

Sedation Manual

2nd Edition

December 2008



Paediatric Procedural Sedation



**Emergency Department
Royal Children's Hospital**

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Objectives & Limitations

The sedation program has been developed to minimize risks associated with procedural sedation of children in the emergency department. As a risk reduction strategy this program strives to ensure that doctors and nurses are familiar with the theoretical background and have the practical skills to participate in procedural sedation of children in the emergency department setting.

The program is multifaceted: in addition to the manual, the program includes lectures, multiple choice examinations and direct training. Standardized materials are used, including a sedation check list, parent handout and consent form. The program requires the completion of basic life support (BLS), paediatric life support (PLS) or advanced paediatric life support (APLS) training. It does not include airway training. Paediatric airway training is provided in the operating theatre as part of the emergency department rotation for registrars.

We are grateful for the constructive feedback we have received from many emergency staff at Royal Children's Hospital and from other hospitals. A number of changes have been implemented in the 2nd edition of this manual and the sedation record. Based on trainee feedback we have expanded the scientific background sections for the sedation agents used. Based on a review of emergency department sedation registry data midazolam was only used in 1% of all sedation. We have therefore excluded midazolam from the education program.

The materials were specifically developed for use in the emergency departments at the Royal Children's Hospital and Sunshine Hospital. The agents used, staffing and training background of doctors and nurses and the back-up systems available are specific to the emergency departments where this program was originally developed. Transferring this program into other settings or other hospitals will require the adjustment of the materials and processes outlined and co-ordination with relevant hospital departments such as anaesthesia. The methods described in this manual cannot be guaranteed to be safe and efficacious in all circumstances. Unexpected adverse events are possible even in healthy children. Sedative agents should only be used by those with appropriate training and experience in a hospital environment with facilities and back up to the standards recommended by the American Academy of Pediatrics¹ and other relevant bodies^{2,3}.

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Sedation Competency

The Process

All doctors and nurses working in the Royal Children's Hospital Emergency Department must be sedation accredited prior to administering or assisting with the administration of any sedative agents. The process of accreditation is as follows:

- Read sedation manual.
- Complete online MCQ – “**General Sedation and Nitrous oxide**” and “**Ketamine administration**”. This is located on the RCH intranet at the following address: http://www.rch.org.au/emerg_quiz/index.php. A pass mark of 90% is required for the multiple choice questions.
- Attend sedation lecture
- Practical demonstration of nitrous oxide delivery systems.
- Practical competency assessment of nitrous oxide delivery system undertaken by the nurse educator or nurse facilitators.
- Demonstration of a current Basic Life Support (BLS) certification. Paediatric Life Support (PLS) or Advanced Paediatric Life Support (APLS) certification is expected for registrars, fellows and nurses.

Module 1

General Sedation

Overview

Children experience a more intense physical and emotional reaction to painful or threatening procedures than adults. The goals of sedation of children in the emergency department include minimizing pain, anxiety, the patient's movement which may jeopardize the procedure and maximizing the chances of success for the procedure performed, returning the patient to his or her pre-sedated state as quickly as possible while assuring the patient's safety⁴. In addition to minimizing the negative psychological experience for the child, sedation will reduce fear and distress in subsequent presentations to health care facilities.

Sedation for diagnostic, interventional medical and surgical procedures includes the administration by any route or technique of all forms of drugs that result in depression of the central nervous system. Sedation is not without risk because of the potential for unintentional loss of consciousness, depression of protective airway reflexes, depression of respiration, depression of cardiovascular system, potential for drug interactions due to the variety and combination of drugs used, the possibility of excessive amounts of drugs being used to compensate for inadequate analgesia, individual variations in response to the drugs used, particularly in children, and the wide variety of procedures performed². However, studies have shown that sedation of children in the emergency department can be performed safely⁵⁻¹¹.

The purpose of this education and guideline module is to reduce the risks associated with sedation in children and establish standardized practice in the emergency department. It attempts to incorporate guidelines and recommendations developed by paediatric, emergency and anaesthesiology societies¹⁻³¹²⁻¹⁶ as well as existing emergency department clinical guidelines (www.rch.org.au/clinicalguide/cpg.cfm?doc_id=5146, www.rch.org.au/clinicalguide/cpg.cfm?doc_id=5145) and hospital wide sedation guidelines (www.rch.org.au/rchcpg/?doc_id=9188#1in) at Royal Children's Hospital. The general sedation module applies to all paediatric sedations in the emergency department irrespective of the drug used.

Learning Objectives

To reduce clinical risk by the implementation of this learning package and achieve clinical competency for sedation use in the following four areas:

1. Pre-procedure

- Decreasing need for sedation
- Alternatives to pharmacological sedation.
- Risk assessment
- Assessment of contraindications
- Consultation with a senior doctor
- Fasting status
- Consent and parent information
- Equipment & drug preparation
- Staff required for sedation
- Observations
- Communication with parents and other staff
- Completion of the sedation check list

2. During procedure

- Drug administration
- Monitoring of child

3. Post procedure

- Monitoring of child
- Discharge criteria
- Discharge instructions

4. Documentation

Introduction

The goal for sedation is to minimize physical discomfort or pain for procedures, to control behaviour, particularly movement, to minimize psychological disturbance and distress, to maximize the potential for amnesia and to guard patient safety.

The following education modules and guidelines for sedation are intended for use in the emergency department in patients who are generally healthy or have only mild systemic disease. Patients with complex medical problems, more severely ill patients and very young children should not be sedated in the emergency department.

It is unreasonable to expect sedation to be effective for extremely painful or prolonged procedures. Patients who are extremely anxious prior to the procedure need special consideration and might also be more suitable for general anaesthesia (http://www.rch.org.au/rchcpg/index.cfm?doc_id=9188).

Sedation is a continuum from minimal anxiolysis to a state of deep sedation but not including general anaesthesia. The response to sedative drugs is not always predictable for an individual patient and staff need to be prepared to deal with a patient who becomes much more sedated than intended.

The goal for safe and successful sedation can be maximized by excluding patients at high risk for failure and preparing the patient, the family, the environment, and staff as best as possible to handle both expected and unexpected outcomes and ensure a safe discharge from the emergency department.

The record of sedation (MR 180) on the following page lists all important considerations prior to, during and after sedation in the emergency department. The form is completed for all sedations and should be regarded as a crucial checklist to ensure safe sedation. The completed form is filed in the patient history. All sedations are audited for quality assurance, based on the record of sedation checklist. All topics noted on the form will be discussed in the subsequent sections of this manual.

Emergency

The Royal Children's Hospital Melbourne



UR NUMBER

SURNAME

GIVEN NAME(S)

DATE OF BIRTH

AFFIX PATIENT LABEL HERE ↑

Trial MR180/O Record of sedation for procedure in Emergency Department

This is not a medication order. Use this form for procedural sedation with oral, IV, inhaled agents

Date: ___ / ___ / ___ Time: _____ Type of procedure: _____

() * Number corresponds to the information provided on the reverse

Prior to sedation

Risk assessment and exclusion criteria checked (1)* Yes

List if any:

If Emergency Department consultant informed, name of ED consultant:

Prepare patient/parents

Fasted from (2)* _____ (solids) _____ (liquids)

Sedation handout discussed with patient / parent Yes

Informed written consent obtained: indications discussed possible adverse events discussed Yes

Adequate staff available (3)* Yes

Baseline observations (Sedation Score, HR, RR, SpO₂) performed immediately prior to administering sedation (BP for Ketamine) Yes

Sedation agent prescribed on Medication Chart Yes

Non-pharmacological techniques planned (e.g. distraction box) Yes No

Other analgesic/sedative agents administered Yes No

Prepare venue

Equipment is present and functioning: procedure equipment, emergency equipment (4)* Yes

'Time Out' or 'Positive Patient Identification' (5)* please tick box below Yes

All sections should be completed prior to the patient proceeding to the 'sedation period'.

During sedation period

Drugs administered by accredited staff member Yes

Vital signs/Sedation Score documented every 5 minutes Yes

Post-procedure

Patient returned to baseline Sedation Score Yes No

Observation within normal limits Yes No

Discharge criteria meet (7)* Yes No

Post-sedation care discussed (Sedation handout) (N.B. safety and injury prevention highlighted) Yes

Summary of sedation episode (please tick)

Sedation used: nitrous oxide ketamine IM ketamine IV midazolam oral other _____

Total dose: _____ mg OR N₂O range _____ - _____ % for _____ minutes

Deepest level of sedation: _____ (indicate UMSS score)

Side effects/adverse events: No Yes (specify) _____

Staff member identification (Print name, sign, designation for each entry)

Time Out completed by: (5)* Tick box below if completed by the Sedation accredited staff member listed on left

Sedation accredited staff member:

Sedation accredited staff member:

Handed over to:

Time:

Drill holes where indicated in Cyan keyline.
Do not print Cyan.

Trial MR180/O Record of sedation for procedure in ED

1. Risk assessment		<p>If any child meets the risk assessment criteria OR if you have reservations, contact the Emergency Department consultant for further discussion before using a sedation agent.</p>	
		Significant risk of delayed gastric emptying or vomiting e.g. bowel obstruction, gastro-oesophageal reflux	
		Significant respiratory disease e.g. upper airway obstruction, airway infection, apnoea, exacerbation of asthma, pneumonia	
		Significant cardiovascular impairment e.g. pulmonary hypertension, cardiomyopathy, hypovolemia	
		Abnormal conscious state/risk of raised ICP e.g. head injury, meningitis, space occupying lesion	
		Acute systemic infection e.g. sepsis	
		Immunosuppression e.g. post-op transplant, neutropenia	
		Significant liver disease / liver failure e.g. biliary atresia	
		Prior adverse event	
		Prior allergic reaction	
		Patient receiving opioids or other sedative agents	
		Age less than or equal to 2 years (for nitrous oxide and ketamine)	
Exclusion criteria	Nitrous Oxide	Ketamine	
	Lung cyst Bowel obstruction Middle ear disease Pneumothorax Head injury	< 1 year or > 12 years Glaucoma Head injury, CNS lesion, epilepsy ADHD, psychosis	
2. Fasting times	Nitrous Oxide	Oral agents	Ketamine
	2 hours solids and liquids	2 hours solids and liquids	4 hours solids 2 hours liquids
3. Staff levels	2 staff required 1 accredited	2 staff required 1 accredited	3 staff required 2 accredited
4. Location and equipment check	<p>Location: nitrous oxide in treatment rooms, ketamine in resuscitation rooms</p> <p>Equipment: this equipment should be in the room at all times, turned on and functioning during the sedation period</p> <ul style="list-style-type: none"> suction device bag / valve / mask for size of patient with correct mask Oxygen available by mask monitoring equipment (HR, RR, SpO₂, BP) access to resuscitation trolley with appropriate sized airway equipment 		
5. 'Time Out' or 'Positive identification'	<p>Both staff involved in the procedure will confirm the following:</p> <ul style="list-style-type: none"> the patient's identity checked by ID band or positive identification confirm or mark site (if applicable) procedure to be performed 		
6. Details of Sedation Score (UMSS)	<p>0 = Awake and alert</p> <p>1 = Minimally sedated: may appear tired/sleepy, responds to verbal conversation and/or sound</p> <p>2 = Moderately sedated: somnolent/sleeping, easily roused with light tactile stimulation or simple verbal command</p> <p>3 = Deep sedation: deep sleep, rousable only with deep or significant physical stimulation</p> <p>4 = Unrousable</p>		
7. Discharge criteria	<ul style="list-style-type: none"> resumption of pre-sedation level resumption of purposeful neuromuscular activity ability to ambulate or sit without support (if appropriate) ability to verbalise (if appropriate) final set of vital signs within normal limits for patient's age ability to tolerate oral fluids 		

Prior to the Procedure:
Decreasing the Need for Sedation

Factors that may decrease sedation requirements of the paediatric patient include:

Systemic pain relief:

- Administration of simple analgesia, paracetamol, ibuprofen, codeine, or codeine and paracetamol mixture (Painstop®). Removal of pain may decrease patient anxiety and thus can decrease the need for sedation. For severe pain intranasal fentanyl or intravenous morphine may be required. Analgesia should never be administered intramuscularly.

Local pain relief:

- Topical use of “ALA” (Laceraine ®) (Adrenaline/Lignocaine/Amethocaine) to provide local topical anaesthesia into open wounds.
- Local AnGel® (Amethocaine 4%) cream applied to skin prior to IV insertion, blood taking or lumbar puncture. The cream should cover the area you wish to use and must only be applied onto intact skin. Angel cream takes 30-60 minutes to provide local anaesthesia. Effective skin anaesthesia will last approx 4-6 hrs after removal .

<http://www.rch.org.au/pharmacopoeia/pages/amethocaine.html>

Non painful wound repair:

- Consider the use of Dermabond® (2-Octyl Cyanoacrylate) or Steristrips® or both in place of sutures. It is often quick, painless and has similar cosmetic outcomes when used appropriately.

Prior to the Procedure: Non-Pharmacological Approaches

Non-pharmacological approaches will, in some children, reduce or avoid the need for sedation; in many instances it will make procedures less distressing for patients, family and staff.

The integration of non-pharmacological techniques will help achieve the goals of sedation by:

- decreasing the anticipatory anxiety of the child and his/her family before the procedure
- reducing the pain and anxiety of the child and distress of his/her parents during the procedure
- promoting effective coping with subsequent medical procedures

Non-pharmacological techniques described here can be used by staff in the ED with little training, who can model them for the parents and other primary caregivers. These approaches and techniques will be more difficult or impossible to apply in children who are <3 years of age, children who are cognitively impaired, children who have a significant behavioural disorder and especially children who have been previously traumatized by medical procedures. It is best to think of the procedure in four stages: preparation, immediately before, during and after the procedure.

Staff Preparation

Examine your own beliefs around pain and be aware how this could influence your interaction with a patient. (For example: Do you believe non-pharmacological techniques are helpful, even possible? How do you personally cope with pain and anxiety?)

All staff team members need to know who is responsible for what during the procedure, in particular who can function as a “safe” person for the child and is providing emotional/social support to the child and the family.

Role of the Parents

Think of parents as allies who can interact with their child and relax/distract them. Invite parents and the child to be part of the team as active participants and not just passive recipients. Most children want their parents to be present and most parents want to be there. Evidence is mixed as to whether parents’ presence is helpful during painful procedures; it appears to depend on what they do.

Research has identified behaviours which promote coping and behaviours which promote distress (see below). It is effective for staff to model coping promoting behaviours, especially if there is not enough time or resources to coach parents directly.

Coping promoting behaviours:

- Non-procedural talk and distraction
- Prompting children to use coping behaviours
- Breathing techniques (for example slow deep breathing)
- Humour

Behaviour to be avoided

- Apologizing, criticizing, bargaining with the child
- Giving the child control over when to start the procedure
- Catastrophising and becoming agitated

Prepare the Child

Find out a bit about them, their likes and dislikes. Ask them what they would rather be doing right now. Find out about their knowledge and expectations about the procedure. Let them ask questions. Be honest about what will happen and correct any misconceptions. (See language section regarding discussing pain) Find out child's previous experiences with medical procedures and any coping skills. Instill confidence (see language). Provide age appropriate information about the procedure, including any sensations to expect (smells, noises, and physical sensations). Children need to know what they will look and feel like afterwards (e.g. if there will be a bandage, tube, IV). Use books, drawings or a doll if necessary. Tell the child when the procedure will happen, with enough time to prepare but not so long that increases anticipatory anxiety.

Agree on goals and interventions with the child (e.g. breathing to feel calm and talking about last birthday party). Tell the child how they can be helpful to increase his/her sense of competency. For example, get them to hold mask.

Environment

Remember children may see you as big and threatening, thus the child should be attended to by calm, friendly adults. Do not get equipment ready in front of children but they may need to see and touch it to feel less anxious. Keep unexpected events to a minimum and explain any surprises, like a loudspeaker noise.

Holding

Use "positioning for comfort" and avoid forceful restraint. Have the child sitting rather than lying wherever possible. Do not use parents for restraint, only comfort hold. (Refer to Parent Handout – Appendix 2)

Language including choice and control

Choices of words/phrases/imagery in the first seconds of the therapeutic encounter may set the stage for the child's response to the procedure. It is very important to comment positively on some aspect of the child's physical state. Be very careful with your choice of words. Use language to suggest that the child will get well and will return home.

Acknowledge what is happening and suggest its positive side. This indicates some control over something). Make positive suggestions related to treatment procedures and imply change, possibly for the better e.g. "as I wash the cut, the hurt can wash away". Emphasize the qualitative sensation that child may experience such as cold, tingling and pressure so that the child focuses on what he/she is feeling and not just on a hurting aspect.

If the procedure is likely to cause some pain, describe the pain in familiar terms that he/she will understand. The parents will have some examples of pain that their child has experienced during play or pain that their child may have observed someone else experience without distress.

Avoid deceptive statement such as "this shouldn't hurt". Children do not forget dishonest statements easily. Rather provide suggestions for coping eg "I wouldn't be surprised if this hardly bothers you, especially when you see what's happening in the video cartoon."

Immediately before the Procedure

Remain calm and firm. Do not focus on feelings once the procedure is imminent. Do not bargain, negotiate or apologise, as it increases distress. Give children a sense of control by letting them make choices e.g. where to sit for the procedure, which hand to use for the IV insertion or the flavour for the nitrous oxide mask. Do not give the child a choice about when to start the procedure as it increases anticipatory anxiety. Just before the procedure, stop talking about the procedure or focusing on it in any way and encourage the use of relaxation and distraction.

During the Procedure

Distraction is actively engaging child onto a positive focus away from the negative focus without tricking the child. Find out from the child what he or she likes doing best: if sport, which one; if the X Box, which game; if playing with a pet, what name (so you can engage them).

Use age appropriate distraction such as bubbles, windmills, stories, music, toys, electronic games, non procedural talk or imagery. To promote relaxation encourage breathing exercises, muscle relaxation and imagining a favourite place, sport or activity.

Continue the verbal distraction/imagery. Prompt the child to use coping behaviours and praise all attempts.

Post procedure

Only say “it is finished” at the very end of the procedure. Focus on positive coping efforts and continue distraction. Allow the child time to recover. Instill a sense of achievement no matter what happened. Use pain medication as required. Avoid focusing on any further procedures till nearer the time.

Health Evaluation

Health evaluation prior to sedation includes standard history and physical examination as documented on the standard emergency department medical record as well as health issues specific for children undergoing procedural sedation.

The weight should be recorded on the Emergency Department observation chart (MR 105) and the Medication chart (MR 690/A) to allow easy calculation of any medications used during the sedation or in case of an emergency. Allergies should also be recorded on both these forms.

A risk assessment should be performed using the risk assessment prompt on the back of the sedation checklist and listed below. The list intends to identify children at higher risk of complications who might be unsuitable for sedation in the emergency department¹⁷. The list includes features indicating a higher risk of airway complications and cardiovascular instability during sedations.

Risk Assessment

Increased risk of airway compromise leading to obstruction

- Snoring, stridor, sleep apnoea
- Craniofacial abnormalities
- History of airway difficulties
- Children < 1 year

Increased risk of hypoventilation

- Patients with reduced sensitivity to CO₂ retention – chronic lung disease, neuromuscular disorders
- Abnormalities of the respiratory centre – brainstem tumors

Increased risk of aspiration

- Vomiting, bowel obstruction, gastro-oesophageal reflux
- Altered mental status
- Cerebral palsy
- History of aspiration

Increased risk of bronchospasm or laryngospasm

- Asthma, recent upper or lower respiratory tract infection

Increased risk of cardiovascular compromise

- Cardiac disease, hypovolaemia, sepsis

History of sedation failure**Moderate or severe systemic disease which limits the activity of the child.****Exclusion Criteria**

In addition there are drug specific contraindications which need to be considered as part of a sedation plan. Drug specific contraindications are addressed in detail in the drug modules and are also listed on the back of the sedation checklist.

Any positive finding on risk assessment or any drug specific contraindications should be discussed with an emergency consultant.

Fasting Pre-Procedure

Most patients who present to the emergency department are likely to have consumed solids and or fluids within 4 hours of their presentation. In general, when the procedure does not need to be performed immediately, then the patient should be fasted from the time a procedural sedation becomes a consideration, ideally at triage, and at least until the recommended minimum fasting times have been met.

The relationship between minimum fasting times and the risk of adverse outcomes in sedation has not been well studied and minimum fasting times for sedation are under debate. Some recent data indicate that fasting and adverse events in emergency department sedation in children are not closely linked^{18 19}. Recommended minimum fasting times are based on a consensus of emergency department consultants at Sunshine Hospital and Royal Children's Hospital. As a reminder they are listed on the back of the sedation checklist. Actual fasting times are to be recorded on the sedation checklist.

The recommended minimum fasting times are as follows:

Nitrous oxide

- 2 hour fasting status for solids & liquids

Ketamine IM & IV

- 4 hours fasting status for solids or milk & 2 hours for clear liquids

Please note that after an injury even prolonged fasting does not guarantee an empty stomach in the setting of injury.

In circumstances where the child's fasting status is not assured, the increased risks of vomiting during sedation must be carefully weighed against its benefits, and the lightest effective sedation should be used.

Options for patients who are not fasted

Children who are being fasted in the emergency department prior to sedation are able to sit in the waiting room until the required time.

Circumstances where the child requires continuing management of the injury or other conditions should remain in the cubicle area.

If the procedure is non urgent and the child is not fasted, consider the child's return at a later time when adequate fasting is assured.

After 2300hrs procedural sedations should not be undertaken in the emergency department unless a consultant is present and available.

Consent & Parent Information

Written consent must be obtained from the parent or legal guardian of the child before proceeding with any drug administration. A senior nurse or doctor may obtain the consent for nitrous oxide. However, consent for ketamine must be obtained by a physician.

An explanation must be provided to the responsible adult with reference to the type of sedation considered, an explanation of the procedure and the associated risks of the sedation as well as the procedure itself. The elements which should be discussed with the parent or guardian are outlined in the parent handout for procedural sedation. The relevant section of the handout explaining what sedation is and outlining the risks associated with sedation is included below.

Like the sedation parent handout, the consent form itself is part of the sedation package and requires the signature of parent or legal guardian at the bottom of the form after the necessary explanations have been provided. The Procedural Information is part of the individual Sedation Packs to be kept in the ED for each potential participant. (See Appendix 3)



Sedation for procedures - for the Emergency Department

This fact sheet is for children having sedation for a procedure while in the Emergency Department at The Royal Children's Hospital.

Part One: About sedation

Sedation is a medicine given to children to make them feel sleepy and relaxed. This medicine can be given by mouth (drinking), breathing in a gas or by an injection into a muscle or a vein.

Reasons for having sedation

Your child may become distressed or have pain when having certain tests or treatments. Procedural sedation (sedation for procedures) 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 with more ease and with less distress for you and your child. Your child may not remember the procedure at all or remember small amounts only. This is normal.

Permission to give sedation

As the parent or caregiver, you must give us consent for sedation. You need to understand the reasons for sedation and the following risks -

We will carefully check your child's breathing and if required, we will give your child oxygen through a mask or breathing tube.

Children may vomit. Very rarely, they may breathe the vomit into their lungs, which may need some specific treatment.

They may need to be treated with extra medicines, such as antihistamines.

For your child's safety, do not take your child home until staff tell you it is safe to do so. Expect to wait for an hour or more after the procedure.

About Ketamine

Ketamine is commonly used in Australian hospitals for sedation in children. When we give your child Ketamine, they get sleepy and do not remember what happened. There are some special features about sedation with Ketamine for you to know -

It is given by injection into a vein.
Your child may seem to be awake after receiving Ketamine.
Your child may move and need someone to hold them still.
Your child may drool more than usual.

Sometimes as your child wakes up, they may have some agitation, hallucinations or nightmares. These sensations usually improve if you comfort your child in a quiet and dark area until they are fully awake.

Part Two: Helping your child

Helping your child before the procedure

Ask the doctor/ nurse to explain the procedure to you and to your child.
Talk to your child about some ways to cope (for example — looking at an interactive book, using their imagination to be in a nice place, blowing bubbles).
It helps not being too upset or nervous yourself as your child will notice this.

Helping your child during the procedure

Having a parent (or another adult) who knows the child stay with them is usually helpful.
The level in which you will be able to engage/involve your child will depend on how deeply sedated your child becomes. Your child may need reminders of the coping methods you decided upon earlier. For example, “blow away the hurt.” 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 eg. music or video options 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.

Helping your child after 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. For example “*you did a great job blowing away the hurt*”.

Preparation prior to sedation

Staff

Nitrous oxide

- One doctor to perform the procedure.
- One nurse, credentialed in nitrous oxide use

Ketamine

- One doctor to perform the procedure.
- One doctor to administer the sedation. This doctor must be credentialed in ketamine sedation and PLS/APLS certified.
- One registered nurse capable of supporting airway management and advanced monitoring of patients. This nurse must be credentialed in ketamine sedation and PLS/APLS certified.
- Emergency consultant available and present.

All required staff must be present before any drug is administered.

One staff member must be continuously responsible for observation of the patient's vital signs, airway patency, adequacy of ventilation, oxygen saturation, heart rate, blood pressure and level of sedation for all of the sedation.

Location

Sedations with nitrous oxide can be performed in the procedure room. Sedations with ketamine can only be performed in the resuscitation area. This will ensure that resuscitation equipment is available in case of adverse events.

Equipment

Equipment must be checked and readily available **prior** to commencing procedural sedation. A reminder of the necessary equipment is listed on the back of the record of sedation.

- Bag / valve / mask set up for appropriate size and able to deliver O₂ with O₂ tubing attached. Appropriate range of masks. The correct mask size must be used. It should fit snugly on the child's face over nose and mouth.
- Suction working with a Yankauer sucker attached
- Oxygen tubing attached to oxygen source with appropriate size mask
- Pulse oximetry operative – to monitor oxygen saturation pre, during & post procedure
- ECG monitoring equipment readily available available for all sedations and operative for ketamine use
- Blood pressure monitoring readily available for all sedations and operative for ketamine use.

Note: If the child is very unsettled pre-procedure it may be helpful to apply the BP cuff, oxygen saturation probe or attach the ECG leads once sedation is taking effect.

Observations

An initial set of observations must be obtained within one hour prior to the administration of the sedation and must be documented on the emergency department nursing observation chart. If the child is agitated and unsettled prior to the procedure consider the accuracy of observations due to distress.

Observations include:

- Pulse
- Respiratory Rate
- Blood Pressure (ketamine)
- Oxygen saturation
- Depth of sedation (measured using the University of Michigan Sedation Scale; UMSS²⁰)

UMSS scores:

0=awake and alert,

1=minimally sedated: may appear tired/sleepy, responds to verbal conversation&/or sound

2=moderately sedated: somnolent/sleeping, easily roused with light tactile stimulation or simple verbal command

3=deep sedation: deep sleep, rousable only with deep or significant physical stimuli

4=unrousable

Medication Orders

All medications used in sedations, including nitrous oxide, require written orders on the Medication chart MR 52.

- Calculate the correct dose of sedation medication for the child based on the correct patient weight.
- Write the dose, route, and time of administration on the observation chart (legibly).

Time Out

Both staff involved in the procedure will confirm the following:

- The patient's identity checked by ID band or positive identification
- Confirm or mark site (if applicable)
- Procedure to be performed

Completion of the Record of Sedation form (MR 180/0).

All sedations require the completion of the sedation checklist. It lists the main issues to be considered pre-procedure on the front and more detailed explanations on the back of the form.

A patient label sticker should be placed at the top of the sedation checklist and the boxes for the type of procedure, sedation used, time and date should be completed.

All pre-sedation tick boxes on the front of the form should be checked prior to commencing a sedation.

The sedation checklist is written in the form of a treatment order. It should be signed at the bottom of the page by the doctor ordering the sedation and by the nurse administering or assisting in the sedation. Additional staff participating in the procedure should also be listed.

During the sedation

Drug Administration

Intravenous sedation drugs are only to be administered by physicians. Drugs should always be checked with a second person prior to administration. Drug syringes should be labeled with the content and concentration. Nitrous oxide can be administered by credentialed nurses or physicians.

Monitoring of Child

Communication between all staff involved with the procedure is essential to ensure safe practice and detection of possible complications. The treating doctor must be informed of any observations that fall outside normal values to ensure appropriate interventions.

Normal Observation Values Guide

AGE	Weight (kg)	Systolic BP		Diastolic Maximum	Heart Rate	Respiratory Rate
		Min	Max			
		(mmHg)				
3 months	6	50			100-170	30-50
6 months	8	60			100-170	30-50
1 year	10	65			100-170	30-50
2 years	13	65			100-160	20-30
4 years	15	70			80-130	20
6 years	20	75	106	64	70-115	16
8 years	25	80	110	76	70-110	16
10 years	30	85	118	82	60-105	16
12 years	40	90	112	84	60-100	16

<http://www.rch.org.au/clinicalguide/forms/resusCard.cfm>

Pulse oximetry should be continuously monitored in all sedations. Heart rate, oxygen saturation, respiratory rate and conscious state (using the UMSS sedation score) should be recorded 5 minutely following the administration of the sedation medication until the child is beginning to rouse following the procedure. During ketamine sedations continuous cardiac monitoring should be employed and blood pressure should be obtained and recorded 5 minutely.

Any change in vital signs, change in the sedation scores or oxygen saturation <94% should be immediately communicated with the physician responsible for the sedation and might require immediate intervention for airway compromise or cardiovascular depression. After the procedure is complete the stimulation (eg pain) associated with the procedure is reduced, this may cause children to become more sedated than during the procedure.

Post procedure

The child must be observed by a member of nursing staff until full recovery.

Following the procedure observations and sedation scores should be taken and recorded every 15 minutes.

If the child remains deeply sedated following the procedure, then they should have observations and sedation scores recorded every 5 minutes until they are more awake, show age appropriate activity and respond to the parents.

All side effects or adverse events should be documented on the observation chart (MR 105) and the sedation record (MR180).

Keep child nil orally until fully alert.

The deepest level of sedation should also be recorded on the record of sedation (MR180). Please note that sedation with ketamine as a dissociative agent does not fit the standard depth of sedation scores. Therefore the patient sedated with ketamine can be described and documented as being "ketaminised".

Discharge criteria

The child cannot be discharged until all discharge criteria are met. It is impossible to set a specific 'discharge time' post administration of the drug. Each patient responds to sedation on an individual basis. It is essential to assess each patient individually by using the following discharge criteria as listed on the back of the sedation checklist.

- Resumption of pre-sedation level of consciousness
- Resumption of purposeful neuromuscular activity
- Ability to ambulate (if appropriate) or able to sit without support
- Ability to verbalize appropriate for age
- Final set of vital signs are within normal limits for the child's age
- Ability to tolerate oral fluids. (Initial fluids offered can include water, an icy pole or cordial)

For a very young or handicapped child, the aim is to achieve the pre-sedation level of responsiveness or as close as possible to the normal level of functioning for the particular child. This should be achieved by communicating with the parent or guardian to establish what is normal for that child. In addition, a responsible adult needs to be available to accompany the patient home.

Discharge Instructions

A parent or guardian will be advised on discharge instructions as per the section 4 of the parent handout shown below.

Sedation for procedures - for the Emergency Department

Part Three: Care of your child on your way home and for the next 24 hours

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

If your child falls asleep in the car seat, watch them to make sure that they do not have any difficulty breathing. **DO NOT** leave your child alone in a car seat or alone in the car.

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.

Check on your child's sleeping pattern the night after getting home. If their sleeping seems heavy or strange then wake them up gently. If you cannot wake them or something seems very wrong in their appearance or breathing, call an ambulance and return to the hospital immediately.

Sometimes children may feel sick or vomit if they eat a big meal too soon after sedation. **Give your child clear liquids such as diluted fruit juice, icy poles, jelly, clear soup etc.**

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).

Key points to remember

Sedation is commonly used in children for procedures.

You need to give consent before your child has sedation.

Make sure you understand the reasons for and the risks of sedation.

Be as open and honest as you can with your child about what is going to happen and it helps not to be too upset yourself.

Look under "s" for sedation on the [Kids Health Info](#) website for more factsheets on different types of sedation.

When to call the doctor

Please call the Emergency Department at Royal Children's Hospital (03 9345 6153) if your child:

Vomits more than twice.

Has strange or unusual behaviour.

If you have any questions.

The name of the doctor who gave your child sedation is:

Dr _____

This factsheet was produced by The Emergency Department in consultation with the [Department of Anaesthesia](#), the Royal Children's Hospital. First published 2006. Reviewed Oct 2007.

It is essential that all points on the information sheet are discussed by either medical or nursing staff and the parent / guardian verbalize an understanding of discharge instructions. The name of the doctor must be documented on the discharge sheet, to ensure parents have a contact person for any queries. A discharge letter to the child's local medical practitioner will be required detailing any follow up instructions related to the diagnosis or procedure.

Adverse Events

Adverse events should be recorded on the nursing observation chart as they occur. Adverse events should also be recorded on the sedation checklist after the procedure. Adverse events and complications include:

- Failure to achieve adequate sedation
- Unintentional loss of consciousness
- Prolonged or excessive sedation
- Hypoxaemia (O₂ saturation <94%)
- Depression of protective airway reflexes – airway obstruction requiring airway adjunct or sustained jaw lift maneuver
- Respiratory depression and apnoea – requiring oxygen administration, bag-mask-ventilation or intubation
- Laryngospasm, bronchospasm and increased airway secretions
- Depression of cardiovascular system - hypotension, bradycardia,
- Vomiting
- Aspiration
- Allergic reaction
- Unscheduled admission related to sedation.

Summary of documentation

Documentation of sedations includes the following elements:

- History and physical examination on the standard medical record by the sedation physician
- Recording of weight, allergies, risk assessment, contraindications and fasting times on the sedation checklist after sedation order is signed by the sedation physician and countersigned by the sedation nurse
- Checkmarks on the sedation checklist for all other issues listed pre, during and post procedure as a joint responsibility of sedation physician and nurse
- Consent form signed by parents and countersigned by the sedation physician
- Medication order on the observation chart signed by the sedation physician
- Recording of observations before, during the procedure and during recovery on the observation chart by the sedation nurse

Module 2

Nitrous oxide

Nitrous Oxide

Background

Nitrous oxide is an anaesthetic gas, which is delivered in variable concentrations with oxygen. The exact mechanism of nitrous oxide is unknown. It has modest analgesic and sedative properties, with minimal respiratory and cardiovascular depression¹⁵.

Studies in children have shown nitrous oxide to be an effective agent for reducing pain during painful procedures¹⁵, and it can be delivered painlessly through inhalation. Its quick onset of action and recovery makes it ideal for use in the emergency department²¹. It is being used in a number of countries and has been shown to be a safe agent in several large series^{5 6 22-24}. In the past it was mainly used at 50% nitrous oxide or less; more recently 70% nitrous oxide (with 30% oxygen) has been shown to have a similar safety profile as 50%⁶.

Nitrous oxide has a short duration of action. Onset is within minutes and peak effect is at 3-5 minutes to induce these effects with a nitrous oxide-oxygen mixture and a few minutes for them to wear off.

Nitrous oxide in the emergency department is available in two different forms. It is available as Entonox in a premixed cylinder of 50% oxygen and 50% nitrous oxide and via the Quantiflex machine which allows nitrous oxide to be administered in a concentration varying between 0% and 70% (further details are explained below).

It is not clear for how long patients who receive nitrous oxide as a single agent should be fasted for. In a study on nitrous oxide sedation from our emergency department the frequency of vomiting was not associated with the duration of preprocedural fasting¹⁹. Current guidelines from the Royal Australasian College of Physicians recommend a fasting period of 2 hours if a concentration of nitrous oxide of more than 50% is used¹⁶. If nitrous oxide is used in conjunction with other sedative agents, longer fasting time is required.

Indications for use

Nitrous oxide can be used where short acting analgesia is required for procedures that may cause pain, discomfort or anxiety.

Useful for:

- Suturing (with topical anaesthesia)
- IV insertion (with topical anaesthesia)
- Removal of foreign bodies from ear / soft tissues
- Minor fracture manipulation/ moulding of plaster
- Burns dressings
- Injection of local anaesthetic
- Other painful procedures

Limitations:

- Very painful procedures (manipulation of significantly displaced fracture or abscess incision and drainage)
- Facial (perioral) lacerations
- Procedures requiring immobility

Adverse Reactions

Nitrous oxide is usually well tolerated by children in the emergency department. Most children only have mild side effects such as vomiting, nausea, dizziness, lightheadedness and occasionally nightmares. Parents should be warned that vomiting occurs relatively frequently both during and after the procedure and even after arrival home¹⁹. In a series of 762 patients from our emergency department who received nitrous oxide alone⁶, 6% of patients vomited, 1% became agitated and less than 5 each became light headed, hyperventilated, or had hallucinations. One patient desaturated after the sedation and required oxygen administration. He was admitted for observation and discharged without further sequelae. No patient aspirated or required airway support. Children who received 70% nitrous oxide had deeper sedation levels than children who received 50% but there was no significant difference in adverse events.

A possible adverse event is aspiration if the vomiting occurs while the patient is deeply sedated. With deeper sedation airway patency can be lost. Patients with underlying airway problems or acute respiratory infections or illnesses are particularly vulnerable. In our emergency department series 3% of patients were deeply sedated, mainly after receiving 70% nitrous oxide⁶.

Nitrous oxide is known to increase intracranial pressure and increase pulmonary vascular pressure²⁵. Nitrous oxide diffuses more rapidly than nitrogen and can expand air-containing spaces within the body¹⁵. If the cavity does not have rigid walls, the volume increases. Therefore it is contraindicated in all patients with the possibility of closed air spaces such as in the gastrointestinal tract, middle ear, sinus cavities, pneumocephalus, pneumothorax or after diving accidents (decompression sickness).

Nitrous oxide oxidizes the cobalt ion in the vitamin B12 dependent enzyme methionine synthetase resulting in the formation of hydroxyl radicals which are responsible for the inactivation and destruction of this enzyme and the subsequent depletion of vitamin B12 stores¹⁵. Methionine synthetase is required for DNA synthesis and therefore the production of rapidly dividing tissues such as bone marrow and gastrointestinal mucosa. Methionine is necessary for the formation of myelin, a key building block for nerves. Nitrous oxide induced bone marrow toxicity is progressive but reversible and can be prevented by the administration of folic acid. Neurotoxicity associated with nitrous oxide is rare but can be rapid and irreversible, even after brief exposure¹⁵. Those at risk of vitamin B 12 deficiency include some vegetarians, the newborn of vegetarian mothers, patients with gastrointestinal pathology, the elderly or patients taking proton pump inhibitors and H₂ blockers¹⁵. Nitrous oxide induced inactivation of methionine synthetase can also affect homocysteine metabolism, although the significance of this is unknown. Information about these rare adverse events comes from case reports only. There are no data to guide the appropriate maximum duration or number of times a patient can be safely exposed to nitrous oxide. If nitrous oxide is to be used repeatedly it may be reasonable to administer methionine, vitamin B12 and possibly folic or folinic acid¹⁵. Nitrous oxide should be avoided in patients with metabolic diseases such as methionine synthetase deficiency, homocystinuria and methylmalonic academia²⁶.

Occupational exposure should be kept to a minimum by ensuring a suitable scavenging system is used and a consistent and adequate mask seal to the patient's face is maintained. The scavenging system should be connected directly to piped wall suction only (never portable) and turned to a medium flow.

Exposure to nitrous oxide should be avoided during pregnancy. The data on fertility risks of nitrous oxide are unclear, even in staff exposed to the agent repeatedly^{27 28}. However, it is recommended that exposure to nitrous oxide not occur in the first trimester of pregnancy. Repeated exposure should be avoided in the 2nd and 3rd trimesters as well.

Contraindications for use

Nitrous oxide should not be used in the following situations:

Increased risk of airway loss

- Less than 1 year of age
- Acute respiratory infection (URTI) or exacerbation of asthma
- Airway obstruction or history of difficult airway management

Risk of expansion of airfilled closed space

- Chest injury, suspicion of pneumothorax or lung cyst
- Abdominal distension or bowel obstruction
- Head injury
- Decompression sickness or air embolism
- Middle ear disease

Increase in pulmonary vascular pressure

- Pulmonary Hypertension

Patients at risk for nitrous oxide induced bone marrow suppression, neurotoxicity or increased homocysteine levels

- History of B12 or folate deficiency
- Nutritionally compromised patients, vegetarians, patients on H₂ blockers or proton pump inhibitors
- Concurrent underlying serious illness, severe infection or extensive tissue damage
- Patients with metabolic diseases associated with homocysteine metabolism (methionine synthetase deficiency, homocystinuria and methylmalonic academia)

Nitrous oxide administration requires:

- Health Evaluation and Risk Assessment (See Module 1)
- Written consent (See Module 1)

Fasting prior to procedure

2 hour fasting status for solids & liquids.

Equipment

All the equipment should be in the room, functioning and turned on for the sedation (See Module 1)

For nitrous oxide sedation the additional equipment required:

- Separate oxygen source with mask other than the nitrous oxide oxygen source.
- Bacterial filters for use in the nitrous oxide circuit
- Scented essences for diversion therapy (eg chocolate, strawberry essence etc). Please note that the essence should be applied to the inside of the mask, not to the filter, as it decreases the filter's efficiency.

It is important that the child is familiarized with the equipment prior to its use. This will result in improved cooperation and decrease anxiety.

Staffing requirements

A minimum of two staff members present

- The proceduralist.
- Sedation accredited nurse or doctor to administer nitrous oxide.

Observations

There should be continuous monitoring and 5 minutely documentation of:

- Respiratory rate.
- Oxygen saturation (including 5 minutes post procedure)
- Heart rate
- Conscious state.

On completion of the procedure and administration of nitrous oxide the child needs to be monitored until their conscious state returns to the baseline. Please note that if the patient is developmentally impaired, the parents can aid in the assessment of when the child returns to normal mental status.

Cautions

- Staff or parents thought to be pregnant should avoid being present during nitrous oxide administration.
- A scavenging unit (Quantiflex system) should be used at all times when administering nitrous oxide to decrease the exposure to staff.

Prior to Procedure

- Check that the oxygen and nitrous oxide hoses are connected to the wall outlets.
- Check the gauges to ensure that there is an adequate supply of oxygen and nitrous oxide (if tanks are used rather than the wall supply)
- Check inspiratory/expiratory hoses are connected and the reservoir bag inflates with no leak.
- Select the appropriate size face mask
- Attach bacterial filter between inspiratory hose and face mask.
- Ensure scavenging system is correctly attached to the expiratory hose of the system and turned on To minimize pollution.
- Attach oxygen saturation probe.

During Procedure

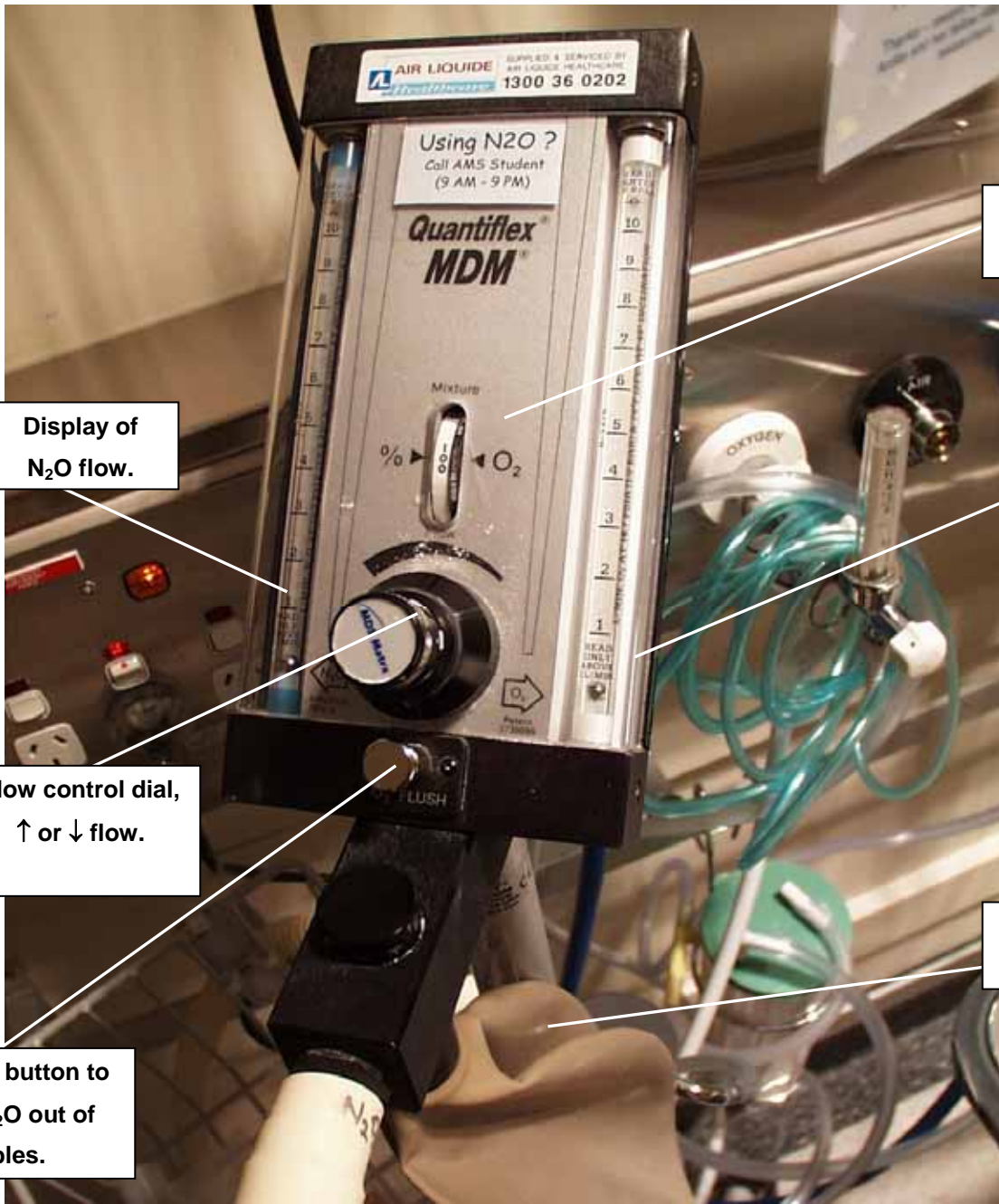
- Adjust the flow of oxygen/nitrous oxide to achieve desired concentration (usually 50-70% nitrous oxide)
- Apply face mask ensuring adequate seal
- Observe the reservoir bag to monitor and to ensure there is a supply of nitrous oxide for the patient to breathe and to ensure that the bag does not overextend.
- Nitrous oxide/oxygen mix should be applied for 3 minutes prior to procedure to ensure maximum analgesic effect.
- The patient should continue to breathe nitrous oxide/oxygen mix for the duration of the procedure
- Monitor sedation levels and adjust percentage of nitrous oxide versus oxygen as required.
- Continuous monitoring and assessment of vital signs throughout the procedure (see observation recommendations).
- Administer 100% oxygen for 2 minutes after the procedure is finished to avoid diffusion hypoxia.
- Document the use of nitrous oxide on the observation chart.

Post Procedure

- Turn off suction scavenger
- Discard bacterial filter
- Place face mask in box for sterilization.
- Monitor child until their conscious state returns to baseline.

Discharge Criteria

For post-procedural discharge criteria and documentation please refer to Module 1: General Sedation



Display of N₂O flow.

Dial up % O₂

Display of O₂ Flow

Flow control dial, ↑ or ↓ flow.

Reservoir bag

O₂ Flush button to clear N₂O out of cables.

Entonox

Entonox is the fixed 50:50 mixture of nitrous oxide and oxygen. It is stored in blue tanks (the standard packaging for all nitrous oxide) and have a demand valve circuit. This means that the patient has to take a breath of a certain depth to allow gas to flow from the tank to the patient. Patients under 4 years of age are less able to create the necessary negative pressure to open the demand valve. The Entonox machine does not allow scavenging of exhaled gas.

Entonox is mobile and easily transferable between cubicles and is often effective in the initial management of deformed limb fractures while more sustainable analgesia can be organized. However, the Quantiflex MDM should be used in preference whenever possible, as it allows variation of the nitrous oxide concentration from 30%-70%, allows administration of 100% oxygen as a “washout” after the procedure and room air pollution using a scavenger system.

Please refer to nitrous oxide information on:

- Indications for use
- Adverse reactions
- Contraindications for use
- Fasting times

Prior to Procedure

- Check that there is an adequate supply of gas in the blue tank (if less than 5000 kRa, obtain a fresh cylinder).
- Check that the Entonox tank valve is open.
- Check cylinder connection to regulator pipe.
- Select the appropriate sized mask or mouth piece.
- Attach bacterial filter between demand valve and mask.

During Procedure

- Apply face mask ensuring adequate seal
- Observe that the patient has adequate demand/tidal volume to activate the valve on the Entonox circuit, by listening to the inspiratory/expiratory noise from the circuit.
- Nitrous oxide mix should be applied for 3 minutes prior to procedure to ensure maximum effect.
- The patient should continue to breathe Nitrous oxide mix for the duration of the procedure
- Monitor sedation levels.
- Continuous monitoring and assessment of vital signs throughout the procedure (see observation recommendations).
- Document the use of Entonox.

Post Procedure

- Discard bacterial filter
- Place face mask in box for sterilization.
- Monitor child until their conscious state returns to baseline.

Discharge Criteria

For post-procedural discharge criteria and documentation please refer to Module 1: General Sedation

Module 3

Ketamine

Ketamine

Background

Ketamine is a dissociative anaesthetic agent. The unique “dissociative state” resulting from ketamine can be described as a general trance-like state characterized by profound analgesia, sedation, amnesia and immobilization^{8 29}. Protective airway reflexes and spontaneous respiration as well as cardiovascular stability are maintained. This trance-like state has been described by the expression, “the lights are on, but no one’s home”, as the eyes remain open with a “disconnected” stare and nystagmus. Ketamine acts by binding to N-methyl-D-aspartate (NMDA) receptors and creates a dissociation (disconnection) between the cortex and the limbic system and prevents the higher centres from perceiving visual, auditory or painful stimuli. Ketamine “dissociative” sedation is different from moderate or deep sedation or general anaesthesia and cannot be described in these terms to assess sedation depth. It also does not follow the typical dose response relationship of sedative agents on a continuum of gradually increasing levels of sedation and concurrent cardiorespiratory depression^{30 31}.

Ketamine is an ideal agent to facilitate short painful procedures, especially in children, who might otherwise require other general anaesthetic agents. It has many features that are attractive in the ED setting: rapid onset (less than 5 minutes IM or IV – see table), consistently effective analgesia and amnesia, and airway stability.

Its safe use in children has been documented in numerous series^{11 32-34}. A study by Green et al of ketamine use in 1022 children in the emergency department produced acceptable sedation in 98% of patients; airway complications occurred in 1% but were transient, quickly identified and did not require intubation. Vomiting occurred in 7% and emergence reactions, mostly mild, in 19%. Another study of 266 children receiving IV ketamine reported an adverse respiratory events in 5%, vomiting in 19% and emergence reactions, mostly mild, in 27%³⁴. In a series of 229 patients from our department³³ 72% had no adverse events. The most frequent adverse event was vomiting, mainly during the recovery phase, in 14%. Ten patients had airway complications and required oxygen and airway repositioning. One patient required bag mask ventilation. No patient required intubation, suffered an aspiration or needed to be admitted.

It is also used extensively in developing countries for major and minor surgery and in disaster and battlefield settings where no anaesthetist or facilities are available.

In the emergency setting ketamine is used via IM or IV injection. Both routes seem safe and effective but there are only limited data directly comparing IM and IV use³⁵. A randomized controlled trial of 225 patients comparing IM and IV ketamine for orthopaedic procedures in children found that IM ketamine

sedation at 4mg/kg was significantly longer than IV sedation at 1mg/kg (median 129 minutes vs 80 minutes)³⁶. In our department, IM and IV are used at almost equal proportions by physician preference. Time to discharge from drug administration is 30 minutes shorter with IV ketamine administration compared to IM, but time from triage to discharge is not significantly shorter (IM 5.7 hours, IV 5.3 hours; p=0.66)³³. In both studies IM administration was associated with more vomiting than after IV administration^{33 36}. IV should be used if an IV is already in situ, if it can be inserted quickly and with minimal distress to the child or for prolonged procedures³⁵. Some physicians may feel more comfortable with IV access in case of an adverse event. However, there are no reported cases in which prophylactic IV access averted a ketamine associated adverse event^{31 35}.

Recommended ketamine dosing for IM injection is 4mg/kg, for IV injection 1-1.5mg/kg slowly over 1 minute⁸. Younger children may require higher doses of ketamine per bodyweight than older children³⁷.

Fasting times for sedation as recommended by the American Society of Anesthesiologists and the American Academy of Pediatrics^{1 13} are similar to those for general anaesthesia at 6 hours for solids and infant formula. Ketamine, however, is an agent which maintains protective airway reflexes and there have been no documented reports of clinically significant ketamine associated aspiration in patients without contraindications⁸. In the UK a 3 hour fast is recommended for ketamine sedation in the emergency department³⁸. In our emergency department a 4 hour fast for solids and milk and 2 hours for clear liquids is required

Indications for use

- Very painful procedures
- Laceration repair in young children
- Reduction of fractures or dislocations
- Abscess incision and drainage
- Wound exploration for foreign body
- Removal of foreign bodies from eye, ear, nose and skin

Adverse Reactions

- Respiratory depression
- Airway malposition
- Hypersalivation
- Laryngospasm
- Cardiovascular stimulation
- Musculoskeletal effects
- Seizures
- Intracranial pressure elevation
- Ataxia
- Emergence reaction
- Vomiting

Respiratory depression

Ketamine may cause mild respiratory depression. Severe respiratory depression is rare but is increased in frequency if ketamine is pushed by rapid IV bolus, when CNS abnormalities are present or in young infants. Neonates and small infants have greater difficulty maintaining a patent airway with any sedative agent. Therefore, in our department ketamine is contraindicated in infants less than 1 year of age. Ketamine IV must be given slowly (over 1 minute)^{8 31}.

Airway Malposition

Malposition of the airway can occur. It is critical to continuously pay attention to airway patency and reposition head or jaw if snoring respirations or stridor develop.

Hypersalivation

Ketamine stimulates salivary and tracheobronchial secretions. Atropine or glycopyrolate has been recommended as adjunctive agents to be co-administered with IV or IM ketamine. A randomized controlled trial of 83 paediatric patients showed a lower hypersalivation rate with atropine (11% vs 31%; $p=0.03$)³⁹. However, since then a large prospective series of 947 patients without atropine use showed a low rate of hypersalivation⁴⁰. In the emergency department at Royal Children's Hospital, 91% of ketamine sedations are undertaken without atropine³³.

Laryngospasm

In a series of 1022 paediatric patients who received IM ketamine four episodes of laryngospasm occurred; all were transient and without further sequelae¹¹. Generally with anaesthesia young age and respiratory infections increase the risk of laryngospasm. Clinicians need to be prepared to treat laryngospasm with oxygen and assisted ventilation until the episode subsides.

Cardiovascular stimulation

Ketamine is sympathomimetic and can produce mild to moderate increases of blood pressure, heart rate, cardiac output and oxygen consumption. In patients with maximal sympathetic drive (eg severe hypovolaemia, pericardial tamponade) the intrinsic cardiac depressant effects of ketamine may be revealed.

Musculoskeletal effects

Skeletal muscle hypertonicity and random movement of head and extremities are often observed. Parents might interpret this as lack of sedation and need to be forewarned.

Seizures

There are case reports of brief seizures related to ketamine in patients with underlying seizure disorders. In a series of 229 children from our department there was one brief, self resolving seizure³³.

Intracranial pressure elevation

There is inconclusive evidence that ketamine increases the intracranial and intraocular pressure³¹. Therefore any patient with head trauma, hydrocephalus or CNS lesions or with glaucoma or acute globe injury should not receive ketamine sedation.

Ataxia

With ketamine ataxia can be pronounced during recovery. Ambulation must be avoided until full equilibrium is restored.

Emergence reactions

Ketamine usually stimulates hallucinations and dreaming during recovery. Their frequency is age dependent. They are more frequent in adults than in adolescents and rare in children under 10 years. In a study of 1022 children, 18% had mild agitation and 2% had more pronounced agitation but only 2 children required treatment. Both responded rapidly to small dosages of midazolam¹¹. Although evidence is limited³¹ a number of strategies have been used to reduce emergence reactions. They include planned topics for dreaming, dim lighting and maintaining a quiet environment. Although there is no clear evidence for specific age limits it is prudent to avoid ketamine sedation in adolescents. Patients with psychosis or behavioral abnormalities should not be given ketamine due to the risk of increased recovery reactions.

Co-administration of low dose benzodiazepines has been used to prevent and treat ketamine emergence reactions. However, these agents slow ketamine metabolism, which may prolong recovery time and may lead to respiratory depression. Two randomised controlled trials of ketamine used in children with or

without low dose midazolam failed to show any difference in the rate of recovery agitation^{34 41}. Therefore, midazolam should not be used routinely as an adjunctive agent for ketamine sedation.

Vomiting

May occur in late recovery phase when the patient is already alert. There are no documented reports of clinically significant ketamine associated aspiration syndrome⁸. A recent large randomized controlled trial of IV ketamine sedation plus ondansetron versus IV ketamine sedation plus placebo showed a significantly lower rate of vomiting with ondansetron (5% vs 13%; $p=0.02$)⁴².

Contraindications

There is insufficient data to safely administer ketamine to children under 1 year in the emergency setting. These children are at increased risk of airway complications. Procedures requiring sedation in infants should take place in the operating theatre.

Children over 12 years of age experience an increase in emergence reaction. Therefore, ketamine should be avoided in children in this age group.

Table: Contraindications for ketamine use (relative and absolute)

Contraindications	Potential adverse effects of Ketamine
Children < 1year	Increased risk of airway complications
Children >12 years	Increased risk of severe emergence reactions
Previous adverse reaction to ketamine	
Any respiratory complaint asthma active respiratory tract infection or disease pneumonia procedures involving the airway or pharynx	Increased bronchospasm, airway secretions & laryngospasm
Cardiovascular disease	Increases heart rate, oxygen consumption and workload of the heart.
Head Injury associated with loss of consciousness, ltered level of consciousness or emesis Altered conscious state CNS mass lesions, hydrocephalus other conditions associated with raised intracranial pressure	Increased intra-cranial pressure
Glaucoma or acute globe injury	Increased intra-ocular pressure
Bowel obstruction	Increase incidence of vomiting as a result of the bowel obstruction & potential airway complications when sedated
Psychosis, ADHD	More severe emergence reaction / recovery agitation
Porphyria, thyrotoxicosis, unstable epilepsy	Anecdotal evidence of enhanced sympatomimetic responses ³¹ Brief seizures

Fasting state prior to procedure

The recommended fasting times for ketamine IV and IM are :

4 hours fasting status for solids & 2 hours for liquids

Ketamine administration requires:

- Health Evaluation and Risk Assessment
- Written consent

For further information on these topics please refer to Module 1 “General Sedation Module”.

Additional information on obtaining consent for Ketamine

The trance like state, open eyes and occasional random movements seen during ketamine administration can be frightening for parents. Therefore it is important to explain the effects of ketamine to the parent. The sedation handout provides good talking points in the discussion with parents about the expected events during the sedation and possible sequelae after the procedure.

Sedation for procedures - for the Emergency Department



About Ketamine

Ketamine is commonly used in Australian hospitals for sedation in children. When we give your child Ketamine, they get sleepy and do not remember what happened. There are some special features about sedation with Ketamine for you to know -

- It is given by injection into a vein.
- Your child may seem to be awake after receiving Ketamine.
- Your child may move and need someone to hold them still.
- Your child may drool more than usual.

Sometimes as your child wakes up, they may have some agitation, hallucinations or nightmares. These sensations usually improve if you comfort your child in a quiet and dark area until they are fully awake.

Observations

Observations should be continuously monitored and documented every 5 minutes until the child returns to normal conscious state:

- Pulse
- Respiratory Rate
- Blood Pressure
- Oxygen saturation
- Sedation score (as measured by UMSS)

For more detailed information please refer to Module 1: General Sedation Module.

Location

Sedations with Ketamine can only be performed in the resuscitation area.

Staff required for procedure

A minimum of three staff members:

- The proceduralist.
- Sedation doctor to administer the Ketamine. This doctor must be credentialed in Ketamine sedation and PLS/APLS certified.
- Nurse must be credentialed in ketamine sedation and PLS/APLS certified.
- The Emergency Consultant must be consulted regarding the patient and available during the procedure.

All required personnel must be present and equipment checked and available prior to the administration of ketamine.

Ketamine IV must only be administered by the sedation doctor.

Ketamine dose

There is no reversal agent for ketamine. The following table explains the differences between administration of Ketamine IV and IM⁸. Ketamine IV must be given as a slow IV push over 1 minute, to avoid transient respiratory depression.

Route of administration	Intra – muscular (IM)	Intravenous (IV)
Advantages	No IV necessary	Ease of repeat dosing, Slightly faster recovery
Clinical onset	3-5 minutes	1 minute
Duration of Effective sedation	15 – 30 minutes	15 minutes
Recovery	90-150 minutes	60 minutes
Initial dose	4mg/kg	1-1.5mg/kg
Subsequent dose	Insert IV and give further doses 0.25mg/kg IV	0.25mg/kg
Maximum dose	5 mg/kg	5mg/kg

Drug preparation

IM administration

Give into a large muscle eg thigh. If atropine is given as an adjunctive agent, ketamine & atropine can be mixed into the same syringe in a single injection.

IV administration

Ketamine & atropine (if required) can be mixed together or administered separately. Atropine is ideally given before Ketamine.

Equipment

- Bag / valve / mask set up for appropriate size and able to deliver O₂ with O₂ tubing attached
- Resuscitation trolley with full intubation equipment setup (ETT, laryngoscope, introducer, McGills forceps, ties)
- Appropriate size Guedel airway
- Suction with a yankauer sucker attached
- Oxygen tubing attached to oxygen source with appropriate size mask
- Pulse oximetry operative – to monitor oxygen saturation pre, during & post procedure
- ECG monitoring equipment
- Blood pressure monitoring

A three-lead cardiac monitor, saturation probe and non invasive BP monitoring should be applied for the duration of the procedure and recovery period.

Prior, During and Post Procedure Management

See Module 1 General Sedation

Discharge Criteria

See Module 1 General Sedation Module.

Atropine

Pharmacological Action

Relaxes smooth muscles, inhibits salivary and bronchial secretions, increases heart rate and dilates pupils. These effects are due to competitive inhibition of muscarinic acetylcholinergic parasympathetic postganglionic receptors. It can be used to reduce salivary and tracheobronchial secretions associated with ketamine administration.

Dose

20 mcg / kg (0.02 mg / kg)
Max 0.5 mg/dose; total max 1 mg

It may be administered IV or IM (the dose is the same irrespective of the route of delivery).

<http://www.rch.org.au/pharmacopoeia/pages/atropine.html>

References

1. American Academy of P, American Academy of Pediatric D, Cote CJ, Wilson S, Work Group on S. Guidelines for monitoring and management of pediatric patients during and after sedation for diagnostic and therapeutic procedures: an update. *Pediatrics* 2006;118(6):2587-602.
2. Anaesthetists AaNZCo. *Guidelines on Conscious Sedation for Diagnostic, Interventional Medical and Surgical Procedures. PS9.*: Australian and New Zealand College of Anaesthetists, 2001.
3. Australasian College for Emergency Medicine A, New Zealand College of A, Faculty of Pain M, Joint Faculty of Intensive Care M. Statement on clinical principles for procedural sedation. *Emergency Medicine (Fremantle, W A)* 2003;15(2):205-6.
4. Nelson D. Pediatric procedural sedation in the emergency department. In: Krauss BB, editor. *Pediatric procedural sedation and anesthesia*: Lippincott Williams & Wilkins, Philadelphia, 1999.
5. Zier JL, Drake GJ, McCormick PC, Clinch KM, Cornfield DN. Case-series of nurse-administered nitrous oxide for urinary catheterization in children. *Anesthesia & Analgesia* 2007;104(4):876-9.
6. Babl FE, Oakley E, Seaman C, Barnett P, Sharwood LN. High-concentration nitrous oxide for procedural sedation in children: adverse events and depth of sedation. *Pediatrics* 2008;121(3):e528-32.
7. Sacchetti A, Stander E, Ferguson N, Maniar G, Valko P. Pediatric Procedural Sedation in the Community Emergency Department: results from the ProSCED registry. *Pediatric Emergency Care* 2007;23(4):218-22.
8. Krauss B, Green SM. Procedural sedation and analgesia in children.[see comment]. *Lancet* 2006;367(9512):766-80.
9. Cravero JP, Blike GT, Beach M, Gallagher SM, Hertzog JH, Havidich JE, et al. Incidence and nature of adverse events during pediatric sedation/anesthesia for procedures outside the operating room: report from the Pediatric Sedation Research Consortium. *Pediatrics* 2006;118(3):1087-96.
10. Roback MG, Wathen JE, Bajaj L, Bothner JP. Adverse events associated with procedural sedation and analgesia in a pediatric emergency department: a comparison of common parenteral drugs. *Academic Emergency Medicine* 2005;12(6):508-13.
11. Green SM, Rothrock SG, Lynch EL, Ho M, Harris T, Hestdalen R, et al. Intramuscular ketamine for pediatric sedation in the emergency department: safety profile in 1,022 cases.[see comment]. *Annals of Emergency Medicine* 1998;31(6):688-97.
12. Anonymous. Guidelines for monitoring and management of pediatric patients during and after sedation for diagnostic and therapeutic procedures: addendum. *Pediatrics* 2002;110(4):836-8.
13. American Society of Anesthesiologists Task Force on S, Analgesia by N-A. Practice guidelines for sedation and analgesia by non-anesthesiologists. *Anesthesiology* 2002;96(4):1004-17.
14. ACEP. Clinical policy for procedural sedation and analgesia in the emergency department. American College of Emergency Physicians. *Ann Emerg Med* 1998;31(5):663-77.
15. Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine. *Acute Pain Management: Scientific Evidence.*: Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine, 2005.
16. Anonymous. Guideline statement: management of procedure-related pain in children and adolescents. *Journal of Paediatrics & Child Health* 2006;42 Suppl 1:S1-29.

17. Hoffman GM, Nowakowski R, Troshynski TJ, Berens RJ, Weisman SJ. Risk reduction in pediatric procedural sedation by application of an American Academy of Pediatrics/American Society of Anesthesiologists process model. *Pediatrics* 2002;109(2):236-43.
18. Agrawal D, Manzi SF, Gupta R, Krauss B. Preprocedural fasting state and adverse events in children undergoing procedural sedation and analgesia in a pediatric emergency department.[see comment]. *Annals of Emergency Medicine* 2003;42(5):636-46.
19. Babl FE, Puspitadewi A, Barnett P, Oakley E, Spicer M. Preprocedural fasting state and adverse events in children receiving nitrous oxide for procedural sedation and analgesia. *Pediatric Emergency Care* 2005;21(11):736-43.
20. Malviya S, Voepel-Lewis T, Tait AR, Merkel S, Tremper K, Naughton N. Depth of sedation in children undergoing computed tomography: validity and reliability of the University of Michigan Sedation Scale (UMSS). *Br J Anaesth* 2002;88:241-5.
21. Krauss B. Continuous-flow nitrous oxide: searching for the ideal procedural anxiolytic for toddlers.[comment]. *Annals of Emergency Medicine* 2001;37(1):61-2.
22. Gall O, Annequin D, Benoit G, Glabeke E, Vrancea F, Murat I. Adverse events of premixed nitrous oxide and oxygen for procedural sedation in children. *Lancet* 2001;358(9292):1514-5.
23. Annequin D, Carbajal R, Chauvin P, Gall O, Tourniaire B, Murat I. Fixed 50% nitrous oxide oxygen mixture for painful procedures: A French survey. *Pediatrics* 2000;105(4):E47.
24. Frampton A, Browne GJ, Lam LT, Cooper MG, Lane LG. Nurse administered relative analgesia using high concentration nitrous oxide to facilitate minor procedures in children in an emergency department.[see comment]. *Emergency Medicine Journal* 2003;20(5):410-3.
25. Hilgenberg JC, McCammon RL, Stoelting RK. Pulmonary and systemic vascular responses to nitrous oxide in patients with mitral stenosis and pulmonary hypertension. *Anesthesia & Analgesia* 1980;59(5):323-6.
26. Baum VC. When nitrous oxide is no laughing matter: nitrous oxide and pediatric anesthesia. *Paediatric Anaesthesia* 2007;17(9):824-30.
27. Axelsson G, Ahlborg G, Jr., Bodin L. Shift work, nitrous oxide exposure, and spontaneous abortion among Swedish midwives. *Occupational & Environmental Medicine* 1996;53(6):374-8.
28. Rowland AS, Baird DD, Weinberg CR, Shore DL, Shy CM, Wilcox AJ. Reduced fertility among women employed as dental assistants exposed to high levels of nitrous oxide.[see comment]. *New England Journal of Medicine* 1992;327(14):993-7.
29. Morton NS. Ketamine for procedural sedation and analgesia in pediatric emergency medicine: a UK perspective. *Paediatric Anaesthesia* 2008;18(1):25-9.
30. Howes MC. Ketamine for paediatric sedation/analgesia in the emergency department. *Emerg Med J.* 2008;21:275-280.
31. Green SM, Krauss B. Clinical practice guideline for emergency department ketamine dissociative sedation in children. *Annals of Emergency Medicine* 2004;44(5):460-71.
32. Green SM, Rothrock SG, Harris T, Hopkins GA, Garrett W, Sherwin T. Intravenous ketamine for pediatric sedation in the emergency department: safety profile with 156 cases. *Academic Emergency Medicine* 1998;5(10):971-6.
33. Ramaswamy P, Deasy C, Sharwood LN, Babl F. Pediatric procedural sedation with ketamine: Time to discharge after IM vs IV administration. *In press.*
34. Wathen JE, Roback MG, Mackenzie T, Bothner JP. Does midazolam alter the clinical effects of intravenous ketamine sedation in children? A double-blind, randomized, controlled, emergency department trial. *Annals of Emergency Medicine* 2000;36(6):579-88.
35. Green SM, Krauss B. Should I give ketamine i.v. or i.m.?[comment]. *Annals of Emergency Medicine* 2006;48(5):613-4.
36. Roback MG, Wathen JE, MacKenzie T, Bajaj L. A randomized, controlled trial of i.v. versus i.m. ketamine for sedation of pediatric patients receiving emergency department

- orthopedic procedures.[see comment]. *Annals of Emergency Medicine* 2006;48(5):605-12.
37. Herd D, Anderson BJ. Ketamine disposition in children presenting for procedural sedation and analgesia in a children's emergency department. *Pediatric Anesthesia* 2007;17:622-629.
 38. BAEM. Guideline for ketamine sedation in emergency departments. Available from: <http://www.emergencymed.org.uk>, 2004.
 39. Heinz P, Geelhoed GC, Wee C, Pascoe EM. Is atropine needed with ketamine sedation? A prospective, randomised, double blind study. *Emergency Medicine Journal* 2006;23(3):206-9.
 40. Brown L, Christian-Kopp S, Sherwin T, Khan A, Barcega B, al. e. Adjunctive atropin in unnecessary during ketamine sedation in children. *Academic Emergency Medicine* 2008;15:314-318.
 41. Sherwin TS, Green SM, Khan A, Chapman DS, Dannenberg B. Does adjunctive midazolam reduce recovery agitation after ketamine sedation for pediatric procedures? A randomized, double-blind, placebo-controlled trial.[see comment]. *Annals of Emergency Medicine* 2000;35(3):229-38.
 42. Langston WT, Wathen JE, Roback MG, Bajaj L. Effect of ondansetron on the incidence of vomiting associated with ketamine sedation in children: A double-blind, randomized, placebo-controlled trial. *Ann Emerg Med* 2008;52:30-34.
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Appendix 1



Emergency



UR NUMBER

SURNAME

GIVEN NAME(S)

DATE OF BIRTH

AFFIX PATIENT LABEL HERE ↑

MR180/0 Record of sedation for procedure in the Emergency Department

This is **not** a medication order. Use this form for procedural sedation with oral, IV, IM, inhaled agents

Date: ___ / ___ / ___ Time: _____ Type of procedure: _____

() * Number corresponds to the information provided on the reverse

Prior to sedation

Risk assessment and exclusion criteria checked (1)* Yes

List if any:

If Emergency Department consultant informed, name of ED consultant:

Prepare patient/parents

Fasted from (2)* _____ (solids) _____ (liquids)

Sedation handout discussed with patient / parent Yes

Informed written consent obtained: indications discussed possible adverse events discussed Yes

Adequate staff available (3)* Yes

Baseline observations (Sedation Score, HR, RR, SpO₂) performed immediately prior to administering sedation (BP for Ketamine) Yes

Sedation agent prescribed on Medication Chart Yes

Weight and allergies documented on medication chart Yes

Non-pharmacological techniques planned (e.g. distraction box) Yes No

Other analgesic / sedative agents administered. If yes, specify _____ Yes No

Prepare venue

Equipment is present and functioning: procedure equipment, emergency equipment (4)* Yes

'Time Out' or 'Positive Patient Identification' (5)* please tick box below Yes

All sections should be completed prior to the patient proceeding to the 'sedation period'.

During sedation period

Drugs administered by accredited staff member Yes

Vital signs / Sedation Score documented every 5 minutes Yes

Post-procedure

Patient returned to baseline Sedation Score Yes

Observation within normal limits Yes

Discharge criteria met (7)* Yes

Post-sedation care discussed (Sedation handout) (N.B. safety and injury prevention highlighted) Yes

Summary of sedation episode (please tick)

Sedation used: nitrous oxide ketamine IM ketamine IV midazolam oral other, specify _____

Total dose: _____ mg OR N₂O _____ % for _____ minutes

Deepest level of sedation: _____ (indicate UMSS score) (6)*

Side effects/adverse events: No Yes (specify)

Staff member identification (Print name, sign, designation for each entry)

Time Out completed by: (5)*
Tick box by staff member listed

Sedation accredited staff member:

Sedation accredited staff member:

Handed over to:

Record of sedation for procedure in ED MR180/0

1. Risk assessment	If any child meets the risk assessment criteria OR if you have reservations, contact the Emergency Department consultant for further discussion before using a sedation agent.		
	Significant risk of delayed gastric emptying or vomiting e.g. bowel obstruction, gastro-oesophageal reflux		
	Significant respiratory disease e.g. upper airway obstruction, airway infection, apnoea, exacerbation of asthma, pneumonia		
	Significant cardiovascular impairment e.g. pulmonary hypertension, cardiomyopathy, hypovolemia		
	Abnormal conscious state/risk of raised ICP e.g. head injury, meningitis, space occupying lesion		
	Acute systemic infection e.g. sepsis		
	Immunosuppression e.g. post-op transplant, neutropenia		
	Significant liver disease / liver failure e.g. biliary atresia		
	Prior adverse event		
	Prior allergic reaction		
	Patient receiving opioids or other sedative agents		
	Age less than or equal to 2 years		
Exclusion criteria	Nitrous Oxide <ul style="list-style-type: none"> • Lung cyst • Bowel obstruction • Middle ear disease • Pneumothorax • Head injury 	<ul style="list-style-type: none"> • B12 folate deficiency • Abnormal homocysteine metabolism 	Ketamine <ul style="list-style-type: none"> • < 1 year or > 12 years • Glaucoma • Head injury, CNS lesion, epilepsy • ADHD, psychosis
2. Fasting times	Nitrous Oxide 2 hours solids and liquids	Oral agents 2 hours solids and liquids	Ketamine 4 hours solids or milk 2 hours clear liquids
3. Staff levels	2 staff required 1 accredited	2 staff required 1 accredited	3 staff required 2 accredited
4. Location and equipment check	Location: nitrous oxide in treatment rooms, ketamine in resuscitation rooms Equipment: this equipment should be in the room at all times, turned on and functioning during the sedation period <ul style="list-style-type: none"> • suction device • bag / valve / mask for size of patient with correct mask • Oxygen available by mask • monitoring equipment (HR, RR, SpO₂, BP) • access to resuscitation trolley with appropriate sized airway equipment 		
5. 'Time Out' or 'Positive identification'	Both staff involved in the procedure will confirm the following: <ul style="list-style-type: none"> • the patient's identity checked by ID band or positive identification • confirm or mark site (if applicable) • procedure to be performed 		
6. Details of Sedation Score (UMSS)	0 = Awake and alert 1 = Minimally sedated: may appear tired/sleepy, responds to verbal conversation and/or sound 2 = Moderately sedated: somnolent/sleeping, easily roused with light tactile stimulation or simple verbal command 3 = Deep sedation: deep sleep, rousable only with deep or significant physical stimulation 4 = Unrousable		
7. Discharge criteria	<ul style="list-style-type: none"> • resumption of pre-sedation level of consciousness • resumption of purposeful neuromuscular activity • ability to ambulate or sit without support (if appropriate) • ability to verbalise (if appropriate) • final set of vital signs within normal limits for patient's age • ability to tolerate oral fluids 		

Appendix 2

Sedation for procedures – for the Outpatient or Emergency Dept

This fact sheet is for children having sedation for a procedure while in the Outpatients Department or Emergency Department at The Royal Children's Hospital.

Part one: about sedation

Sedation is a medicine given to children to make them feel sleepy and relaxed. This medicine can be given by drinking, breathing in a gas or by an injection.

Reasons for having sedation

Your child may become distressed or have pain when having certain tests or treatments. Procedural sedation (sedation for procedures) aims to reduce your child's pain and anxiety. The sedation may make them feel sleepy and or make them unable to remember the procedure. The procedures can then be done without causing less distress for you and your child.

Permission to give sedation

As the parent or caregiver you must give us consent for sedation. You need to understand the reasons for sedation and the following risks:

What you need to know before consenting for sedation

1. We will carefully check your child's breathing and if required, we will give your child oxygen through a mask or breathing tube.
2. Children may vomit. Very rarely, they may breathe the vomit into their lungs, which may require some specific treatment.
3. They may need to be treated with extra medicines such as antihistamines.
4. For your child's safety, do not take your child home until staff tell you it is safe to. Expect to wait for an hour or more after the procedure.

About Ketamine

Ketamine is commonly used in Australian hospitals for sedation in children. When we give your child Ketamine, they get sleepy and do not remember what happened. There are some special features about sedation with Ketamine for you to know:

It is given by injection into the vein.
Your child may seem to be awake after receiving Ketamine.
Your child may move and need someone to hold them still.
Your child may drool more than usual.

Sometimes, as your child wakes up they may have some agitation, hallucinations or nightmares. These sensations usually improve if you comfort your child in a quiet dark area until they are fully awake.

Part two: helping your child

Helping your child before the procedure

Ask the doctor/ nurse to explain the procedure to you and to your child.
Talk to your child about some ways to cope (for example – looking at an interactive book, using their imagination to be in a nice place, blowing bubbles.
It helps not being too upset or nervous yourself – your child will notice this.

Helping your child during the procedure

Having a parent (or another adult) who knows the child stay with them is usually helpful.

The level in which you will be able to engage/involve your child will depend on how deeply sedated your child becomes. Your child may need reminders of the coping methods you decided upon earlier. For example, “blow away the hurt.” 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 eg. music or video options, 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 occur.

Helping your child after 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. For example “*you did a great job blowing away the hurt.*”

Part three: Care of your child on your way home and for the next 24 hours

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

If your child falls asleep in the car seat, watch them to make sure that they do not have any difficulty breathing. DO NOT leave your child alone in a car seat or alone in the car.

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.

Check on your child’s sleeping pattern the night after getting home. If their sleeping seems heavy or strange then wake them up gently. If you cannot wake them or something seems very wrong in their appearance or breathing, call an ambulance and return to the hospital immediately.

Sometimes children may feel sick or vomit if they eat a big meal too soon after sedation. **Give your child clear liquids such as diluted fruit juice, icy poles, jelly, clear soup etc.**

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).

Key points to remember

Sedation is commonly used in children for procedures.

You need to give consent before your child has sedation.

Make sure you understand the reasons for and the risks of sedation.

Be as open and honest as you can with your child about what is going to happen and it helps not to be too upset yourself.

When to call the doctor

Please call the Emergency Department at Royal Children’s Hospital (03-9345 6153) if your child:

Vomits more than twice

Has strange or unusual behaviour



If you have any questions.

The name of the doctor who performed the sedation is:

Dr _____

This fact sheet produced by The Emergency Department in consultation with the Department of Anaesthesia, the Royal Children’s Hospital. First uploaded: April 2006.

Appendix 3

 <p>The Royal Children's Hospital Melbourne</p>	<p>PATIENT NAME</p> <p>MR NUMBER</p> <p>AFFIX PATIENT LABEL HERE</p>	
<h2>Hospital Consent Form</h2>		
<p>I, _____</p>	<p>being the patient/mother of/father of/guardian of _____</p> <p>consent to the following procedure / course of treatment / anaesthesia</p>	
<p>This is/these are:</p>		
<p>Procedure 1</p>		
<p>Procedure 2</p>		
<p>Procedure 3</p>		
<p>(NAME OF PROCEDURES/TREATMENTS)</p>		
<p>Please note – the doctor should explain to you and you should understand the following three points:</p>		
<p>1 Signing this consent means that you understand the procedure, its possible side effects, its risks and the real expectations of recovery. It also means that you understand that the procedure may be done by a senior doctor or senior doctor in training.</p>	<p>2 Consenting to the above also consents to the use of tissue for diagnostic and treatment purposes of you or your child. Tissue refers to a sample that may be taken from the body – this might be a sample of an organ or a sample of a body fluid, like blood.</p>	<p>3 Consenting to the above also means that any remaining tissue may be kept and used for ethically approved research, education and laboratory quality procedures</p>
<p>The three points listed above have been explained to me by Dr _____ and I give my consent</p>		
<p>Signature _____</p>	<p>Date / /</p>	
<p>Treating Doctor/Proceduralist</p>		
<p>I, _____</p> <p>having a good understanding of the nature of the procedure, its material risks and its complications, have explained to the above named patient/parent/guardian the nature and effect of the operation(s) and/or treatment(s). In my opinion he/she has understood this explanation and has signed in my presence.</p>		
<p>Signature _____</p>	<p>Date / /</p>	
<p>If interpreter service used</p>		
<p>Name of interpreter _____</p>		
<p>STOCK NO 2250.9</p>	<p>PLEASE SEE OVER FOR GUIDE TO OBTAINING CONSENT</p>	

CONSENT FORM

MR132

A guide for obtaining consent.

Who can obtain consent?

To obtain consent a member of the treating team must have a thorough understanding of the procedure and its material risks. In most circumstances this should be the Consultant or Registrar.

Who can consent?

Parents/guardians

In Victoria the legal age of maturity is 18 years. Therefore, as a general principle, parents or guardians are required to give consent for treatment.

Minors

Minors below the age of 18 years may be legally able to give consent to treatment, provided that the doctor is satisfied that the young person has reached sufficient maturity to be competent to give consent. (This is usually accepted as above the age of 14 years.) Competency would be decided on determination of the child's ability to comprehend the treatment proposed, its side effects, the consequences of non-treatment and other treatment options.

The intellectually disabled and their guardians

In the case of an intellectually disabled 18-year-old (or older), who has insufficient understanding, the law requires the appointment of a guardian. The guardian is able to consent on behalf of the 18-year-old to treatments, which are in their interest. The 18-year-old's parents play no role unless they have been legally appointed as guardians.

Explanatory note relating to Interpreters

The use of an RCH approved interpreter is mandatory, whenever a consentor's English language skills are insufficient to clearly comprehend the suggested procedure, its material risks and its complications.

Completing the form

- Write legibly in block letters
- Avoid abbreviations eg. GAMP, CL & P etc.
- Separate different procedures eg.
 1. Tonsillectomy
 2. Adenoidectomy

Where different specialists are performing separate procedures, two consent forms should be completed eg. Cleft Lip and Palate Repair consent completed by Plastic Surgeon, Tympanoplasty consent completed by ENT surgeon