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ESSENTIAL DENTAL KNOWLEDGE

Developing a Classification System for Prioritizing Pediatric Dental Patients Needing Treatment under General Anesthesia

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ABSTRACT

Purpose: The aim of this study was to explore a classification system for children requiring full-mouth dental rehabilitation (FMDR) in the operating room (OR) and its association with adverse events.

Methods: Patients treated at a pediatric dental residency clinic and determined to need FMDR in the OR were classified on initial examination, based on the extent of caries, pain and the presence of a dental abscess. On the treatment date, parents were given a questionnaire concerning adverse events that occurred while waiting for treatment. X^2 tests of independence were used to determine associations between classification (OR code) and the occurrence of adverse events. The Pearson's *r* test was used to determine relations among adverse events and wait time.

Results: The study included 82 patients (age range 2–10 years, mean 4.73 years, median 4 years). The average wait time was 55.6 days. The most common OR classification was caries in the outer third of dentin without pain or abscess, and the most common adverse event was difficulty eating or drinking. The OR code category most closely associated with negative outcomes was the presence of a dental abscess, followed by caries depth, then pain. Wait time was not associated with the occurrence of adverse events.

Conclusions: These data provide evidence to support the need for a classification system for children requiring FMDR in the OR. Dental abscess, caries depth and pain were associated with adverse events.

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In some regions of Canada, dental treatment has been reported to be the most common reason for day surgery for children aged 12–59 months.[1] The American Academy of Pediatric Dentistry (AAPD) advocates, when indicated, hospitalization and equal access to operating room (OR) facilities for oral care of infants, children, adolescents and people with special health care needs.[2] Wait times to receive treatment in a hospital have been reported in some areas in Canada to be 9–12 months, whereas, in the United States, residency training programs report that children requiring general anesthesia who are in pain wait 28 days while those not in pain wait 71 days.[3,4] Many adverse events happen to patients waiting for dental treatment under general anesthesia, including missed days of school, loss of sleep and pain.[5,6] In contrast, after dental rehabilitation, parents have reported a significant increase in quality of life of their child, demonstrated by improved sleep, behaviour and eating and fewer complaints of pain.[7]

In the field of medicine, tools exist to prioritize patients on waiting lists in areas such as hip and knee replacement, MRI scanning, cataract surgery, general surgery and children's mental health.[8–12] The medical literature proposes that priority be defined in terms of the extent of suffering, the expected benefit and the natural history of the condition.[13]

The dental literature includes limited studies on tools to prioritize children needing full-mouth dental rehabilitation (FMDR) in the OR. A prioritization system was developed for The Hospital for Sick Children in Toronto by looking at the patient's medical risk and dental status. Use of this system improved timeliness of treatment for urgent cases.[14,15] Although the data were not clinically significant, a trend suggested an increasing burden of disease with longer wait times for these children.[15]

Overall, there is evidence that while patients wait for dental work in the OR, adverse events occur. A classification system or tool has the potential to assign a higher risk child to an earlier date in the OR, therefore minimizing adverse events. Research looking at a classification system aimed at reducing symptoms experienced by patients who are waiting for treatment in the OR is limited. The aim of our study was to examine a classification system developed for children requiring FMDR in the OR and the association of adverse events with the OR codes assigned by the classification system.

Materials and Methods

We randomly selected 92 patients from those presenting to a pediatric dental residency outpatient clinic. Inclusion criteria were an acute stress reaction on initial evaluation, caries or caries and abscesses and the need for FMDR in the OR. The initial examination was completed by 8 pediatric dental residents, and data were entered into the electronic dental record.

After reviewing the electronic dental record, a pediatric dental resident assigned patients an OR code. This classification was based on depth of caries; presence or absence of pain and type of pain (irreversible or reversible pulpitis); and presence or absence of a radiographic or clinical abscess. If the patient had caries limited to the outer third of dentin, the patient was assigned a 1, caries that were approaching the pulp were assigned a 2 and caries into the pulp were assigned a 3. This was based on the tooth with the most advanced caries in the mouth. In addition, if the patient was currently in pain, then P was added to the code, and if the patient had a clinical or radiographic dental abscess then an A was assigned (**Table 1**). Decisions were made with the aid of radiographs, if available, or the clinical judgement of the dentist at the initial evaluation. Categorization of patients had no effect on the scheduling of their treatment.

On the day of the FMDR, informed consent was obtained from parents, and they were given a survey. The survey requested information on adverse events that had occurred while waiting for their appointment and the timing of these events.

X^2 tests of independence were used to explore potential associations between OR codes (subdivided into 3 groups: caries depth, pain and abscess) and whether patients experienced any adverse events. A Pearson's r test was used to determine whether a significant relation existed between waiting time (in days) and the number of adverse events experienced by patients. A 95% confidence interval (CI) was used ($\alpha = 0.05$).

This project was approved by the Institution Review Board at Bon Secours Richmond Health System.

Results

Of the 92 participants recruited, 10 were excluded from the analysis because treatment rendered on the day of FMDR was unrelated to dental caries or because data in the electronic dental record were not complete and, therefore, an accurate OR code could not be assigned. The mean age of the study participants (36 girls, 46 boys) was 4.73 years, median 4 years and range 2–10 years.

Patients presented 8 different OR code categories, the most common being caries limited to enamel and outer third of dentin without pain or a dental abscess (code 1), followed by caries approaching the pulp (code 2) (**Table 1**).

The number of patients reporting at least 1 adverse event was 31 (37.8%), with an average of 0.94 events reported per patient. The most frequently reported adverse event was difficulty eating or drinking (**Table 2**).

The relation between all 3 OR code categories (caries depth, presence of pain and presence of dental abscess) and adverse events was statistically significant ($p = 0.05$), with the presence of a dental abscess showing the strongest predictive value, followed by caries depth (**Table 3**). Of patients with caries into the pulp, 69% reported symptoms while waiting for treatment whereas only 19.2% of patients with caries limited to the outer third of dentin reported symptoms (**Table 4**). Furthermore, 81.8% of patients reported pain on presentation, and 91.7% with a dental abscess reported adverse events.

The average wait time between the initial visit and OR date was 55.6 days. The relation between wait time and adverse events was not statistically significant.

Table 1: Operating room (OR) codes and proportion of patients assigned to each ($n = 82$).

OR code	Description	No. patients (%)
1	Caries limited to the outer third of dentin	25 (30.5)
1P	Caries limited to outer third of dentin, pain	1 (1.2)
2	Caries approaching the pulp	22 (26.8)
2P	Caries approaching the pulp, pain	5 (6.1)
3	Caries into the pulp	11 (13.4)
3P	Caries into the pulp, pain	6 (7.3)
3A	Caries into the pulp, dental abscess	2 (2.4)
3PA	Caries into the pulp, pain, dental abscess	10 (12.2)

Table 2: Occurrence of adverse events among patients waiting for an appointment ($n = 82$).

Adverse event	No. patients (%)
Difficulty eating/drinking	23 (28.0)
Difficulty sleeping	10 (12.2)
Missed days of school	3 (3.7)
Needed pain medications	18 (22.0)
Needed antibiotics	7 (8.5)
Subsequent dental visits	11 (13.4)
Swelling/emergency room visits	5 (6.1)

Table 3: Occurrence of adverse events among patients waiting for an appointment ($n = 82$).

OR code category	Value	df	Asymptotic significance (2-sided)
Abscess			
Pearson X^2	17.344*	1	0.000
Likelihood ratio	18.107	1	0.000
Linear-by-linear association	17.133	1	0.000
Pain			
Pearson X^2	24.771†	1	0.000
Likelihood ratio	25.168	1	0.000
Linear-by-linear association	24.469	1	0.000
Caries depth			
Pearson X^2	18.579‡	2	0.000
Likelihood ratio	18.764	2	0.000
Linear-by-linear association	14.715	1	0.000

** 1 cell (25.0%) has expected count < 5. The minimum expected count is 4.54.*

† 0 cells (0.0%) have expected count < 5. The minimum expected count is 8.32.

‡ 0 cells (0.0%) have expected count < 5. The minimum expected count is 9.83.

Table 4: Relation between operating room (OR) code categories and the occurrence of adverse events among patients waiting for treatment (*n* = 82).

OR code category	% patients reporting adverse events
Caries depth: 1	19.2
Caries depth: 2	22.2
Caries depth: 3	69.0
Pain absent	21.7
Pain present: P	81.8
Abscess absent	28.6
Abscess present: A	91.7

Table 5: Proposed prioritization system for scheduling patients for the operating room (OR) with target wait times.

Classification	Target OR wait time
High risk: dental abscess	Scheduled within 6 weeks
Moderate risk: caries approaching the pulp and/or pain	Scheduled between 6 weeks and 3 months
Low risk: no dental abscess, no caries approaching the pulp and no pain	When OR time available and < 6 months

Discussion

There are limited data in the dental literature on the development of a system to prioritize OR bookings for children who require FMDR. However, patients report adverse outcomes while waiting for treatment, and those in underserved areas may have a much longer wait time.6 Identification of the highest priority cases may decrease the number of adverse outcomes in a patient population.

Before this initiative, children using the clinic were scheduled according to when they had their initial examination. This study developed a classification system or OR code to assess the codes' relation to adverse events in hopes of minimizing such events.

Patients present at various stages of progression of dental disease, and some are at risk of negative outcomes sooner than others. Thus, a general guideline applied to all patients that performing treatment as soon as possible may not be best compared with prioritizing use of OR time and resources based on acuity. Assuming that patients who wait longer will experience more symptoms may not be accurate, because the occurrence of adverse events is patient specific.

The relation between caries depth, pain and dental abscess and adverse events was statistically significant and, thus, this information can be used to assist in prioritizing scheduling patients for the OR. Furthermore, the presence of a dental abscess should influence scheduling most, because of its strongest predictive value. We propose that these 3 simple parameters, which can often be generally determined at a dental visit, be used as a framework for prioritizing patients when scheduling OR treatment.

The prioritization system created by The Hospital for Sick Children aimed to help children obtain treatment within target wait times determined by expert opinion.[14,15] Classification was based on medical history, dental abscess, caries and whether caries were approaching the pulp. The system did not prove to be statistically significant in reducing dental treatment burden, but a trend suggested an increasing burden of dental disease for children with longer wait times. The classification system developed in our study has similar parameters, but 1 limitation is not including medical history.

In the medical profession, much has been done to formulate and validate prioritization systems to help allocate limited OR resources.[8–12] Much of this research has been dedicated to creating reliable ratings that can be applied consistently among practitioners, as well as comparing their results with patients' perceptions of urgency and patient-reported outcomes, using tools such as the EuroQol (EQ-5D). Such robust validation is needed in the dental field when considering a prioritization system.

We chose 3 parameters (caries depth, pain and dental abscess) based on their simplicity and their ability to be quickly determined in a fast-paced clinical setting. Building on the foundation laid by the classification system created at The Hospital for Sick Children, we propose a simple prioritization system (**Table 5**).[14,15] This system would be easy to implement in any clinical setting and could minimize the occurrence of adverse events while patients wait for treatment in the OR. Validation of the scale is needed and potential refinements, such as including medical history, could be indicated.

Limitations

The conclusions of this study are limited, in part, because only oral health measures were investigated and not the overall medical status of patients. Questionnaires for parents were only in English, which limited the participant population and patient history was provided by the parent. Furthermore, the findings would have been strengthened by a larger number of participants and calibration of all practitioners who completed the initial examination. In addition, radiographs for young children and special needs patients commonly cannot be obtained pre-operatively. Therefore, the initial diagnosis and coding may not be as accurate as in patients where radiographs were able to be obtained.

Conclusion

Caries depth, pain and the presence of a dental abscess are predictive of adverse events while patients wait for treatment in the OR and, therefore, can be used when formulating a prioritization system. Clinicians who use these oral health measures when determining OR schedules can minimize the occurrence of adverse events experienced by patients. Further research is needed to examine and validate the proposed OR prioritization system.

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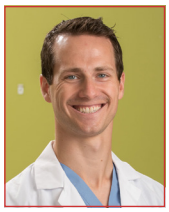

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