Management Of theCritically Ill Obstetric Patient



BY

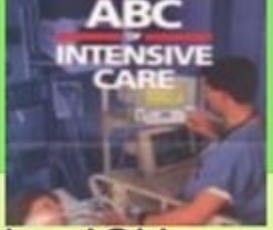
Dr.Salah Roshdy (MD)

Prof.of OB/GYN

Chief of OB/GYB

Director of Saudi Board

Introduction



- The leading obstetric causes requiring ICU admission worldwide are pre-eclampsia and haemorrhage, and tend to mirror the causes of maternal death.
- Admission rates of pregnant women to ICUs are set to rise in coming years, as increasing numbers of women are becoming pregnant with significant medical co-morbidities (such as congenital heart defects, organ transplants, and ischaemic heart disease), as both life-expectancy for these conditions and maternal age are increasing.

The following points are important when dealing with critically ill obstetric patients in general

- **Consider the normal physiological changes of pregnancy, otherwise underlying disease may be over- or under-diagnosed.**
- **If a test, treatment or procedure is necessary then it should be carried out (with appropriate protective measures), and not delayed or disregarded because the woman is pregnant.**

- **Remember that there are two patients involved, the mother and the fetus, and the optimal treatment/management for one may have adverse effects on/implications for the other.**



Why do pregnant women become critically ill?



Pregnant women can become critically ill due to a wide range of conditions, and these can be divided into four main groups:

- Specific to pregnancy: e.g.

  pre-eclampsia, acute fatty liver,

  obstetric haemorrhage, amniotic fluid embolus,and peripartum cardiomyopathy.

- Increased susceptibility in pregnancy: e.g. venous thromboembolism, aspiration syndromes.
- Underlying medical condition that is exacerbated by pregnancy: e.g.

  congenital heart disease,

  pulmonary hypertension, and

  chronic renal failure.

- **Unrelated to pregnancy and coincidently developed during pregnancy: e.g.**

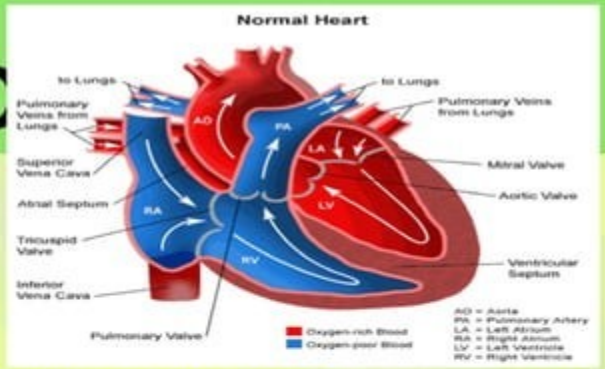
  diabetic ketoacidosis,

  pneumonia, and

  asthma.

Physiological changes in pregnancy





- Increased cardiac output, stroke volume, and heart rate.
- Decreased systemic and pulmonary vascular resistance.
- Decreased BP in first and second trimesters, but rises again in third trimester.
- No change in PAOP and CVP.
- Decreased serum colloid osmotic pressure (COP) and COP:PAOP ratio.

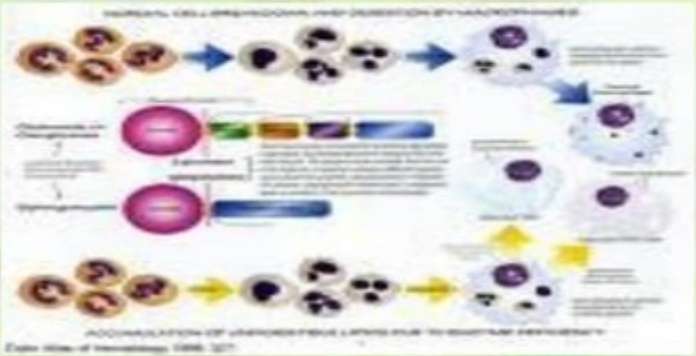
Respiratory

- Increased oxygen consumption and demand, and metabolic rate.
- Increased tidal and minute volume, but no change in respiratory rate.
- Respiratory alkalosis (decreased $PaCO_2$ and increased PaO_2).
- Decreased functional residual capacity but no change in vital capacity.
- Laryngeal oedema.



Haematological

- Increased plasma volume.
- Haemodilutional anaemia.
- Hypercoagulable state.
- Fall in platelet count.



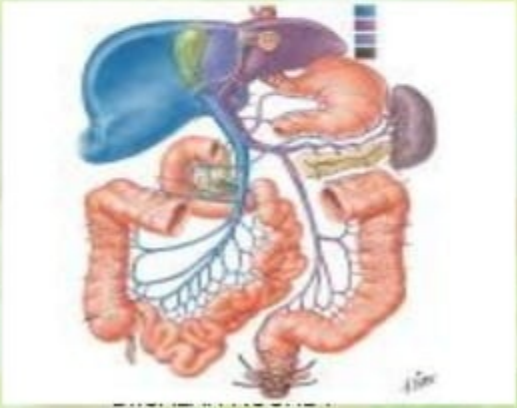
Renal



- Hydronephrosis.
- Increased renal plasma flow, glomerular filtration rate (GFR), creatinine clearance.
- Proteinuria (<300 mg/24 h).
- Reduced excretion of sodium and water load with resultant peripheral oedema.

Gastrointestinal and liver

- Reduced gastrointestinal motility and increased risk of aspiration.
- Increased liver metabolism.







Multi-organ critical illness disease states

ARDS

ARDS is defined as:

- **Severe hypoxaemia [partial pressure of oxygen in arterial blood (PaO2)/fraction of inspired oxygen (FiO2) 200 mmHg .**
- **Diffuse bilateral infiltrates on chest X-ray.**



ARDS

- Pulmonary artery occlusion pressure <18 mmHg (i.e. normal left atrial pressure and left ventricular function, to exclude cardiogenic pulmonary oedema).
- A milder form, known as ‘acute lung injury (ALI)’ is present if the PaO2/FiO2 300 mmHg .

The commonest causes of ARDS in pregnancy are haemorrhage and infection.

shock

- Shock' is a broad term used to describe acute circulatory collapse, with failure of adequate oxygen delivery to the tissues. The underlying cause of shock can be grouped into one of six categories:



Causes of shock

- Hypovolaemic—loss of circulating blood volume (e.g. haemorrhage, DKA).
- Septic—sometimes called ‘distributive’.
- Obstructive—obstruction to the circulation (e.g. tamponade, pulmonary or amniotic fluid embolus).

Causes of shock

- Cardiogenic—severe heart failure (e.g. myocardial infarction).
- Anaphylactic—allergen-induced vasodilatation (e.g. peanut allergy).
- Neurogenic (spinal)—lesion above T6 causes loss of sympathetic outflow, leading to vasodilatation, bradycardia and hypothermia.

- **The most common causes in obstetrics are haemorrhage and sepsis.**
- **Patients who are ‘shocked’ exhibit a number of common features:**

Magnitude of the Problem

- 529,000 maternal deaths each year globally
- 20-60% are due to PPH
- Many will suffer morbidity

Magnitude of the Problem (cont'd)

- 14 million cases of PPH per year
- Uterine atony accounts for an estimated 70 to 90 % of cases
- On average a woman will die within 2 hours after onset of excessive bleeding if she does not receive prompt treatment

Physiology of Hemorrhage

- Decreased
  - Mean arterial pressure (MAP)
  - Central venous Pressure (CVP)
  - Pulmonary Capillary Web Pressure (PCWP)
  - Stroke Work (SW)
  - Stroke Volume (SV)
  - Cardiac Output (CO)
  - O2 Consumption
  - Mixed Venous O2 Saturation (MVO2)

Physiology of Hemorrhage

- Increased
  - Systemic vascular resistance (SVR)
  - Arterial –Venous O2 (A-V O2) difference
  - Catecholamine release
  - Heart rate (HR)
  - Pulmonary vascular resistance (PVR)
  - Myocardial contractility
  - Platelet aggregation
    - Small vessel occlusion
    - impaired microcirculation
    - Micro-embolization to lungs

Physiology of Hemorrhage

Adrenergic effect

- Constriction of venules and small veins

  Increased venous return (preload)
- Systemic hypotension
- Decreased capillary hydrostatic pressure
- Fluid mobilization
- Decreased blood viscosity

Physiology of Hemorrhage

Anaerobic metabolism

- Metabolic acidosis
- Hyperventilation

  Increased intra-thoracic pressure

  Incr. venous return
- Vasoconstriction

  Blood redistribution

Impact of Hemorrhage

Maternal

- Hypotension
- Oliguria
- Acidosis
- Collapse
- Acute renal failure
- Shock liver, lung
- ARDS
- Pituitary necrosis

Fetal

- Blood flow redirects to Salvage brain, heart, adrenals
- Ultimately, fetal cerebral blood flow decreases

Clinical presentation

- **Hypotension (systolic BP <100 mmHg).**
- **Tachycardia (heart rate>100 beats/min, except spinal shock).**
- **Tachypnoea (respiratory rate>30/min).**
- **Oliguria (urine output<30 ml/h).**
- **Confusion, agitation or drowsiness.**
- **Other features will depend on the underlying cause.**



Systemic inflammatory response syndrome and sepsis (SIRS)

The SIRS is a spectrum of clinical conditions caused by an immune response to infection or trauma, and characterised by systemic inflammation and coagulation

SIRS is defined as the presence of at least two of the following criteria :

- **Temperature >38 or <36 ° C.**
- **Heart rate >90 beats/min.**
- **Respiratory rate >20/min or PaCO2 (32 mmHg).**
- **White cell count >12 000 or <4000 cells/mm3, or >10% immature (band) forms.**

- Sepsis is defined as SIRS secondary to an infection
- Severe sepsis when there are features of organ dysfunction such as hypotension or oliguria.
- Septic shock has developed when hypotension persists despite adequate fluid resuscitation.
- Sepsis is the leading cause of multiple organ failure, acute renal failure, and ARDS, and carries a mortality of 40–60%.

Management of diseases of particular importance in pregnancy



Sever Pre-eclampsia

- Possible crises of pre-eclampsia include the HELLP syndrome (haemolysis, elevated liver enzymes and low platelets) and eclampsia. The commonest causes of death are cerebral haemorrhage and ARDS, and other maternal complications include acute renal failure, haemorrhage, (DIC), and liver dysfunction



They key management points are

- control of hypertension (methyldopa, nifedipine, labetalol, and/or hydralazine),
- treatment or prophylaxis of seizures (magnesium sulphate),
- careful fluid administration to avoid pulmonary oedema, and
- decision regarding delivery.

Acute fatty liver of pregnancy

- Acute fatty liver is rare, affecting 1 in 10 000 pregnancies, but may proceed to hepatic failure with high maternal and fetal mortality rates.
- Management involves maternal resuscitation with correction of coagulopathy, fluid imbalance and hypoglycaemia, and treatment of liver failure, intensive fetal monitoring, and urgent delivery.




A
B
O
AB
A
B
O
AB

Hemorrhagic Shock

- Management -

Maintain aerobic metabolism

O_2 *Delivery* = *C.O. x Sa* O_2 *x %Hb*

- Fluid management
- ↑ Oxygenation
- Transfusion

CO = cardiac output

SaO2 = arterial oxygen saturation

Hemorrhagic Shock

- Management -

Acute Blood Loss

↓

Loss of circulatory Volume

Loss of O_2 carrying capacity

↓

Restore volume → 1 - Crystalloid; 2 - Colloid

↑↑ SaO_2 → Supplemental O_2

↑↑ O_2 carrying capacity → Transfusion

Hemorrhagic Shock

- Fluid Management replacement of blood loss-

Crystalloid	v.	Colloid
3:1 ratio to estimated blood loss		1:1 ratio to EBL
↑ Circulatory volume		↑↑↑ Circulatory volume
↑ Interstitial fluids		Does not ↑ Interstitial fluid
		May ↑ risk pulmonary edema and ARDS
		May ↑ risk coagulopathy

Hypovolemic Shock → Crystalloid best *initial* intervention

→ Colloid is a temporizing measure

→ Hemostasis and Transfusion is the best answer

Managing blood loss by hemorrhage class

Class	Blood Loss	Volume Deficit	Spx	Rx
I	≤ 1000 cc	15%	Orthostatic tachycardia	Crystalloid
II	1001-1500	15-25%	Incr. HR, orthostasis, mental Decr cap refill	Crystalloid,
III	1501-2500	25-40%	Incr HR, RR Decr BP, Oliguria	Crystalloid Colloid, RBCs
IV	> 2500	> 40%	Obtunded Oliguria/anuria CV collapse	RBC, Crystalloid, Colloid

Approaches to Hemorrhage

Hemorrhage drills

- Ob, Anesthesiolgy, Blood Bank, Nursing, other staff

Experienced operator for anticipated blood loss

O neg blood available

Organized response team for unanticipated blood loss

What doesn't work

- Lack of immediate response
- Crystalloid when blood is needed
- Delayed operative response
- Delayed transfusion response

DIC

- DIC is a secondary phenomenon, following a trigger of generalised coagulation activity. Further consumption of platelets, clotting factors and fibrin occurs, resulting in a vicious circle of continuing bleeding and yet consumption of clotting components

DIC

DIC is associated with a large number of obstetric conditions including

- major obstetric haemorrhage,
- pre-eclampsia,
- acute fatty liver,
- chorioamnionitis,
- septic shock,
- amniotic fluid embolism, and
- retained dead fetus.

DIC

- Management is similar to that for obstetric haemorrhage, namely prompt resuscitation and fluid replacement, with location and treatment of the underlying cause.
- Blood products need to be given as soon as available, including packed red cells, fresh frozen plasma (FFP), cryoprecipitate, and platelets.
- More recent developments include the use of recombinant activated Factor VII and aprotinin (an antifibrinolytic).

Cardiac Disease

- Around 1% of pregnant women have serious cardiac disease.
- Those with pulmonary vascular disease are at particular high risk, with maternal mortality of 30% in Eisenmenger's syndrome and 30–50% in pulmonary hypertension (primary and secondary).
- Important factors affecting the outcome of the pregnancy include:

- New York Heart Association (NYHA) functional class.
- Left ventricular function.
- Presence and severity of pulmonary hypertension.
- Presence of cyanosis.
- Haemodynamic significance of the lesion.
- Degree of left heart obstruction.

Peripartum Cardiomyopathy

- This is a cardiomyopathy specific to pregnancy, and defined as the development of cardiac failure in the last month of pregnancy or within 5 months of delivery, in the absence of both an identifiable cause and recognizable heart disease before this.

- **The aetiology is unknown, but risk factors include multiple pregnancy, multiparity, pre-eclampsia, and prolonged tocolysis.**

Outcomes differ between studies:

- **7–52% of women recover,**
- **7–14% require transplantation,**
- **with a maternal mortality rate of between 6% and 60%.**

Cardiopulmonary arrest

- Fortunately, cardiopulmonary arrest is a rare complication of pregnancy affecting 1 in 30 000 pregnancies, but the maternal outcome is poor. In contrast to the non-pregnant individual when a primary cardiac cause is more common,
- causes in the pregnant woman to be considered include haemorrhage, placental abruption, pulmonary or amniotic fluid embolism, eclampsia, and drug toxicity

Cardiopulmonary arrest

- Basic and advanced life support are essentially the same as for non-pregnant individuals.
- One important difference is the need to keep the women in the left lateral position (using Cardiff wedge or pillow) to avoid vena caval compression.
- If resuscitation is not successful within 5 min then CS should be performed because of the risk of fetal hypoxia.



Thromboembolic Disease

- Venous thromboembolic disease (VTE) is the commonest direct cause of maternal death in pregnancy and the puerperium in the UK.
- Pregnant women at increased risk of VTE (including previous VTE, thrombophilia, and other risk factors e.g. immobility) should receive postnatal and/or antenatal thromboprophylaxis

Thromboembolic Disease

- This is important for critically ill obstetric patients with long periods of immobility, who will need subcutaneous low molecular weight heparin (LMWH) (e.g. 40 mg od or bd enoxaparin depending on level of risk) and graduated compression stockings.

Sepsis in Pregnancy

- Worldwide, infection is still a significant cause of maternal death.
- Pregnant women are more susceptible to certain infections due to reduced cell-mediated immunity and raised corticosteroid levels.
- The onset of life-threatening sepsis in pregnant women can be insidious, with rapid clinical deterioration, and pyrexia is not always present.
- One reason that the prognosis is still more favourable than the non-obstetric population, is that the source of infection is usually the pelvis, and potentially more amenable to intervention.

Sepsis in Pregnancy

- Conditions associated with an increased risk of sepsis are prolonged rupture of membranes, emergency CS, instrumentation of the genital tract, and retained products of conception or placenta.
- Septic shock with DIC is an ominous sign if it develops.

Amniotic Fluid Embolus

- This is a rare, but serious complication of pregnancy, affecting 1 in 80 000 pregnancies. Mortality is greater than 80%, and up to 50% within the first hour.
- Amniotic fluid or fetal matter enters the maternal circulation causing an anaphylactic-like reaction, with women developing
- sudden onset of breathlessness,
- cyanosis, hypoxia, confusion, and hypotension, often followed by cardiac arrest.

Amniotic Fluid Embolus

- Complications include seizures, DIC and pulmonary oedema.
- There is no specific treatment, and management is supportive and symptomatic, involving adequate oxygenation and ventilation, maintaining circulation, and correction of coagulopathy.





Aims Of Critical Care Management



General

- The priorities in dealing with a critically ill patient are immediate resuscitation and assessment of deranged physiology, with a systematic, organ-by-organ approach. These are generic, regardless of the primary underlying pathology, and will precede more specific diagnostic considerations.



General

- Critical care medicine involves intensive monitoring and physiological support, for patients with life-threatening, but potentially reversible conditions. They are managed in either an ICU (level 3) or HDU (level 2) setting.
- Level 3 care usually involves patients with multi-organ failure and requiring mechanical ventilation

Cardiovascular

- Cardiovascular support aims to maintain adequate cardiac output and BP.
- This may include fluid administration ,
- correction of electrolyte disturbances,
- anti-arrhythmics, inotropic and vasopressor drugs,
- thrombolysis, cardiac pacemakers, ventilatory support, and intra-aortic balloon

Respiratory

- Respiratory support aims to maintain adequate gas exchange. Management focuses on maintaining an airway and giving oxygen therapy



Renal

- Early recognition and appropriate management of renal impairment and oliguria is important to avoid the development of acute renal failure. Management will depend on the underlying cause, but involves careful fluid administration with a fluid challenge

- Monitoring may involve measurement of hourly urine output, fluid balance, serum urea and creatinine, and electrolytes.

Gastrointestinal

- Nutritional support is usually required, to avoid the complications of malnutrition such as impaired wound healing and immune function.

- Stress ulceration and gastrointestinal bleeding are reduced by early enteral feeding, however, proton pump inhibitor prophylaxis is required if patients are not able to be fed.
- Maintaining normoglycaemia has been shown to improve outcome .

Neurological

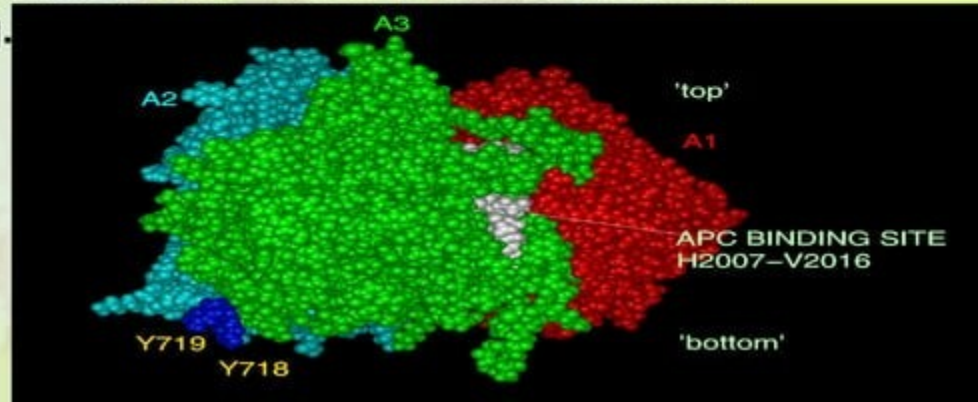
- Neurological support aims to relieve pain and anxiety, and prevent secondary cerebral damage if there has been an initial insult.
- The level of sedation required will depend on factors such as the ventilation mode and need for invasive procedures.
- Monitoring may involve measurement of level of consciousness (Glasgow Coma Scale).

Current Developments In Critical Care Management



Activated protein C

- Recombinant human activated protein C, has been shown to significantly reduce mortality in severe sepsis.
- It has anti-inflammatory, antithrombotic, and profibrinolytic properties,
- but one side effect is a small increased risk of bleeding.



Intensive Insulin Therapy

- Insulin resistance and hyperglycaemia are common in critically ill patients, even in those not previously known to be diabetic.
- Intensive insulin therapy, to keep blood glucose at or below 6.1 mmol/l, has been shown to reduce mortality, as well as decreasing a number of other complications including prolonged mechanical ventilation and need for renal replacement therapy.
- It is administered using an insulin and dextrose 'sliding-scale'.



Corticosteroids In Sepsis

- Patients in septic shock often have relative adrenocortical insufficiency, and therefore low-dose corticosteroid replacement is frequently used.
- Trials have shown a reduction in mortality without significant adverse effect .

Ventilation Strategies

- A ‘protective lung strategy’ should be employed for mechanical ventilation with conditions such as ALI/ARDS.
- The aim is to optimise alveolar recruitment and oxygenation, while avoiding pressure-induced lung damage (barotrauma) or over-distension (volutrauma)



Recombinant Factor VII

- Recombinant activated Factor VIIa (NovoSevenTM) is being used for intractable blood loss and fulminant DIC, as it induces short-term local haemostasis.
- It has been used for the treatment of obstetric haemorrhage, with lifesaving results in some cases.


THANK
YOU!
Http://maomao520.yeah.net