Anaesthetic Emergencies:
Recent changes and developments

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Scope of the talk

- Australian data on anaesthetic deaths
- General principles
- Human factors
- Difficult airways
- Anaphylaxis
- Cardiac arrest
Deaths attributable to anaesthesia

- ANZCA in 2006 published a review of anaesthesia-related mortality in Australia during the three years 2000-02. The 2003-2005 data is not yet published.
- Over 2000-02 there were 1988 deaths associated with anaesthesia and surgery.
- 137 deaths were considered wholly or partly attributable to anaesthesia (7% of total).
- The total number of anaesthetics in Australia during this period is estimated to be 7,650,000.
- This gives a figure of one death for every 56,000 anaesthetics.
- Most cases had more than one causal or contributory factor (mean = 2.5)
Deaths attributable to anaesthesia

- Of these 137 deaths, 20% ASA 1-2 patients, 80% in ASA 3-5 patients.
- The majority (66%) were urgent or emergency procedures.
- Over 50% occurred in metropolitan public teaching hospitals. 10% occurred in rural base hospitals and 2% occurred in rural district hospital.
- 75% of deaths were administered by a specialist anaesthetist, 12% were administered by a trainee, and only 9% by non-specialist anaesthetists.
- The two biggest categories of surgery were orthopaedics (25%) and abdominal surgery (15%), with endoscopy accounting for 10%
Deaths attributable to anaesthesia

• Pre-operative
  – assessment (30%)
  – management (12%)
• Anaesthetic technique
  – choice of technique (22%)
  – airway maintenance (7%)
• Anaesthetic drugs
  – dosage (22%)
  – selection (12%)
  – adverse drug reaction (10%)
Deaths attributable to anaesthesia

• Anaesthetic management
  – crisis management (16%)
  – inadequate monitoring (15 %)
  – equip failure (0%)
  – inadequate or inappropriate resuscitation (13%)

• Post operative
  – management (22%)
  – supervision/ monitoring (13%)

• Organisational
  – inadequate supervision or assistance (12%)
  – organisational problems (12%)
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General crisis algorithm

- **Confirm there is a crisis**
  - Check patient’s pulse and colour
  - Check monitoring – especially capnography
  - Check iv access, circuit, vapourizer and gas supply

- **Non-specific therapy**
  - Inform others in the theatre
  - Call for help (get skilled medical and nursing assistance)
  - Switch to 100% oxygen
  - Consider CPR, fluids, vasopressors
  - If in doubt isolate pt from equipment by ventilating with self-inflating bag from independent supply O2, connect capnography & give iv anaesthesia.
Diagnostic and specific therapy

- Common things occur commonly!
- Patient factors
  - review pre-op assessment
  - reassess current pt status
- Surgical factors
  - ask surgeons if they are doing anything to cause problems
- Anaesthetic factors
  - Airway, ventilation, circulation, drugs…
- Equipment factors
  - clinically confirm all monitors & review/ isolate all equipment
- Evaluate treatment, reconsider diagnosis if not responding
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Human factors

• Compared to the nuclear and aviation industries, healthcare has a culture where human error is considered as poor performance or weakness.

• A safer culture is where human error is accepted as normal and where systems and training aim to prevent small errors turning into errors that harm people.
Anaesthetists’ non-technical skills

- Defined as behaviours not directly related to use of medical expertise, drugs or equipment.
- Interpersonal skills such as communications, teamwork and leadership
- Cognitive skills such as situational awareness and decision-making
- Good anaesthetists are good at the skills, but they have not traditionally been taught or discussed explicitly
Human factors - references

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The difficult airway

- An important cause of anaesthesia-related death is an inability to maintain a patent airway.
- Decreasing incidence of deaths due primarily to loss of airway – perhaps improved equipment and training.
- Still important cases which receive comment from coroners.
- Difficult airway management associated with oral and dental trauma.
Frequency of airway problems

- Difficult intubation 1/50
- Failure to intubate 1/500 (1/250 in obstetrics)
- Failure to intubate or ventilate 1/5,000
Predictors of airway difficulty

- History of difficult intubation
- Obesity
- Mallampati Class III-IV
- Inability to prognath
- Inter-incisor distance <4cm
- Thyromental distance <6cm
- ROM neck <80 degrees
Mallampati classification
Unexpected difficult intubation

- Principles:
- Maintain oxygenation
- Prevent airway trauma
- Call for best available help as soon as difficulty is experienced
- Have backup plans for what to do if you can’t intubate. Exactly what to do depends on the fasting status and urgency of the surgery.
Plan A: Initial intubation attempts

- First attempt at direct laryngoscopy should be with optimum positioning of the head and neck and preoxygenation.
- Use of external laryngeal manipulation should be integral at the first attempt.
- Consider use of a bougie at first or subsequent laryngoscopies if grade II-III view (feel for “clicks”).
- If fail first attempt, ensure ventilation with mask is possible.
Plan A: Initial intubation plan

- If unsuccessful think about why and CHANGE SOMETHING
- Change position – add pillow
- Alternative blade (McCoy)
- Gum elastic bougie
- Stylet/ Introducer
- Two attempts with a given laryngoscope, max of four attempts
- If still fails wake patient up
Plan B: Secondary tracheal intubation plan

- Both classic (LMA) and intubating laryngeal mask (ILMA) can be used
- Either blindly or using the aid of a fibreoptic bronchoscopy an endotracheal tube can be passed into the trachea
- No more than two attempts
Plan C: Maintain oxygenation and ventilation and postpone surgery

- If difficulty ventilating, need a hierarchy of manoeuvres to improve the airway.
- Oropharyngeal and nasopharyngeal airways.
- Two-person bag-mask ventilation
- Insertion of LMA – classic, pro-seal or intubating LMAs.
- “other supraglottic devices” – a plethora
Plan D: Rescue techniques when can’t intubate, can’t ventilate

• This means oxygenation can’t be maintained despite maximal attempts.
• The patient will die without a cricothyroidotomy.
• Options here are:
  – Commercial kit
  – Surgical (stab) cricothyroidotomy
  – Cannula cricothyroidotomy.
The difficult airway - cases

  http://www.rcoa.ac.uk/docs/Bulletin48.pdf
  Discusses “human factors” and “non-technical skills” in the context of an airways death.

• Jankowski case, Perth, 2001

• Rasmussen case, Perth, 2003
The difficult airway - references

• ASA guidelines on management of the difficult airway, *Anaesthesiology*, 2003, 98:1269-77


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Anaphylaxis

• Suspect when have one of more of the following:
  – Unexplained hypotension (60%)
  – Cutaneous signs (80%) – angioedema, erythema or rash
  – Bronchospasm (40%)
• Estimated incidence 1:10,000 GA’s
• 10% cases result in death
• Note Europeans now calling anaphylactoid reactions “non-allergic anaphylaxis”
Offending drugs

- Muscle relaxants 60%
  - Suxamethonium, rocuronium, atracurium
- Latex 20%
- Antibiotics 15% - penicillins
- Colloids 4% - gelatin, dextrans
- Other 1% - many agents can cause
Initial Therapy

- Stop administration of drugs likely to have caused the anaphylaxis
- Call for help
- Use ABC approach
- Maintain/secure airway and give 100% oxygen
- Lay patient flat with legs elevated
- **Give adrenaline** – titrate to BP
  - 10mcg iv for hypotension
  - 50-100mcg iv for cardiovascular collapse
- Start intravenous crystalloid at a high rate.
Secondary therapy

- Give antihistamine
  - Phenergan (=promethazine HCl) 25mg iv
- Give corticosteroids
  - hydrocortisone 200mg iv
- Consider catecholamine infusion
  - 0.05-0.1 mcg/kg/min or adrenaline or noradrenaline
- Bronchodilators might be required for ongoing bronchospasm
- Arrange transfer to critical care area
- Careful assessment of airway swelling prior to extubation
  - consider leaving intubated for 24 hours
FAQ’s & myths

• Should I give a test dose of antibiotics? – No
• Should I avoid cephalosporins in patients with a history of anaphylaxis to penicillin? – Probably
• Should I avoid propofol in patients who are allergic to eggs, soya or nuts? – There is no evidence that you should
• Should I give an H2 blocking drug in the management of anaphylaxis? – No
Investigation

• This is the responsibility of the anaesthetist who administered the drugs
• Blood for mast cell tryptase
  – Take as soon as time permits after onset of symptoms.
  – Repeat at 1-2 hours after onset of symptoms
  – Repeat in “convalescence” >24 hours after onset of symptoms.
  – If analysis delayed >48 hours, need to be frozen at -20 degrees.
  – Currently done at Royal Prince Alfred Hospital and Royal Newcastle. Contact immunology departments.
  – positive mast cell tryptase = anaphylaxis
• If positive MCT or even if negative but strong clinical suspicion, refer for skin prick testing. This can be done via Royal Prince Alfred Clinical Immunology.
04/06/04 23:40 Tryptase:
Reference values studied in 129 apparently healthy children and adults without evidence of mast cell stimulation, show a geometric mean of 5.6 ug/L and an upper 95% confidence limit of 13.5 ug/L.

Increased levels of tryptase can normally be detected up to 3 to 6 hours after the anaphylactic reaction. Levels return to normal within 12 to 14 hours after release.
Anaphylaxis - references


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Current ACLS guidelines

• The International Liaison Committee on Resuscitation (ILCOR) last updated its guidelines in 2005.
• Australian Resuscitation Council last policy statement 2006.
• Summarize key points and highlight new parts of current BLS and ACLS algorithms
Cardiac Arrest

“There are only two interventions that have been shown to improve survival unequivocally. The first of these is competent basic life support. The second is prompt defibrillation for patients in ventricular fibrillation or pulseless ventricular tachycardia.”

- The vast majority of adults who can be revived after cardiac arrest are in VF or pulseless VT.
- Defibrillation is the single most important intervention
- The probability of survival decreases as the time between collapse and defibrillation increases
Chest compressions

• Minimise interruptions to chest compressions
• Chest compressions at 100/minute.
• 30 chest compressions: 2 lung inflations
• Pause chest compressions for ventilation until “definitive” airway
• Once have definitive airway, chest compressions continue without interruption for ventilation
Defibrillation

- Biphasic defibrillators now becoming predominant
- Widespread availability of automated external defibrillators
- Use single shocks at maximum energy
- In witnessed arrest and AED is immediately available, shock.
- Otherwise, CPR for 2 min prior to first shock
- Don’t assess rhythm after each shock, but immediately resume 2 minutes of CPR
Airway

- Do not hyperventilate
- ETT and also LMA regarded as acceptable definitive airways
- Once have definitive airway, do not interrupt chest compressions
- Capnography where possible to confirm ETT placement
- Securing ETT identified as important
Drugs in VF arrest

• Meticulous, systematic review reveals that relevant, valid and credible evidence to confirm a benefit due to these agents (adrenaline, lignocaine, procainamide, amiodarone, and bicarbonate) simply does not exist.

• Adrenaline, amiodarone and atropine main ones to use.
VF and pulseless VT

Ventricular Fibrillation/Pulseless VT

Cardiac Arrest
Defibrillator Arrives
Give Vasopressor
Consider Antiarrythmic

CPR
Rhythm Check
A
CPR
Rhythm Check
CPR
Rhythm Check
CPR

CPR = 5 cycles or 2 minutes of CPR
= CPR while defibrillator charging
= Shock

Go to A
VF and pulseless VT
Therapeutic hypothermia

“Unconscious adult patients with spontaneous circulation after out-of-hospital cardiac arrest should be cooled to 32°C to 34°C for 12 to 24 hours when the initial rhythm was VF”

ILCOR guidelines 2003
ACLS - references

- Australian Resuscitation Council
  http://www.resus.org.au/
- ILCOR 2005 guidelines
  http://circ.ahajournals.org/content/vol112/22_suppI/
- European Resuscitation Council