Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 2 (2026): June 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i2.2534
Original Article

Anaesthetists' peri-operative off-label use of alpha-2 adrenergic agonists in paediatric patients at a Johannesburg academic hospital: A descriptive study.

Esaias Janse van Rensburg[1*], Laura Indiveri[2] and Palesa Mogane[3]
[1]Department of Anaesthesiology, University of the Witwatersrand, Faculty of Health Sciences, 7 York Road, Parktown, Johannesburg, 2193, South Africa.
[2]Department of Anaesthesiology, Charlotte Maxeke Johannesburg Academic Hospital, 7 York Road, Parktown, Johannesburg 2193, South Africa.
[3]Department of Anaesthesiology, Chris Hani Baragwanath Academic Hospital, 26 Chris Hani Rd, Soweto, South Africa.

Abstract

Background

The use of alpha (α)-2 adrenergic agonists, specifically clonidine and dexmedetomidine, has increased in paediatric anaesthesia due to their sedative and opioid-sparing properties. However, their use remains largely off-label, leading to variability in clinical practice. This study aimed to describe the peri-operative administration patterns, dosing, and safety of these agents at a high-volume South African academic hospital.

Methods

A retrospective, cross-sectional descriptive observational study was conducted at Chris Hani Baragwanath Academic Hospital (CHBAH). Clinical records of 300 children (aged 0–14 years) who received either clonidine (n = 152) or dexmedetomidine (n = 148) between April and June 2025 were analysed. Data on demographics, surgical discipline, ASA physical status, dosing, and adverse events were extracted and compared.

Results

Dexmedetomidine was preferentially used in patients with higher American Society of Anaesthesiologists classifications (ASA) and those undergoing burns surgery ($p < 0.05$). Clonidine was more frequently utilized in orthopaedic procedures and via the caudal route. The intravenous (IV) route was dominant (91%), with most agents administered intra-operatively as a bolus. Median IV doses were 0.77 mcg/kg for clonidine and 0.54 mcg/kg for dexmedetomidine. Side effects, including hypotension (<2%) and hypothermia (<5%), were rare and not significantly different between groups.

Conclusions

Both clonidine and dexmedetomidine are utilized frequently and safely as off-label adjuncts in this setting. While dexmedetomidine is favoured for physiologically vulnerable patients, clonidine remains a routinely used, cost-effective alternative. The local dosing practices are more conservative than international benchmarks, with minimal adverse events observed.

Recommendations

The findings of this study support the continued use of clonidine and dexmedetomidine as perioperative adjuncts in paediatric anaesthesia. Development of local institutional guidelines may assist in promoting greater consistency in practice. Regular audit of prescribing patterns and adverse events should be encouraged to support safe off-label use of α-2 adrenergic agonists in paediatric patients.

Keywords: *Clonidine, Dexmedetomidine, Alpha-2 agonists, Paediatric anaesthesia, Off-label drug use*
Submitted: March 23, 2026 **Accepted:** April 25, 2026 **Published:** June 24, 2026

Corresponding author: Esaias Janse van Rensburg*
Email: 2885959@students.wits.ac.za
Department of Anaesthesiology, University of the Witwatersrand, Faculty of Health Sciences, 7 York Road, Parktown, Johannesburg, 2193, South Africa.

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 2 (2026): June 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i2.2534
Original Article

Introduction

The utilisation of α-2 adrenergic agonists as adjuncts in paediatric anaesthesia has gained considerable traction over the past two decades [1, 2]. Their sedative, anxiolytic, and co-analgesic properties have rendered them particularly advantageous in this patient cohort, where perioperative anxiety, opioid-sparing analgesia, and sympatholysis remain central objectives [3-5]. Within this pharmacological class, clonidine and dexmedetomidine represent the two principal agents used in clinical anaesthesia [6].

Clonidine was first introduced into clinical practice in 1966 as an antihypertensive agent. Its scope of use has subsequently expanded to encompass multiple paediatric indications, including attention deficit hyperactivity disorder, opioid and benzodiazepine withdrawal syndromes, analgesia, and sleep disturbances [2]. Dexmedetomidine, a more selective α-2 agonist, received regulatory approval in 1999 for sedation in adult intensive care units [7], with the earliest reports of paediatric use published in 2002 as part of a composite series of case reports [8]. Since that time, its use has broadened substantially, with heterogeneous dosing regimens, varied routes of administration, and expanding indications across paediatric populations [9-11]. An international survey of 791 paediatric anaesthesiologists reported that 70% routinely used dexmedetomidine, predominantly for procedural sedation, with notable inter-clinician variability in dosing and a low incidence of adverse events. Amongst those who did not use dexmedetomidine, the predominant limitation was a lack of familiarity or training rather than concerns regarding safety or efficacy[9].

The paediatric population is rarely the subject of large-scale, rigorous clinical trials, resulting in the frequent off-label use of anaesthetic and sedative agents [12, 13]. Off-label prescribing refers to the use of a pharmaceutical agent in a dose, indication, or via a route of administration not formally approved by regulatory authorities, such as the United States Food and Drug Administration (FDA) or the South African Health Products Regulatory Authority (SAHPRA). This practice remains legal and is guided by available evidence and clinical expertise, and is done mainly for the patients' benefit. The administration of clonidine and dexmedetomidine in paediatrics is categorised as off-label [9, 14, 15]. This creates potential variability in practice and underscores the need for context-specific data.

The clinical applications of α-2 adrenergic agonists in paediatric anaesthesia range from premedication to intra-operative use and post-operative recovery. As pre-operative agents, both clonidine and dexmedetomidine have demonstrated efficacy via intranasal and buccal routes. Compared with midazolam, dexmedetomidine has a slower onset but reduces emergence agitation and improves recovery quality, while clonidine offers comparable sedation with favourable behavioural scores and analgesic properties[16-19]. Head-to-head comparisons suggest dexmedetomidine may provide superior co-operation during induction of anaesthesia and lower post-operative pain when used in regional nerve blocks, though clonidine remains a safe and effective alternative[20-22].

Intra-operatively, α-2 agonists reduce anaesthetic and analgesic requirements. Dexmedetomidine has been shown to lower the minimum alveolar concentration of sevoflurane in a dose-dependent manner and exert opioid-sparing effects in surgeries such as hypospadias repair and adenotonsillectomy, while clonidine has similarly reduced anaesthetic needs when used as an adjuvant[5, 23, 24]. Their use in neurosurgery and airway procedures provides sympatholysis, reduces agitation, and allows maintenance of spontaneous ventilation with limited respiratory complications[25-28]. In congenital cardiac surgery, dexmedetomidine has been reported to assist in managing perioperative tachyarrhythmias, although transient hypotension and bradyarrhythmias can occur [29]. As adjuvants in neuraxial anaesthesia, clonidine and dexmedetomidine both prolong caudal and intrathecal analgesia, reduce post-operative pain scores, and lower rescue analgesic requirements. Comparative trials frequently suggest that dexmedetomidine provides a longer duration of analgesia, with clonidine as a safe and effective alternative[30-35].

Beyond the operating theatre, α-2 agonists have an expanding role in procedural sedation, intensive care, and post-operative recovery. Dexmedetomidine has proven superior to midazolam for sedation during imaging, with fewer rescue interventions and stable cardiorespiratory effects, while clonidine has also been incorporated into paediatric sedation guidelines[18, 36, 37]. Both agents reduce the incidence of emergence delirium, post-operative nausea and vomiting, and opioid use, with dexmedetomidine demonstrating particular efficacy in reducing agitation and enhancing recovery after sevoflurane anaesthesia[38-43].

In the intensive care setting, clonidine and dexmedetomidine have shown sedative- and opioid-sparing properties, improving analgesia in ventilated and critically ill patients while mitigating withdrawal syndromes following prolonged opioid and benzodiazepine infusions[44-50]. Collectively, their broad applicability underscores their value as versatile adjuncts in paediatric anaesthesia.

Despite their increasing popularity, local guidance remains limited, and patterns of α-2 adrenergic agonist utilisation are incompletely standardized. Understanding how these drugs are being used in South African academic hospitals is therefore of both clinical and academic importance. Such

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 2 (2026): June 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i2.2534
Original Article

knowledge could inform safer prescribing, highlight areas where local practice aligns or diverges from international norms, and ultimately strengthen and institutionalize national recommendations.

The present study was undertaken to describe the perioperative use of clonidine and dexmedetomidine in children at a high-patient-volume centre such as CHBAH. Specific objectives were to: (i) characterise routes of administration and dosing practices; (ii) compare use across paediatric age groups, ASA physical status classifications, and urgency of surgery; (iii) evaluate patterns of use by surgical discipline; and (iv) identify differences in the clinical contexts in which clonidine and dexmedetomidine were chosen and (v) record documented side effects known to be associated with α-2 agonist use.

Methods

Design

This was a retrospective, cross-sectional, descriptive observational study using routinely collected anaesthetic records. Consecutive convenient sampling was used. The study aimed to evaluate perioperative administration practices of clonidine and dexmedetomidine in paediatric patients at a single academic centre.

Setting and study population

This study was conducted at Chris Hani Baragwanath Academic Hospital (CHBAH), Johannesburg, a large tertiary referral centre providing paediatric surgical services. Anaesthetic records from children undergoing a procedure or surgery between April 2025 and June 2025 were reviewed.

Inclusion criteria and exclusion criteria

All children aged 0–14 years who underwent anaesthesia during the study period and received either clonidine or dexmedetomidine as part of their peri-operative or peri-procedural anaesthetic management were eligible for inclusion.

Anaesthetic records were excluded if key variables required for analysis were missing or illegible. These variables included patient age, body weight, ASA status, or the documented dose of clonidine or dexmedetomidine administered.

Sample size

The sample size was calculated in collaboration with a biostatistician, and a pilot study was performed, looking at one month's worth of anaesthetic charts. The pilot study showed 444 children receiving anaesthesia. The charts reviewed had 18.9% (84/444) children receiving dexmedetomidine and 10.5% (47/444) clonidine, thus a total of 29.4% (131/444) had received an alpha-2 agonist. A sample size of 168 for receiving dexmedetomidine and 88 for receiving clonidine for at least two months was required to give 90% power to answer the research questions. Considering the missing data of about 15%, at least 300 participants in the overall study were needed. Considering this and extrapolating data from the pilot study (131 for a month, thus 262 for two months, and 393 for three months), three months' worth of charts were needed to yield the required sample size.

Data collection

Data was extracted manually by the principal investigator from paediatric anaesthetic records and entered into a standardised data collection form (Microsoft Excel). The data collection sheet included:

Demographics: age (in months), sex, and weight.

Clinical status: ASA physical status classification, urgency of procedure (emergency vs elective).

Perioperative details: surgical discipline or investigation, timing of administration, and route of drug delivery (intravenous, caudal, intrathecal, oral, or intranasal).

Drug-related variables: drug administered (clonidine or dexmedetomidine), route-specific doses (absolute doses in mcg where available), and total weight-adjusted dose (mcg/kg).

Recorded side effects known to be associated with α-2 agonist administration, namely bradycardia, hypotension with a vasopressor or inotrope given, hypothermia (below 35.5 degrees Celsius), and excessive sedation.

Ethical considerations

Ethics approval was obtained on the 9th of July 2025 from the Human Research Ethics Committee (Medical) at the University of the Witwatersrand (Clearance certificate no: M250652). Permission was also obtained from the Medical Advisory Committee (MAC) and the CEO of CHBAH. As this was a retrospective review of anaesthetic records, no direct patient contact occurred. To ensure confidentiality, no personal identifiers (such as names, hospital numbers, or addresses) were recorded in the study database. Data was anonymised at the point of entry, and access to electronic files was restricted to study investigators.

Informed consent statement

Patient consent was waived due to the retrospective nature of the study,

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 2 (2026): June 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i2.2534
Original Article

The use of anonymised anaesthetic records and the absence of direct patient contact.

Data analysis

Data was analysed using R version 4.5.2 (Vienna, Austria). Descriptive statistics were used to summarise patient demographics, administration practices, and dosing characteristics, as well as to explore associations between variables. Continuous variables were summarised using measures of central tendency and dispersion and are presented as means with standard deviations or medians with interquartile ranges, depending on the distribution of the data. Categorical variables were summarised as frequencies and percentages. Demographic and clinical characteristics were compared by the drug received. Statistical tests were used to determine whether there was a difference in the proportion or median of the appropriate characteristic and included Pearson's chi-squared test and Fisher's exact test for categorical data and the Wilcoxon rank sum test for continuous data. Confidence intervals (95% CI) were calculated to provide an estimate of precision. All statistical tests were two-sided, and a p-value of less than 0.05 was considered statistically significant.

Results

The intended sample size for this study was 300 cases, which was defined at the outset of the study. To achieve this, 934 paediatric anaesthetic records were screened. Of these, approximately one-third (34%; n = 322) involved administration of an α-2 agonist, with clonidine (18%; n = 164) and dexmedetomidine (17%; n = 158) used in near-equal proportions.

Following exclusion of 22 records due to missing or illegible data in key variables, 300 (N) eligible cases remained for analysis, meeting the predefined sample size. This final cohort comprised 152 (51%) clonidine and 148 (49%) dexmedetomidine cases (Table 1).

Table 1: Summary of patient demographics by medication group

Characteristic	Clonidine n = 152 (95% CI)[1]	Dexmedetomidine n = 148 (95% CI)[1]	p-value
Age (months)	64 (36 – 108) (64-79)	52 (26 – 96) (57-71)	0.16[2]
Sex			0.79[3]
Female	65 (43) (35%-51%)	61 (41) (33%-50%)	
Male	87 (57) (49%-65%)	87 (59) (50%-67%)	
Weight (kg)	18 (12 – 25) (19-22)	16 (12 – 25) (18-22)	0.62[2]
ASA Status			0.022[4]
I	82 (54) (46%-62%)	63 (43) (35%-51%)	
II	44 (29) (22%-37%)	39 (26) (20%-34%)	
III	25 (16) (11%-24%)	45 (30) (23%-39%)	
IV	1 (0.7) (0.03%-4.2%)	1 (0.7) (0.04%-4.3%)	
Surgery/Procedure Type			<0.001[3]
Burns	30 (20) (14%-27%)	60 (41) (33%-49%)	
Orthopaedics	47 (31) (24%-39%)	35 (24) (17%-31%)	
Paediatric General Surgery	39 (26) (19%-33%)	17 (11) (7.0%-18%)	
Otorhinolaryngology	19 (13) (7.9%-19%)	17 (11) (7.0%-18%)	
Ophthalmology	2 (1.3) (0.23%-5.2%)	13 (8.8) (5.0%-15%)	
Other[5]	15 (9.9) (5.8%-16%)	6 (4.1) (1.7%-9.0%)	

[1]Median (IQR); n (%)
[2]Wilcoxon rank sum test
[3]Pearson's Chi-squared test
[4]Fisher's exact test
[5]Interventional radiology, MRI suite, plastic surgery, neurosurgery, and maxillofacial and oral surgery
Abbreviation: CI = Confidence Interval

The patient demographics across the two α-2 agonist groups were broadly comparable, with no significant differences in sex, age, or weight distribution (p values > 0.05). A trend was observed toward the use of dexmedetomidine over clonidine in marginally younger, ASA III, and burns patients.

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 2 (2026): June 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i2.2534
Original Article

Table 2: Summary of administration practices by medication group

Characteristic	Clonidine n = 152 (95% CI)[1]	Dexmedetomidine n = 148 (95% CI)[1]	p-value
Urgency of Case			0.56[2]
Elective	77 (51) (42%-59%)	70 (47) (39%-56%)	
Emergency	75 (49) (41%-58%)	78 (53) (44%-61%)	
Timing			0.68[3]
Intra-operative	150 (98.7) (95%-100%)	145 (98) (94%-99%)	
Pre-operative	2 (1.3) (0.23%-5.2%)	3 (2.0) (0.52%-6.3%)	
Route of Administration			<0.001[3]
IV	134 (88) (82%-93%)	139 (94) (88%-97%)	
Caudal	16 (11) (6.3%-17%)	4 (2.7) (0.87%-7.2%)	
Intranasal	0 (0) (0.00%-3.1%)	5 (3.4) (1.3%-8.1%)	
Oral	2 (1.3) (0.23%-5.2%)	0 (0) (0.00%-3.2%)	
Side-effects			
Excessive Sedation	0 (0) (0.00%-3.1%)	1 (0.7) (0.04%-4.3%)	0.49[3]
Hypotension	3 (2.0) (0.51%-6.1%)	1 (0.7) (0.04%-4.3%)	0.62[3]
Bradycardia	0 (0) (0.00%-3.1%)	0 (0) (0.00%-3.2%)	
Hypoxia	4 (2.6) (0.85%-7.0%)	2 (1.4) (0.23%-5.3%)	0.68[3]
Hypothermia	7 (4.6) (2.0%-9.6%)	5 (3.4) (1.3%-8.1%)	0.59[2]

[1]n (%)
[2]Pearson's Chi-squared test
[3]Fisher's exact test
Abbreviation: CI = Confidence Interval

The administration patterns (Table 2) demonstrate that α-2 agonists were used in comparable proportions in elective (clonidine n = 77; dexmedetomidine n = 70; total n = 147; 49% of N) and emergency cases (clonidine n = 75; dexmedetomidine n = 78; total n = 153; 51% of N). Despite the overall elective–emergency distribution not being intentionally balanced, there was no statistically significant difference in the use of clonidine versus dexmedetomidine between elective and emergency cohorts (p = 0.56). The pre-operative administration was done using only the oral and intranasal routes.

Few instances (n = 3) were noted where dexmedetomidine was used as a controlled infusion intravenously, with the vast majority (97.8%) of IV administration being given as a bolus. Neither α-2 agonist was administered intrathecally. Reported adverse events were minimal, with no statistically significant differences in side-effect frequency between the two drugs (p values > 0.05). Incidents of hypotension with a vasopressor or inotrope administered, hypoxia, and hypothermia were rare (< 5 %).

Table 3: Dose (mcg/kg) per route of administration by drug.

Route administered	**Clonidine[1]**	**Dexmedetomidine[1]**	**p-value[2]**
IV	0.77 (0.50 – 1.00)	0.54 (0.45 – 0.97)	<0.001
Caudal	0.97 (0.83 – 1.18)	1.00 (0.75 – 1.00)	0.96
Oral	4.00 (2.00 – 6.00)	-	
Intranasal	-	1.92 (0.47 – 2.00)	

[1]Median (IQR)
[2]Wilcoxon rank sum test

Analysis of dose data (Table 3 and Figure 1) revealed that clonidine was administered at a higher median dose than dexmedetomidine when given intravenously. For caudal administration, median doses were comparable. The oral

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 2 (2026): June 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i2.2534
Original Article

and intranasal dosing for clonidine and dexmedetomidine, respectively, had a substantially wider range compared to the IV and caudal routes.

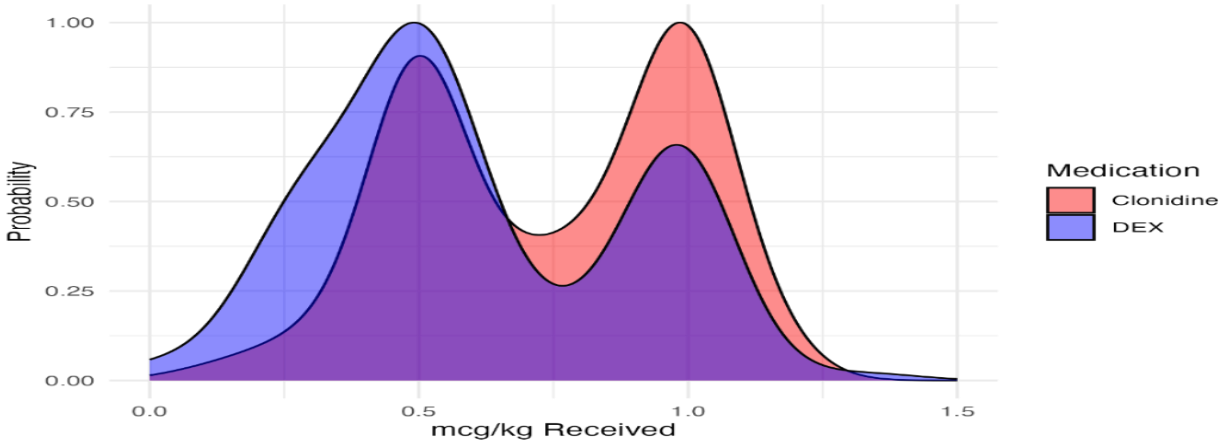

Figure 1: Probability function of the mcg/kg by each medication among the IV route of administration.

Discussion

The study aimed to describe the scope and rationale of α-2 agonist use in the paediatric population at a high-patient-volume centre such as CHBAH. This undertaking was to provide valuable and much-needed data in a patient population in which rigorous clinical trials are rarely undertaken. Demographic characteristics did not play a role in the differences in usage (p values > 0.05) between the two groups. The ASA status and procedure type were the drivers (p-values < 0.05) of the differences observed.

While statistically significant differences were observed in ASA classification and surgical discipline between the two drug groups, these findings should be interpreted cautiously. The observational design of the study does not allow conclusions regarding causality or superiority of one agent over the other. Rather, the results likely reflect clinician preference and contextual decision-making within routine clinical practice.

The preferential use of dexmedetomidine in more vulnerable patients with higher ASA classifications is consistent with published literature demonstrating its favourable haemodynamic profile, shorter half-life, and greater α-2 receptor selectivity when compared with clonidine [51]. It has been shown that dexmedetomidine allows for predictable titration and rapid offset, which is advantageous in patients with limited physiological reserve [52]. The infrequent use of both drugs in patients with an ASA classification of IV or higher reflects apprehension regarding their perioperative use in critically ill paediatric patients, attributable to their sympatholytic properties [11].

Burns patients represent a physiologically distinct paediatric population, characterised by heightened sympathetic activation, altered drug pharmacokinetics, significant fluid shifts, increased bleeding risk, and resultant haemodynamic instability [53]. Dexmedetomidine has been reported to attenuate stress responses while preserving cardiovascular stability [11, 51]. The preferential use of dexmedetomidine in the burns cohort in this study is therefore consistent with existing evidence and likely reflects its established role in managing physiologically labile patients. In contrast, clonidine was more frequently used in orthopaedic patients, who were generally classified as lower ASA status and undergoing more predictable surgical procedures, where prolonged analgesic benefit rather than rapid titratability may have been prioritised.

The four most common disciplines in which both drugs were used, namely burns, orthopaedics, paediatric general surgery, and otorhinolaryngology, were due to the higher volume of paediatric patients that these surgical disciplines are required to service, rather than the preference of α-2 agonist use necessarily. The even distribution of use of both drugs across emergency and elective cases suggests that their use is not limited to controlled elective environments and that clinicians are confident in using either agent even

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 2 (2026): June 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i2.2534
Original Article

in urgent to emergent cases. This is supported by literature demonstrating the safe use of dexmedetomidine and clonidine in urgent and emergent paediatric procedures [54, 55].

Both α-2 agonists were predominantly given intra-operatively, reflecting their principal role as anaesthetic adjuncts rather than premedicants at this institution. This practice differs from reports internationally describing frequent pre-induction or pre-procedural use [56-59], and instead indicates a local tendency to administer these agents under direct anaesthetist supervision intra-operatively. This could be explained by concerns for safety due to a lack of monitoring pre-operatively if administered as a pre-medication. Additionally, restricted pre-operative use may be attributed to the substantially higher doses required [37] for the desired clinical effect via oral and intranasal routes, together with limited availability and cost considerations (dexmedetomidine is considered costly) [60], constraining drug availability in other patients.

The IV route dominated in this study because it is primarily used intra-operatively (when the majority of α-2 agonists were administered), where it is preferred for its more predictable pharmacokinetics. [35, 61]. Oral and intranasal routes, while effective for sedation and anxiolysis, are associated with delayed onset and inter-individual variability in absorption [62], which may limit their practicality in high-volume operating environments such as at the study institution.

Multiple randomised controlled trials have demonstrated that the addition of α-2 agonists to caudal local anaesthetics prolongs postoperative analgesia, with dexmedetomidine often producing a longer duration of analgesia compared with clonidine [30, 35]. Despite this, clonidine was more frequently used via the caudal route in the study cohort. This may reflect its longer elimination half-life, extensive historical use in paediatric regional anaesthesia, and greater clinician familiarity [63]. Furthermore, intermittent availability of dexmedetomidine may have influenced drug selection in this setting.

Limited side effects were reported. However, it is important to recognise that these events are influenced by several confounding factors inherent to paediatric anaesthesia and surgery. The majority of cases were conducted under general anaesthesia, where frequently administered agents such as volatile anaesthetics and opioids can independently contribute to cardiovascular and thermoregulatory changes [64-66]. Additionally, the cold operating theatre environment and inherent bleeding risk associated with surgery further predispose patients to these effects [67, 68]. Consequently, the observed side effects cannot be attributed solely to the α-2 agonists themselves, but rather to the combined physiological impact of anaesthesia, environmental conditions, and concurrent medications.

The dosing of both clonidine and dexmedetomidine used at this institution is conservative compared to other international centres [9], where reported doses up to 4mcg/kg IV dexmedetomidine were used as a bolus, whereas 2.5mcg/kg IV was the highest recorded bolus administered at the study institution. The median dose of dexmedetomidine reported from the international survey [9] was 1mcg/kg IV, whereas the median dose observed in this study was 0.53mcg/kg IV.

Clonidine was also administered at doses lower than those reported in international studies. Doses of 3mcg/kg IV were administered to children in two randomized control trials [69, 70], whereas the maximum dose reported in this study centre was 2.22mcg/kg IV, which was also considered an outlier (considering median = 0.77mcg/kg; IQR = 0.50 – 1.00 mcg/kg). Dexmedetomidine was mainly administered as a slow bolus rather than a controlled infusion, which suggests confidence in its haemodynamic safety profile when given at the relatively conservative reported doses. This supports concurring evidence by Biro et al that bolus dosing in a resource-limited institution with limited controlled infusion pumps remains safe and effective [71].

The caudal dexmedetomidine doses were comparable to some international practices at ~1 µg/kg [30, 31, 72]. Other centres [35] administered clonidine and dexmedetomidine at doses of 2 µg/kg via the caudal route, making dosage appear comparatively conservative. Intrathecal use of α-2 agonists was not seen in this study. This could reflect the variation in spinal cord anatomy versus that of adults, with a lower ending spinal cord as low as L3 in children [73], with a higher perceived risk of spinal cord injury during the spinal procedure. The variability observed in oral clonidine doses (2–6 mcg/kg) may reflect off-label, situational use rather than standardised dosing. Importantly, no adverse haemodynamic effects were associated with these outlier cases.

Generalisability

The findings of this study may apply to other tertiary and academic hospitals in South Africa and similar low- and middle-income countries where paediatric anaesthesia services are delivered in high-volume, resource-constrained environments. However, differences in drug availability, clinician experience, institutional protocols, and patient case-mix may limit direct extrapolation of these findings to other settings. Consequently, external validation through multicentre studies is warranted.

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 2 (2026): June 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i2.2534
Original Article

Conclusion

Clonidine and dexmedetomidine were frequently used as perioperative adjuncts in paediatric patients and were associated with a low incidence of documented adverse events. Dexmedetomidine was more commonly used in patients with greater physiological vulnerability, whereas clonidine remained an important cost-effective alternative. The findings support the development of local prescribing guidance and provide baseline data for future prospective multicentre studies evaluating the safety and effectiveness of α-2 adrenergic agonists in paediatric anaesthesia.

Limitations

This study has several limitations. Firstly, its retrospective design relied on the accuracy and completeness of routinely recorded anaesthetic records, creating the potential for information and documentation bias. Secondly, adverse events may have been under-reported because only documented events could be analysed. Thirdly, the clinician's rationale for selecting clonidine or dexmedetomidine could not be determined from the available records and may have been influenced by factors not captured in the dataset, including practitioner preference and drug availability. Finally, as this was a single-centre study conducted at a large academic referral hospital, the findings may not be representative of practices in district, regional, or private healthcare settings.

Recommendations

The findings of this study support the continued use of clonidine and dexmedetomidine as perioperative adjuncts in paediatric anaesthesia when administered by appropriately trained clinicians. Given the variability observed in dosing and routes of administration, the development of local institutional guidelines may assist in promoting greater consistency in practice. Regular audit of prescribing patterns and adverse events should also be encouraged to support safe off-label use of α-2 adrenergic agonists in paediatric patients.

Future research

Future prospective multicentre studies are needed to evaluate the effectiveness, safety, and optimal dosing strategies of clonidine and dexmedetomidine across different paediatric surgical populations. Comparative studies examining patient-centred outcomes such as postoperative analgesia, emergence delirium, recovery profiles, and haemodynamic stability would further strengthen the evidence base for the use of α-2 adrenergic agonists in children.

Author contributions

Conceptualization: E.J.v.R.
Methodology: E.J.v.R., P.M., L.I.
Data Curation: E.J.v.R
Supervision: P.M., L.I.
Formal Analysis: E.J.v.R.
Writing – Original Draft: E.J.v.R.
Writing – Review & Editing: P.M., L.I.

Acknowledgements

The authors thank Brian Brummer for his valuable assistance with the statistical analysis and interpretation of the study data.

Abbreviations

α-2 – Alpha-2
ASA – American Society of Anaesthesiologists
CHBAH – Chris Hani Baragwanath Academic Hospital
CI – Confidence Interval
DEX: Dexmedetomidine
FDA – Food and Drug Administration
IQR – Interquartile Range
IV – Intravenous
MAC – Medical Advisory Committee
mcg: Micrograms
mcg/kg: Micrograms per kilogram
MRI – Magnetic Resonance Imaging
N – Total sample size
n – Sub-group of total sample size
SAHPRA – South African Health Products Regulatory Authority

Grant information

The author(s) declared that no grants were involved in supporting this work.

Institutional review board statement

The study was conducted in accordance with the Declaration of Helsinki [74] and approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand (Clearance certificate no: M250652).

Conflicts of interest

The authors declare no conflicts of interest.

Data availability statement

The datasets generated and/or analysed during the current study are not publicly available due to institutional data protection policies, but are available from the corresponding author on reasonable request.

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 2 (2026): June 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i2.2534
Original Article

References

1. Sottas CE, Anderson BJ. Dexmedetomidine: The new all-in-one drug in paediatric anaesthesia? Curr Opin Anaesthesiol. 2017;30(4):441-51. https://doi.org/10.1097/aco.0000000000000488
2. Afshari A. Clonidine in pediatric anesthesia: The new panacea or a drug still looking for an indication? Curr Opin Anaesthesiol. 2019;32(3):327-33. https://doi.org/10.1097/ACO.0000000000000724
3. Seybold JL, Ramamurthi RJ, Hammer GB. The use of dexmedetomidine during laryngoscopy, bronchoscopy, and tracheal extubation following tracheal reconstruction. Paediatr Anaesth. 2007;17(12):1212-4. https://doi.org/10.1111/j.1460-9592.2007.02346.x
4. Bae H-B. Dexmedetomidine: An attractive adjunct to anesthesia. Korean J Anesthesiol. 2017;70(4):375-6. https://doi.org/10.4097/kjae.2017.70.4.375
5. Patel A, Davidson M, Tran MCJ, Quraishi H, Schoenberg C, Sant M, et al. Dexmedetomidine infusion for analgesia and prevention of emergence agitation in children with obstructive sleep apnea syndrome undergoing tonsillectomy and adenoidectomy. Anesth Analg. 2010;111(4):1004-10. https://doi.org/10.1213/ANE.0b013e3181ee82fa
6. Nguyen V, Tiemann D, Park E, Salehi A. Alpha-2 Agonists. Anesthesiol Clin. 2017;35(2):233-45. https://doi.org/10.1016/j.anclin.2017.01.009
7. McMorrow SP, Abramo TJ. Dexmedetomidine sedation: Uses in pediatric procedural sedation outside the operating room. Pediatr Emerg Care. 2012;28(3):292-6. https://doi.org/10.1097/PEC.0b013e3182495e1b
8. Tobias JD, Berkenbosch JW. Initial experience with dexmedetomidine in paediatric-aged patients. Paediatr Anaesth. 2002;12(2):171-5. https://doi.org/10.1046/j.1460-9592.2002.00805.x
9. van Hoorn CE, Flint RB, Skowno J, Davies P, Engelhardt T, Lalwani K, et al. Off-label use of dexmedetomidine in paediatric anaesthesiology: An international survey of 791 (paediatric) anaesthesiologists. Eur J Clin Pharmacol. 2021;77(4):625-35. https://doi.org/10.1007/s00228-020-03028-2
10. Afonso J, Reis F. Dexmedetomidine: Current role in anesthesia and intensive care. Rev Bras Anestesiol. 2012;62(1):118-33. https://doi.org/10.1016/S0034-7094(12)70110-1
11. Lin R, Ansermino JM. Dexmedetomidine in paediatric anaesthesia. BJA Educ. 2020;20(10):348-53. https://doi.org/10.1016/j.bjae.2020.05.004
12. Neville KA, Frattarelli DAC, Galinkin JL, Green TP, Johnson TD, Paul IM, et al. Off-Label Use of Drugs in Children. Pediatrics (Evanston). 2014;133(3):563-7. https://doi.org/10.1542/peds.2013-4060
13. Ngcobo NN, Mathibe LJ. Off-label use of medicines in South Africa: A review. Orphanet J Rare Dis. 2024;19(1):448. https://doi.org/10.1186/s13023-024-03476-4
14. Garioud ALdB, Nielsen BN, Falcon L, Mondrup F, Afshari A. Clonidine for preventing emergence agitation in infants: Protocol and statistical analysis plan. Acta Anaesthesiol Scand. 2023;67(5):663-9. https://doi.org/10.1111/aas.14212
15. Neubert A, Baarslag MA, Dijk Mv, Rosmalen Jv, Standing JF, Sheng Y, et al. The CLOSED trial: Clonidine compared with midazolam for SEDation of paediatric patients in the intensive care unit: study protocol for a multicentre randomised controlled trial. BMJ Open. 2017;7(6):e016031. https://doi.org/10.1136/bmjopen-2017-016031
16. Jannu V, Mane RS, Dhorigol MG, Sanikop CS. A comparison of oral midazolam and oral dexmedetomidine as premedication in pediatric anesthesia. Saudi J Anaesth. 2016;10(4). https://doi.org/10.4103/1658-354X.177333
17. Sajid B, Mohamed T, Jumaila M. A comparison of oral dexmedetomidine and oral midazolam as premedicants in children. J Anaesthesiol Clin Pharmacol. 2019;35(1). https://doi.org/10.4103/joacp.JOACP_20_18
18. Tervonen M, Pokka T, Kallio M, Peltoniemi O. Systematic review and meta-analysis found that intranasal dexmedetomidine was a safe and effective sedative drug during paediatric procedural sedation. Acta Paediatr. 2020;109(10):2008-16. https://doi.org/10.1111/apa.15348
19. Ali ST, Asthana V, Gupta D, Singh SK. A Comparative Evaluation of Oral Clonidine, Dexmedetomidine, and Melatonin As Premedicants in Pediatric Patients Undergoing Subumbilical Surgeries. Rom J Anaesth Intensive

Care. 2020;27(1):35-42. https://doi.org/10.2478/rjaic-2020-0006
20. Mostafa MF, Hamed E, Amin AH, Herdan R. Dexmedetomidine versus clonidine adjuvants to levobupivacaine for ultrasound-guided transversus abdominis plane block in paediatric laparoscopic orchiopexy: Randomised, double-blind study. Eur J Pain. 2021;25(2):497-507. https://doi.org/10.1002/ejp.1689
21. Reena, Kumar A. Comparative study between intravenous dexmedetomidine and clonidine as premedication in pediatric patients undergoing spinal anesthesia. Egypt J Anaesth. 2018;34(4):129-34. https://doi.org/10.1016/j.egja.2018.07.001
22. Sidhu GK, Jindal S, Kaur G, Singh G, Gupta KK, Aggarwal S. Comparison of Intranasal Dexmedetomidine with Intranasal Clonidine as a Premedication in Surgery. Indian J Pediatr. 2016;83(11):1253-8. https://doi.org/10.1007/s12098-016-2149-4
23. Guo YX, Luo K, Jiang PP, Wang D, Wang YZ, Yang XL. Minimal alveolar concentration of sevoflurane in combination with dexmedetomidine in patients with hysteroscopy: An up-down sequential allocation study. Basic Clin Pharmacol Toxicol. 2022;131(5):364-71. https://doi.org/10.1111/bcpt.13777
24. Al-Zaben KR, Qudaisat IY, Al-Ghanem SM, Massad IM, Al-Mustafa MM, Al-Oweidi AS, et al. Intraoperative administration of dexmedetomidine reduces the analgesic requirements for children undergoing hypospadias surgery. Eur J Anaesthesiol. 2010;27(3):247-52. https://doi.org/10.1097/EJA.0b013e32833522bf
25. Kanamori F, Araki Y, Yokoyama K, Uda K, Kurimoto M, Shiba Y, et al. The usefulness and safety of dexmedetomidine for postoperative sedation in pediatric patients with moyamoya disease. J Neurosurg Pediatr. 2022;30(3):301-7. https://doi.org/10.3171/2022.6.PEDS2241
26. Gupta N, Rath GP, Prabhakar H, Dash HH. Effect of intraoperative dexmedetomidine on postoperative recovery profile of children undergoing surgery for spinal dysraphism. J Neurosurg Anesthesiol. 2013;25(3):271-8. https://doi.org/10.1097/ANA.0b013e31828cb6c0
27. Ard J, Doyle W, Bekker A. Awake craniotomy with dexmedetomidine in pediatric patients. J Neurosurg Anesthesiol. 2003;15(3):263-6. https://doi.org/10.1097/00008506-200307000-00015
28. Chen KZ, Ye M, Hu CB, Shen X. Dexmedetomidine vs remifentanil intravenous anaesthesia and spontaneous ventilation for airway foreign body removal in children. Br J Anaesth. 2014;112(5):892-7. https://doi.org/10.1093/bja/aet490
29. Chrysostomou C, Beerman L, Shiderly D, Berry D, Morell VO, Munoz R. Dexmedetomidine: A novel drug for the treatment of atrial and junctional tachyarrhythmias during the perioperative period for congenital cardiac surgery: A preliminary study. Anesth Analg. 2008;107(5):1514-22. https://doi.org/10.1213/ane.0b013e318186499c
30. Wu H-H, Wang H-T, Jin J-J, Cui G-B, Zhou K-C, Chen Y, et al. Does Dexmedetomidine as a Neuraxial Adjuvant Facilitate Better Anesthesia and Analgesia? A Systematic Review and Meta-Analysis. PLoS One. 2014;9(3):e93114. https://doi.org/10.1371/journal.pone.0093114
31. Goyal V, Kubre J, Radhakrishnan K. Dexmedetomidine as an adjuvant to bupivacaine in caudal analgesia in children. Anesth Essays Res. 2016;10(2):227-32. https://doi.org/10.4103/0259-1162.174468
32. El-Feky EM, Abd El Aziz AA. Fentanyl, dexmedetomidine, and dexamethasone as adjuvants to local anesthetics in caudal analgesia in pediatrics: A comparative study. Egypt J Anaesth. 2015;31(2):175-80. https://doi.org/10.1016/j.egja.2014.11.005
33. Ismail AA, Mohamed Hamza H, Ali Gado A. Efficacy of dexmedetomidine versus morphine as an adjunct to bupivacaine in caudal anesthesia for pediatric thoracic surgeries: A randomised controlled trial. Anesth Pain Med. 2021;11(2):e112296-e. https://doi.org/10.5812/aapm.112296
34. Fares KM, Mohamed SA-B, Abd El-Rahman AM, AbdeLemam RM, Osman AMM. Analgesic effect of intrathecal fentanyl vs dexmedetomidine as adjuvants to bupivacaine following abdominal surgery for cancer in children, a randomised trial. Pain Med. 2020;21(11):2634-41. https://doi.org/10.1093/pm/pnaa259
35. El-Hennawy AM, Abd-Elwahab AM, Abd-Elmaksoud AM, El-Ozairy HS, Boulis SR. Addition of clonidine or dexmedetomidine to bupivacaine prolongs caudal analgesia in children.

Br J Anaesth. 2009;103(2):268-74. https://doi.org/10.1093/bja/aep159
36. Koroglu A, Demirbilek S, Teksan H, Sagır O, But AK, Ersoy MO. Sedative, haemodynamic and respiratory effects of dexmedetomidine in children undergoing magnetic resonance imaging examination: Preliminary results. Br J Anaesth. 2005;94(6):821-4. https://doi.org/10.1093/bja/aei119
37. SASA paediatric guidelines for the safe use of procedural sedation and analgesia for diagnostic and therapeutic procedures in children: 2021–2026. South Afr J Anaesth Analg. 2021;27(4):S1-S84. https://doi.org/10.36303/SAJAA.2021.27.4.S2.2635
38. Petre M-A, Levin DN, Englesakis M, Maynes JT, Pechlivanoglou P, Aoyama K. Dexmedetomidine vs. total intravenous anaesthesia in paediatric emergence delirium: A network meta-analysis. Eur J Anaesthesiol. 2021;38(11):1111-23. https://doi.org/10.1097/EJA.0000000000001490
39. Shukry M, Clyde MC, Kalarickal PL, Ramadhyani U. Does dexmedetomidine prevent emergence delirium in children after sevoflurane-based general anesthesia? Paediatr Anaesth. 2005;15(12):1098-104. https://doi.org/10.1111/j.1460-9592.2005.01660.x
40. Koceroglu I, Devrim S, Bingol Tanriverdi T, Gura Celik M. The effects of dexmedetomidine and tramadol on post-operative pain and agitation, and extubation quality in paediatric patients undergoing adenotonsillectomy surgery: A randomised trial. J Clin Pharm Ther. 2020;45(2):340-6. https://doi.org/10.1111/jcpt.13080
41. Chiang F-W, Chang J-L, Hsu S-C, Hsu K-Y, Chu KC-W, Huang C-J, et al. Dexmedetomidine use in pediatric strabismus surgery: A systematic review and meta-analysis. PLoS One. 2020;15(10):e0240553-e. https://doi.org/10.1371/journal.pone.0240553
42. Wang X, Deng Q, Liu B, Yu X. Preventing Emergence Agitation Using Ancillary Drugs with Sevoflurane for Pediatric Anesthesia: A Network Meta-Analysis. Mol Neurobiol. 2017;54(9):7312-26. https://doi.org/10.1007/s12035-016-0229-0
43. Xess S, Singh V, Singh PR, Kaushal D, Digraskar V. Comparison of dexmedetomidine and clonidine for the prevention of emergence delirium in children undergoing lower abdominal surgery under sevoflurane anesthesia. The Indian Anaesthetists Forum. 2023;24(2):89-95. https://doi.org/10.4103/TheIAForum.TheIAForum_100_22
44. Tobias JD, Berkenbosch JW. Sedation during mechanical ventilation in infants and children: Dexmedetomidine versus midazolam. South Med J. 2004;97(5):451-5. https://doi.org/10.1097/00007611-200405000-00007
45. Chrysostomou C, Di Filippo S, Manrique A-M. Use of dexmedetomidine in children after cardiac and thoracic surgery. Pediatr Crit Care Med. 2006;7(2):194. https://doi.org/10.1097/00130478-200603000-00038
46. Weaver P, Brual R, Blair D. Analgesia and sedation in critically ill patients with burns. AACN Adv Crit Care. 2022;33(2):125-9. https://doi.org/10.4037/aacnacc2022588
47. Nosanov LB, Brandt JL, Schneider DM, Johnson LS. Pain management in burn patients. Curr Trauma Rep. 2020;6(4):161-73. https://doi.org/10.1007/s40719-020-00203-9
48. Walker J, Maccallum M, Fischer C, Kopcha R, Saylors R, McCall J. Sedation using dexmedetomidine in pediatric burn patients. J Burn Care Res. 2006;27(2):206-10. https://doi.org/10.1097/01.BCR.0000200910.76019.CF
49. Mondardini MC, Daverio M, Caramelli F, Conti G, Zaggia C, Lazzarini R, et al. Dexmedetomidine for prevention of opioid/benzodiazepine withdrawal syndrome in pediatric intensive care unit: Interim analysis of a randomised controlled trial. Pharmacotherapy. 2022;42(2):145-53. https://doi.org/10.1002/phar.2654
50. Sadozai L, Prot-Labarthe S, Bourdon O, Dauger S, Deho A. Use of continuous infusion of clonidine for sedation in critically ill infants and children. Arch Pediatr. 2022;29(2):116-20. https://doi.org/10.1016/j.arcped.2021.11.015
51. Jiang J, Shen H, Zhang J, Wu Z, Shao X, Cui J, et al. Comparative Study of the Adverse Events Associated With Adjuvant Use of Dexmedetomidine and Clonidine in Local Anesthesia. Front Med. 2021;8:602966. https://doi.org/10.3389/fmed.2021.602966
52. Morse JD, Cortinez LI, Anderson BJ. Pharmacokinetic concepts for dexmedetomidine target-controlled infusion pumps in children.

Paediatr Anaesth. 2021;31(9):924-31. https://doi.org/10.1111/pan.14235
53. Welling H, Ostrowski SR, Stensballe J, Vestergaard MR, Partoft S, White J, et al. Management of bleeding in major burn surgery. Burns. 2019;45(4):755-62. https://doi.org/10.1016/j.burns.2018.08.024
54. Gregory H, Bethel C, Anton G, Whitaker M, Zargham S. A Case Series of the Use of Intranasal Dexmedetomidine for Procedural Sedation in the Pediatric Emergency Department. J Pediatr Pharmacol Ther. 2025;30(3):376-80. https://doi.org/10.5863/jppt-24-00077
55. Alizadeh R, Mireskandari S-M, Azarshahin M, Darabi M-E, Padmehr R, Jafarzadeh A, et al. Oral Clonidine Premedication Reduces Nausea and Vomiting in Children after Appendectomy. Iran J Pediatr. 2012;22:399-403. Available from:https://pmc.ncbi.nlm.nih.gov/articles/PMC3564098/.
56. Peng K, Wu SR, Ji FH, Li J. Premedication with dexmedetomidine in pediatric patients: a systematic review and meta-analysis. Clinics (Sao Paulo). 2014;69(11):777-86. https://doi.org/10.6061/clinics/2014(11)12
57. Mikawa K, Maekawa N, Nishina K, Takao Y, Yaku H, Obara H. Efficacy of oral clonidine premedication in children. Anesthesiology. 1993;79(5):926-31. https://doi.org/10.1097/00000542-199311000-00009
58. Keskes M, Amouri N, Ketata S, Derbel R, Charfi M, Zouche I, et al. The interest of intranasal clonidine in the prevention of perioperative children's anxiety: a prospective randomized trial. Pan Afr Med J. 2023;46:37. https://doi.org/10.11604/pamj.2023.46.37.40310
59. Fu Y, Zhang Q, Jiang Y, Lang B. A comparative evaluation of intranasal α2-adrenoceptor agonists and intranasal midazolam as premedication in pediatric sedation: A meta-analysis of randomized controlled trials. PLoS One. 2023;18(2):e0281751. https://doi.org/10.1371/journal.pone.0281751
60. 60. South African Medicine Price Registry. South Africa.2022 [Available from: http://www.mpr.gov.za/PublishedDocuments.aspx#DocCatId=21.
61. Miller RD, Gropper MA, Eriksson LI, Fleisher LA, Wiener-Kronish JP, Cohen NH. Miller's Anesthesia. 9th ed: Elsevier; 2020.
62. Hanning SM, Orlu Gul M, Toni I, Neubert A, Tuleu C, CloSed C. A mini-review of non-parenteral clonidine preparations for paediatric sedation. J Pharm Pharmacol. 2017;69(4):398-405. https://doi.org/10.1111/jphp.12662
63. Davies DS, Wing AM, Reid JL, Neill DM, Tippett P, Dollery CT. Pharmacokinetics and concentration-effect relationships of intravenous and oral clonidine. Clin Pharmacol Ther. 1977;21(5):593-601. https://doi.org/10.1002/cpt1977215593
64. Nemeth M, Miller C, Bräuer A. Perioperative Hypothermia in Children. Int J Environ Res Public Health. 2021;18(14). https://doi.org/10.3390/ijerph18147541
65. 65.Jöhr M, Berger TM. Paediatric anaesthesia and inhalation agents. Best Pract Res Clin Anaesthesiol. 2005;19(3):501-22. https://doi.org/10.1016/j.bpa.2005.01.001
66. Ilala TT, Teku Ayano G, Seife MA, Yinges Kebede M, Geleta BA, Tamrat Yilma K. Prevalence of Bradycardia After Induction of General Anesthesia and Associated Factors Among Surgical Pediatric Patients. A Prospective Observational Study. Pediatric Health Med Ther. 2023;14:419-34. https://doi.org/10.2147/phmt.S429321
67. Lee SY, Wan SYK, Tay CL, Tan ZH, Wong I, Chua M, et al. Perioperative Temperature Management in Children: What Matters? Pediatr Qual Saf. 2020;5(5):e350. https://doi.org/10.1097/pq9.0000000000000350
68. Aran AA, Karam O, Nellis ME. Bleeding in Critically Ill Children—Review of Literature, Knowledge Gaps, and Suggestions for Future Investigation. Front Pediatr. 2021;9:611680. https://doi.org/10.3389/fped.2021.611680
69. Ydemann M, Nielsen BN, Wetterslev J, Henneberg S, Lauritsen T, Steen N, et al. Effect of clonidine to prevent agitation in children after sevoflurane anaesthesia: a randomised placebo-controlled multicentre trial. Dan Med J. 2016;63(6). https://doi.org/10.1016/S2352-4642(17)30127-X
70. Bock M, Kunz P, Schreckenberger R, Graf BM, Martin E, Motsch J. Comparison of caudal and intravenous clonidine in the prevention of agitation after sevoflurane in children†. Br J Anaesth. 2002;88(6):790-6. https://doi.org/10.1093/bja/88.6.790

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 2 (2026): June 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i2.2534
Original Article

71. 71. Biro Y, Tabi Y, Gileles-Hillel A, Rekhtman D. Evaluating the safety and efficacy of rapid bolus-only dexmedetomidine for pediatric EEG sedation: a retrospective study. Eur J Pediatr. 2025;184(12):772. https://doi.org/10.1007/s00431-025-06567-x
72. Ewais BE, Taeimah M, Kamal MM, Mohamed EMA. Effect of Dexmedetomidine as an Adjuvant to Bupivacaine in Ultrasound Guided Transversus Abdominis Plane Block versus Caudal Block for Postoperative Analgesia in Children Undergoing Congenital Inguinal Hernia Repair. QJM: An International Journal of Medicine. 2023;116(Supplement_1). https://doi.org/10.1093/qjmed/hcad069.032
73. Wilson DA, Prince JR. John Caffey Award. MR imaging determination of the location of the normal conus medullaris throughout childhood. AJR Am J Roentgenol. 1989;152(5):1029-32. https://doi.org/10.2214/ajr.152.5.1029
74. World Medical A. World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. J Am Med Assoc. 2013;310(20):2191-4. https://doi.org/10.1001/jama.2013.281053

Publisher details

Student's Journal of Health Research (SJHR)
(ISSN 2709-9997) Online
(ISSN 3006-1059) Print
Category: Non-Governmental & Non-profit Organization
Email: studentsjournal2020@gmail.com
WhatsApp: +256 775 434 261
Location: Scholar's Summit Nakigalala, P. O. Box 701432, Entebbe Uganda, East Africa