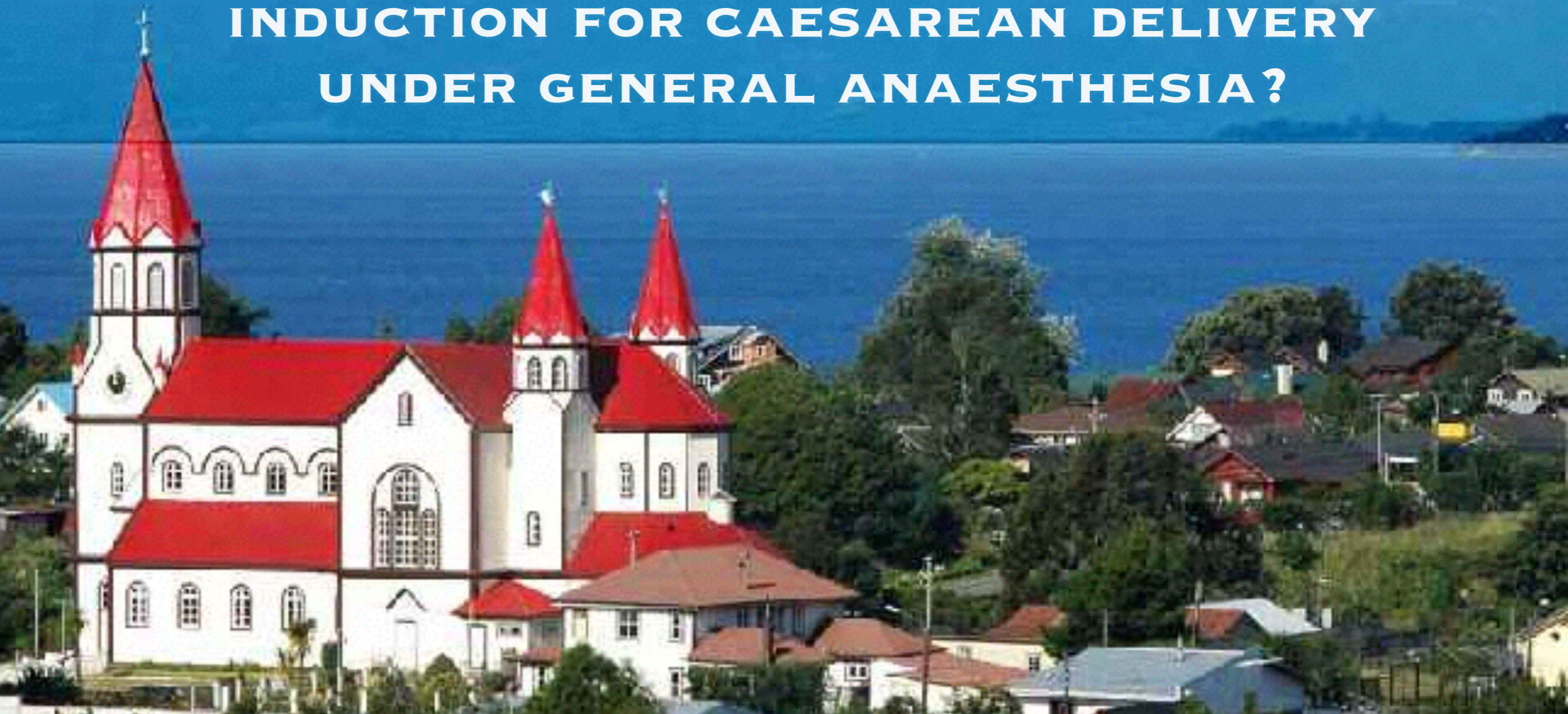


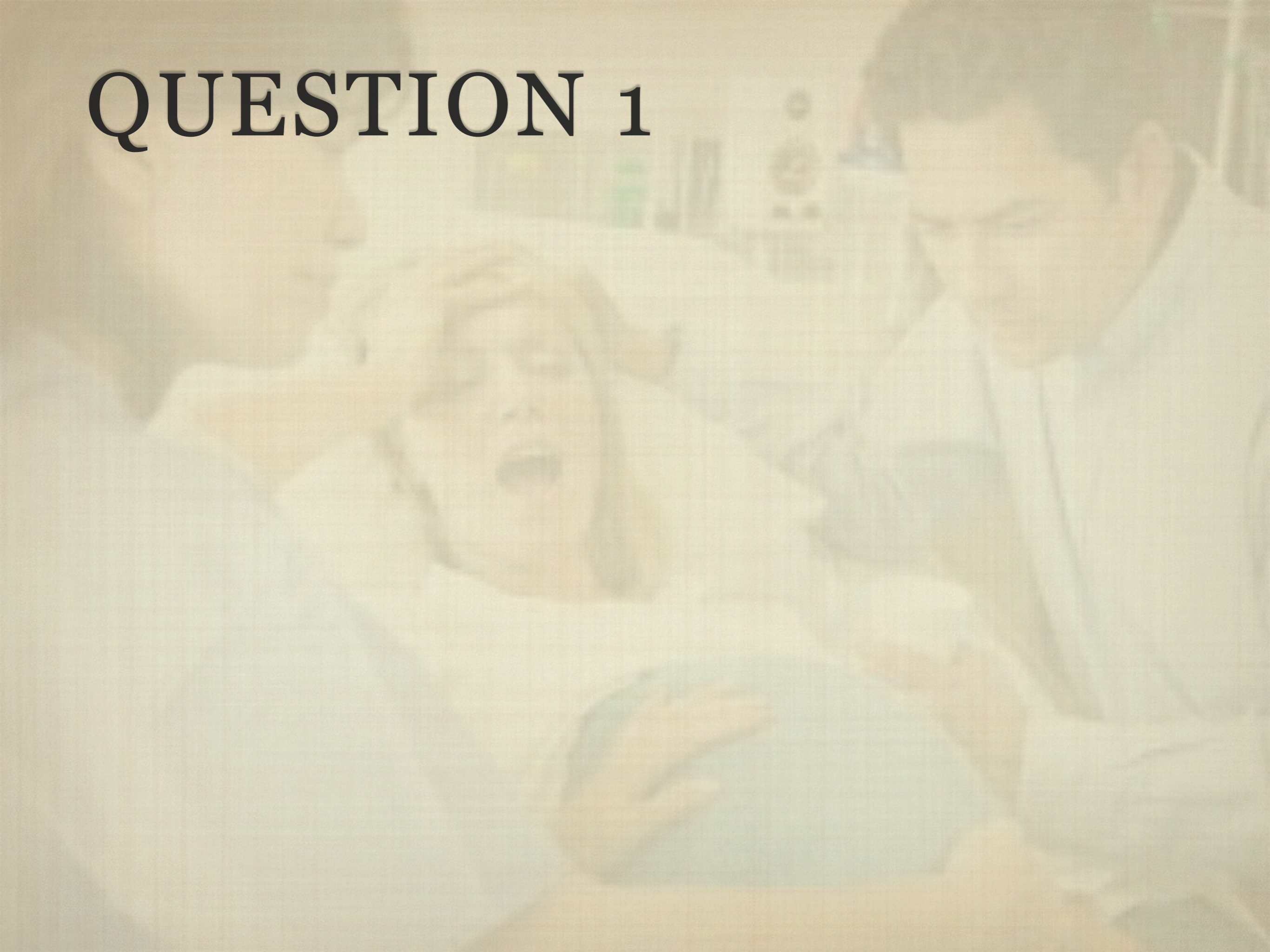


roshan fernando, uclh, london, UK

**SHOULD
INDUCTION FOR CAESAREAN DELIVERY
UNDER GENERAL ANAESTHESIA?**



QUESTION 1



QUESTION 1

When do you give opioids during a c section?

QUESTION 1

When do you give opioids during a c section?

- 1. immediately before GA induction with thio / sux etc**

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When do you give opioids during a c section?

- 1. immediately before GA induction with thio / sux etc**
- 2. after cord clamping (after the baby is delivered)**

QUESTION 1

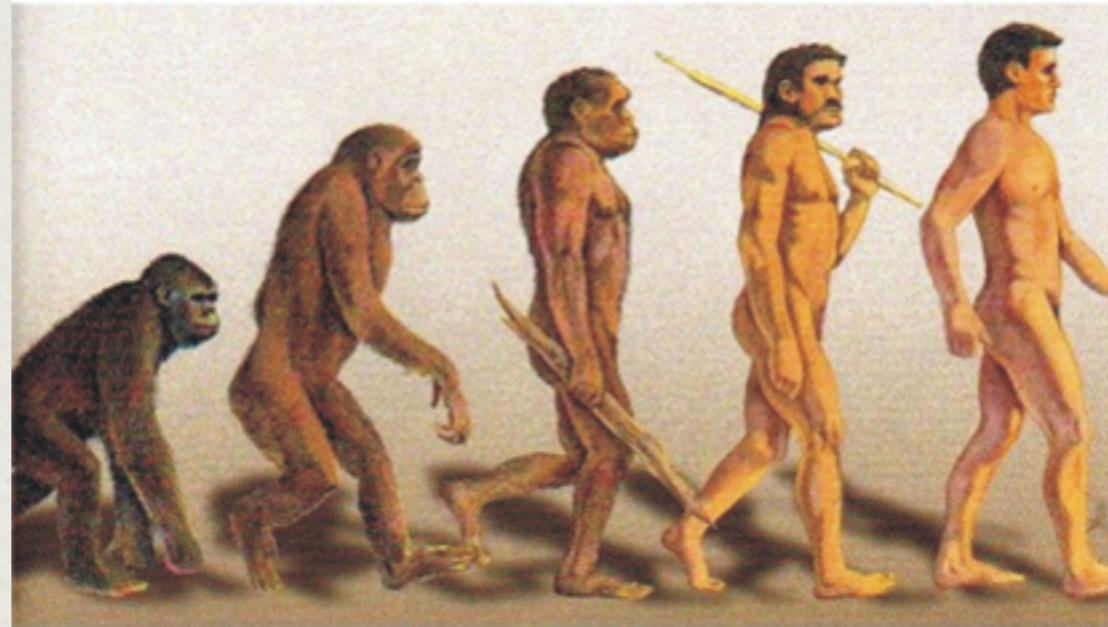
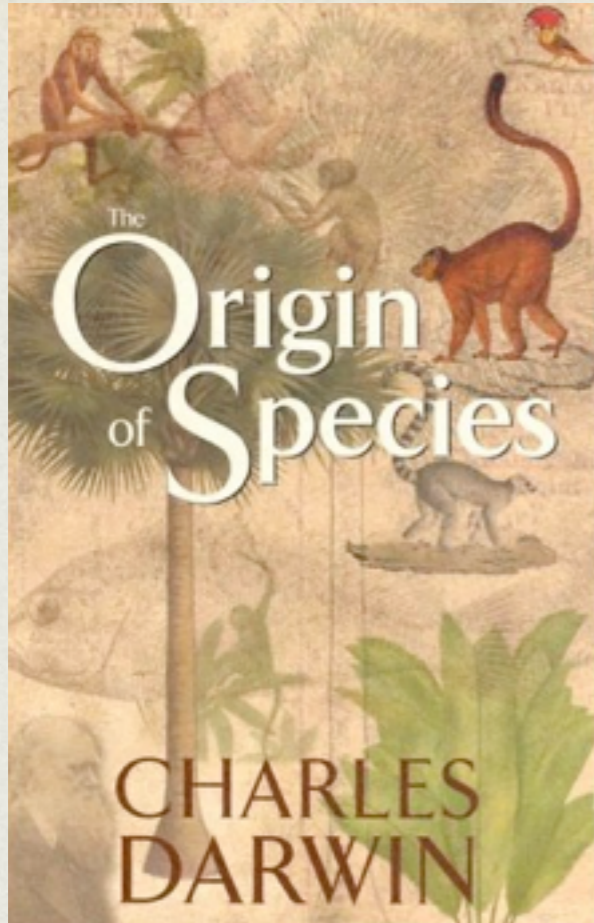
When do you give opioids during a c section?

- 1. immediately before GA induction with thio / sux etc**
- 2. after cord clamping (after the baby is delivered)**
- 3. you don't give opioids at all at any point**

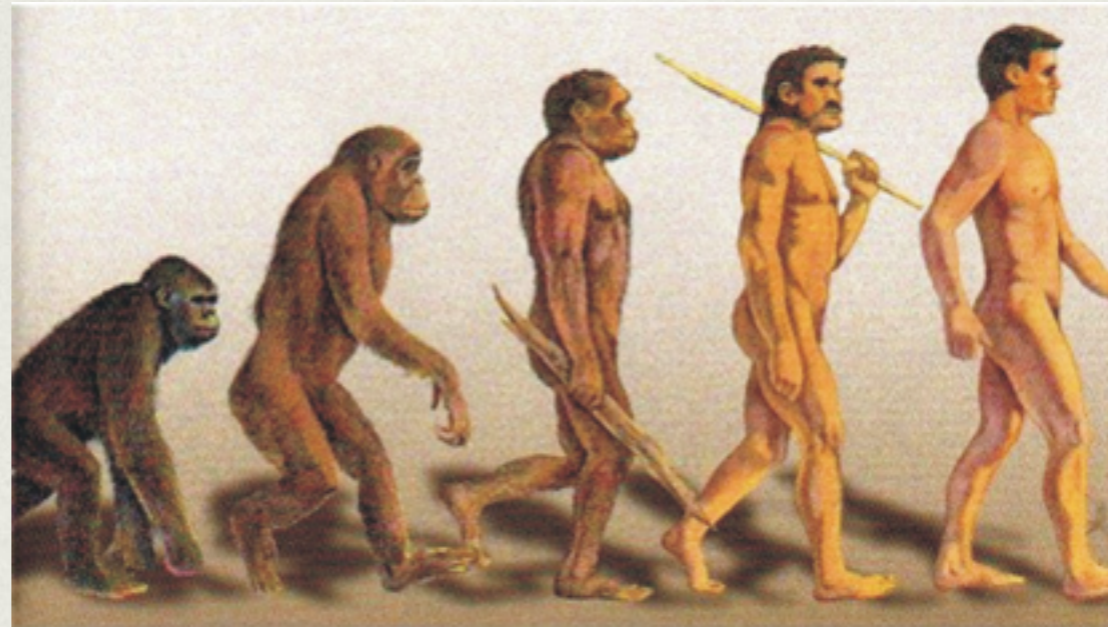
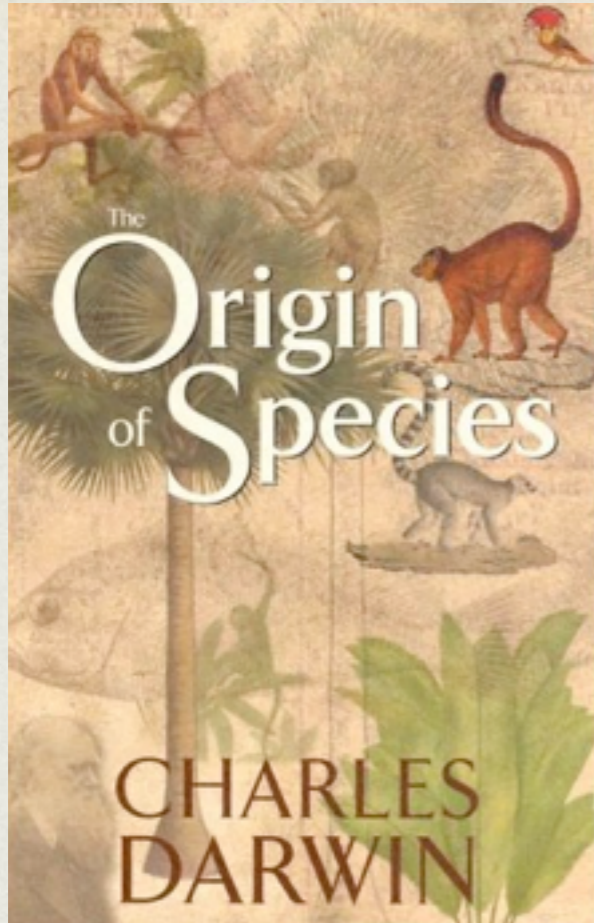
QUESTION 1

When do you give opioids during a c section?

- 1. immediately before GA induction with thio / sux etc**
- 2. after cord clamping (after the baby is delivered)**
- 3. you don't give opioids at all at any point**
- 4. you've got no idea where the delivery ward is !**



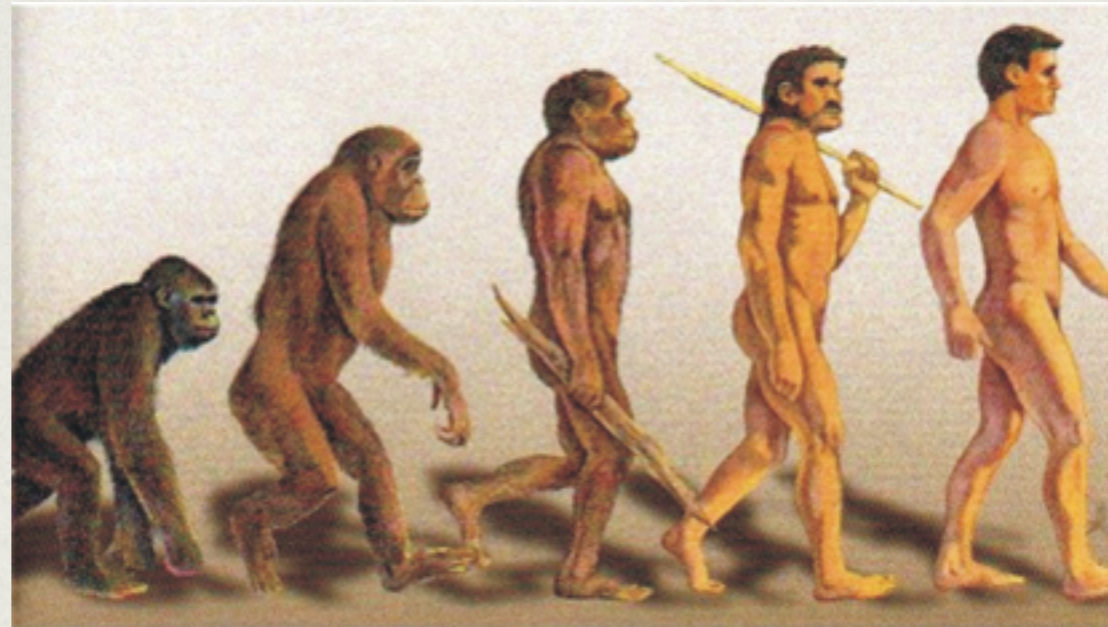
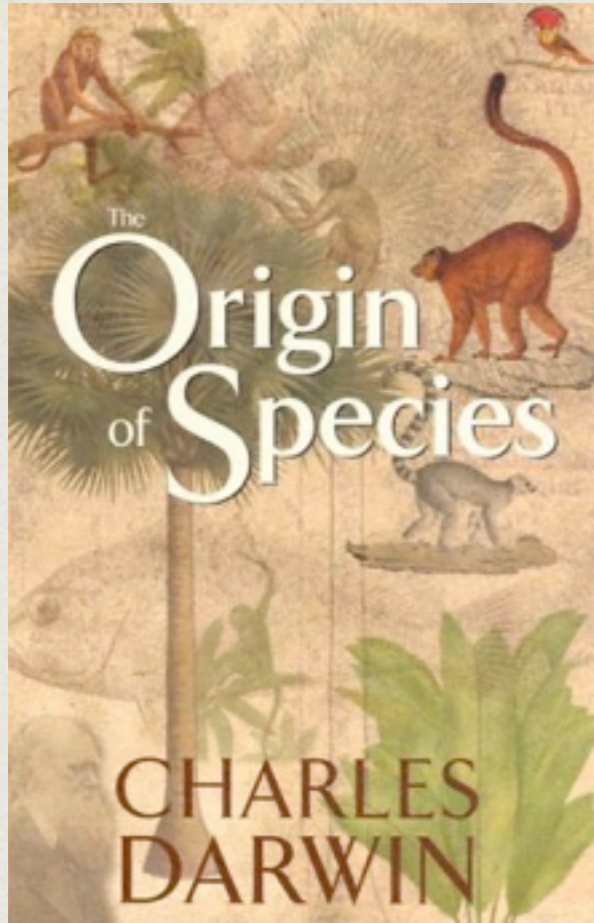
evolution



evolution



university student



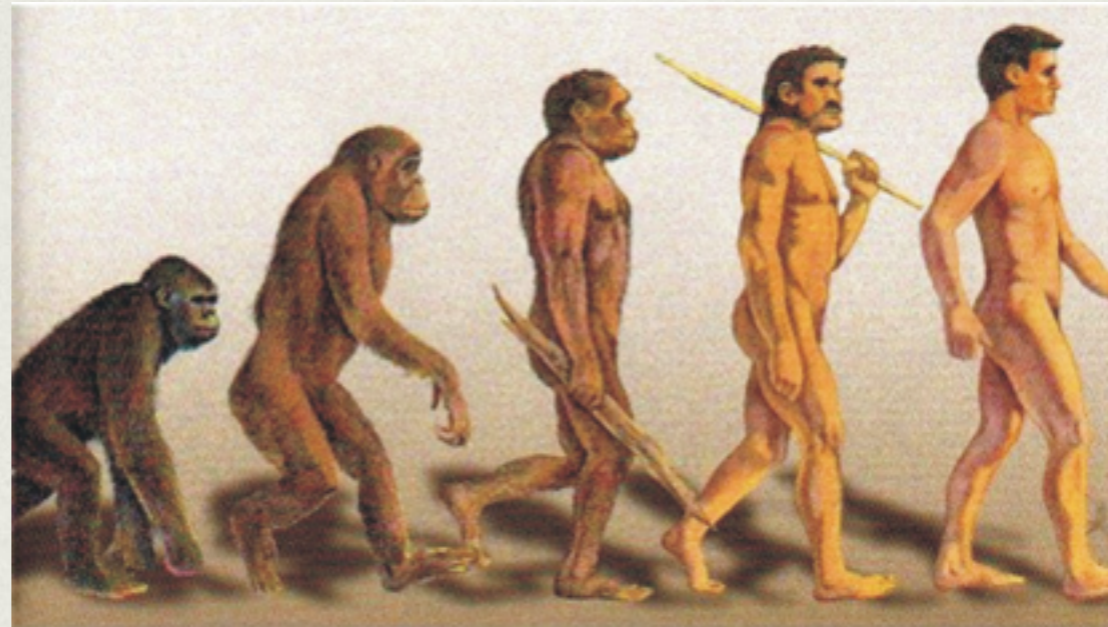
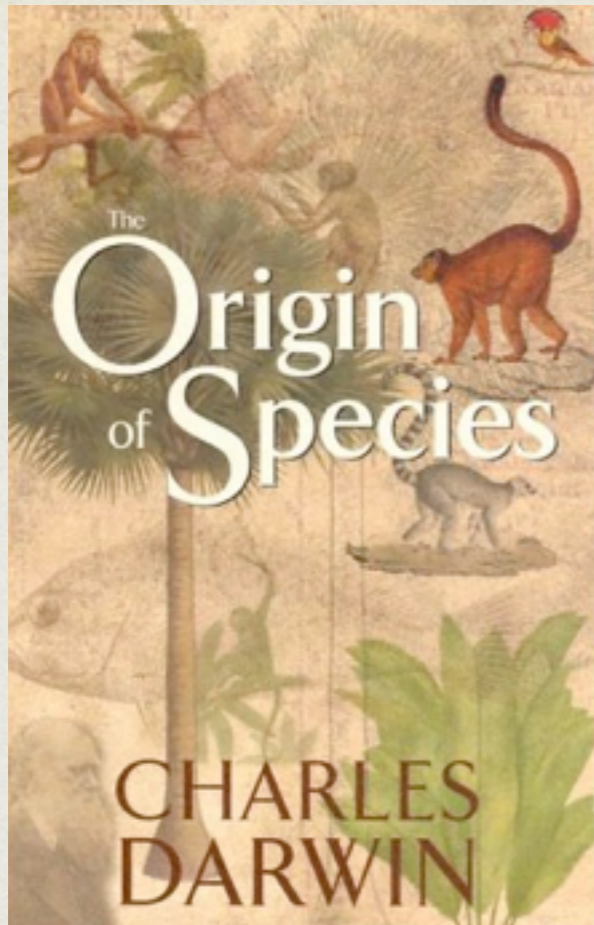
evolution



university student



anaesthesiologist



evolution



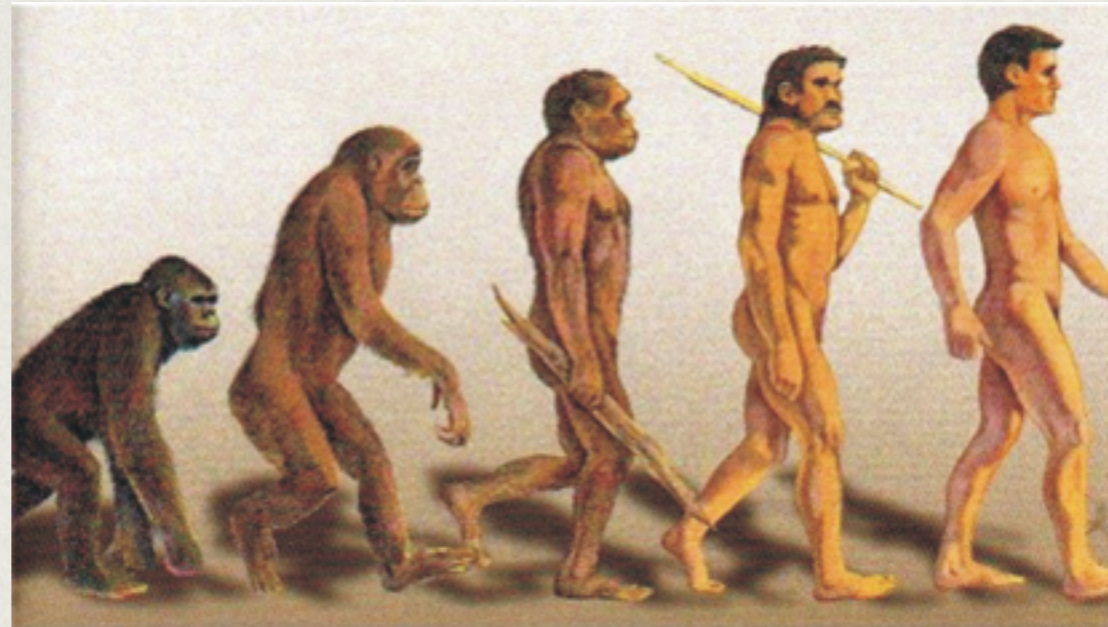
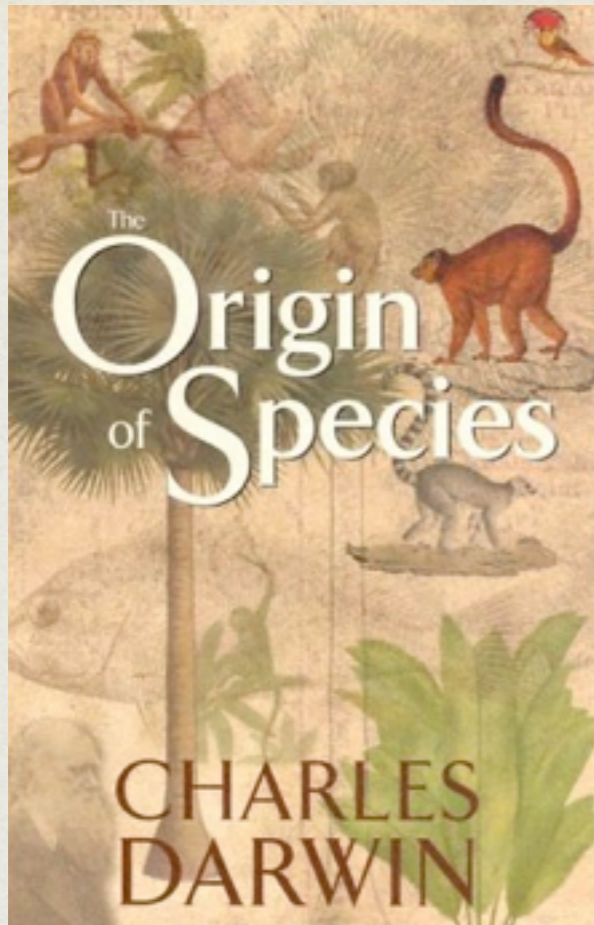
university student



anaesthesiologist



porn star



evolution



university student



anaesthesiologist



porn star

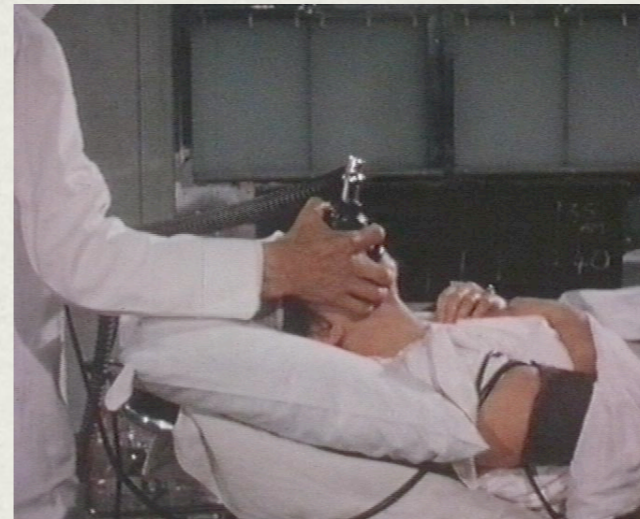


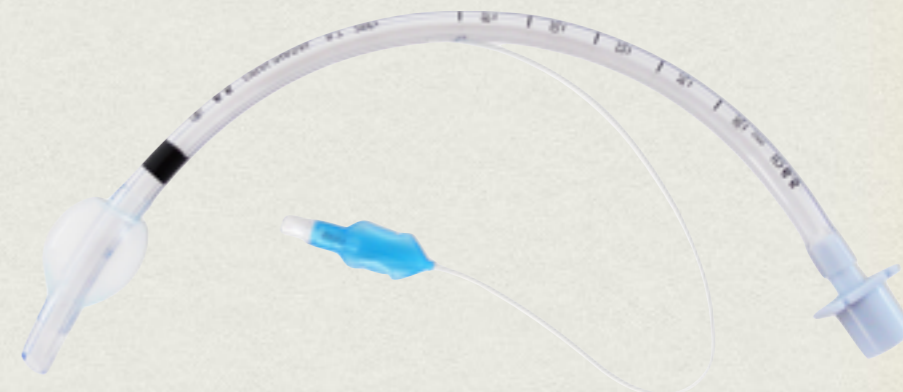
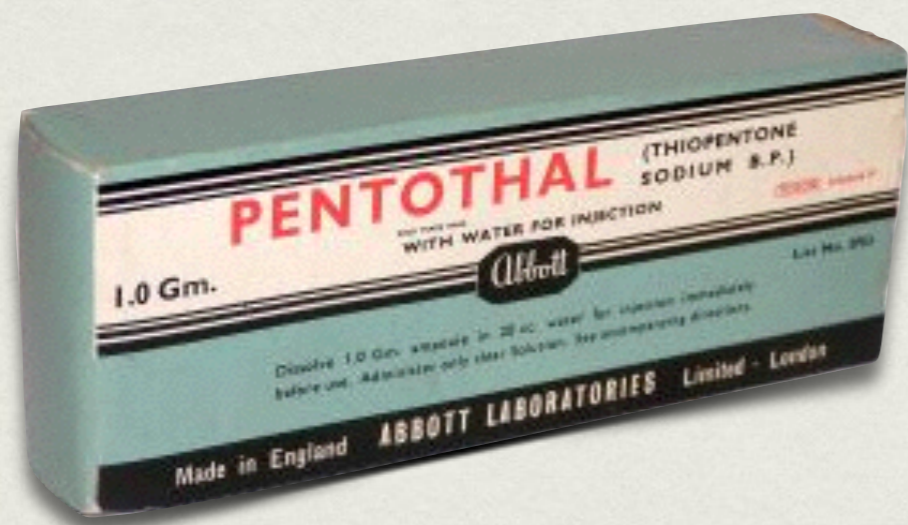
today

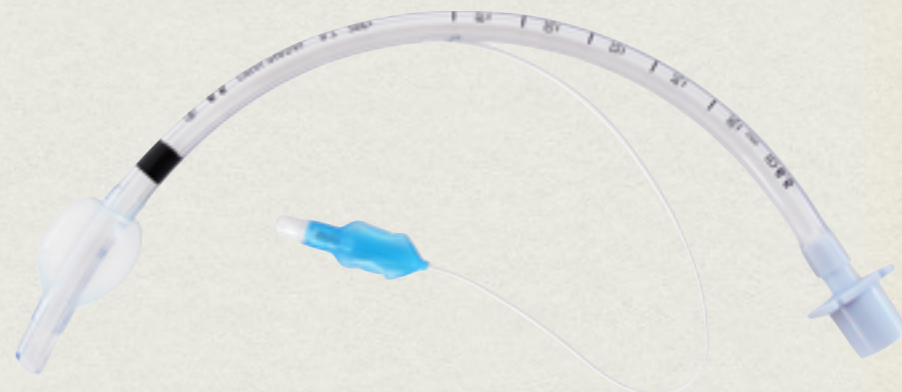
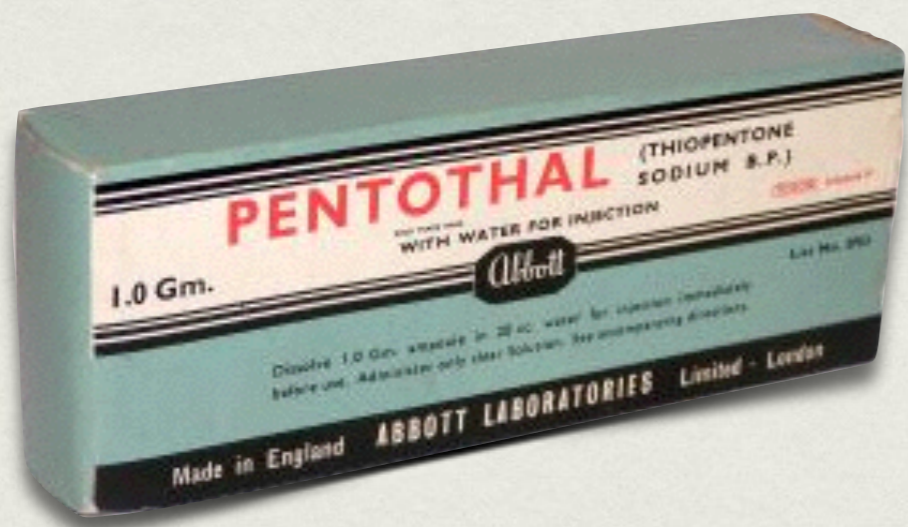
rapid sequence induction, 50 yrs ago ...

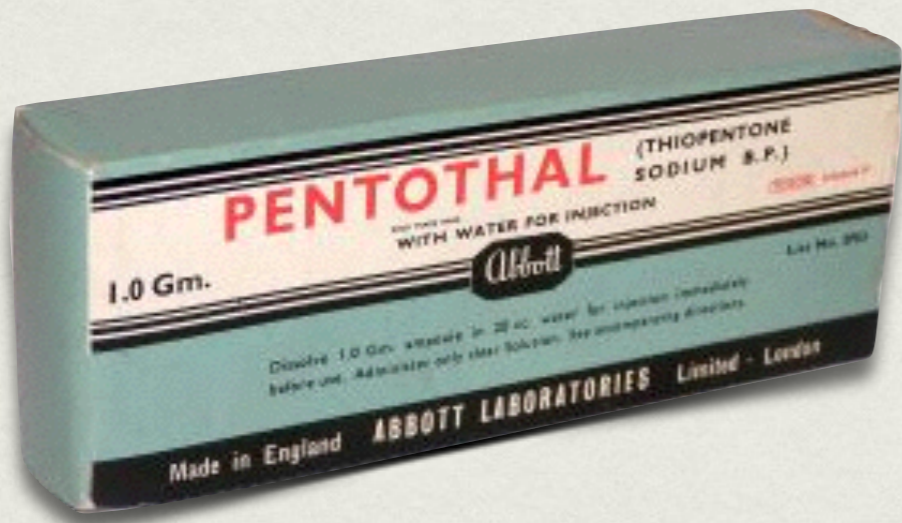


- no lateral table tilt
- no cricoid pressure
- bag & mask ventilation

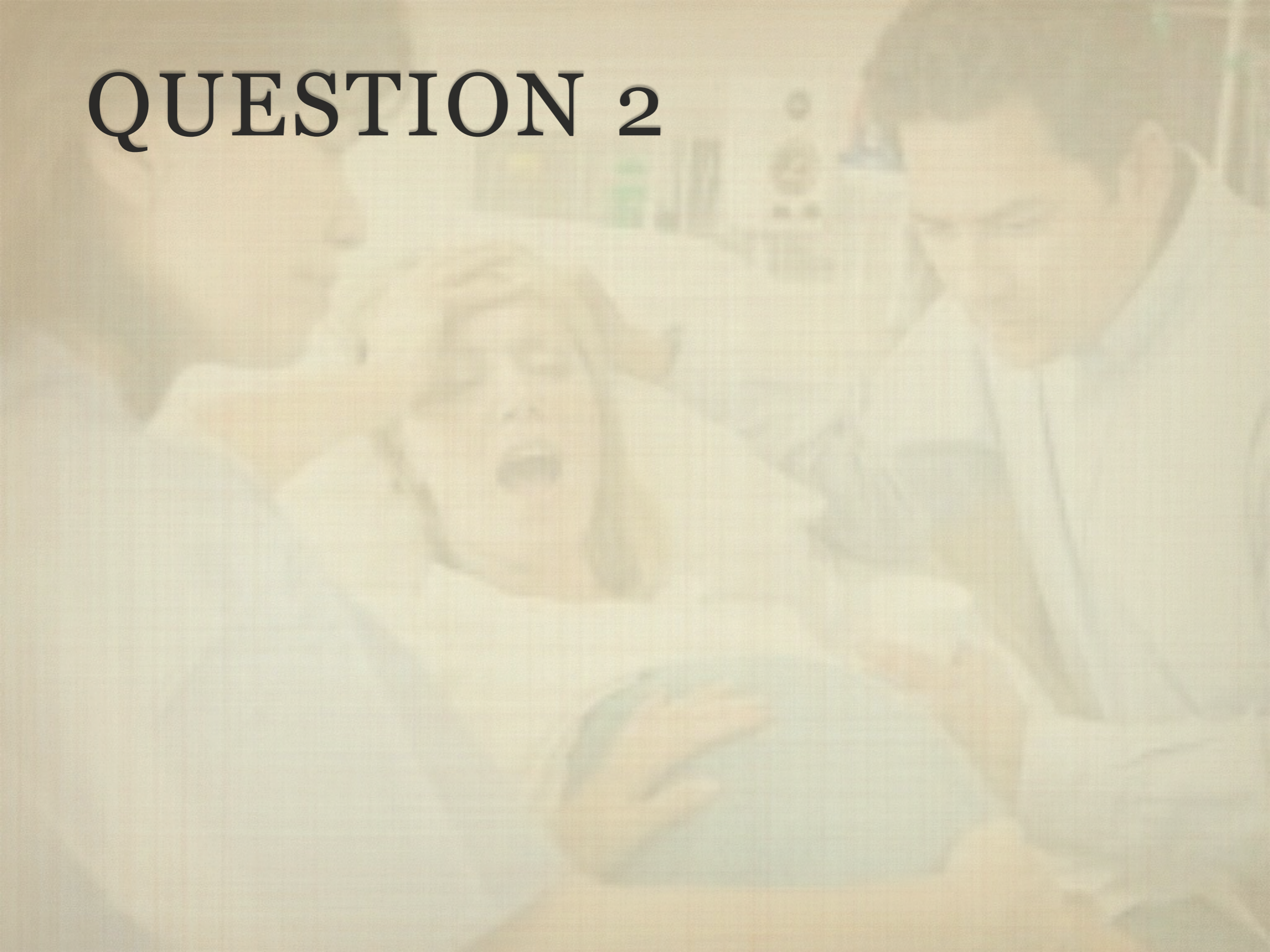








QUESTION 2



QUESTION 2

what's your routine obstetric rapid sequence GA

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1. **opioid** / **thiopentone** (propofol) / **sux** / **ETT**

QUESTION 2

what's your routine obstetric rapid sequence GA

1. **opioid** / **thiopentone** (propofol) / **sux** / **ETT**

2. **thiopentone** (propofol) / **sux** / **ETT** > **opioid post delivery**

QUESTION 2

what's your routine obstetric rapid sequence GA

1. **opioid** / **thiopentone** (propofol) / **sux** / **ETT**
2. **thiopentone** (propofol) / **sux** / **ETT** > **opioid post delivery**
3. **opioid** / **propofol** (thio) / **rocuronium** / **ETT**

QUESTION 2

what's your routine obstetric rapid sequence GA

1. **opioid** / thiopentone (propofol) / **sux** / **ETT**
2. thiopentone (propofol) / **sux** / **ETT** > **opioid post delivery**
3. **opioid** / propofol (thio) / **rocuronium** / **ETT**
4. propofol (thio) / **rocuronium** / **ETT** > **opioid post delivery**



“st elsewhere”

~ Metrolite 500
 @ del oxy Suits (2v)
 ⊕ 0.5 units/hr.

* Pre - O₂ / Girard →
 * fentanyl 100 mg (2v) given while pre-O₂
 * Tio 350
 Rocuronil 60

* ETT 7.0
 O₂ / air / Seno
 Cida

FI02	0.45
SpO2	100
ETCO2	—
PAW/VT exp	24
MV/RR	
CVP/Cardiac Output	
Urine	
Blood loss	
Temperature	
IV fluids 1	←
IV fluids 2	←

“st elsewhere”

Metabolic 500g

del oxy Switz (2v)
⊕ 0.5 units/hr.

* Pre-O₂/Circard →

* fentanyl 100mg (2v) give while pre-O₂

* Thio 350mg

Rocuronil-60mg

* ETT 7.0

O₂/air/Sens

Cida

FI02	0.45
SpO2	100
ETCO2	—
PAW/VT exp	24
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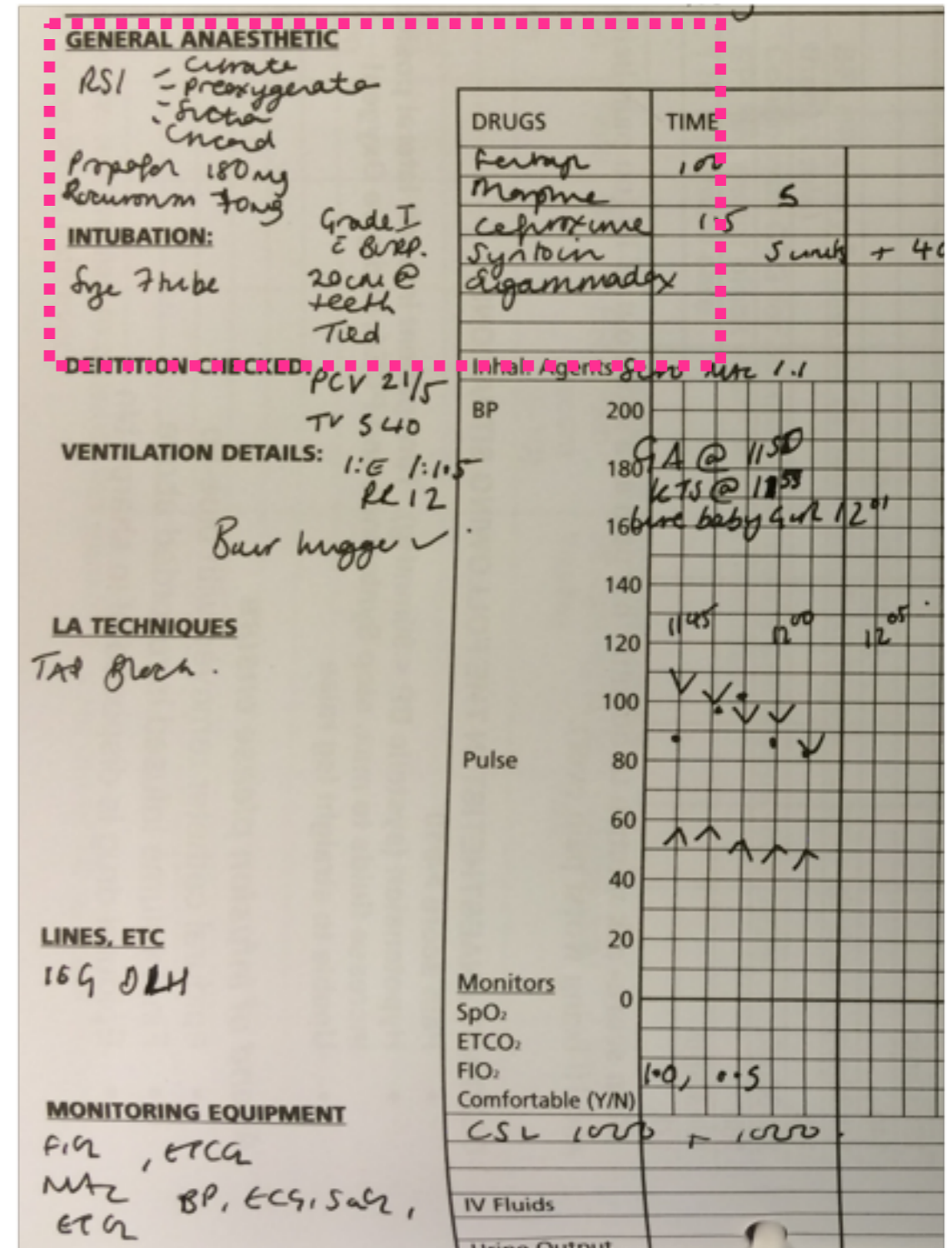
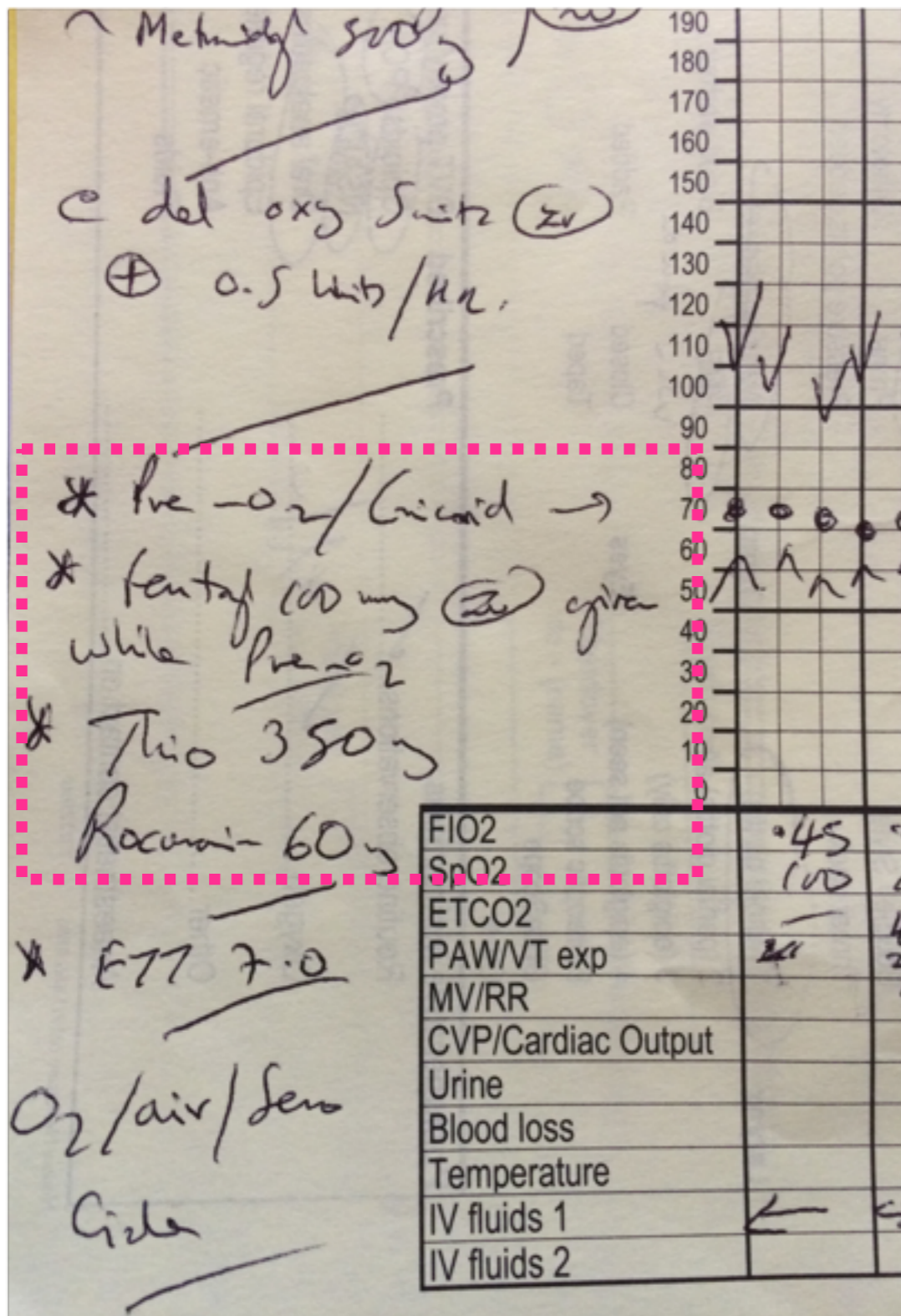
* Thio 350mg

Rocuronil-60mg

FI02	
SpO2	

“st elsewhere”

UCLH / EGA



GENERAL ANAESTHETIC

RSI - Cuvate
 - preoxygenate
 - Suction
 - Cincard

Propofol 180mg
 Rocuronium 70mg

INTUBATION:

Size 7 tube

Grade I
 c BURP.
 20cm @
 teeth
 Tied

DENTITION CHECKED:

PCV 21/5
 TV 540

DRUGS	TIME
Fentanyl	100
Morphine	5
Cefuroxime	1.5
Syntocin	5 units + 40
Digammax	
Inhal Agents	Sur MAC 1.1
BP	200

GENERAL ANAESTHETIC

RSI - Cuvate
 - preoxygenate
 - Suction
 - Cincard

Propofol 180mg
 Rocuronium 70mg

INTUBATION:

Size 7 tube

Grade I
 c BURP.
 20cm @
 teeth
 Tied

DRUGS	TIME
Fentanyl	100
Morphine	
Cefuroxime	1.5
Syntocin	
Digammax	



*its all about trusting people... having confidence
in what they say*



Vs.



the problem ...



background to obstetric GA

pain & physiology

familiarity

difficult airway

awareness

fetal concerns

the problem ...

background to obstetric GA

pain & physiology

familiarity

difficult airway

awareness

fetal concerns





background to obstetric GA

- old opioids slow onset ... **new opioids fast onset / offset**
- **delay** return of spont. respiration after failed intubation !
- critical ↓ SpO₂ before return of spont. respiration

Apnoea in pregnancy: an investigation using physiological modelling

S. H. McClelland,¹ D. G. Bogod² and J. G. Hardman³



Benumof 1997

background to obstetric GA



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Benumof 1997

background to obstetric GA



- old opioids slow onset ... **new opioids fast onset / offset**
- **delay** return of spont. respiration after failed intubation !
- critical ↓ SpO₂ before return on

pregnant patients
desaturate quicker

Apnoea in pregnancy: an investigation using physiological modelling

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Anaesthesia



Benumof 1997

pain & physiology

mother



team anaesthesia



- **opioids the norm outside obstetrics**
- laryngoscopy / intubation
 - ↑↑ HR ↑↑ BP ↑↑ VO₂
 - ↑↑ catecholamine release
 - ↑↑ myocardial contractility



balanced anaesthesia

pain & physiology

mother



team anaesthesia



- opioids the norm outside obstetrics

- laryngoscopy / intubation

what about high risk mothers ??

e.g. cardiac

BP ↑↑ VO2

- ↑↑ catecholamine release

- ↑↑ myocardial contractility

balanced anaesthesia

Uterine Blood Flow and Plasma Norepinephrine Changes during Maternal Stress in the Pregnant Ewe

Sol M. Shnider, M.D.,* Richard G. Wright, M.D.,† Gershon Levinson, M.D.,‡ Michael F. Roizen, M.D.,§
K. Lindsay Wallis, M.B., Ch.B.,† Stephen H. Rolbin, M.D.C.M.,† John B. Craft, M.D.*

1979



Reduced uterine blood flow and fetal hypoxemia with acute maternal stress: experimental observation in the pregnant baboon

1979



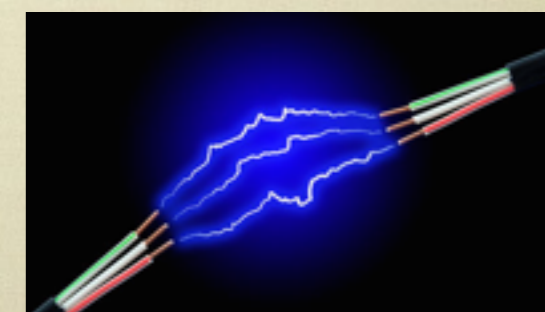
■ **painful stimulus: electrical current or toe clamping !!**

■ ↓↓ uterine blood flow for several minutes

■ ↑↑ catecholamines

■ ↓↓ fetal heart rate

■ ↓↓ fetal oxygenation



Uterine Blood Flow and Plasma Norepinephrine Changes during Maternal Stress in the Pregnant Ewe

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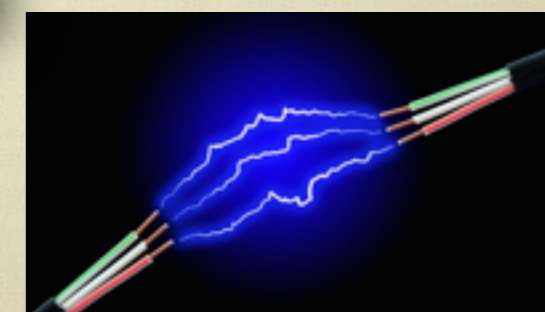
■ ↓↓ uterine blood flow for several minutes

■ ↑↑ catecholamines

■ ↓↓ fetal heart rate

■ ↓↓ fetal oxygenation

what about fetal distress in a compromised fetus



human studies

Maternal and foetal effects of remifentanil for general anaesthesia in parturients undergoing caesarean section: a systematic review and meta-analysis **Heesen et al, 2013**

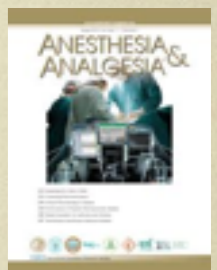


Does intravenous fentanyl affect Apgar scores & umbilical vessel blood gases during caesarean section under general anaesthesia **Maghsoudloo et al, 2010**



Alfentanil Given Immediately Before the Induction of Anesthesia for Elective Cesarean Delivery

Gin T, Ngan Kee W et al, 2013



human studies

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↓ CVS response to intubation & surgery
↑ fetal base excess

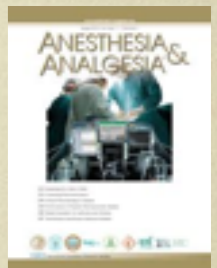
**umbilical
under**

oudloo et al, 2010



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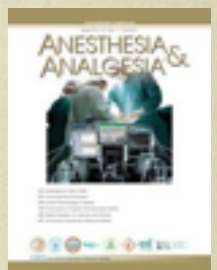
Does intravenous fentanyl affect Apgar scores & umbilical vessel blood gases during caesarean section under general anaesthesia **Maghsoudloo et al, 2010**



- improved CVS stability
- Apgars & cord gases similar

**duction of
ivery**

h Kee W et al, 2013



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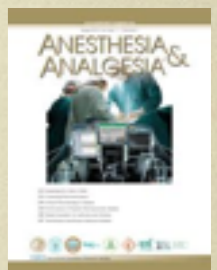


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Alfentanil Given Immediately Before the Induction of Anesthesia for Elective Cesarean Delivery

Gin T, Ngan Kee W et al, 2013



- improved CVS
- ↓↓ maternal catecholamines / ↑↑ UAPO₂
- ↓↓ 1 min Apgar

the problem



familiarity

Training in anaesthesia: a vanishing art?

Johnson RV, 2000



**General anaesthesia in obstetrics:
what about the trainers?**

Bartlett R, 2012



**Rapid sequence induction: a national survey
of practice**

Morris & Cook, 2001



the problem

< 5 GAs / year



familiarity

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the problem



< 2 GAs / year

familiarity

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the problem



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Johnson RV, 2000



75% of anaesthetists used opioids routinely for RSII

s:

Bartlett R, 2012



Rapid sequence induction: a national survey of practice

Morris & Cook, 2001



the problem



difficult airway

↑↑ risk of failed intubation in obstetrics

↑↑ obesity airway challenges

↓↓ GA exposure for all anaesthetists

the problem

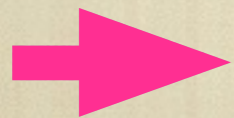


difficult airway

↑↑ **risk of failed intubation in obstetrics**

↑↑ **obesity airway challenges**

↓↓ **GA exposure for all anaesthetists**



the problem



difficult airway

opioids improve intubating conditions

Dose of alfentanil needed to obtain optimal intubation conditions during rapid-sequence induction of anaesthesia with thiopentone and rocuronium

non-obstetric study

Abou-Arab MH, 2007



- **RSII: 36-40 mcg/kg alfent + thiopentone + rocuronium**
- improved intubation conditions

the problem



difficult airway

opioids improve intubating conditions

Influence of induction technique on intubating conditions after rocuronium in adults: comparison with rapid-sequence induction using thiopentone & suxamethonium

non-obstetric study

Sparr HJ, 1996



- RSI: 20 mcg/kg alfentanil + thiopentone + rocuronium
- improved intubation conditions

the problem



awareness

NAP5

5th National Audit Project of
The Royal College of Anaesthetists and the
Association of Anaesthetists of Great Britain and Ireland

Accidental Awareness during General Anaesthesia in the United Kingdom and Ireland

Report and findings

September 2014

Editors

Professor Jaideep J Pandit
Professor Tim M Cook



The Royal College of Anaesthetists



Association of Anaesthetists of
Great Britain and Ireland



	Estimated annual	AAGA	
	Number of cases	Number	Incidence
All obstetric GAs	17,000	14	1:1,200 (0.08%)
CS under GA	8,000	12	1:670 (0.15%)
GA for other procedures	9,000	2	1:4,500 (0.02%)

the problem



awareness

*“ there were 14 cases of AAGA during obs anaesthesia.
Obstetric cases account for only 0.8% of all GAs **BUT** ~
10% of all AAGA reports to NAP5“*

NAP5

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awareness

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- syringe swaps, inappropriate thiopentone doses, failure to turn on volatile agent
- “mind the gap”
- “opioids should be considered”

the problem

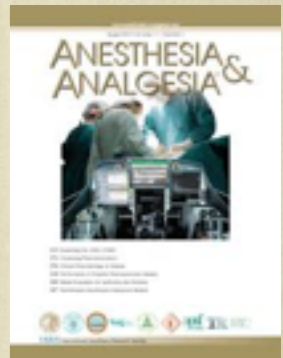


awareness

271 cases of
AAGA

Awareness During Anesthesia: Risk Factors, Causes and Sequelae: A Review of Reported Cases in the Literature

Ghoneim MM, 2009



the problem

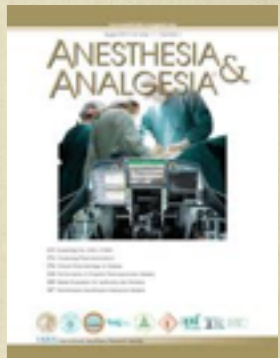


awareness

271 cases of
AAGA

Awareness During Anesthesia: Risk Factors, Causes and Sequelae: A Review of Reported Cases in the Literature

Ghoneim MM, 2009



*“ The anesthetic regimens that were reported in awareness cases used less premedicants, induction and maintenance anesthetics and less **opioids** as compared with the control sample“*

the problem



fetal concerns

RESEARCH ARTICLE

Open Access

Neonatal effect of remifentanyl in general anaesthesia for caesarean section: a randomized trial

Pavlina Noskova, 2015



elective c delivery

general anaesthesia

- RCT, 150 patients remifent 1mcg/kg, 30 sec pre-induction GA
- outcomes: Apgar scores // respiratory support // cord gases

the problem



fetal concerns

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BMC
Anesthesiology

elective c delivery

general anaesthesia

Apgar score 0-7	remifentanil	control	P value
1 min	19	7 *	0.017
5 min	5	2	0.442
10 min	0	0	-

the problem



fetal concerns

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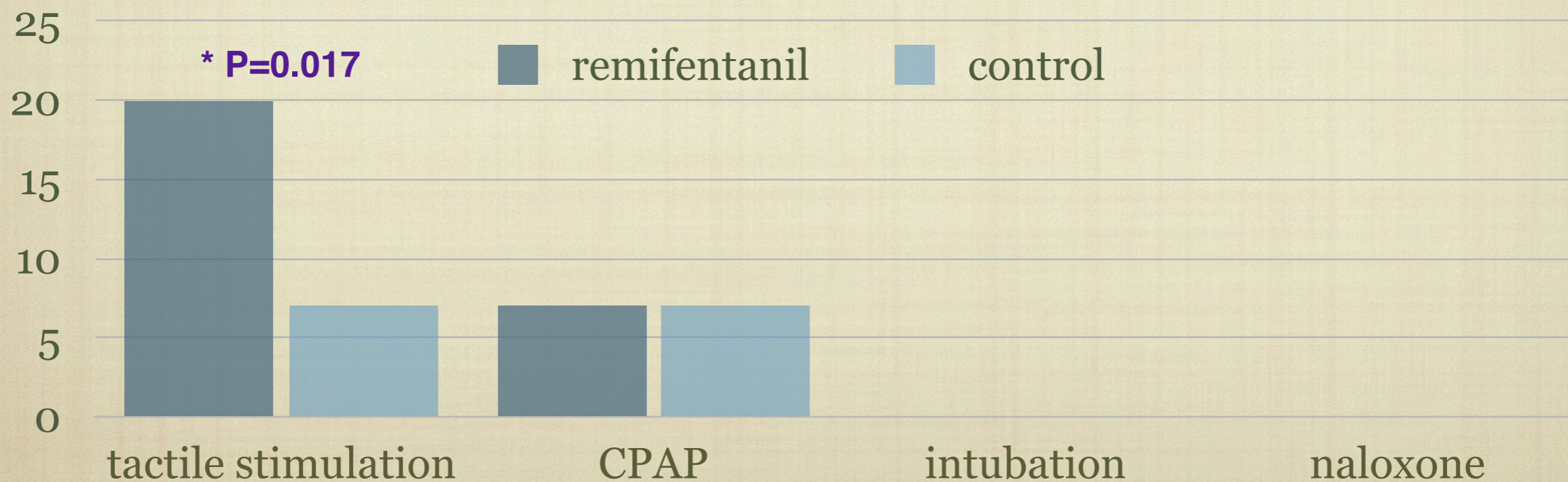
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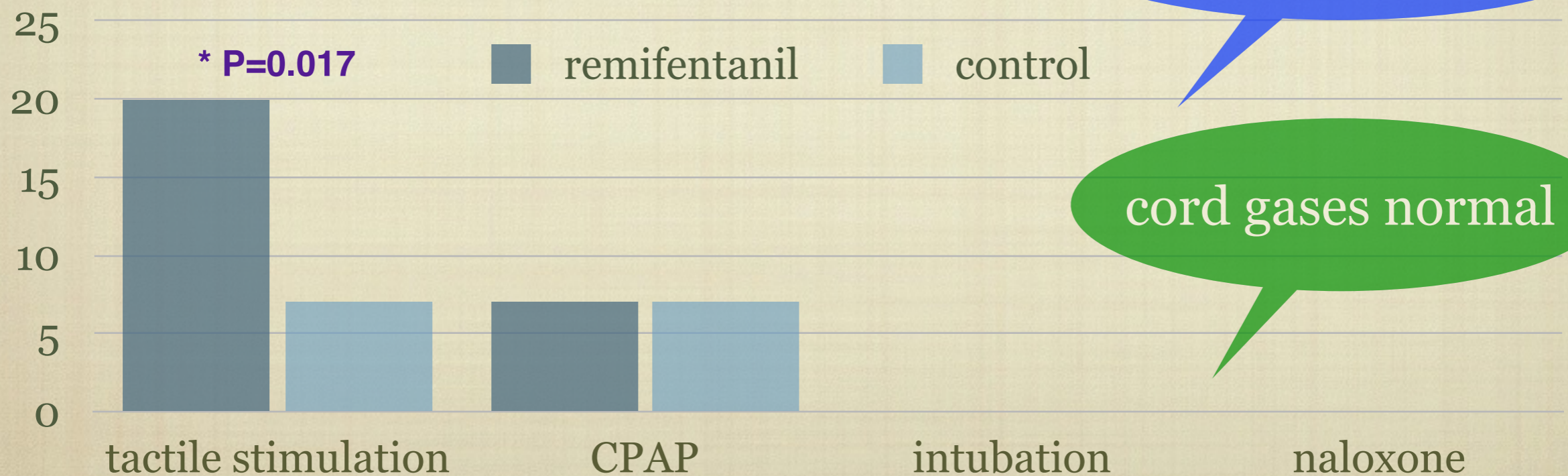
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Pavlina Noskova, 2015



the problem



fetal concerns

elective c delivery

general anaesthesia

Remifentanyl for cesarean section under general anesthesia: effects on maternal stress hormone secretion and neonatal well-being: a randomized trial

Draisci, 2008



- **RCT, 42 patients**

- remifent 0.5mcg/kg bolus pre-induction + iv infusion (0.15mcg/kg/min)

- vs. fentanyl after cord clamping

the problem



fetal concerns

elective c delivery

general anaesthesia

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the problem



fetal concerns

elective c delivery

general anaesthesia

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Draisci, 2008



■ ↓↓ ACTH level

■ ↓↓ Apgar scores ↓↓ pH (but all within normal range)

■ 3 neonates intubated temporary ... no naloxone given ...

remifentanil gp

the problem



fetal concerns

elective c delivery

general anaesthesia

Maternal and neonatal effects of remifentanil for general anaesthesia for Caesarean delivery.

Bouattour, 2007



■ RCT, 40 patients

■ remifent 0.5mcg/kg pre-induction bolus + infusion 0.2mcg/kg/min

■ no neonatal depression ?? dose dependent effect

the problem



fetal concerns

elective c delivery

general anaesthesia

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- remifent 0.5mcg/kg pre-induction bolus + infusion 0.2mcg/kg/min
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the problem



fetal concerns

elective c delivery

general anaesthesia

Maternal and Neonatal Effects of Remifentanyl at Induction of General Anesthesia for Cesarean Delivery

A Randomized, Double-blind, Controlled Trial

Warwick Ngan Kee, 2006



▪ RCT, 40 patients

▪ remifent 1 mcg/kg pre-induction single bolus

▪ Apgar / cord gases equivalent; 2 neonates >> naloxone



the problem



fetal concerns

elective c delivery
general anaesthesia

Maternal and Neonatal Effects of Remifentanil at Induction of General Anesthesia for Cesarean Delivery
A Randomized, Double-blind, Controlled Trial
Warwick Ngan Kee, 2006



UV/ MA
0.73

UA/ UV
0.60

remifentanil pharmacokinetics



the problem



fetal concerns

elective c delivery

general anaesthesia

Maternal and Neonatal Effects of Remifentanil at Induction of General Anesthesia for Cesarean Delivery

A Randomized, Double-blind, Controlled Trial

Warwick Ngan Kee, 2006



UV/ MA
0.73

remifentanil pharmacokinetics

UA/ UV
0.60

“remifentanil readily crosses the placenta, but undergoes metabolism / redistribution in the neonate”



neonatal outcome issues



“neonatal outcome” secondary

other obstetric factors

Apgars subjective

neonatal support criteria

thiopentone vs. propofol

neonatal outcome issues

“neonatal outcome” secondary

other obstetric factors

Apgars subjective

neonatal support criteria

thiopentone vs. propofol



to conclude

DOUBTS

DOUBTS



opioids are dangerous

fetal depression

only use in high risk mothers

its ok to use an unfamiliar GA technique

TRUST ME



TRUST ME

use a technique you are familiar with
not one you use twice a year

don't be frightened of opioids ...
use a short acting one ? remifentanil

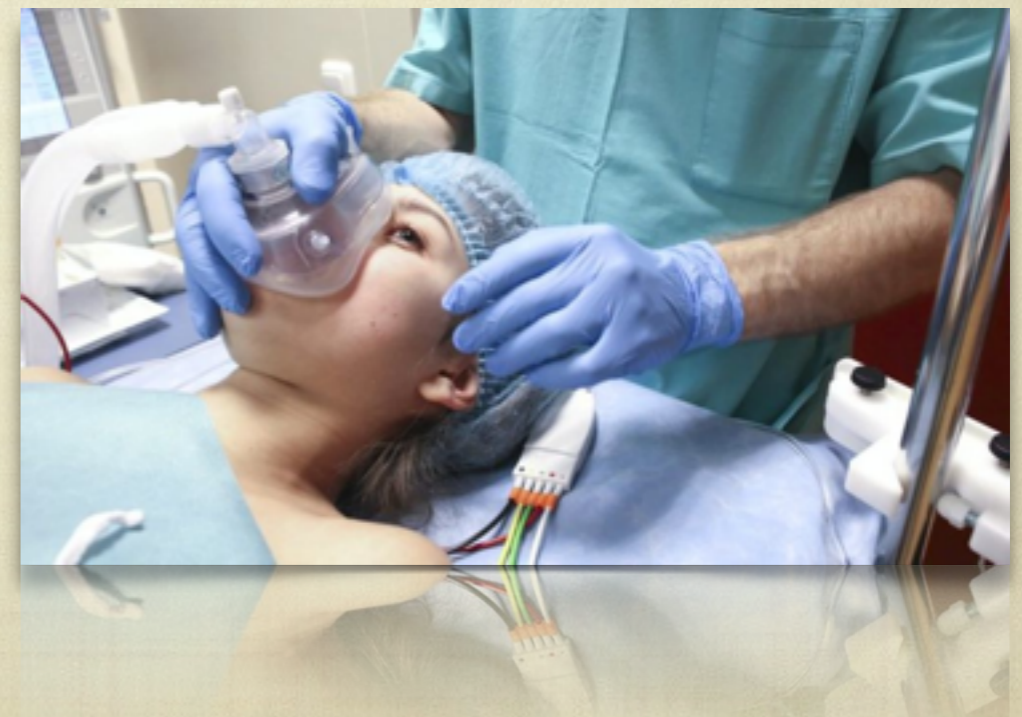
most of the GA cases are emergency ...
so neonatology support present



only one conclusion

only one conclusion

“opioids should routinely be given at induction for GA caesarean delivery”



thank you

