

Retrospective Analysis of Oral Sedation Outcomes in Pediatric Dentistry at Tufts (2014–2024): Success Rates, Failures, and Paradoxical Reactions

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Introduction

Oral sedation is commonly used in pediatric dentistry to manage anxiety and facilitate treatment completion. Tufts sedation protocols utilize oral midazolam with or without nitrous oxide. Outcomes were categorized as successful (completion of planned treatment), failed (inability to complete treatment due to inadequate sedation or behavioral limitations), or paradoxical reaction (refusal of treatment, forceful crying, combative). Additionally, paradoxical reactions were analyzed separately, as this reactions do not necessarily preclude treatment completion and may be influenced by provider judgment and caregiver preferences. This study evaluates sedation outcomes and the incidence of paradoxical reactions over a 10-year period.

Purpose

The purpose of this study was to evaluate the efficacy of oral midazolam sedation in pediatric dental patients by assessing overall success rates, identifying the incidence of and factors contributing to paradoxical reactions, and determining patterns in sedation failures, along with potential predictive factors for sedation outcomes.

Methods

This retrospective cohort study reviewed patient records from the Pediatric Dental Department at Tufts University School of Dental Medicine, spanning January 2014 through December 2024. Records were included for patients aged 3 to 8 years who underwent dental procedures utilizing the Tufts sedation protocol, and for whom complete documentation of the sedation protocol, demographics, and procedure outcomes were available.

Statistical Analysis

A convenience sample of 1,528 pediatric dental patients (3,105 chart notes) treated at Tufts University School of Dental Medicine from 2014 to 2024 was identified. 1,870 chart reviews have been completed and are included in this preliminary analysis.

Descriptive statistics and mixed-effects logistic regression were used to evaluate associations between variables and outcomes, accounting for repeated visits per patient. Statistical significance was set at $p < 0.05$. Analyses were performed using Stata 18.

Results

From the analysis of 1,870 sedation visits we found the following:

- Mean age at first sedation visit was 4.76 ± 1.41 years.
- Nitrous oxide was used in 51.7% of cases.
- 90.8% of treatments were completed successfully.
- Failure rate of 9.4%.
- Paradoxical reactions were observed in 19.4% of patients across all Frankl categories.
- Age was not significantly associated with treatment outcomes.
- Preop behavior was significantly associated with outcomes.
 - Patients with Frankl 3 and 4 had significantly lower odds of treatment failure and paradoxical reactions compared to Frankl 1
 - No differences were observed between Frankl 1 and 2.

Conclusion

This retrospective study provides insight into efficacy of oral midazolam sedation outcomes in pediatric dental patients. Findings demonstrate high treatment success. Preoperative behavior was a key predictor of outcomes, with improved success observed in patients with Frankl scores ≥ 3 . Nearly 1 in 5 children exhibited a paradoxical reaction, highlighting the need to discuss this with parents during the consent process.

References

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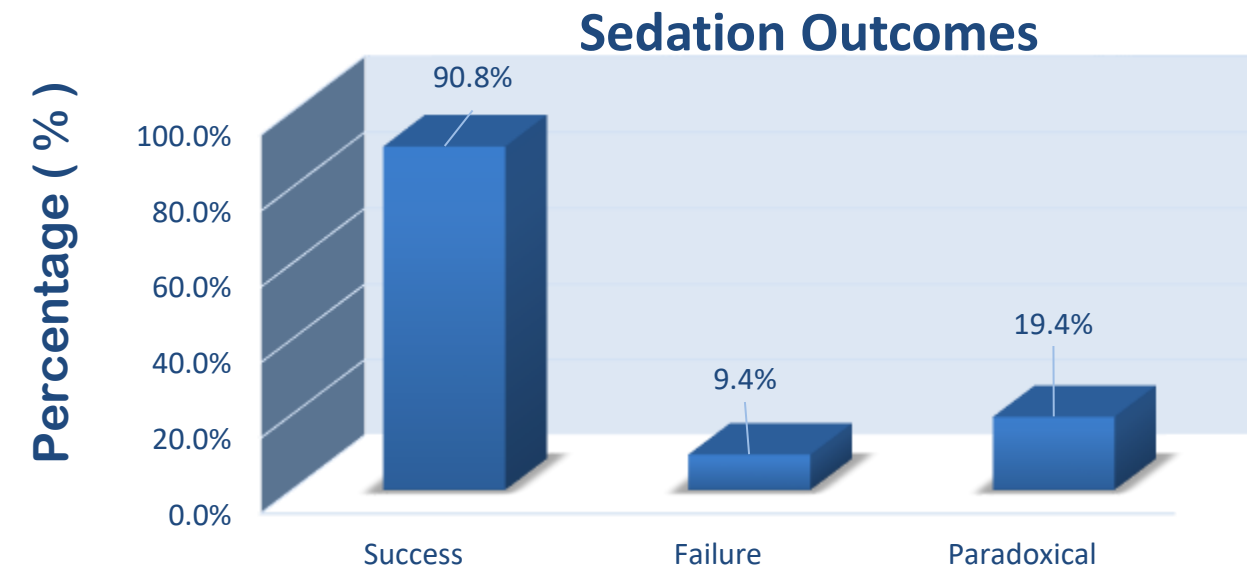


Fig.1 Distribution of sedation outcomes demonstrating a high overall treatment success rate, with paradoxical reactions occurring in approximately 1 in 5 patients.

Odds of Treatment Failure by Preop Frankl Score

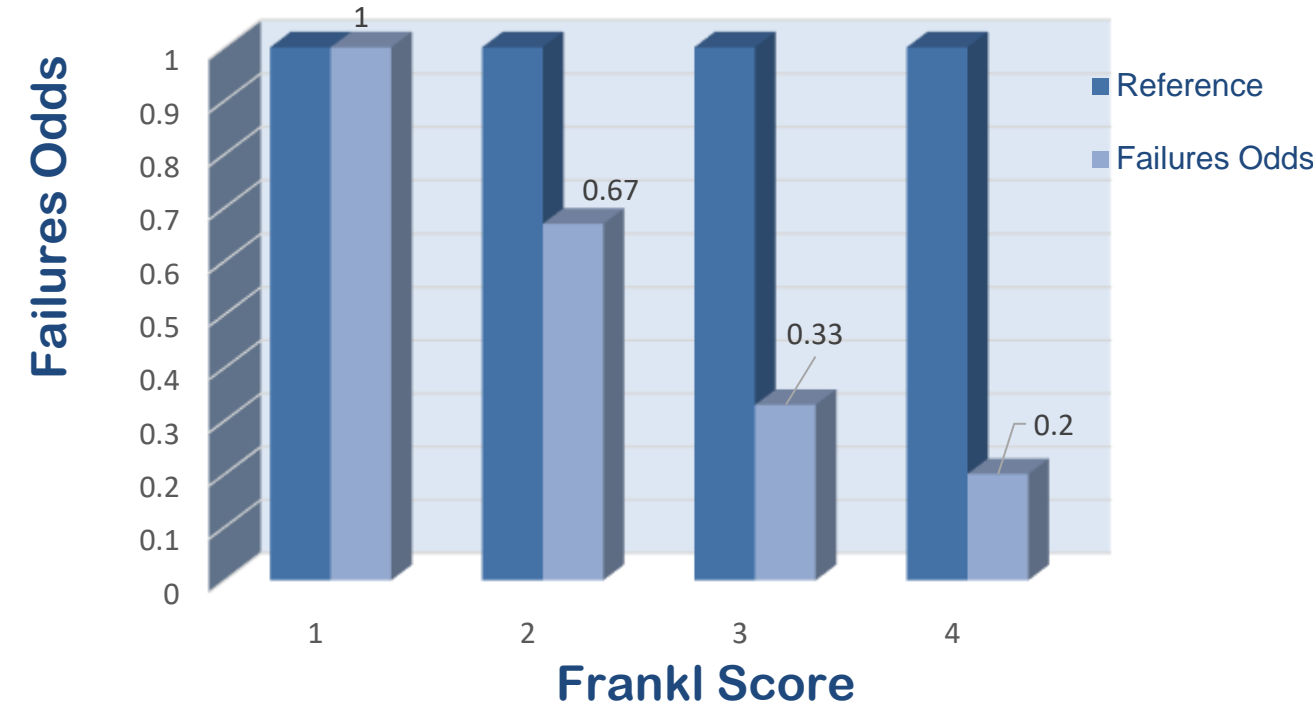


Fig.2. Odds of treatment failure decreased with increasing Frankl scores. Compared with Frankl score 1, patients with Frankl scores 3 and 4 demonstrated significantly lower odds of failure, while Frankl score 2 was not significantly different.

Frankl 3 vs 1: OR = **0.33**, $p < 0.001$

Frankl 4 vs 1: OR = **0.20**, $p < 0.001$

Frankl 2 vs 1: Not statistically significant ($p = 0.20$)