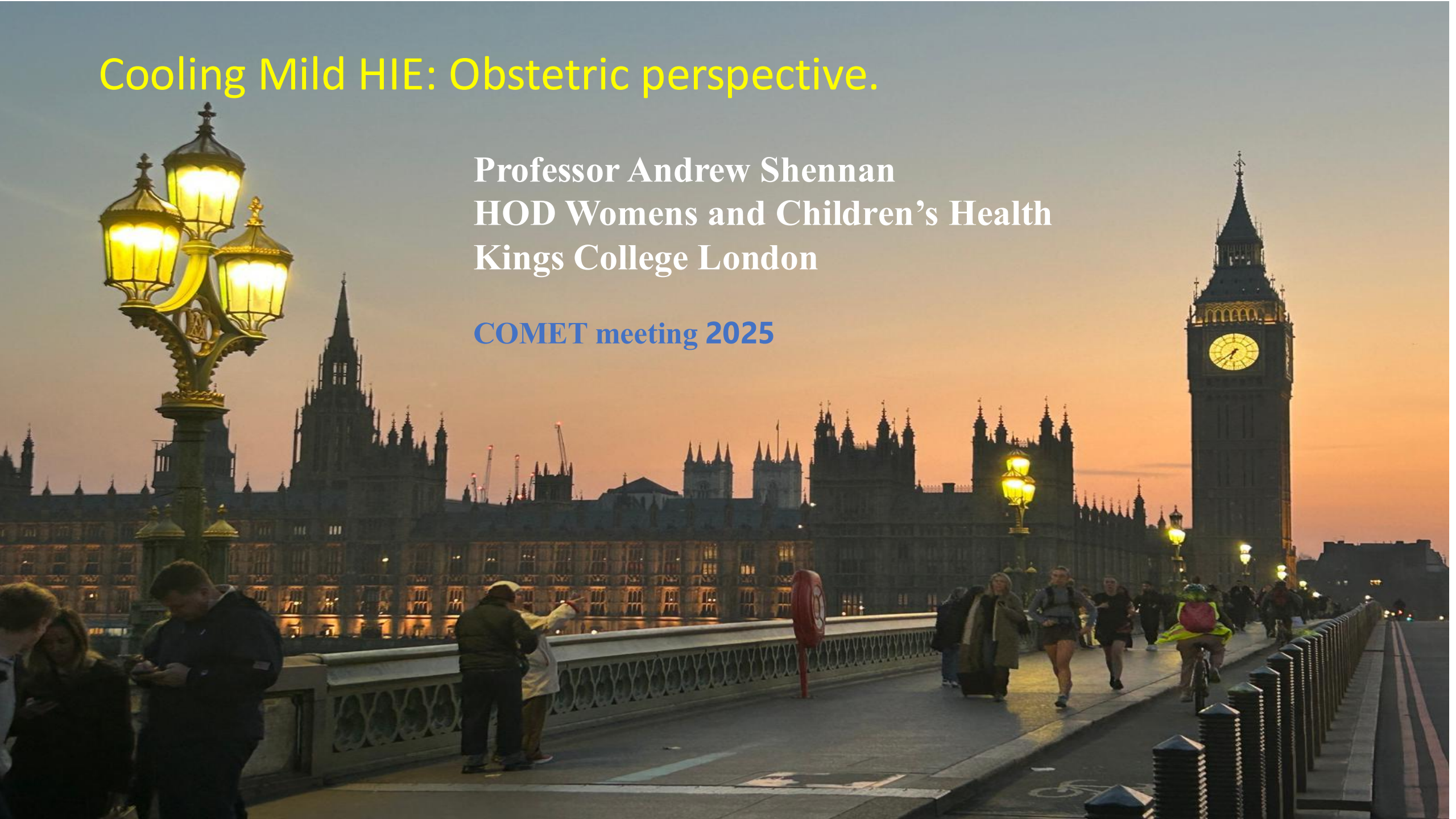
Cooling Mild HIE: Obstetric perspective.



Professor Andrew Shennan
HOD Womens and Children's Health
Kings College London

COMET meeting 2025

Queensland Clinical Guidelines

Translating evidence into best clinical practice

Maternity and Neonatal **Clinical Guideline**

Hypoxic ischaemic encephalopathy (HIE)

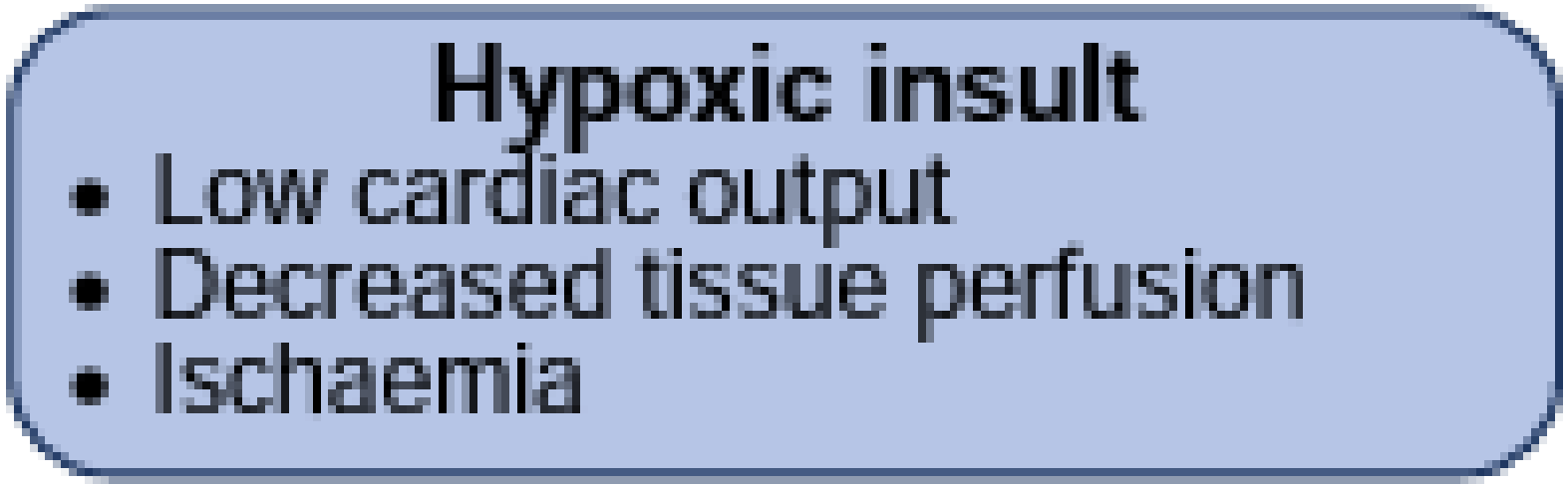

Hypoxic insult
Low cardiac output
Decreased tissue perfusion
Ischaemia

Table 3. Intrapartum events

Aspect	Consideration
Context	• An absence of an intrapartum sentinel event does not exclude the diagnosis of HIE

Significant events	• Peripartum or intrapartum hypoxic-ischaemic event[15,21,22], e.g.:
	  ○ Uterine rupture[15]
	  ○ Placental abruption[15]
	  ○ Cord accident including prolapse[3,17,18]
	  ○ Hypotension
	  ○ Amniotic fluid embolism[17]
	  ○ Fetal exsanguination from a vasa praevia or large feto-maternal haemorrhage[21]
	• Prolonged shoulder dystocia
	• Prolonged labour with transverse arrest[15]
	• Difficult instrumental birth

Intrapartum fetal heart rate pattern	• Abnormal fetal heart rate patterns associated with fetal hypoxia ○ Refer to Queensland Clinical Guideline: *Intrapartum fetal surveillance*[23]
Other	• Meconium in liquor

2.1 Maternal

Table 1. Maternal risk factors

Aspect	Consideration

Medical conditions	• Thyroid disease[12]
	• Hypertension disorder in pregnancy[1,3]
	  ○ Refer to Queensland Clinical Guideline *Hypertension and pregnancy*[13]
	• Diabetes[12]–pre-existing or gestational
	  ○ Refer to Queensland Clinical Guideline: *Gestational diabetes mellitus*[14]
	• Immune disorders[15] (e.g. antiphospholipid syndrome)
	• Chronic conditions[15] (e.g. renal disease)
	• Exposure to infections or drugs[15]

In-utero	• Elevated temperature[3,16] (e.g. chorioamnionitis[12], funisitis[17]) • Ante/intrapartum haemorrhage or uterine rupture[2,16-19] • Hypotension[12] • Trauma[12]

Predisposing factors[12]	• Illicit substance use[15,16]
	• Potential for birthing complications:
	  ○ Shoulder dystocia[18,20]
	  ○ Nulliparous women[16,18,20]
	  ○ Overweight[20]
	  ○ Short stature[20]
	• History of:
	  ○ Pre-eclampsia
	  ○ Placental vasculopathy
	• Previous caesarean section associated with uterine rupture[20]
	• Multiple pregnancy[1]

Table 2. Fetal/baby risk factors

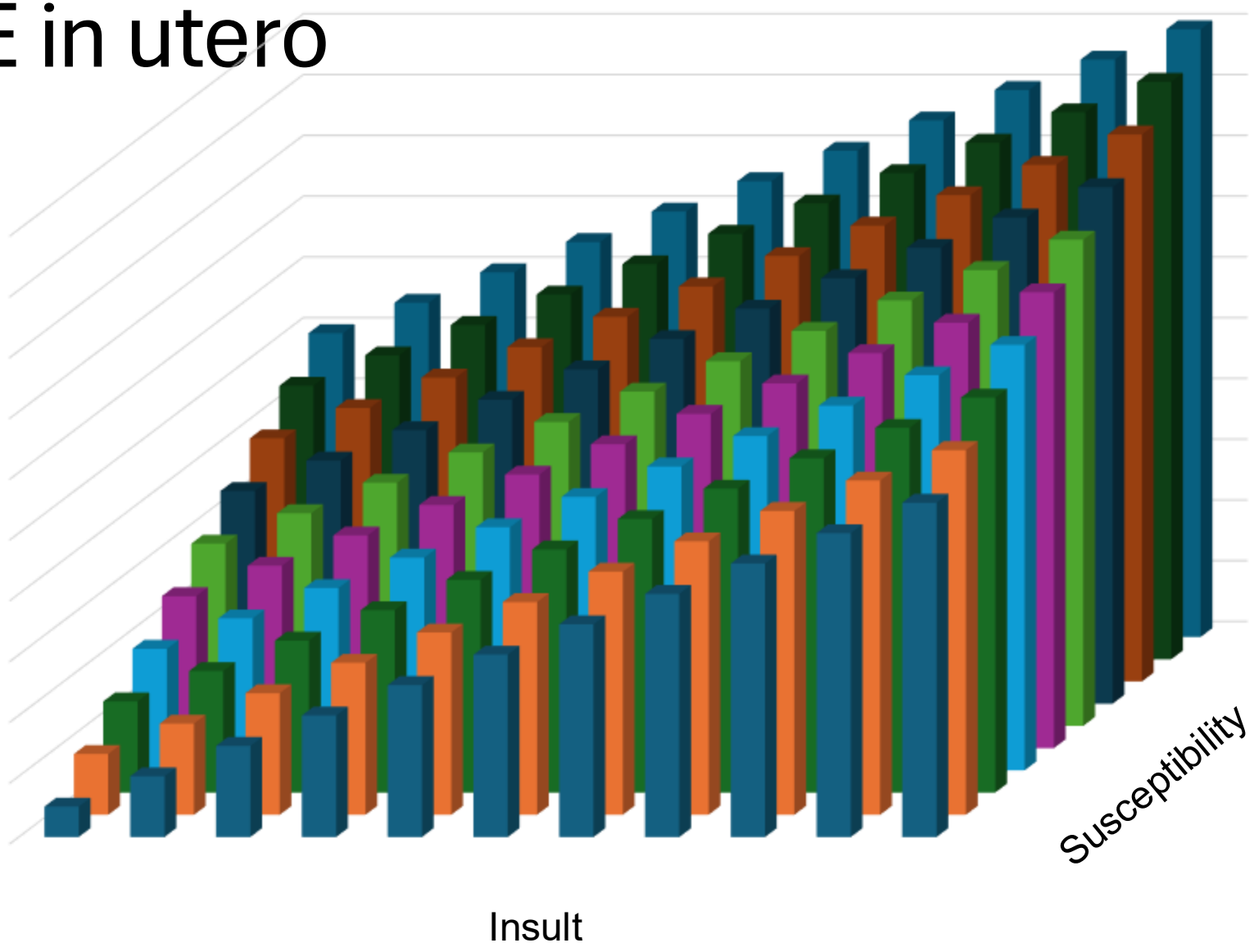
Aspect	Consideration

Antepartum assessment	• Fetal movements:
	  ○ Useful indicator of fetal health
	  ○ Detection by maternal perception or real-time ultrasound scan (USS)[15]
	  ○ Refer to Queensland Clinical Guideline: *Fetal movements*[20]
	• Fetal heart rate[3,12]
	• Biophysical profile–fetal breathing, movement, tone and amniotic fluid volume[15]
	• Growth–identification of fetal growth restriction (FGR)[3,15]
	• Blood flow velocity–Doppler flows in umbilical and fetal cerebral and systemic vessels[15]

Fetoplacental[15]	• Oligohydramnios or polyhydramnios • Multiple pregnancy (in particular monochorionic) where cerebral perfusion may be compromised • Previous fetal death • Uteroplacental failure resulting in FGR and consequent intrapartum asphyxia
Intrapartum assessment	• Fetal heart rate • Fetal blood lactate • Cardiotocograph (CTG)

Postpartum	• Paired umbilical cord blood gas
	• Low Apgar scores[3]
	• Presence of comorbidities
	  ○ Severe pulmonary hypertension of the newborn[12]
	  ○ Severe recurrent apnoeic events[12]
	  ○ Severe pulmonary disease[12]

HIE in utero



The following scenarios are considered instances of negligence:

- Failure to diagnose and properly treat chorioamnionitis or monitor the mother and baby when the condition is detected
- Failure to diagnose PROM and follow the medical care standards necessary to prevent ascending infection
- Failure to start antibiotics when chorioamnionitis is diagnosed
- Failure to induce labor or order a C-section
- Failure to deliver the baby at an appropriate time; failure to follow care standards when performing a C-section or vaginal delivery or when using delivery assistance tools.
- Failure to obtain informed consent, including advising the patient of the risks and alternative delivery options

Chorioamnionitis

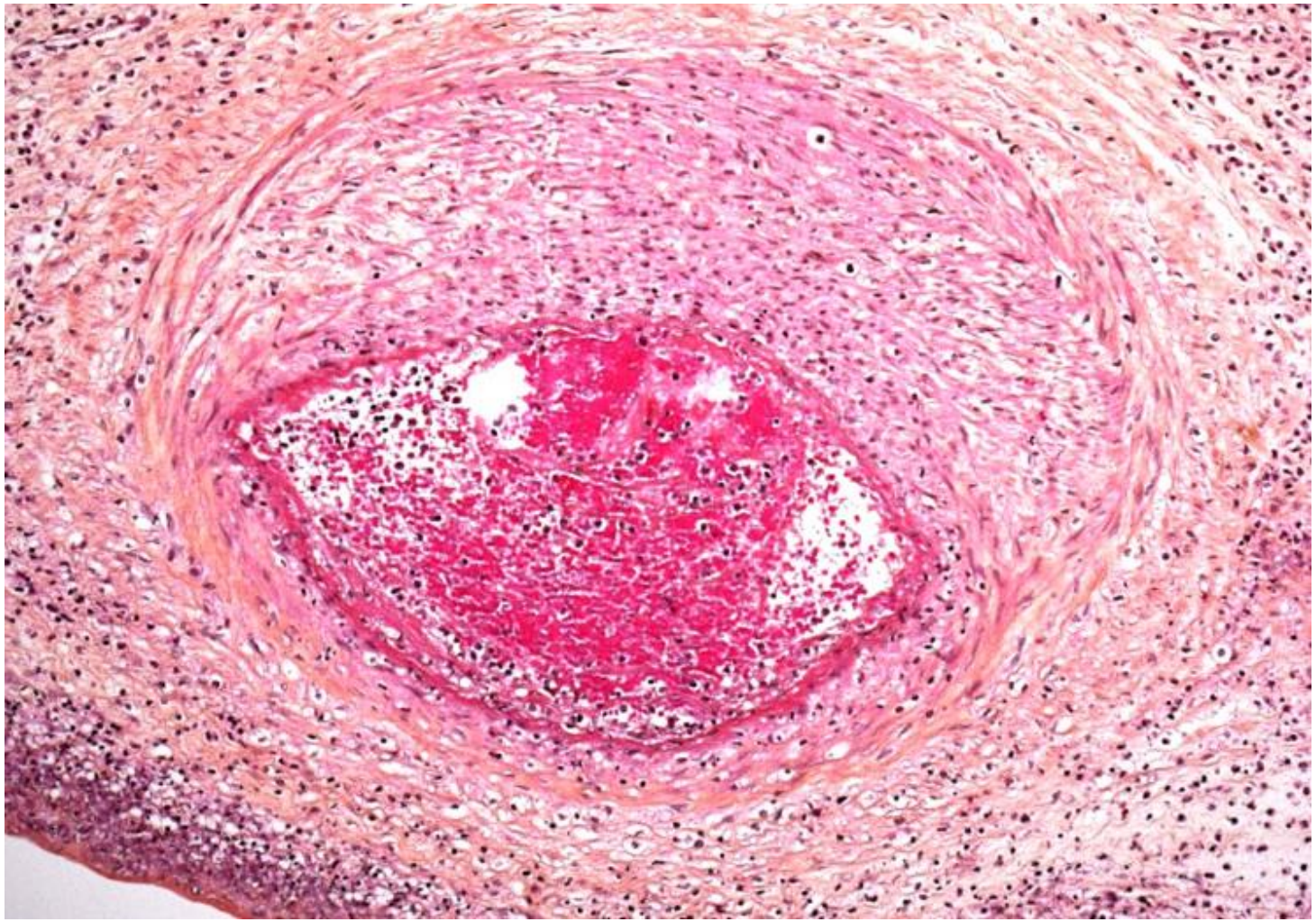


Figure 1

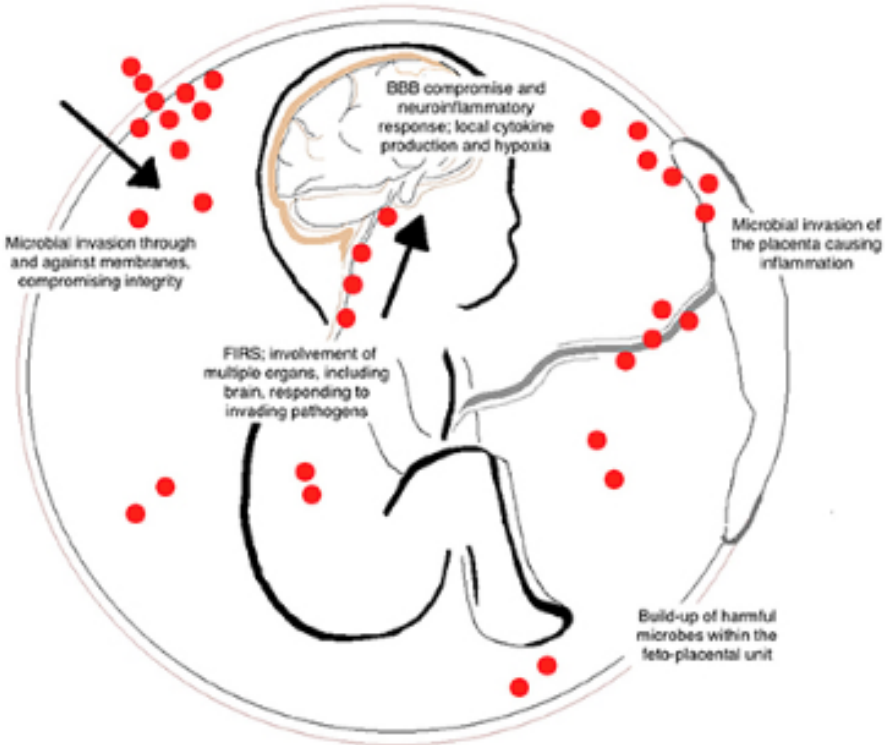


FIGURE 1. CONTRIBUTING FACTORS OF BRAIN INJURY TO THE FETUS FOLLOWING CHORIOAMNIONITIS. Bacterial entry during fetal development can occur by many different routes including the placental circulation and through placental membranes (indicated by the red dots). The invasion of microorganisms results in inflammation of the feto-placental unit and the development of fetal inflammatory response syndrome (FIRS). Within the fetus, this can cause hypoxia, blood vessel damage, and blood brain barrier (BBB) compromise. These common responses lead to long-term alterations in white matter development within the fetal brain.

REVIEW article

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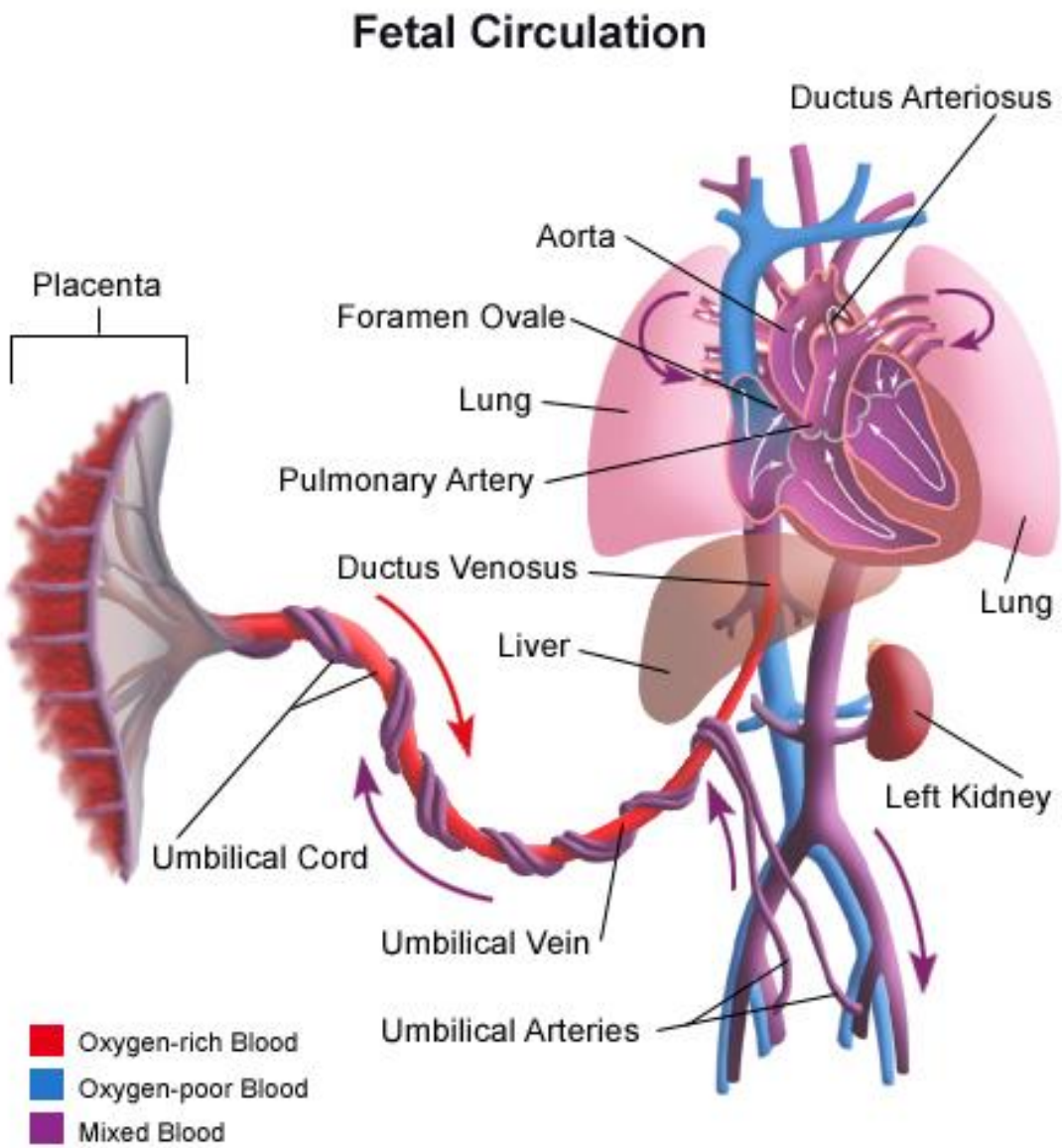
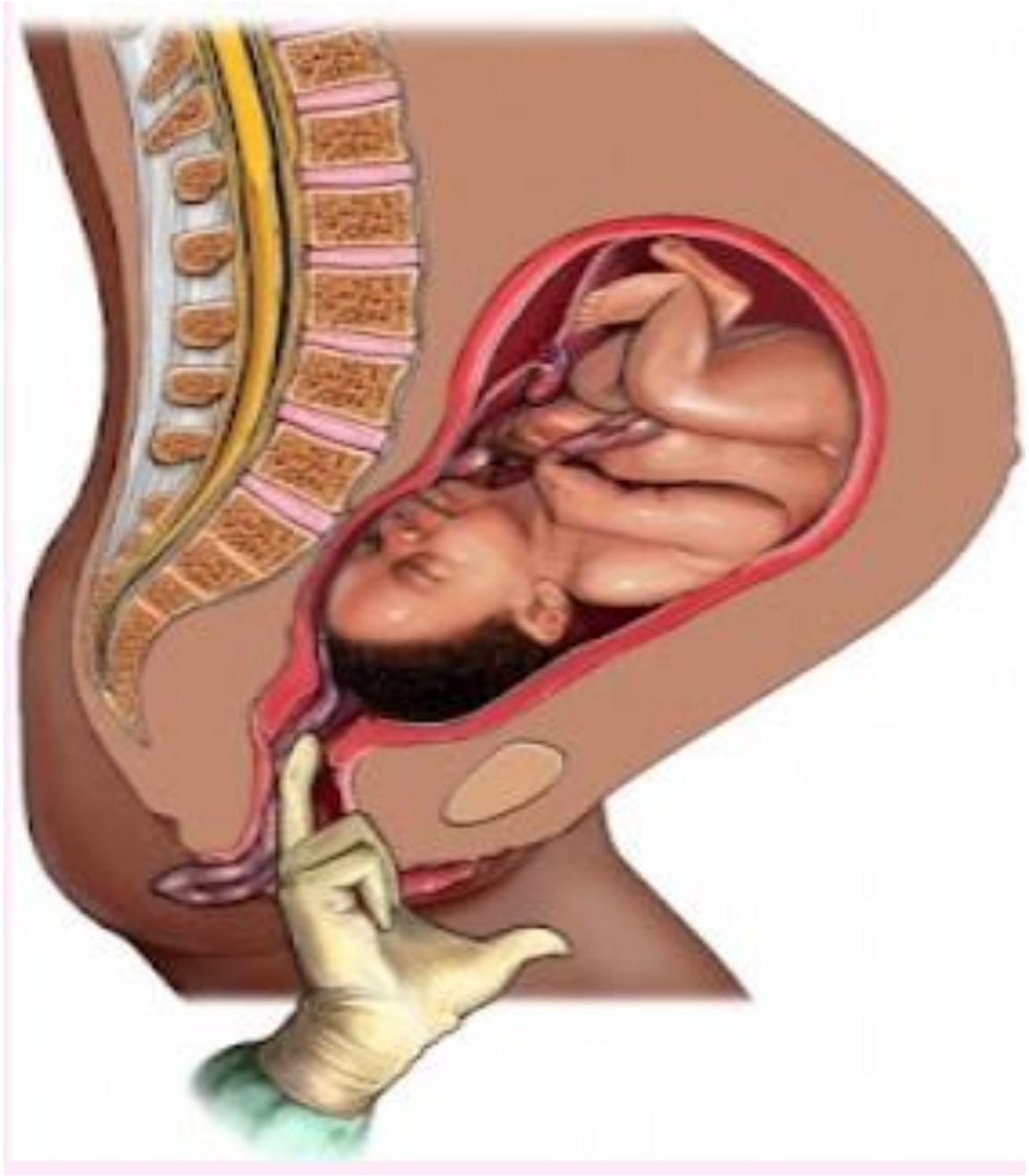
Sec. Child and Adolescent Psychiatry
https://doi.org/10.3389/fnins.2017.00200

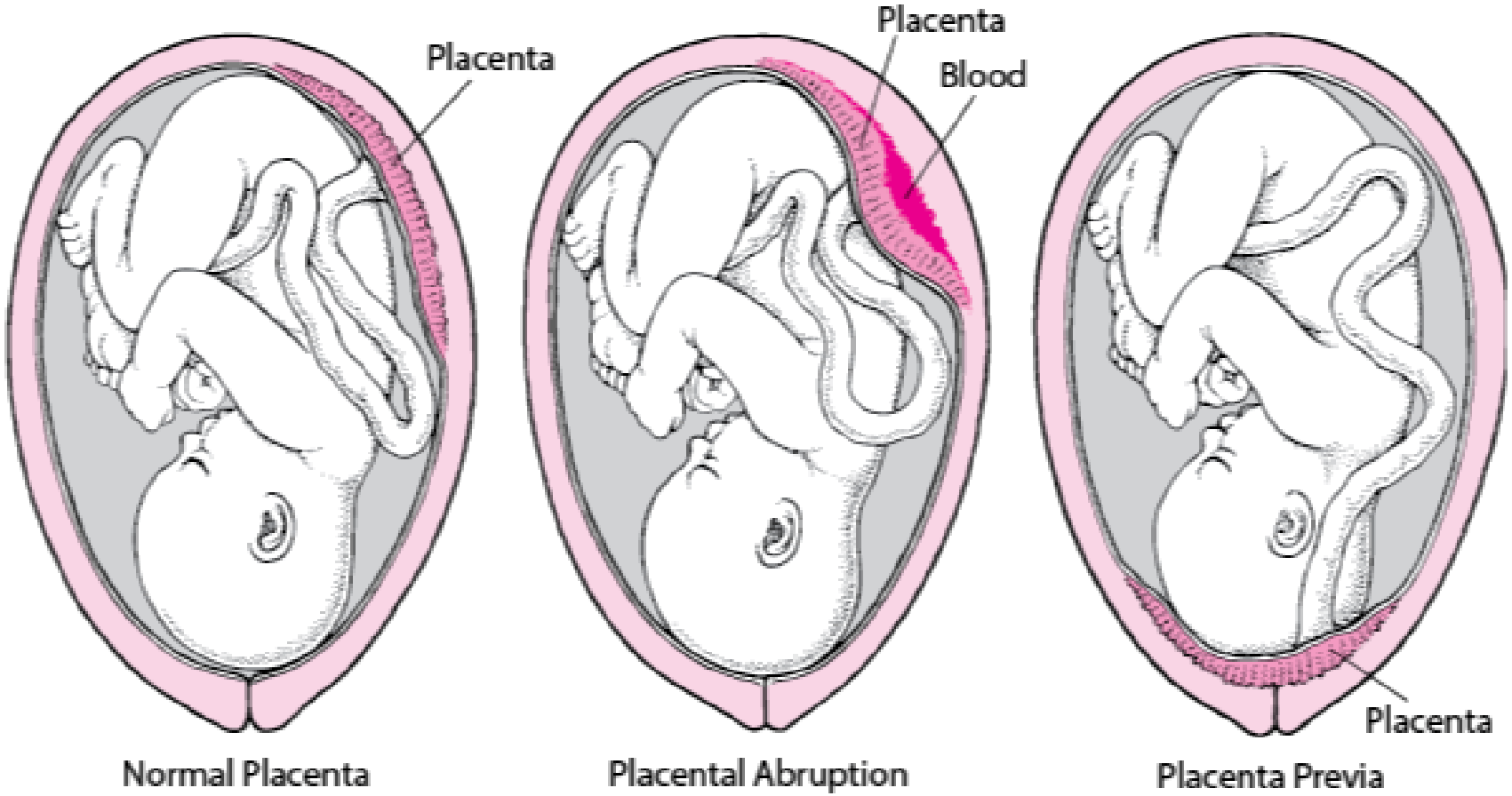
Acute problems: cord integrity



Cord Prolapse



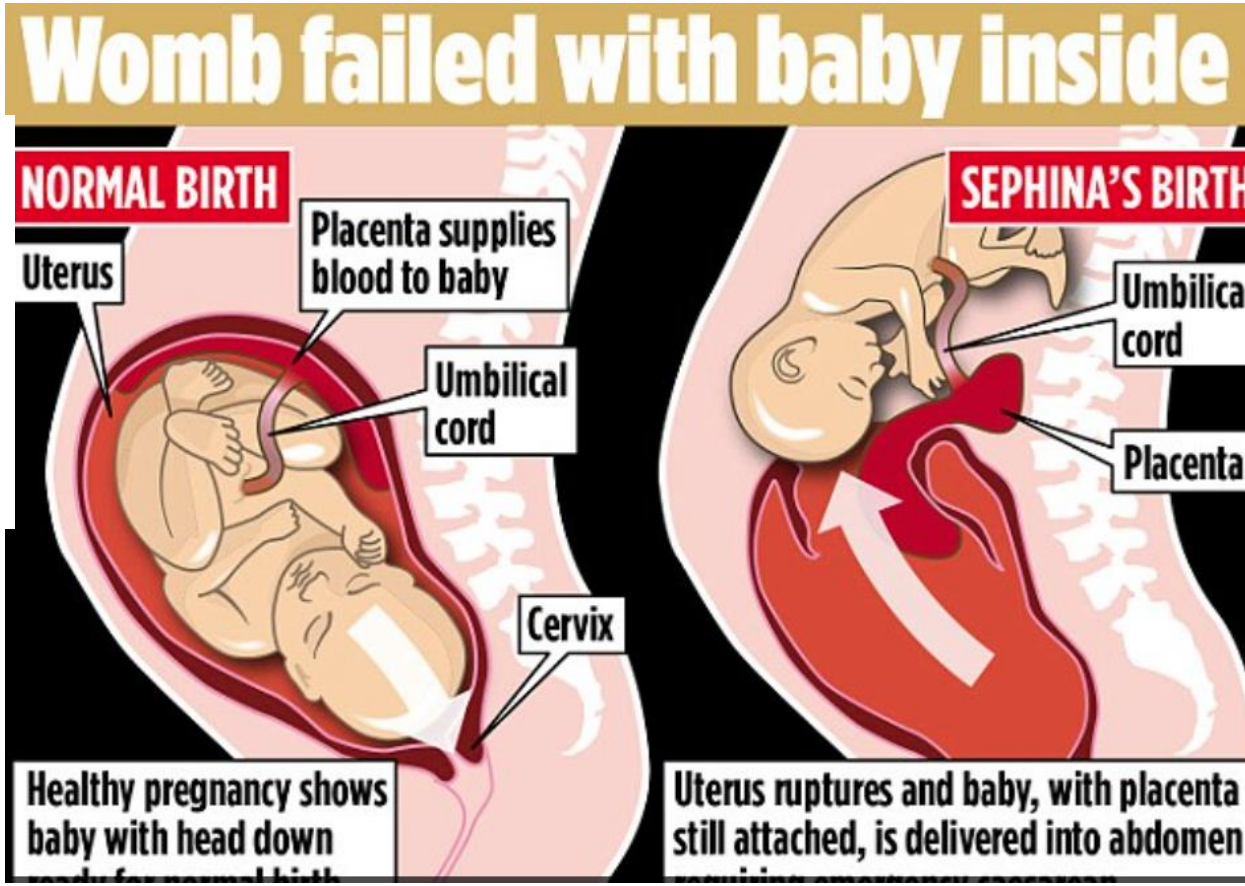
Antepartum haemorrage: abruption



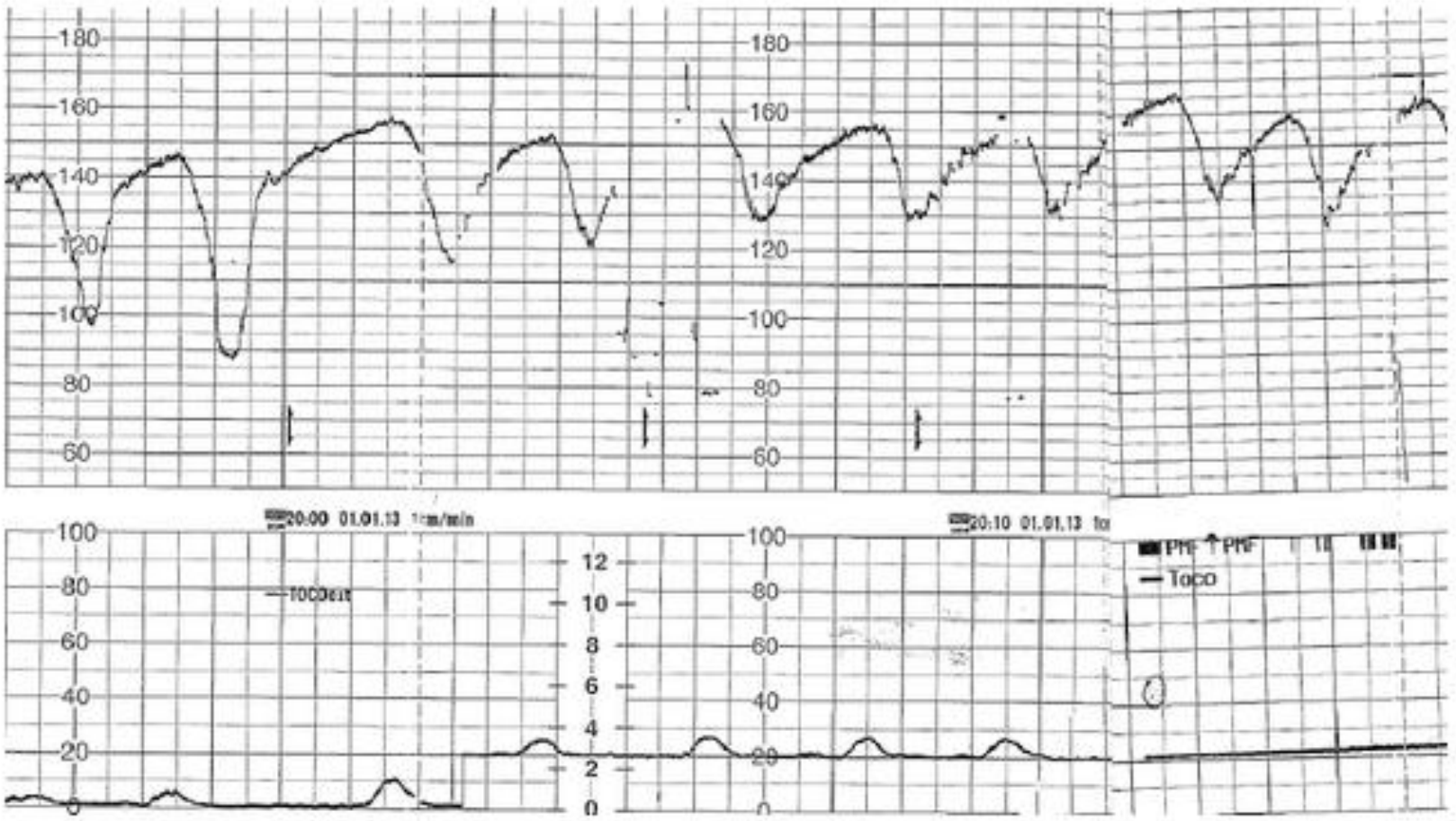
Ruptured uterus

Miracle birth that's brought Christmas joy: Baby girl who was 'born' into her mother's abdomen is saved by doctor

- Masina Frost gave birth to baby Sephina in London by emergency c-section
- The tiny tot had ejected into the abdominal cavity when her womb ruptured
- Professor Andrew Shennan saved mother and child with 30 second operation



The problem with CTG



Oxytocin use and operative vaginal delivery risk factors

TABLE 3 Comparison of labor characteristics between the case (stage 2 and 3 hypoxic–ischemic encephalopathy) and control groups

Characteristics	Cases $n = 32$ (%)	Controls $n = 81$ (%)	p
Onset of labor			
Spontaneous	19 (59.4)	55 (67.9)	0.39
Induction	13 (40.6)	26 (32.1)	
Oxytocin use	20 (62.5)	31 (38.3)	0.02
FHR 2 h before birth (FIGO)			
Normal	3 (9.4)	6 (7.4)	0.48
Suspicious	6 (18.8)	9 (11.1)	
Pathological	23 (71.9)	66 (81.5)	
Mode of delivery			
Vaginal delivery	1 (3.1)	23 (28.4)	0.01
Operative vaginal delivery	13 (40.6)	23 (28.4)[a]	
Cesarean	18 (56.3)	39 (48.2)[a]	

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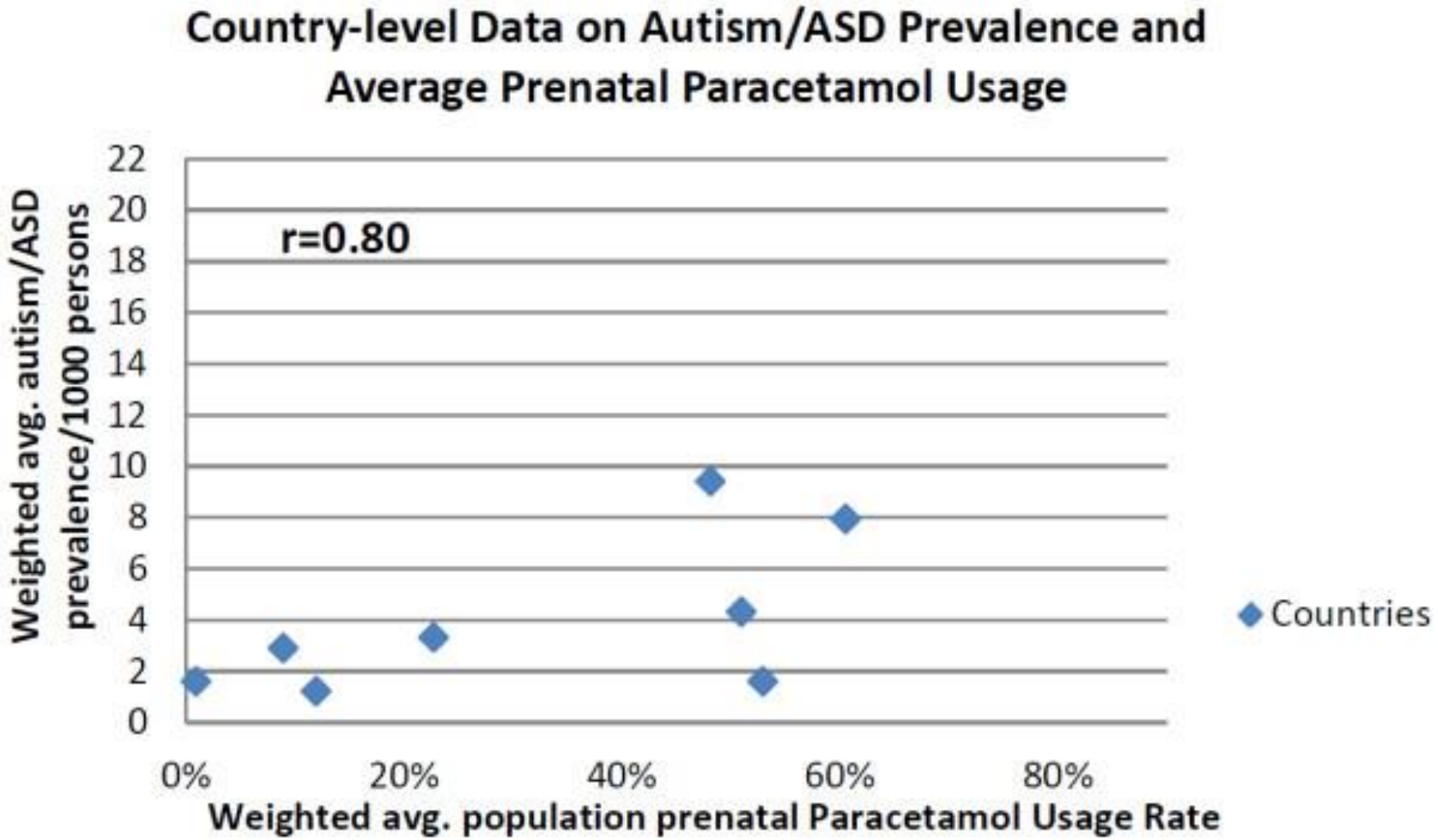
ORIGINAL RESEARCH ARTICLE

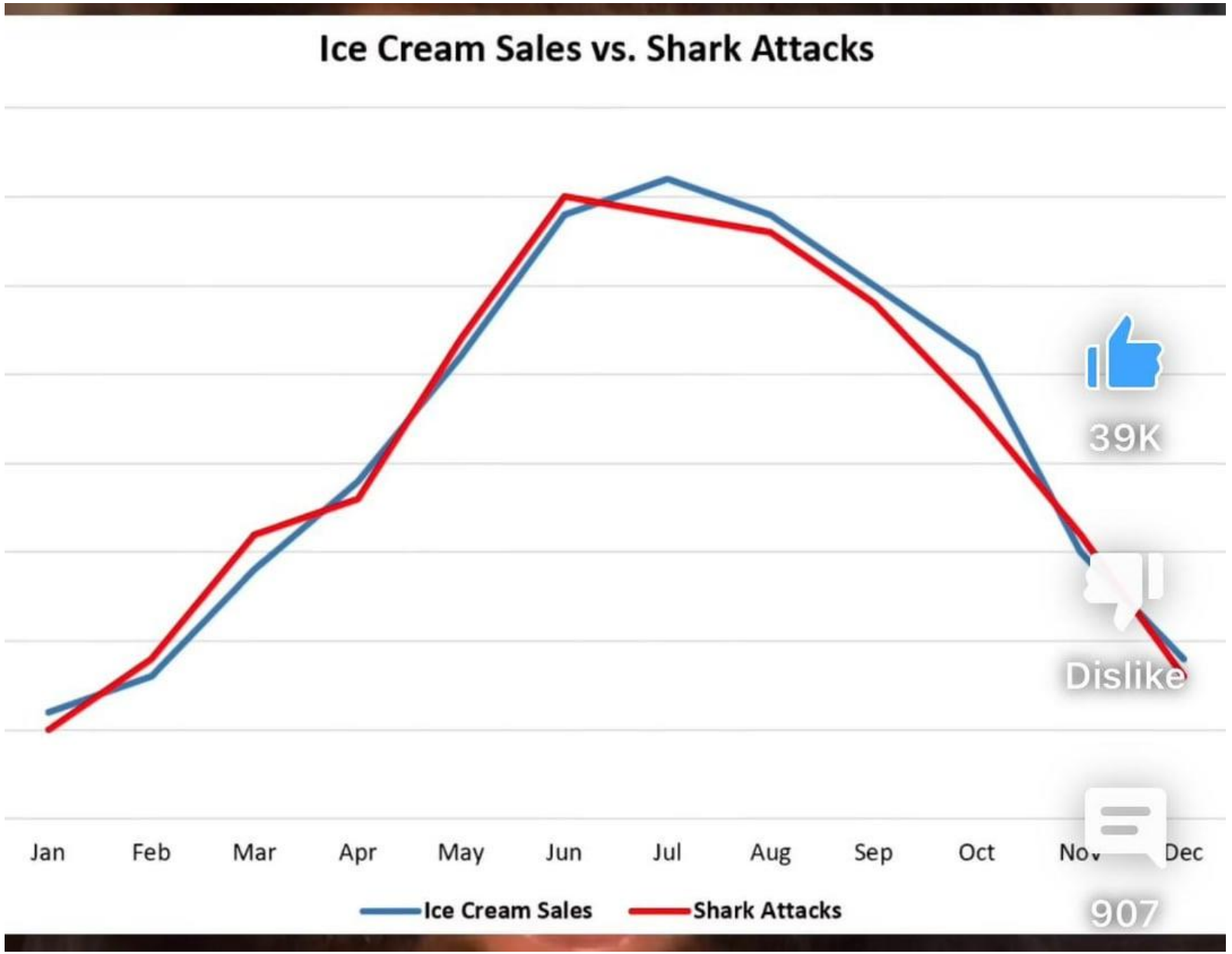
Risk factors for hypoxic–ischemic encephalopathy in cases of severe acidosis: A case–control study

Perrine Lorain[1] | Alexandra Bower[2] | Elsa Gottardi[1] | Marc Dommergues[3] | Laurence Foix L'Helias[2,4] | Isabelle Guellec[4,5] | Gilles Kayem[1,4]

TABLE 5 Predictive factors for hypoxic–ischemic encephalopathy: Multivariable analysis of all women and women in labor

	Overall population		Women in labor	
Factors	Crude OR[95% CI]	Adjusted OR[95% CI]	Crude OR[95% CI]	Adjusted OR[95% CI]
Age	1.0 [0.9–1.0]	1.0 [0.9–1.1]	1.0 [0.9–1.0]	1.0 [0.9–1.1]
Nulliparity	1.3 [0.6–2.8]	2.3 [0.8–6.4]	0.9 [0.4–2.1]	1.7 [0.5–5.2]
Hypertension, preeclampsia, SGA	0.5 [0.2–1.3]	0.3 [0.1–1.4]	0.4 [0.1–1.2]	0.3 [0.1–1.8]
Gestational diabetes	2.0 [0.8–5.2]	3.3 [0.9–12.1]	1.8 [0.6–5.7]	1.8 [0.4–8.3]
Acute event	**5.1 [2.0–13.1]**	**6.4 [1.8–22.5]**	**5.5 [2.0–15.2]**	**6.6 [1.6–27.2]**
Thick meconium at delivery	**3.2 [1.4–7.5]**	**2.9 [1.0–8.6]**	**2.7 [1.1–6.7]**	2.9 [0.9–9.3]
Umbilical pH at birth				
[6.90–7.00]	1	1		1
[6.85–6.90]	**5.3 [1.8–15.7]**	**10.5 [2.9–38.3]**		**4.8 [1.1–20.3]**
<6.85	**7.1 [2.7–18.4]**	**8.6 [2.5–29.9]**		**6.2 [1.7–22.8]**
Maternal temperature ≥38 °C at delivery	**2.6 [1.0–6.7]**	**3.5 [1.0–11.9]**	2.4 [0.9–6.6]	2.7 [0.7–10.1]
Oxytocin use			**2.6 [1.2–6.5]**	1.6 [0.5–4.7]


Country-level Data on Autism/ASD Prevalence and Average Prenatal Paracetamol Usage
r=0.80
Weighted avg. autism/ASD prevalence/1000 persons
22
20
18
16
14
12
10
8
6
4
2
0
0%
20%
40%
60%
80%
Weighted avg. population prenatal Paracetamol Usage Rate
Countries


Ice Cream Sales vs. Shark Attacks
39K
Dislike
907
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Ice Cream Sales
Shark Attacks

Key Benefits of Randomization

Eliminates Selection Bias:
Randomization prevents researchers from deliberately or unintentionally assigning participants to specific groups, which could influence the study's outcomes.

Balancing Known and Unknown Factors:
It balances both known and unknown confounding variables between groups, preventing systematic differences that could lead to misleading results.

Ensures Validity of Statistical Tests:
Random allocation provides a fair basis for statistical tests of significance, ensuring the assumption that the groups are comparable is met.

Supports Blinding:
Randomization is a key component in maintaining the blinding of participants and researchers, which further reduces bias.

Supports Causality:
By creating truly comparable groups, it is the most rigorous method to determine if an intervention is the cause of a specific outcome, rather than a third, unmeasured factor.


Alice Beardmore-Gray, Tanya Robbins, Alex Ridout, Natasha Hezelgrave, Nicola Vousden,
Hannah Nathan, Katy Kuhrt, Alice Hurrell, Louisa Samuels,
Candace Beoku-Betts, Chileshe Mabula-Bwalya
Nurture others: you will shine in their glory