected first, followed by the maxillary molars and then the mandibular molars. The maxillary first molar was the tooth most commonly associated with a diagnosis of abscess or cellulitis and unsurprisingly the most commonly involved in a hospital admission. A diagnosis of S-ECC was made in 13 percent of patients, indicating that the children five years old and younger with extensive treatment needs made up a meaningful proportion of the population. Because health caries is a progressive disease that spreads both within affected teeth and

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throughout the dentition, it unsurprising that so many children had multiple caries infected teeth.

The most common permanent tooth associated with a caries-related emergency was the mandibular first molar. It is important to note that the carious process that leads to acute symptoms takes time to develop. Older children with relatively new dentitions may have fewer opportunities to have disease extensive enough to elicit symptoms requiring emergency attention. Further, older children may have a greater opportunity to obtain care in private practice by general dentists because of a willingness to treat older children.[12] In studies that looked at the general population, the 19 to 35 age group comprised the largest cohort of caries-related ED patients.[13,14]

The proportion of children that received a definitive surgical treatment at children's hospitals that provide an on-call health service can arguably vary, but one study of a children's hospital with an on-call v service revealed that most patients were still managed pharmacologically.[9] That 22 percent of children had definitive surgical care within the SickKids ED is due to the presence of a health clinic in the ED. A further 18 percent of children were referred to the health clinic and subsequently received definitive surgical intervention within SickKids as well. Common documented reasons for delayed treatment included parental preference for definitive treatment when the child was feeling better, limited patient cooperation requiring assistance that could be better managed within the general health clinic, and extensive treatment needs that would require general anesthesia. Of interest is the increased use of sedation that occurred over the course of the study. This is consistent with recent trends in the children's health community away from traditional methods of behavior management, such as restraint, towards sedation.[16]

While this study helps us understand caries-related emergencies that presented to an ED, the picture is not yet complete. An evaluation of self-reported ED visits for complaints in the adult population of Canada demonstrated that access to health insurance or publicly funded care was associated with reduced utilization of the ED for complaints.[1] In the US, patients covered by Medicaid or those without health insurance present to the ED disproportionately more than those with private health coverage.[17] The question also remains as to the cost implications of these ED visits and whether it would be more economical for governments to simply provide more preventive insurance coverage to those who cannot afford a private insurance plan. While a US study shows preventive care is three times more expensive than providing treatment within the ED,[18] it is unknown whether this finding would hold true in Canada. Future studies evaluating the cost of providing care within a Canadian EDs could help evaluate the feasibility of more centers establishing emergency health services.

Conclusion

1. At SickKids, a major tertiary care children's hospital in Canada's most populated city, the ED appears to provide an important acces point to health treatment for caries-relatedcomplaints.
2. At our institution, the majority of patients with a caries-related complaint received a consultation with a dentist and definitive care was provided within the ED for over20 percent of children. Overall, 43.5 percent of children received a diagnosis and identification of the associated teeth with definitive treatment within thehospital.
3. With the number of visits increasing, pediatric hospital EDs should be preparedto manage the emergent sequelae of healthcaries.

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