Prospective Assessment of a Procedure Behavior Score During Pediatric Dental Sedation

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Introduction

University Pediatric Dentistry offers several levels of dental sedation: oral moderate, intranasal moderate, intravenous moderate, and deep intravenous sedation. Dental treatment under sedation is completed by Pediatric Dental Attendings, Pediatric Dental Residents, and an Oral Surgeon. The first phase of this study evaluated inter-rater reliability of a behavior score for dental sedation procedures and showed a Spearman Rank R of 0.81 and Weighted Cohen Kappa of 0.74. This prospective observational study used a modified version of the Pediatric Sedation Behavior Score (Figure 1) in which several categories were updated, and a structured matrix (Figure 2) was added with the goal of improved interrater reliability. While the Richmond Agitation-Sedation Score evaluates depth of sedation and patient movement, our rubric provides a structured assessment, incorporating degree of procedural completion, patient crying/movement, use of restraint(s), variations in sedative use, and oversedation criteria. This study was conducted concurrently with a Prospective Assessment of a Procedure Airway Score During Pediatric Dental Sedation.

Figure 1.

BEHAVIOR SCORE: OVERALL ASSESSMENT		PLEASE CIRCLE OVERALL BEHAVIOR SCORE	
1B	FAIL: PROC. NOT STARTED DUE TO BEHAVIOR OR OVERSEDATION	6B	MOD: PROC. MOST / ALL COMPLETED, REPEATED MOVEMENT, REPEATED EXTRA BOLUS NEEDED WITH MILD DELAY OR OVERSEDATION REQUIRE PHYSICAL STIM.
2B	FAIL: PROC. ONLY MINIMALLY COMPLETE, TOO COMBATIVE OR AGITATED; OR DUE TO OVERSEDATION	7B	GOOD: PROC. COMPLETED, REPEATED HEAD MOVEMENT OR EXTRA BOLUS NEEDED OR OVERSEDATION REQUIRE VERBAL STIM.
3B	POOR: PROC. ONLY PARTIAL COMPLETE , OR CASE COMPLETED WITH CONSTANT RESTRAINT OR DUE TO OVERSEDATION	8B	GOOD: PROC. COMPLETED, REPEATED PERIPHERAL MOVEMENT OR SLIGHT HEAD MOVEMENT
4B	POOR: PROC. MOST COMPLETED, MULTIPLE BOLUSES WITH SIGNIFICANT DELAY, PROLONGED RESTRAINT	9B	EXC: PROC. COMPLETED, INTERMITTANT PERIPHERAL MOVEMENT
5B	MOD: PROC. MOST / ALL COMPLETED, CONSTANT MOVEMENT, INTERMITTANT RESTRAINT OR ADJUNCT SEDATIVE USED OR OVERSEDATION ALL COMPLETED	10B	EXC: PROC. COMPLETED, NO NOISE OR MOVEMENT

Figure 2.

DATA 2: COMPONENTS OF BEHAVIOR SCORE			*PLEASE CIRCLE ONE ASSESSMENT ITEM FOR EACH COMPONENT*		
WHAT COMPONENTS ARE PART OF THIS BEHAVIOR ASSESSMENT TOOL	V	W	X	Y	Z
1) DEGREE OF COMPLETION	FULL/EXTRA	MOST	PARTIAL	MINIMAL	NONE
2) ACTUAL DEPTH OF SEDATION	DEEP	MODERATE / DEEP	MODERATE	MINIMAL	NONE
3) CRYING / MOVEMENT	NONE	SLIGHT	MILD	MODERATE	SEVERE
4) TYPE OF RESTRAINT	NONE / PAPOOSE	OCCASIONAL HEAD / ARM	CONSTANT HEAD / ARM	OCCASIONAL BODY	CONSTANT BODY
5) RASS SCORE (SEE DEPTH OF SEDATION GUIDE)	RASS -1 TO -5	RASS 0	RASS +1 OR +2	RASS +3	RASS +4
6) SEDATIVE USE	PER PLAN	EXTRA DOSE / MINIMAL DELAY	MULTIPLE DOSES / MILD DELAY	ADJUNCT REQUIRED / MOD. DELAY	SEVERE DELAY
7) OVER-SEDATION CRITERIA (SEE DEPTH OF SEDATION GUIDE)	NONE	MINIMAL NO TREATMENT	VERBAL STIMULATION	PHYSICAL STIMULATION	REVERSAL

Methods

This prospective observational study was approved by University at Buffalo's Institutional Review Board. Written consent was received from the parents/guardians of pediatric patients ages 5 and 17 (inclusive) who reported to University Pediatric Dentistry for sedation procedures. Children seven or more years of age, who were capable of assent, signed a written assent form. The Pediatric Sedation Behavior Score form was completed by the sedation resident/nurse and the operating dentist, with raters blinded to one another's assessment. Patient demographics, Richmond Agitation-Sedation Scale scores, procedural details and sedative use were recorded. Data was then entered onto an Excel spreadsheet and a comparative data analysis was used.

TABLE 1. DEMOGRAPHICS	
AGE (YRS) [mean]	9.3
WEIGHT (KG) [mean]	40.9
MALE (number)	55
FEMALE (number)	73

TABLE 2. MEDICAL HISTORY	
ASA1	91
ASA 2	37
ADHD	5
ASD	4
DD	1

Figure 3. BEHAVIOR SCORES

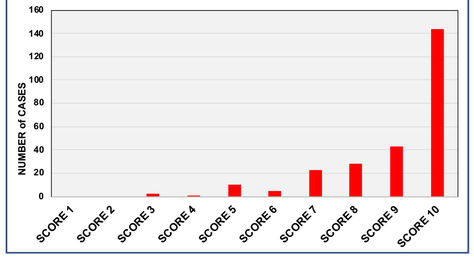


Figure 4. SPEARMAN RANK "BEHAVIOR SCORE"

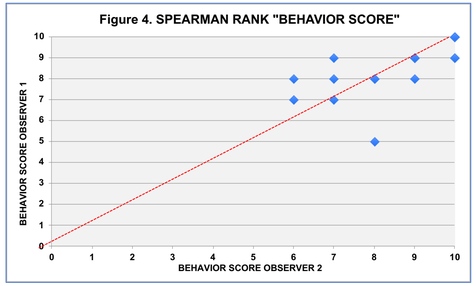


Figure 5. BEHAVIOR COMPONENT SCORE AGREEMENT

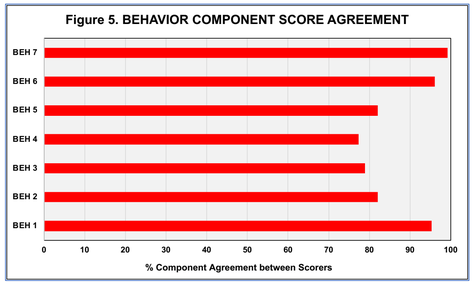
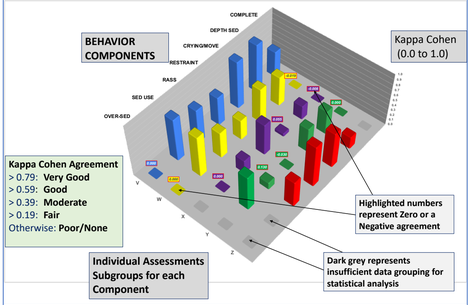


Figure 6. KAPPA COHEN AGREEMENT for the 5 ASSESSMENTS within each of the 7 BEHAVIOR COMPONENTS



Results

Data collection and analysis has occurred for 128 patients to date for a variety of dental procedures under oral moderate sedation (n=34), moderate IV sedation (n=4) and deep IV sedation (n=90). Patient ages ranged from 5 to 17, with an average age of 7.8. Patient demographics are shown in Table 1. The medical background information including the ASA scores and ADHD, ASD or DD status are shown in Table 2.

The Pediatric Sedation Behavior Scores ranged between 3 and 10 (Figure 3). The Spearman Rank Correlation was used to determine the strength of the relationship between assessors. Interrater reliability was found to be R of 0.942 (Figure 4). The degree of disagreement between the raters was evaluated using a Linear Weighted Cohen Kappa to assess the consistency of scores between the raters. The Weighted Cohen Kappa was 0.889 which is very good. The individual Behavior Score components showed high agreement (Figure 5). The agreement for each assessment is shown in figure 6. For some components statistical analysis was not possible, however for most of the assessment subgroups the Kappa Cohen was moderate or better.

Discussion

A procedural behavior score is a subjective value. So far the use of a scoring matrix along with some minor modifications appears to have improved the inter-rater reliability from the previous iteration of the score, as shown by an improved Spearman Rank Correlation and the Weighted Cohen Kappa values of the current study. Analysis of the individual components will also us to better evaluate which components appear best suited for this outcome score. After we have recruited a total of 150 patients another analysis will be made to determine if there is a consistent improvement in the inter-rate reliability and to determine whether we need to change any of the components. Further modifications after IRB approval may be made upon the results of this analysis.