Latte di Fata

Dott.ssa C.Battaglia, Dott. N.Zugni, Dott.ssa F.Ferrazin

JC mercoledì 20 maggio 2015 ore 15.00 – Auletta 2CR

1985

American Academy of Pediatrics, Committee on Drugs and Section on Anesthesiology. Guidelines for the elective use of conscious sedation, deep sedation, and general anesthesia in pediatric patients. *Pediatrics*. 1985;76:317–321

1986

American Academy of Pediatric Dentistry. Guidelines for the elective use of conscious sedation, deep sedation, and general anesthesia in pediatric patients. *ASDC J Dent Child*. 1986;53: 21–22

1992

American Academy of Pediatrics, Committee on Drugs. Guidelines for monitoring and management of pediatric patients during and after sedation for diagnostic and therapeutic procedures. *Pediatrics*. 1992;89:1110–1115

2002

American Academy of Pediatrics, Committee on Drugs. Guidelines for monitoring and management of pediatric patients during and after sedation for diagnostic and therapeutic procedures: addendum. *Pediatrics*. 2002;110:836–838

2006

American Academy of Pediatric Dentistry, Ad Hoc Committee on Sedation and Anesthesia. *Guidelines on the Elective Use of Minimal, Moderate, and Deep Sedation and General Anesthesia for Pediatric Dental Patients*. Chicago, IL: American Academy of Pediatric Dentistry; 2004. Available at: www.aapd.org/media/Policies_Guidelines/G_Sedation.pdf. Accessed February 7, 2006

Conscious sedation

A medically controlled state of depressed consciousness that:

(1) allows protective reflexes to be maintained;
(2) retains the patient's ability to maintain a patent airway independently and continuously;
(3) permits appropriate response by the patient to physical stimulation and/or verbal command, eg, "open your eyes."

Deep sedation

A medically controlled state of depression consciousness or unconsciousness from which the patient is not easily aroused.

- may be accompanied by a partial or complete loss of protective reflexes, including the inability to maintain an airway independently and to respond purposefully to physical stimulation or to verbal command.

The state and risks of deep sedation may be indistinguishable from those of general anaesthesia

AMERICAN ACADEMY OF PEDIATRICS

JOINT COMMISSION ON ACCREDITATION OF HEALTHCARE ORGANIZZATION

PEDIATRICS®
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Guidelines for Monitoring and Management of Pediatric Patients During and After Sedation for Diagnostic and Therapeutic Procedures: An Update

American Academy of Pediatrics, American Academy of Pediatric Dentistry, Charles J. Coté and Stephen Wilson

Pediatrics 2006;118;2587
DOI: 10.1542/peds.2006-2780

AMERICAN SOCIETY OF ANESTESIOLOGISTS

AMERICAN ACADEMY OF PEDIATRIC DENTISTRY

American Academy of Pediatrics
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- **Minimal sedation** (formerly anxiolysis):

a drug-induced state during which patients *respond normally* to verbal commands; although cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.

- **Moderate sedation** (formerly conscious sedation or sedation/analgesia):

a drug-induced depression of consciousness during which patients *respond purposefully* to verbal commands (eg, "open your eyes," either alone or accompanied by light tactile stimulation, such as a light tap on the shoulder or face).

With moderate sedation, no intervention is required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained. However, in the case of procedures that may themselves cause airway obstruction (eg, dental or endoscopic), the practitioner must recognize an obstruction and assist the patient in opening the airway.

PEDIATRICS Volume 118, Number 6, December 2006

- **Deep sedation** (deep sedation/analgesia):

a drug-induced depression of consciousness during which patients cannot be easily aroused but respond purposefully after repeated verbal or painful stimulation (eg, purposefully pushing away the noxious stimuli).
The ability to independently maintain ventilatory function **may be** impaired.
Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained.
A state of deep sedation may be accompanied by partial or complete loss of protective airway reflexes.

- **General anesthesia:**

a drug-induced loss of consciousness during which patients are not arousable, even by painful stimulation.
The ability to independently maintain ventilatory function is **often** impaired.
Patients often require assistance in maintaining a patent airway, and positive-pressure ventilation may be required because of depressed spontaneous ventilation or drug-induced depression of neuromuscular function.
Cardiovascular function may be impaired.

Ramsay sedation score levels

1° livello Paziente ansioso, agitato o irrequieto

2° livello Paziente tranquillo orientato e collaborante

3° livello Paziente che risponde solo a chiamata/ai comandi

4° livello Paziente addormentato, presenta una pronta risposta ad una leggera pressione sulla radice del naso o ad un forte stimolo uditivo

5° livello Paziente addormentato presenta una risposta rallentata ad una leggera pressione radice del naso o ad un forte stimolo uditivo

6° livello Paziente addormentato, nessuna risposta ad una leggera pressione sulla radice del naso o ad un forte stimolo uditivo

Redrawn from Ramsay, MA, Savage, TM, Simpson, BR, Goodwin, R, Br Med J 1974; 2:656.

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GOALS OF SEDATION AND ANALGESIA:

- Guard the patient's safety and welfare;
- Minimize physical discomfort and pain;
- Control anxiety, minimize psychological trauma, and maximize the potential for amnesia;
- Control behavior and/or movement to allow the safe completion of the procedure;
- Return the patient to a state in which safe discharge from medical supervision, as determined by recognized criteria, is possible

APPENDIX 2 Recommended Discharge Criteria

1. Cardiovascular function and airway patency are satisfactory and stable.
2. The patient is easily arousable, and protective reflexes are intact.
3. The patient can talk (if age appropriate).
4. The patient can sit up unaided (if age appropriate).
5. For a very young or handicapped child incapable of the usually expected responses, the presedation level of responsiveness or a level as close as possible to the normal level for that child should be achieved.
6. The state of hydration is adequate.

PEDIATRICS Volume 118, Number 6, December 2006

PREPARATION FOR PEDIATRIC PROCEDURAL SEDATION

PRE- SEDATION EVALUATION

1. The health evaluation
2. Airway assessment
3. Risk classification
4. Fasting and aspiration risk

PREPARATION

♠Informed consent
♥Monitoring
♦Vascular access
♣Equipment

PRE- SEDATION EVALUATION

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1. The health evaluation

- age and weight
- a health history
- a review of systems with a special focus on abnormalities of ...nary, renal, or hepatic function that might alter the child' ... sedating/analgesic medications
- determination of vital ... ...ure, respiratory rate, and temper...

FOR SOME CHILDREN WHO ARE VERY UPSET OR NONCOOPERATIVE, THIS MAY NOT BE POSSIBLE, AND A NOTE SHOULD BE WRITTEN TO DOCUMENT THIS OCCURRENCE

2. ...

- ...amination, including a focused evaluation of the airway (tonsillar hy...trophy, abnormal anatomy [eg, mandibular hypoplasia]) to determine if there is an increased risk of airway obstruction

3. Risk classification

- a physical status evaluation (ASA classification)

PRE- SEDATION EVALUATION

FOCUSED MEDICAL HISTORY

- Major medical illnesses, especially affecting the respiratory, cardiovascular, and neurologic systems
- History of snoring or central or obstructive sleep apnea
- History of prior sedation or general anesthesia including any prior complications
- Family history of an adverse reaction to sedation, analgesia, or general anesthesia
- Pregnancy status, if applicable
- Drug or food allergies
- Current therapies
- Recent illicit drug use
- Review of systems that evaluate cardiac, pulmonary, renal, bowel, and hepatic function

Mandt MJ, Roback MG.
Assessment and monitoring of pediatric procedural sedation.
Clin Ped Emerg Med 2007; 8:223

➔ ***IDENTIFY POTENTIAL SEDATION RISKS***

PRE- SEDATION EVALUATION

4. Fasting and Aspiration Risk

PRE- SEDATION EVALUATION

4. Fasting and Aspiration Risk

Elective procedures

Table 1. APPROPRIATE INTAKE OF FOOD AND LIQUIDS BEFORE ELECTIVE SEDATION*

Ingested material	Minimum fasting period (h)
Clear liquids: water, fruit juices without pulp, carbonated beverages, clear tea, black coffee	2
Breast milk	4
Infant formula	6
Nonhuman milk: because nonhuman milk is similar to solids in gastric emptying time, the amount ingested must be considered when determining an appropriate fasting period	6
Light meal: a light meal typically consists of toast and clear liquids. Meals that include fried or fatty foods or meat may prolong gastric emptying time. Both the amount and type of foods ingested must be considered when determining an appropriate fasting period.	6

* American Society of Anesthesiologists. Practice Guidelines for Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration: Application to Healthy Patients Undergoing Elective Procedures. A Report of the American Society of Anesthesiologists. Available at: "http://www.asahq.org/publicationsAndServices/npoguide.html".

PRE- SEDATION EVALUATION

4. Fasting and Aspiration Risk

Preoperative fasting for preventing perioperative complications in children (Review)

Brady MC, Kinn S, Ness V, O'Rourke K, Randhawa N, Stuart P

PRE- SEDATION EVALUATION

4. Fasting and Aspiration Risk

25 randomised controlled trials involving 2543 children considered to be at normal risk of regurgitation or aspiration during anaesthesia

OBJECTIVE: to systematically identify, appraise and synthesise the evidence of the effects of different preoperative fasting regimens (duration, type and volume of permitted intake) on perioperative complications and patient well being (including aspiration, regurgitation and related morbidity, thirst, hunger, pain, comfort, behaviour, nausea, vomiting) in children.

4. Fasting and Aspiration Risk

Primary outcomes

• rate of adverse events (aspiration/regurgitation) or those arising as a result of aspiration including related morbidity (primarily aspiration pneumonia) or case fatality;

• volume and/or pH of gastric contents (on induction of anaesthesia) with the quality of the aspirate (nature of any particles observed) described narratively;

• concentration of marker dye (for example phenol red) as an indicator of gastric emptying.

Secondary outcomes

• thirst;

• hunger;

• pain;

• behaviour;

• comfort;

• nausea; and

• vomiting.

PRE- SEDATION EVALUATION

4. Fasting and Aspiration Risk

Children at normal risk of regurgitation and aspiration, given unlimited clear fluids up to two hours preoperatively are not at a clinically significant risk of increased gastric volume than children who follow a standard fast.

Analysis 1.1. Comparison 1 Duration - Short Fluid Fast versus Standard Fast, Outcome 1 Gastric contents - Volume (ml/kg).

Review: Preoperative fasting for preventing perioperative complications in children

Comparison: 1 Duration - Short Fluid Fast versus Standard Fast

Outcome: 1 Gastric contents - Volume (ml/kg)

Study or subgroup	Short Fluid Fast N	Mean(SD)	Standard Fast N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Fluids (up to 120 minutes preop) versus Standard Fast (no H2-receptor antagonists)							
Maekawa 1993a	35	0.39 (0.46)	35	0.36 (0.42)		12.4 %	0.03 [-0.18, 0.24]
Meakin 1985a	35	0.37 (0.35)	20	0.21 (0.31)		14.6 %	0.16 [-0.02, 0.34]
Nicolson 1992	44	0.6 (0.9)	47	0.4 (0.6)		6.8 %	0.20 [-0.12, 0.52]
Sandhar 1989a	13	0.34 (0.3)	19	0.25 (0.3)		12.0 %	0.09 [-0.12, 0.30]
Sarti 1991	32	0.44 (0.37)	30	0.38 (0.3)		15.6 %	0.06 [-0.11, 0.23]
Schreiner 1990	48	0.44 (0.51)	67	0.57 (0.51)		13.7 %	-0.13 [-0.32, 0.06]
Welborn 1993	41	0.08 (0.18)	43	0.08 (0.21)		25.0 %	0.0 [-0.08, 0.08]
Subtotal (95% CI)	**248**		**261**			**100.0 %**	**0.03 [-0.03, 0.10]**

Heterogeneity: Tau² = 0.00; Chi² = 6.82, df = 6 (P = 0.34); I² =12%

Test for overall effect: Z = 0.97 (P = 0.33)

PRE- SEDATION EVALUATION

4. Fasting and Aspiration Risk

Analysis 1.2. Comparison 1 Duration - Short Fluid Fast versus Standard Fast, Outcome 2 Gastric contents - pH.

Review: Preoperative fasting for preventing perioperative complications in children

Comparison: 1 Duration - Short Fluid Fast versus Standard Fast

Outcome: 2 Gastric contents - pH

Study or subgroup	Short Fluid Fast N	Mean(SD)	Standard Fast N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Fluids (up to 120 minutes preop) versus Standard Fast (no H2-receptor antagonists)							
Goresky 1992a	48	1.96 (1.18)	51	1.94 (0.93)		11.5 %	0.02 [-0.40, 0.44]
Maekawa 1993a	27	1.67 (0.65)	25	1.72 (0.48)		14.2 %	-0.05 [-0.36, 0.26]
Meakin 1985a	31	2.14 (1.31)	14	1.85 (0.29)		10.1 %	0.29 [-0.20, 0.78]
Nicolson 1992	20	1.9 (0.7)	17	2 (0.4)		12.9 %	-0.10 [-0.46, 0.26]
Sandhar 1989a	12	1.83 (0.85)	10	2.1 (0.96)		5.8 %	-0.27 [-1.04, 0.50]
Sarti 1991	32	1.7 (0.9)	30	1.6 (1)		10.3 %	0.10 [-0.37, 0.57]
Schreiner 1990	35	1.82 (0.53)	48	1.77 (0.59)		15.9 %	0.05 [-0.19, 0.29]
Welborn 1993	41	1.45 (0.07)	43	1.41 (0.17)		19.4 %	0.04 [-0.02, 0.10]
Subtotal (95% CI)	**246**		**238**			**100.0 %**	**0.04 [-0.01, 0.09]**
Heterogeneity: Tau² = 0.0; Chi² = 2.62, df = 7 (P = 0.92); I² =0.0%							
Test for overall effect: Z = 1.41 (P = 0.16)							
2 Fluids (up to 120 minutes preop) versus Standard Fast (+ H2-receptor antagonists)							
Goresky 1992b	53	4.09 (2.26)	47	3.7 (2.33)		63.0 %	0.39 [-0.51, 1.29]
Sandhar 1989b	15	4.76 (1.63)	14	3.97 (1.79)		37.0 %	0.79 [-0.46, 2.04]
Subtotal (95% CI)	**68**		**61**			**100.0 %**	**0.53 [-0.20, 1.26]**
Heterogeneity: Tau² = 0.0; Chi² = 0.26, df = 1 (P = 0.61); I² =0.0%							
Test for overall effect: Z = 1.41 (P = 0.16)							

PRE- SEDATION EVALUATION

4. Fasting and Aspiration Risk

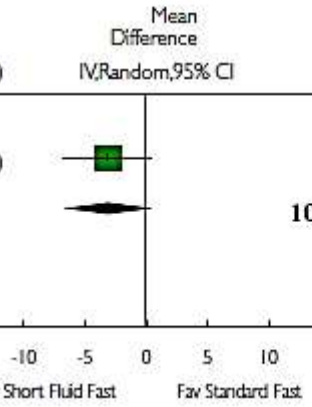
Analysis 1.3. Comparison 1 Duration - Short Fluid Fast versus Standard Fast, Outcome 3 Gastric contents - Phenol red based volume (ml).

Review: Preoperative fasting for preventing perioperative complications in children

Comparison: 1 Duration - Short Fluid Fast versus Standard Fast

Outcome: 3 Gastric contents - Phenol red based volume (ml)

Study or subgroup	Short Fluid Fast N	Mean(SD)	Standard Fast N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Fluids (up to 180 minutes preop) versus Standard Fast							
Miller 1990	19	6.3 (3.4)	25	9.4 (8.2)		100.0 %	-3.10 [-6.66, 0.46]
Subtotal (95% CI)	**19**		**25**			**100.0 %**	**-3.10 [-6.66, 0.46]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.71 (P = 0.088)							



PRE- SEDATION EVALUATION

4. Fasting and Aspiration Risk

Trial	Method	Measure	Comparison	Result
SHORTENED FLUID FAST versus STANDARD FAST				
Fluids up to 120 mins preoperatively				
Goresky 1992a	reported	adverse event, coughing, aspiration	1. Standard Fast + placebo (n = 60) 2. Apple juice [5 ml/kg] + placebo 2 hrs preop (n = 60)	8 spat out or vomited treatment agent (unclear which group). 1 experienced flushing and sweating after intervention (possibly vaso-vagal response). 1 coughing regurgitation and aspiration on induction (65 ml apple juice)

The risks of aspiration/regurgitation were very low in this group of patients (1 out of 1208).

Preoperative fasting for preventing perioperative complications in children (Review)

PRE- SEDATION EVALUATION

4. Fasting and Aspiration Risk

Children permitted fluids up to 120 minutes preoperatively were not found to experience higher gastric volumes or lower gastric pH values than those who fasted.

The children permitted fluids were less thirsty and hungry, better behaved and more comfortable than those who fasted.

Table 1. APPROPRIATE INTAKE OF FOOD AND LIQUIDS BEFORE ELECTIVE SEDATION*

Ingested material	Minimum fasting period (h)
Clear liquids: water, fruit juices without pulp, carbonated beverages, clear tea, black coffee	2
Breast milk	4
Infant formula	6
Nonhuman milk: because nonhuman milk is similar to solids in gastric emptying time, the amount ingested must be considered when determining an appropriate fasting period	6
Light meal: a light meal typically consists of toast and clear liquids. Meals that include fried or fatty foods or meat may prolong gastric emptying time. Both the amount and type of foods ingested must be considered when determining an appropriate fasting period.	6

* American Society of Anesthesiologists. Practice Guidelines for Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration: Application to Healthy Patients Undergoing Elective Procedures. A Report of the American Society of Anesthesiologists. Available at: "http://www.asahq.org/publicationsAndServices/npoguide.html".

PRE- SEDATION EVALUATION

4. Fasting and Aspiration Risk

Urgent or emergent procedures

Valutare attentamente i rischi e i benefici della procedura nei pazienti che non rientrano nelle linee guida sul digiuno dell'American Society of Anesthesiologists

Children considered to be at high risk of regurgitation/aspiration include those who are:

- Emergency cases (especially following trauma);
- Possibility of a difficult airway
- Conditions predisposing to esophageal reflux (ie, gastritis, bowel obstruction, or ileus, obese, gastric disorders or disease).
- Young infants (eg, <6 months)
- Severe systemic disease with functional limitation (ASA class ≥3)
- Other clinical considerations that the clinician may judge to increase aspiration risk (eg, altered mental status)

Green SM, Roback MG, Miner JR, et al
Fasting and emergency department procedural sedation and analgesia: a consensus-based clinical practice advisory.
Ann Emerg Med 2007; 49:454.

PRE- SEDATION EVALUATION

4. Fasting and Aspiration Risk

Urgent or emergent procedures

Ann Emerg Med. 2003 Nov;42(5):636-46.

Preprocedural fasting state and adverse events in children undergoing procedural sedation and analgesia in a pediatric emergency department.

Agrawal D[1], Manzi SF, Gupta R, Krauss B.

- In a prospective case series of 905 children receiving procedural sedation
- 509 children who did not meet ASA fasting guidelines for elective procedures (56%)
- Adverse events occurred in 32 (8.1%) of 396 patients who met, and 35 (6.9%) of 509 patients who did not meet fasting guidelines.
- There was no association between preprocedural fasting state and adverse events.
- Adverse events were associated with deeper levels of sedation

Relationship between maximum depth of sedation achieved and occurrence of adverse events.

Maximum Depth of Sedation*	Adverse Event Rate, No. (%)
1	0/6 (0.0)
2	4/95 (4.2)
3	18/284 (6.3)
4	28/365 (7.7)
5	13/92 (14.1)
6	1/1 (100.0)
Totals	64/843 (7.6)

*Data on depth of sedation were available on 843 sedated patients, of whom 64 (7.6%) had associated adverse events. Maximum depth of sedation achieved during procedure: 1, anxious, agitated, or restless; 2, cooperative, oriented, or tranquil; 3, asleep, brisk response to light stroke of cheek; 4, asleep, sluggish response to light stroke of cheek; 5, no response to light stroke of cheek but responds to painful stimuli; 6, no response to painful stimuli.

PREPARATION

♠ Informed consent

♣ Equipment

♥ Monitoring

♦ Vascular access

♠ Informed consent

Clear communication, in a child-friendly manner, of information relating to the preparation required for the procedure or investigation, and related sedation technique. This will include the needs of the patient and their parents or carers, ensuring that implications (sedation safety and efficacy) are clearly understood by both the patient and their parent or carer prior to informed consent.

SEDATION IN CHILDREN AND YOUNG PEOPLE
The Royal College of Physicians,

♠ Informed consent

Codice civile

Art. 316.
Responsabilità genitoriale.
Entrambi i genitori hanno la responsabilità genitoriale che è esercitata di comune accordo tenendo conto delle capacità, delle inclinazioni naturali e delle aspirazioni del figlio.

Art. 317.
Impedimento di uno dei genitori.
Nel caso di lontananza, di incapacità o di altro impedimento che renda impossibile ad uno dei genitori l'esercizio della responsabilità genitoriale, questa è esercitata in modo esclusivo dall'altro.

♠ Informed consent

Legge 8 febbraio 2006, n. 54
"Disposizioni in materia di separazione dei genitori e affidamento condiviso dei figli"

«Art. 155. – *(Provvedimenti riguardo ai figli)* [...] La potestà genitoriale è esercitata da entrambi i genitori. Le decisioni di maggiore interesse per i figli relative all'istruzione, all'educazione e alla salute sono assunte di comune accordo tenendo conto delle capacità, dell'inclinazione naturale e delle aspirazioni dei figli. In caso di disaccordo la decisione è rimessa al giudice. [...] »

«Art. 155-*bis*. – *(Affidamento a un solo genitore e opposizione all'affidamento condiviso).* Il giudice può disporre l'affidamento dei figli ad uno solo dei genitori qualora ritenga con provvedimento motivato che l'affidamento all'altro sia contrario all'interesse del minore.»

♣Equipment

PREPARATION AND SETUP FOR SEDATION PROCEDURES

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SOAPME ♣

S *(suction)*: size-appropriate suction catheters and a functioning suction apparatus (eg, Yankauer-type suction)

O *(oxygen)*: adequate oxygen supply and functioning flow meters/other devices to allow its delivery

A *(airway)*: size-appropriate airway equipment (nasopharyngeal and oropharyngeal airways, laryngoscope blades [checked and functioning], endotracheal tubes, stylets, face mask, bag-valve-mask or equivalent device)

P *(pharmacy)*: all the basic drugs needed to support life during an emergency, including antagonists as indicated

M *(monitors)*: functioning pulse oximeter with size appropriate, and other monitors as appropriate for the procedure (eg, noninvasive blood pressure, end-tidal CO2, ECG, stethoscope)

E *(equipment)*: special equipment or drugs for a particular case (eg, defibrillator)

Guidelines for Monitoring and Management of Pediatric Patients During and After Sedation for Diagnostic and Therapeutic Procedures: An Update 2006

PEDIATRICS Volume 118, Number 6, December 2006

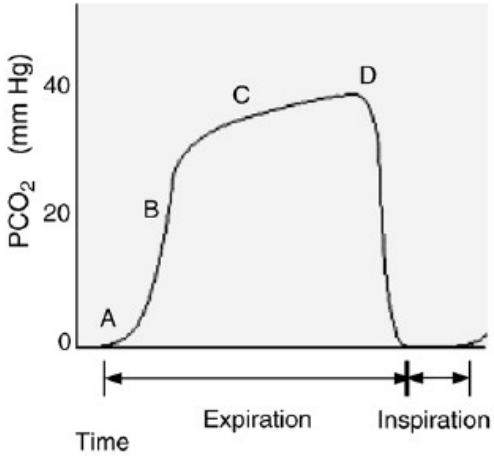
PREPARATION AND SETUP FOR SEDATION PROCEDURES

MONITORING

- Continuous visual observation of face, mouth, and chest wall movement when feasible
- Initial and repeated measures of vital signs
- Continuous measurement of heart rate and pulse oximetry
- Repeated blood pressure measurements in patients receiving moderate or deep sedation or agents known to cause hemodynamic instability
- End tidal carbon dioxide detection, especially when visual observation of breathing is not possible (eg, during magnetic resonance imaging)

PREPARATION AND SETUP FOR SEDATION PROCEDURES

♥ $EtCO_2$



- EtCO2 monitoring identified alveolar hypoventilation in 56% of procedures and apnea during 24%

- Increases in EtCO2 may be detected in patients with respiratory depression before hypoxemia is noted, particularly in those who are receiving supplemental oxygen. EtCO2 is also more sensitive for detecting hypoventilation and apnea than clinical assessment

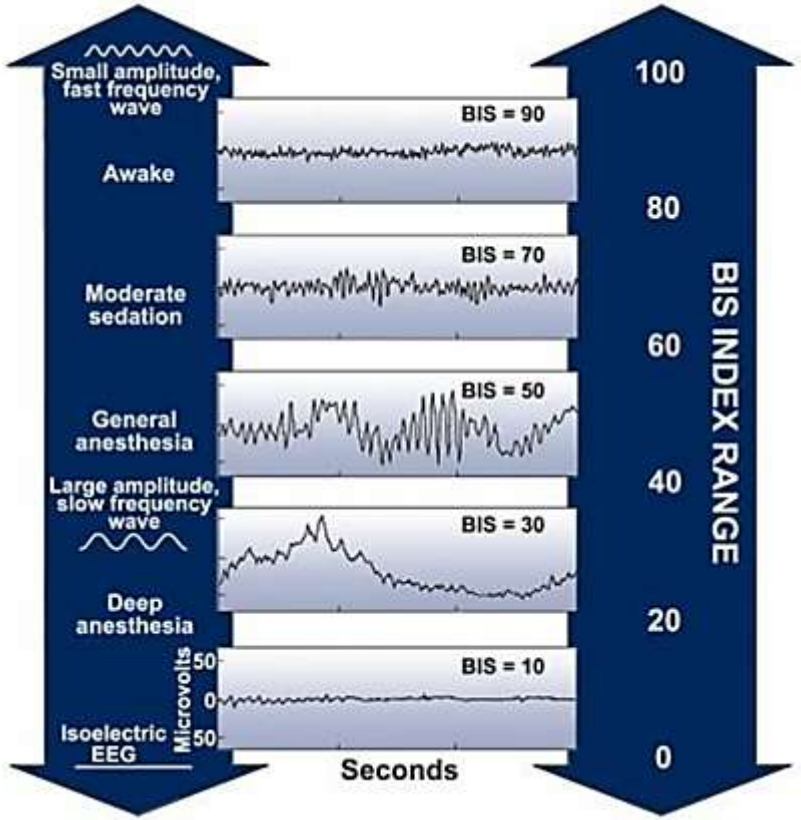
Pediatrics. 2006 Jun;117(6):e1170-8. Epub 2006 May 15.

Microstream capnography improves patient monitoring during moderate sedation: a randomized, controlled trial.

Lightdale JR[1], Goldmann DA, Feldman HA, Newburg AR, DiNardo JA, Fox VL.

PREPARATION AND SETUP FOR SEDATION PROCEDURES

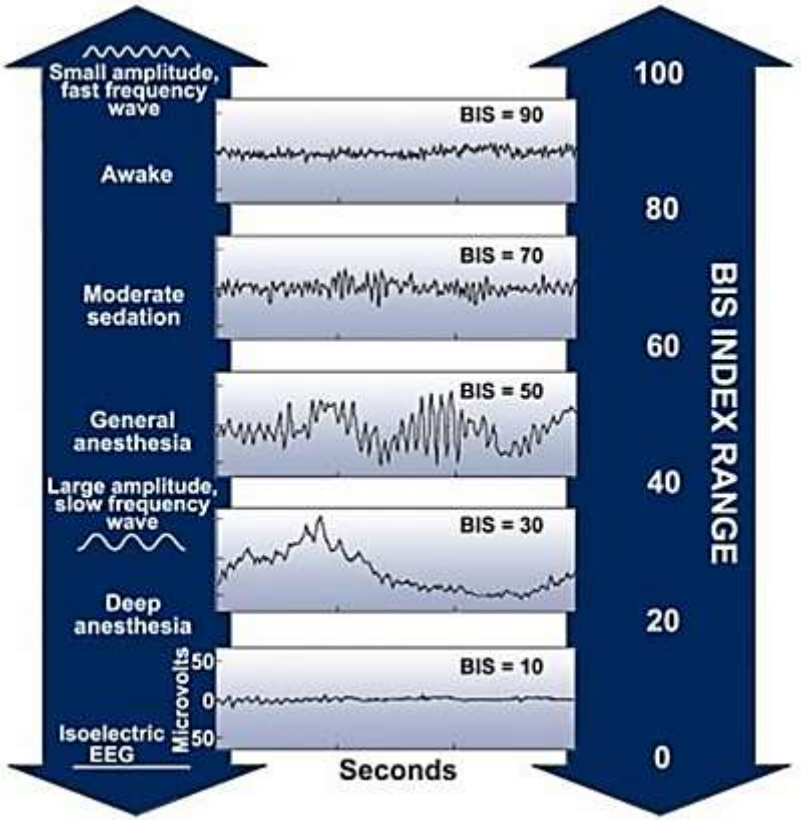
♥ BIS



BISx Pediatric Sensor, single patient use

BIS

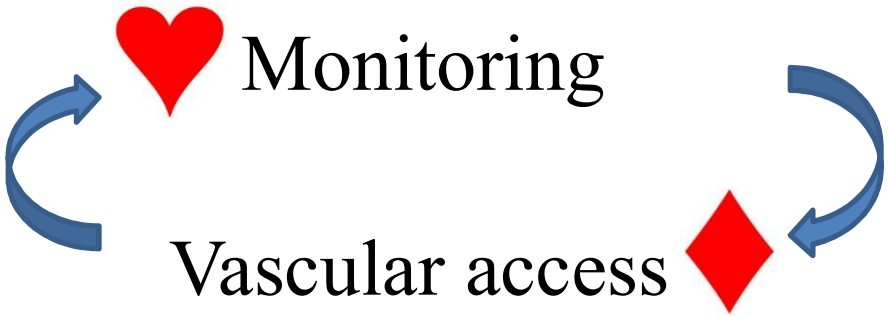
In a combined analysis of four observational studies, BIS was found to differentiate light from moderate or deep sedation in children with reasonable sensitivity (74 to 83%) and specificity (78 to 84%). However, BIS differentiated moderate from deep sedation with poor sensitivity (58 to 71%) and specificity (57 to 66%). BIS values in children were lower in infants and patients who received opioids. BIS values did not correlate with sedation depth in children receiving ketamine.



Pediatrics. 2007 Sep;120(3):e461-70.

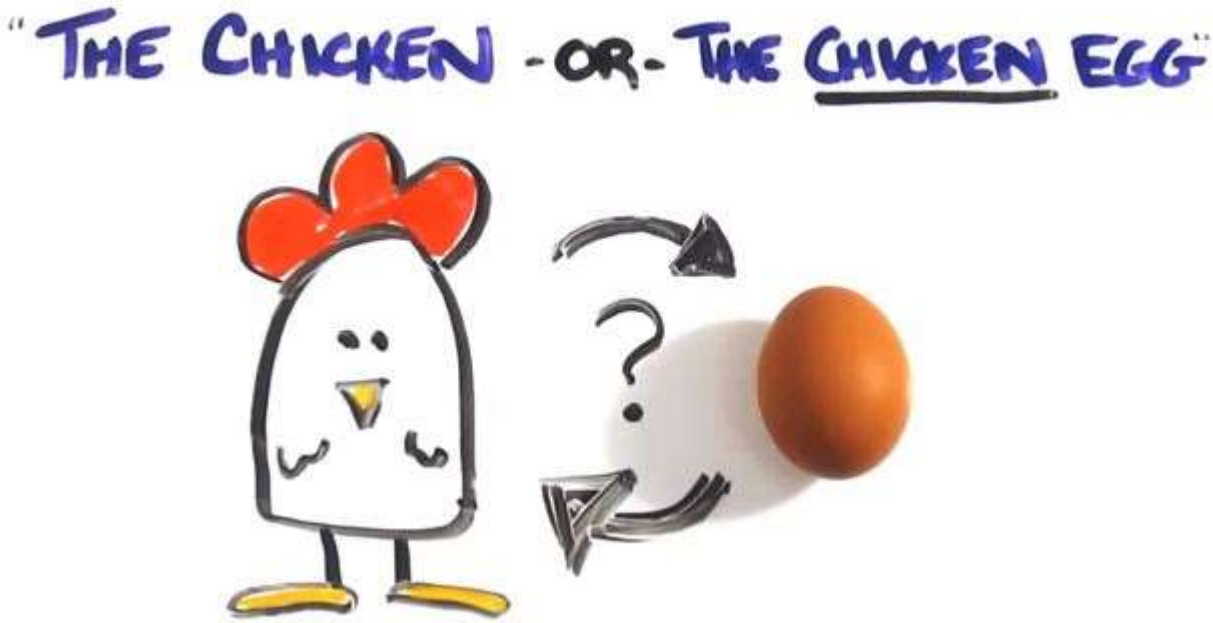
Effect of age and sedative agent on the accuracy of bispectral index in detecting depth of sedation in children.

Malviya S[1], Voepel-Lewis T, Tait AR, Watcha MF, Sadhasivam S, Friesen RH.



♥ Monitoring

♦ Vascular access



ADVERSE OUTCOME

ADVERSE OUTCOME

- ASPIRATION
- RESPIRATORY INTERVENTION:
  - Oral-pharyngeal Airway;
  - Endotracheal Intubation;
  - Assisted Ventilation
- CARDIAC ARREST REQUIRING EITHER/OR:
  - External Cardiac Massage
  - Defibrillation
- OXYGEN DESATURATION <90%
- VOMITING

ADVERSE OUTCOME

Factors that contributed to adverse outcomes were:

- Inadequate and inconsistent physiologic monitoring
- Inadequate medical evaluation before sedation
- No independent observer
- Medication errors
- Inadequate recovery procedures

Arch Pediatr Adolesc Med. 2006 Feb;160(2):211-6.

Effect on hospital-wide sedation practices after implementation of the 2001 JCAHO procedural sedation and analgesia guidelines.

Pitetti R[1], Davis PJ, Redlinger R, White J, Wiener E, Calhoun KH.

Hospital-wide implementation of national sedation and analgesia guidelines in one children′s hospital resulted in a significant reduction in monthly adverse events during pediatric procedural sedation from 11 to 5% over three years ($p < 0.001$)

ADVERSE OUTCOME

Pediatrics. 2006 Sep;118(3):1087-96.

Incidence and nature of adverse events during pediatric sedation/anesthesia for procedures outside the operating room: report from the Pediatric Sedation Research Consortium.

Cravero JP[1], Blike GT, Beach M, Gallagher SM, Hertzog JH, Havidich JE, Gelman B; Pediatric Sedation Research Consortium.

- Incidence of adverse events (primarily transient oxygen desaturation, vomiting, and excessive secretions) was 3%
- Laryngospasm and apnea occurred less commonly and there were no deaths
- One patient was successfully resuscitated from cardiac arrest
- Failed sedation, defined as complications necessitating postponement of further sedation without completion of the procedure, occurred in up to 1.5% of sedations

Thus, adverse events are relatively common in pediatric procedural sedation, but when personnel rapidly respond and reverse the adverse event, deleterious outcomes are rare.

PHARMACOLOGIC AGENTS FOR PEDIATRIC PROCEDURAL SEDATION

KETAMINA

Use: Induzione e mantenimento dell'anestesia generale
Use Off-Label: Complex regional pain syndrome; Analgesia; Sedation

Meccanismo d'azione
Produce uno stato similcatalettico in cui il paziente è dissociato dall'ambiente circostante per azione diretta sulla corteccia e sistema limbico.

- È un antagonista non competitivo del recettore NMDA che blocca glutammato.
- Produce effetti psicoto-mimetici attraverso l'aumento del release della dopamina, e la stimolazione dei recettori dopaminergici D2
- Agisce a livello dei recettori oppioidi contribuendo sia all'analgesia che alle reazioni disforiche.
- Ha proprietà simpatomimetiche mediate dall'incremento della trasmissione monoaminergica centrale e periferica.
- Inibisce la trasmissione colinergica a livello centrale che contribuisce all'induzione dello stato anestetico e allucinatorio.
- Gli effetti sulla trasmissione neuromuscolare sono invece meno rilevanti.

KETAMINA

Modalità di somministrazione e dosaggi pediatrici:

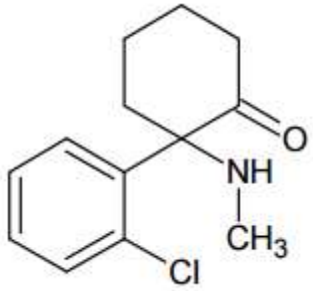
OS: da 6 a 10 mg/kg mescolata con acqua somministrata 30 minuti prima della procedura

IM: da 3 a 7 mg/kg

EV: da 1 a 1,5 mg/kg
quando somministrato con propofol, ridurre la dose iniziale di 0,5 mg / kg

ONSET: da 1 a 2 min

DURATA: da 15 a 30 min



KETAMINA

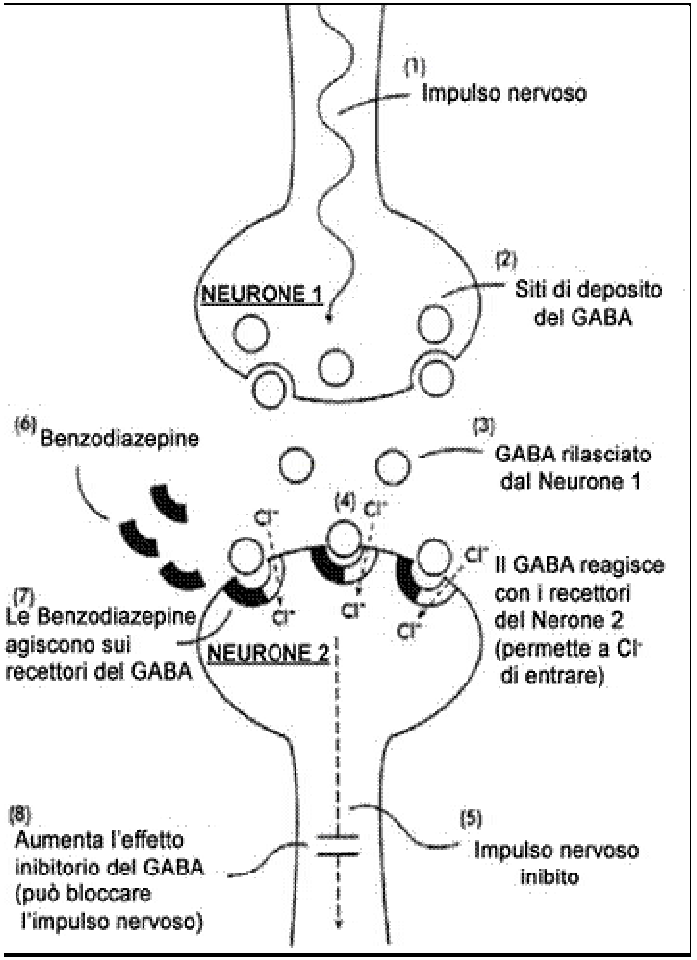
Reazioni avverse

- Cardiovascolare: aritmia, bradi/tachicardia, ipertensione
- Sistema nervoso centrale: pressione intracranica aumentata
- Dermatologica: eritema (transitoria), rash tipo morbillo (transitoria
- Gastrointestinali: Anoressia, nausea, salivazione aumentata, vomito
- Locale: Dolore al sito di iniezione, esantema al sito di iniezione
- Neuromuscolare e scheletrico: tono muscolare scheletrico maggiore (movimenti tonico-clonici)
- Oculare: Diplopia, aumento della pressione intraoculare, nistagmo
- Respiratoria: ostruzione delle vie aeree, apnea, secrezioni bronchiali aumento, depressione respiratoria, laringospasmo
- Varie: anafilassi, dipendenza con l'uso prolungato, reazioni emergenti (comprende confusione, delirio, lo stato onirico, eccitazione, allucinazioni, comportamento irrazionale, immagini vivide)

MIDAZOLAM

Therapeutic Category: Benzodiazepine; Anticonvulsant; Hypnotic; Sedative

Meccanismo d'azione:
Legame stereospecifico ai recettori delle benzodiazepine sul neurone postsinaptico GABAergico posti in diversi siti all'interno del sistema nervoso centrale, tra cui il sistema limbico e formazione reticolare.
Il potenziamento dell'effetto inibitorio del GABA sull'eccitabilità neuronale risulta in una maggiore permeabilità della membrana neuronale a ioni cloruro.
Questo spostamento di ioni cloruro risulta a sua volta in un'iperpolarizzazione (uno stato meno eccitabile, con sedazione ed effetti ansiolitici) e stabilizzazione.



MIDAZOLAM

Modalità di somministrazione e dosaggi pediatrici

> 6 mesi, bambini e adolescenti ≤16 anni:

→OS: Singola dose: 0,25-0,5mg/kg circa 20 minuti prima della procedura (dose massima: 20 mg).

Nota:
I pazienti più giovani (da 6 mesi a <6 anni) e quelli meno cooperativi possono richiedere dosi più elevate (fino a 1mg/kg);
vanno invece utilizzate dosi iniziale più basse (0,25mg/kg) in pazienti con compromissione cardiaca o respiratoria, concomitante depressione del SNC, o pazienti chirurgici ad alto rischio.

→IM: da 0,1 a 0,15mg/kg da 30-60 minuti prima dell'intervento chirurgico (Dose massima totale: 10 mg).

Nota:
dosi fino a 0,5mg/kg sono stati utilizzati in pazienti più ansiosi;

→Rettale: Singola dose: 0,25-0,5mg/kg

→Intranasale: da 0,2 a 0,3mg/kg (dose singola massima: 10 mg);
si può ripetere sino ad un massimo di 0,5mg/kg (dose massima totale: 10 mg)

Nota: alcuni ricercatori suggeriscono la premedicazione con lidocaina intranasale per diminuire l'irritazione e la successiva agitazione (Chiaretti 2011; Lugo 1993)

MIDAZOLAM

→ IntraVenous

➔ Bambini da 6 mesi a 5 anni: iniziale: 0.05 a 0.1mg/kg;
può essere ripetuto ogni 2-5 min, titolare attentamente la dose in base al livello di sedazione desiderato; dose massima totale: 6 mg.

➔ Bambini da 6 a 12 anni: iniziale: 0,025-0,05mg/kg;
può essere ripetuto ogni 2-5 min, titolare attentamente la dose in base al livello di sedazione desiderato; dose massima totale: 10 mg.

➔ Bambini 12 e 16 anni: Dose da adulti; dose massima totale: 10 mg.

ONSET: da 1 a 3 min

DURATA: da 15 a 60 min in relazione alla dose ultilizzata

MIDAZOLAM

- Fornisce sedazione ma NO analgesia. Per le procedure dolorose, un agente analgesico (ad esempio, ketamina, fentanil) deve essere co-somministrato.

- Fornisce amnesia, ansiolisi mite, e lieve sedazione per le procedure che non richiedono completo immobilismo (per esempio, riparazione di lacerazione con anestesia topica locale)

- Il Flumazenil può invertire gli effetti, ma deve essere evitato nei pazienti con disturbi convulsivi

- Effetti comuni negativi: depressione respiratoria e apnea, specialmente se combinata con farmaci oppioidi (ad esempio, fentanil); reazioni paradosse, tra cui iperattività, comportamento aggressivo, e pianto inconsolabile

FLUMAZENIL

USO: antagonista specifico delle benzodiazepine

MECCANISMO D'AZIONE:
Elevata affinità per il recettore delle benzodiazepine ma attività intrinseca minima.
È velocemente metabolizzato nel fegato ed i sui metaboliti sono escreti nelle urine.
Agisce come antagonista competitivo in presenza di agonisti benzodiazepinici.
Inizio d'azione rapido ed una emivita di eliminazione di circa 1 ora.

DOSI:

- 0.2 mg somministrata in 15 secondi.

Se non si ottiene il livello richiesto di coscienza entro 60 secondi può essere somministrata un'ulteriore dose di 0.1 mg e ripetuta ad intervalli di 60 secondi. (Dose massima 1.0 mg)

PROPOFOL

USO: Induzione e mantenimento dell'anestesia generale

MECCANISMO D'AZIONE:
Diminuisce la velocità di dissociazione del GABA dal suo recettore, aumentando in tal modo la durata dell'apertura del canale GABA-attivato dello ione cloro. Inoltre possiede effetti di blocco dei canali ionici nel tessuto della corteccia cerebrale e dei recettori nicotinici dell'acetilcolina, cosi come effetti inibitori sul segnale del lisofosfotidato nei recettori dei mediatori lipidici.

DOSI:

- 25 mcg/kg/min (si può aumentare fino ad 100-200 mcg/Kg/min fino al raggiungimento della sedazione desiderata)
- Bolo: 0.5-1 mg/Kg o 1-2 mg/Kg per bambini compresi tra 6 mesi e 2 anni). Ripete il bolo ogni 3 – 5 minuti fino a dose massima di 3 mg/Kg.
- Ridurre il dosaggio del 50% per bambini con output cardiaco ridotto o ipovolemia

PROPOFOL

Agent	Initial intravenous dose*	Repeat intravenous dose (as needed to achieve desired level of sedation)	Onset (minute)	Duration (minutes)	Comments
Propofol•	Initiate infusion at 25 mcg/kg per minute and titrate gradually to response (range 50 to 200 mcg/kg per minute)Δ OR 0.5 to 1 mg/kg IV bolus dose (children two years of age and older) 1 to 2 mg/kg IV bolus dose (infants 6 months to 2 years of age) Significant dose reduction necessary for patients who are debilitated or with reduced cardiac output	Not applicable for continuous IV infusion, titrate infusion rate as needed OR Additional IV bolus dose 0.5 mg/kg every 3 to 5 minutes titrating as needed up to 3 mg/kg. Wait at least 3 to 5 minutes between doses to assess effect.	≤0.5	5 to 15 after single bolus dose, longer after prolonged infusion or when repeated bolus doses are given	▪ Provides sedation but NO analgesia. For painful procedures, an analgesic agent (eg, ketamine, fentanyl) should be co-administered. Commonly used for diagnostic imaging (CT, MRI). ▪ Rapid onset of sedation with good neurologic recovery. Reduces intracranial pressure. ▪ Peripheral injection site painΔ ▪ Common adverse events: Respiratory depression, oxygen desaturation, apnea, hypotension, and/or rapid transition to deeper levels of sedation, especially with overly rapid administration of bolus injection ▪ Absolute contraindications: Egg or soy allergy, porphyria

PROPOFOL

BENEFICI: inizio d'azione e recupero più rapido rispetto ad altri agenti, riduce la PIC

EVENTI AVVERSI: depressione respiratoria, apnea ed ipotensione.
A causa del rapido inizio e della potenza del farmaco è più difficile da titolare con un piano di sedazione più profondo rispetto al previsto

CONTROINDICAZIONI: attenzione all'allergia alla lecitina del latte, fosfolipidi del tuorlo d'uovo e olio di soia (in 28 bambini con documentata reazione allergica solo 1 ha presentato eritema e orticaria)

DEXMETEDOMIDINA

USO: Sedazione-analgesia di breve durata (<24 ore) di pazienti ventilati meccanicamente

MECCANISMO D'AZIONE: agonista alfa2-adrenorecettore altamente selettivo (alfa-2/alfa-1 1620/1) rispetto alla clonidina. DEX ha mostrato un effetto morfinico maggiore rispetto alla clonidina. Emivita 2-3 ore.
È attivo anche a livello dei recettori periferici alfa2 implicati nella regolazione del sistema cardiovascolare inibendo il rilascio di norepinefrina. Può ridurre i livelli tonici dell'attività del sistema simpatico efferente dal SNC e aumentare l'attività vagale sul cuore.

DOSI:

- Bolo iniziale di 0.5-1 mcg/Kg/min in 10 minuti seguito da infusione di 0.5-1 mcg/Kg/h
- Nasale: 1.5 mcg/Kg
- Bocca: 3-4 mcg/Kg

DEXMETEDOMIDINA

BENEFICI: minor rischio di depressione respiratoria, elevata efficacia nei bambini, utile nello svezzamento dei ventilatori. Effetto anti brivido. Effeto analgesico in dolore lieve e moderato.

EVENTI AVVERSI: Effetti CV:

- basse velocità di infusione causa bradicardia e ipotensione
- velocità di infusione maggiore ipertensione e maggiore bradicardia

Profonda bradicardia descritta in pazienti con patologie di conduzione AV.

CONTROINDICAZIONI: pazienti che assumono farmaci per ridurre la conduzione AV, patologie della conduzione AV, ipotensione

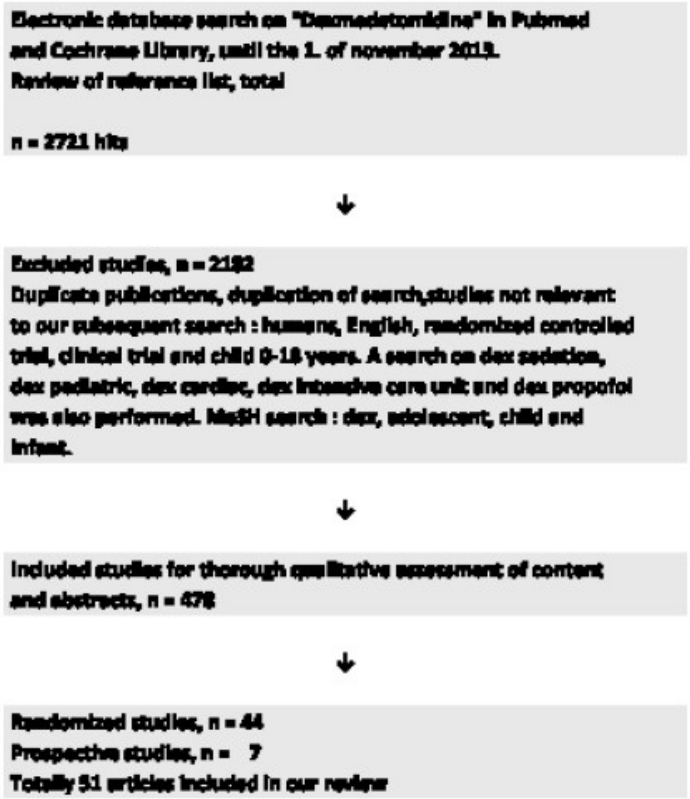
DEXMETEDOMIDINA

Agent	Initial intravenous dose*	Repeat intravenous dose (as needed to achieve desired level of sedation)	Onset (minute)	Duration (minutes)	Comments
Dexmedetomidine	1 to 3 mcg/kg loading dose (over 10 minutes) followed by 0.5 to 2 mcg/kg per **hour** continuous infusion Children younger than 5 years of age may require maintenance infusion rates at the higher end of the range shown	Not applicable for continuous infusion, titrate infusion rate as needed	5 to 10	30 to 70	▪ Sedation and modest analgesia without respiratory depression. Commonly used for diagnostic imaging (CT, MRI). ▪ Common adverse events: Bradycardia, hypertension, or, especially with loading dose, hypotension ▪ Relative contraindications: Children who are debilitated, inadequately hydrated, or have reduced cardiac output ▪ Absolute contraindication: Patients receiving digoxin or other medications acting on sinus node or with sinus node dysfunction

Dexmedetomidine in the pediatric population: a review

M. Z. PLAMBECH [1], A. AFSHARI [2]

[1]Department of Anesthesiology, Copenhagen University, Hvidovre Hospital, Hvidovre, Denmark; [2]Department of Anesthesiology, Copenhagen University, Rigshospitalet, Juliane Marie Center, Copenhagen, Denmark



PREMEDICATION:

- Intranasal Dex administered 60 minutes before induction **appears superior** to oral midazolam administered 30 minutes prior to induction with lower level of sedation while reduced anxiety measured by scoring during separation from parents, and a significantly lower level of pain in the first two hours post-operatively

AGITATION:

- Dex has intraoperatively been compared with fentanyl, for the **reduction of postoperative opioid** consumption and agitation after sevoflurane anesthesia
- A **significant reduction in the postoperative need for opioids**, the incidence and duration of severe agitation, fewer desaturations episodes, and a shorter time to extubation are also some of the other reported benefits

SEDATION:

- For instance, it has been **evaluated satisfactory** for magnetic resonance imaging (MRI) sedation in combination with midazolam *vs*. propofol, but also alone in comparison with propofol and finally in comparison with Midazolam
- The authors found a significantly **shorter onset of sedation, recovery and discharge** time in the Dex group, with lower mean arterial pressure (MAP) without bradycardia. However, the quality of MRI in Dex group was found to be significantly better, with a reduced need for rescue drugs

DISCUSSION:

- Dex is not yet fully approved for use in the pediatric population, it is used extensively and increasingly **off-label** in various settings. The published literature suggests that it has a relatively safe hemodynamic, respiratory and pharmacodynamic profile. However, it is important to state the full safety and efficacy of Dex is yet to be established in children.
- Dex must be administered only as a diluted iv. infusion using a controlled infusion device. Based on the published literature and as stated in, when opting for a continuous infusion for sedation, a dose equivalent to **0.2 to 0.7 µg/kg/h** seems safe and it may not be advisable to exceed 1 µg/kg/h due to lack of evidence. The loading dose when given, ranges from 0.5-1 µg/kg and is typically infused over 10 min. This generally provides clinically effective onset of sedation within 10 to 15 minutes after initiation of infusion. However, there is an ongoing debate on the value of a loading dose because of fear of increased risk of adverse effects.

SELECTION OF MEDICATIONS FOR PEDIATRIC PROCEDURAL SEDATION

NCGC National Clinical Guideline Centre

Sedation in children and young people

Sedation for diagnostic and therapeutic procedures in children and young people

Commissioned by the National Institute for Health and Clinical Excellence

Published by the National Clinical Guideline Centre at

The Royal College of Physicians, 11 St Andrews Place, Regents Park, London, NW1 4BT

First published December 2010

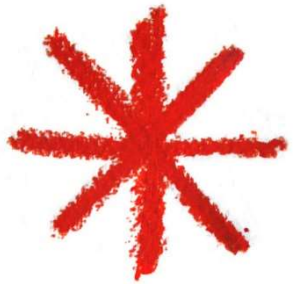
CHOICE OF SEDATIVE AGENTS

- Clinical settings e la profondità mirata di sedazione
- Dipende dal grado di dolore previsto
- Quantità di movimento consentito durante la procedura
- Fattore paziente

CLINICAL SETTINGS
AND THE TARGETED DEPTH OF SEDATION

- painless imaging
- painful procedures
- dental procedures
- endoscopy

SEDATION IN CHILDREN AND YOUNG PEOPLE
The Royal College of Physicians,



CHOICE OF SEDATIVE AGENTS

The level of sedation achieved depends on the drug used and the dose at which it is given. When choosing between sedation techniques, healthcare professionals must consider the effectiveness of the drug in achieving the required level of sedation, the duration of that effect, and the margin of safety between the dose required to achieve sedation and the dose that is likely to cause anaesthesia.

SEDATION IN CHILDREN AND YOUNG PEOPLE
The Royal College of Physicians,

SEDATION FOR PAINFUL PROCEDURES
Analgesia

- KETAMINE has both sedative and analgesic properties and can thus be used alone to provide sedation for painful procedures.
- DEXMEDETOMIDINE have limited analgesic properties that may be inadequate. Additional analgesic medications are needed for moderately or severely painful procedures
- MIDAZOLAM AND PROPOFOL do not have analgesic properties and need to be combined with other analgesic agents
- Options for supplementary analgesia include topical, local, and regional infiltrated anesthetics and systemic analgesic medications

PAINFUL PROCEDURES

- **Minimally Painful**
- **Moderately Painful**
- **Severely Painful**

SEDATION FOR PAINFUL PROCEDURES
Minimally painful

- Local anesthetics can be delivered topically or by direct infiltration to diminish or abolish the pain without the need for sedation, especially when age-appropriate nonpharmacologic interventions are used

A total of 60 obese children and adolescents and 30 growth-retarded children and adolescents, aged 5 to 18 years, with reported anxiety and/or difficulties with IV access. The patients were randomly assigned to receive midazolam os (dose, 0.3 mg/kg; maximum dose, 15 mg), 50% nitrous oxide, or 10% nitrous oxide. All patients received lidocaine-prilocaine.
Compared with treatment with midazolam, **treatment with 50% nitrous oxide during IV line procedures results in a shorter total procedure time, improved rate of IV access, and a better experience for the child or adolescent.**
Only under rare circumstances should obese children or adolescents be treated with midazolam because of the long procedure time.

Ekborm K, Kalman S, Jakobsson J, Efficient intravenous access without distress: a double-blind randomized study of midazolam and nitrous oxide in children and adolescents. Arch Pediatr Adolesc Med 2011; 165:785.

Sedation of children undergoing dental treatment (Review)

Lourenço-Matharu L, Ashley PF, Furness S

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2012, Issue 3

http://www.thecochranelibrary.com

WILEY

SEDATION OF CHILDREN UNDERGOING DENTAL TREATMENT

36 RCT, 2810 participants

- Bambini e adolescenti di età tra 0 e 16 anni (includendo anche bambini con disturbi del comportamento e bambini fragili)
- Bambini che hanno bisogno di un semplice trattamento ricostruttivo in anestesia locale, o estrazioni o management del trauma dentale (es: riposizionamento)

O B J E C T I V E S

Valutare l'efficacia e i dosaggi dei farmaci sedativi in relazione alla gestione del comportamento in paediatric dentistry.

SEDATION OF CHILDREN UNDERGOING DENTAL TREATMENT

Trials have been placed in 3 groups:

- those comparing active treatment with a *placebo*;
- those comparing different *doses of the same agent* (or different routes of administration of the same agent);
- those which compare *different agents* head to head.

TYPES OF OUTCOME MEASURES

Primary

Behaviour

Secondary

1. Completion of treatment (yes/no)
2. Postoperative anxiety
3. Adverse events

SEDATION OF CHILDREN UNDERGOING DENTAL TREATMENT

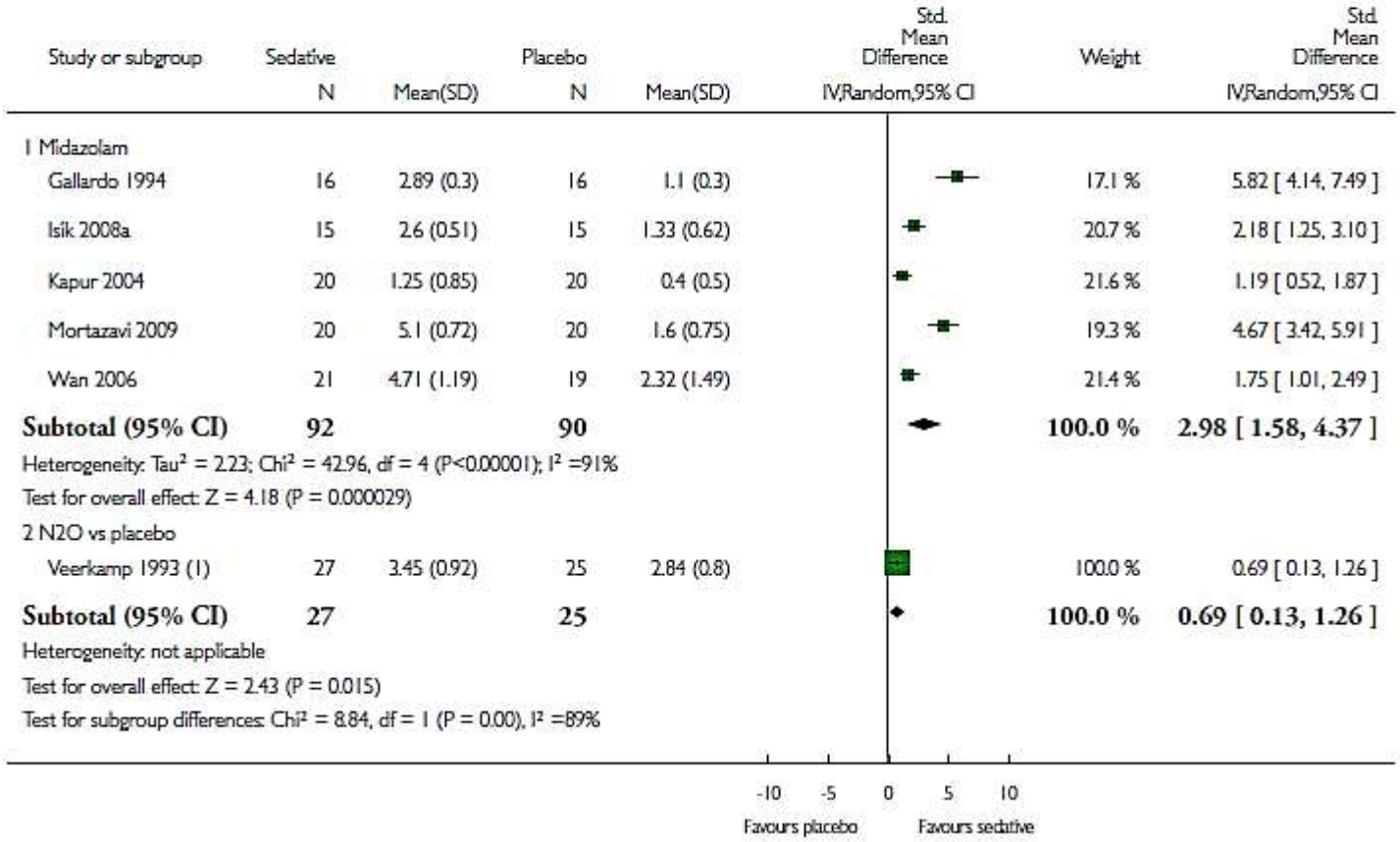
Table 1. Comparison of behaviour/sedation rating scales

Score	Ramsay sedation scale	Briekopf & Buttner emotional status scale	Frankl behaviour rating scale	Houpt behaviour Rating Scale
1	Awake, anxious & agitated, restless or both	Irritated: awake, restless, crying	Refusal/distress	Aborted: no treatment rendered
2	Awake, co-operative, orientated, tranquil	Normal: awake, calm	Unco-operative/reluctant	Poor: treatment interrupted, only partial treatment was completed
3	Awake responds to commands only	Inactive: tired, hardly moving	Co-operative/reserved	Fair: treatment interrupted but eventually completed
4	Asleep, brisk response	Sleepy: drowsy, with reaction but rousable	Interested/enjoyed	Good: difficult but all treatment was performed
5	Asleep, sluggish response			Very good: some limited crying & movement
6	Asleep, no response			Excellent: no crying or movement

(from Wan 2006)

PLACEBO STUDIES:

Rispetto al placebo, la somministrazione di midazolam per via orale, migliorava il comportamento dei bambini, con variazioni proporzionali al dosaggio usato.
Rispetto al placebo anche l'inalazione di protossido di azoto era efficiente, senza effetti collaterali notabili.



SUMMARY OF MAIN RESULTS

DOSAGE STUDIES

Two studies (Aydintug 2004; Isik 2008b) evaluated oral midazolam:

Aydintug 2004 compared 0.5 mg/kg oral midazolam versus 0.35mg/kg rectal midazolam and found both to be effective with no differences in behaviour between the groups.

Isik 2008b randomised children to oral doses of either 0.2 mg/kg, 0.5 mg/kg, 0.75 mg/kg or 1 mg/kg after fasting for 3 to 5 hours.
All children also received 40% nitrous oxide in oxygen.
Children in groups 3 and 4 had a statistically significantly greater sedation score compared to those in groups 1 and 2 (P< 0.05)
Sedation was considered inadequate in 86%, 38%, 23%and 38%of children in groups 1 to 4 respectively.
Three children in group 4 (1mg/kg) had delayed recovery time and in one patient a desaturation.
Authors recommended the **0.75 mg/kg dose** as providing adequate sedation with good recovery time and few adverse effects.

DOSAGE STUDIES

Il midazolam orale alla dose da 0.5 a 0.75 mg/kg è un efficiente sedativo per bambini.

SUMMARY OF MAIN RESULTS

PLACEBO STUDIES:

Rispetto al placebo, la somministrazione di midazolam per via orale, migliorava il comportamento dei bambini, con variazioni proporzionali al dosaggio usato.
C'è una debole evidenza in 2 studi, e cioè che l'inalazione di protossido di azoto era anche molto efficiente rispetto al placebo, senza effetti collaterali notabili.
Ciò suggerisce che questo potrebbe essere un efficace metodo di gestione del comportamento dei bambini.

DOSAGE STUDIES

Il midazolam orale alla dose da 0.5 a 0.75 mg/kg è un efficiente sedativo per bambini.

COMPARISON STUDIES

In questo gruppo non sono stati trovati 2 studi che hanno testano lo stesso intervento.
Non c'è sufficiente evidenza per stabilire alcuna conclusione da questi studi.

SEDATION FOR PAINFUL PROCEDURES
MODERATELY OR SEVERELY PAINFUL

SEDATION FOR PAINFUL PROCEDURES
MODERATELY OR SEVERELY PAINFUL

•Procedural sedation with intravenous ketamine, ketamine combined with midazolam or ketamine combined with propofol

•Ketamine alone or in combination with midazolam or propofol provides more effective sedation and anxiolysis for very painful procedures, such as fracture reduction or bone marrow aspiration, than n2o2 alone and lower risk of respiratory events during sedation than opioids combined with midazolam or propofol

•Although vomiting may occur more frequently in patients who receive ketamine sedation without propofol than other sedation regimens, this adverse effect can be mitigated by pretreatment with ondansetron or combination sedation with propofol

Shah a, mosdossy g, mcleod s, lehnhardt k, peddle m, rieder m.
A blinded, randomized controlled trial to evaluate ketamine/propofol versus ketamine alone for procedural sedation in children. Ann emerg med. 2011;57(5):425.

Pediatrics. 1998 Oct;102(4 Pt 1):956-63.

Comparison of fentanyl/midazolam with ketamine/midazolam for pediatric orthopedic emergencies.

Kennedy RM[1], Porter FL, Miller JP, Jaffe DM.

- In a blinded trial of 260 children, 5 to 15 years of age
- Patients who received ketamine combined with midazolam had clinically significantly lower distress during the procedure and higher orthopedist satisfaction than those who received midazolam and fentanyl.
- Sedation with ketamine and midazolam was associated with clinically significantly fewer respiratory complications than midazolam and fentanyl (hypoxia: 6 versus 24%, respectively; breathing cues: 1 versus 12%, respectively; and supplemental oxygen requirement: 10 versus 20%, respectively)

Pediatrics. 2003 Jul;112(1 Pt 1):116-23.

Comparison of propofol/fentanyl versus ketamine/midazolam for brief orthopedic procedural sedation in a pediatric emergency department.

Godambe SA[1], Elliot V, Matheny D, Pershad J.

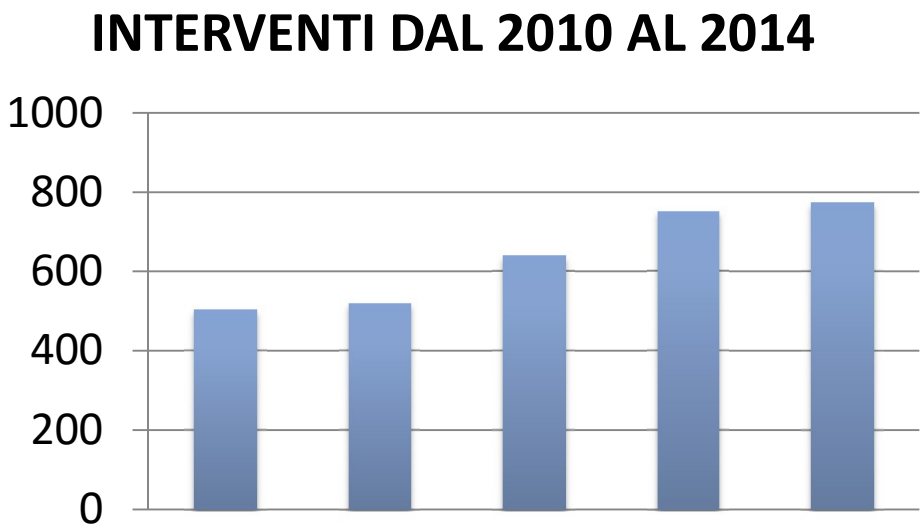
- In a trial of 113 children, 3 to 18 years of age
- patients who received ketamine and midazolam had clinically significantly lower distress during the procedure and higher orthopedist satisfaction than those who received midazolam and fentanyl

Evidence favors ketamine alone or in combination with midazolam as an effective and safe sedative regimen for children undergoing brief, painful procedures in the emergency department.

SEDAZIONE NEL REPARTO PEDIATRICO DI MAXILLO FACCIALE DI BRESCIA

PROBLEMATICHE NELLE SEDAZIONI IN MAXILLO FACCIALE:

- Unico reparto pediatrico di maxillofacciale in Italia
- Campo operatorio a livello delle vie aeree
- Incremento degli interventi annuali e giornalieri



PSYCHOLOGICAL PREPARATION

PARENTAL PRESENCE IN ANAESTHESIA INDUCTION

L'autorizzazione alla presenza dei genitori durante l'induzione in anestesia, è controversa, in molti casi si basa sull'equilibrio tra la richiesta dei genitori e le preferenze degli anestesisti.

AGAINIST:

- la non prevedibile risposta del genitore alla situazione,
- l'incremento dei livelli di ansia e stress del genitore,
- i problemi logistici di movimento dentro e fuori dall'area,
- l'extra stress sull'anestesista a causa della presenza di un osservatore emozionalmente coinvolto e le potenziali implicazioni legali di avere un genitore presente.

SUPPORTERS:

- il trauma da separazione è evitato,
- questo aumenta la collaborazione del bambino,
- minimizza la necessità di premedicazione,
- diminuisce nel bambino l'ansia durante l'induzione,
- facilita il comportamento a lungo termine di successive operazioni chirurgiche e migliora la soddisfazione dei genitori.

PSYCHOLOGICAL PREPARATION

Techniques recommended include:

- *Tell-show-do*
- *Voice control*
- *Positive reinforcement*

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PSYCHOLOGICAL PREPARATION

Tell-show-do è una tecnica di modelling del comportamento descritta da Addelston che coinvolge spiegazioni verbali delle procedure in frasi (cosa, perché e come una procedura verrà eseguita) adeguata al livello di sviluppo del paziente (dire);
Dimostrazione per il paziente dell'aspetto visivo, uditivo, olfattivo, e tattili della procedura in un ambiente mostrato sicuro e non minaccioso (mostra);
e poi completare la procedura (fare), delicatamente, senza alcuna pausa e senza deviare dalla spiegazione e dimostrazione.
La tecnica tell-show-do viene utilizzata con capacità di comunicazione (verbale e non verbale) e rinforzo positivo.

Voice control controllo del volume, del tono e del ritmo della voce in modo da influenzare il comportamento del paziente.

Positive reinforcement riguarda la ricompensa ai comportamenti desiderati sia con atteggiamenti sociali positivi, come una voce e un'espressione del viso rassicuranti, elogi verbali, e adeguate dimostrazioni fisiche di affetto da parte di tutti i membri del team odontoiatrico, che con rinforzi positivi non sociali, come oggetti e giocattoli.

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CHOICE OF SEDATIVE AGENTS

- Clinical settings and the targeted depth of sedation
- Depend upon the anticipated degree of pain
- The allowable amount of motion encountered during the procedure
- Patient factors

CLINICAL SETTINGS AND THE TARGETED DEPTH OF SEDATION

- painless imaging
- painful procedures
- dental procedures
- endoscopy

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CHOICE OF SEDATIVE AGENTS

The level of sedation achieved depends on the drug used and the dose at which it is given. When choosing between sedation techniques, healthcare professionals must consider the effectiveness of the drug in achieving the required level of sedation, the duration of that effect, and the margin of safety between the dose required to achieve sedation and the dose that is likely to cause anaesthesia.

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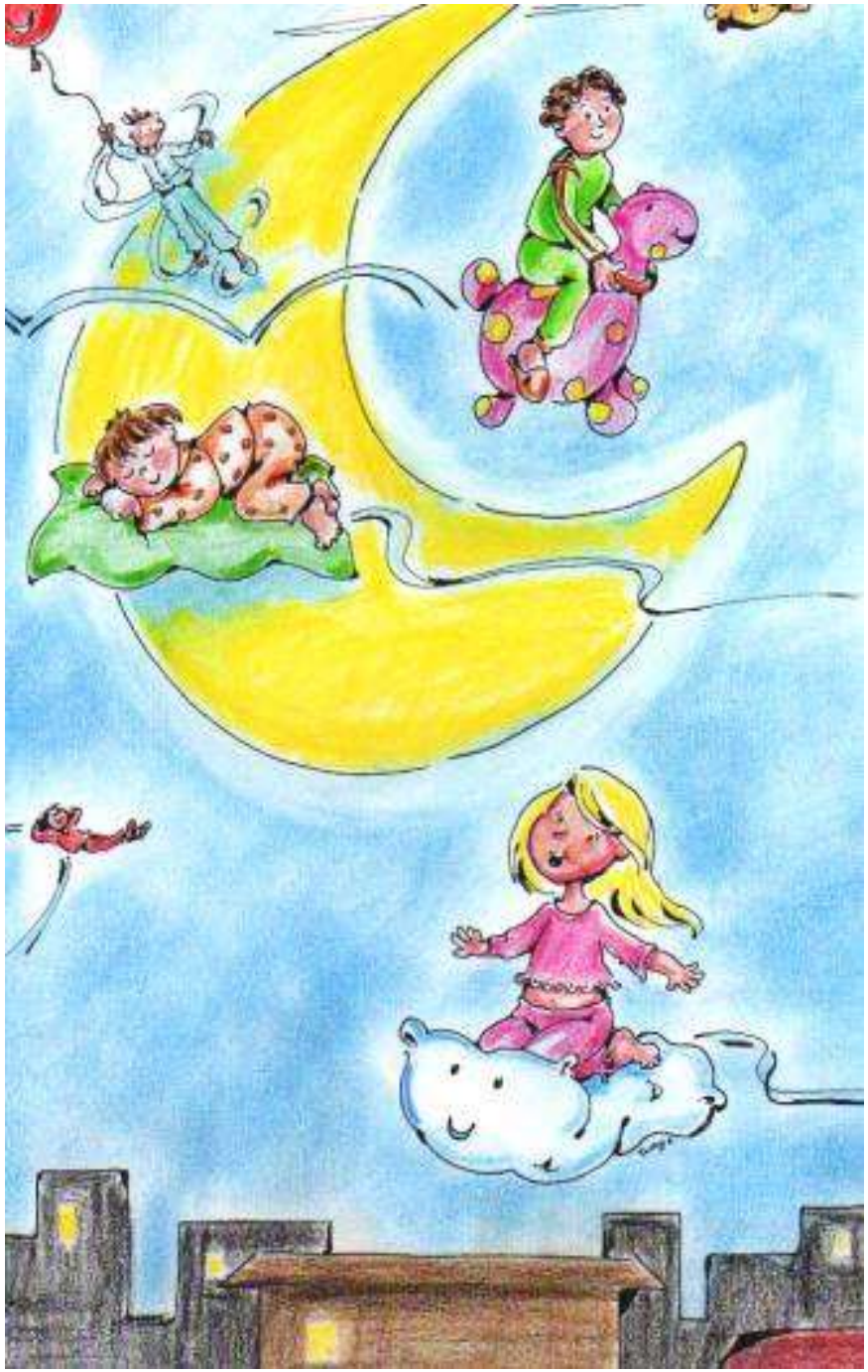
SPEDALI CIVILI DI BRESCIA
SEDAZIONE NEL REPARTO PEDIATRICO DI MAXILLO FACCIALE



1. MANCANZA ACCESSO VENOSO

- <u>Bambini con peso corporeo ≤ 15 kg</u>
  Midazolam (0.1mg/kg) I.M.
  + Ketamina (4-8 mg/Kg) I.M.
  e conseguente reperimento
  accesso venoso di sicurezza

+/- **ANESTESIA LOCALE**
+
STARTER ANTALGICO
Paracetamolo 15mg/kg
+ Ketoprofene 1,5mg/kg

SPEDALI CIVILI DI BRESCIA
SEDAZIONE NEL REPARTO PEDIATRICO DI MAXILLO FACCIALE

1. MANCANZA ACCESSO VENOSO

- Bambini con peso corporeo ≥ 15 kg

Sevoflorane in maschera facciale
e conseguente reperimento
accesso venoso di sicurezza

Latte di fata:
Midazolam 0,1mg/kg + Propofol 1% 3mg/kg

2. PRESENZA ACCESSO VENOSO

Latte di fata:
Midazolam 0,1mg/kg + Propofol 1% 3mg/kg

+/- **ANESTESIA LOCALE**
+
STARTER ANTALGICO
Paracetamolo 15mg/kg
+ Ketoprofene 1,5mg/kg

In some settings, the use of local anaesthesia was included because the effect of analgesia is likely to be crucial to the success of any sedation for painful procedures.

Special considerations

Local anesthetic agents

All local anesthetic agents are cardiac depressants and may cause central nervous system excitation or depression. Particular attention should be paid to dosage in small children.[64,66] To ensure that the patient will not receive an excessive dose, the maximum allowable safe dosage (ie, mg/kg) should be calculated before administration. There may be enhanced sedative effects when the highest recommended doses of local anesthetic drugs are used in combination with other sedatives or narcotics (see Tables two and three for limits and conversion

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In some settings, the use of local anaesthesia was included because the effect of analgesia is likely to be crucial to the success of any sedation for painful procedures.

Table 2. COMMONLY USED LOCAL ANESTHETIC AGENTS: DOSES, DURATION, AND CALCULATIONS*

Local anesthetic	Maximum dose with Epinephrine (mg/kg)		Duration of action (min) ‡
	Medical	Dental	
Esters			
Procaine	10.0	6	60-90
Chloroprocaine	20.0	12	30-60
Tetracaine	1.5	1	180-600
Amides			
Lidocaine	7.0	4.4	90-200
Mepivacaine	7.0	4.4	120-240
Bupivacaine	3.0	1.3	180-600
Levobupivacaine	3.0	2	180-600
Ropivacaine	3.0	2	180-600
Articaine		7	60-230

* Maximum recommended doses and duration of action. Note that lower doses should be used in very vascular areas.

† These are maximum doses of local anesthetics combined with epinephrine; lower doses are recommended when used without epinephrine. Doses of amides should be decreased by 30 percent in infants younger than six months. When lidocaine is being administered intravascularly (eg, during intravenous regional anesthesia), the dose should be decreased to three to five mg/kg; long-acting local anesthetic agents should not be used for intravenous regional anesthesia.

‡ Duration of action is dependent on concentration, total dose, and site of administration; use of epinephrine; and the patient's age.

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Protocollo…

Grazie per l'attenzione!