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### Symptoms

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Specific Problems

Amniotic Fluid Embolism

- 4th commonest cause of direct maternal death 1:12:000
- 70% within labour, 11% post partum
- 50% mortality; only 15% survive without neuro impairment
- thought entry via small tears in lower uterine segment & endocervix
- likely due to anaphylactic response to fetal tissue
- sequelae:
  - phase 1: within 30mins: intense ↑ pulses vasoC ⇒ R heart failure, ↓ O2, ↑ CO2, ↓ pH
  - phase 2: L heart failure ⇒ pulmon oedema
  - coagulopathy
  - 50% mortality in 1st hour
- RFs:
  - >35yr multip
  - obstructed labour esp with uterine stimulants
  - multiple pregnancy or short labours
- signs (often a diagnosis of exclusion:)
  - sudden pHTN ⇒ heart failure ⇒ sudden collapse with ↓ bp & fetal distress
  - APO (>90% of cases) & cyanosis (80%)
  - hypoxaemia
  - coagulopathy (80%)
  - seizures (50%)
  - cardiac arrest (>90%)

Diagnosis
- still no diagnostic marker for AFE - diagnosis of exclusion

Management
- purely supportive:
  - senior staff
  - early delivery of fetus vital for both parties survival
  - oxygiration - may require NIV (CPAP/PEEP)/intubation
  - aggressively support
    - coagulopathy - high risk of DIC. Involve haematologist
    - R heart strain
    - uterine tone - use routine meds
  - deliver baby as quickly as possible
  - possible but not evidence evidence based:
    - steroids
    - plasma exchange/haemofiltration
    - bypass

Airway Fire

Prevention
- triangle of fire:
  - fuel = any material that burns
  - ignition = laser, diathermy (rarely)
  - oxidiser = O2 or nitrous
- thus:
  - use as low FiO2 as possible, avoid nitrous
  - saline in ETT cuff,
  - pack wet throat pack around ETT
  - add methylene blue to proximal cuff - obvious is laser penetrates it
  - laser ETT
- be aware of risk of fire


**Diagnosis**
- Diagnosis usually by surgeon or smoke from field when laser or diathermy

**Immediate management:**
- disconnect breathing circuit immediately, clamp end of ETT, flood with saline (field & down ETT)
- only re-ventilate when fire extinguished - monitor SpO2
- supraglottic fire:
  - always remove ETT (if involved)
  - BMV if required
- infraglottic fire:
  - always remove ETT
  - BMV
- bronchoscopy to inspect airway (+/- ETT if in place)
- inspect ETT for missing fragments
- re-establish secure airway - likely ETT to remain for prolonged ventilation in ICU
- if reintubation impossible use all other options as CICO
- expedite end of operation

**Subsequent management:**
- dex 4-8mg qds - to limit burn oedema
- defer extubation
- watch for ALI/ARDS
- refer to burn centre early for Rx of scaring & stenosis

**Non-Airway Patient Fire**
- beware fire under drapes and neuraxial techniques
- recognition may be difficult

**Prevention:**
- avoid alcohol based skin preps
- allow adequate time for drying
- maintenance & checks on electrical equipment

**Immediate management:**
- remove all drapes & flammable material from patient
- extinguish fire:
  - flood with saline or use CO2 canister (safe in wounds) (black stripe on cylinder)
  - do not use liquid on electrical equipment

**Operating Room Fire**
- where is fire:
  - intermittent noise = adjacent area . make provisional preparations to evacuate but remain still
  - continuous noise = fire in your area → start preparing to evacuate
- establish person in charge of fire - usually nursing staff fire marshal
- all staff perform rapid visual check of area

**Immediate Management**
- Action based on size of fire:
  - small fire - extinguish with extinguishers
  - large ⇒
    - stop all work
    - call fire department
    - evacuate non essential persons to designated safe area
    - evacuate patients if does not compromise safety of staff
      - collect self inflating bags, O2 supply, drugs to reverse patient
      - on way out: close theatre doors and turn off gas supply to room
      - only fire dept re-open door
    - staff should not risk life to stay with patient
    - follow evac route - do not use lift. use mattresses to drag patients down stairs
    - should have pre-designated evac area eg carpark outside ICU
- consider ventilated patient has better chance of survival from toxic fumes if left connected to ventilator in place

**Autonomic Dysreflexia**
- classically post spinal cord injury in reflex phase with massive SNS surge ⇒ malignant HTN
- prevention: use neuraxial anaesthesia spinal > epidural

**Immediate Management:**
- ABC 100% O2
- position head up
- identify cause and try to treat/stop
- rapid onset & short acting pharmacological agents:
  - deepen anaesthetic
  - ensure adequate pain control
  - nifedipine 10mg sublingually
  - GTN -
    - IV = 100mcg bolus & rpt
    - IV infusion 0.5-10mg/hr
    - SL spray 400mcg
  - phentolamine 2-10mg IV PRN
- continue to titrate management until control

**Electrical Power Failure**

**Systems**
- hospitals should have 2 levels of redundancy:
  - onsite emergency generator -
    - = red power socket
    - normally diesel powered.
    - Activated by automatic sensors detecting ↓voltage from municipal supply for 2 mins
  - uninterrupted power supply -
    - = blue socket
    - battery backup which can provide instant continuous power
    - use on any essential equipment without internal battery backup
    - NB fault between battery bank and socket will still ⇒ power outage
- Anaesthetic machine:
  - depends on make what happens if power lost
  - may work completely
  - may only see functioning ventilator, gas supply & vapour for limited time only
  - may stop working completely

**Immediate Management**
- activate internal hospital disaster plan
- DA and nurse in charge to liaise with hosp control centre
- use flashlights, laryngoscope or mobile phone lights (do not use naked flame)
- minimise load on UPS - only essential equipment without internal battery into blue socket
- check for airflow at common gas outlet port - r/o ventilator failure
- convert to spont ventilation technique (vaporisers are unreliable without power & ↓s load on UPS)
- hand crank bypass or ECMO
- use BMV
- clinical assessment for hypoxia, perfusion. Use portable monitors asap
- switch to battery powered TIVA
- expedite end of surgery
Pipeline Oxygen Failure

Presentation
- should have visual & audible alarm of failure
- may see vent stop, O2 flush button failure
- should check for leaks, machine failure, obstruction in supply hose

Immediate Management
- turn on O2 reserve cylinder fully
- check pressure gauge on reserve cylinder
- switch to manual ventilation ⇒ if vent uses O2 as driving gas it will save gas
- convert circuit to closed circle to conserve gas (close APL valve)
- check for disconnections
- convert to TIVA

Subsequent Management
- disconnect pipeline supply:
  - if failure at source then risk of contaminant
  - reestablishment of pipeline supply will override cylinder supply as higher pressure
- expedite end of surgery
- declare an emergency to hospital disaster team
  - ?other areas affected
  - stop all surgery
- liaise with medical engineering ⇒ when will O2 supply be turned back on
- if cylinder runs out ⇒ use RA +/- via a BMV
  - risk of hypoxia

Paeds
- T piece in paeds
  - cannot deliver IPPV without gas supply
  - is wasteful - should convert to circle system

High ICP
- approach to management:
  - optimise blood flow into & out of brain:
    - exclude venous obstruction
    - check ventilation
    - defend CPP
  - ↓brain metabolic rate:
    - drugs = opioids, benzo’s, propofol, barbituas
    - moderate hypothermia
    - avoid: ↑BSL, fever, seizure
  - osmotherapies:
    - manitol 0.25-0.5g/kg
    - hypertonic saline 0.25ml/kg 23.4% ⇒ aim Na 155
  - surgery ⇒ EVD/drain

Intra-Arterial Injection
- where is cannula:
  - pulse near
  - blood bright red
  - ultrasound
  - pulsatile flow
  - transduce cannula
- fentanyl: no issues
- propofol:
  - severe distal hyperaemia which can last hrs to 1 week
  - full recovery is the norm
- thiopentone:
  ‣ severe pain & blanching
  ‣ profound constriction by local NA release
  ‣ may crystalise & embolise to distal vessels

**Treatment**
- Stop injection
- leave cannula in-situ
- inject:
  ‣ 100mg lignocaine, 40mg papaverine in 10-20ml Norm saline
- prevent vasospasm:
  ‣ nimodipine
  ‣ targeted urokinase
  ‣ O2
  ‣ GTN
  ‣ sympathetic block
- give systemic analgesia
- prevent thrombosis ⇒ heparin +/- warfarin thereafter
- liaise with vascular surgeon

**Extravasation of Anaesthetic Agent**
- wide range of symptoms from local ischaemia/necrosis to compartment syndrome/amputation

**Treatment**
- no proven definitive Rx
- leave cannula in situ
- options:
  ‣ hyaluronidase - 2 options (max dose 1500units):
    ‣ subcut 15units/ml saline at 5-10 sites along leading edge of extravasation has been used successfully
    ‣ through cannula
  ‣ Steroids - via cannula
  ‣ Phentolamine 5-10mg in 10ml saline given submit into area
  ‣ regional stellate ganglion block:
    ‣ neck fully extended
    ‣ Feel for C7 transverse process above sternoclavicular joint
    ‣ retract carotid out of the way
    ‣ aim to hit transverse process with needle and inject
  ‣ topical cooling and warming

**Restraint**
- = primarily used for safety
- = physical vs. chemical
- Prerequisite/indication:
  - restraint should occur in a safe and respectful and least restrictive but effective manner.
  - Restraint should be applied only to enhance or maintain the safety of consumers, service providers, or others.
- Service provider training and competency is critical, both to the appropriate and safe use of restraint, and to minimising the use of restraint.
- Legal/ethical considerations:
  - = acting for the consumer’s good (beneficence),
  - avoiding harm to all (non-maleficence)
  - respecting the dignity + human rights.
  - NEVER use restraint/seclusion for punitive reasons.
- The Standard = at all times promote the interests, safety, and well-being of all.
- Any unauthorised restriction on a consumer’s freedom of movement could be seen as unlawful.
- Organisations should have policies to guide implementation and seek legal advice PRN.
Symptoms

Hypoxia
- I need to ensure oxygen is getting from the reticulated supply to the vital organs. I would......
- Rapid visual check from wall ➔ circuit ➔ airway ➔ lungs ➔ circulation
- differentials:
  ‣ hypoxic hypoxia:
    - low FiO2
    - hypoventilation
    - VQ mismatch
    - shunt
    - diffusion limitation
  ‣ Anaemic hypoxia
  ‣ Circulatory hypoxia
  ‣ Histotoxic hypoxia

High Airway Pressure
- I would examine the chest looking for signs of bronchospasm, pneumothorax or any other gross pathology

Hyperthermia

Differential
- infection
- metabolic
- pyrogens/transfusion
- ICH
- exogenous
- other: MH, serotonin syndrome, NMS, thyroid storm

Hypothermia

Differential
Anaesthesia:
  ‣ behavioural
  ‣ ↓autonomical control ➔ ↑IT range
  ‣ vasodilation ➔ movement of heat to periphery
  ‣ heat loss: radiation, convection, conduction, evapouration
  ‣ cold fluids
  ‣ ↓metabolism
Patient:
  ‣ hypothyroid
  ‣ ↓BMI
  ‣ elderly
  ‣ autonomic neuropathy
Surgical:
  ‣ long procedures
  ‣ large surface area
  ‣ cold washes/TURP
  ‣ CPB
Treatment

Preop:
- active warming
- passive warming with clothes/blankets

Intraop:
- active:
  - Bair hugger/electric mat
  - radiant warmer
  - bypass circuit + heat exchange
- passive:
  - foil
  - fluid warmer
  - warm OT
  - HME/CO2 absorber
  - ↓exposure
  - an. technique

Loss of Consciousness

Patient
- CNS:
  - seizure
  - stroke
  - ↑ICP
- Resp:
  - ↑CO2
  - ↓O2
  - acidosis
- CVS:
  - ↓CO/perfusion
  - arrhythmia
  - heart failure
- metabolic:
  - BSL
  - electrolytes
  - ↓temp
- Rare:
  - anaphylaxis
  - FES/cement
  - serotonin syndrome, NMS
  - drug withdrawal

Anaesthesia
- med
- high spinal

Surgical
- TURP
- carcinoid
- neurosurg

Post Op Agitation
- drug related:
  - opioids/sedatives
  - central anticholinergic syndrome
- pain
- full bladder
- CNS:
  - post ictal
  - stroke
- trauma
- bleeding
- drug withdrawal

- Resp:
  - ↑CO2, ↓O2
  - acidosis

- CVS:
  - fat embolism
  - ↓bp, arrhythmia

- metabolism:
  - ↑↓Na
  - ↓BSL

## Post Op Blindness

### Differential
- ION
- retinal vein or arterial occlusion
- cortical stroke
- direct trauma to eye

- other ocular complications:
  - glaucoma
  - corneal abrasions
  - chemical injuries
  - laser injuries
  - retinal haemorrhage
  - TURP

### Long Case
- airway - ETT
- monitoring:
  - invasive bp +/- CVL
  - temp
  - IDUC

- Equipment:
  - special mattress padding
  - warming devices eg fluid warmer

- Position/padding:
  - pressure sores - occipital, scapula, sacral
  - nerve damage
  - DVT

- eye mouth cares
- staff - fatigue & breaks