Care and Treatment Plan: Use of Nitrous Oxide/Oxygen in Pain Management – *Adult*

Definition

A sweet smelling, colourless 50/50 gas mixture of nitrous oxide and oxygen (Canadian product names: Entonox, Alnox Gas, Liqui-med Analgesic Gas) commonly self-administered by the client through a demand-valve mask and supervised by registered nurses with **Remote Nursing** Certified Practice (RN(C)). Nitrous oxide/oxygen supports combustion.

Registered nurses with **Remote Nursing** certified practice designation are authorized to manage, diagnose and treat pain in adults with the use of nitrous oxide.

Indications

Nitrous oxide/oxygen is used in moderate to severe pain management situations when immediate, short-term analgesia and anxiolysis with minimal sedation is required such as during a difficult dressing change, the application of splints to fracture sites or during labour.

- The RN(C) may administer nitrous oxide 50%/oxygen 50% to manage pain under the following conditions:
- Stable trauma, such as a minor Motor Vehicle Accident (MVA), fall, recreational injury, or assault
- Burns
- Obstetric clients, particularly labour
- Chest pain
- Abdominal pain
- Painful treatments such as dressing changes or splinting fractures

Action

Central nervous system (CNS) depressant action, possibly by partially inhibiting action potentials of the CNS that leads to sedation. As a mild analgesic, it has an action similar to morphine as it may act on opiate receptors. It does cause some sympathetic stimulation, which supports blood pressure, systemic resistance and cardiac output. "Spontaneous respirations, airway protective reflexes, and hemodynamic status are generally preserved at concentrations typically used for sedation and analgesia" (Grant, 2009).

Pharmacokinetics

- Absorption: rapid via the lungs
- Metabolism: body
- Excretion: primarily exhaled, minimal amount through skin
- Onset: 1-2 minutes., wears off in 2-8 minutes

Contraindications

- Sensitivity to nitrous oxide
- Any condition or suspected condition involving trapped gas as the nitrous oxide will also diffuse into the airspaces:
  - Bowel obstruction
  - Air embolism
  - Pneumothorax
  - Middle ear infection
  - Decompression sickness
  - Vitreoretinal surgery and intraocular gas bubble
- Head injury with impaired consciousness as nitrous oxide /oxygen will further increase intra cranial pressure (ICP)
- Client inability to comply with instructions

- Suspected inhalation injury with oxygen saturation of less than 100%
- Client has taken nitroglycerin in the last 5 minutes
- Usage in an enclosed treatment area without ventilation
- Use for a continuous period of more than 24 hours

Precautions

Factors that require extra caution in instituting nitrous oxide /oxygen therapy:

- Maxillo-facial injuries which affect ability to hold the mask firmly on the face
- Chronic obstructive pulmonary disease (COPD)
- Distended abdomen
- Shock
- Intoxicated clients
- SCUBA diving within the last 24 hours

Adverse Effects

- CNS: Dizziness, drowsiness, headache, confusion or decreased level of consciousness, or CNS excitation (including seizures), amnesia, giddiness, tingling
- Gastrointestinal: Nausea and/or vomiting
- Respiratory: Apnea
- Cardiac: Decreased cardiac output and hypotension
- Miscellaneous: Aggravation of middle ear (increased pressure), inhalation by caregiver affects caregiver ability to function; interference with B12 and folate metabolism

Drug Interactions

- No known significant reactions

Pregnancy Risk Factors

- Considered safe during pregnancy and labour and delivery

Route/Dose

- For mild sedation, anxiolysis and analgesia – nitrous oxide/oxygen for inhalation:
    - Self-administered by client using hand-held facemask or mouthpiece. This ensures that if client becomes too drowsy, they cease to inhale the gas.

Availability

- Supplied in blue cylinders

Nursing Implications

- Ensure adequate ventilation of the room to avoid bystander effects
- Conduct a history and physical examination to rule out the contraindications for use of nitrous oxide/oxygen. This includes a cardio-respiratory, gastrointestinal and ear-nose-throat (ENT) exam
- Ensure client is able to follow directions
- Obtain a baseline set of vital signs, including oxygen saturation
- Monitor closely during administration; note patient responsiveness, colour, respiratory status

Client Teaching

- Nitrous oxide/oxygen is self-administered through a demand-valve with face mask or mouthpiece.
- If the pain is spasmodic or episodic, as in labour, encourage the client to stop using the gas during the pain-free periods.
- Review the adverse effects of nitrous oxide/oxygen.
- Do not use while smoking.

Procedure

- Have the client apply the mask or hold mouth-piece to own face
- Encourage slow, deep breaths to allow the demand-valve to function
- If the mask falls away as the client becomes sedated, do not replace the mask
- Allow the client to use nitrous oxide/oxygen until the pain is relieved or side-effects appear
- Discontinue if cyanosis develops

Storage

- Tanks should be stored in a horizontal position, preferably above freezing
- Improper storage may lead to separation of N_2O_2 and O_2 (where the N_2O_2 rises to the top of the cylinder). This includes:
  - Tank being stored below -6° C
  - Gas is stagnant over a long period of time
  - Tank has been stored in a vertical position
- If any of these have occurred, invert the cylinder several times to mix the gases in the cylinder

Documentation

- As per agency policy.

References

More recent editions of any of the items in the References List may have been published since this DST was published. If you have a newer version, please use it.

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