General Anesthesia for Cesarean Delivery

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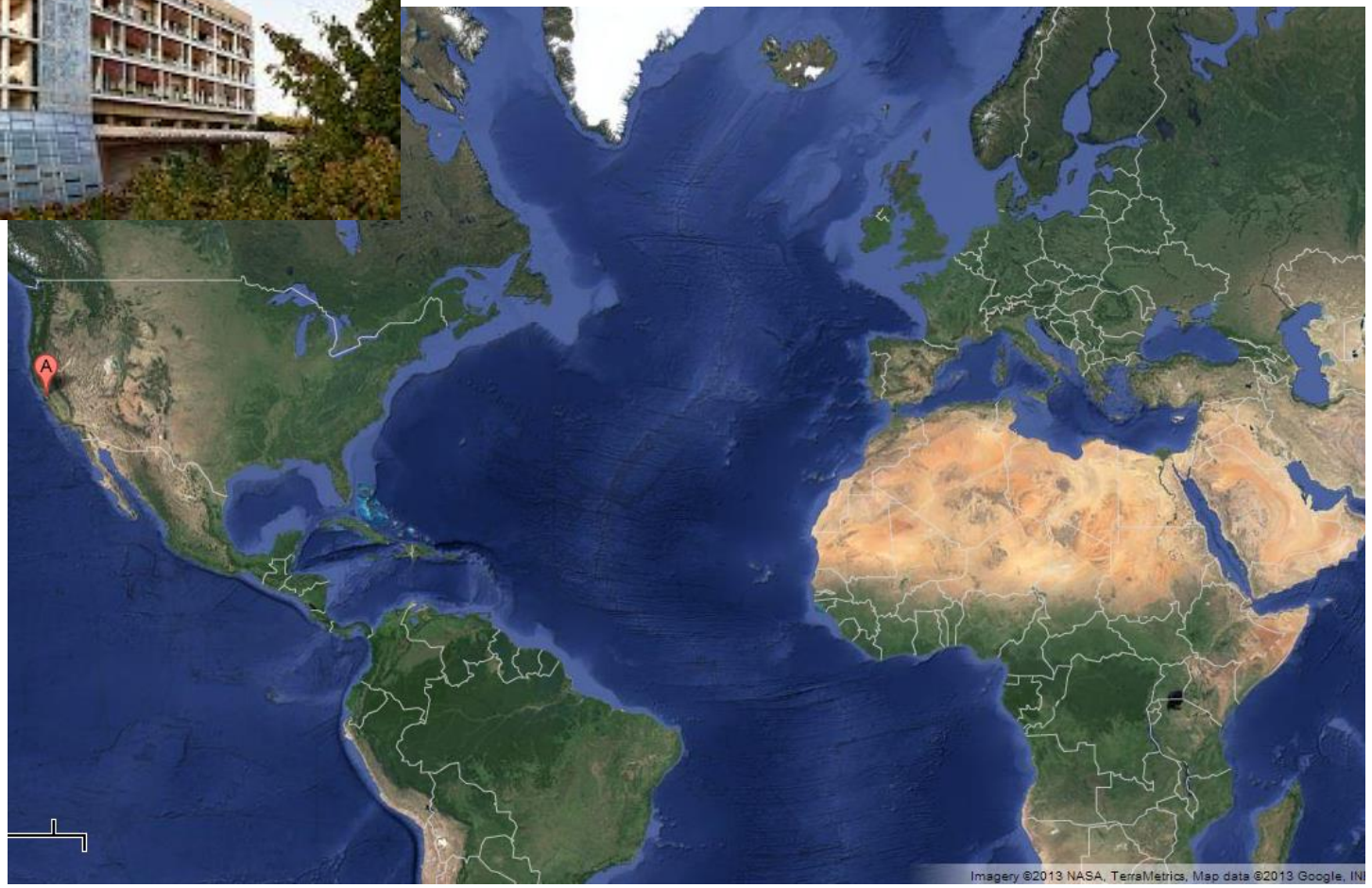
Disclosures

Nothing to declare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Learning objectives

- Recognize when general anesthesia is **indicated** for cesarean delivery
- Review **critical steps** in the process
- Describe the significance of **multidisciplinary team training**
- Identify the importance of **qualitative analysis**

Outline

1) **Indications for general anesthesia vs. neuraxial anesthesia**
2) The common ‘routine’
    a) Aspiration prophylaxis
    b) Positioning
    c) Preoxygenation
    d) Induction agents
    e) Muscle relaxants
    f) Cricoid pressure
    g) Extubation
3) Multidisciplinary team training
4) Qualitative analysis

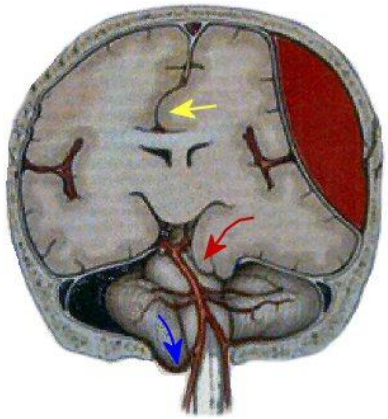
Indications for general anesthesia vs. neuraxial anesthesia

- **Time frame/urgency**
  - Determined by OB's assessment of fetal compromise
- **Inadequate/failed** neuraxial block, due to:
  - Labor analgesia epidural unsuccessfully converted to surgical anesthesia
  - Primary technique in the OR
- **Contraindication(s)** to neuraxial anesthesia
- Maternal **refusal** of neuraxial anesthesia

Fetal and maternal indications for general anesthesia

<u>Fetal indications</u>

- Non-reassuring **fetal trace** (sustained)
- Prolapsed **umbilical cord** (if fetal compromise)
- Uterine **rupture**



<u>Maternal indications</u>

Contraindication(s) for neuraxial anesthesia:

- **Hemorrhage/coagulopathy**
- **Fixed** cardiac output state (e.g. severe AS)
- Septic **shock**
- ↑ ICP

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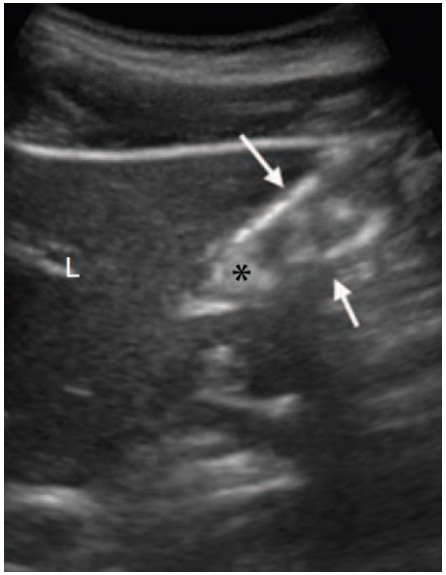
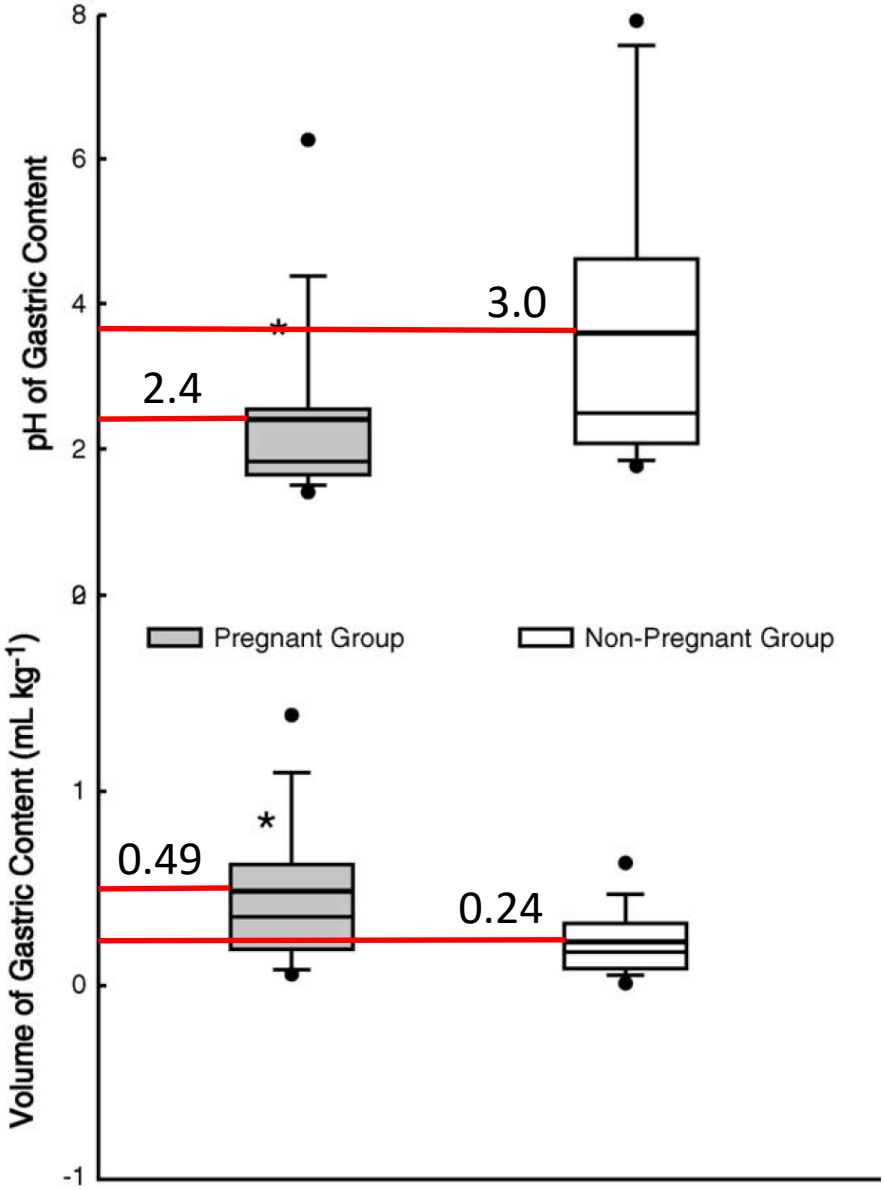
The common ‘routine’

- Preoperative **assessment**
- Preoperative **patient care**
- **Equipment** availability check
- **Induction/intubation**
- Intraoperative management
  - **Pre**-delivery
  - **Post**-delivery
- **Extubation**
- Postoperative **management**
  - On-going assessment
  - Evaluation/monitoring (vital signs)
    - Heart rate
    - Blood pressure
    - Respiratory rate
    - Conscious level
    - Temperature
    - Pain

Gastric volume + pH



Gastric antral area:
Laboring patient ≥381 mm^2
Non-pregnant adult ≥340 mm^2



Jay et al. Eur J Anaesthesiol. 2017;34:150-7
Hong et al. J Clin Anesth. 2005;17:451-5

Aspiration prophylaxis

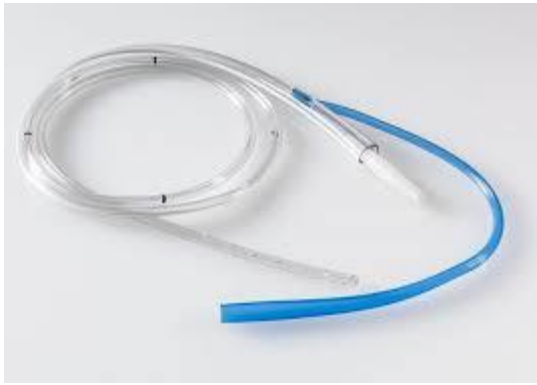
↓ Gastric acidity

- Sodium citrate 0.3 M (30 mL)
- H_2 receptor antagonists
  - Ranitidine 150 mg PO or 50 mg IV
- Proton pump inhibitor
  - Omeprazole 20 mg PO
  - Pantoprazole 40 mg IV

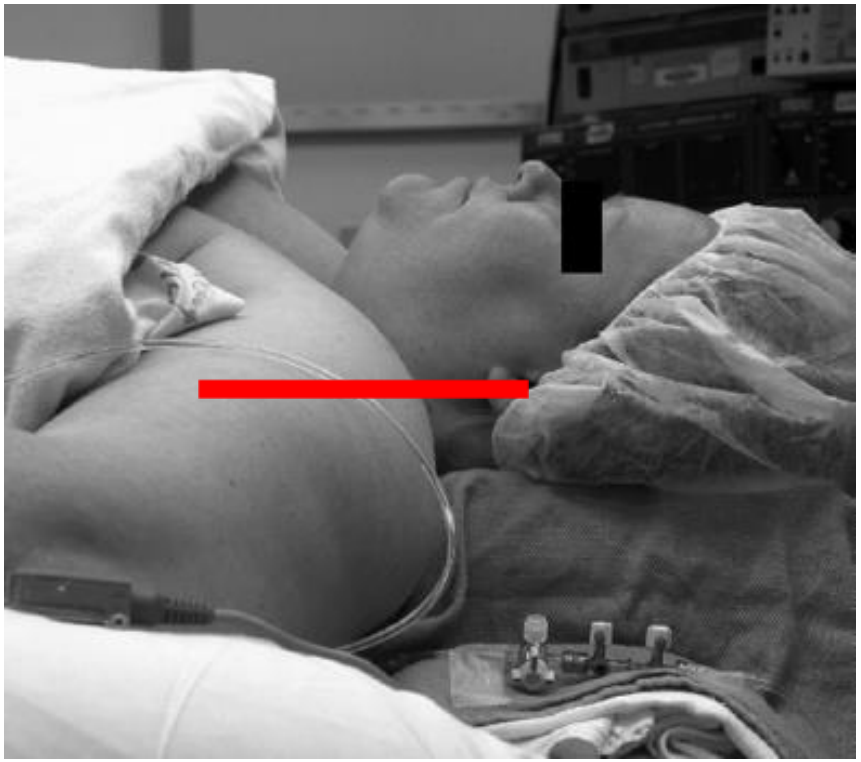
↓ Gastric volume

- Prokinetic
  - Metoclopramide 10 mg PO or 10 mg IV

If **full** stomach:



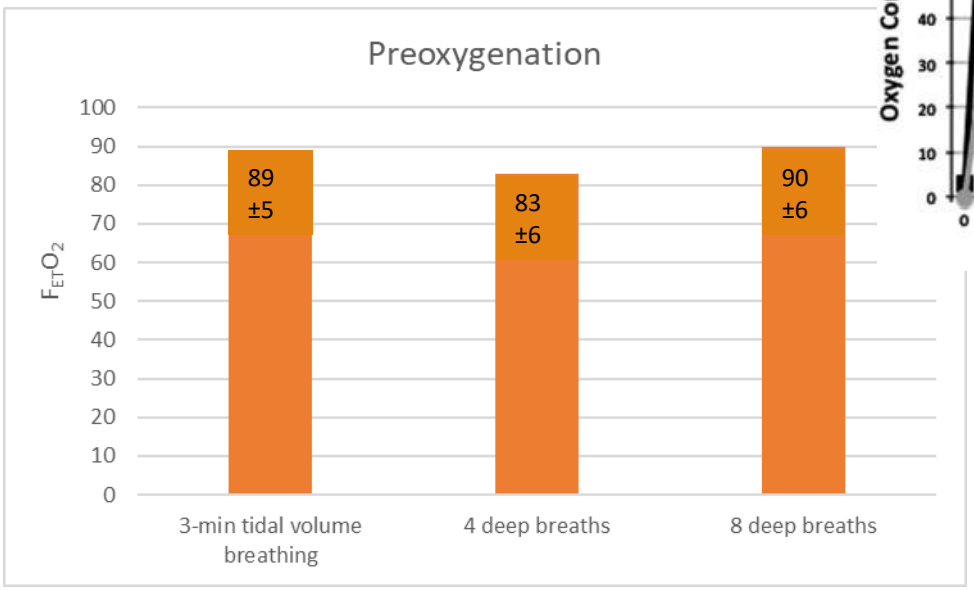
Positioning

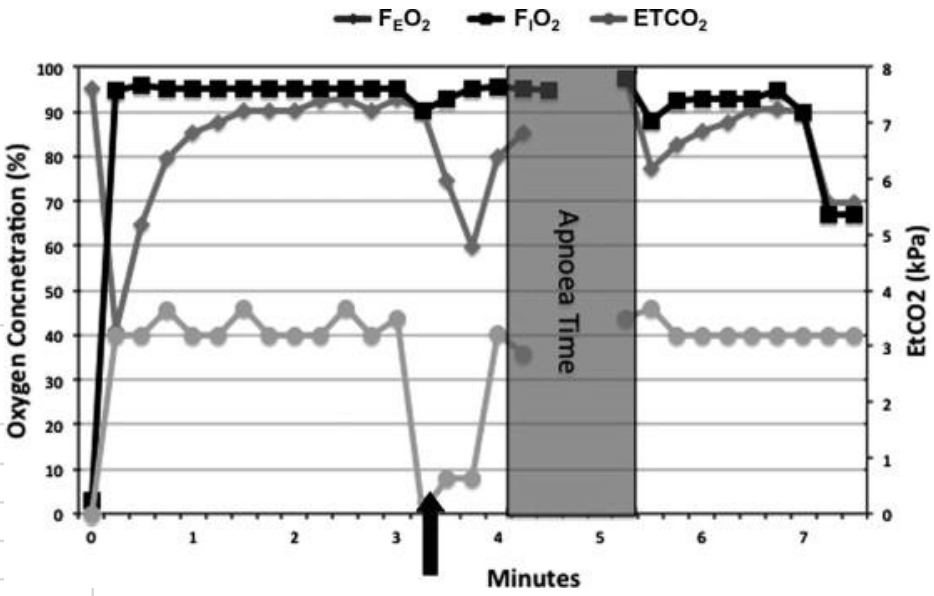


‘Ramped’ Position: View at laryngoscopy significantly different (P=0.037)

Brodsky et al. Anesth Analg 2003;96:1841

Preoxygenation





Chiron et al. Int J Obstet Anesth. 2004;13:11-14
Porter et al. Int J Obstet Anesth. 2011;20:363-5

Induction agents

- **Propofol 2.0 – 2.5 mg/kg**
  - Induction dose ↓
  - Elimination $t_{1/2}$ unaltered
- **Thiopental 5.0 mg/kg**
  - Elimination $t_{1/2}$ prolonged
- **Etomidate 0.2 mg/kg**
- **Ketamine 2 mg/kg**

Sympathetic response to laryngoscopy

→ Generally not an issue in healthy patients

- PreE
- Cardiac disease
- ↑ ICP
  - Remifentanil 1 mcg/kg (if time)
  - Esmolol 1-2 mg/kg
  - Fentanyl 3-4 mcg/kg

Muscle relaxants

DMR

Succinylcholine 1.5 mg/kg

↓ Pseudocholinesterase activity during pregnancy

No clinical prolongation of block

Onset: 30-60 s

Duration: 6-10 min

NDMR

Rocuronium 0.6 mg/kg

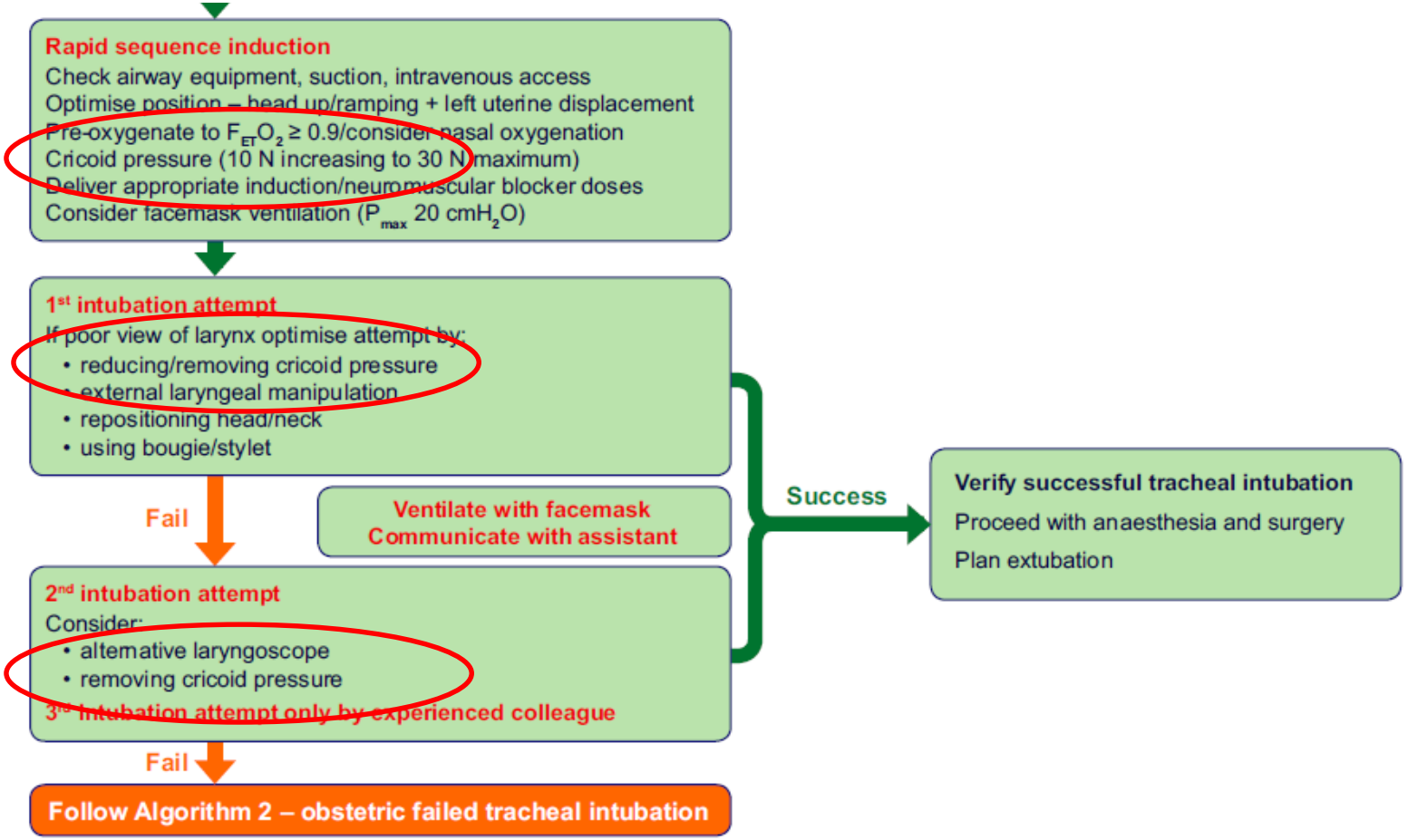
Vecuronium 0.08-0.1 mg/kg

Pancuronium 0.04-0.1 mg/kg

↑ sensitivity (especially if patient on magnesium)

Not usually required

Cricoid pressure



Mushambi et al. Anaesthesia. 2015;70:1286-1306

Extubation

- Emergence
- **Extubation**
  - **Awake**
  - Appropriate **positioning**
  - Adequate **TV + RR**
- Recovery

Monitor oxygenation + ventilation

Anesthesia-related maternal deaths (1985-2003)

	Procedure	Type	Complication	Cause of death
#1	Emergency CD	GA	Airway obstruction, on emergence from GA	Cardiac arrest
#2	Emergency D+C (VD)	GA	Hypoventilation/obstruction in PACU	Cardiac arrest
#3	D+E (1^{st} trimester)	Sedation	Hypoventilation/obstruction in PACU	Cardiac arrest
#4	Elective CD	Spinal	Hypoventilation/obstruction in PACU	Cardiac arrest Dilated cardiomyopathy Cocaine
#5	Emergency CD	Spinal + PCA	Airway obstruction/apnea in postpartum ward	Difficult intubation during cardiac arrest
#6	Elective CD	Epidural + GA	High spinal	Cardiac arrest x2 Acute MI (postop Day 1)
#7	Elective CD	Spinal + GA	Cardiac arrest x2 after spinal	Unplanned extubation (day 26) Anoxic encephalopathy
#8	Emergency D+C (VD)	GA	Cardiac arrest during emergence from GA	Cardiac arrest Cardiomyopathy

Mhyre et al. Anesthesiology. 2007;106:1096-104

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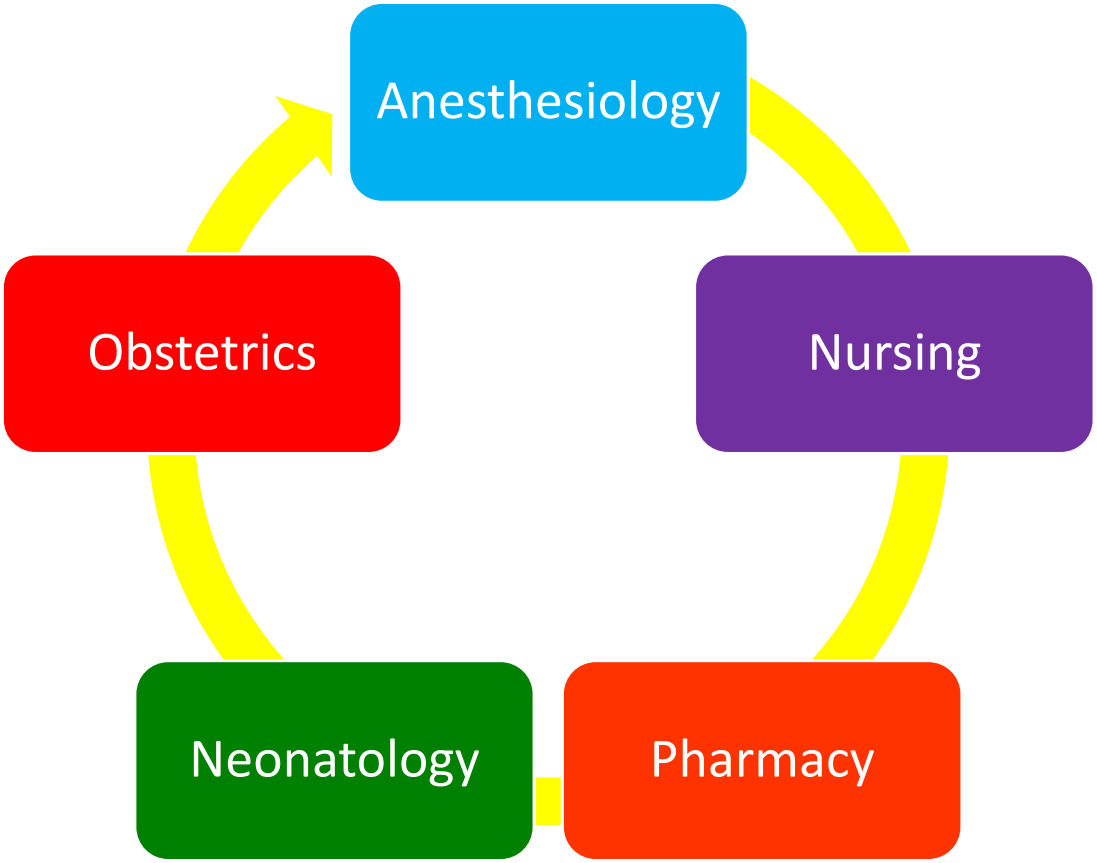
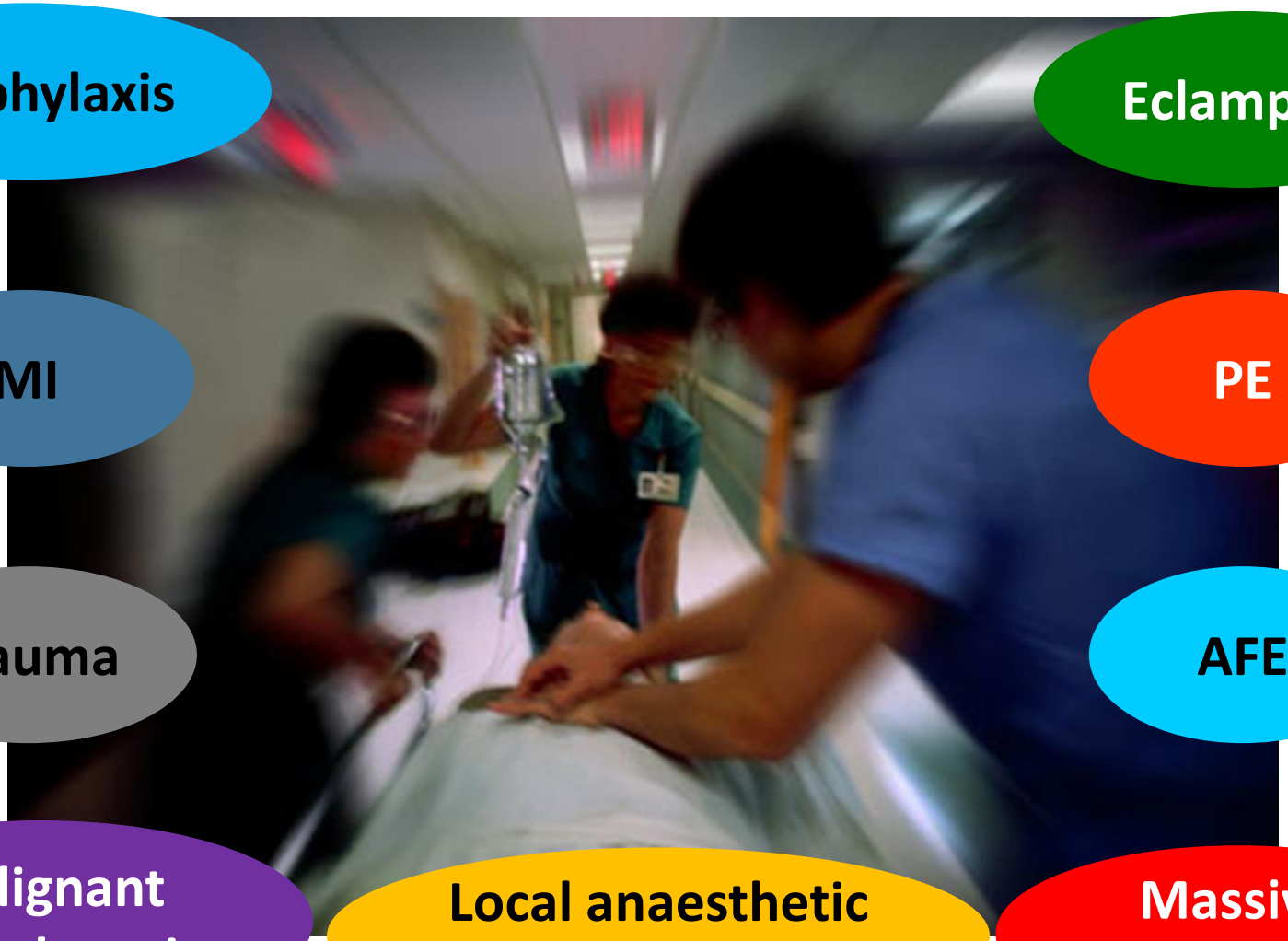
Multidisciplinary team training



Why prepare like this…?

For events like this…?



Anaphylaxis

Eclampsia

MI

PE

Trauma

AFE

Malignant hyperthermia

Local anaesthetic systemic toxicity

Massive hemorrhage

Purpose of simulation

- Improve **team** performance
- **Multidisciplinary**
- No patient **harm**
- Identify **errors**
- Practice **rare** events
- Uncover **system errors**
- Event **debrief**

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Qualitative analysis

1) Improve **service delivery** for the patient + healthcare provider
2) Identify **obstacles** to change(s)
3) Implement **change(s)**

Root Cause Information for **Maternal** Sentinel Events

(resulting in death or permanent loss of function)

2004 to June 2013	N = 112
Human Factors	57
Communication	54
Assessment	46
Leadership	45
No route cause identified	23
Information Management	22
Physical Environment	17
Continuum of Care	16
Care Planning	13
Medication Use	12

Root Cause Information for **Anaesthesia-related** Sentinel Events

(resulting in death or permanent loss of function)

2004 to June 2013	N = 96
Anaesthesia Care	57
Assessment	53
Human Factors	50
Communication	49
Leadership	42
Information Management	16
Medication Use	15
Physical Environment	15
No Root Cause Identified	10
Continuum of Care	8

In summary

- ✓ Recognized when general anesthesia is **indicated** for cesarean delivery
- ✓ Reviewed **critical steps** in the process
- ✓ Described significance of **multidisciplinary team training**
- ✓ Identified importance of **qualitative analysis**

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