MONITORING, RECOVERY AND DISCHARGE

NICOLE MCKEEVER BDS BSC MFDS MSC PG DIP

OBJECTIVES

- Identify the role of the sedation team in monitoring, recovery and discharge
- Be aware of the importance of monitoring
- Know how to clinically monitor a patient to determine their level of consciousness, cooperation, respiration, heart rate, skin colour, and to respond appropriately to changes
- Select and demonstrate the use of appropriate electromechanical monitoring techniques and respond to changes (SaO2, NIBP, ECG, end tidal CO2, BIS)
- Recognise common electrical monitoring artefacts and malfunctions
- Requirements for recovery and discharge
- Practical drawing up drugs

ROLE OF THE SEDATION TEAM

THE IMPORTANCE OF THE DENTAL NURSE IN SEDATION

- Operator-sedationist technique
- I think it should be called operator-sedationist-nurse assisted technique
- As an operator sedationist when treatment starts the dentist will be focused on the treatment of the patient
- During treatment it is very important that as a nurse you are carrying out clinical and electromechanical monitoring – aid in early detection of an emergency
- Assistance with behaviour management is also key
- Patients treated under sedation are vulnerable we have a duty of care to look after them and keep them safe
- Be vigilant!

ROLE OF THE SEDATION TEAM

- SDCEP "The patient should be monitored **peri-operatively** by an appropriately trained member of staff in a manner suited to the patient and sedation technique"
- To provide **safe and effective** sedation to aid dental treatment
- Maintain **contemporaneous records** of the clinical and electromechanical monitoring peri-operatively
- When working as an operator sedationist there must be a **second appropriately trained person** present capable of monitoring the patient and assisting the dentist should complications arise
- Sedationist and all other members of the clinical team are familiar with the **emergency protocols**, including roles in **the recognition and management of sedation related complications and medical emergencies**

DEDICATED SEDATIONIST

- Required for advanced techniques

- Other circumstances
  - Pt is medically compromised/has a physical disability or is emotionally challenging
  - The operator or sedationist is inexperienced
  - Patient has a history of being difficult to manage
  - Dental procedure is complex or prolonged
  - Treating patients at extremes of age

MONITORING

WHY MONITOR?

- Monitor - An apparatus that measures a physiologic function that delivers an **audible/visual warning** when the measured function falls outside of predetermined parameters
- Careful monitoring is important to allow **early detection** of adverse side effects and allow for early intervention to prevent serious complications arising
- Sedation has the ability to significantly affect **'ABC'** and as a result we must monitor for changes in these
- Monitoring the patient's vital signs begins with visual checks as well as utilizing monitoring equipment

NAME THE 2 TYPES OF MONITORING

TYPES OF MONITORING

- There are 2 types of monitoring:
  - Clinical
  - Electromechanical

VITAL SIGNS

- Monitoring of **vital signs** must take place **throughout** the appointment
- Although the patient's vital signs have been checked at the assessment visit they should be **reassessed** on arrival for the treatment appointment to ensure they are **still fit and healthy and ready to receive sedation**
- **As the dental nurse you will have a lead role in performing these checks**
- This is not a box ticking exercise **– think about what the recordings mean**
- **Vital signs:**
  - heart rate,
  - respiratory rate
  - oxygen saturations
  - blood pressure

MONITORING OF THE PATIENT UNDER IVS

- **Clinical**
- Consciousness
  - Ensure verbal contact is maintained
  - AVPU
- ABC
  - Airway patency
  - Respiratory rate and depth
  - Skin Colour
  - Capillary Refill
  - Pulse rate, rhythm, volume

- **Electromechanical**
  - Non-invasive blood pressure (NIBP) measurement
  - Heart rate (HR)
  - Oxygen Saturation (SaO2)

- ASA III/IV
  - ECG
  - Capnography

- **Other**
  - bispectral index (BSI)

CLINICAL MONITORING

AVPU – ASSESS LEVEL OF CONSCIOUSNESS

- Alert – full awake, responsive, aware of surroundings
- Voice - patient responds to verbal commands – open their eyes when spoken to
- Pain – patient responds to pain stimuli
- Unresponsive - patient does not respond to any stimuli

AIRWAY PATENCY

- A patent airway does not make any abnormal sounds

Sound	Cause	Management
Snoring	Hypopharygeal obstruction by tongue	?
Gurgling	Foreign matter (blood, vomitus, water) in airway	?
Wheezing	bronchospasm	?
Choking	Foreign body	?
Crowing	Laryngospasm	?

RESPIRATORY RATE AND DEPTH (BREATHS PER MINUTE)

- Important as drugs used in sedation are respiratory depressants
- Count the number of breaths taken in 1 minute – looking at the rise and fall of the chest
- Can be measured whilst taking pulse
- Monitoring of respiratory adequacy:
  - Respiratory rate (normal 12-18 BPM)
  - Observe chest wall movement – agonal breathing worrying sign (gasps, 2-3 breaths per min)
  - Colour of mucous membranes – oral mucosa/fingernail bed
- Rapid breathing – anxiety or pain
- Reduced breathing – respiratory depression – oversedation

SKIN COLOUR

This can be observed upon the patient's arrival

- **Pale** – Faint, anaemia
- **Grey** – heart attack
- **Blue** – Cyanosis – low oxygen levels in the blood
- **Red** – allergy, raised blood pressure, alcohol dependence
- **Yellow** – Jaundice

- Another factor that can be observed on arrival is the patient's **behaviour or demeanour**
  - Ask the patient how they are feeling today as you bring them in from the waiting room
  - Ask them if they are feeling anxious
  - **Anxiety can increase a patient's heart rate and blood pressure, anxiety can exacerbate stress related conditions such as those patients that have ischaemic heart disease, angina, asthma, epilepsy, predisposed to fainting**

HOW DO YOU ASSESS CAPILLARY REFILL?

CAPILLARY REFILL

- Test used to evaluate blood flow through the small blood vessels in the skin, called capillaries. It's often used in emergency and clinical settings to assess circulation and dehydration

1. **Procedure**: Press down on the patient's fingernail until it turns white (blanching), which temporarily stops the blood flow
2. **Observation**: The pressure is then released observe how long it takes for the colour to return to normal
3. **Normal Refill Time**: In a healthy individual, the colour should return within 2 seconds or less
4. **Prolonged Refill Time**: If it takes longer than 2 seconds, it may indicate poor blood circulation, dehydration, shock

- Capillary refill is a simple but valuable tool for quickly assessing a patient's **circulatory status**

PULSE (BEATS PER MINUTE - BPM)

- Normally done electromechanically via pulse oximeter
- **Normal 60-80 BPM average 72**
- **Manual** - fleshy portion of 2 fingers gently placed over superficial artery for 30 secs – double this value - radial, brachial, carotid, labial, facial, superficial, temporal
- When a **radial pulse** is palpable the systolic blood pressure **(SBP) is at least 80mmhg**
- **Brachial pulse** palpable SBP is at least **70mmHg**
- **Carotid** the SBP is at least **60mmHg**
- **Bradycardia (<50BPM)–** may indicate faint, decreased perfusion, increased risk of ischaemia, (elderly tend to have bradycardia)
- **Tachycardia (>100BPM)** – anxiety, pain, intrarterial La

MONITORING INTERVALS

- Pre-operative
- After drug titration (La, midazolam top ups)
- Intraoperative
- Postoperative
- Any significant events
- Recovery
- Discharge

- ASA - BP and HR Every 5 minutes

ELECTROMECHANICAL MONITORING

NURSES ROLE IN MONITORING

- Sedation nurse should be able **to set up and use monitoring equipment** confidently and competently
- Be able to communicate with the patient and gain their **consent** to carry out monitoring
- Have an understanding of how it works and be able to **interpret the readings** and **make appropriate interventions** if required
- Ensure the patient is **comfortable**

MONITORING EQUIPMENT

- **Pulse oximeter (alarmed)**
- **Non-invasive blood pressure monitor (alarmed)**
- Capnography
- ECG



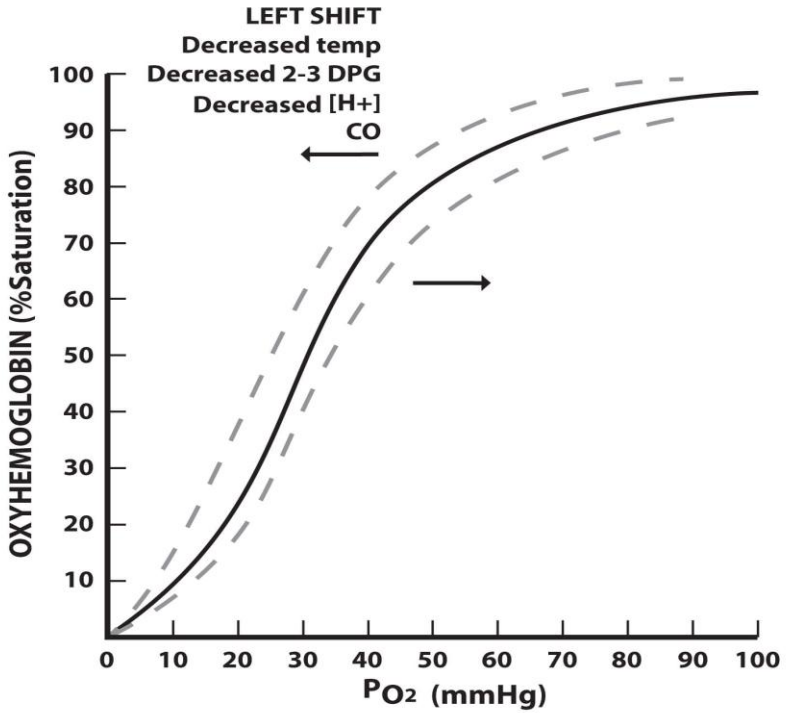
IN CLINIC CHECKS

- Ensure all leads are connected properly
- Switch the machine on so to ensure that it performs self-calibration
- Switch off the machine to test the battery
- Set the alarms
- Place it in a position where it can be seen by operator and nurse
- Listen for the bleep
- Periodically look at the machine to check reading
- If any concerns inform the clinician immediately

PULSE OXIMETRY

- **Monitors respiratory and cardiovascular function**
- Measures **arterial oxygen saturation** and **pulse rate**, allows early detection of cerebral hypoxia
- Probe – **finger/earlobe**
- Uses optical plethysmography and spectrophotometry
- OP – utilizes light absorption to reproduce waveforms produced by pulsatile blood
- SP – uses various wavelengths of light to perform quantitative measurements of absorption through a given substance e.g. blood. This determines the percentage of saturation.
- Measures and compares the absorption of 2 different wavelengths of red and infrared light by the arterial blood
- The colour of blood changes according to the degree of oxygen saturation which has an affect on the absorption spectrum
- Calculates the relative absorption of the two wavelengths indicates the oxygen saturation
- Recorded as a %
- **Normal 98-100% (smokers 97%)**

OXYGEN DISSOCIATION CURVE



- **Vertical axis – amount of saturated haemoglobin**
- **Horizontal axis – partial pressure of oxygen (oxygen tension)**
- Oxygen saturation is the volume of oxygen attached to haemoglobin
- If saturations drop below 90% indication of inhibited respiratory or cardiovascular activity

PULSE OXIMETRY

- Accurate readings can be affected by:
  - **Excessive movement** – patient's will tap their finger! - can lead to changes in light absorption, producing artifact pulses, or changes to saturation levels
  - **Cold extremities/ low perfusion** - less blood for the pulse oximeter to read – warm extremities
  - **Pigmented skin** – can overestimate oxygen saturation levels in patients with darker skin
  - **Nail varnish/false nails** – black, blue, green, purple, and brown – can cause interference – remove -reposition
  - **Fluorescent/bright lights** – dilutes the infrared light

  - **NB: There is roughly a one minute time delay in the oximeter so when readings drop <90% act promptly**

PULSE OXIMETRY

- Most common causes of desaturation during sedation
  - Slight respiratory depression from midazolam
  - Breath holding
  - Over-sedation
- Action
  - Encourage the patient to take a few deep breaths
  - If sats remain <90% - supplemental oxygen
  - If the sats still don't increase after this = oversedation – reverse with flumazenil
  - Unconscious - CPR
  - Emergency services

SUPPLEMENTAL OXYGEN



- 3-4 litres/min via nasal cannula
- Useful for patients who keep desaturating
- Patients who have conditions aggravated by stress
  - Epilepsy
  - Angina
  - MI

TIPS AND TRICKS IN PULSE OXIMETRY



- Make sure **the probe is on the finger securely**
- If patient is wearing nail varnish and it is impacting readings turn the probe onto the side of the finger
- Ensure the infrared **light is positioned over the nail** bed
- Keep the pulse oximeter on the hand **opposite the arm with the BP** cuff on as when the cuff inflates in reduced readings and the oximeter will alarm

MEASURING BLOOD PRESSURE (MILLIMETRES OF MERCURY)

- **Noninvasive blood pressure measurement NIBP**
- Arm should be positioned at **heart level**, patient should be asked to remain still and not talk
- **Normal BP 120/80 mmHg** (top figure is the systolic measurement, lower is diastolic)
- **If the pts BP is elevated repeat measurements a further 2 times 1 min apart**
  - **>160/95 ASA III**
  - RCS anaesthetists guidance on BP before elective surgery can be as high as **180/110mmHg**
  - Patient with hypertension increased risk of **MI and CVA**
- **Incorrect sized BP cuff can cause of false readings**
  - **Highs** – cuff too small, arm below heart level
  - **Lows**- cuff too large, extremity is above heart level,

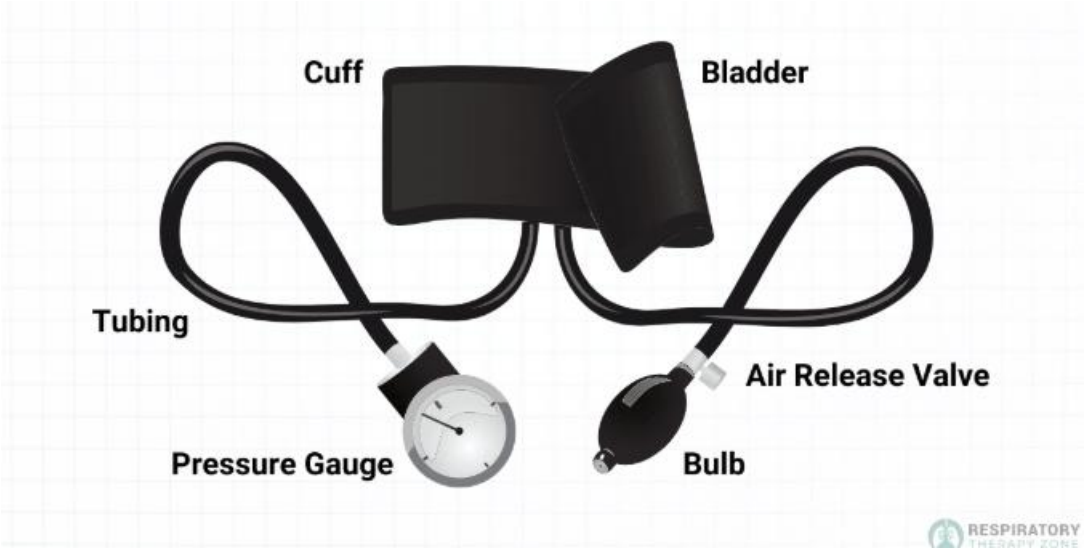
TECHNIQUE OF MANUAL BLOOD PRESSURE

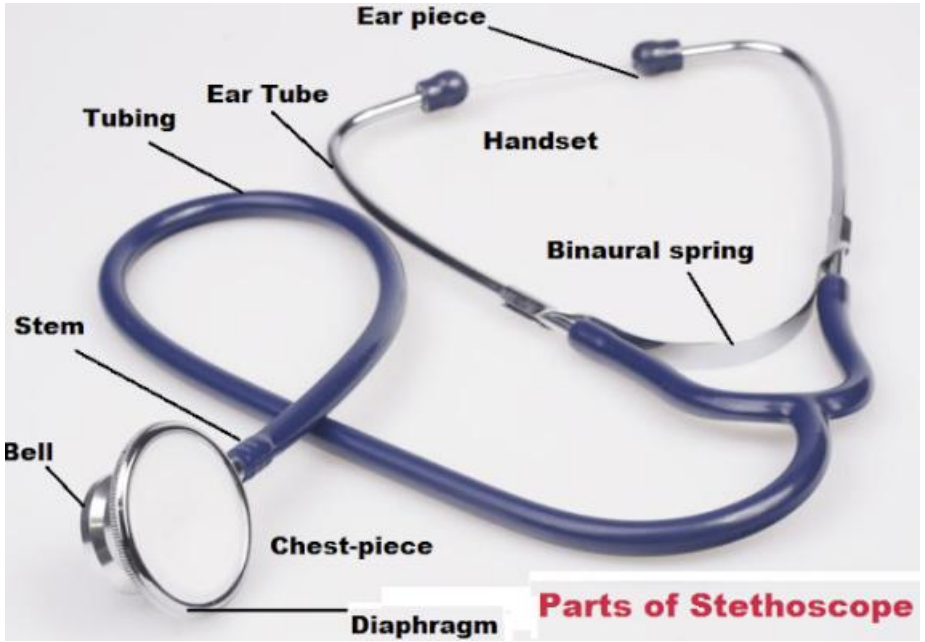
- **Equipment: Sphygmomanometer and stethoscope**
- Cuff applied to patient on upper arm **2-3 cm** above the elbow
- Identify and **palpate radial pulse** – inflate cuff until you can no longer palpate the pulse – make a note of the reading from the dial - this estimates what your systolic blood pressure is
- Then apply the stethoscope over the **brachial artery**
- Inflate the cuff **to 20to 30 mmHg** greater than what you had noted - **explain to the patient that the cuff will feel tight**
- **Slowly deflate the cuff whilst looking at the dial and listening to the stethoscope, whenever you hear the first "thud" sound and see the dial hand waver this is your systolic reading and when the sound disappears**

KORTOKOFF SOUNDS

- K1: Audible sharp thud (systolic)
- K2: Blowing or swishing sound
- K3: Thudding sound
- K4: muffled sound
- K5: laminar blood flow (diastolic)

SPHYGMOMANOMETER AND STETHOSCOPE





TIPS FOR MEASURING BLOOD PRESSURE

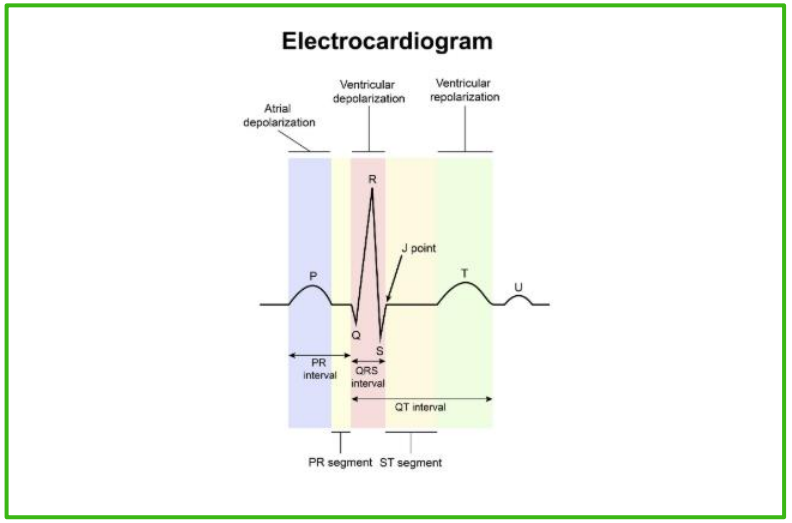
- **Explain to the patient what you are going to do** and that the cuff will go tight on their arm
- Place the patients arm at the **level of their heart**
- Inspect the cuff there will be a side that says **"this side to patient"** apply this side to the patient's arm
- There will also be an **"artery"** marker on the cuff, line this up with the **medial aspect of the antecubital fossa where the brachial artery is**
- The **tubes** coming from the cuff should run **down the patient's arm**
- If the cuff is slightly inflated before taking measurement detach cuff and deflate it
- **Measure the BP every 5mins as per ASA guidance**

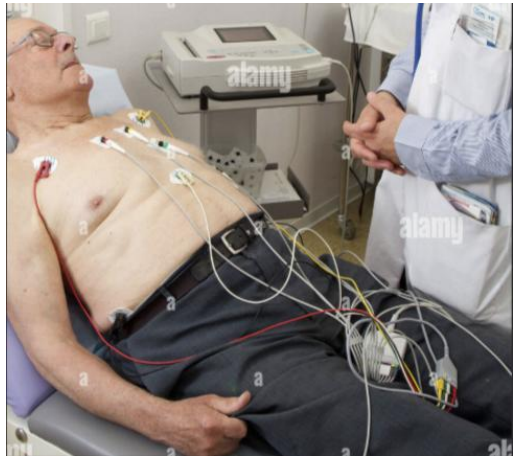
SET YOUR ALARMS



- SBP (normal 120)
  - High 170
  - Low 90
- DBP (normal 80)
  - High 100
  - Low 50
- Heart Rate (normal 60-80)
  - High 140
  - Low 50 (55 in your book)
- Oxygen Saturations (normal 98-100%)
  - 90%

ECG AND CAPNOGRAPHY





- **Monitoring by electrocardiogram (ECG) or capnography is not currently required for conscious sedation for dental treatment. However, such additional monitoring may be appropriate for ASA grade III and IV patients**
- ECG is a medical test that measures the electrical activity of your heart. It's commonly used to detect heart problems and monitor the heart's health
- During the test, small electrodes are placed on your skin to pick up the electrical signals your heart produces each time it beats. These signals are then recorded and displayed as a series of waves on a monitor or printout. The patterns in these waves can help doctors diagnose various heart conditions, such as arrhythmias, heart attacks, and other heart-related issues.

ECG AND CAPNOGRAPHY

- Capnography is a **non-invasive diagnostic technique** that provides continuous monitoring of the concentration of carbon dioxide in exhaled breath - end tidal CO2
- It offers critical insights into a patient's ventilatory, metabolic, and circulatory status
- More reliable than pulse oximetry as it measures the CO2 in exhaled air, no time delay



A - B	Inspiratory baseline
B - C	Expiratory upstroke
C - D	Alveolar plateau
D	End-tidal concentration
D - E	Inspiratory downstroke

BISPECTRAL INDEX MONITOR (BSI)



- To determine the depth of sedation, the clinician assesses the patient's speech, responsiveness, change in facial expression, muscle tone and acceptance of treatment.
- However, many patients such as those with learning disabilities (LD) or neurodisability (ND), are not able to maintain verbal contact as a result of their disability. It may be difficult to elicit the level of consciousness for these patients and to determine when the end point of sedation is reached.
- The bispectral index (BIS) monitor was developed to measure the hypnotic state (level of consciousness) during sedation and general anaesthesia. The BIS monitor works on the principles that cerebral electrical activity (as recorded in the electroencephalogram - EEG) is representative of cerebral function and that EEG waveforms change with the level of consciousness.6
- A computerised algorithm converts the EEG into a numerical value ranging from 0 to 100, with zero representing no brain activity, and 100 indicative of an alert and awake status.

RECOVERY AND DISCHARGE

RECOVERY

- A **progressive step down** from completion of treatment to the patient's discharge
- Monitor the patient **throughout the recovery** period until they are assessed as fit for discharge – Clinical, Pulse ox/HR and NIBP
- Ensure that an **appropriately trained** member of the clinical team monitors the patient throughout the recovery period
- Ensure that the **sedationist remains available** to see the patient urgently in the event of any complications
- The decision to **discharge** a patient following any type of sedation is the responsibility of the **sedationist**
- aspects of the discharge process may be **delegated** to a suitably trained member of the clinical team
- Be aware of the need for sufficient **recovery** time following administration of a **reversal agent**


25°C
19
LCD
2.8"
vtech
VOL +
MENU
SELECT
VOL -
POWER
TALK
LCD OFF
EXIT
LINK
vtech

DISCHARGE CRITERIA

- The patient is **orientated** in time, place and person
- **Vital signs are stable** and within normal limits for the patient – **have dentist check these**
- **Respiratory status** is not compromised
- **Pain** and discomfort have been addressed
- Where relevant, **haemostasis** has been achieved
- The **cannula** has been removed
- The responsible **escort** is present, and arrangements have been made for supervision
- Written and verbal **post-operative instructions** for both the sedation technique and dental treatment have been given to the patient and escort

MODIFIED ALDRETE SCORE

Observation	2	1	0
Respiration	Able to take a deep breath and cough	Dyspnea/shallow breathing	Apnea/stopped breathing
O_2 Saturation	Maintains >92% on room air	Needs supplemental O_2 to maintain sats >90%	Saturation <90% even with supplemental O_2
Consciousness	Fully awake	Arousable when calling	Not responding
Circulation	BP +/-20mmHg pre-op	BP +/-20-50mmHg pre-op	BP +/- 50mmHg pre-op
Activity	Able to move 4 extremities voluntarily or on command	Able to move 2 extremities voluntarily or on command	Able to move O extremities voluntarily or on command

Score of 9 or 10 - suitable for discharge, less than this need to consider intervention

RECORD KEEPING

PRE-TREATMENT RECORD

- Meticulous record keeping is important - it is the first thing that will be reviewed if complications arise
- Presence of escort
- Time that food and drink were last consumed
- Transport arrangements
- Compliance with pre-treatment instructions
- Presence of written consent for the procedure and reconfirmed
- Any changes to PMH

TREATMENT RECORD

- Dose, route and times of administration of drugs
- Site of cannulation and attempted cannulation
- Details of clinical and electromechanical monitoring
- Personnel present in the surgery
- Pt reaction, sedation score, success of sedation
- Dental treatment provided

RECOVERY/DISCHARGE RECORD

- Monitoring – appropriate details of measurements and observations throughout
- Pre-discharge assessment – discharge criteria met
- Written POIG and explained to pt and escort
- Removal of cannula
- Time of discharge

Sedation Scoring

1	Fully awake and orientated
2	Drowsy
3	Eyes closed, responds promptly on verbal command
4	Eyes closed, rousable on mild physical stimulus
5	Eyes closed, unrousable on mild physical stimulus

HEIGHT, WEIGHT AND BODY MASS INDEX

- BMI is defined as the weight in kilograms divided by the square of the height in metres (kg/ m2).
- However, the concept of BMI has significant limitations. It ignores many factors such as differences in muscle mass, bone mass and genetic make up.
- For example, BMI may over- estimate adiposity among persons who are very athletic and have a large muscle mass
- Underestimation can occur in individuals who have lost muscle mass such as the ill or elderly

BMI

- Excess weight around the chest and neck can reduce respiratory reserve increased risk of oxygen desaturation, airway access more difficult
- Can be prone to wheeze, if a patient is wheezing it is likely their oxygen saturations are 95% or less
- Sedation window is shorter
- Veins can be difficult to access
- Patients with increased BMI greater risk of HTN, heart disease, diabetes, liver disease
- Patients with BMI >35 greater risk of obstructive sleep apnea
- OSA – why we avoid sedating these pts
  - oxygen desaturation
  - sensitive to opioids and sedative respiratory depression – affects the pharyngeal airway dilator muscles
  - inc risk postoperative cardiac events
  - the risk of complications is much reduced in those treated with CPAP
  - the problem is that a lot of these patients are undiagnosed

WHO OBESITY CLASSIFICATION

Body Mass Index	Classification
<18.5	Underweight
18.5 – 24.9	Normal
25-29.9	Overweight
30-34.9	Obese 1
35-39.9	Obese 2
>40	Obese 3

BMI AND ASA

- BMI >35 with other co-morbidities - not suitable for primary care
- BMI up to 40, pt otherwise fit and well - suitable for primary care

BMI	ASA
<18.5	III
18.5-24.9	I
25-29.9	I
30-34.9	I
34.9-40	II
>40	III

RA MONITORING

- Clinical: AVPU, skin colour, capillary refill, pulse, airway patency, respiratory rate
- Electromechanical in certain situations – ASA III
- Monitor the machine for dropping gas levels and need for changing to back tanks
- Monitor the reservoir bag to monitor patient's respiratory rate and that they are breathing appropriately
- Hissing noise from machine can mean bodoc seal is worn or missing and that gas is leaking from the machine
- Don't encourage the patient to talk whilst they are having RA as they will not breath the gas effectively
- If the patient is oversedated press O2 flush

DRAWING UP DRUGS

FLUMAZENIL

- Loss of verbal contact
- Flumazenil 0.1mg/ml in 5ml ampoule
- Benzodiazepine reversal agent
- Competitive GABA receptor antagonist
- Dose:
  - **Conscious adult:** 0.2mg initial - over 15s to avoid HTN, Tachycardia, anxiety. Wait 60 sec for response, then titrate additional doses 0.1mg
  - **Unconscious adult:** 0.5mg
  - Max dose: 2 vials = 1mg - epileptogenic in high dose
  - **No more than 3mg in 1 hour period**



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