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Sedation Overhead Cost Analysis

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Introduction

In pediatric dentistry, a sedation procedure is considered an advanced behavioral technique in delivering the appropriate care for select comprehensive pediatric dentistry cases. Sedation encounters are also necessary for a school/program to maintain or obtain pediatric dental residency accreditation. Because of this, many pediatric dentists offer sedation services in their office in order to provide the appropriate treatment for select cases. These sedation levels can range from level 1 minimal sedation up to general anesthesia under the direct care of a licensed anesthesiologist. This cost analysis will provide a basic guideline for the pediatric dentist interested in providing sedation services in their new or existing office. The analysis will include a breakdown of required supplies, equipment, pharmacological agents, staff needed to provide said services.

Methods

After we had identified the relevant sedation components, a spreadsheet was created to calculate the costs. These components include the following: additional staff, sedation agents, adjunct medications, monitoring equipment, airway and IV supplies, emergency medications and equipment. Most of the costs will be acquired using McKesson, a well-known supplier of pharmaceutical as well as medical supplies. Also, different types of sedation as well as University or Private locations will be accounted for (Table 1)

TABLE 2: SEDATIVES	UNIT	VIAL SIZE	$ COST/UNIT
MIDAZOLAM PO	1 mg	118 ml (multi)	1.75
MIDAZOLAM IN	5 mg	1 ml	2.65
MIDAZOLAM IV	2 mg	2 ml	2.24
FENTANYL	100 mcg	2 ml	2.20
SUFENTANIL	50 mcg	1 ml	10.34
REMIFENTANIL	250 mcg	1 vial powder	24.76
MORPHINE	2 mg	2 ml	3.09
DEXMEDETOMIDINE	100 mcg	2 ml	9.55
KETAMINE	500 mg	5 ml	25.43
PROPOFOL	200 mg	20 ml	11.32
SEVOFLURANE	1%/L/min	250 ml (multi)	0.036

TABLE 3: ADJUNCT	UNIT	VIAL SIZE	$ COST /UNIT
ONDANSETRON IV	4 mg	2 ml	1.14
ONDANSETRON SL	4 mg	2 ml	0.75
KETOROLAC IV/IM	30 mg	1 ml	4.81
DEXAMETHASONE IV	10 mg	1 ml	3.28
GLYCOPYRROLATE IV	0.2 mg	1 ml	9.50
EMLA CREAM	5 g	30g tube	5.88

TABLE 4: EQUIPMENT	MODEL	$ COST /UNIT
MONITOR	GE BE40	4585
MONITOR + Gas Analysis	GE BE40 + module	9100
INFUSION PUMP	BRAUN, Perfusor	4026
SEDATION CART, Medium	Waterloo Medical	1200
IV POLE	Generic	102
ANESTHESIA MACHINE	Drager Fabius Tiro	22000

Results

Information for four types of sedation are presented; Moderate Oral/IN, Moderate IV, Deep IV sedation and short deep inhalational (table 1) .Staffing requirements (DDS, MD, RN and resident) are reviewed for both the University and private office setting (table 1). The cost of the commonly used sedative and analgesic medications is shown in table 2. Most of these sedatives are relatively inexpensive. Adjunct medications are shown in table 3. Table 4 includes the main equipment that will need to be purchased depending on the types of sedation offered. For monitoring, we use the GE B40 and each monitor costs upwards of $4000.

For a 25 kg child, 16mg oral midazolam costs about $28, 10 mg IN midazolam about $5 (Table 5) plus the cost of a MAD device (~ $10). For IV sedation 4mg IV Midazolam ($4.50) and 50 mcg Fentanyl ($1.00) are both relatively inexpensive. There is also the consideration of drug vial cost or drug dose cost, depending on the size of the drug vials available and whether they are designed for multidose use.

Table 6: DEPRECIATION TIMES FOR FIXED COSTS	YEARS
EQUIPMENT MAJOR [A]	7
EQUIPMENT MINOR [B]	5
NON ROUTINE CONSUMABLES [C]	3
EMERGENCY NON ROUTINE MEDS [D]	1
MALIGNANT HYPERTHERMIA KIT [E]	2

Some of the sedation costs are fixed, such as monitors, disposables, sedation carts, emergency drugs and equipment, these can last for several years before they need replacement (Table 6). These costs need to be factored into each case, related to how many cases are done per year to distribute the charges equally. An example of the equipment needed for a sedation cart (Oral or IV) is shown in table 7. Most of this equipment will probably not be used but must be available if needed. The costs for each of the different components of sedation for the different types of sedation is shown in table 7. For different types of sedation different components are more expensive. Using inhalational sedation has the highest fixed cost due to the anesthesia machine but requires little or no adjunct or IV supplies. Interestingly, oral sedation is the most expensive sedative. Total sedation costs excluding staffing range from $32.25 to $97.42 for the university practice and $28.47 to $103.28 for the private office. Staffing costs relate to additional staff (RN~ $45+/hour) for sedation and recovery monitoring as well as the cost of additional sedation providers such as Anesthesiologists ($3000+/day), depending on your location. With nursing these increase to $75-187 University and $114-310 Private, plus the anesthesia charges if appropriate. A code cart and Defibrillator were assumed to be already available.

Discussion

Understanding the requirements for different sedation options and the costs is important for the Pediatric Dentist when considering offering these options in their dental practice. Sedatives are only a small component as equipment costs slightly higher. However, nurses and anesthesia providers are the main expense. Setting up the office for sedation as such is relatively inexpensive.

Table 6: ORAL SED Cart: CONTENTS AND STOCKING COSTS			536.23	
Supplies	Number	$ Unit Cost	$ Total Cost	FIXED
22G Angiocath	10	3.40	33.98	C
Alcohol	20	0.02	0.36	C
Tegaderm	10	0.60	5.98	C
Tape	2	1.96	3.93	C
Tournique	10	0.25	2.53	C
2x2 Gauze Sponge	10	0.02	0.22	C
IV set	5	1.96	9.81	C
IV Fluid, LR500	5	7.48	37.40	C
Syringe 1ml	10	0.34	3.41	C
Syringe 3 ml	10	0.10	0.99	-
Syringe 5 ml	10	0.18	1.84	C
Syringe 10 ml	10	0.20	2.05	C
Needles (20G)	25	0.14	3.42	C
Atropine	1	24.89	24.89	D
Ondasetron SL	10	0.75	7.45	D
Naloxone	2	18.34	36.68	D
Flumazenil	2	7.83	15.66	D
MAD Atomizer	5	10.36	51.80	-
Ambubag (Adult/Pediatric)	1	48.02	48.02	B
Oxygen Facemask(Adult/Ped)	2	4.41	8.82	C
Laryngoscope Handle/Blade set (Miller 1,2,3, Mac 2,3)	1	166.67	166.67	B
Oral Airway Set (50-90mm)	1	0.60	0.60	C
ETT SET (adult/Peds), 3.5 to 6 uncuffed, 5.5 to 7 cuffed	1	59.44	59.44	C
Stylets (8F, 10F, 14F)	1	10.29	10.29	C
ETCO2_O2 NC	4	3.91	15.65	C
IV SED Cart:(In Additional to Oral Cart)			675.18	FIXED
Epinephrine	1	27.19	27.19	D
Albuterol	1	0.23	0.23	D
Benadryl	1	1.88	1.88	D
Hydrocortisone	1	1.88	1.88	D
Nasal Airway	1	65.18	65.18	C
LMA Set	1	42.60	42.60	C

TABLE 1: TYPE OF SEDATION	DESCRIPTION	NO. CASES	NURSE COST / DAY	NURSE COST / CASE	MOD (% CANCEL)	MD	DDS /OS	RES	NURSE
A) ORAL SEDATION (25KG)	ORAL MID ONLY (RES)	18	675	43.13	0.15	1	1	10	2
B) ORAL SEDATION (25KG)	IN MID ONLY (RES)	18	675	43.13	0.15	1	1	10	2
C) PED IV MOD SEDATION (40KG)	MID, FENT ONLY (RES)	10	720	82.80	0.15	1	1	4	2
D) ADULT DEEP OS (70KG)	DEEP PROP INFUSION (RES) (no glycop)	8	765	109.97	0.15	1	1	2	2
E) PED DEEP OS (35KG)	DEEP PROP INFUSION (RES) (no glycop)	8	765	109.97	0.15	1	1	2	2
F) PED DEEP RESTORE (30KG) - (short 20 mins)	DEEP PROP INFUSION (RES) (no glycop)	8	720	103.50	0.15	1	1	2	2
G) PED SHORT INHAL XO (3 NURSES)	SHORT DEEP INH (RES)	18	1080	69.00	0.15	1	1	1	3
H) ORAL SEDATION (25KG) - PRIVATE	ORAL MID ONLY NO RES	6	450	86.25	0.15	0	1	0	2
I) ORAL SEDATION (25KG) - PRIVATE	IN MID ONLY NO RES	6	450	86.25	0.15	0	1	0	2
J) PED IV MOD SEDATION (40KG) - PRIVATE	MID, FENT ONLY NO RES	8	720	103.50	0.15	1	1	0	2
K) PED DEEP RESTORE (35KG) - (long - 30mins) PRIVATE	DEEP PROP INFUSION NO RES (no glycop)	6	1080	207.00	0.15	1	1	0	3

Table 5: SEDATION	SED 1	DOSE S1	SED_COST 1	SED 2	DOSE S2	SED_COST 2	SED 3	DOSE S3	SED_COST 3	TOT SED COST
A) ORAL SED	PO MID	16	27.98							27.98
B) IN SED	IN MID	10	5.29							5.29
C) PED IV MOD	IV MID	5	6.73	IV FENT	75	2.20				8.93
D) ADULT OS	IV MID	4	4.49	IV FENT	100	2.20	IV PROP	180.25	11.32	18.00
E) PED DEEP OS	IV MID	3.5	4.49	IV FENT	75	2.20	IV PROP	144.73	11.32	18.00
F) PED DEEP	PROPINF	141.9	11.32	IV MID	4	4.49	IV FENT	75	2.20	18.00
G) GNG	SEVO	480	17.38							17.38
H) ORAL PRIVATE	PO MID	16	27.98							27.98
I) IN PRIVATE	IN MID	10	8.98							8.98
J) IV MOD - PRIVATE	IV MID	5	6.73	IV FENT	75	2.20				8.93
K) PED DEEP PRIVATE	PROPINF	192.3	11.32	IV MID	5	6.73	IV FENT	100	2.20	20.25

Table 6: Sedation Cost	SEDATION	ADJUNCT	NEED/SYR / IV	ANES / MONITOR	FIXED COSTS	TOTAL SED COST	COST PLUS NURSE
A) ORAL SED	27.98	0.07	0.00	1.59	13.64	43.28	86.40
B) IN SED	5.29	0.07	11.66	1.59	13.64	32.25	75.38
C) PED IV MOD	8.93	14.20	16.86	5.76	14.74	60.49	143.29
D) ADULT OS	18.00	12.05	19.98	10.09	17.41	77.53	187.50
E) PED DEEP OS	18.00	9.10	19.81	10.09	17.34	74.34	184.31
F) PED DEEP	18.00	9.10	20.82	18.35	11.23	77.51	181.01
G) GNG	17.38	0.45	0.00	21.68	57.92	97.42	166.42
H) ORAL PRIVATE	27.98	0.07	0.00	1.65	6.11	35.82	122.07
I) IN PRIVATE	8.98	0.07	11.66	1.65	6.11	28.47	114.72
J) IV MOD - PRIVATE	8.93	14.20	23.66	5.76	12.40	64.95	168.45
K) PED DEEP PRIVATE	20.25	9.10	20.82	18.35	34.76	103.28	310.28