GIPPSLAND HEALTH SERVICE CONSORTIUM

Procedural Sedation in Emergency Department/Urgent Care Centres

NAME_____

HEALTH SERVICE_____

This SDLP was developed in 2021 by Robyn Godbold Gippsland Regional Nursing & Midwifery Education Coordinator with assistance from Michelle Hibberson GSHS Perioperative Educator. Peer reviewed by Faye Logan Clinical Nurse Educator Emergency Department West Gippsland Healthcare Group. Updated 2025 by Erin Bransden CNE Emergency Department BRHS and Dayna Stewart Perioperative Nurse Educator at BRHS.

The nitrous oxide section of the SDLP has been directly adapted from Bass Coast Health SDLP *Nitrous Oxide use in the Emergency Department 2019*. BCH acknowledges Peninsula Health for the original SDLP.

October 2025

CPD Points 5

Procedural Sedation in ED & UCC

INTRODUCTION

This SDLP has been developed to enhance the knowledge and skills of registered nurses who are required to care for patients undergoing procedural sedation in the Emergency Department (ED)/Urgent Care Centre (UCC).

In conjunction with the learning package and completion of the quiz you are required to familiarise yourself with your local protocols and guidelines in relation to these procedures. Please obtain access to these as you work through this SDLP.

Local accreditation requirements

Advanced Life Support Competency may be a prerequisite at your Health Service, they may also have other specific training and competency requirements related to this skill, please ensure you are familiar with these.

Learning Objectives

On successful completion of this SDLP and any other training and competency requirements required by your Health Service the learner should:

- Have a clear understanding of procedural sedation, indications for and local governance around patient selection/exclusion criteria and staffing requirements
- Have sound knowledge of the risks associated with procedural sedation in ED/UCC
- Be able to setup equipment and environment to safely care for these patients in ED/UCC
- Be able to safely care for the patient during and post procedure including escalation of care as required
- Be able to clearly identify discharge criteria and or escalate care if required
- Be able to provide discharge education and advice to patient and carer
- Be able to assist with and complete all required documentation

PROCEDURAL SEDATION/ANALGESIA

Definitions:

Australian and New Zealand College of Anaesthetists (ANZCA) define **procedural sedation** as: "the patient is in a state of drug induced tolerance of uncomfortable or painful diagnostic or interventional medical, dental or surgical procedures. Lack of memory of distressing events and or analgesia may be desired outcomes, but lack of response to painful stimulation is not assured." (ANZCA 2023, pp24)

Minimal sedation: "A drug-induced state of diminished anxiety, during which patients are conscious and respond purposefully to verbal commands or light tactile stimulation. Features of minimal sedation include maintenance of airway patency and reflexes, as well as ventilatory and cardiovascular function, although there may be some reduction in cognition and physical dexterity." (ANZCA 2023, pp24)

Moderate sedation: "A drug-induced state of depressed consciousness during which patients retain the ability to respond purposefully to verbal commands and tactile stimulation. Features of moderate sedation include maintenance of airway patency and reflexes, as well as ventilation and cardiovascular function. However, minimal interventions to maintain airway patency, spontaneous ventilation or cardiovascular function may, be required." (ANZCA 2023, pp24)

Deep sedation: "A drug-induced state of depressed consciousness during which patients are not easily roused and may respond only to noxious stimulation. Features of deep sedation may be difficult to distinguish from general anaesthesia and include impaired ability to maintain an airway, inadequate spontaneous ventilation and/or impaired cardiovascular function. Deep sedation can readily and rapidly progress to general anaesthesia with onset of unconsciousness and inability to maintain an airway." (ANZCA 2023, pp24)

General Anaesthesia: "Is a drug induced state characterised by absence of purposeful response to any stimulus, loss of protective airway reflexes, depression of respiration and disturbance of circulatory reflexes". (ANZCA 2023, pp23)

These definitions are from the PG09(G) *Guideline on procedural sedation, 2023.*

https://www.anzca.edu.au/getContentAsset/3faa17f6-a6e0-4719-9992-9d67acef952b/80feb437-d24d-46b8-a858-4a2a28b9b970/PG09(G)-Sedation-2023.pdf?language=en

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	Minimal Sedation (Anxiolysis)	Moderate Sedation/ Analgesia	Deep Sedation/ Analgesia	General Anesthesia
Responsiveness	Normal response to verbal stimulation	Purposeful response to verbal or tactile stimulation	Purposeful response after repeated or painful stimulation	Unresponsive, even with painful stimuli
Airway patency	Unaffected	No intervention needed	May require intervention	Intervention often required
Spontaneous breathing	Unaffected	Adequate	May be inadequate	Frequently inadequate
Cardiovascular function	Unaffected	Usually maintained	Usually maintained	May be impaired

* Reflex withdrawal from a painful stimulus does not represent a purposeful response.

Dutu, M., Ivascu, R., Morlova, D., Stanca, A. E., Corneci, D. & Negoita, S. (2019). Procedural Sedation and Analgesia in Adults - new trends in patients safety. *Central European Journal of Clinical Research*. 2. 11-22. https//doi.org/10.2478/cejcr-2019-0003

Aim of procedural sedation in ED/UCC

Procedural sedation is intended to safely result in a depressed level of consciousness that allows the patient to maintain oxygenation and airway control independently during painful procedures. The goal is for the patient to have minimal sedation, resulting in anxiolysis and mild-moderate sedation/analgesia. (see table above)

Risks

Procedural sedation has risks associated with it depending on the drugs/dosages used, and individual patient responses, as well as the age and general wellbeing of the patient. Procedural sedation potentially carries all of the risks of general anaesthesia, including airway obstruction, depression of respiration and cardiovascular collapse, despite being considerably safer the vast majority of the time.

Staff assisting with these procedures and caring for patients post procedure must be prepared to manage these risks.

- Airway: loss of airway protection and patency, vomiting, aspiration
- Breathing: depression of respiration, reduction in respiratory rate or change to respiratory effort or rhythm
- Cardiovascular: depression of cardiovascular system, hypotension, bradycardia
- Drug interactions: adverse reactions, allergic reactions or anaphylaxis
- High sensitivity to drugs or individual variations in response to drugs which may lead to deeper sedation and loss of consciousness
- Under sedation with higher dosages being used during procedure than anticipated. Particularly in certain patient populations
    - Paediatrics
    - Elderly
    - Patients with underlying disease or comorbidities
- Risks of the actual procedure being undertaken

Indications for procedural sedation in the ED/UCC

The following are examples of patient scenarios where sedation may be used. This list is not exhaustive and other procedures may be considered.

- Closed reduction of simple fractures
- Relocation of dislocations
- Plaster application
- Incision and drainage of abscess
- Laceration repair/ sutures
- Wound dressing or debridement
- Burns Management
- Removal of foreign body
- Cardioversion

Please note: These indications may vary depending on capability frameworks and local circumstances.

Patient selection and risk assessment

Each health service will have specific guidelines in relation to staff credentialing, staffing, capability frameworks, patient selection and exclusion criteria. Prior to conducting procedural sedation these must be met according to your local protocol.

Patient selection

Paediatric criteria: in line with local guideline/capability framework
Royal Children's Hospital Guideline: Ketamine use for procedural sedation is a good reference point for looking at this.
https://www.rch.org.au/clinicalguide/guideline_index/Ketamine_use_for_procedural_sedation/

This guideline has been endorsed by Safer Care Victoria.

Some considerations in patient selection/exclusion

- Patients risk of airway, respiratory or cardiovascular compromise
- Comorbidities, obesity
- Delayed gastric emptying (GLP-1 agonists, oesophageal dysmotility disorders)
- Current clinical condition

Paediatric patient exclusion criteria

- Please follow local guideline for age-related exclusion criteria in paediatrics

Adult exclusion criteria

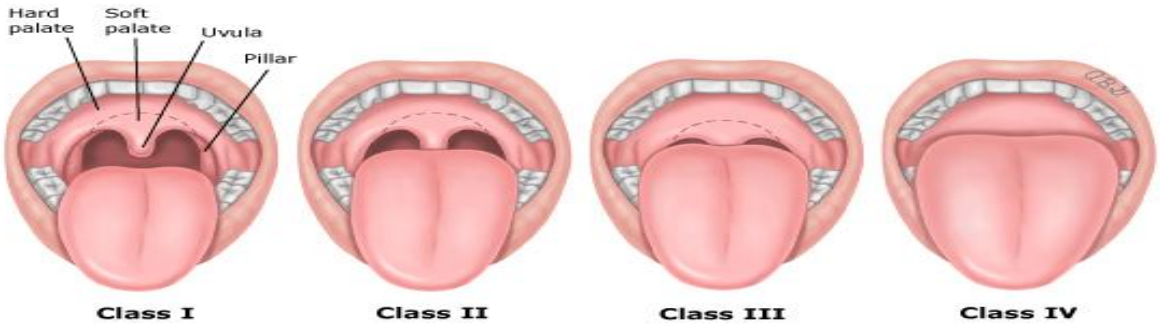
Your health service will also have guidelines around exclusion criteria in adults. Examples on this may include

- Age exclusions upper and lower
- Patients risk of airway, respiratory or cardiovascular compromise
- Local BMI policy
- Clinical condition
- Past history and co-morbidities
- Previous experiences with procedural sedation

Patient preparation and assessment

It is important that patients who are being considered for procedural sedation in the ED/UCC undergo a rigorous assessment process to ensure they meet patient selection criteria for your health service.

- **Baseline observations** including, pulse, BP, respiratory rate & effort, pulse oximetry, ECG, pain score and level of sedation
- **AMPLE**
    - **A**llergies
    - **M**edications
    - **P**ast History/co morbidities
    - **L**ast ate or drank: fasting status
    - **E**vents: injury, rationale for procedure
- Physical Examination including airway assessment
    - Airway assessment: **LEMON**
        - **L**ook
        - **E**valuate
        - **M**allampati score (airway opening assessment – see image below)



        - **O**bstruction for example sleep apnoea
        - **N**eck Mobility
- ASA classification

Category	Physical Status
ASA 1	Normal healthy patient
ASA 2	Patient with mild systemic disease
ASA 3	Patient with severe systemic disease that is not a constant threat to life
ASA 4	Patient with severe systemic disease that is a constant threat to life
ASA 5	Moribund patient not expected to survive with or without surgery

(American Society of Anaesthesiologists)

- Does the patient suffer from **reflux?**
- Pathology and imaging results
- **Informed consent** for procedure and sedation
- **Patient procedure identification and matching** as per guidelines
- **Weight** for all patients (many sedative agents have weight-based dosing in paediatrics and adults)

Paediatric: Please provide parents/carers with RCH sedation for procedures factsheet prior to the procedure

https://www.rch.org.au/kidsinfo/fact_sheets/Sedation_for_procedures/

Equipment and environment

Environment: Procedure should be conducted in **resuscitation bay**, **exception being** use of **nitrous oxide and oxygen (only) as analgesia**.
Equipment: (equipment specific to the administration of N2O & O2 will be covered in a subsequent section of the learning package). All equipment should be checked as ready to use and immediately available in the room

- Pulse oximeter
- NIBP
- ECG monitor
- Drugs for procedure and availability of reversal agents
- Oxygen & oxygen delivery devices with capnography monitoring capability
- Capnography monitor
- Suction source and catheters
- Bag and mask to provide manual ventilation
- Airway equipment including for emergency airway management
    - Oropharyngeal airways/Nasopharyngeal airways
    - Laryngeal masks
        - Standard adult 3,4 & 5
        - LMA with gastric port 3, 4, & 5
        - Paediatric: according to weight
    - Endotracheal tubes and intubation equipment
        - Adult 7.5 for female, 8.0 for a male
        - Paediatric age/4 + 4 or utilise guides according to weight
    - Difficult airway equipment/trolley (Vortex trolley)
- Defibrillator
- Resuscitation trolley and drugs
- 2 patent IV cannulas (preferably 20G or larger) and IV fluids
- Appropriate documentation & checklists

- **Paediatrics**
    - A current **weight** is mandatory for all paediatric patients
    - Monitoring equipment appropriate to age and size of child e.g. oximeter probes & BP cuffs
    - Set appropriate parameters on monitors
    - **ViCTOR observation chart appropriate to age of child**
    - Resuscitation and airway equipment suitable for age and weight of child
    - Access to drug protocols and equipment guides specific to paediatrics
        - Royal Children's Hospital: Clinical Practice Guideline: drug doses
          Clinical Practice Guidelines : Emergency drug doses - CPG (rch.org.au)

        - Monash Children's Hospital: Paediatric Emergency Medication Book
          https://monashchildrenshospital.org/for-health-professionals/resources/resuscitation/

Refer to ANZCA Position Statement PS09 (2014) for a full list of equipment https://www.anzca.edu.au/safety-advocacy/standards-of-practice/policies,-statements,-and-guidelines

Patient monitoring during procedure

The nurse's role in this is paramount, particularly in relation to monitoring of the airway, breathing, circulation and level of sedation. They should not leave the patient during the procedure and until the patient's GCS has returned to baseline post procedure, unless another appropriately credentialed nurse is present to take over.

- Airway patency and breathing rate and effort should be monitored continuously
- Capnography recommended (see local guideline)
- Continuous pulse oximetry with alarm and parameters set, including paediatric parameters in relation to age
- ECG monitoring with parameters set and alarm enabled, including paediatric parameters in relation to age
- NIBP 3-5 minutely
- Level of sedation continuously
- Level of pain
- Escalation of care in response to clinical deterioration

Patient must have a patent IV cannula with IV fluids attached.

Monitoring and management of airway and breathing

Assessment and interventions in response to needs is a vital skill in caring for patients during and in the recovery period post procedural sedation. As discussed, levels of sedation and patient responses to drugs can be hugely variable and not clearly defined. The patient's airway and breathing may become compromised even when that was not anticipated.

Monitoring for signs of airway obstruction or patient's inability to maintain their own airway:

- Laboured or noisy breathing
- Minimal escape of air from mouth
- Abdominal wall movement and paradoxical chest movement (in drawing of spaces between the ribs and above the collar bones during inspiration)
- Apnoea

Airway Interventions

- Patient may require airway support
    - Chin lift & head tilt
    - Jaw thrust
    - Insertion of guedel's or naso-pharyngeal airway
    - Patient positioning (lateral position)
    - Escalation of care in response to clinical deterioration
    - Advanced airway options
- Paediatrics: airway interventions appropriate to age. When opening airway smaller incremental movements in the younger child

Monitoring for effectiveness of breathing, most importantly suppression of breathing due to sedation (look, listen & feel):

- Ensure airway is open & maintained prior to assessment of breathing
- Respiratory rate and effort
- Chest wall movement use of accessory muscles
- Pulse oximetry (SpO2) & capnography
- Skin colour
- Altered level of consciousness
- Signs of respiratory distress or airway obstruction
- Auscultation of chest

Breathing interventions & preparedness to manage in the absence of adequate breathing:

- Patient positioning
- Supplemental oxygen during, immediately post & when indicated
- Assistance with breathing, bag and mask, insertion of advanced airway devices
- Escalation of care in response to clinical deterioration
- Preparedness and familiarity with equipment to manage the difficult airway

Monitoring of cardiovascular status

Drugs used in procedural sedation have the potential to impair cardiovascular stability therefore monitoring of this during and post procedure is critical

- Continuous pulse oximetry (SpO2) & heart rate monitoring during and post procedure
- NIBP 3-5 minutely during procedure and at frequent intervals post procedure
- Continuous ECG monitoring during procedure and if indicated post procedure

Cardiovascular status and management of abnormalities

- IV cannulation and IV fluids which can be bolused to maintain haemodynamic status.
    - Utilise paediatric guides as discussed earlier
- Medications to support blood pressure
- Escalation of care in response to clinical deterioration
- Resuscitation equipment available

Monitoring of sedation levels

Levels of sedation are a continuum and the level of sedation for the patient in reality may vary from what was planned.
Sedation scoring should be done as a

- Baseline
- Immediately pre procedure
- During procedure **continuously**
- Post procedure according to your guideline.

It is a critical marker of a patient's readiness for discharge.

Example of sedation scoring:

Value	Patient state
0	Awake and alert
1	Minimally sedated: tired/sleepy, appropriate response to verbal conversation, and/or sound
2	Moderately sedated: somnolent/sleeping, easily aroused with light tactile stimulation or a simple verbal command
3	Deeply sedated: deep sleep, aroused only with significant physical stimulation
4	Unarousable

University of Michigan sedation score

Continue sedation scoring up until discharge. Sedation level needs to have returned to normal or pre procedure level prior to discharge.

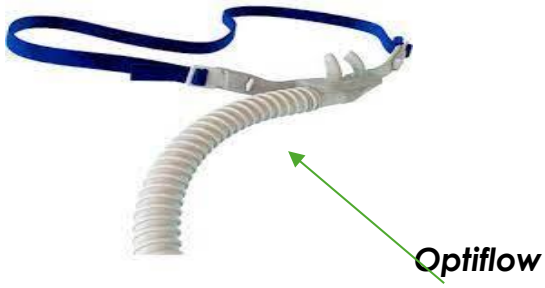
Oxygenation

Pre-oxygenation

Prior to the administration of any anaesthetic, including procedural sedation, patients should be pre-oxygenated. The aim of pre-oxygenation is to increase the patients' functional residual capacity (oxygen reserves). Increasing the functional residual capacity will increase the length of time to oxygen desaturation during periods of apnoea. However, this is dependent on several patient factors including comorbidities.

Although procedural sedation is unlikely to result in apnoea, individual patients respond differently to anaesthetic medications and therefore all patients are at risk of apnoea and require pre-oxygenation. Ideally patients should be pre-oxygenated with 100% oxygen for several minutes prior to the administration of anaesthetic medication.

Pre-oxygenation can be delivered through a mask or through humidified high-flow oxygen (example: Optiflow) if available within your organisation or through standardised face mask.



- Ideally pre procedure depending on patient population as this provides a safety buffer if there is a period of hypoventilation or apnoea
    - Pre oxygenation may not be recommended in paediatric/disability population depending on their tolerance or the type of sedation being used

Oxygenation during procedure

- During procedure should continue and in immediate post procedure

Medications for procedural sedation

A variety of drugs and techniques are available for procedural sedation. Drugs can be administered via various routes, including oral, intra-nasal, rectal, sub-cutaneous, intramuscular, intravenous and inhaled. (ANZCA, 2014)

Most commonly used drugs

- Benzodiazepines such as midazolam for sedation
- Opioids such as fentanyl to provide analgesia
- Ketamine
- Propofol intravenous anaesthetic agent
- Nitrous Oxide & oxygen inhalational analgesia

More information on drugs will be outlined at the end of this section of the SDLP

Patient monitoring post procedure

Recovery from the procedure and sedation should continue in the resuscitation area of the ED/UCC. The registered Nurse should remain with patient until sedation score is 0-1.
Observation regime should continue according to local guidelines, but should be at frequent intervals

- Some guidelines recommend observation period continues for 60 minute's post sedation score returning to normal, however this may vary and specific patient criteria may be specified rather than a timeframe
- Observations should include:
    - Airway patency, respiratory rate and effort
    - Pulse oximetry SpO2 & HR
    - NIBP
    - Sedation score
    - Level of pain
    - Capnography
    - ECG monitoring
    - Other observations related to specifics of procedure such as wound, dressing & limb observations (neurovascular).

Discharge criteria

It is critical that the patient meets your local discharge criteria. Most health services will have a checklist, which may include:

- Vital signs returned to patients normal (within 10% of baseline)
- Sedation level returned to normal or pre procedure level
- Tolerating diet & fluids
- Can ambulate independently or at pre procedure level
- Written and verbal discharge advice given
- Responsible carer to accompany patient home
- Pain well controlled and analgesia provided if required for discharge

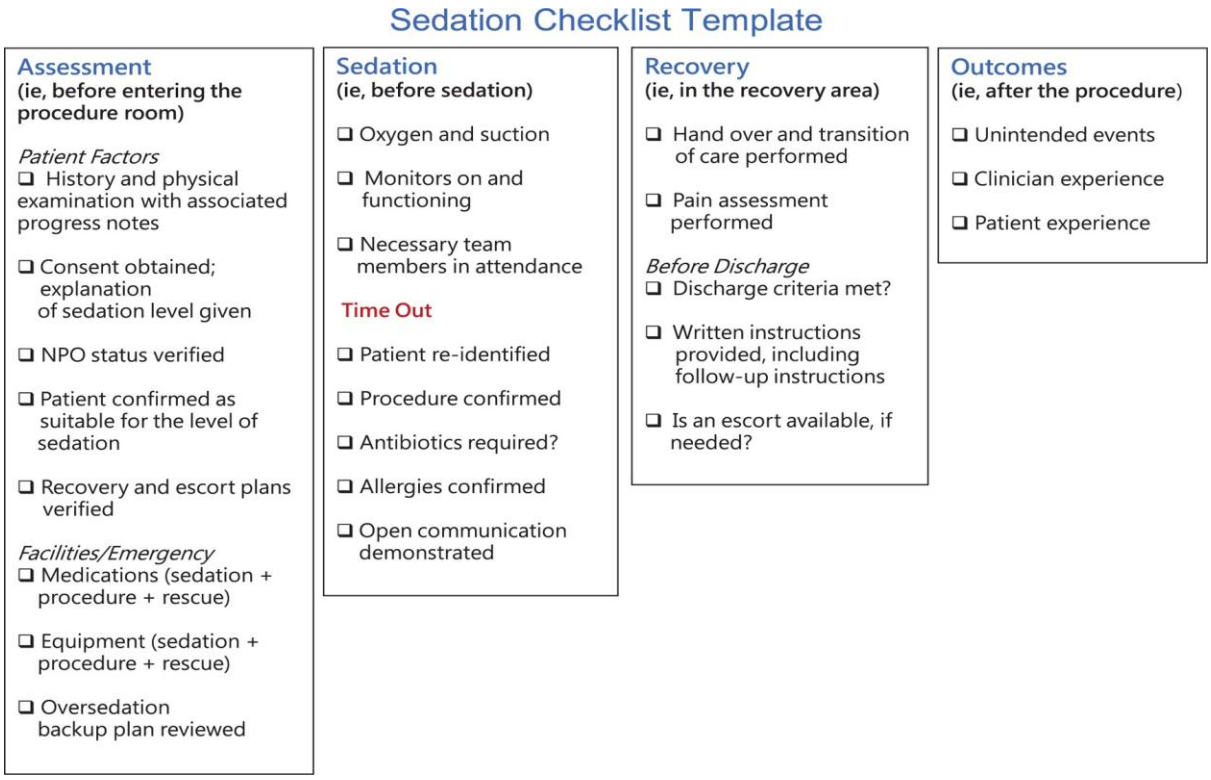
Paediatric discharge criteria

- Stable vital signs for age, sedation score returned to pre procedure level
- Show appropriate gross motor function for age
- Be appropriately interactive with caregiver
- Follow commands and verbalise appropriately for age
- Tolerating fluids
- Be accompanied by a responsible caregiver
- Pain controlled

Documentation

Documentation falls not only to nursing staff but the medical officers providing sedation and undertaking the procedure.

- Documentation of assessment findings, procedural sedation checklist
- Staffing present
- Procedure & drugs administered
- Any complications during procedural sedation
- Observations. Ensure **paediatric** observations are documented on the appropriate **ViCTOR chart for age**
- Discharge criteria
- Patient & carer education
- Escalation of care and interventions provided
- Riskman for adverse events



Procedural Sedation Medications

As discussed drugs can be administered via various routes, including oral, intra-nasal, rectal, sub-cutaneous, intramuscular, intravenous and inhaled. (ANZCA, 2014)

Midazolam

Administration of midazolam results in sedation, amnesia and anxiolysis, it has no analgesic properties. Midazolam can be administered IV, IM, orally, rectally and nasally. Absorption will vary depending on the route of administration. Oral or IV is recommended routes in paediatrics.

- Onset of action IV 2-5 minutes
- Half-life 1-4 hours
- Caution with obese, elderly and alcohol/opiates as sedative effect is increased
- Side effects are predominantly cardiorespiratory depression
    - Hypotension
    - Respiratory depression/apnoea
    - Paradoxical excitement (unexpected excitement)
- Reversal agent **Flumazenil**

Ketamine

Administration of ketamine results in a dissociative and amnesic state, it also provides analgesia

- Does not affect pharyngeal-laryngeal reflexes so can be considered when patient has not fasted
- Onset of action IV 1 minute
- Duration of action 5-10 minutes
- Contraindicated when an increase in BP is risky to patient
- Side effects
    - Hypertension
    - Tachycardia
    - Hyper salivation
    - Laryngospasm
    - Hyper-sensitivity to environmental stimuli

Ketamine for paediatrics

Ketamine is commonly used for procedural sedation in the paediatric population.
Please refer to the Royal Children's Hospital Guideline: Ketamine use for procedural sedation (Safer Care Victoria endorsed)
https://www.rch.org.au/clinicalguide/guideline_index/Ketamine_use_for_procedural_sedation/

Your local guideline will guide you in age limit exclusions.
Can be given IV or IM. IM can be useful if IV access difficult however recovery will be delayed (RCH, 2019). Vomiting may be more likely with IM route and not having IV access may be an issue if complications occur.

Side effects

- Random purposeless movements, muscle twitching, rash and vocalisations
- Transient tachycardia/hypertension
- Transient laryngospasm
- Hyper salivation
- Apnoea or respiratory depression
- Emesis
- Unpleasant emergence phenomena
- Recovery agitation

Post procedure

- Nil orally until fully alert

- Nurse in a quiet area with minimal noise and physical contact, dim lighting if possible (must allow for careful observation of child) and do not stimulate prematurely (RCH, 2019). This will help minimise the effects of the unpleasant emergence phenomena/delirium

Propofol

Please note this drug may not be used for procedural sedation in your ED/UCC.
Administration of propofol causes deep sedation to general anaesthesia. It has no analgesic properties

- Rapid onset 30-90 seconds
- Duration of action dose dependant 5-10 minutes
- Side effects
    - Pain on injection
    - Apnoea
    - Hypotension

Opioids

Fentanyl is the most commonly used opioid in procedural sedation to provide analgesia. It may be used in combination with one of the other listed drugs. Morphine may also be used.

Utilisation of opioids with other drugs or agents can have a synergistic effect enhancing the procedural sedation process but may also contribute to increasing the level of sedation.

Fentanyl is generally administered IV but can be administered intranasally.

Reversal agent **naloxone**

Nitrous Oxide

Administration provides analgesia and amnesia. It has no sedative properties
Nitrous oxide use will be detailed in a later section of this SDLP.

Nitrous Oxide use in the Emergency Department/UCC

This section of the SDLP has been directly adapted from Bass Coast Health SDLP Nitrous Oxide use in the Emergency Department 2019. BCH acknowledges Peninsula Health for the original SDLP.

There are equipment photographs shown in this section which may not be the same as the equipment used at your Health ServicePlease review the equipment used at your health service and ensure you have had adequate training in the use of that equipment in line with your local competency framework.

Learning Objective

This section of the SDLP will provide the registered nurse with the knowledge and skills to safely and effectively administer nitrous oxide to the patient in the emergency department/UCC for the purposes of procedural sedation/analgesia.

Local accreditation requirements

Your health service will direct you on accreditation and competency prior to you undertaking this skill in your emergency department/UCC. Completion of this SDLP and the quiz followed by supervised practice and completion of a competency-based skills assessment will be the usual requirements. There may also be some guidelines around ongoing competency.

Nitrous Oxide (N2O)

Nitrous Oxide is an anaesthetic gas, which induces a light anaesthesia. Its characteristics also include moderate analgesia, amnesia and anxiolysis; however, 15% of people experience no analgesic effects. It is a tasteless, colourless gas that is rapidly absorbed via the pulmonary vasculature directly into the blood stream and does not combine with haemoglobin or any of the body tissues. The gas is delivered in variable concentrations with oxygen. Nitrous Oxide affects the cerebral cortex (not the brainstem) so circulatory and respiratory depression may not be as pronounced as with other anaesthetic agents, however, in some circumstances these side effects are still possible. The exact mechanism of its action is unknown.

The goal of sedation is to minimize physical discomfort or pain, control movement during a procedure and to reduce psychological distress and anxiety. N2O has a rapid onset of action within 30-60 seconds and reaches a maximum effect at 5 minutes. It should be applied 3-5 minutes prior to commencement of procedure. It has a short duration of action wearing off after 4-5 minutes once the nitrous mask or mouthpiece has been removed from the patient. It is used for minor procedures of short duration, and is particularly good for children.

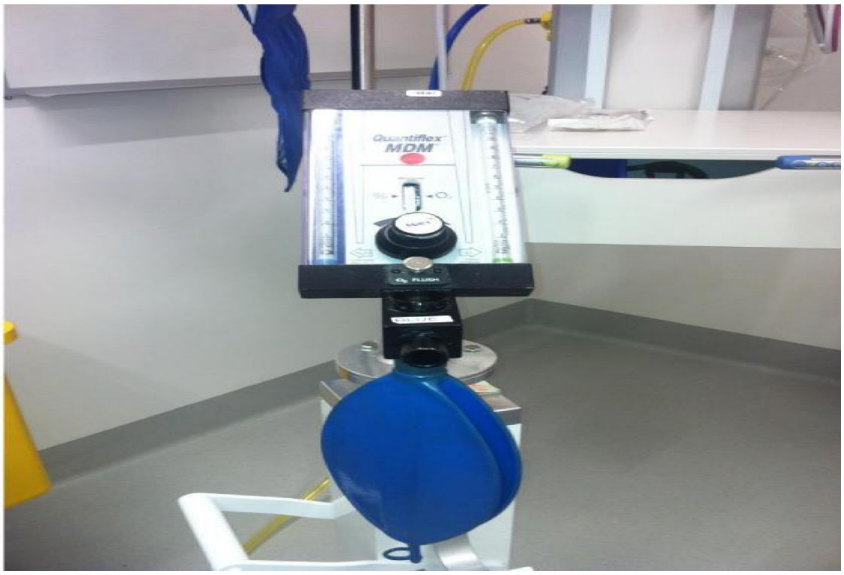
N2O is a simple asphyxiant and therefore must be **administered simultaneously with oxygen**.

It can be supplied in two forms

- Entonox: premixed cylinder of N20 & O2 which is delivered by a demand triggered valve (50/50 mix)

- Continuous flow metre delivery via a mixer which allows for variable concentrations of N2O & O2 up to a maximum of 70% N2O & 30% O2. N2O mains is identified via a blue gas wall outlet. Supply to the mixer maybe via wall outlet or portable cylinders.

Oxygen & Nitrous Oxide wall outlets



Quantiflex MDM

Indications

N2O is recommended for short minor procedures, to reduce pain, anxiety and limit movement that may hinder the procedure.

Examples include:

- Suturing
- Manipulation of a minor fracture
- Application of a back slab
- Removal of foreign bodies
- Relocation of a joint
- Painful dressings
- Lumbar puncture
- I.V. Cannulation

Contraindications

Nitrous Oxide will diffuse into air-filled spaces causing increased pressure within a cavity. It may also exacerbate airway obstruction.
It is contraindicated in the following patients:

- Children less than 1 year of age
- Patients who are unable to follow instructions i.e. confused/aggressive
- Severe acute respiratory infection
- Severe airway disease e.g. Asthma, COAD
- Head injury with LOC or altered conscious state
- Closed space disease: bowel obstruction, pneumothorax, pneumoencephaly, pneumoperitoneum, pneumomediastinum
- Early pregnancy – first 2 trimesters
- Middle ear disease, including otitis media
- History of B12 or folate insufficiency
- Nutritionally compromised patients, patients on H2 blockers or proton pump inhibitors.
- Patients with metabolic diseases associated with homocysteine metabolism

Relative Contraindication

Ingestion of fluid and solids – It is recommended that all patients be fasted for 2 hours of both solids and fluid prior to use of N2O. If the patient has not fasted for this time it must be discussed with the medical officer in charge

Adverse Side Effects

- Vomiting, nausea, dizziness, light-headedness.
- Vomiting may occur both during and after the procedure and even after being discharged home.
- Prolonged or excessive sedation
- Sustained hypoxaemia
- Decreased cardiac output and stroke volume
- Airway obstruction, especially in patients with an acute respiratory infection or underlying airway disease
- Respiratory depression and apnoea. N2O has no direct respiratory effects however it can depress the ventilatory stimulation produced by hypoxia and hypercarbia, and can potentiate the apnoea caused by the concurrent use of any drug that may cause respiratory depression, such as benzodiazepines or morphine
- Increased intracranial pressure
- Increased pulmonary vascular pressure
- Diffusion of nitrous gas into a closed cavity containing air thus increasing pressure.
- Inactivation of vitamin B12

Administration

To administer Nitrous Oxide, the following staff must be present:

Proceduralist – Medical Officer

Nitrous oxide accredited staff – may be a Nurse or MO accredited by your health service in the use of Nitrous Oxide

Caution – Staff or any person who may be pregnant should avoid being present during N2O administration. N2O has the potential to be teratogenic due to its inactivation of vitamin B12.

Documentation

Documentation for patients requiring Nitrous Oxide should include the following:

- Written consent
- Allergies
- History
- Weight for paediatrics
- Completion of Procedural Sedation Checklist:
- Medical Officer to complete "Risk assessment"
- Accredited Nurse to complete "Sedation Administration"
- Medication order on medication chart

- Recording of observations before procedure, then five minutely during procedure and until baseline conscious state is returned.
- Documentation of sedation score using the University of Michigan Sedation Score system - 5 minutely

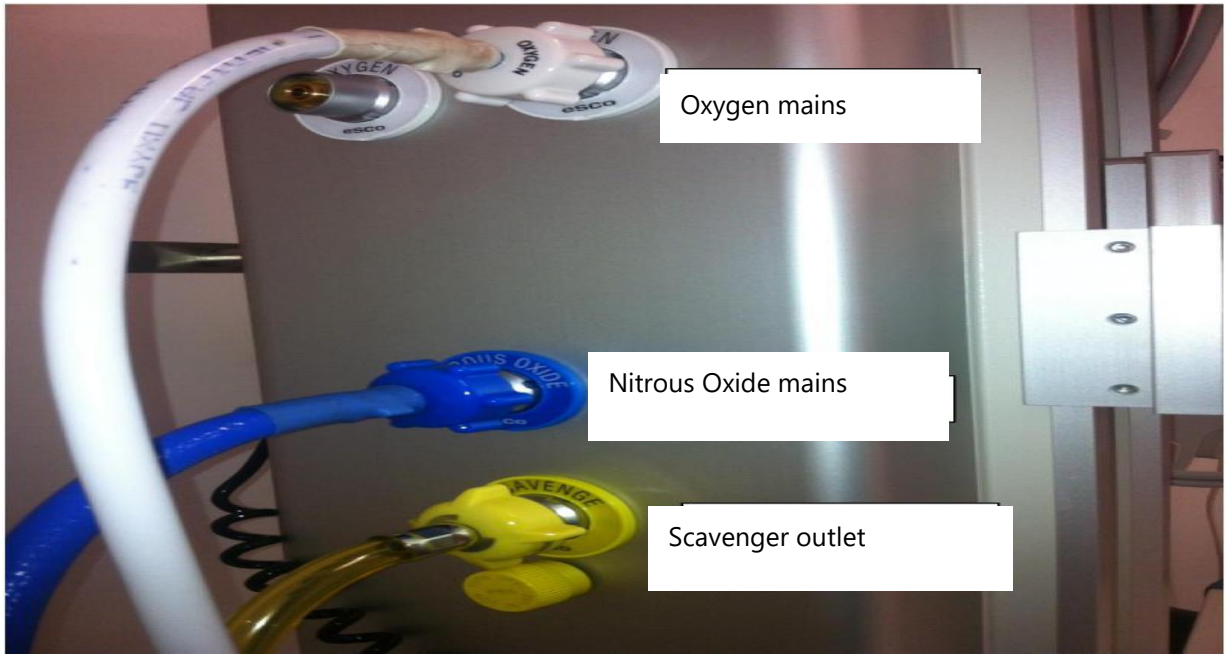
Value	Patient state
0	Awake and alert
1	Minimally sedated: tired/sleepy, appropriate response to verbal conversation, and/or sound
2	Moderately sedated: somnolent/sleeping, easily aroused with light tactile stimulation or a simple verbal command
3	Deeply sedated: deep sleep, aroused only with significant physical stimulation
4	Unarousable

Consent

A written consent is obtained by the medical officer with completion of the Procedural Sedation Checklist.

Blended delivery system using mains gases

Delivery of Nitrous Oxide via a blender system should only be used in areas with a scavenger outlet/suction



Equipment descriptions in the following pages refer to the Quantiflex MDM. The principles of administration remain the same but some specific references to equipment management may be slightly different if this is not the equipment used at your health service.

Equipment

- Separate oxygen and suction source (to that attached to the blender)
- Appropriate size bag valve and mask circuit
- Oxygen saturation monitor
- Single patient disposable Nitrous Oxide circuits-double limb, blue and pink
- Mouthpiece or mask. The correct size mask should fit snugly over the patients face and mouth.
- Blender nitrous oxide and oxygen delivery device

Preparation

- Ensure Procedural Sedation Checklist has been completed by both Medical Officer and accredited nurse in the appropriate areas (see next page)
- Check written order for N2O on medication chart
- Ensure patient/guardian informed of procedure, written consent completed
- Check oxygen and suction equipment ensuring suction catheters available
- Ensure patient is attached to pulse oximeter
- Document baseline observations including conscious state, HR, BP and RR
- Ensure the white oxygen hose is connected to the oxygen cylinder or wall outlet and oxygen cylinder valve open
- Ensure the blue nitrous oxide hose is connected to the nitrous oxide cylinder or wall outlet and cylinder outlet is turned to open
- Connect scavenger to low wall suction
- Check gauges of oxygen and N20 and 02 cylinders to ensure adequate gas supply in both.
- Connect disposable patient breathing circuit to the mixer. These circuits are single patient use.
- The disposable circuits come with a mouthpiece attached, or alternatively remove mouthpiece and apply appropriate sized disposable mask. The circuit also includes a built in viral/bacterial filter.

Nitrous Oxide tubing examples only check equipment used at your health service

Initially set the mixer dial to 100% oxygen. This is to ensure the reservoir bag is inflating correctly with no leaks and that the appropriate flow is being delivered. (again follow instructions for your local equipment if it is not the Quantiflex MDM Mixer)

Mixer dial set at 100% oxygen

Quantiflex MDM Mixer (please note this is an example only you may use different equipment at your health service)

Please ensure you have received education on the equipment used at your health service to administer nitrous oxide. You may have to complete a competency-based assessment in relation to this.

Procedure

Place the mask over the patients face/or mouth piece and ask them to breathe in.

You will see the reservoir bag collapse slightly as the patient takes a breath in. If the reservoir bag is over filling, turn down the flow dial. The reservoir bag will continue to fill and decrease as the patient takes a breath in. If this is not occurring, the inspiratory and expiratory circuits may have been placed incorrectly and connections need to be checked. (This description applies to the Quantiflex MDM Mixer if this is not the equipment used at your health service then follow instructions specific to that equipment).

The "mixer" dial is used to set the amount of oxygen required. This will also determine the N2O concentration. Maximum mixture is 30% oxygen: 70% nitrous oxide.

OXYGEN %	NITROUS OXIDE %	Comment
100%	0	Oxygen only
50%	50%	Minimum concentration
30%	70%	Maximum concentration

Percentage Oxygen/ Nitrous Oxide

The percentage of oxygen to N2O required is titrated to maintain adequate pain relief

N2O should be applied for 3-5 minutes prior to the procedure to ensure adequate analgesic effect.

Monitor sedation levels continuously and adjust gas concentration as required.

The patient should continue to breathe the N2O mix until the procedure is complete. The flow may be adjusted throughout the procedure to ensure adequate inflation of reservoir bag.

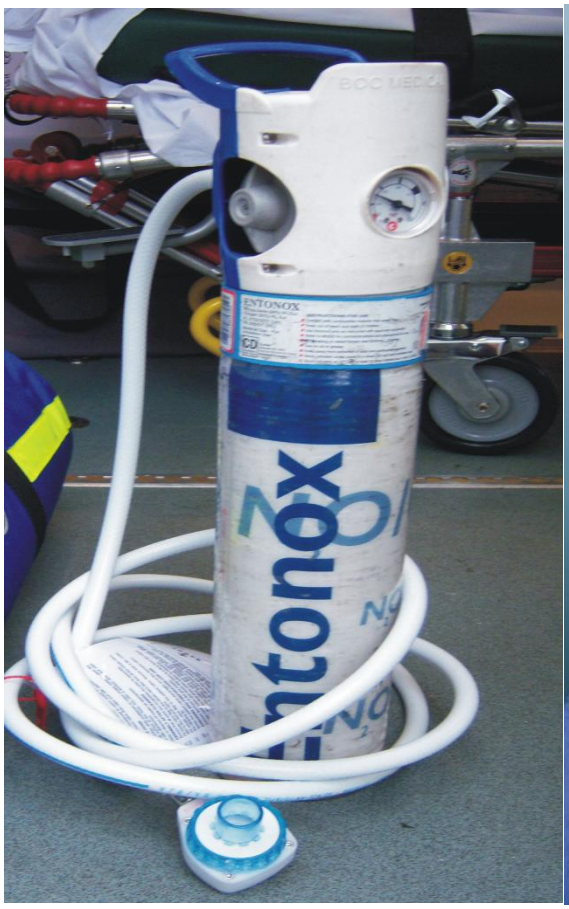
100% Oxygen can be administered to the patient at any stage during the procedure, by turning the "mixer" dial to 100%, or pressing the "O2 flush" button to purge 100% Oxygen. (Remove the mask from the patients' face before pushing the oxygen flush button)

Disposable N2O administration tubing, filter and facemask

If you are the accredited nurse caring for the patient, you must stay with the patient throughout the nitrous oxide administration and the recovery period

Procedure Entonox

- Check cylinder is connected securely to regulator
- Attach delivery hose, filter and mask or mouthpiece to the demand valve
- Turn the cylinder to open and check amount of nitrous oxide and oxygen left in tank on the gauge (if less than 500KPa change cylinder)
- Patient should self-administer for a few minutes (3-5 minutes) immediately prior to commencement of procedure. A sound is heard on inspiration if gases are flowing properly
- Procedure is performed with patient continuously using nitrous oxide till painful part of procedure is complete (and 1 minute afterwards)



Observations

- Perform baseline observations including BP, RR, HR, SpO2 and sedation score
- Observation of airway and breathing must be continuous throughout the procedure and until baseline sedation level is returned.
- Continually monitor heart rate and SpO2
- During sedation document 5 minutely heart rate, respiratory rate, SpO2

- Monitor sedation level and document 5 minutely using the University of Michigan Sedation Score until patient is spontaneously awake without stimulus
- BP is taken at commencement of sedation and then at least 15 minutely
- Post sedation at least 15 minutely observations and sedation score is required until patient returns to baseline
- Cardiac monitoring is not routinely required. If the patient has a pre-existing cardiac condition, then cardiac monitoring should be used.
- Note that after the sedation is completed the stimulation associated with the procedure is reduced. This may cause the patient to become more sedated. Continue to observe airway and breathing.

The patient is not to be left unattended until baseline sedation score returns

Post Procedure

- Purge the circuit with oxygen using the "O2 flush" button lifting the mask from the patient's face
- Administer 100% oxygen for 2 -3 minutes or until the patient is alert to prevent diffusion hypoxia
  - Diffusion hypoxia may occur when the N2O & O2 is stopped. When N2O is discontinued, nitrous oxide diffuses out of the blood into the alveoli in large volumes. If the patient only breathes room air at this time, the combination of N2O and nitrogen in the alveoli may reduce the alveoli PO2, leading to diffusion hypoxia.
    Administering 100% O2 for 2-3 minutes prevents this.
- Continue to monitor SpO2
- Perform 5 minutely RR, HR and sedation score until baseline conscious level returns
- Perform at least 15 minutely BP until baseline conscious state returns
- Turn off scavenger suction
- Leave the nitrous oxide mixer clear of any circuits. A clean/new circuit will only be opened prior to next use
- Turn off O2 and N20 cylinder valves
- After use discard the entire disposable circuit and mask or mouthpiece in the standard rubbish

Paediatrics

Principles as described apply to paediatric patients

- Follow local guideline in terms of selection/exclusion criteria
- Ensure you have age specific monitoring equipment (with parameters set), masks of appropriate size, appropriate resuscitation equipment & age specific ViCTOR observation chart
- Engage parents to help reassure child
- Orientate child and family to environment and equipment
- Use distraction therapy and if available a scented mask
- Use a mask not a mouthpiece
- Sit the child comfortably and have the parent close for reassurance
- Carefully monitor airway, breathing and level of consciousness applying appropriate interventions as necessary throughout the procedure
- Ensure continuous pulse oximetry throughout procedure and during the recovery phase
- Remain with child at all times during procedure and the recovery phase
- Escalate care as required

Watch this video

Royal Children's Hospital Video: A child's guide to hospital Nitrous oxide
https://vimeo.com/117129661

Discharge Criteria

Patients may be discharged when medically appropriate and the following criteria are met:

- Return of pre-sedation level of alertness
- Resumption of purposeful neuromuscular activity
- Ability to ambulate or sit without support (if appropriate)
- Ability to verbalise appropriate to age
- Final set of observations are within normal limits
- Ability to tolerate oral fluids

If patients don't meet the discharge criteria you need delay discharge escalate their care.

Daily Checking Procedure

Equipment needs to be checked at the commencement of each shift this ensures it is in working order and ready for use when required.

- Adult and paediatric bag & mask device
- Double limb disposable circuits
- Small and large face masks
- Procedure sedation checklists
- Patient consent form
- Parent information sheet

Continuous flow via a mixer or equipment used at your health service.

- Check all connections system
- Check oxygen and N2O hoses are attached to correct cylinders/wall outlet
- If using cylinders check oxygen and N20 cylinders have adequate supply and are then turned off
- Check scavenger
- Place N2O mixer on 100%
- Increase flow to check reservoir bag inflates with no leaks
- Dial mixer to 90% oxygen and 10% N2O
- Disconnect oxygen from cylinder/wall and check N2O safety cut off stops N2O delivery (hypoxic safety check). The nitrous should not flow without oxygen.
- This is a key safety check to ensure that nitrous oxide is not administered without oxygen. As discussed previously nitrous oxide on its own is an asphyxiant
- Reconnect oxygen hose to cylinder/wall outlet

Procedural sedation videos & other resources

These 2 videos have been produced by West Gippsland Healthcare Group ED staff. Please view them to consolidate your learning, the content is based on WGHG protocols and guidelines and align with WGHG capability framework.

You again must review your local guideline as it may vary from the information provided in these 2 videos.

Video 1: ED Procedural Sedation: Medication Overview
https://vimeo.com/465582801/0c5c5408a2

Video 2: ED Procedural Sedation: Scenarios
https://vimeo.com/465585341/146e3bdb4a

Royal Children's Hospital Procedural Sedation Fact Sheet
https://www.rch.org.au/kidsinfo/fact_sheets/Sedation_for_procedures/

Royal Children's Hospital Clinical Practice Guideline: Nitrous Oxide-oxygen mix
https://www.rch.org.au/clinicalguide/guideline_index/Nitrous_Oxide_Oxygen_Mix/

Procedural Sedation Quiz (forward to your clinical educators on completion)

1. Your patient has had a shoulder relocation under procedural sedation in UCC. You are observing your patient post procedure, his breathing is noisy, laboured with paradoxical chest movement.
   What are your **immediate** actions?

   a) Open & support airway, assess & support breathing, escalate care
   b) Increase oxygen flow rate and take a full set of observations
   c) Increase oxygen flow rate and phone doctor on call
   d) Complete and document a full set of observations then escalate care

2. Procedural sedation should be conducted in which area of ED/UCC

   a) Any bay within ED/UCC
   b) Plaster room if plaster is required
   c) Any bay that has patient monitoring equipment
   d) Resuscitation bay

3. Prior to administration of procedural sedation what documentation must be complete

   a) Medication order & consent forms
   b) Medication order, procedural sedation checklist & consent forms
   c) Consent forms, procedural sedation checklist & discharge criteria
   d) Consent forms, procedural sedation checklist and admission forms

4. Nitrous oxide is a fast-acting analgesic gas with sedation properties. How long should it be applied prior to the procedure commencing?
   a) 1-2 minutes
   b) 3-5 minutes
   c) 5-10 minutes
   d) 10 minutes

5. You have been instructed to discharge your patient as it is 60mins post procedure. Their sedation score still remains at 2 (using University of Michigan sedation score) they were awake and alert pre procedural sedation.
   What are your actions?

   a) Delay discharge until patient is awake and alert in line with your discharge criteria
   b) Prepare patient for discharge and ask carer to observe carefully until they reach a more normal level of alertness
   c) Transfer out of the resuscitation area to a waiting room, until they meet the discharge criteria
   d) Discharge patient as Instructions from more senior staff members always override discharge criteria

6. Following removal of nitrous oxide, the effects wear off in approximately?
   a) 1-2 minutes
   b) 4-5 minutes
   c) 6-8 minutes
   d) 8-10 minutes

7. A patient has been ordered nitrous oxide for procedural sedation for relocation of a dislocated shoulder. They had a drink an hour ago. What would you do?
   a) Wait until patient has been fasted for 2 hours prior to administration of nitrous oxide
   b) Use an alternative form of sedation
   c) Give the nitrous oxide with the patient lying on their left side
   d) Consult senior medical officer regarding use of nitrous oxide

8. Nitrous oxide can be administered on its own without oxygen

   True or false

9. The following presentations are contraindications for nitrous oxide **except**
   a) Severe acute respiratory infection
   b) Severe airway disease e.g. Asthma, COAD
   c) Child 4 years of age
   d) Closed head injury with altered level of consciousness

10. Flumazenil is the reversal agent for which of the following agents used in procedural sedation?

    a) Ketamine
    b) Opioids
    c) Propofol
    d) Midazolam

11. Administration of midazolam results in (there is more than 1 correct answer)

    a) Analgesia
    b) Amnesia
    c) Sedation
    d) Anxiolysis

12. Ketamine used in procedural sedation provides some analgesia

    True or False

13. Hyper-salivation maybe a side effect of which of the following drugs?

    a) Propofol
    b) Opioids
    c) Ketamine
    d) Midazolam

14. Which of the following medications used in procedural sedation may result in unpleasant emergence phenomena/delirium?

    a) Nitrous Oxide
    b) Ketamine
    c) Midazolam
    d) Fentanyl

15. Adult patients can be discharged home alone following procedural sedation as long as they have normal vital signs?

    True or False

16. Procedural sedation in ED/UCC may be considered for the following procedures except

    a) Minor suturing
    b) Open reduction of a fracture
    c) Painful dressings
    d) Manipulation of a minor fracture

17. A patient may briefly appear more sedated on immediate cessation of the painful procedure

    True or False

18. Diffusion hypoxaemia is best avoided by

    a) Slowly weaning nitrous oxide at the end of the procedure
    b) Getting the patient to breath room air as soon as procedure is completed
    c) Administering 100% oxygen for 2-3 minute's post procedure or until patient is alert
    d) Administering oxygen only in response to abnormal SpO2

19. You are the credentialed nurse administering the nitrous oxide to a 5-year-old child and you are asked by the proceduralist to collect a piece of equipment. The child's vital signs are stable and the parent agrees to hold the mask while you are gone. What is your response?

    a) As vital signs are stable it is ok to leave the area to get the equipment, and ask parent to ring call bell if assistance is required
    b) Decline, ring call bell for assistance, credentialed staff member is responsible for gas delivery, assessment and monitoring of the patient and should not leave the patient

20. A five year-old is ordered nitrous oxide for injection of local anaesthetic prior to suturing of a small leg wound.
    What is the most appropriate method of administering this?
    a) None as it is contraindicated in this age group
    b) Via nasal prongs connected to a blender delivery device
    c) Via a mouthpiece connected to a blender delivery device
    d) Via a face mask connected to a blender delivery device

References

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https://www.rch.org.au/clinicalguide/guideline_index/Ketamine_use_for_procedural_sedation/

Royal Children's Hospital 2021 Kids Info Fact Sheet *Sedation for Procedures*
https://www.rch.org.au/kidsinfo/fact_sheets/Sedation_for_procedures/

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