NIMDTA Refresher in Conscious Sedation in Dentistry

Nicole McKeever BDS BSc MFDS PG Dip Con Sed

Registered STAC Mentor for Conscious Sedation

My Sedation Experience

- Trust level training 2015 Dental Core Training 2
- Society for advancement of Anaesthesia in Dentistry (SAAD) course 2016
- Fortwilliam Specialist Clinic 2016
- Provide inhalation sedation with nitrous oxide and oxygen and intravenous sedation with midazolam
- Diploma in Conscious Sedation in Dentistry Newcastle University 2019





Objectives

- Be able to define conscious sedation in relation to dentistry
- Be able to set up, use and shut down a portable inhalation sedation machine in a systemised manner
- Be able to carry out portable inhalation sedation machine safety checks
- Be aware of the dental sedation guidelines relevant to practicing sedation in Northern Ireland
- Know how to set up for an IVS appointment and carry out venepuncture
- Know how to set up for, monitor, recover and discharge a sedation patient
- Discuss what's new in conscious sedation
- Discuss dental sedation cases

Today's Programme

- 9.30-11.30am Inhalation Sedation
- 11.30-12.30am Conscious Sedation Guidelines
- 12.30-1pm Lunch
- 1pm-4pm Intravenous Sedation

Conscious sedation

- The use of a drug/drugs to induce a state of CNS depression which enables treatment to be carried out whilst verbal contact is maintained. The drugs and techniques used must carry a wide margin of safety in order to render the loss of consciousness unlikely

- GDC standard 1.2.4 ”you should manage patients’ dental pain and anxiety appropriately”

- ADHS – 54% adults in NI have moderate to extreme dental anxiety
- CDHS – 14 – 24% children in NI have moderate to extreme dental anxiety

An alternative to GA in Children

- Looked at 7 case series 83-97% of appropriately selected children were treated successfully with RA who would have otherwise required a GA
- Equates to 45-64% of all children referred for GA being manageable with RA instead
- Case selection:
  - Orthodontic treatment
  - Older children
  - Children requiring <4 extractions
- Morbidity is minor and infrequent
- High user satisfaction and in some cases higher than GA
- More treatment episodes than GA
- Cheaper to provide

Lyratzopoulos and Blain 2003

Indications and Contraindications of IS

Inhalation Sedation

- Semi-hypnotic technique
- N_2O/O_2 produces a state of anxiolysis through CNS depression
- These physiological changes enhance patient suggestibility so that with the aid of behavior management anxiolysis is increased
- Increases pt cooperation allowing treatment to be carried out
- Pt remains conscious throughout

Indications

- Mild to moderate dental anxiety in children and adults
- Needle phobia
- Gag reflex
- Medically compromised patients:
  - Asthma (Caution advised in those with COPD)
  - IHD
  - Anaemia
  - Epilepsy
  - Liver/kidney disease
- An alternative to IV/GA
- Help those with limited dental treatement experience

Contraindications

- Upper respiratory tract infections
- Nasal obstruction/mouth breathers
- Serious respiratory disease
- Very young children
- Moderate to severe learning difficulties/ psychiatric disorders
- Severe anxiety
- Claustrophobia
- Nasal or facial deformity
- N_2O abuse/vegan/elderly
- Pregnant women
- Patients taking methotrexate (anti-folate effect)
- Viteroretinal surgery in the last 3 months
- Middle ear/ sinus infection
- Anterior teeth - access
- Severe forms of MND, Parkinson's, Myasthenia Gravis, MS

Pharmacology of Nitrous Oxide



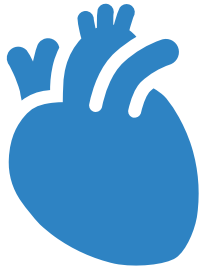
N_2O Properties

- Colourless, sweet smelling gas
- Stored as a liquid in blue cylinder when valve opened becomes a gas
- Supports combustion
- Specific gravity 1.53
- 750psi, does not reflect contents of cylinder, will fall to 0psi when empty
- Low blood/gas solubility
- Low oil/water solubility
- O_2 2000psi, stored as compressed gas in white/black cylinder, pressure does reflect contents

Mode of Action

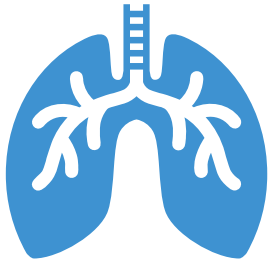
- Inhaled – lung – heart – brain
- $GABA_A$ receptors – Anxiolysis
- Opioid receptors – Analgesia
- NMDA receptors - Anaesthetic - MAC 105%

Clinical Effects of N_2O



Cardiovascular system

Minimal effect
Cutaneous vasodilation
Myocardial depressant at high dose



Respiratory System

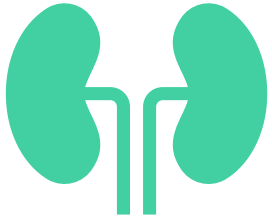
Non-irritant
Mild depression of alveolar ventilation
Diffusion hypoxia

Clinical Effects of N_2O



Central Nervous System

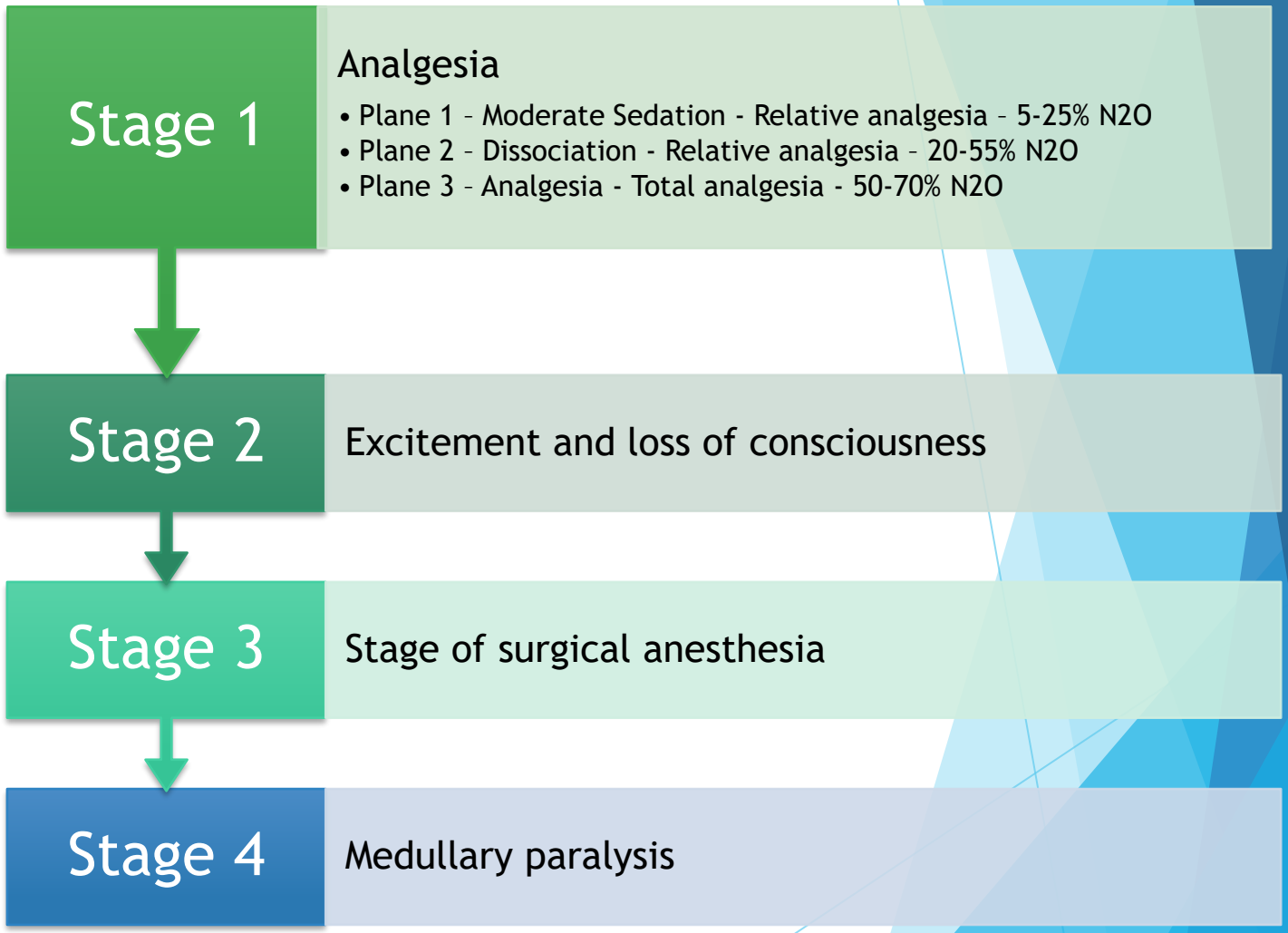
- CNS depressant
- Depression of senses (sight, hearing, touch)
- Minimal amnesia



Liver/Kidney

Not excreted/ metabolised

Guedel's Stages of Anaesthesia



Plane 1 – Moderate Sedation – 5-20%

- Signs
  - Looks awake
  - Responds clearly
  - Retains open mouth
  - Gag slightly reduced
- Symptoms
  - Feels relaxed
  - Tingling – fingers, toes, cheeks, tongue
  - Feeling of well being
- Clinical – pulse, BP, RR, laryngeal reflexes and pupil reactions will all be normal

Plane 2 – Dissociation – 20-55%

- Signs
  - Dreamy faraway look
  - Slow response, slurred speech
  - Reduced gag
  - Retains open mouth
  - Moderate analgesia

- Symptoms
  - Feels light/heavy/warm
  - Paraesthesia marked
  - +/- laughing
  - Very suggestible

- Clinical – Pulse, BP, RR, laryngeal reflexes and pupil reactions should be unaffected

Plane 3 – Analgesia – 50-70%

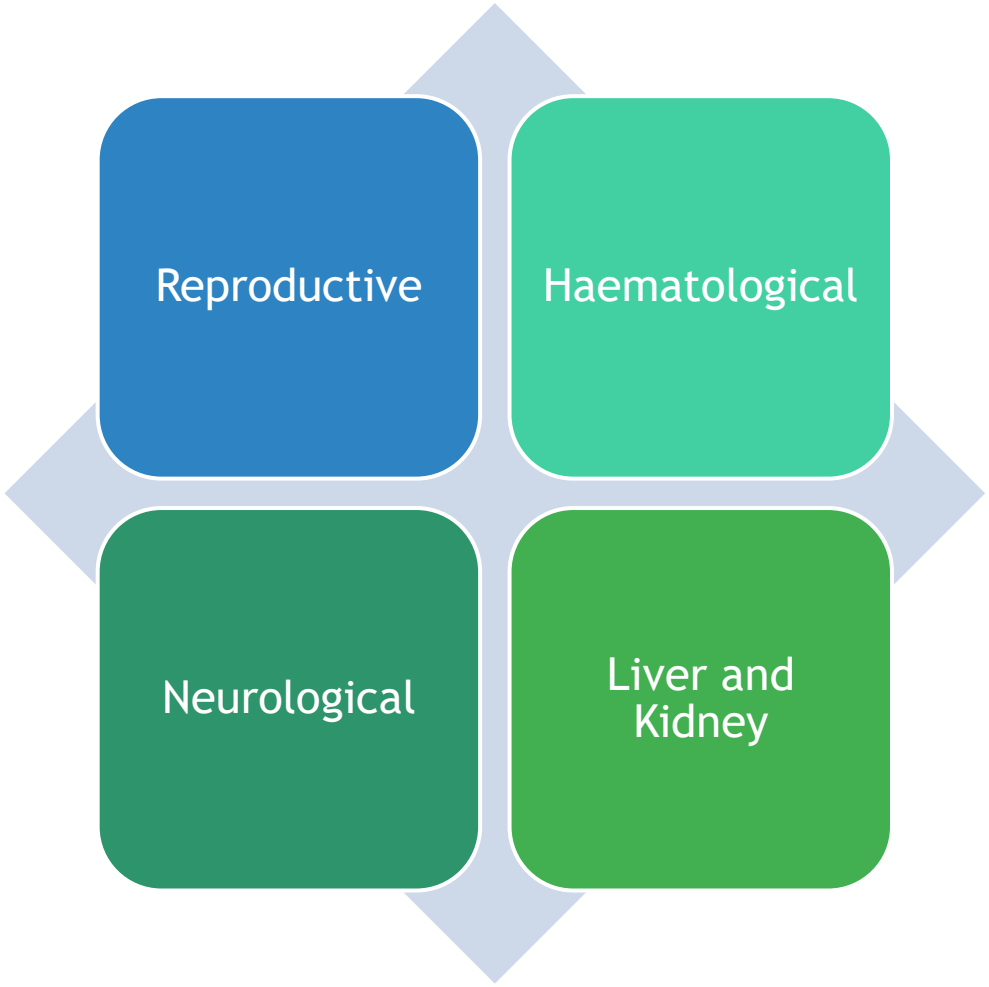
- Signs
  - Verbal contact difficult
  - Loss of open mouth sign
  - Glottic reflex depressed
  - Loss of cooperation
- Symptoms
  - Feels disorientated +/- nausea, dizzy, vomitting
  - Total analgesia
  - Feeling of doom and gloom
  - Loss of consciousness may occur
- Clinical
  - inc HR, inc RR, inc BP, loss of consciousness

Adverse Effects of Chronic Exposure

Adverse Effects of Chronic Exposure

- N_2O causes oxidation of vitamin B12
- Vit B12 is required for methionine synthetase production
- An enzyme required for folate and DNA synthesis
- Cellular production impairment

Adverse Effects of Chronic Exposure



Nitrous oxide and fertility/ pregnancy

- Female dental nursing staff undergoing IVF treatment should avoid being present for treatment under RA
- Those in first trimester of pregnancy should also avoid assisting for treatment under RA

Reducing N_2O Pollution

Exposure limit 100ppm 8hr TWA

Good mask fit

Patient selection

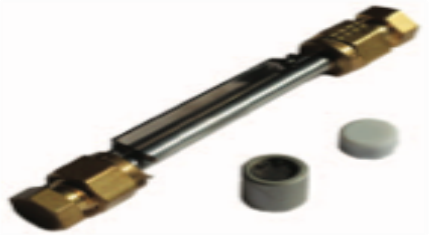
Minimal effective dose

Scavenging

Equipment maintenance

Monitoring

Ventilation



Scavenging

- Active
  - Tubing that plug into the surgeries wet-line slow suction system
  - Mini-scav potable units
  - Dedicated built in systems
- Passive
  - Open windows and doors
  - Fans

Vacuum control block





Equipment

- Piped or portable systems
- Active scavenging system
- Health and safety considerations: bottle carriage, storage and COSHH
- Additional costs: nasal hoods, tubing, reusable or disposable systems

Safety features

Colour coding

- N_2O – Blue
- O_2 - White/ Black
  - E 680 litres 45mins oxygen
  - E cylinder 5.9kg when empty 8.8kg full



Pin index



Bodoc Seal





Minimum O_2 Delivery 30%

Nitrous Oxide Cut-Out



Gas Pressure Dials

- N_2O 750psi
- O_2 2000psi, 137 bar



Scavenging – 45L/min - National Institute of Occupational Health and Safety

Scavenging is a means to collect and remove excess gases to prevent them from being vented back into the operating room





O_2 Flush



- 45-50L/min
- Rapidly clears nitrous from the breathing circuit
  - Diffusion hypoxia
  - Oversedation
  - Delayed recovery

Air Entrainment Valve



- Part of the machine's hypoxic guard
- Opens to allow fresh room air into the bag tee of the flowmeter if oxygen runs out and nitrous oxide cut out engages

Other Features

Nasal Hood with One-Way Valve

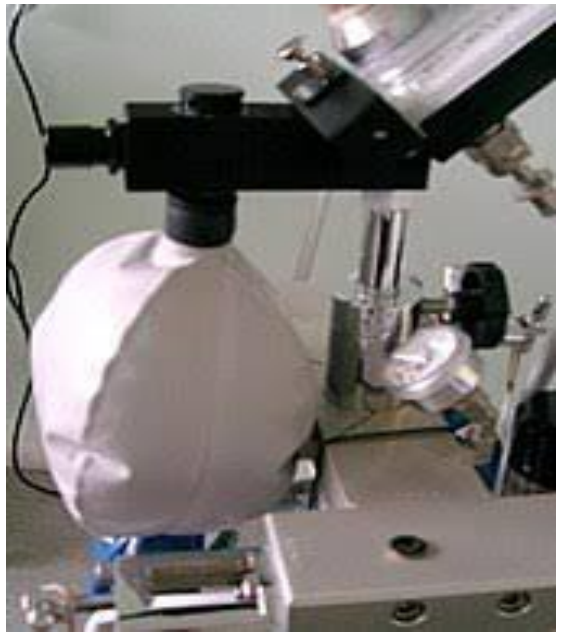


Flow Control and Mixer Control





Reservoir Bag



- 2-3 litre bag
- Monitors patient respiration rate
- Autoclavable - regular autoclaving shortens life expectancy of bag

Pre-sedation checks

- Before the patient enters the surgery
- Dental chair and equipment working properly
- 'in use' and 'full' cylinders correctly attached
- Fail-safe oxygen cut out working
- Reservoir bag, tubing and nasal hoods intact and connected properly
- Scavenging system working
- Emergency equipment and drugs available
- Other equipment required for dental treatment

Preparation of the patient

- Discuss with patient and or parent what is involved including the treatment
- Discuss in an age appropriate way 'happy air'
- Explain what they might feel - 'light, floaty, warm, tingly'
- Written consent required
- Assess ASA / medical history
- Patent nasal airways
- May consider recording vital signs like pulse and respiratory rate

Preparation of the patient

- Light meal 2 hours before appointment
- Children accompanied by a responsible adult
- Transport home by car or taxi
- Children not allowed to ride bikes, operate machinery, drive vehicles remainder of the day
- Children supervised by and adult remainder of the day
- Adults do not require an escort, inadvisable that the drive - judgement, reaction time, attention can be impaired
- Most adults will have recovered after 5-10mins, some may take up to 30mins

Treatment visit

- Settle patient into chair
- If parent is staying in the room check whether or not they are pregnant
- Select appropriate size of mask
- Reassured that they can talk during the treatment
- Place patient in supine position before starting sedation
- Fit the mask



Treatment visit

- Start with 100% oxygen 4 litres/min children, 6 litres/min adults - ensure ther are no leaks
- Patient encouraged to close mouth and breath through their nose
- Titrated at 10 to 5% increments 1 minute at a time (20-40% nitrous for kids)
- Behaviour management/ suggestion throughout
- Patient should be relaxed may notice tingling
- If ok to proceed start with topical/ la and proceed -encourage nasal breathing
- If patient can't maintain an open mouth – sedation is too deep



Monitoring, Recovery, and Discharge

Monitoring of the Patient Under IS

- No electromehanical monitoring
- Ensure verbal contact maintained
  - AVPU
- ABC
  - airway patency
  - respiration (rate and depth)
  - skin colour
  - capillary refill
  - pulse rate, rhythm and volume

Management of Over Sedation

- Reduce N_2O by 5/10%
- Monitor pt and reassure
- May have to revert to 100% O_2
- O_2 Flush

Recovery and Discharge

When treatment complete switch 100% O_2

Breathe for 3 - 5minutes through nose – prevent diffusion hypoxia

Remove nasal hood

Sit patient up, not dizzy/walk unaided

D/C with or without escort depending on pt need

Decontamination of IS machine

Potential sources of cross infection

- Flow meter and breathing bag
- Nasal hood/masks
- Tubing attached to the mask
- Fresh gas hose
- Free standing unit/ Tanks

External Cleaning of the Machine

Don’t:

- Use very wet or foamy wipes - unless squeezed out to remove excess moisture
- Never spray onto the equipment
- Use excessive moisture of any kind
- Use any cleaning material containing alcohol or bleach



Flow Meter and Breathing Bag

- Patient is not in contact with this
- One way valve
- Protective barriers
- Latex free bag autoclavable – once a week
- Cylinders and stand – wipe down





Nasal Hood/Tubing

- Disposable – dispose of after every patient
- Autoclavable – autoclave after every patient
- Double mask - sterilize both inner and outer liners
- Disconnect mask from tubing prior to sterilization in autoclave
- Corrugated tubing cannot be sterilized - wash
- waste gas tubing



Decontamination

- Cleaning
- Disinfection
- Inspection
- Sterilisation

Disinfection

- **Do not** spray disinfectant directly onto machine
- If using wipes **wring** out so they are not too wet
- Make sure disinfectant is washed off prior to steam sterilization as the disinfectant can **crystalise** and cause skin irritation to patient

Cleaning

- Wash in warm water with mild detergent OR
- Use washer disinfector
- Rinse with water then proceed to sterilisation

Sterilisation

- Steam autoclave
  - Bag or wrap 134-137 degrees 3 minutes
  - Bag or wrap 121-123 degrees 15 minutes

Cylinder Storage

Cylinders should be stored in a secure, well ventilated and weatherproof area

Cylinders should be secured upright by brackets or chains

E size cylinders may be stored horizontally

The storage area should have adequate means of access to facilitate delivery/collection

Storage areas should be clearly identified with compressed gases signage

So far as is practical, lighting and electrical equipment should be sited away from cylinder storage area

Lubricants should be avoided

When handling cylinders always ensure that hands are clean and free from oil or grease





The Logistics

- How many sets of nasal hoods and tubing do you have?
- What time does it take for the nasal hoods and tubing to be processed through your decontamination room
- How many patients can you book in to a session/ a day

Case Report



- 28 yo female receiving treatment under inhalation sedation for extraction of LL6
- Titrated 50% nitrous
- At the end of the procedure the patient reported cramping in her hands
- O/E the patient's hands appeared to be in spasm

Hyperventilation and Tetany



Tetany - Contraction of distal muscles in hands and feet



Hyperventilation = lowering of carbon dioxide = hypocalcaemia



Hypocalcaemia = lowered threshold for the firing of action potentials causing contraction of the peripheral skeletal muscle



Management

- Recovered patient with oxygen 3mins to prevent diffusion hypoxia
- Turned oxygen and scavenging off encouraged patient to breath in through nose and out through mouth with lips pursed to increase CO_2 levels
- Patient recovered well after 3minutes
- Alternatively could use paper bag / non-rebreathing mask without oxygen

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Questions




THANK
YOU



Email me at:
nmckeever312@hotmail.com