Obstetric emergencies in Critical Care

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Overview

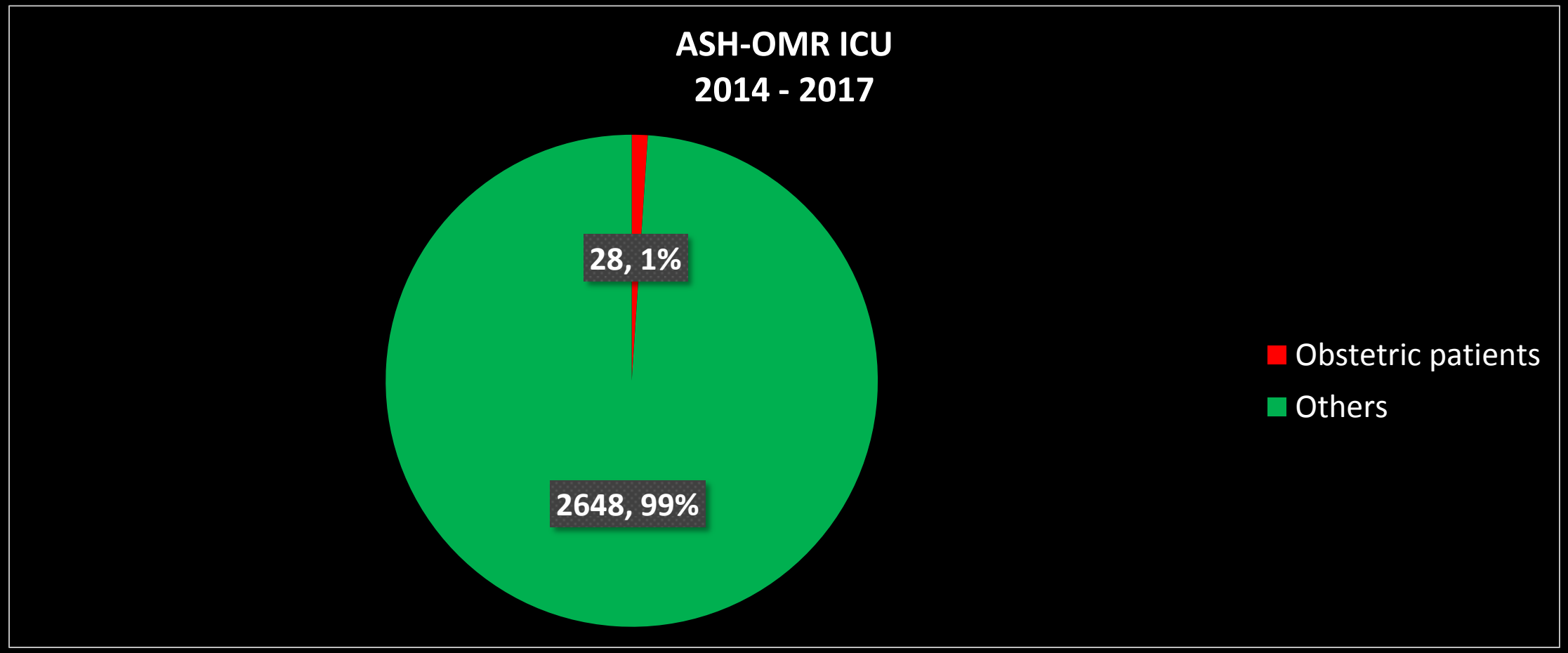
- Data
- Why it is special?
- Anatomical and physiological changes
- Specific conditions
- Imaging
- Drugs

Published data

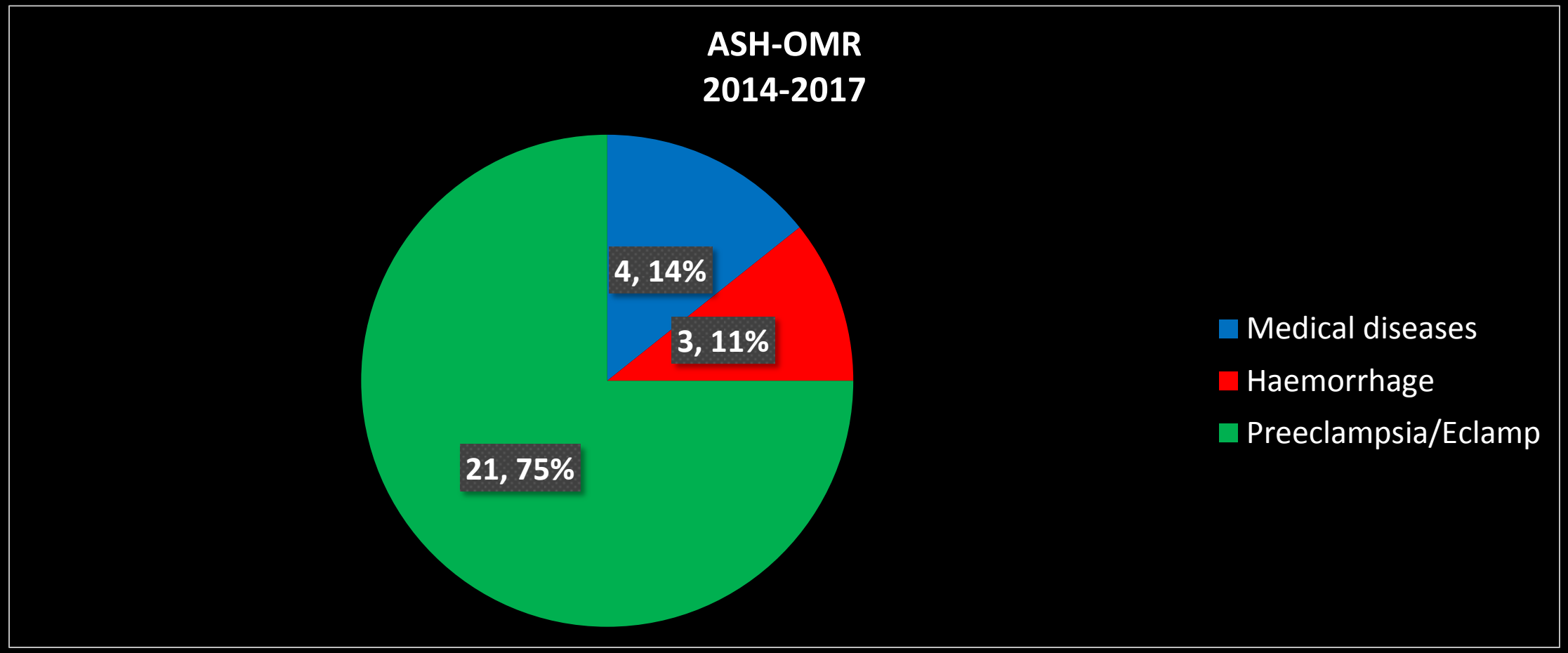
- <2% of all admissions to ICU
- 0.9% in the UK and US
- Mortality 5-20%
- 0.7 to 13.5 ICU admissions/1000 deliveries

ICM 2010

How common is it in our set up?



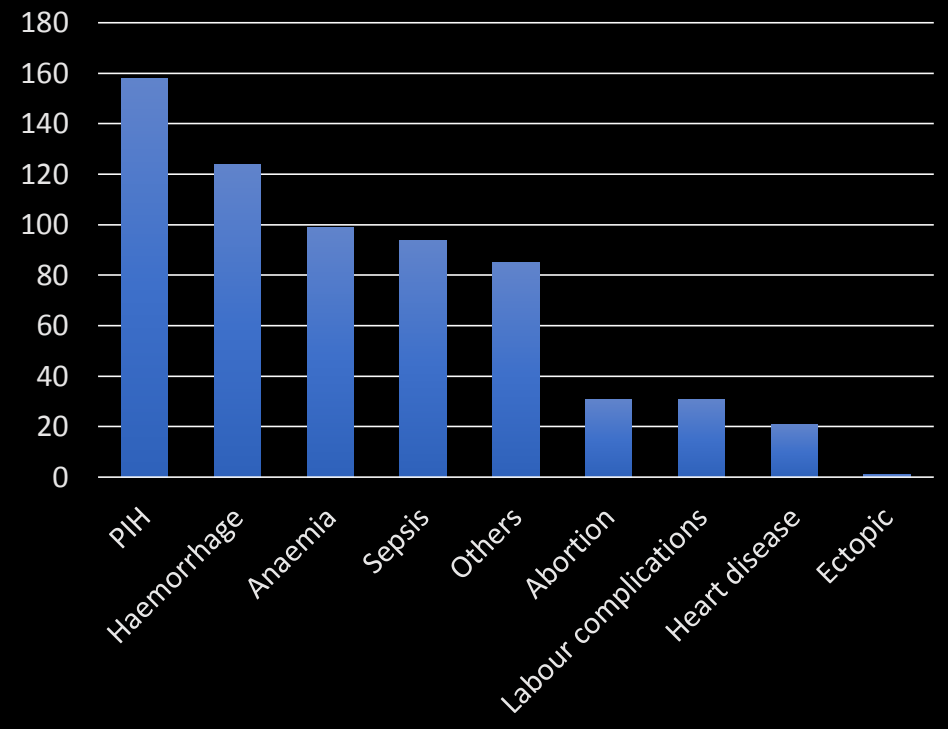
Indications for admission



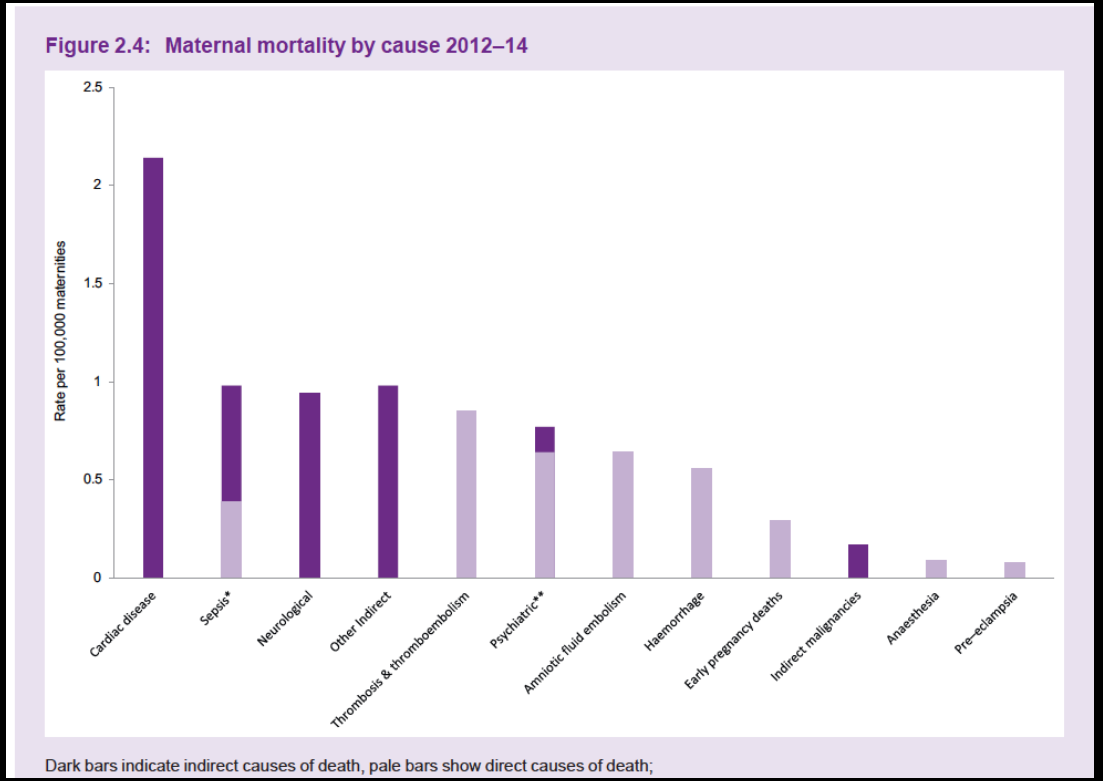
Causes - comparison

IJCM; 2017

2005-2014 data



MBRRACE UK



Why is the management different?

- Physiological change associated with pregnancy
- Pregnancy specific conditions
- Presence of a fetus
- Clinicians lack of familiarity

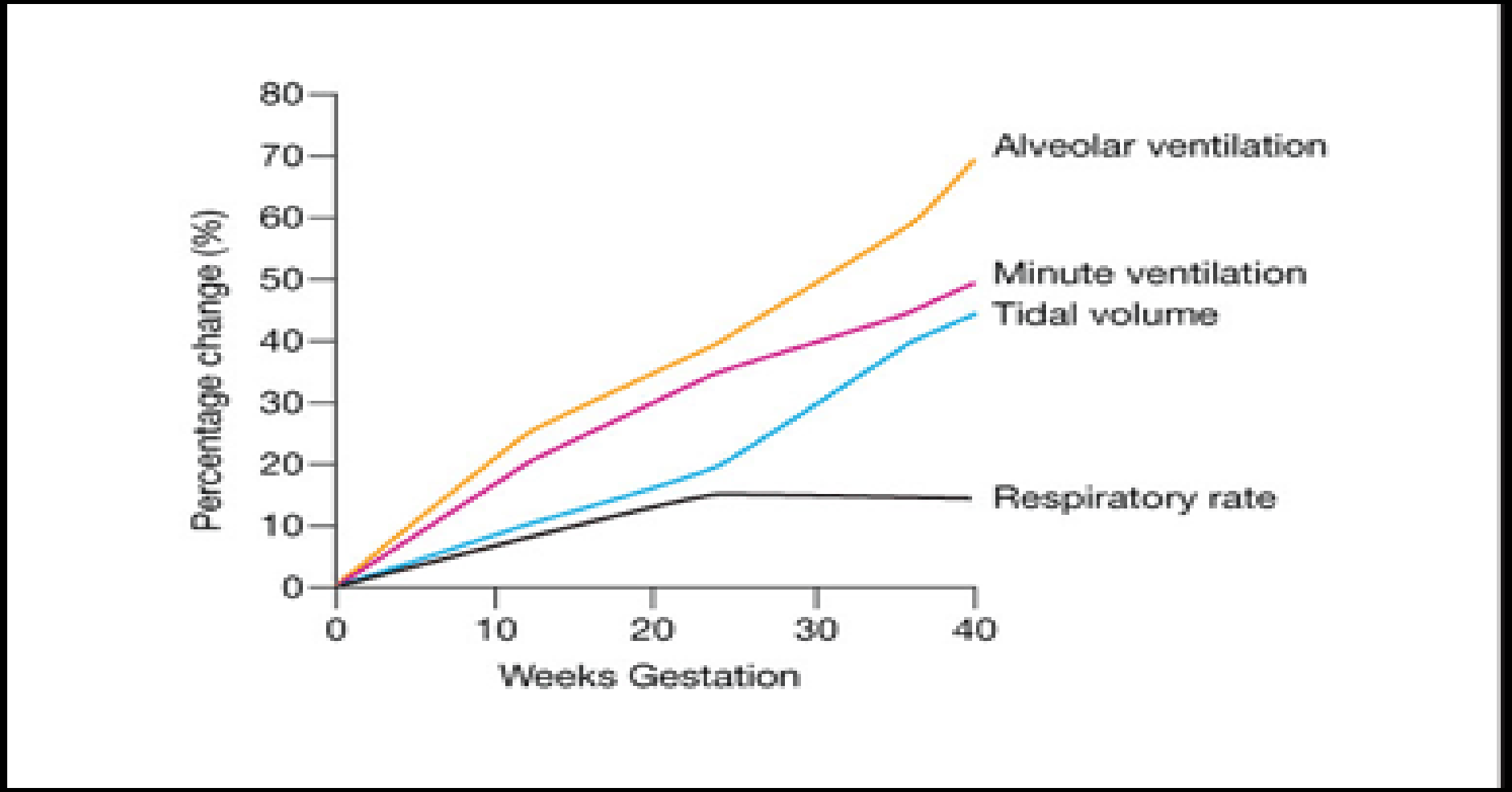
Anatomical and Physiological changes

- Difficult airway
- Aspiration risk
- Remember the TILT!

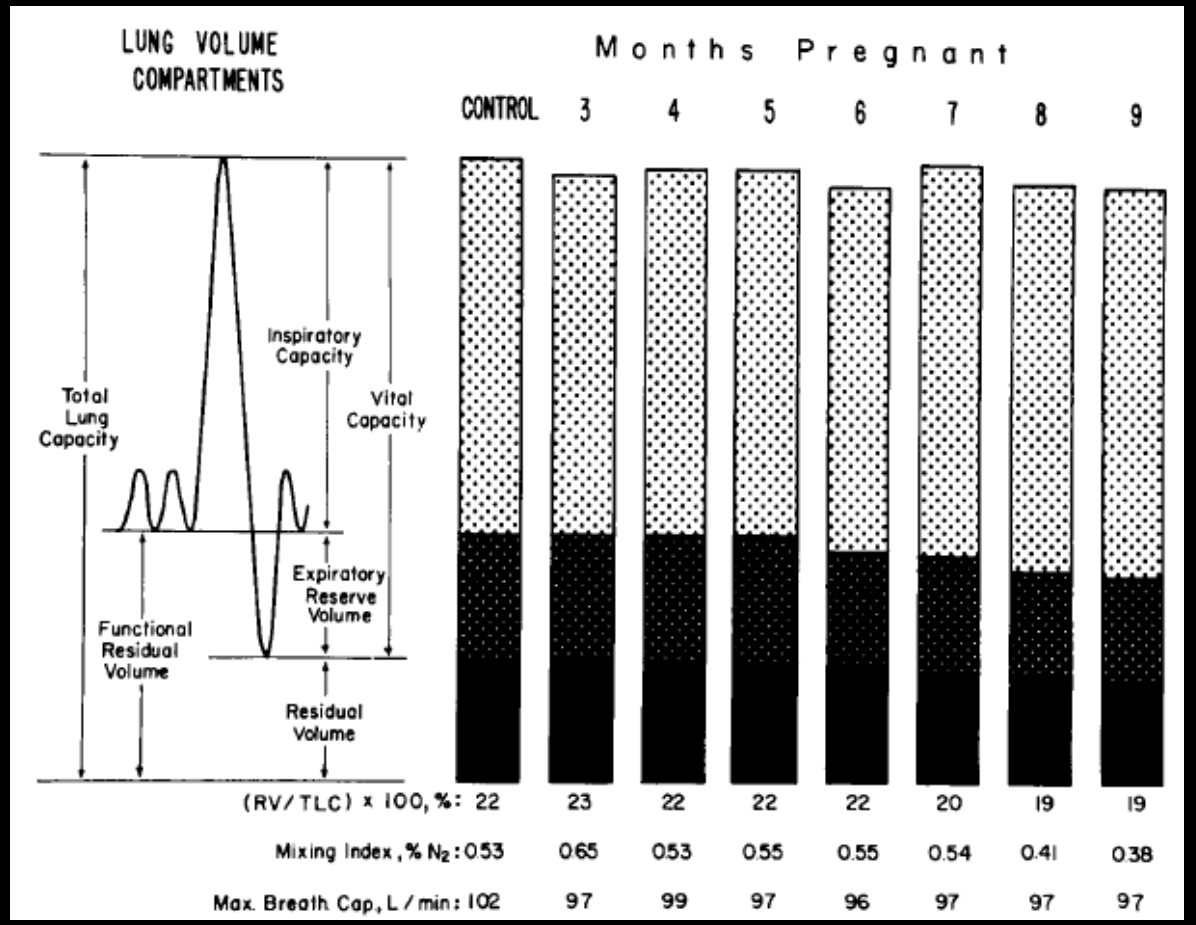
- What is good for the mother is generally good for the foetus

- Mother is the priority!

Respiratory changes



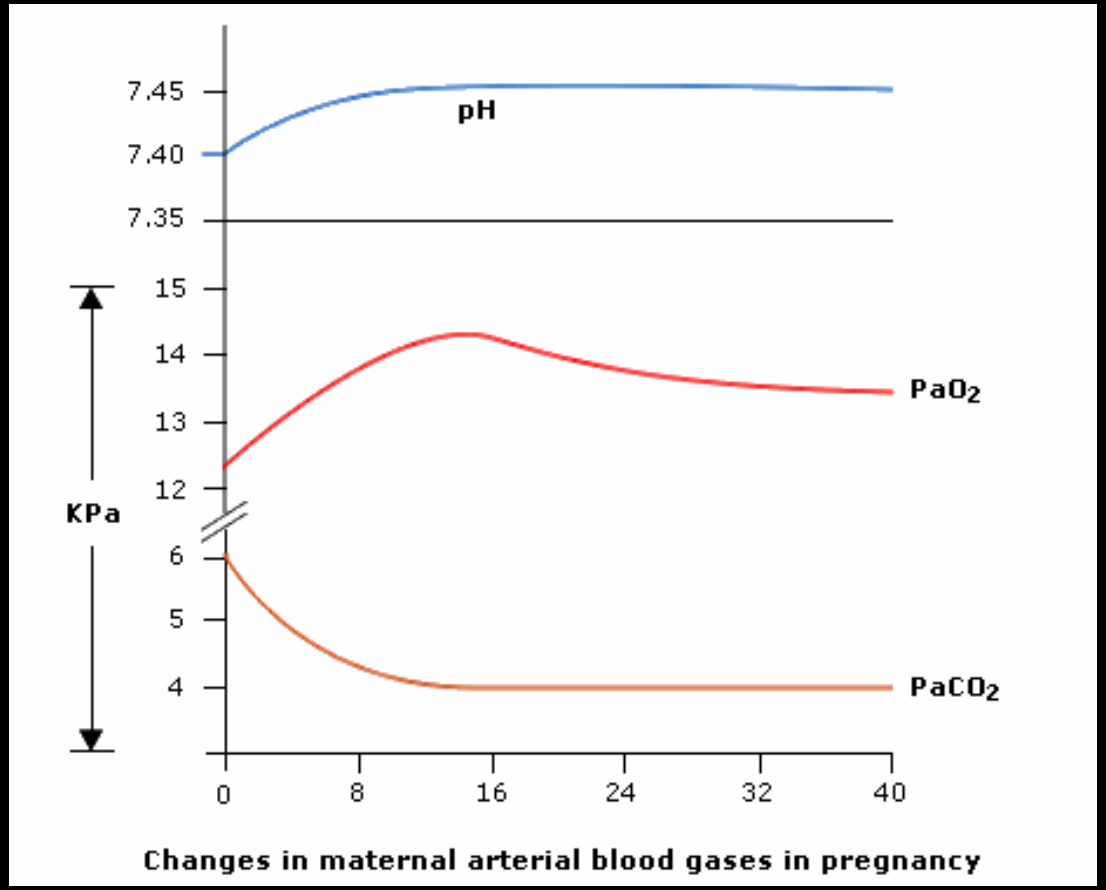
Respiratory changes



ABG

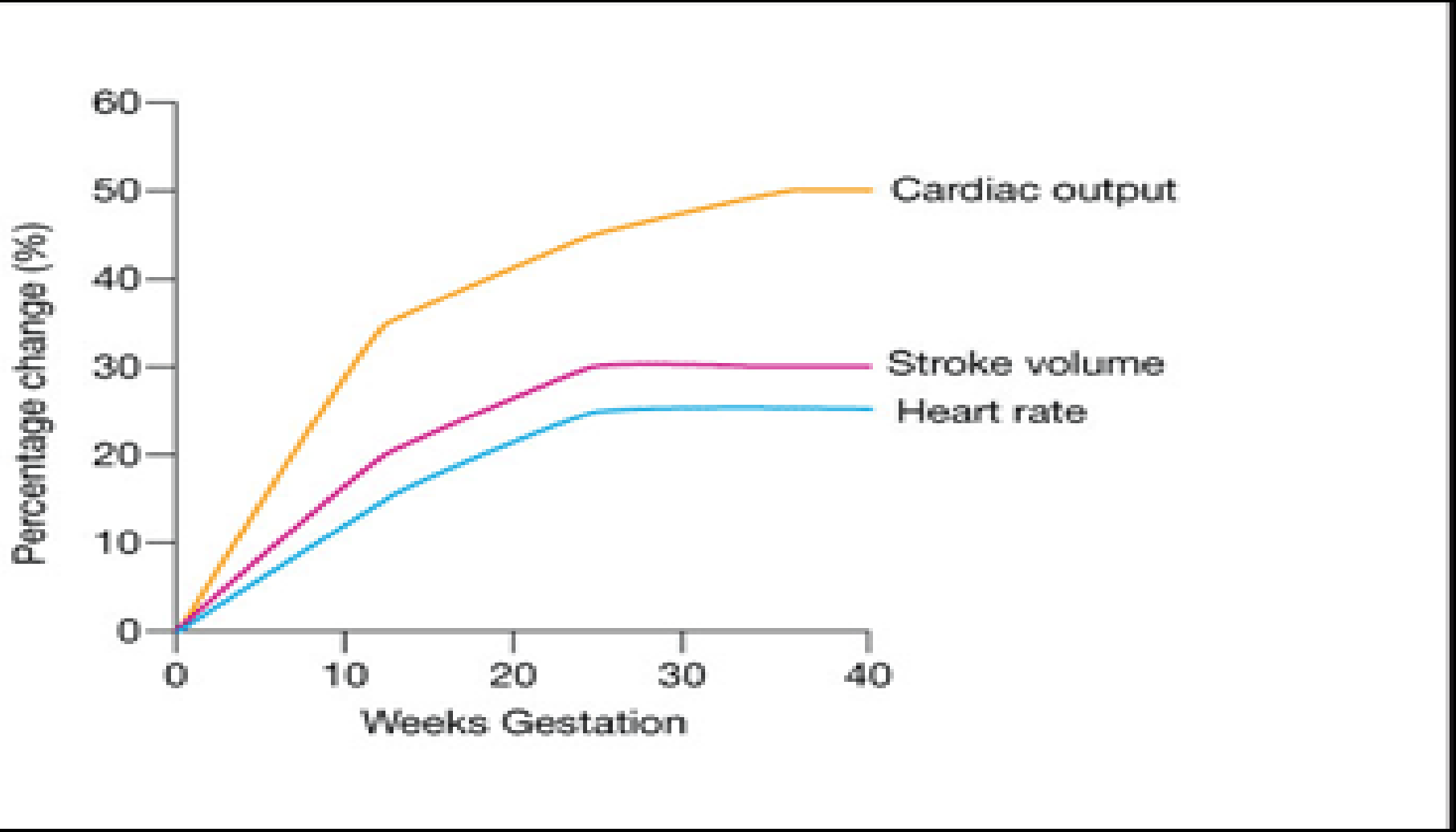
Table 1. Reference ranges for respiratory function in pregnancy

	Normal values	
Investigations	*Pregnant*	*Non-pregnant*
pH	7.40–7.47	7.35–7.45
pCO_2, mmHg (kPa)	≤ 30 (3.6–4.3)	35–40 (4.7–6.0)
pO_2, mmHg (kPa)	100–104 (12.6–14.0)	90–100 (10.6–14.0)
Base excess	No change	+2 to –2
Bicarbonate (mmol/l)	18–22	20–28

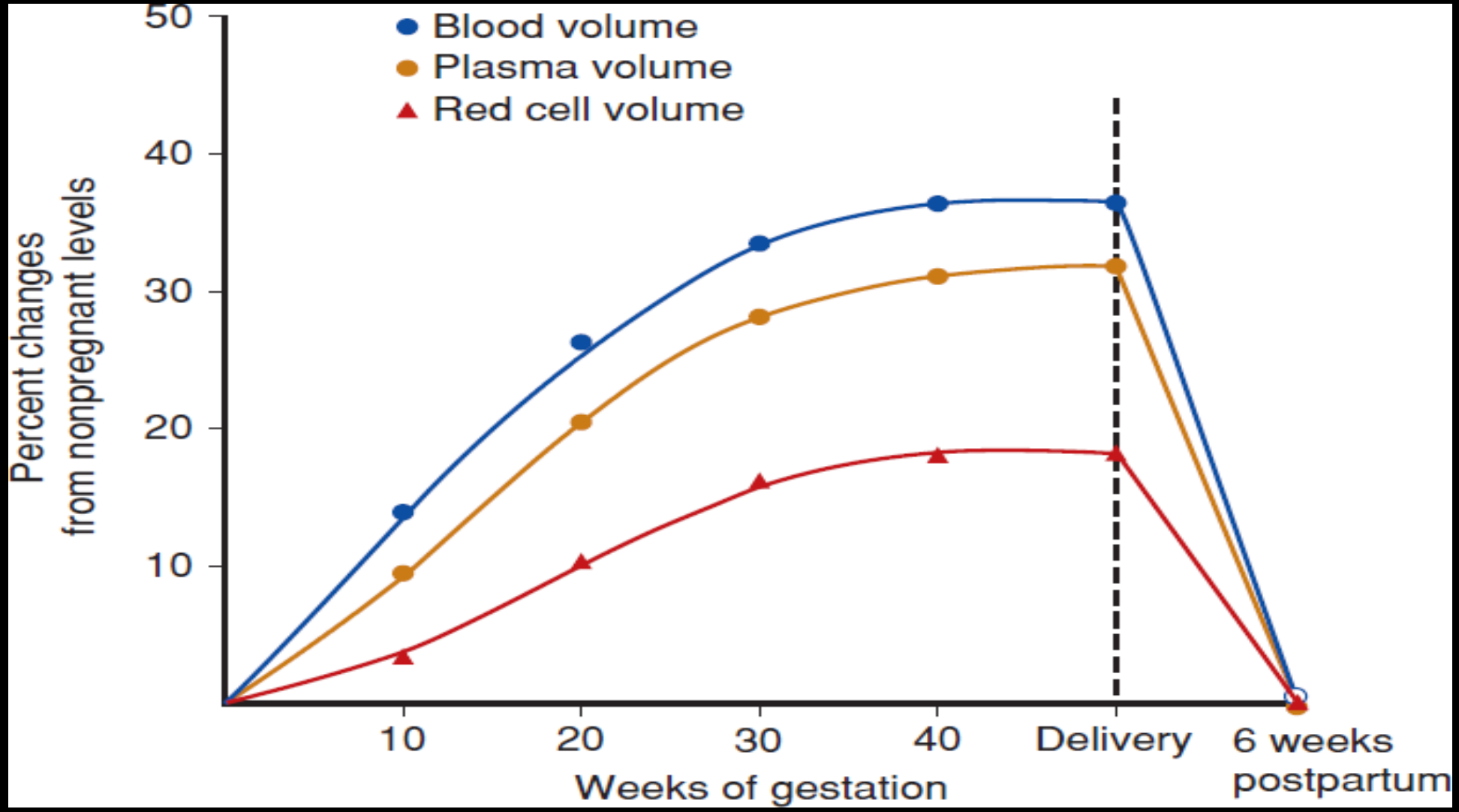


Changes in maternal arterial blood gases in pregnancy

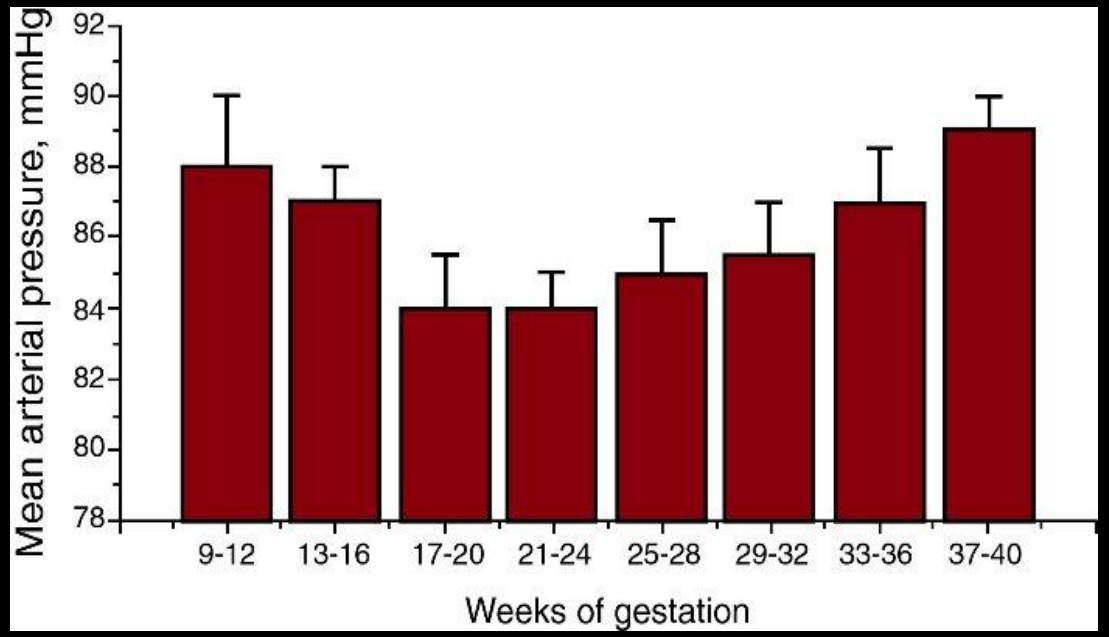
Cardiovascular changes

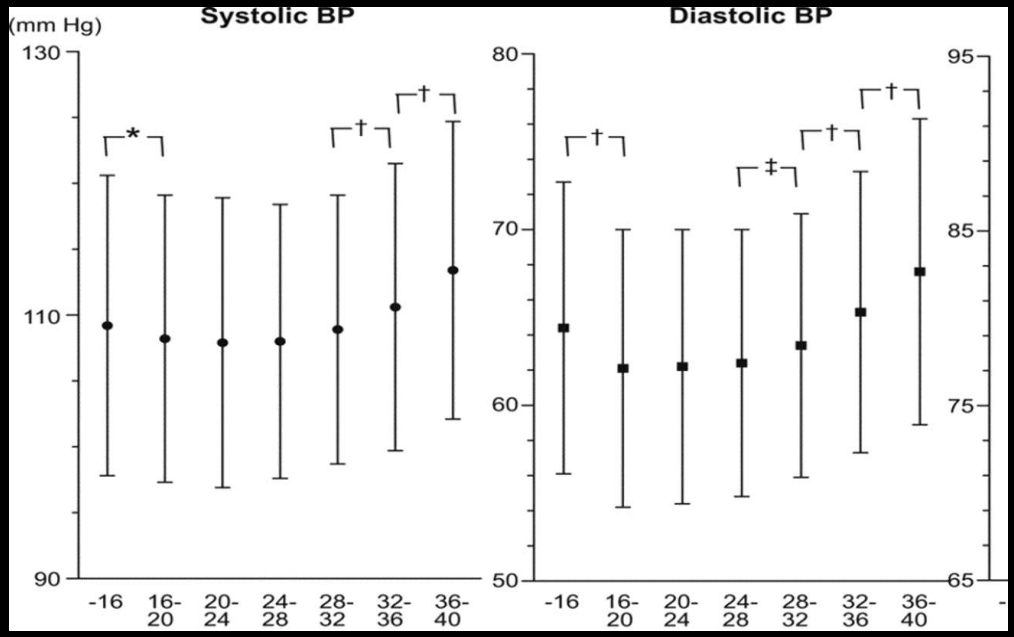


Haematological changes

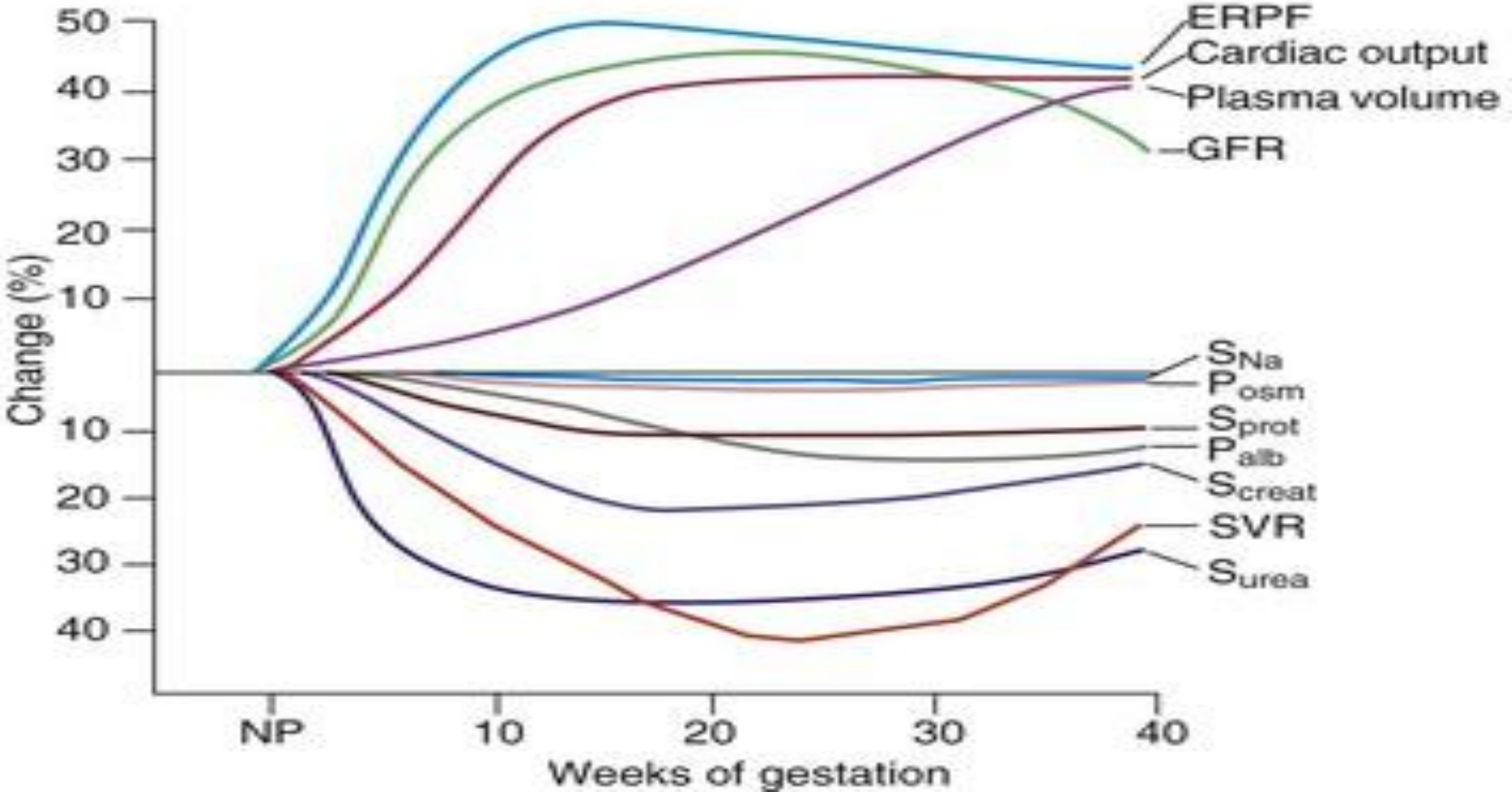


BP during pregnancy





Hemodynamic and Biochemical Changes in Normal Pregnancy



Pregnancy specific conditions

- Preeclampsia and eclampsia
- HELLP/AFLP
- Haemorrhage
- Peripartum cardiomyopathy
- Amniotic fluid embolus

Preeclampsia

- SBP ≥ 140; DBP ≥ 90
- 2 separate occasions – 4 hours apart (Or ≥160/110 one reading)
- After 20 weeks gestation
- Previously normotensive

- AND

Proteinuria >300mg in 24 hours

(≥ 1+ on dipstick)

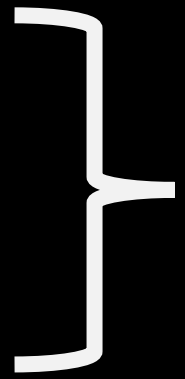
AND / OR

- New onset hypertension with new organ dysfunction (Severe Pre-eclampsia)

  - Platelets <100000
  - Creat > 1.1 (doubling of creat)
  - Transaminases at least doubled
  - Pulmonary oedema
  - Cerebral or visual symptoms

Spectrum

- Hypertension
- Proteinuria
- Organ dysfunction



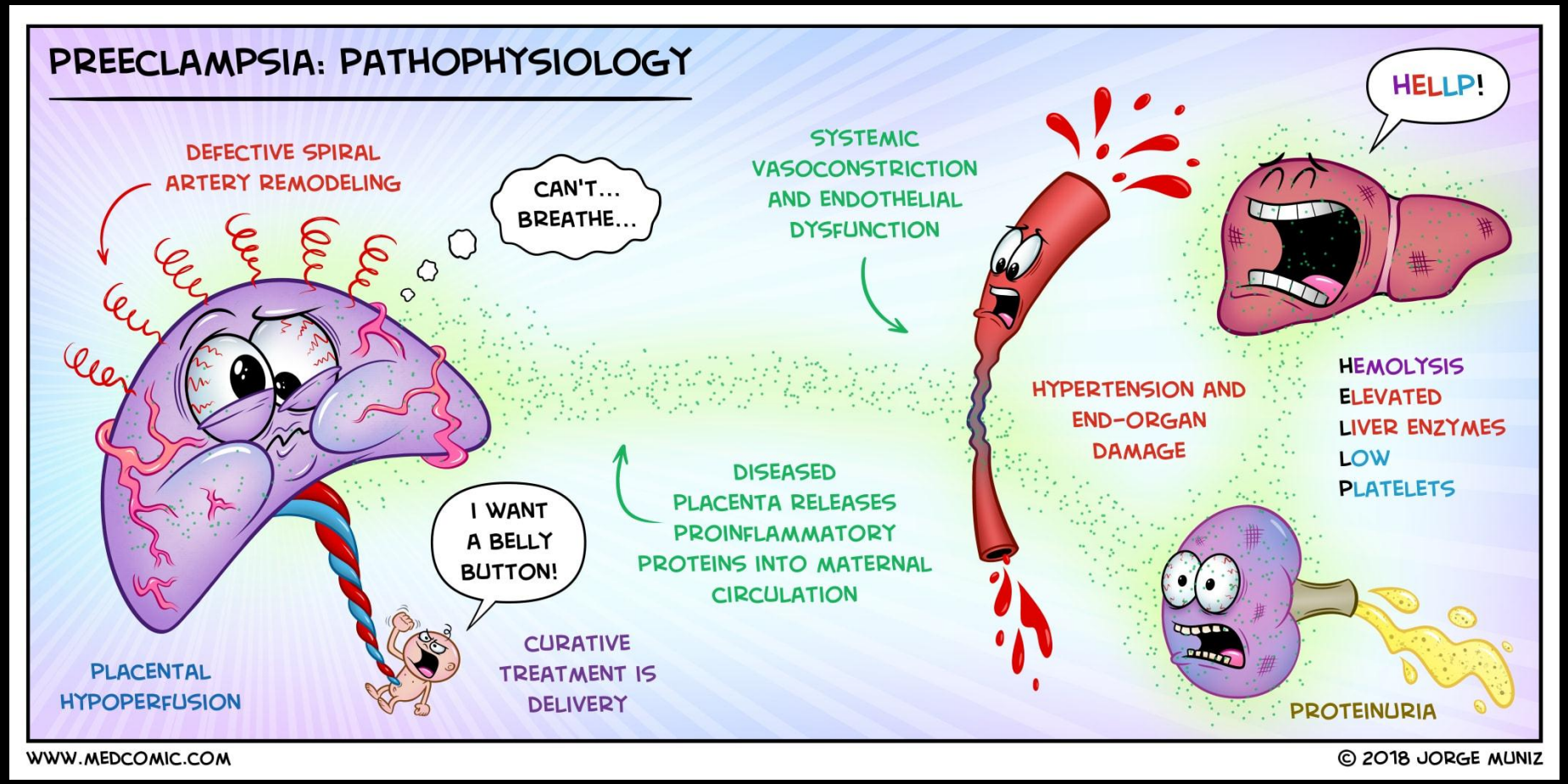
Preeclampsia

+

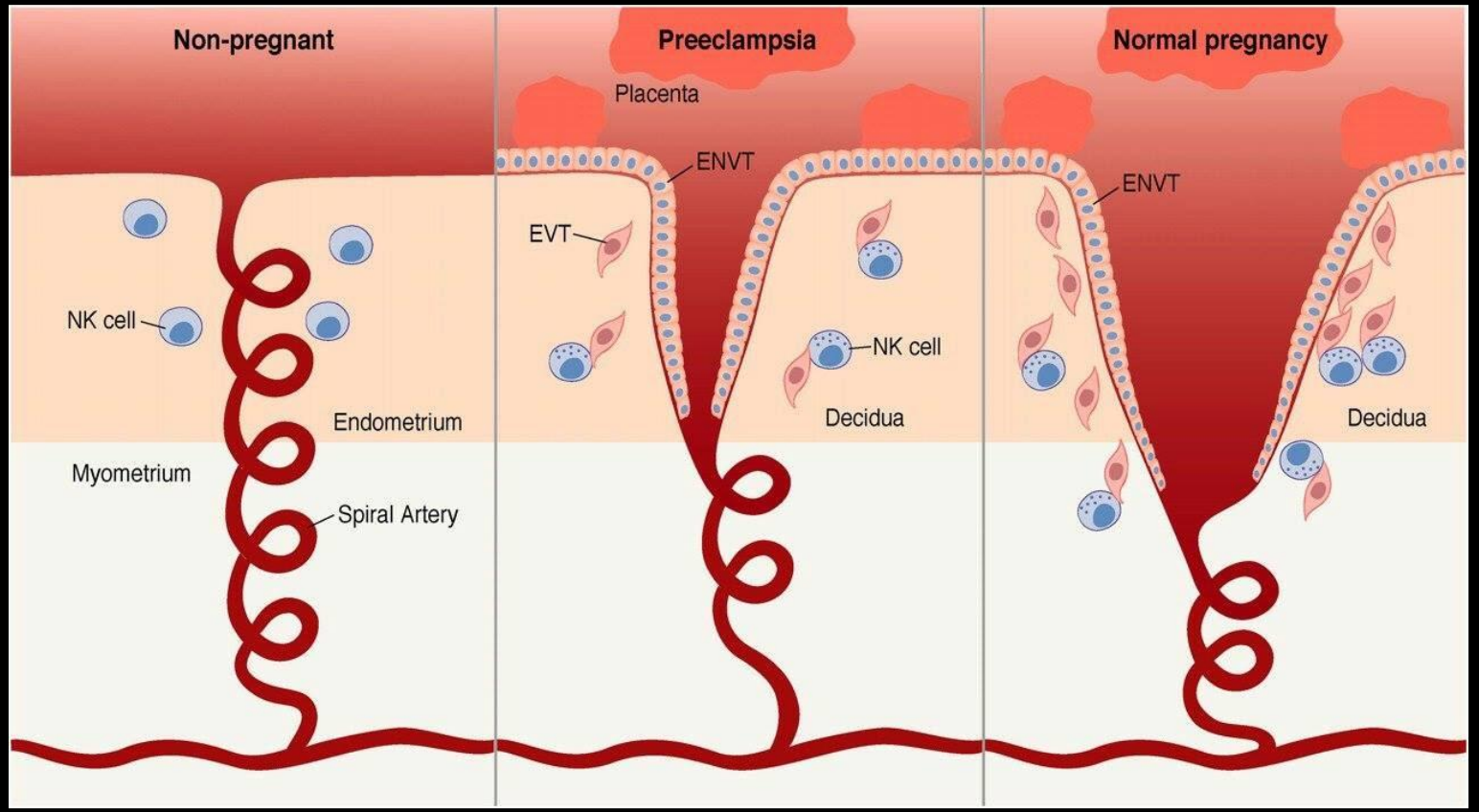
- Seizures

Eclampsia (greatest risk – just before delivery to 24 hours after)

Pathophysiology



Spiral artery remodeling defect



Preeclampsia - Presentation

- Hypertension
- Headache
- Pulmonary oedema and respiratory failure
- Renal dysfunction
- Coagulopathy
- Right UQ pain secondary to bleeding under the liver capsule
- Liver dysfunction

- HELLP (discuss)

Eclampsia

- 38% antenatal
- 18% intrapartum
- 44% postpartum
- 20% no PET
- Cause for seizure unclear
  - Cerebral overregulation results in vasospasm of cerebral arteries, underperfusion, localized ischemia/infarction and cytotoxic (intracellular) edema
  - Loss of autoregulation of cerebral blood flow in response to high systemic pressure (ie, hypertensive encephalopathy) results in hyperperfusion, endothelial damage, and vasogenic (extracellular) edema (PRES).

Treatment

- BP control
  - Labetalol, Nifedipine, Hydralazine, NTG, Methyldopa
- Watch for pulmonary oedema and be cautious with fluids
- Monitor UO
- Delivery of the foetus

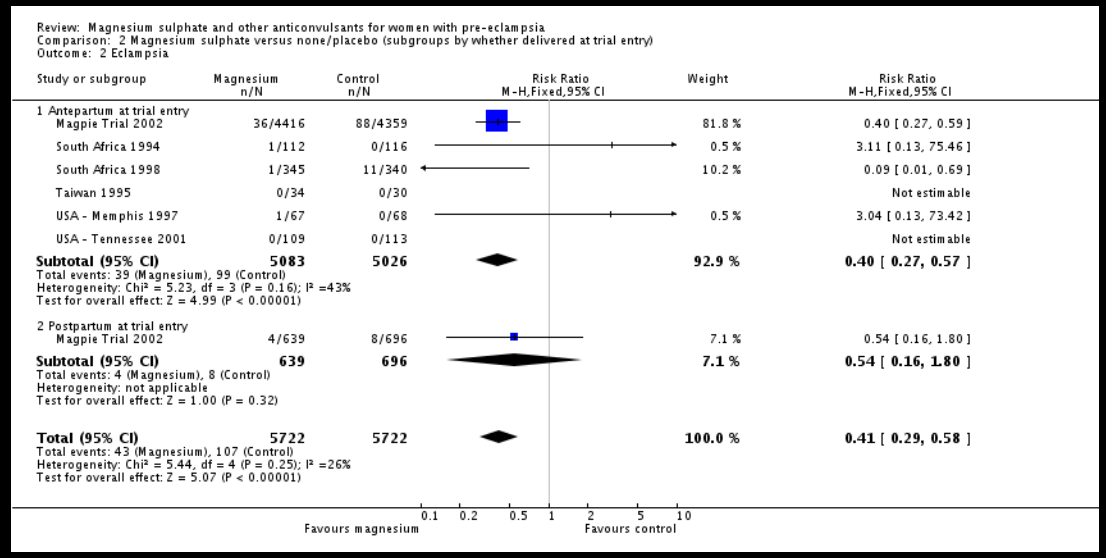
$MgSO_4$ – Seizure prophylaxis

- All pregnant women with preeclampsia
- At the onset of labour and continued post-partum
- A standard prophylactic and therapeutic MgSO4 regime includes:
  - Loading dose of 4-6 g over 15 min intravenously
  - Maintenance infusion of 1-2 g/hr
  - Target serum concentration of magnesium: 2-3.5 mmol/L (4.8–8.4 mg/dL)
- Monitoring of magnesium levels
- Most centres continue MgSO4 therapy for at least 24 hours post-partum
- MAGPIE trial

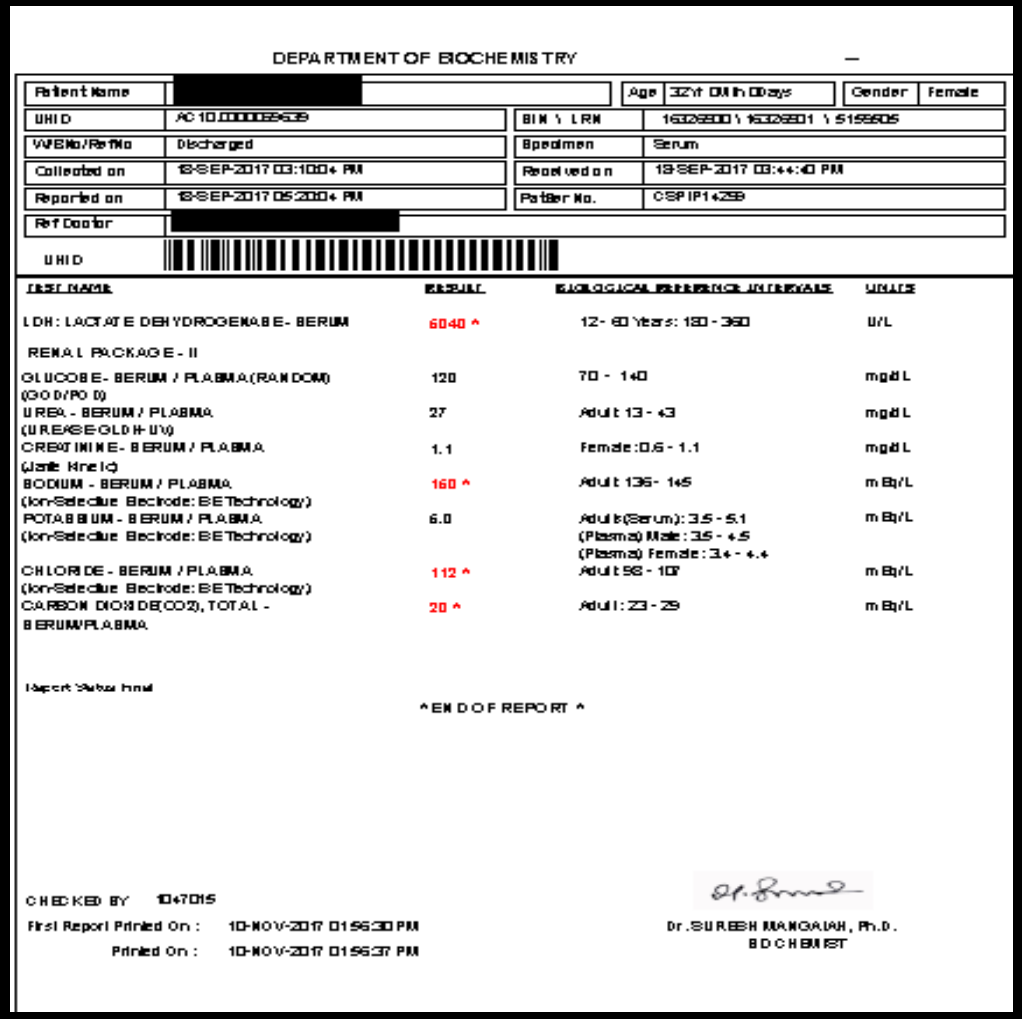
MAGPIE trial Lancet 2002

2010 Cochrane review

- 10,000 patients
- 33 countries
- Women allocated magnesium sulphate had a 58% lower risk of eclampsia than those allocated placebo



HELLP



DEPARTMENT OF BIOCHEMISTRY

Patient Name	[redacted]		Age	32Yr 0Mth 0Days	Gender: Female
UHID	AC10.0000069639		BIN \ LRN	16326800 \ 16326801 \ 5156605	
W/BNo/RefNo	Discharged		Specimen	Serum	
Collected on	18-SEP-2017 03:10:04 PM		Received on	18-SEP-2017 03:44:40 PM	
Reported on	18-SEP-2017 05:20:04 PM		Patser No.	CSPIP14299	
Ref Doctor	[redacted]				
UHID	[redacted]				

TEST NAME	RESULT	BIOLOGICAL REFERENCE INTERVALS	UNITS
LDH: LACTATE DEHYDROGENASE- SERUM	6040 ^	12- 60 Years: 180 - 360	U/L
RENAL PACKAGE - II			
GLUCOSE- SERUM / PLASMA(RANDOM) (GOD/POD)	120	70 - 140	mg/dL
UREA - SERUM / PLASMA (UREASE/GLDH-UV)	27	Adult 13 - 43	mg/dL
CREATININE- SERUM / PLASMA (Jaffe Kinetic)	1.1	Female:0.6 - 1.1	mg/dL
SODIUM - SERUM / PLASMA (Ion-Selective Electrode: BETechnology)	160 ^	Adult 136- 145	mEq/L
POTASSIUM - SERUM / PLASMA (Ion-Selective Electrode: BETechnology)	6.0	Adult(Serum): 3.5 - 5.1 (Plasma) Male: 3.5 - 4.5 (Plasma) Female: 3.4 - 4.4	mEq/L
CHLORIDE - SERUM / PLASMA (Ion-Selective Electrode: BETechnology)	112 ^	Adult 98 - 107	mEq/L
CARBON DIOXIDE(CO2), TOTAL - SERUM/PLASMA	20 ^	Adult: 23 - 29	mEq/L

Report Status Final

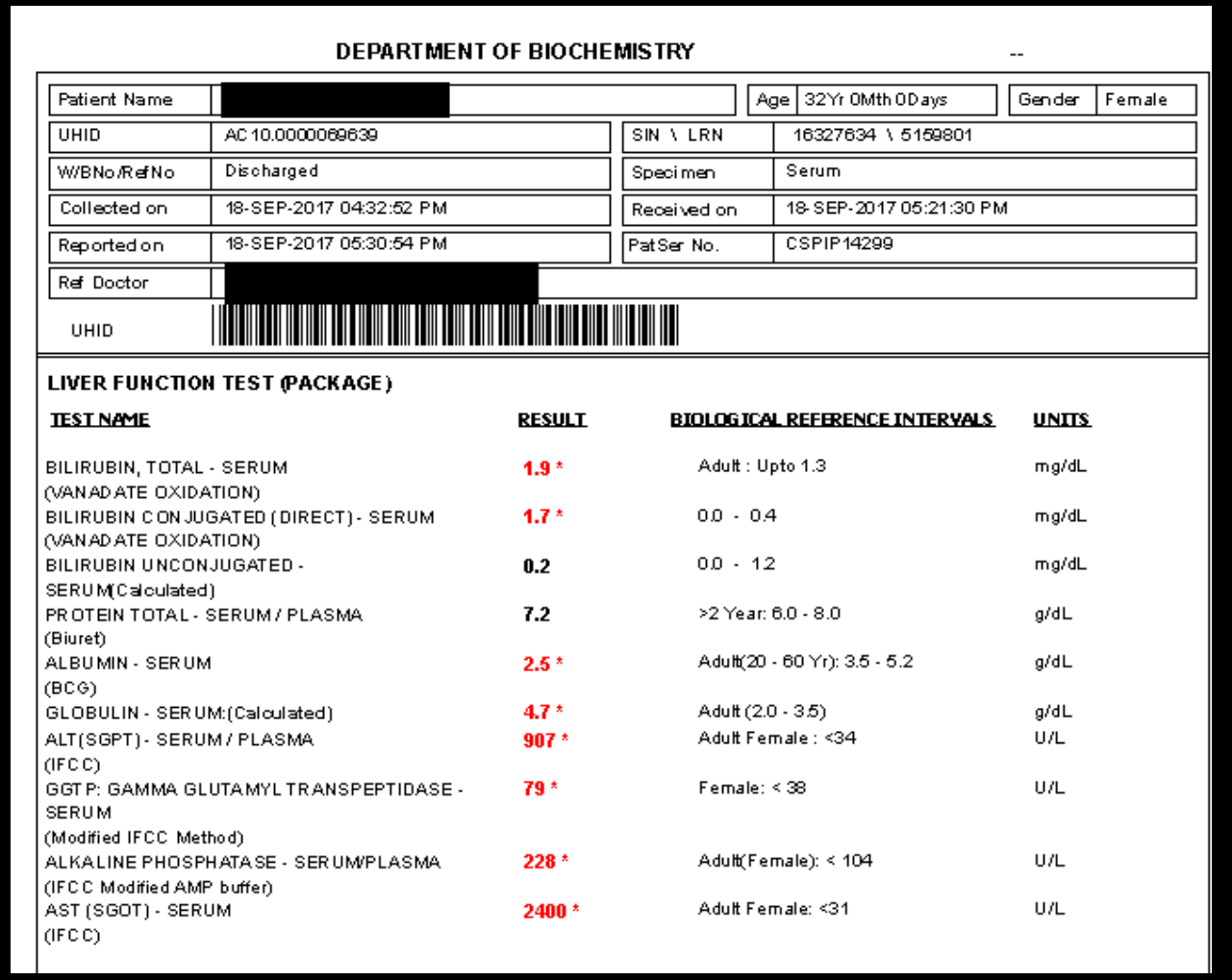
^ END OF REPORT ^

CHECKED BY 1047015

First Report Printed On : 10-NOV-2017 01:56:30 PM

Printed On : 10-NOV-2017 01:56:37 PM

Dr.SURESH MANGALAH, Ph.D.
BIOCHEMIST



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Patient Name	[redacted]		Age	32Yr 0Mth 0Days	Gender: Female
UHID	AC10.0000069639		SIN \ LRN	16327634 \ 5159801	
W/BNo/RefNo	Discharged		Specimen	Serum	
Collected on	18-SEP-2017 04:32:52 PM		Received on	18-SEP-2017 05:21:30 PM	
Reported on	18-SEP-2017 05:30:54 PM		PatSer No.	CSPIP14299	
Ref Doctor	[redacted]				
UHID	[redacted]				

LIVER FUNCTION TEST (PACKAGE)

TEST NAME	RESULT	BIOLOGICAL REFERENCE INTERVALS	UNITS
BILIRUBIN, TOTAL - SERUM (VANADATE OXIDATION)	1.9 *	Adult : Upto 1.3	mg/dL
BILIRUBIN CONJUGATED (DIRECT) - SERUM (VANADATE OXIDATION)	1.7 *	0.0 - 0.4	mg/dL
BILIRUBIN UNCONJUGATED - SERUM(Calculated)	0.2	0.0 - 1.2	mg/dL
PROTEIN TOTAL - SERUM / PLASMA (Biuret)	7.2	>2 Year: 6.0 - 8.0	g/dL
ALBUMIN - SERUM (BCG)	2.5 *	Adult(20 - 60 Yr): 3.5 - 5.2	g/dL
GLOBULIN - SERUM:(Calculated)	4.7 *	Adult (2.0 - 3.5)	g/dL
ALT(SGPT) - SERUM / PLASMA (IFCC)	907 *	Adult Female : <34	U/L
GGTP: GAMMA GLUTAMYL TRANSPEPTIDASE - SERUM (Modified IFCC Method)	79 *	Female: < 38	U/L
ALKALINE PHOSPHATASE - SERUM/PLASMA (IFCC Modified AMP buffer)	228 *	Adult(Female): < 104	U/L
AST (SGOT) - SERUM (IFCC)	2400 *	Adult Female: <31	U/L

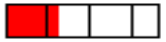
HELLP

- 20% of Preeclamptics
- 0.1 to 0.2% of pregnancies
- Criteria:
  - Microangiopathic hemolytic anemia
  - Platelet count ≤100,000 cells/microL.
  - Total bilirubin ≥1.2 mg/dL.
  - Serum AST >2 times upper limit of normal (it is a single test that reflects both hepatocellular necrosis and red cell hemolysis)
- Steroids do not resolve HELLP
  - Dexamethasone MAY be used before 34 weeks
- Early Delivery

AFLP

- 1 in 7000 to 1 in 20,000 deliveries.
- Multiple gestations and possibly in women who are underweight.
- Characterized by microvesicular fatty infiltration of hepatocytes, is a disorder which is unique to human pregnancy
- Typically occurs in 3rd trimester
- Symptoms - nausea or vomiting , epigastric pain anorexia, and jaundice
- Labs:
    - Elevated serum aminotransferases (upto 1000)
    - Elevated bilirubin, serum ammonia, PT/INR
    - Hypoglycemia
- Large clinical overlap between AFLP and HELLP syndrome and it may be difficult, even impossible, to differentiate them
- Can progress to fulminant liver failure
- Can recur in subsequent pregnancies

LFTs in pregnancy

Disease	Trimester	Laboratory studies		Differential diagnosis	Prognosis
	1 2 3 PP	Aminotransferase levels (int. unit/L)	Other findings		
Hyperemesis gravidarum		Mean ALT: 45 may be normal or >500	Bilirubin usually normal	Gastroenteritis, cholecystitis, hepatitis, peptic ulcer disease, pancreatitis, appendicitis, diabetic ketoacidosis, hyperthyroidism, drug toxicity	No maternal or fetal mortality; may recur with subsequent pregnancies
HELLP syndrome		AST >70, marked elevations in the setting of hepatic infarction	Platelets <100,000/mm^3 LDH >600 int. units/L	Acute fatty liver of pregnancy, gastroenteritis, hepatitis, appendicitis, cholelithiasis, immune thrombocytopenia, hemolytic uremic syndrome	Maternal mortality is low, but complication rates are high; fetal mortality may be as high as 35%; recurs in 3 to 27% of subsequent pregnancies
Intrahepatic cholestasis of pregnancy		ALT/AST are usually <500; occasionally they are >1000	Bile acid concentration elevated	Cholelithiasis, viral hepatitis, primary biliary cirrhosis, drug hepatotoxicity, urinary tract infection. Urinary tract infection or other sepsis may either cause or worsen cholestasis.	No maternal mortality; associated with premature delivery and stillbirth (fetal mortality 1 to 2%); recurs in 60 to 70% of subsequent pregnancies
Acute fatty liver of pregnancy		Modest elevations, up to 500 int. unit/L	Elevated WBC count Elevated INR Decreased platelets Decreased glucose Elevated uric acid Elevated ammonia	HELLP syndrome, drug toxicity, fulminant viral hepatitis	Maternal and fetal mortality is low if prompt stabilization and delivery; recurrence may be seen in subsequent pregnancies

PPH

PPH (Atony, trauma, coagulopathy)

- Resuscitation
- Thorough check
- Drugs
- Interventional radiology
- Hysterectomy

- Difficulties (estimation, physiologic changes etc)

Lancet May 2017

Effect of early tranexamic acid administration on mortality, hysterectomy, and other morbidities in women with post-partum haemorrhage (WOMAN): an international, randomised, double-blind, placebo-controlled trial

Lancet 2017; 389: 2105–16

Peripartum Cardiomyopathy

- Cardiomyopathy developing in the last month of gestation or in the first 5 months post- partum period without an identifiable cause
- 1: 3500 but associated with 20-50% mortality
- Presentation similar to LV systolic failure
- Avoid ACE-I , usually hydralazine, nitrates and digoxin used
- ACE-I can be used in the post partum phase
- About half the women recover normal LV function within 6 months
- Persistence of LV dysfunction is associated with poor prognosis

Amniotic fluid embolism

- Rare (3.3 per 100000 deliveries)
- High mortality (15-85%)
- 50% die in the first hour
- Placental membrane tear – torn uterine vein
- Lanugo, vernix and fluid enters maternal circulation
- Hypertonic uterus? Oxytocin?
- Any type of delivery
- Advanced age

- Collapse during delivery or shortly after
- MSOF incl. ARDS and severe DIC (manage accordingly)

Radiological imaging - Principles

- Maternal benefit outweighs potential foetal risk.
- Do not withhold any investigation that may have maternal benefit because of concern about potential harmful fetal effects.
- Avoid unnecessary routine imaging
- Limit fetal radiation by applying a lead apron to the maternal abdomen.
- Consider alternate investigations i.e. MRI

Radiological imaging

- The risk of teratogenesis is greatest from week 1-15 of gestation.
- Exposure to ionising radiation is expressed in terms of the rad and fetal exposure to <5 rad is considered safe.

	Fetal dose (millirad)
Chest X Ray	<1
CT Thorax	30-1300
CT Abdomen	250
CT Brain	<1000
CTPA	<50

Drugs

- A&B – No risk
- C – Inconclusive evidence – Maternal benefit > fetal harm
  - Norad, adrenaline, digoxin etc
- D – Fetal risk, but use if maternal benefit > fetal harm
  - Fluconazole, Midazolam etc
- X – Contra-indicated

CPR in pregnancy

- Rate, ratio, depth – same
- Hand position
- Early intubation
- Peri-mortem section – decision within 5 minutes

Other conditions

- OHSS
- Tocolytic induced pulmonary oedema

- Dengue, H1N1, stroke (medical illnesses), Trauma

Summary

- Team work (Intensivists, obstetricians, nurses and midwives) improves outcomes
- Important to remember the physiological changes
- Be familiar with specific conditions