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CLINICAL EFFECTIVENESS COMMITTEE Guideline for ketamine sedation of children in Emergency Departments

Summary of recommendations

1. Before ketamine is used all other options should be fully considered, including analgesia, reassurance, distraction, entonox, intranasal diamorphine, etc.
2. The doses advised for analgesic sedation are designed to leave the patient capable of protecting their airway. There is a significant risk of a failure of sedation if the procedure is prolonged, and the clinician must recognise that the option of general anaesthesia may be preferred in these circumstances.
3. There is no evidence that complications are reduced if the child is fasted, however traditional anaesthetic practice favours a period of fasting prior to any sedative procedure. The fasting state of the child should be considered in relation to the urgency of the procedure, but recent food intake should not be considered as an absolute contraindication to ketamine use.
4. Ketamine should be only used by clinicians experienced in its use and capable of managing any complications, particularly airway obstruction, apnoea and laryngospasm. The doctor managing the ketamine sedation and airway should be suitably trained and experienced in ketamine use, with a full range of advanced airway skills.
5. At least three staff are required: a doctor to manage the sedation and airway, a clinician to perform the procedure and an experienced nurse to monitor and support the patient, family and clinical staff. Observations should be regularly taken and recorded.
6. The child should be managed in a high dependency or resuscitation area with immediate access to full resuscitation facilities. Monitoring should include ECG, blood pressure, respiration and pulse oximetry. Supplemental oxygen should be given and suction must be available.
7. After the procedure the child should recover in a quiet, observed and monitored area under the continuous observation of a trained member of staff. Recovery should be complete between 60 and 120 minutes, depending on the dose and route used.
8. There should be a documentation and audit system in place within a system of clinical governance.

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Scope

This guideline is to assist experienced emergency physicians using ketamine sedation for children in Emergency Departments. This guideline covers the use of ketamine for analgesic sedation in children via either the intravenous or intramuscular route.

Reason for development

This guideline has been prepared to improve and standardise patient care.

Introduction

Ketamine is a unique dissociative drug introduced into clinical practice in 1970. It has anxiolytic, analgesic, amnesic and dissociative properties with a wide safety margin. It is most commonly used to facilitate short painful procedures, such as suturing under local anaesthetic, removal of a foreign body or brief orthopaedic manipulations.

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Ketamine should be only used by clinicians experienced in its use and capable of managing any complications, particularly airway obstruction, apnoea and laryngospasm.

There should be a documentation and audit system in place within a system of clinical governance.

Indications: (Evidence Levels 2-3)

Ketamine can be used to induce analgesic sedation in children who will need a painful or frightening procedure during the course of their emergency care. It can be used instead of general anaesthesia for minor and moderate procedures in combination with local anaesthetic techniques.

It avoids the need to physically restrain a child.

Trials suggest over 90% efficacy for parenteral Ketamine.

There is no evidence of improved emergence phenomena if midazolam is used as a supplement. (Evidence level 2)

There is no evidence of reduced airway problems if atropine is used as a supplement with low dose ketamine. (Evidence level 3)

Contraindications: (Evidence levels 4 and 5)

- Age less than 12 months due to an increased risk of laryngospasm and airway complications. Children aged between 12 and 24 months should only receive ketamine sedation from expert staff (usually a consultant)
- A high risk of laryngospasm (active respiratory infection, active asthma)
- Unstable or abnormal airway. Tracheal surgery or stenosis.
- Active upper or lower respiratory tract infection
- Proposed procedure within the mouth or pharynx
- Patients with severe psychological problems such as cognitive or motor delay or severe behavioural problems.
- Significant cardiac disease (angina, heart failure, malignant hypertension)
- Recent significant head injury or reduced level of consciousness
- Intracranial hypertension with CSF obstruction.
- Intra-ocular pathology (glaucoma, penetrating injury)
- Previous psychotic illness
- Uncontrolled epilepsy
- Hyperthyroidism or Thyroid medication
- Porphyria
- Prior adverse reaction to Ketamine

Procedure:

1. Discuss the proposed procedure and use of ketamine with parent or guardian and obtain written consent. The known risks are: mild agitation (20%), moderate/severe agitation (1-5%), rash (10%), vomiting (7%), transient clonic movements (5%), airway problems (1%). It is important to emphasise to the consenting adult that nystagmus, purposeless movements and some degree of dissociation are normal during ketamine sedation, so that these are expected.
2. The child should be managed in a high dependency or resuscitation area with immediate access to full resuscitation facilities. Monitoring should include ECG, blood pressure, respiration and pulse oximetry. Supplemental oxygen should be given and suction must be available.
3. At least three staff are required: a doctor to manage the sedation and airway, a clinician to perform the procedure and an experienced nurse to monitor and support the patient, family and clinical staff. Observations should be regularly taken and recorded.
4. The doctor managing the ketamine sedation and airway should be suitably trained and experienced in ketamine use, with a full range of advanced airway skills.
5. There is no evidence that complications are reduced if the child is fasted, however traditional anaesthetic practice favours a period of fasting prior to any sedative procedure. The fasting state of the child should be considered in relation to the urgency of the procedure, but recent food intake should not be considered as an absolute contraindication to ketamine use.
6. Where time permits, topical anaesthesia (EMLA, Amytop, etc.) should be used to reduce the pain of intravenous cannulation or intramuscular injection.
7. The dose of ketamine is 1.0 mg/kg by slow intravenous injection over at least one minute or 2.5mg/kg IM as a single injection in the lateral aspect of the thigh. The dose should be based on the child's actual weight, not age. Caution and careful checking are required in drawing up the correct dose since there are three different formulations of ketamine available (10mg/l, 50mg/ml and 100mg/ml). A dose chart showing the correct dose and volume to be given according to the child's weight is valuable in preventing errors (see Appendix Two for an example of such a chart).

8. Encourage the child to child and parents to talk (dream) about happy topics. This helps minimise unpleasant emergency phenomena
9. Adequate sedation is usually indicated by loss of response to verbal stimuli and nystagmus: heart rate, blood pressure and respiration rate may all increase slightly. Lacrimation or salivation may be observed. The effects of the drug are usually apparent 1-2 minutes after an IV dose, and 5 minutes after an IM dose.
10. Supplemental doses of 0.5mg/kg by slow IV injection or 1mg/kg IM may be given if required.
11. Local anaesthetic should be used where indicated.
12. After the procedure the child should recover in a quiet, observed and monitored area under the continuous observation of a trained member of staff. Recovery should be complete between 60 and 120 minutes, depending on the dose and route used.
13. The child can be safely discharged once they are able to ambulate and vocalise/converse at pre-sedation levels. An advice sheet should be given to the parent or guardian advising rest and quiet, supervised activity for the remainder of that day. The child should not eat or drink for two hours after discharge because of the risk of nausea and vomiting.
14. The medical record and local audit documentation should be completed.
15. At the end of the procedure ensure that any remaining ketamine is discarded, and that this is witnessed. The empty bottle can then be placed in a sharps bin.

Potential Complications: (evidence level 2, 3, 4)

Airway:

- Noisy breathing is usually due to airway mal-position and occurs at an incidence of <1%. This can normally be corrected by routine airway position management.
- In rare cases laryngospasm may occur (0.3%). The reported incidence of intubation for laryngospasm is 0.02%. A recent meta-analysis showed that low IM doses of ketamine (<3.0 mg/kg) exhibited significantly less overall airway and respiratory adverse events. There were no occurrences of either laryngospasm or apnoea in the 682 children receiving lower IM doses. (Green et al, 2008)

Vomiting: 5 - 10% incidence. This usually occurs during the recovery phase.

Lacrimation and salivation: 10% incidence

Transient rash: 10% incidence

Transient clonic movements: <5%

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Review

The clinical effectiveness committee approved this guideline in July 2009. It will be reviewed in September 2012 or sooner if important evidence becomes available.

Disclaimers

The College recognises that patients, their situations, Emergency Departments and staff all vary. This guideline cannot cover all possible scenarios. The ultimate responsibility for the interpretation and application of this guideline, the use of current information and a patient's overall care and wellbeing resides with the treating clinician.

Research Recommendations

None identified.

Audit standards

There should be a documentation and audit system in place within a system of clinical governance.

Key words for search

Ketamine, sedation, child.

Appendix 1

Methodology

Where possible, appropriate evidence has been sought and appraised using standard appraisal methods. High quality evidence is not always available to inform recommendations. Best Practice Guidelines rely heavily on the consensus of senior emergency physicians and invited experts.

Evidence Levels

1. Evidence from at least one systematic review of multiple well designed randomised control trials
2. Evidence from at least one published properly designed randomised control trials of appropriate size and setting
3. Evidence from well designed trials without randomisation, single group pre/post, cohort, time series or matched case control studies
4. Evidence from well designed non experimental studies from more than one centre or research group
5. Opinions, respected authority, clinical evidence, descriptive studies or consensus reports.

Appendix 2

Example dose chart: KETAMINE 100 mg/ml solution for I.M. use in children.

Kg	Dose 2.5mg/kg	(mg)	Volume (ml) 100 mg/ml
10	25		0.26
11	27.5		0.28
12	30		0.30
13	32.5		0.34
14	35		0.36
15	37.5		0.38
16	40		0.40
17	42.5		0.44
18	45		0.46
19	47.5		0.48
20	50		0.50
21	52.5		0.54
22	55		0.56
23	57.5		0.58
24	60		0.60
25	62.5		0.64
26	65		0.66
27	67.5		0.68
28	70		0.70
29	72.5		0.74
30	75		0.76

Appendix 3: Example Monitoring Chart for Ketamine Sedation

Patient details

Weight _____ kg

Date _____

Time _____

Doctor performing procedure _____

Doctor performing sedation _____

Nurse present _____

Time(s)																						
Ketamine dose (state IV or IM)																						
Other drugs																						
Conscious level (AVPU)																						
O ₂ l/min																						
SpO ₂ %																						
ECG sinus / ectopics etc																						
	200																					
	190																					
	180																					
	170																					
	160																					
	150																					
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	130																					
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	10																					
	5																					

Appendix 4: Patient and Parent information

Example Ketamine Information Sheet for Parents

Part One: About sedation and ketamine

Your child may become distressed or have pain when having certain procedure (tests or treatments). Sedation for procedures (procedural sedation) aims to reduce your child's pain and anxiety. The sedation may make your child feel sleepy and relaxed, meaning the procedure can be performed more easily and with less distress for you and your child. Your child may not remember the procedure at all or only remember small amounts only. This is normal.

Ketamine is commonly used in hospitals for sedation in children. There are some special features about sedation with ketamine for you to know:

- Your child will be cared for by a senior doctor and nurse
- It is given by injection into a vein or into the muscle of the thigh
- Your child may seem to be awake after receiving ketamine
- Your child may move a little without obvious cause, this is normal
- Your child's eyes may twitch, this is normal
- Your child may report odd dreams on waking up, and may become a little agitated (less than 20% of children experience this). This tends to improve if you comfort your child in a quiet area until they are fully awake
- One in ten children develop a rash
- One in ten children vomit
- One in ten children will have some eye watering, or may drool
- One in twenty children have some twitching movements
- Rarely (0.3%) there can be laryngospasm (vocal cords close)
- In 0.02% of cases your child may need to be given a general anesthetic with a breathing tube placed in their windpipe.

Part Two: How to help your child

Before the procedure

- Ask the doctor/ nurse to explain the procedure to you and to your child. If you do not understand please tell us
- Talk to your child about some ways to cope (for example — looking at a book, using their imagination to be in a nice place or blowing bubbles)
- Try not to be too upset or nervous yourself as your child will notice this.

During the procedure

- A parent (or another adult) who knows your child may stay with them and this is usually helpful for your child
- Depending on how deeply sedated your child becomes, they may need reminders of the coping methods you decided upon earlier. This sort of distraction is very helpful
- Giving your child a sense of control with some simple choices is helpful. We can allow them to choose things they may like e.g. music and which finger the oxygen probe may be placed on
- It is not helpful to allow your child to decide the exact moment the procedure is going to happen.

Following the procedure

- Remain with your child. They may not remember where they are or why they are in hospital
- Focus on the good things your child did.

Part Three: After you go home

Sometimes the delayed effects of the medicines may make your child a bit confused, sleepy or clumsy. You need to be extra careful in caring for and supervising your child for the next 24 hours.

- Most children recover within 90 minutes. Your child will be safe to go home when they are fully awake, can walk unaided and manage to drink without vomiting. Once home they should be closely supervised for the first 8 hours and avoid strenuous play or sporting activity for 24 hours
- Supervise all playing and bathing for the next 8 hours after getting home. DO NOT let your child swim or use play equipment (bikes, monkey bars etc) that might cause an accident for the next 24 hours.
- Sometimes children may feel sick or vomit if they eat a big meal too soon after sedation. Give your child small amounts of clear liquids such as diluted fruit juice, ice lollies, jelly, clear soup etc. and wait two hours before giving them a meal
- Let your child sleep. Children may go to sleep again after getting home from the hospital. Sometimes children may sleep more because of the sedation medicine; this is normal
- If you have any concerns that your child may be experiencing problems relating to the sedation that they have received, please contact the local Emergency Department to discuss the issues with a senior doctor or nurse.

Appendix 5: Example Discharge Advice for Parents

Your child has had a procedure undertaken using a medicine called Ketamine. You should be extra vigilant for the next 24 hours. If you have any questions please do not hesitate to contact the Emergency Department on XXXX.

Following discharge we would advise;

- No eating and drinking for the next 2 hours and until your child is completely awake and alert and has no nausea
- No playing that requires coordination (bikes / swings/ monkey bars etc) for the next 24 hours as these activities might result in your child injuring themselves
- No swimming without adult supervision for 24 hours
- Supervise all playing and bathing for the next 8 hours
- Return to the Emergency Department immediately if your child's breathing appears abnormal, they vomit more than once or they have any other symptoms about which you are concerned.