Remote anaesthesia

Anaesthesia in a hyperbaric chamber

Anaesthesia in a dental surgery

Problems in transporting patients
Anaesthesia in a hyperbaric chamber

Hyperbaric chamber
  Increased atmospheric pressure, usually up to 3 atm
  Commonly chamber contains air, but oxygen headboxes or masks are used to deliver high FiO₂

Indications
  CO poisoning, gas embolism, decompression illness
  Acute infections, sports injuries
  Maintenance of oxygen transport in anaemia
  Increased arterial oxygenation in anaesthesia

Physiological effects
  Increased barometric pressure
  Pressure reversal of anaesthesia requires much higher pressures
  Increased partial pressure of oxygen, risk of toxicity

Practical use
  Limited duration
  Oxygen toxicity
  Decompression obligation
  Monitoring difficulty
  Patient discomfort

Equilibration
  Middle ear and lung

Equipment
  Increased fire hazard so minimal use of electrical devices
  Monitors usually placed outside chamber with long cables
  Pressure devices need adjustment
  Catheter balloons need deflation prior to compression or decompression (e.g. Swan)
  Blood gas assessment is complicated by decompression of sample
  Defibrillation is hazardous
  IV giving set air-fluid level changes with pressure change

Anaesthetic machine
  Flow meters under read
  Vaporizers deliver same partial pressure but reduced vol%
  Special ventilators required

Anaesthesia
  Trials in
    Carotid, caesarean, lung lavage
Would you anaesthetize in a dental surgery?

College Policy T5 (1995)

Principles of anaesthetic care
- Suitable medical practitioner
- Medical preanaesthetic consultation
- Compliant monitoring
- Anaesthetist has discretion to cancel cases

Staffing
- Assistant to the anaesthetist
- Assistance for positioning
- Technical assistance for equipment service

Equipment
- Anaesthetic machine for each anaesthetizing location
- Calibrated vaporizers
- Suitable breathing systems
- Paediatric breathing systems if children are being anaesthetized
- Safety devices
  - Indexed gas connection, oxygen reserve supply, oxygen failure warning device, oxygen analyzer, anti-hypoxic interlock, pressure relief valve, non-slip common gas outlet connection, scavenging
- Separate ventilating device with independent oxygen supply
- Compliant suction equipment
- Other equipment
  - Gloves, masks, eye protection etc.
  - Stethoscope, sphygmomanometer, compliant monitoring
  - Range of face masks, airways, ETTs and connectors
  - Two laryngoscopes and a range of blades
  - Introducers, syringe, clamps, Magill’s forceps, tapes, scissors, lube, throat pack
  - Tourniquets, IV equipment, sharps container
- Regional equipment
- Defibrillator

Environment
- Good lighting
- Emergency lighting
- Telephone or intercom
- Refrigerator
- Environmental temperature control
- Chair which allows rapid head-down or horizontal positioning

Drugs
- Anaesthetic agents
- Emergency drugs for initial management of
  - Anaphylaxis, arrhythmias, cardiac arrest, pulmonary oedema, hypotension, hypertension, bronchospasm, respiratory depression, hypoglycaemia, hyperglycaemia, adrenal dysfunction, malignant hyperpyrexia (dantrolene at nearby hospital), coagulopathy
- Mechanism for checking use-by dates

Maintenance
- Routines for checking equipment
- Twice yearly service of anaesthetic machine with documentation
- Protocol for checking the anaesthetic machine

Recovery
- Compliant recovery room
- Contingency plan for emergency transfer to hospital care
Problems in transporting patients.

Assistance
  Two staff minimum for patient transport
  One to resuscitate, one to get help
  At least one must be familiar with the route and destination

Airway and breathing
  If intubated, the ETT must be well-secured
  Ventilation
    Apnoeic for short periods (e.g. induction room to OR)
    Self-inflating bag
    Gas-powered ventilator (e.g. Dräger Oxylog)
    Battery-powered ventilator (e.g. some Siemens models, Dräger Julian)
  Portable oxygen source adequate for expected duration of transport
  Portable suction
  N₂O and anaesthetic vapours usually not available
    Vaporizers do not operate correctly when shaken

Circulation
  External pacing device must have adequate battery power and leads secure
  Intravenous infusions must have adequate length and be well-secured
    Best attached to bed
  Warming devices will not operate without AC power
  Circulatory support devices must have adequate tubing length and battery power
    and triggering not subject to interference (e.g. IABP, LVAD)

Monitoring
  SpO₂, ECG, NIBP or invasive pressure usually available
    Adequate lead length and battery power required
  Gas analysis, complex monitors usually not available
  Vibration in transport may interfere with all monitors
    Greater dependence on clinical signs: pulse, colour, chest movement
    Conflicts with need to keep patient covered and warm

Drugs and equipment
  Awake patient
    Emergency induction drugs and airway equipment
  Maintenance of anaesthetized patient
    Sedative or hypnotic agents
      e.g. midazolam, morphine, thiopentone, propofol
    Relaxants
      longer-acting agents preferred
  Emergency drugs
    Resuscitation drugs, pressors
      Specific agents depending on patient's condition
        e.g. anticonvulsants, vasodilators

Other
  Surgical drains
    Chest drains clamped or placed so as to ensure no “backflow”

College Policy: Minimum Standards for Transport of the Critically Ill (P23)

Administrative guidelines
  Central coordination to minimize delays
  Clear determination of responsibility
  Appropriate documentation
  Quality assurance mechanism

Categories of transport
  Prehospital, interhospital (emergency and semi-elective), intrahospital

Staffing
Prehospital: appropriate ambulance service personnel
Interhospital: experienced medical, nursing, technical and ambulance staff
Specifically trained personnel for neonatal and infant transport
Intrahospital: appropriate medical and nursing personnel

Transport
Vehicle determined by availability, urgency, distance, conditions
Requirements for safety, space, gases and energy, access, lighting, temperature control, restraints, noise and vibration, speed, communication, pressurization, headsets for auditory alarms
Special issues with aircraft: pressure, space, motion, noise
Fundamental requirement for stable vital signs, secure airway, secure IV, secure catheters and appropriate monitoring before departure

Equipment
Regard to size, weight, durability, battery life, restraint
Respiratory
Oxygen, airways, masks, nebulizer, self-inflating bag with PEEP, suction, ventilator with pressure and disconnect alarms, intubation set, cricothyroidotomy set, pleural drainage set
Circulatory
Monitor, defibrillator, pacer, oximeter, anaeroid sphygmomanometer, cannulae, fluids, pump set, infusion pumps, arterial pressure transducer, syringes, needles, MAST
Other
NGT, IDC, Cophenylcaine, instruments, sutures, dressings, prep, gloves, insulation, thermometer, splints
Drugs
Resuscitation drugs for all likely emergencies
Arrest, hypotension, hypertension, arrhythmia, APO, anaphylaxis, bronchospasm, hypoglycaemia, hyperglycaemia, raised ICP, uterine atony, adrenal dysfunction, narcotic depression, convulsions, agitation, pain, vomiting, electrolyte disturbance

Monitoring
Appropriate to the situation
Clinical monitoring is fundamental
Circulation: pulse and BP
Respiration: frequent assessment
Oxygenation: observation and pulse oximetry
Minimum standards
O₂ supply failure alarm, pulse oximeter, disconnect or ventilator failure alarm, high airway pressure alarm, ECG