

# Critical Care Issues in Pregnancy

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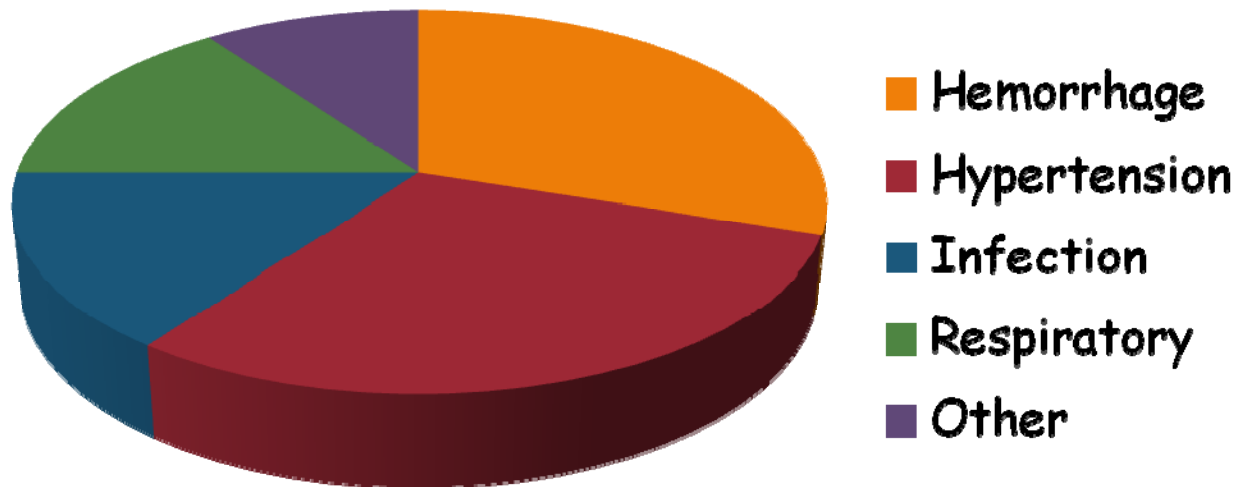


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# Epidemiology

- Approximately .1% of deliveries result in ICU admission
- Generally, 75% - 80 % are during the post-partum period



## Top causes of mortality in obstetric patients admitted to the ICU

Etiology	N (of 1354)	Percentage
Hypertension	20	21.5
Pulmonary	20	21.5
Cardiac	11	11.8
Hemorrhage	8	8.6
CNS	8	8.6
Sepsis/Infection	6	6.4
Malignancy	6	6.4



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# Critical illnesses in pregnancy

A. Conditions unique to pregnancy: account for 50-80% admissions to ICU(account for > 50% ICU admissions):

- Preeclampsia / Eclampsia
- HELLP syndrome
- Acute fatty liver of pregnancy
- Amniotic fluid embolism
- Peri-partum cardiomyopathy
- Puerperal sepsis
- Thrombotic disease
- Obstetric hemorrhage



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# Critical illnesses in pregnancy

B. Pre-existing conditions that may worsen during pregnancy (account for 20-50% ICU admissions):

- Cardiovascular: valvular disease, Eisenmenger's syndrome, cyanotic congenital heart disease, coarctation of aorta, PPH
- Renal: glomerulonephritis, chronic renal insufficiency
- Hematologic: sickle cell disease, anemia
- Liver : cirrhosis
- Endocrine: Diabetes mellitus, prolactinoma
- Rheumatologic: Scleroderma, polymyositis
- Respiratory: cystic fibrosis, lung transplant
- Neurologic: epilepsy, intracranial tumors, Masthenia gravis, Multiple sclerosis.



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# Critical illnesses in pregnancy

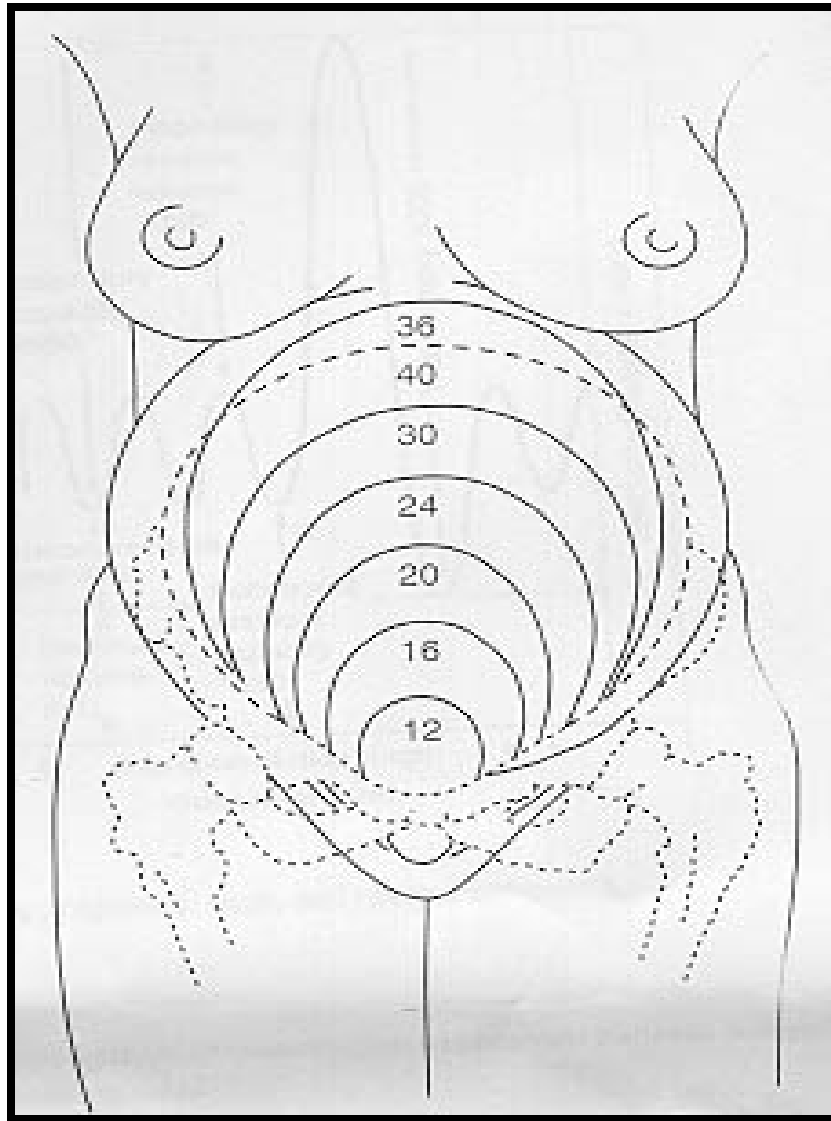
## C. Conditions unrelated to pregnancy:

- Trauma, Burns
- Infections
- ARDS
- Bronchial asthma



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## Anatomic Changes in Pregnancy

- during 2nd trimester, fetus cushioned by amniotic fluid
- during 3rd trimester, uterus thinned
- ↑ uterine blood flow 2° to venous dilatation



# Physiologic Changes - cardiovascular

- ↑ pulse
- ↓ blood pressure
- ↑ plasma volume
- 35% maternal blood loss before manifestation of shock
- supine hypotensive syndrome
- ↑ cardiac index
- ↓ SVR
- ↑ oxygen consumption
- due to prostaglandins, progestin, changes in intracellular calcium & cyclic nucleotides



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# Physiologic Changes - hematopoetic

- ♦ erythroid hyperplasia
- ♦ moderate leukocytosis
- ♦ ↑ factors VII, VIII, IX, X, fibrinogen

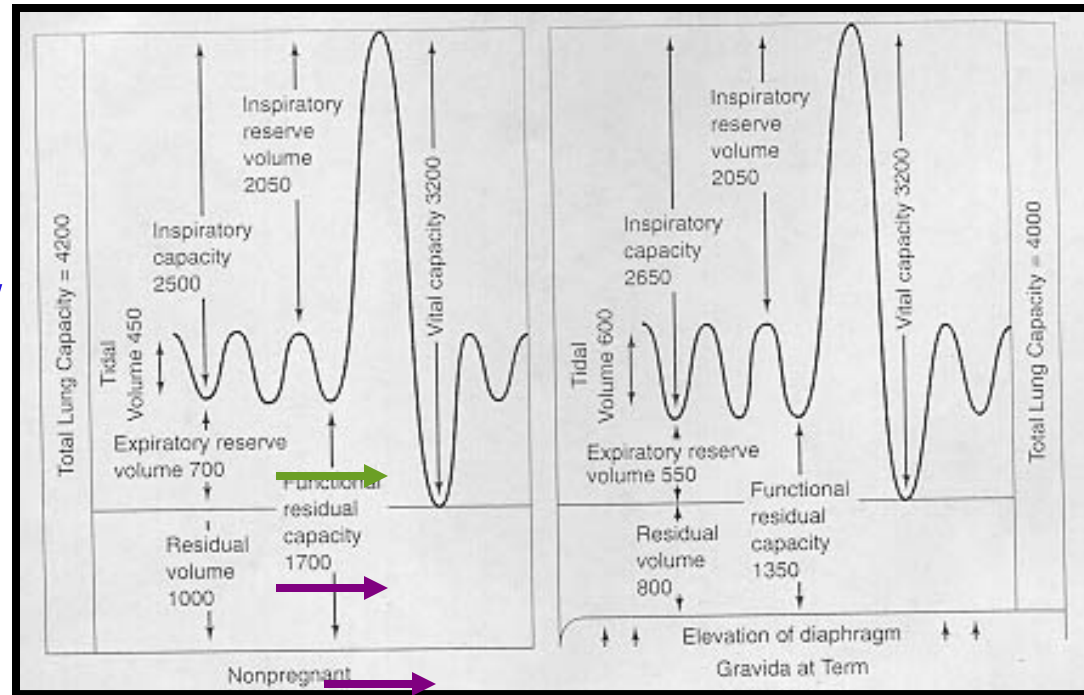


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# Physiologic Changes - respiratory

- Elevated diaphragm
- $\uparrow V_E, V_T, RR$
- $\downarrow$  FRC 2° to expiratory reserve and residual volumes



# Physiologic Changes - GI

- ◆ ↓ motility, secretion & nutrient absorption
- ◆ ↓ LES competence
- ◆ ↑ acid and enzyme production
- ◆ organ displacement
- ◆ abnormal LFTs
- ◆ impaired gallbladder contraction, bile stasis,  
↑ cholesterol saturation □ gallstones



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# Physiologic Changes - renal

- ◆  $\uparrow$  GFR
- ◆  $\uparrow$  renal blood flow
- ◆  $\downarrow$  BUN, creat
- ◆ renal enlargement
- ◆ hydronephrosis / hydroureter



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# Physiologic Changes - endocrine

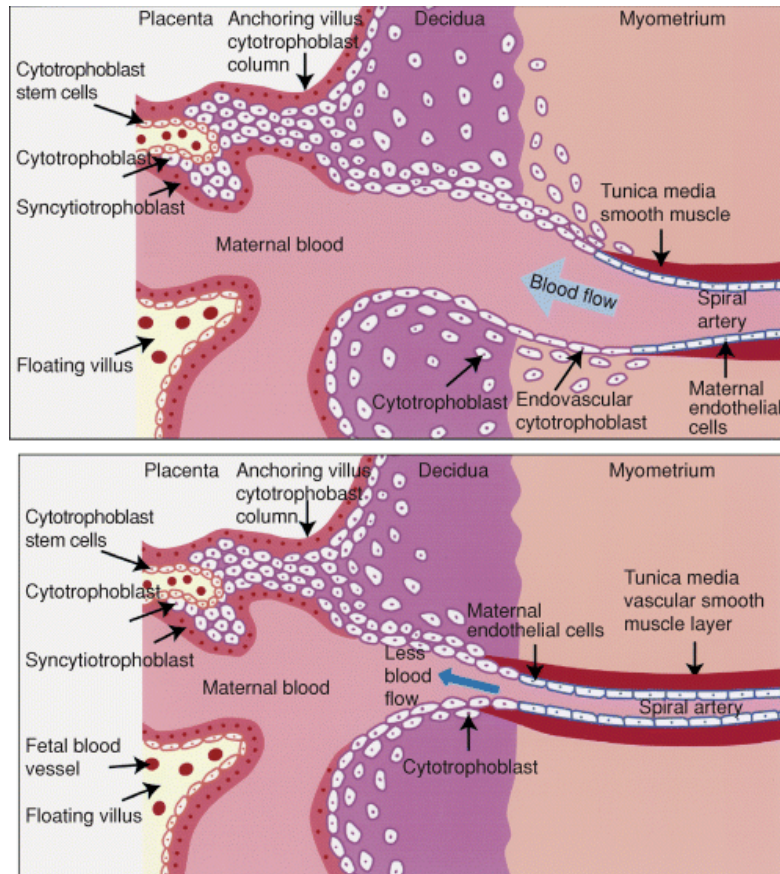
- ◆ pituitary gland enlargement
- ◆ ↓ glucose utilization
- ◆ ↑ lipolysis
- ◆ ↑ peripheral resistance to insulin
- ◆ ↑ calcium reabsorption



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# Pre-eclampsia / Eclampsia



- Complicates 5-8% of pregnancies, after the 20<sup>th</sup> week of gestation
- Procoagulant and proinflammatory state cause by placental hypoperfusion.
- Trophoblast invasion is abnormal preventing appropriate increase in placental blood flow



# Pre-eclampsia / Eclampsia

- Complicates 5-8% of pregnancies, after the 20<sup>th</sup> week of gestation
- Refractory hypertension ( $>160/110$ ), proteinuria, edema,
- Generalized organ system dysfunction / failure in severe cases:  
visual disturbances, HA, seizures, encephalopathy  
pulmonary edema, aspiration  
N/V, epigastric pain due to hepatic capsule distension / hematoma  
thrombocytopenia & DIC
- HELLP syndrome in 2-12% cases
- Treatment is supportive with optimization of oxygen and perfusion.  
Magnesium sulfate for prevention and treatment of seizures.  
Delivery may be indicated.



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# HELLP

- HELLP syndrome in 10-20% cases of preeclampsia
- Syndrome of hemolysis, elevated liver enzymes & low platelets
- 15% patients do not have hypertension
- Presenting symptoms: abdominal pain, nausea & malaise
- Key features: thrombocytopenia, microangiopathic anemia with schistocytes & elevated LDH as well as increased transaminases.
- Complications include hemorrhage & hepatic failure / rupture
- Treatment includes steroids & possible plasma exchange.



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# Amniotic Fluid Embolus (Anaphylactoid Syndrome of Pregnancy)

- Rare catastrophic and life-threatening complication
- Occurs due to disruption in barrier between the amniotic fluid and maternal circulation w/ amniotic fluid entering maternal circulation
- Fluid contains particulate matter, PGs, LTs & thrombokinase like molecule
- Results in PA obstruction, activation of coagulation & inflammation



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# Amniotic Fluid Embolus (Anaphylactoid Syndrome of Pregnancy)

- Characterized by cardiopulmonary collapse (>80%) & coagulopathy resembling DIC
- Signs & symptoms:
  - dyspnea with arterial hypoxemia
  - seizures, loss of consciousness
  - 1<sup>st</sup> pulmonary hypertension, then myocardial depression causing arrest
- Treatment is supportive. Bleeding may be difficult to control and may require recombinant Factor VIIa or uterine artery embolization



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# Peri-partum Cardiomyopathy

- LV failure (EF <45%) late in pregnancy & up to several months post-partum
- 1 in 1300-400 live births
- More prevalent among older women, multiparous, multiple gestations, certain countries (ie Haiti), Africa
- Etiology?: autoimmunity, toxins that trigger immune system dysfunction micronutrient deficiencies, genetics
- Signs & symptoms:  
dyspnea, edema, palpitations  
less common: liver failure, stroke



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# Peri-partum Cardiomyopathy

- Treatment: diuretics,  $\beta$ -Blockers, ACE inhibitors / ARBs. Hydralazine can be used during breast feeding.  
Anticoagulation for EF < 35%.  
LVAD or transplant.
- Prognosis: 50% of patients recover; recovery can occur years after diagnosis  
Subsequent pregnancy should be avoided if EF < 55%.  
Risk of recurrence with subsequent pregnancy in recovered patients is 21%



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# Sepsis

## Causes:

- Urinary tract & pyelonephritis
- Chorioamnionitis
- Septic abortion
- PP endometritis,
- Pelvic thrombophlebitis.

## Pathogens

- *Enterobacteriaceae*  
(*Klebsiella*, *E. coli*)
- *Streptococcus*
- Anaerobes



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# Thromboembolic Disease and Pregnancy

- Hypercoagulable state
  - increased activity of clotting factors (I, II, VII, VIII, X)
  - decreased fibrinolysis (Proteins C&S)
  - activation of platelets
- Venous Hypertension / stasis
  - progesterone increases venous capacitance
  - uterine pressure on IVC



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# Thromboembolic Disease and Pregnancy

- Incidence of DVT of 0.1-0.2%
- Symptoms are the same as non-pregnant
- Work-up:
  - D-dimers not useful
  - V/Q vs CTA
- Treatment:
  - heparin does not cross the placenta (low molecular weight preferable); coumadin which crosses the placenta contraindicated due to teratogenesis
  - thrombolysis can be used for massive embolus



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# Trauma in Pregnancy

- 1% of all trauma
- 2% of all traumatized women
- 6-7% chance of injury during pregnancy
- 1/3 occurs in each trimester
- 20% due to assaults



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# Trauma in Pregnancy

- leading cause of maternal death
- 25% maternal mortality
- 60% fetal mortality
- 80% fetal mortality with maternal shock



## 1° survey

- same as in non-pregnant patient
- delayed signs of shock
- fetal oxygenation depends on circulation.

## 2° survey

- vaginal bleeding
- ruptured membranes
- bulging perineum
- presence of contractions
- abnormal fetal heart tones
- Kleihauer - Betke test



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# Diagnostic Modalities

## ultrasound

- identify – abruption, placenta previa, cord prolapse, oligohydramnios
- gestational age
- biophysical profile

## DPL

- supraumbilical
- open technique

## X-ray

- do what the mom needs
- $\leq 10$  rads - no  $\uparrow$  fetal abnormalities
- microcephaly most common manifestation of high dose exposure
- critical period - 1st 8 weeks
- contrast agents safe



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# Indications for cesarean section

- uncontrollable uterine hemorrhage
- irreparable uterine injury
- maternal injuries obscured by uterus
- unstable, viable fetus
- complications of pregnancy
- maternal death

Time interval	Surviving infants	Intact neurological status
0-5 min	45%	98%
6-15 min	18%	83%
16-25 min	9%	33%
26-35 min	4%	25%
36+ min	1%	0%