

Factors that affect the duration of dental treatment in children during general anaesthesia

 Güler Burcu Senirkentli¹ ,  Zeynep Ersoy²,  Eda Çakmak³,  R. Ebru Tirali⁴

Highlights

Accurate prediction of treatment duration under general anaesthesia is important to improve operating room efficiency and patient safety in children.

Less experienced dentists required longer operative times, while the tooth-specific calculation tool closely predicted actual treatment duration.

Improved treatment planning may enhance clinical efficiency and support safer paediatric dental care under general anaesthesia.

Abstract

Aim: This study aimed to evaluate the dentist's experience, types of procedures performed, and secondary factors that may affect dental treatment in paediatric patients under general anaesthesia (GA). **Methods:** A retrospective cohort study of paediatric patients who underwent dental treatment under general anaesthesia at Baskent University Hospital between 2016 and 2020 was carried out. Patient demographic data were collected, the planned and applied treatment procedures were noted, and the operating times were recorded. Using a newly developed calculation tool, estimated procedure times were calculated for the planned treatments. Years of work as a specialist were recorded to analyse the impact of operator experience. **Results:** The mean age of the patients was 5.29 years (± 1.94 SD), and 58.8% were male. Statistically significant differences were observed in procedure times when comparing patients with and without systemic diseases. Additionally, dentists with 5 years of experience or less required significantly longer procedure times under general anaesthesia compared to those with 6 to 10 years of experience ($p=0.003$) and those with more than 10 years of experience ($p<0.001$). However, no significant difference was found between the groups with 6 to 10 years of experience and those with over 10 years of experience ($p=0.144$). In the obese patient group, dentists with 5 years of experience or less had significantly longer procedure durations than more experienced dentists ($p=0.047$). **Conclusions:** Dentists' experience positively affected the duration of the procedure and the preferred type of procedure performed under GA. A new tool was developed to estimate treatment durations under GA.

Keywords: Body Mass Index; Dental Health; General Anaesthesia; Paediatric Dentistry

Correspondence:

Department of Pediatric Dentistry,
Faculty of Dentistry Baskent
University, Türkiye

E-mail address:

gburcubostanci@yahoo.com

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INTRODUCTION

Some paediatric patients may need dental treatment under general anaesthesia (GA), which is a safe and convenient procedure for dentists and patients.¹ The American Academy of Pediatric Dentistry (AAPD) recommends GA for paediatric dental patients who are unable to cooperate; those who are extremely fearful, anxious, or uncommunicative; those who have complex medical/physical/mental conditions; those who can benefit from GA, protecting them from psychological trauma and reducing medical risks; and those who require immediate comprehensive dental rehabilitation.² An operating room (OR) is often considered the most appropriate setting for providing such care to patients with complex medical conditions.^{3,4} In some cases, anaesthesiologic requirements are not fully considered, and dental care under GA has been reported to be more cost-effective than repeated outpatient restorative visits.⁵ It has been recommended that safe and efficient completion of dental treatment under GA requires specialized training, knowledge, adaptability, and techniques beyond routine practice, in addition to adherence to established protocols and guidelines.^{1,6} Paediatric dentists are trained to recognize the need for hospital-based dental treatment and work with an anaesthesia team to provide optimal patient care.³

It was reported that the average waiting time for complex dental care for children in pain is 28 days for GA, and without pain, the waiting time for GA is 71 days.⁷ Thus, there are substantial increases in the number of patients seeking care and the length of time that children must wait for treatment. Although this is because of insufficient resources in some cases, it is still concerning.⁷ It has been reported that the reason for the long waiting times for treatment under general anaesthesia is the high number of patients with medical needs other than dental treatments in the operating rooms, the

lack of personnel, the high number of patient-related cancellations, and the insufficient use of time in the operating room.^{3,8-10} Improvements in the use of the operating room for paediatric dental procedures will increase the number of patients who can receive treatment, reduce waiting times, prevent delays in dental treatment in children, reduce the use of analgesics and antibiotics, and increase patients' quality of life.¹¹

Despite the increasing demand for paediatric dental treatment under general anaesthesia, accurate prediction of operative time remains challenging. Existing studies have mainly evaluated procedural types or patient characteristics separately, and most estimation approaches rely on generalized or quadrant-based calculations that may overlook the cumulative impact of multiple procedures performed on individual teeth.⁸ This limitation may contribute to inefficient operating room scheduling, prolonged anaesthesia exposure, and increased waiting times for treatment.^{3,7} Therefore, a comprehensive model that simultaneously considers operator experience, patient-related factors, and tooth-specific procedural details is needed to improve time prediction and optimize clinical workflow in paediatric dental GA settings.

Another concern about the dental treatments performed under general anaesthesia is the safety of the procedures.¹² Recently, the US Food and Drug Administration (FDA) reported that exposure to certain sedatives and general anaesthetics might affect the brain development of children under 3 years of age, especially for procedures longer than 3 hours.¹² For several years, there has been debate about its effects on brain development.¹³ Additionally, recent studies revealed an increased risk associated with prolonged dental procedures under general anaesthesia. This underscores the critical importance of predicting procedure time.¹⁴ Previous studies have analysed the duration of dental procedures and surgeries provided to

paediatric patients under general anaesthesia, but no studies have evaluated dentists' experience, and no study has introduced a practical, procedure-based calculation tool for estimating treatment durations under GA in paediatric dentistry.¹⁴⁻¹⁷

This study aimed to investigate the GA time utilized for dental procedures for paediatric patients to improve the planning of OR scheduling and to better understand the GA time requirements through a retrospective cohort study. For these purposes, it was planned to assess the relationship between dentists' experience and GA duration in paediatric dental procedures. Correspondingly effects of patient factors—including systemic disease, ASA classification, BMI, and radiographic assessment—on procedure time were evaluated. Finally, we have developed and tested a new calculation tool designed to predict procedure durations more accurately than the existing quadrant-based methods. By combining operator-related, patient-related, and procedural variables, this study aims to improve OR scheduling efficiency, optimize clinical workflow, and contribute to safer, more predictable paediatric dental care under GA.

METHODS

This retrospective cohort study was approved by the Baskent University Institutional Review Board and Ethics Committee (Project no: D-KA20/45) on 08/01/2021. The study population comprised all paediatric GA cases, including those with ASA grades of 1, 2, and 3, from January 2016 to December 2020. GA for complete dental treatment was deemed necessary when children were unable to cooperate or had physical or mental impairments that inhibited cooperation, based on the expert opinion of the treating dentist. Informed consent was not deemed necessary for this de-identified retrospective study. Patients scheduled for combination cases involving nondental services and those with prolonged bleeding time and

allergic reactions during the procedure were excluded from the study; no additional exclusion criteria were applied. A total of 23 patients were excluded from the study because of eligibility criteria. A total of 400 subjects met the study requirements. In our clinical routine, the guardian of the patient who is scheduled for general anaesthesia selects the dentist. This choice is made in the reception area, independent of the dentist.

The following data were recorded for descriptive statistics: age, sex, weight, height, BMI, American Society of Anesthesiologists (ASA) Physical Status Classification System status, systemic diagnoses, number of teeth treated, planned and applied dental treatments and their estimated operation times, and dental operator experience. The duration of dental cases was obtained from anaesthesia and surgical records. The following times were recorded: (1) the patient's presentation in the OR; (2) when the patient was "anaesthesia ready"; (3) the beginning of the dental operation; (4) the completion of the dental operation; and (5) the completion of anaesthesia (patient's arrival in a post-anaesthesia care unit (PACU)). The duration of the operation was considered the time elapsed (in minutes) from the start of the dentist's actions to when the last dental manipulation was finished.

The time estimates for scheduling dental procedures under the GA were calculated using a modified version of the previously described guidelines (Table 1).¹⁸ The difference between the actual and estimated processing times was calculated using plus and minus values. A single dental examiner collected all dental and medical records. Inconsistencies identified during data collection were resolved by cross-checking electronic and paper records. Any discrepancies not resolved in this manner were excluded from the case study.

Table 1. Estimating case time.¹⁸

Procedure	Time (mins)
Primary dentition:	
1 posterior tooth restoration	7.5
1 anterior tooth restoration	5
Pulpotomy	5
Anterior teeth pulpectomy	10
1 anterior tooth extraction	1
1 posterior tooth extraction	2
Stainless steel crown	5
Strip crown	7
Fissure sealant	3
Restorations of severely crowded teeth	+5*
Permanent dentition:	
1 posterior tooth restoration	10
1 anterior tooth restoration	10
1 anterior tooth extraction	5
1 posterior tooth extraction	7
Fissure sealant	3
Restorations of severely crowded teeth	+10*

Example: Restorations for 4 primary posterior teeth for 2 of them pulpotomy and 1 stainless steel crown and 2 anterior primary teeth and 1 permanent molar teeth would require $(4 \times 7.5) + (2 \times 5) + (1 \times 5) + (2 \times 5) + (1 \times 10) = 65$ minutes dentist operator time.* Additional time for severely crowded teeth

The dental diagnosis was made based on radiographic findings when the patient cooperated sufficiently to allow them; otherwise, it was based solely on visual data. In our study, the total number of procedures varied across all the cases, resulting in differences in procedure times. However, calculations were performed on a per-procedure basis. In addition, it was determined whether the teeth were permanent or primary, and teeth that had undergone restorative or preventive pulp treatment or had been extracted were recorded. To analyse the impact of the operator's experience, the number of years for which the person had worked as a specialist was taken as a basis. All procedures were performed in accordance with the ethical standards of the institutional and national research ethics committees.

Statistical analyses of the data were performed using the Statistical Package for the Social Sciences (SPSS) version 25.0. Quantitative data were summarized as the mean, median, standard deviation, and interquartile range (IQR), whereas qualitative data were collected as numbers and percentages. The Kolmogorov–Smirnov test was used to test whether the data were normally distributed, and the homogeneity of variances was evaluated with Levene's test. The Mann–Whitney U test was used to assess dental procedure times by the presence of systemic diagnoses and radiography. One-way ANOVA and the Kruskal–Wallis test were used to evaluate the duration of dental procedure according to the age group, ASA classification, physician experience, and BMI.

RESULTS

This study revealed 400 patients who underwent treatment under general anaesthesia; 58.8% of the patients were male ($n = 235$), and 41.3% were female ($n = 165$). The patients' mean age was 5.29 ± 1.94 years (1.42 to 15.42 years). The following age categories were used: Group I: 17- to 47-month-old patients ($n=96$, 24%); Group II: 48- to 59-month-old patients ($n=84$, 21%); Group III: 60- to 71-month-old patients ($n=106$, 26.5%);

Group IV: 72- to 83-month-old patients ($n=53$, 13.3%); and Group V: patients who were at least 84 months old ($n=61$, 15.3%). The mean and median durations of GA were 69.42 and 65 minutes, respectively, and the durations ranged from 15 to more than 165 minutes. When the distribution of dental treatment times applied under general anaesthesia was examined according to age group, no statistically significant difference was found ($p=0.934$) (Table 2).

Table 2. Descriptive features and distribution of predicted and actual treatment durations in minutes.

	n* (%)	Predicted times (min)			p	Actual treatment times (min)		
		Mean±SD	Median (IQR)			Mean±SD	Median (IQR)	p
Age Groups								
[17-47] months	96 (24.0)	74.28±30.23	70.50 (43)	.001KW	68.07±25.97	65 (34)	.934KW	
[48-59] months	84 (21.0)	83.73±26.85	81.25 (37)		71.49±25.46	65 (39)		
[60-71] months	106 (26.5)	73.87±23.05	71.50 (26)		69.43±24.95	65 (35)		
[72-83] months	53 (13.3)	72.35±22.32	72 (28)		67.49±23.66	60 (25)		
84+ months	61 (15.3)	60.78±23.22	62 (30)		70.33±26.35	65 (40)		
BMI								
Underweight (<5p)	56 (14.0)	78.61±24.88	73 (31)	.387KW	69.32±22.19	62.50 (34)	.363KW	
Healthy weight (5p-85p)	162 (40.5)	73.98±26.98	71 (33)		68.02±22.82	65 (35)		
Overweight (85p-95p)	22 (5.5)	66.91±20.08	66 (30)		61.14±24.44	60 (21)		
Obesity (>95p)	42 (10.5)	73.79±29.71	68 (43)		71.19±27.18	70 (36)		
Radiography								
Yes	329 (82.3)	73.56±25.71	71 (32)	.361U	68.73±24.71	65 (35)	.411U	
No	71 (17.8)	75.15±29.89	79 (37)		72.61±27.67	70 (40)		
Systemic Diagnoses								
Yes	99 (24.8)	65.61±24.54	63 (34)	.001U	64.01±23.21	60 (30)	.011U	
No	301 (75.2)	76.58±26.54	74 (31)		71.20±25.70	70 (40)		
Systemic Diagnoses								
Cardiological disorders	36 (41.0)	61.35±27.37	61 (38)	.417F	63.25±22.71	60 (24)	.140KW	
Metabolic diseases	26 (29.5)	65.10±24.37	61.25 (33)		55.19±18.99	60 (23)		
Nervous system diseases	26 (29.5)	69.90±22.06	76.50 (34)		70.38±25.41	60 (41)		

n*: Number of patients, Min: Minutes; U: Mann-Whitney U Test, F: One-way ANOVA Test, KW: Kruskal-Wallis Test

The ASA classifications were distributed as follows: ASA I (ASA 1: healthy patients) ($n=308$; 77%), ASA II (ASA 2: mild to moderate systemic disease) ($n=74$; 18.5%), and ASA III (ASA 3: severe systemic disease) ($n=17$; 4.3%). The most prevalent systemic diagnoses corresponded to “cardiological disorders” ($n=43$ patients; 10.5%) and “metabolic diseases” ($n=33$ patients; 8.1%), followed by “nervous system diseases” ($n=32$ patients; 7.8%). A statistically significant difference was observed when comparing the actual and predicted procedure times for patients with and without systemic disease ($p=0.011$ and $p=0.001$, respectively). In addition, no difference was observed when the patients were examined according to the type of systemic disease ($p>0.05$).

When the number of years of work as a specialist in paediatric dentistry was examined, three groups were formed. The first group had 5 years of experience or less ($n=150$), the second group had 6–10 years of experience ($n=137$), and the third group had > 10 years of experience ($n=113$). When the duration of treatment under GA was examined according to dentist experience, years of professional experience were found to result in statistically significant differences. According to the results of the Mann–Whitney U test with Bonferroni correction for multiple comparisons, a significantly longer duration of the actual procedure was needed for the dentists who had less than 5 years of experience compared with dentists who had 6–10 years of experience or more ($p=0.003$). It was also observed that there was a significant difference ($p<0.001$) between dentists with less than 5 years of experience and those with more than 11 years of experience. However, there was no significant difference between specialists in Paediatric Dentistry with 6–10 years of experience and those with 11 or more years of experience ($p=0.144$).

Patients were considered overweight or obese based on their BMI and age-related predictive growth charts from the Centers for Disease

Control and Prevention.¹⁹ Based on these criteria, 56 patients (14%) were underweight, 22 patients (5.5%) were overweight, and 42 patients (10.5%) were obese. When the duration of the treatments applied under general anaesthesia was examined according to the BMI, it was observed that there was no statistically significant difference between the predicted procedure times and the actual procedure times ($p=0.387$ and $p=0.363$, respectively). When the duration of the procedures performed according to the experience of the paediatric dentist was examined only in the patient group defined as obese, it was observed that there was a statistically significant difference (longer operating duration) in the group of physicians with 5 years of experience or less (Table 3) (Figure 1).

While the planning of treatments to be applied under general anaesthesia was performed according to radiographic evaluations for 329 patients, only visual examination methods were used for 71 patients because radiographs could not be obtained. There was no significant difference in terms of the predicted times and actual treatment times according to the previous diagnoses based on the radiographic findings ($p=0.361$ and $p=0.411$, respectively). However, in the patient group in which dental procedures were performed under general anaesthesia without previous radiographic diagnoses, it was observed that the actual procedure duration was longer than the predicted duration calculated according to the applied procedures (Table 2).

In all the evaluated groups, the combination of two dental treatment modalities—surgical (primary and permanent tooth extraction) and restorative—was the most common. The frequencies of the treatment modalities applied were similar for all groups. The frequency of application of stainless-steel crowns and fissure sealants is given in Table 4.

Table 3. Actual and predicted time distribution according to physician experience and patients' body mass index.

		Predicted times (in minutes)			Actual treatment times (in minutes)		
	n	Mean±SD	Median (IQR)	p	Mean±SD	Median (IQR)	p
Dentists Experience							
5 years and less	150	75.29±26.42	74.25 (33)	.420KW	76.73±25.78	75 (30)	<.001KW
6-10 years	137	73.63±27.23	72 (34)		67.75±26.87	60 (45)	
11 years and more	113	72.17±25.69	69 (30)		61.73±19.47	61.73 (30)	
Underweight patients (<5p)							
5 years and less dentists	25	77.70±26.37	70 (37)	.861KW	75.60±24.08	70 (40)	.246KW
6-10 years dentists	16	78.94±27.34	73 (43)		66.69±19.52	60 (24)	
11 years and more dentists	15	79.77±20.86	76 (26)		61.67±19.79	60 (30)	
Healthy weight patients (5p-85p)							
5 years and less dentists	48	73.84±27.62	76 (35)	.737KW	71.98±24.39	67.50 (35)	.135KW
6-10 years dentists	56	75.31±26.28	71.75 (29)		68.75±24.94	65 (40)	
11 years and more dentists	56	72.99±27.32	69.75 (31)	.796KW	63.30±18.35	60 (25)	.460KW
Overweight patients (85p-95p)							
5 years and less dentists	7	66.00±16.44	69.50 (32)		74.29±31.94	60 (70)	
6-10 years dentists	8	62.63±23.19	66.25 (41)		60.00±14.64	57.50 (20)	
11 years and more dentists	7	72.71±21.18	62 (32)		49.29±21.30	50 (35)	
Obesity (>95p)							
5 years and less dentists	17	79.21±26.88	74 (36)	.212KW	83.82±26.90	75 (45)	.047KW
6-10 years dentists	17	74.68±32.98	65 (50)		64.71±24.78	70 (45)	
11 years and more dentists	8	60.38±27.40	55.50 (34)		58.13±24.19	55 (28)	

n*: Number of patients; KW: Kruskal-Wallis Test

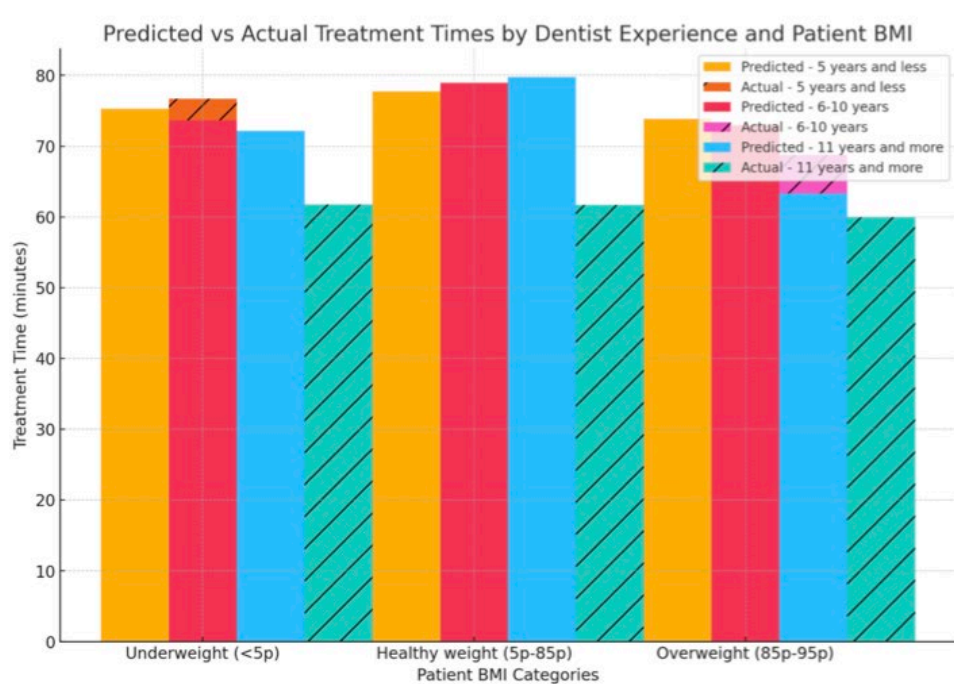


Figure 1. Comparison of predicted and actual treatment times by dentist experience and patient BMI category

Table 4. Distribution of stainless-steel crown and fissure sealant applications.

	Stainless-steel crown	Fissure sealant
Dentists Experience	n	n
5 years and less	36	46
6-10 years	110	18
11 years and more	28	7
Age Groups of the patients		
[17-47] months	51	0
[48-59] months	30	4
[60-71] months	55	24
[72-83] months	27	17
84+ months	11	26
BMI of the patients		
Underweight (<5p)	35	19
Healthy weight (5p-85p)	84	31
Overweight (85p-95p)	8	5
Obesity (>95p)	12	2

n*: number of dental procedures

DISCUSSION

The demand for dental treatment under GA continues to increase in patients with special needs who are unable to cooperate, extremely fearful, anxious, or uncommunicative.^{1,20} Currently, no universally accepted protocols exist for dental treatment performed under GA.¹ Completing full-mouth rehabilitation in a single GA session is advantageous for patients and families compared to multi-session treatments.²⁰ However, predicting serious adverse events during prolonged procedures remains challenging, supporting recommendations for hospital-based dental treatment in such cases.^{14,21,22}

Although the FDA has issued warnings regarding possible adverse effects of anaesthetics and sedatives—such as oxygen desaturation or hypotension—especially in procedures longer than 3 hours,¹² studies have reported no severe complications in paediatric dental GA.⁶ Efficient OR time use remains a priority,¹⁴ and predicting

procedure duration before treatment begins is essential.¹ Foley et al.⁸ evaluated “lost” OR time and reported no significant difference between experienced and trainee providers. In contrast, our study revealed that dentists with ≤5 years of experience had significantly longer operative times than those with 6–10 or ≥11 years of experience did, while no difference was observed between the two more experienced groups. These findings support previous findings that operator experience reduces treatment duration.²³ In our data, stainless steel crowns were more often placed by dentists with 6–10 years of experience, whereas fissure sealants—a preventive measure—were more frequently applied by less experienced dentists, possibly reflecting differences in training approaches.

Permanent tooth extractions under GA were relatively infrequent compared with primary tooth extractions, consistent with prior research.¹⁷ Stainless steel crowns were more common in

younger age groups, whereas the use of fissure sealant was low across all ages. Similar to earlier studies, age influenced the type of procedures performed.²⁴ Longer-than-expected treatment times in older children, especially those with special needs, may be because of more complex permanent tooth care, examination difficulties, or additional conditions such as periodontal disease or impacted teeth.^{17,18,25}

Some studies have reported no difference in GA duration between patients with and without systemic or developmental conditions, whereas others have reported fewer restorative procedures for children with disabilities.²⁶ In addition to operator-related variables, several patient-related characteristics may influence the duration of dental treatment under general anaesthesia. Systemic health status, BMI, radiographic availability, and cooperation level can alter both treatment complexity and intraoperative decision-making. In medically compromised children, treatment plans are often simplified to minimize anaesthetic exposure, which may explain the shorter procedure durations observed in this group.^{27–29} Conversely, the absence of preoperative radiographs may lead to unexpected intraoperative findings, requiring additional interventions and prolonging the operative time, as radiographic assessment has been shown to improve diagnostic accuracy and treatment planning.^{28,29} Similarly, obese patients may present limited oral access and positioning challenges that can increase operative time, particularly when managed by less experienced clinicians.⁶ These findings emphasize that patient-related factors interact with operator experience and should be considered collectively when estimating GA duration.

Dentists often plan simpler treatments for special healthcare needs (SHCN) patients to improve prognosis and reduce GA time.^{27–29} Our results are in line with those of Forsyth et al.¹⁸, who reported shorter actual and predicted procedure times in medically complex patients compared with

healthy ones. This may reflect a more aggressive approach to completing essential treatment quickly. Additionally, certain systemic conditions may influence procedure time; for example, hypoplastic-hypomineralized teeth are frequent in transplant patients because of intensive drug use.^{30,31} Due to the retrospective nature of our study, we could not assess the time per restoration for these teeth; however, prospective research could address this issue.

The mean treatment duration in our study (69.42 min) was comparable to that reported by Ibrahim et al.¹⁵ and Arabovis et al.¹⁶ When radiographs were unavailable—often in younger patients or those with neurological conditions—actual procedure time exceeded predictions. These findings support previous findings that radiographs improve diagnostic accuracy compared to visual inspection alone.^{28,29} The absence of radiographs likely led to intraoperative findings that required unplanned procedures, thereby extending the GA time.

Although BMI did not significantly affect procedure time, obese patients treated by less experienced dentists required longer durations. This may be due to limited oral access, the need for additional preparation time, and anaesthesia adjustments, which require advanced clinical skills.⁶

Time estimates were calculated using a tool adapted from a study by Forsyth et al.¹⁸ Unlike previous quadrant-based estimation methods, the calculation tool used in this study adopts a tooth-specific approach that accounts for the exact number and type of procedures performed. This allows a more individualized estimation of operative time, particularly in complex full-mouth rehabilitation cases frequently encountered under GA.¹⁸ From a clinical perspective, such precise time estimation may support more efficient operating room scheduling, reduce unexpected overtime, and limit prolonged anaesthetic

exposure, which has been associated with potential safety concerns in paediatric patients undergoing longer procedures.^{12,14} Therefore, the proposed model provides not only methodological novelty but also practical clinical relevance for optimizing OR efficiency and improving patient safety. By shifting from a quadrant-based approach to a tooth-specific approach, we achieved closer alignment between the predicted and actual times. This method accounts for multiple procedures per quadrant and allows for additional time in complex cases. Prospective studies should refine the model by incorporating variables such as lesion extent, dental anomalies, and dmfs/DMFS scores.

The retrospective design limited data collection on factors such as caries activity, periodontal health, and oral hygiene, which may influence the duration of GA. Another limitation of this study is that the experience and workflow integration of auxiliary dental staff, such as dental assistants, were not evaluated. Operative efficiency under general anaesthesia is not determined solely by the dentist's experience; effective coordination between the clinician and assisting personnel influences instrument handling, patient positioning, and overall procedural flow. Even highly experienced clinicians may require longer operative times when working with inexperienced assistants, whereas well-trained support staff may contribute to shorter and more efficient procedures. Previous studies evaluating operating room efficiency in paediatric dental general anaesthesia settings have emphasized that team organization and workflow dynamics can affect operative time utilization and scheduling efficiency.^{8,21} Therefore, future prospective studies should include the experience level and team dynamics of auxiliary staff to provide a more comprehensive prediction model for treatment duration under general anaesthesia.

CONCLUSIONS

The duration of paediatric dental procedures under GA is influenced by both operator and patient factors. Less experienced dentists (<5 years) required significantly longer treatment times, particularly in obese patients, whereas those with systemic diseases generally had shorter durations because of more conservative treatment planning. The absence of radiographic evaluation was associated with longer-than-expected procedures, highlighting the importance of accurate preoperative assessment.

The tooth-specific calculation tool developed in this study provided procedure time estimates that closely matched actual durations and represented a practical improvement over previous quadrant-based models. Its adoption in OR scheduling could enhance efficiency, reduce anaesthesia exposure, and improve patient throughput.

In terms of clinical recommendations, complex or time-sensitive cases under GA should be assigned to more experienced operators, radiographic assessments should be used whenever possible to increase planning accuracy, and targeted training for the management of obese paediatric patients under GA should be provided.

Future prospective studies should validate this calculation tool in diverse clinical settings and integrate additional oral health variables to further improve prediction accuracy.

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