



comfort kids

PROCEDURAL SEDATION LEARNING GUIDE FOR HEALTH CARE PROFESSIONALS

- 1. PROCEDURAL SEDATION**
- 2. BENZODIAZEPINE MODULE**
- 3. NITROUS OXIDE MODULE**
- 4. REFERENCES**

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1. Procedural sedation

The Royal Children's Hospital, in conjunction with the Procedural Pain sedation Committee have established Procedural Sedation Guidelines (2006) and a Record of Sedation for Procedures, to improve the quality of care and safe delivery of sedation agents. The aim of the procedural pain program at the Royal Children's Hospital is to provide staff with the education and skills for the use of non- pharmacological and pharmacological agents, and to integrate these into their clinical practice.

The establishment of a hospital-wide program in procedural sedation, ensures uniform practice to address adverse events such as unintentional deep sedation, hypoxemia and failure of sedation and the relationship that exists between adverse effects from drugs and incorrect practices¹.

Sedation is one of the components in the delivery of effective procedural pain management, and should always be used with non-pharmacological techniques such as distraction, positioning and preparation of the child. Using non-pharmacological techniques independently or in conjunction with sedation can decrease, or eliminate, the need for sedation agents.

Introduction

Procedural pain refers to short-lived pain associated with medical (diagnostic) investigations and treatments such as blood tests, dressing changes, insertion or removal of catheters/tubes/intravenous lines, wound care and lumbar punctures.

The program aims to provide a foundation for a uniform approach to the management of procedural pain, distress and anxiety throughout the hospital. Having an established plan for procedures is known to reduce a child's distress, anxiety and psychological trauma and improves patient, family and staff satisfaction.

Learners Aims

The aim of the package is to provide staff with the background required to:

- Appropriately define the patients for whom minimal or moderate sedation is indicated for;
- Identifying what equipment, staffing and venue is required before proceeding with the procedure;
- Determine if the benefits of using a sedation agent(s) outweighs the risks. This includes assessing whether the use of sedation is less distressing than performing the procedure without it;
- Understanding the definitions of the "sedation periods" and criterion to discharge a patient home or to the care of an alternate staff member;
- Safely administer oral, intravenous and inhaled sedation agents;
- Identify the resources and documentation required for a procedural sedation.

Standard required for **competent clinician**: demonstrates the appropriate knowledge and skills to:

- Observe and interpret the patient's level of sedation and vital signs;
- Maintain an airway patency and adequate ventilation;
- Understand the pharmacology of the sedation agent, potential complications/risk factors and appropriate use of antagonist agent.

Standard required for **accredited clinicians**: all of the above and:

- Establish a learning contract with an identified Procedural Sedation Leader;
- Expectation of staff to read, comprehend and apply the principles of the Procedural Sedation Learning Guide and Procedural Sedation Guidelines.
- Safe administration of accredited listed sedation agents as assessed by designated Procedural Sedation Leader;
- Yearly re-accreditation it is ultimately the responsibility of individual staff members to ensure above criteria is maintained. As per the Nursing Board of Victoria statement on competent and self-reflective practice.

Indications for procedural sedation:

Examples of suitable procedures for which procedural sedation may be indicated:

<ul style="list-style-type: none">▪ Lumbar puncture▪ Plaster care▪ Electrophysiological studies▪ Wound dressing care▪ Diagnostic radiology,▪ Venous access or blood work▪ Fractures and plaster care	<ul style="list-style-type: none">▪ Intercostal /drain catheter▪ Skin biopsy▪ Nasogastric or catheter placement or removal▪ Pin care▪ Procedure duration <45 minutes▪ Extraction of foreign body▪ Injections
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Record of sedation for procedures (MR 56S):

This Record of Sedation for Procedures was designed as a documentation and reference guide, assuring that the sedation process is well planned, safe and effective.

There are three components to the “Record of Sedation for a Procedure;” each of the criterions should be completed before preceding the next stage of the procedural sedation.

1. Prior to sedation
2. During the sedation
3. End of sedation criteria* (+ additional criteria for discharge home)

Prior to sedation

The purpose of the risk assessment is to alert the practitioner of children who are at a higher risk of complications. The risk assessment list outlines any child or adolescent who has a minimal reserve (i.e. the “sicker patient”) or patient groups at risk of having an adverse event. If the child meets any of the risk assessment criteria, or the practitioner has reservations about the procedure or agent, please consult the CPMS - pager 5773. This service provides twenty-four hour/seven day a week access.

A child identified as having a risk factor may still undergo a procedural sedation; **providing** a consultation with CPMS has occurred. This includes discussing the degree of risk to the child and assessing a potential alternative sedation agent.

This risk assessment list can be found on the reverse side of the Record of Sedation for Procedures (MR56S) and the Hospital Procedural Sedation Guidelines.

1.1 Risk Assessment

Significant risk of delayed or vomiting

- Bowel obstruction
- Gastro-oesophageal reflux

Significant respiratory disease

- Upper airway obstruction
- Airway infection
- Apnoea
- Exacerbation of asthma
- Pneumonia

Significant cardiovascular impairment

- Pulmonary hypertension
- Cardiomyopathy
- Hypovolemia

Abnormal conscious status/risk of raised ICP

- Head injured
- Meningitis
- Space occupying lesion

Immunosuppression

- Post-op transplant
- Neutropenia

Significant liver disease/liver failure

- Biliary atresia

Acute systemic infection

- Sepsis

Prior adverse event

Prior allergic reaction

Age less than or equal to 6 months (for oral agents only)

Age less than or equal to 2 years (for nitrous oxide and IV midazolam)

Patient receiving opioids or other sedative agents

Note: CPMS consultation is required.

Patients receiving opioids may be given sedation agents for a procedure providing a consultation has occurred to identify the appropriate agent and dose.

Exclusion criteria for nitrous oxide

Any condition where there is a risk of trapped gas e.g. Lung cyst, bowel obstruction, middle ear disease or pneumothorax, excludes the patient group from the use of nitrous oxide. Nitrous oxide will diffuse into the gas filled spaces, leading to increased volume and pressure within that space which may cause the underlying condition to exacerbate.

1.2 Patient Assessment

A thorough patient assessment should be completed before a sedation agent is used. This includes the following:

- Scheduled prescribed drugs
- Drug allergies (recorded on medication chart)
- Pathology results e.g. Platelet count prior to lumbar puncture.
- Last oral intake
- Previous sedation experiences and drugs used

Physical examination

- Current weight
- Baseline vital signs, GSC, and sedation score
- Cardio-respiratory assessment including assessment of patient's airway (particularly to define at-risk groups where expert assistance is required)
- Complete a Record of Sedation for Procedures (MR56S)
- Document baseline vital signs, including BP for IV agents and sedation score on observation chart (MR 77 or MR52B), immediately prior to commencing sedation.

RCH uses the University of Michigan Sedation Score as tabled below:

UMMS- The University Michigan Sedation Score	
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 - also know as "conscious sedation"
3	Deep sedation; deep sleep, rousable only with deep or significant physical stimulation
4	Unrousable

1.3 Fasting

To ensure a safe and consistent approach throughout the hospital, please follow the documented fasting times for procedural sedation. Recommended minimal fasting times for procedural sedation are consistent with current clinical practices in Australian Paediatric Centres and the College of Physicians guidelines. The fasting times are designed to minimise the risk of pulmonary aspiration of gastric contents.

Offering clear fluids up to 2 hours prior to sedation will help minimise the distress related to fasting.

	Oral agents	Nitrous Oxide	IV Midazolam
Fasting times	2 hours solids and liquids	2 hours solids 2 hours breastfeed 2 hours clear fluids	6 hours solids 4 hours breastfeed 2 hours clear fluids

1.4 Consent for sedation and the procedure

Consent should be obtained for **both** the procedure **and** sedation agent.

- Informed consent for the procedural sedation agent must be obtained by a staff member who has an understanding of the sedation agent and can explain to the parents/ carer and patient, the indications for its use and possible risks involved. This should be documented in MR56S and progress notes.
- Informed consent for the procedure should be obtained by the proceduralist.
- For **nitrous oxide** or **intravenous Midazolam**, consent must be obtained by an accredited staff member only.

- Post-sedation care must be discussed with parents/carers, including safety and injury prevention.
- It is recommended that the parent/carer be provided with a fact sheet for the selected sedation agent (www.rch.org.au/kidsinfo).

Sedation handout discussed with patient/parent.

Helping the adults/child understand the procedure and need for sedation is the responsibility of staff involved in the procedure. The appropriate sedation hand-out should be given to all families of children receiving sedation, informing them of the sedation process and associated risks. The procedure itself, risks and instruction for discharge need to be explained to the adult/child independently.

1.5 Adequate staff available

The minimum staff number required is listed on the back of the Record of Sedation for Procedure.

	Oral agents	Nitrous oxide	IV Midazolam
Staff levels	2 staff available 1 competent RN/medical staff	2 staff available 1 accredited	2 staff available 1 accredited

Depending on the sedation agent used a competent/accredited staff member must be responsible for the following:

- Baseline and ongoing vital signs including blood pressure for midazolam, airway patency, adequacy of ventilation and oxygen saturation
- Level of sedation for the duration of the procedure and until the patient has returned to baseline sedation score (UMMS).

Note: if an additional staff member is required (proceduralist) this cannot be the sedator.

1.6 Equipment

In any circumstance where a patient may be sedated the following equipment must be available, turned on and functioning:

- Standard hospital resuscitation trolley with age-appropriate equipment
- Separate and functional suction apparatus with attachment.
- Saturation oximeter and blood pressure monitoring equipment.
- An emergency call system to summon additional help if required
- A room and appropriate size bed or trolley to monitor the child safely, the child should be recovered in “recovery” lateral position.

1.7 Environment

To minimise procedural anxiety:

- Appropriate lighting (to safely execute the procedure and patient observation) and minimal noise
- Prepare the venue and all necessary equipment (keeping needles out of sight) before the patient enters

1.8 Child and parent

Optimising the parent's role is known to reduce the child's anxiety during the procedure. Staff should be sensitive to parents who are not able to provide this support. Children usually cope better with the parent(s) or guardian present. For adolescents, discuss if a parent's presence is preferred.

Distraction tips: plan with the adult and patient what alternative positioning and distraction will be used at the procedure, be prepared to alter and adapt your plan and be clear on who will be distracting or coaching/ talking to the patient.

Parent fact sheets: the following fact sheets are located on the Comfort Kid's website

- Midazolam
- Chloral Hydrate
- Nitrous oxide

1.9 Medications

- Patients should not receive sedative drugs prior to arrival at hospital
- Sedated patients should not be placed in corridor or waiting room areas
- All drug(s) should be documented on Medication Chart MR52.

During sedation period

- Patient must remain in the [line of sight](#) of either a competent staff member for oral agents or accredited staff member for nitrous oxide and IV agents
- Continuous saturation oximetry is required for all sedation agents
- **If sedation score is equal to > 2:** observe and record vital signs and sedation score every 5 minutes. For IV agents, five minutely BP is required.

Line of sight: From the time sedation is administered until the end of the sedation period, the patient must have "line of sight" clinical observation. During the procedure and when the sedation score is > 1, the patient must have continuous immediate clinical supervision.

Post sedation period – place child in the “recovery” position

The ‘sedation period’ is considered over when the patient:

- Returns to **baseline** sedation score and vital signs
- Is easily rousable and has intact protective airway reflex
- Can talk if developmentally appropriate.

Note: until the patient meets these criteria continue to reassess and monitor the child in “recovery” lateral position and keep nil orally.

Transport

If a patient in the ‘sedation period’ needs to be transported:

- Transported patient should be placed in the “recovery” lateral position
- Must have continuous saturation oximetry
- Suction, oxygen and an appropriate sized bag and mask accompanies the patient
- Sedated patients should be accompanied by a competent or accredited staff member who can continuously monitor the patients’ vital signs: airway patency, ventilation and sedation score.

1.10 Discharge criteria for outpatient:

In addition discharge home may be considered (provided other medical factors permit) when the patient meets the following criteria:

- The patient can sit up/walk unaided (if developmentally appropriate)
- The patient has returned to pre-sedation observations (both vital signs and level of sedation)
- A responsible adult is present to accompany the patient home (for all ages)
- Post-sedation care has been discussed with parents/guardians. Safety and injury prevention must be highlighted.

1.11 Documentation

- Complete “Record of Sedation for Procedures” (MR56S)
- Medications (including nitrous oxide) must be prescribed on the patient’s Hospital Medication Chart (MR52)
- Record observations on (MR 77 or MR52B)
- Procedural summary of the event should be completed including:
 - Procedure of event with reference to the equipment, number of attempts, and procedure assessment
 - Recommendations for future interventions, including sedation agent.

Examples of sedation complication or adverse events:

<ul style="list-style-type: none">▪ Failure to achieve adequate sedation▪ Unintentional loss of consciousness▪ Prolonged or excessive sedation▪ Sustained hypoxemia noted from change in baseline saturation▪ Respiratory depression and apnoea - requiring bag-mask-ventilation or intubation	<ul style="list-style-type: none">▪ Laryngospasm, bronchospasm and increased airway secretions▪ Depression of cardiovascular system - hypotension, bradycardia,▪ Vomiting * side effect for N2O▪ Aspiration▪ Allergic reaction▪ Unscheduled admission
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1.12 Occupational health concerns

Prolonged and repetitive exposure to nitrous oxide can suppress liver enzymes involved with vitamin B₁₂ and folate metabolism and inactivate vitamin B₁₂. Occupational exposure can 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.

Pregnancy and nitrous oxide: Exposure to nitrous oxide should be avoided during pregnancy. It is recommended that exposure to nitrous oxide **not occur** in the first trimester of pregnancy. Occasional brief exposure later in pregnancy is considered 'low risk'.

Repeated exposure should be avoided in the 2nd and 3rd trimesters.

Any concerns regarding nitrous oxide and pregnancy can be discussed with anesthetic staff at RCH by referral.

2. Benzodiazepine Module

Midazolam IV administration requires accreditation. Oral Midazolam may be administered by a competent staff member as per the Royal Children's Hospital Procedural Sedation Guidelines. This module will outline the oral/IV midazolam dose, IV titration and common adverse events.

Background

Benzodiazepines have been used in children as sedative hypnotic agents for the management of procedural anxiety, amnesia during procedures and control of seizures. It has no analgesic effects.

Benzodiazepines act as the gamma aminobutyric acid receptor (GABA). GABA receptor stimulators such as Benzodiazepines, potentate the GABA effects of calming the patient, relaxing smooth muscle and producing sleep.

Midazolam can be administered IV, IM, orally, rectally and nasally. Absorption varies with route of administration. The oral dosages are in part metabolized by the liver (first pass effect). Nasal Midazolam is known to cause irritation to children, thus increasing the level of anxiety prior to the start of the procedure. Furthermore if the dose is swallowed, it is unknown what percentage was absorbed, therefore it is recommended oral or intravenous Midazolam is used.

2.1 Indications for use

- Relieve anxiety regarding procedure
- Benzodiazepines have no analgesic effect

Adverse reactions to benzodiazepines

- Cardiorespiratory depression (hypotension, bradycardia and respiratory depression)
- Paradoxical excitement (unexpected excitement)
- Emergence delirium.

Side effects are dose related and vary with route of administration. The route with the highest risk of major side effect is IV Midazolam.

2.1 Midazolam pharmacology

Oral Midazolam

The oral route is the most convenient and easiest route of administration. IV preparation used is bitter and children sometimes refuse it or spit it out. The taste can be disguised by using 5-15 ml of undiluted cordial or 33% sucrose or chocolate syrup. Let the child or family suggest what mix is preferred.

- **Dose oral (ampoule):** 0.5 mg/kg (max 15 mg).
- **Absorption:** oral absorption is rapid, although erratic due to the first pass effect which results in unpredictable blood levels.
- **Maximum effect:** within 30- 60 minutes and duration up to 2 hours.

Note: no serious respiratory depression has been reported in oral administration except when other sedatives drugs/opioids are co-administered.

IV Midazolam

The advantage of IV Midazolam is ease of administration and titration, especially in circumstances when an IV has been sited.

- **Dose:** draw up 0.15 mg/kg (max of 7.5mg) of Midazolam- dilute in 10 mls of 0.9% normal saline. Do not exceed 10mls.
 - Do not exceed 0.15mg/kg dose
- **Titration:** first dose 0.6-1.2mls (0.01-0.02mg/kg) and wait 2-3 minutes. Observe the patients vital signs and sedation score.
 - If desired sedation level has not been achieved, bolus second dose as per first dose. Observe the patients vital signs and sedation score.
- **Peak effect:** effect should be achieved in 2-3 minutes. Continue to observe the patient during the procedure.
- **Duration:** effect may last 30-60 minutes.

Note: rapid administration of IV Midazolam increases the risk of respiratory depression.

Reversal agent: Flumazenil

Is the Benzodiazepine antagonist, it can reverse overdose symptoms of Midazolam. Flumazenil is administered IV.

- **Dose:** 5 mcg/kg every 60 seconds to a total dose of 40 mcg/kg (adult dose: 300-600 mcg)
- **Duration:** it has a short duration of action and might require several doses or an infusion.
- **Located:** emergency trolley, PICU, theatres and pharmacy.

3. Nitrous oxide module

Nitrous oxide may be administered by an **accredited staff member only**. This section of the sedation package will address the principles of nitrous oxide, indications for use, adverse events and toxicity. A guide to administration using the Quantiflex system including photos and a systematic approach to delivering nitrous oxide has been included.

Nitrous oxide as a sedation and analgesia agent is well documented, and when delivered by trained staff, with proper monitoring and established guidelines the incidents of adverse events is minimised¹. However the effect is variable and the analgesia and sedation provided may not be adequate for some patients and procedures.

Accreditation in nitrous oxide administration is available for all medical and division one nursing staff at the Royal Children's Hospital. Staff who have received training from the RCH Emergency Department are required to have one observed sedation episode with an identified procedural sedation leader or procedural pain management educator.

Background

Nitrous oxide is an inhaled gas, which produces an analgesia, anxiolytic, amnesia and anaesthesia, although the exact mechanisms of action are unknown. It is always delivered simultaneously with variable concentrations of oxygen; **never on its own**. The nitrous oxide units at RCH are equipped to deliver a maximum dose of 70% nitrous oxide only, to prevent hypoxemia to the patient.

Studies in children have shown nitrous oxide to be an effective agent for reducing pain and anxiety during procedures, and it can be delivered painlessly. It has a range of effectiveness with 80% experiencing excellent analgesia, 10% some analgesia and for 10% it is not effective.

Diffusion Hypoxia

Nitrous oxide is twenty - forty times more soluble in blood than nitrogen and oxygen. When nitrous oxide is discontinued, nitrous oxide diffuses out of the blood into the alveoli in large volumes. If the patient is allowed to breathe air at this time the combination of nitrous oxide and nitrogen in the alveoli reduces the alveolar PO₂. This causes diffusion hypoxia and is avoided by administering 100% oxygen for 3-5 minutes post procedure. If the patients mask is off for more than 30 seconds or after discontinuing nitrous oxide 100% oxygen must be administered.

Exclusion criteria for nitrous oxide

Any condition where there is a risk of trapped gas e.g. lung cyst, bowel obstruction, middle ear disease, pneumothorax, excludes the patient group from the use of nitrous oxide. This is nitrous oxide will diffuse into the gas filled spaces and lead to increased volume and pressure within that space.

Indications for use

Useful: <ul style="list-style-type: none">▪ Suturing▪ Removal of foreign bodies from ear/soft tissues▪ Fracture manipulation▪ Burns dressings▪ Other painful procedures▪ Injection of local anaesthetic▪ Insertion of intravenous cannula▪ Removal of wound drain, pins, rods, or catheters▪ Insertion of urinary catheter▪ Other minor procedures	Less useful: <ul style="list-style-type: none">▪ Facial (perioral) lacerations▪ Procedures requiring immobility▪ Poor for intense pain▪ Poor for prolonged procedures e.g. those requiring sedation greater than 45 minutes
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Nitrous oxide pharmacological effects are:

- Analgesic
- Sedative
- Amnesic- inability to remember
- Anxiolytic-decreases anxiety

What is Nitrous Oxide?

- Gas
- Colorless
- Heavier than air
- Odorless or almost so

Pharmacokinetics:

- Inhaled gas
- 20 second onset
- Peak effect 1-3 minutes, optimal analgesic effect 3 minutes
- Low fat solubility thus does not really accumulate within the body
- Nitrous oxide has low blood solubility thus rapid clearance when inhalation has ceased
- Rapid fall in arterial concentration once inhalation stops. Feeling of complete recovery in 5 minutes, complete psychometric recovery reported in ~20mins
- $\frac{1}{2}$ life unknown

3.2 Adverse reactions

Nitrous oxide is well tolerated by children; many display mild side effects such as vomiting, dizziness, nausea, and light-headedness. Slowly titrating the dose in 10% increments helps reduce these effects.

Major side effects include:

- Respiratory depression
- Pulmonary aspiration of gastric contents if protective airway reflex is lost
- Apnoea

If deep sedation occurs airway patency can be lost, especially in children with:

- Underlying airway problems
- Acute respiratory infections
- Respiratory illness
- Altered mental state

There is no reversal agent for nitrous oxide.

N₂O toxicity: Prolonged exposure to nitrous oxide can suppress liver enzymes involved with Vitamin B12 and folate metabolism. Repeated exposure > three times a week may result in prolonged inhibition of this system. Altered B12 synthesis can lead to bone marrow suppression.

Prolonged administration leads to:

- Altered B12 synthesis leading to bone marrow depression.

Folinic Acid (Leucovorin Calcium) prophylaxis guidelines

Folinic acid supplementation can protect against this side effect.

There is considerable individual variation in the onset of BMD. Some patients are at higher risk of developing BMD, for example those with:

- Pre-existing B12 deficiency
- Folate deficiency
- Concurrent underlying critical or serious illness e.g. severe infection, fever, extensive tissue damage
- Critical illness

If repeated nitrous oxide use is anticipated in these patients, folinic acid supplementation should be started at the same time as the nitrous oxide. Neuronal degeneration (peripheral sensory and motor impairment) is usually only seen with abuse of nitrous oxide.

If you have any concerns regarding a patient receiving repeated nitrous oxide administration discuss these with the medical team or CPMS.

3.3 Equipment

The accredited staff member must check that the equipment including the nitrous oxide unit is functional before starting a procedure:

Disposable circuits

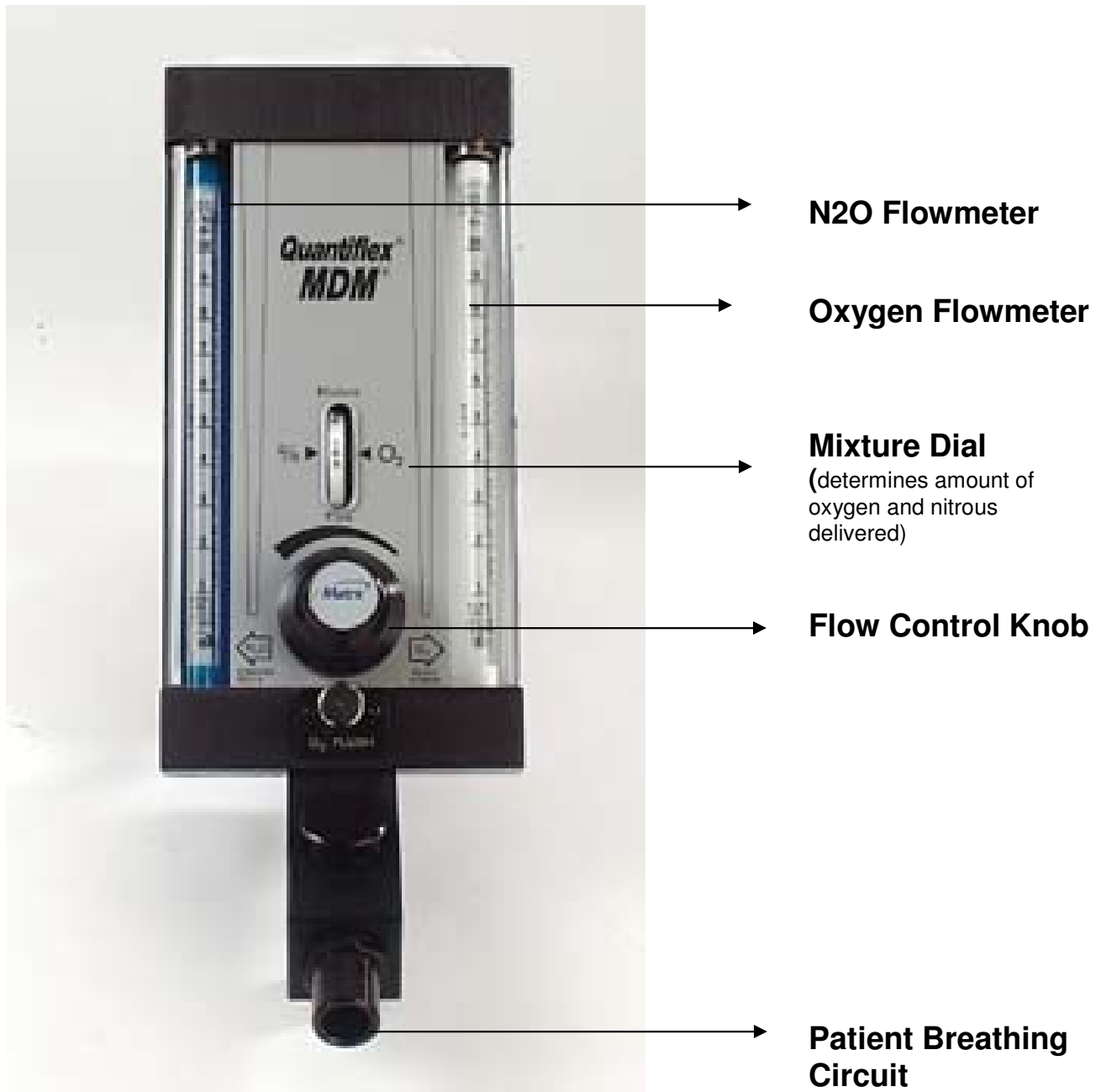
- Separate oxygen source with mask and bag other than the oxygen source on the nitrous oxide unit. Laerdal bags do not give free flow oxygen when used.
- The correct mask size must be used. It should fit snugly on the child's face over nose and mouth. This allows an adequate seal and avoids air entrainment
- Use the disposable patient circuits (blue and pink) which have a built-in filter.
- Check that the oxygen and nitrous oxide hoses are connected to the tanks
- 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 of the disposable circuit are connected and the Quantiflex reservoir bag inflates with no leak
- Ensure scavenging system is correctly attached to the expiratory hose of the circuit. Ensure separate wall mounted suction is on and attached to the nipple of the scavenger system (clear tube).

Silicon circuit all of the above plus:

- Check the silicon circuit is intact and assembled correctly on the nitrous oxide unit.
- Attach the bacterial filter (bactrap) between the inspiratory hose and facemask.

Note: scented essences can be used; apply a small amount to the inside of the mask, not the filter as this will decrease the filter's efficiency.

QUANTIFLEX UNIT



3.4 Nitrous oxide administration guide

As part of the accreditation process for nitrous oxide, staff should be familiar with the basic components of the nitrous oxide unit, how the parts function, and comprehend how to check and troubleshoot the unit.

Sequential guide to administration	Rationale/ Troubleshooting
1. Obtain Record of Sedation for Procedure and identify if the patient meets the sedation criteria for nitrous oxide.	<p>Identify the risk factors/ staffing required, fasting, equipment required prior to administering nitrous oxide.</p> <p>Resource: Record of Sedation for Procedures Procedural Sedation Guidelines Children’s Pain Management Service</p>
2. Ensure a procedural sedation leader/ accredited staff member is available to facilitate the procedural sedation.	<p>Accredited staff can be located in your department or seek assistance from accredited staff members throughout RCH.</p>
3. Check that the equipment, including emergency equipment is present and functioning.	<p>Key points:</p> <ul style="list-style-type: none"> ▪ Adequate gas available in the tanks to perform the procedure. ▪ Resuscitation equipment in present. ▪ Reservoir bag is intact to ensure the delivery of gas to patient. ▪ Circuit is attached properly. <p><u>Trouble shooting</u> Note there are two safety features built into the Quantiflex nitrous oxide unit:</p> <ul style="list-style-type: none"> ▪ The <u>unit will not function</u> unless adequate oxygen source is available <u>at all times</u>. ▪ A maximum concentration of nitrous oxide delivered is 70 % to prevent hypoxemia.

<p>4. Ensure separate wall mounted suction is available and attached to the nipple of the scavenger system (clear tube).</p>	<p>Key points:</p> <ul style="list-style-type: none"> ▪ Scavenger system is attached to separate wall suction unit to prevent nitrous oxide being displaced into the room. ▪ Do not block the holes at the bottom of the scavenger unit (clear tube).
<p>5 Prepare the child for both the procedure and nitrous oxide.</p>	<p>Key points:</p> <ul style="list-style-type: none"> ▪ Let the child play with the mask to decrease distress during the procedure ▪ Explain to the child how the gas will make them feel ▪ Fun games to play with the mask are: <ul style="list-style-type: none"> Pretend you're a space man or fighter pilot Can you make my machine "fart"? Pretend you are an underwater explorer.
<p>6. Choose a facemask to fit the child's face.</p>	<p>Key points:</p> <p>Correct mask placement :</p> <ul style="list-style-type: none"> • Top of the mask should fit on top of bridge of nose and not over the orbit of the eye. • Bottom of the mask fits below the lip and above the chin.
<p>7. Prior to starting the procedure, set the mixture dial to 100% then turn both tanks on. Turn the flow control knob on between five and eight litres.</p>	<p>Key points:</p> <ul style="list-style-type: none"> ▪ Starting the procedures in oxygen prevents nitrous oxide being administered into the atmosphere. ▪ Turn the oxygen gas flow on and note if the reservoir bag fills before placing the mask on the child's face ▪ Using oxygen only, allows the child to experience a few test breathes. The sedator monitors the movement of the reservoir bag to assess if additional flow is required.
<p>8. Start the procedure using 30-50% nitrous oxide by adjusting the mixture dial, noting the child's level of sedation and effect of the gas before increasing the nitrous oxide further. The mixture dial indicates the concentration of oxygen delivered not the concentration of nitrous oxide.</p>	<p>Concentration chart: how to titrate nitrous oxide and oxygen</p> <p>Key points:</p> <ul style="list-style-type: none"> • When the dial reads 100% NO nitrous oxide is being delivered, decreasing the oxygen concentration will introduce nitrous oxide to the patient.

		Percentage chart	
		100% oxygen	No nitrous oxide
		90% oxygen	10% nitrous oxide
		80% oxygen	20% nitrous oxide
		70% oxygen	30% nitrous oxide
		60% oxygen	40% nitrous oxide
		50% oxygen	50% nitrous oxide
		40% oxygen	60% nitrous oxide
		30% oxygen	70% nitrous oxide
		The highest concentration of nitrous oxide that can be delivered is 70%. This safety feature prevents hypoxemia.	
9.	The sedator indicates when the appropriate level of sedation is achieved and continues to assess this throughout the procedure. It is recommended that nitrous oxide is increased in increments of 10% every 2-5 minutes.	Key points: <ul style="list-style-type: none"> ▪ The nitrous oxide administrator remains beside both the child and nitrous oxide unit. ▪ Continuously observe level of sedation, saturations and vital signs. ▪ Slowly increasing the nitrous oxide is known to help prevent vomiting. 	
10.	Reservoir bag alters according to the child's breathing pattern and lung volumes. Adjust the flow control knob which controls the amount of gas filling the reservoir bag.	Key points: <ul style="list-style-type: none"> ▪ The reservoir bag will inflate and deflate as the child breathes. ▪ If the <u>bag appears collapsed or sticking</u>, increase the flow knob, as no fresh gas supply is being delivered to the patient. ▪ If the <u>bag appears over inflated</u> decrease the flow knob or the bag will tear or explode. 	
11.	End of the procedure. Place the child in 100% oxygen for 3 minutes to avoid diffusion hypoxemia and continue until the child returns to baseline sedation score.	Key points: End of administration: <ul style="list-style-type: none"> ▪ Turn off the scavenger ▪ Discard the pink and blue circuit/facemask only. ▪ Turn off the gas tanks. ▪ Clean equipment ▪ If silicon circuit is used dispose the facemask and bactrap filter only. ** 	

At the end of the procedure debrief with the child and parents, praise and reassure the child's efforts. Utilising the "Record of Sedation for Procedure" fill in the sedation summary and sign the document. Enter the event into the N2O log book and sign the medication order.

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Personal notes