

Assessment of Airway Intervention Scoring During Pediatric Dental Sedation

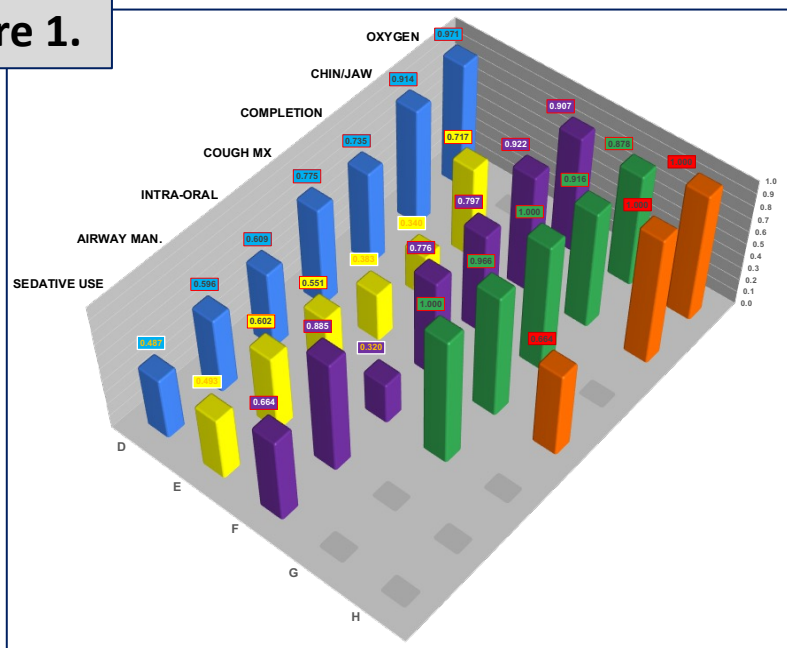
Latifi N, Heard J, Malinovsky J, Heard C

State University of New York University at Buffalo, Department of Pediatric and Community Dentistry

Introduction

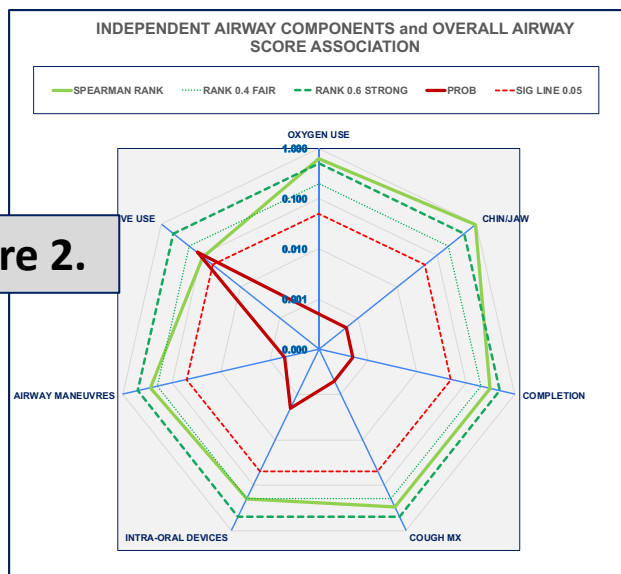
Airway complications are a major concern during Pediatric Dental Sedation. We have previously developed an airway intervention score (Presented AAPD 2021 & 2022) to assess the need for airway support during sedation. The aim of this study is to assess modifications to the components of the score to improve both its interrater reliability and efficacy.

Figure 1.



Each column represents the degree of Kappa Cohen Agreement for each of the 5 options for the 7 components of the Airway score Matrix. The Cohen Kappa numbers highlighted in white outlined boxes were not significant and for those areas that are flat grey, there was not enough data to analyze. The higher the column, the greater the agreement.

The Score after initial evaluation still demonstrated some limitations. Certain components of the score were never assessed (Grey areas, figure 1). Also other components appeared not to significantly contribute to the overall score. The sedation use component criteria did not correlate with the overall score (Figure 2).



Methods

This latent observational study was accepted by the University at Buffalo Institutional Review Board. Patients between the ages of 3 and 17 (inclusive) were recruited as a sample of interest. The airway score (Table 1) was modified due to the concerns from figures 1 and 2, as well as matching changes in clinical practice, and to make it follow a more logic process to allow concurrent computer analysis.

Once parental consent was obtained, the Pediatric Sedation Airway Score form (Table 1) was completed by the sedation resident/nurse and the operating dentist, with raters blinded to one another's evaluation. Patient demographics, Airway Intervention Scores, procedural details and sedative use were documented. Data was then entered into an Excel spreadsheet, and a comparative data analysis was performed. The computer score is utilized to evaluate the precision of raters in assigning overall score based upon components.

AIRWAY COMPONENTS VERSION 3					
Table 1. Modification made to Component Score					
WHAT COMPONENTS ARE PART OF THIS AIRWAY ASSESSMENT TOOL	BEST				WORST
1) OXYGEN USE	NONE / 2L NC	ADDED	3-5L or ≥ 30% O2	6-10L ≥ 50% O2	10L+ 100% O2 /
2) CHIN / JAW MANEUVERS	NONE	OCCASIONAL CHIN LIFT	REPEATED CHIN LIFT, or LIGHT JAW LIFT	FORCEFUL JAW THRUST or FORCEFUL CHINLIFT	REPEATED FORCEFUL JAW THRUST
3) PROCEDURE COMPLETION	NO ISSUES or CANCEL DUE TO BEHAVIOR ONLY	INTERRUPTED OR MOSTLY COMPLETE DUE TO AIRWAY	PARTIAL COMPLETION DUE TO AIRWAY	MINIMAL COMPLETION DUE TO AIRWAY	CANCELLED DUE TO AIRWAY
4) COUGH MANAGEMENT	NO COUGH ISSUES	PRE-DOSE GLYCOPYRROLATE	SUCTION	GLYCOPYRROLATE	EXTRA SEDATION FOR COUGH
5) INTRA-ORAL DEVICES / ASSISTANCE	NO INTRA-ORAL DEVICE ISSUES	ADJUST	CHANGE	REMOVE	ATTENDING INTERVENTION ANY REASON
6) AIRWAY MANEUVERS	NONE	REPOSITION HEAD	TONGUE PULL	ORAL / NASAL AIRWAY / BMV / VENT ASSIST	UNPLANNED ETT / LMA
7) SEDATIVE USE AND AIRWAY	NO CONCERNS	MILD STIMULATION / HOLD PART INITIAL SEDATION DOSE	PAINFUL STIM / STOP SEDATION ADMINISTRATION	DEEPER SEDATION FOR LARYNGOSPASM	SUX FOR LARYNGOSPASM OR REVERSAL

TEXT: RED FOR NOT SIGNIFICANT, GREY FOR NOT ANALYZED, BLUE FOR CHANGE IN CLINICAL PRACTICE, GREEN LOGIC

Table 2. Demographics

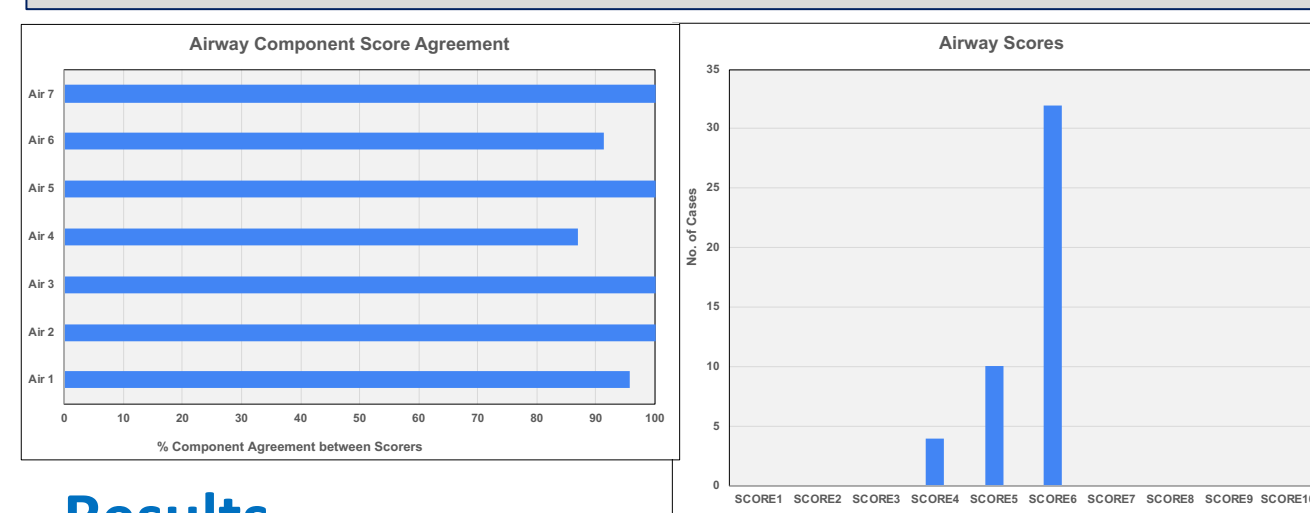
Age (Years)	11.3	4.7
Weight (kg)	48.6	24.8
ASA	1	1 to 2
Mallampati	1	1 to 4
Tonsil	1	0 to 3
Asthma Percentage (%)	5.0	-

Table 3. New Airway Score

AIRWAY SCORE VERSION 3	
SCORE	AIRWAY INTERVENTION
1	CASE CANCELLED DUE TO AIRWAY, or UNPLANNED ETT / LMA USE REQUIRED
2	REVERSAL AGENTS, or SUX FOR SPASM,
3	ORAL, or NASAL AIRWAY, or BMV / VENT ASSIST, or CASE MINIMAL COMPLETION DUE TO AIRWAY
4	TONGUE PULL, or REPEATED FORCEFUL JAW THRUSTS, or CASE PARTIALLY COMPLETE DUE TO AIRWAY
5	FORCE JAW THRUST or FORCE CHIN LIFT REQUIRED, or O2 MAXIMIZED (10L+) / 100% O2, or DEEPER SEDATION SPASM, or MOSTLY COMPLETE DUE TO AIRWAY OR PROCEDURE INTERRUPTED, or ATTENDING INTERVENTION REQUIRED
6	O2 INCREASED (6-10L) / ≥50%O2, or REPEATED CHIN LIFT, or LIGHT JAW LIFT, or REMOVE INTRA-ORAL DEVICE, (BB, PROP, GAUZE, ISOLITE)
7	OCCASIONAL CHIN LIFT, or EXTRA SEDATION FOR COUGH, or CHANGE INTRA-ORAL DEVICE (BB, PROP, GAUZE, ISOLITE)
8	O2 INCREASED (3-5L) / ≥30% O2, or HEAD REPOSITIONED, or GLYCOPYRROLATE FOR COUGHING, or PAINFUL STIMULATION REQUIRED, or ADJUST INTRA-ORAL DEVICE, or STOP SEDATION ADMINISTRATION
9	O2 ADDED (2L NC), or SUCTION FOR COUGHING, or MILD STIMULATION REQUIRED, or HOLD INITIAL SEDATION DOSE, or PRE-DOSE GLYCOPYRROLATE
10	NO O2, or O2 2L NC WITH ETCO2, and NO OTHER ISSUES OR CONCERNS

been recruited. This has resulted in assessment of the individual options for each component being limited and options that are not able to be assessed (Figure 6, grey). Also of note, there are several airway actions, that we would not expect to see frequently enough during our normal clinical practice, that are part of the score. We have amended the study, to try and rectify the ability to assess these components, recruitment should restart in the near future.

Figure 4 a/b. Component Score and Overall Airway Scores



Results

After IRB approval and following parental consent and assent if indicated, we have recruited 23 patients so far. Patient demographics are shown in table 2. The agreement of the new airway score components is shown in Figure 4a and the distribution of the new airway scores (Table 3) in figure 4b. The Spearman Rank (*degree of agreement*) for the Airway scores between the raters was 0.98, improved slightly from 0.97 (Figure 5a). The Spearman Rank for the airway score calculated by the computer based upon the rater scores is shown in figure 5b, both were excellent (rank = 1.0). Also the weighted Cohen Kappa (*degree of disagreement*) improved to 1.0 from 0.98, for the Airway score.

Inter-rater Cohen Kappa analysis of the overall 7 Components scores was about 0.97 for all 7 components (previously ranged from 0.62 to 0.97). Inter-rater analysis of each of the 5 options (D,E,F,G,H) within the 7 components is shown in figure 6. Overall, for most of those available for analysis, there is a significant agreement between the raters for each option, and they are equal to or better than those shown in figure 1.

The agreement between the each of the components and the overall airway score is shown in figure 7. There is not data available for the sedation use, the airway maneuvers no longer appear to be correlated with the overall score. However compared to figure 2, the other components all now have a strong correlation with the outcome.

Discussion

The changes to the airway appear to have made the inter-rater reliability stronger by both Spearman Rank and Kappa Cohen analysis for the overall score. As this score is made up of several components, analysis of these components with respect to inter-rater reliability is important. The new logic arrangement of the score has made it possible for a computer to calculate the score accurately from the chosen component options, this has shown that the raters are actually determining the overall score correctly with respect to the component assessments (Fig. 5). There are several limitations to the study so far; a small number of only deep sedation cases have

Figure 6. New Score Kappa Cohen Agreement

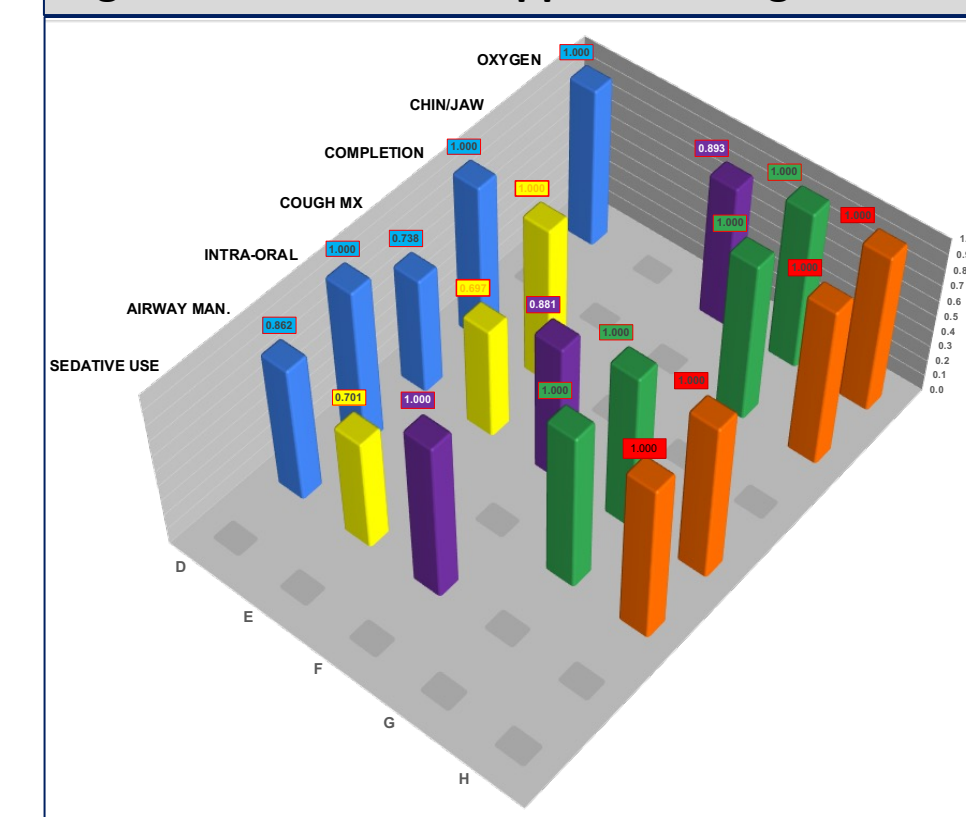


Figure 7. New Airway Score Component Outcome Correlation

