Maternal Critical Care in Islamic Republic of Iran

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Clinical Immunologist, Internist, Intensivist,

My Professional Background

- **Medical Background**
  - MD, University of Calgary, Alberta, Canada,
  - Internal Medicine Residency, University of British Columbia, Vancouver, Canada,
  - Critical Care Subspecialty Training, University of Calgary, Canada,

- **Research Background**
  - MSc and PhD training in Clinical Immunology, University of Alberta, Alberta, Canada,
  - Post-doctoral Fellowship in Respiratory Disease, University of Alberta, Canada,
  - Senior Parker B Francis Fellowship Training, Harvard University, United State,

- **International Humanitarian Background,**
  - President of ISPHR from 1999 to 2015,
  - MSF, In Various Capacities,
  - International Red Cross and Red Crescent,

Ultimate Global Objective

- Maternal Death is somewhat different from all other death in Intensive Care Unit and needs not to exist.

- Pregnancy is a physiological stress test and someone who is able to get pregnant and maintains a pregnancy should be able to overcome most of its potential complication

- WHO hopes and aims that Maternal Mortality all but be eliminated

Workshop Objectives

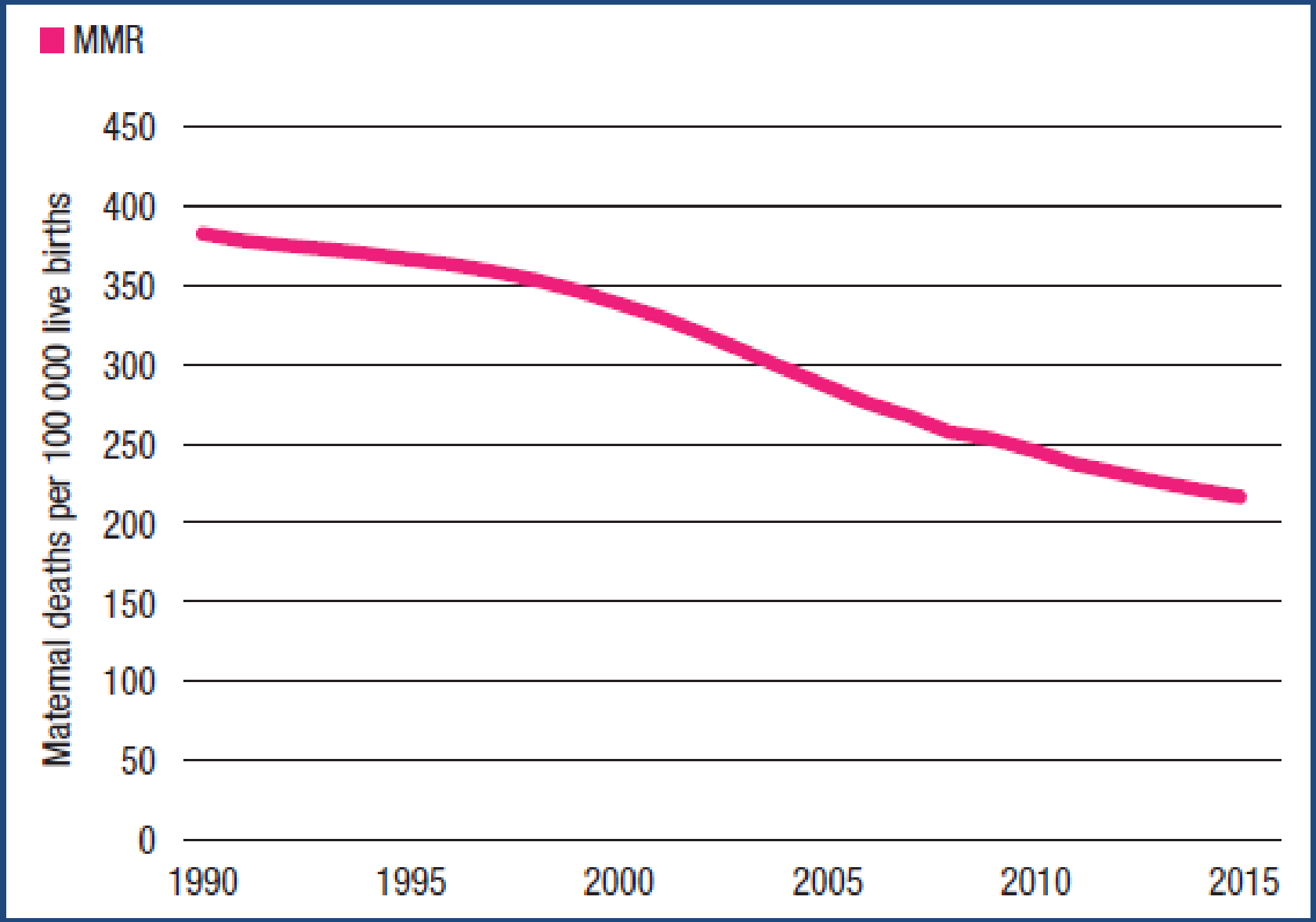
- To facilitate an understanding of the current status of Maternal Mortality in Islamic Republic of Iran.
- To Identify areas in the current state of maternal mortality management where focused practical changes could be introduced with the anticipation that introduced changes could lead to decreased rate of Maternal Mortality.
- To facilitate a better understanding of Maternal Critical care and management of unstable maternal patients.
- To set the stage for the future collaborations with Obstetric/Gynecology and intensivist colleagues,

The Central Questions are;

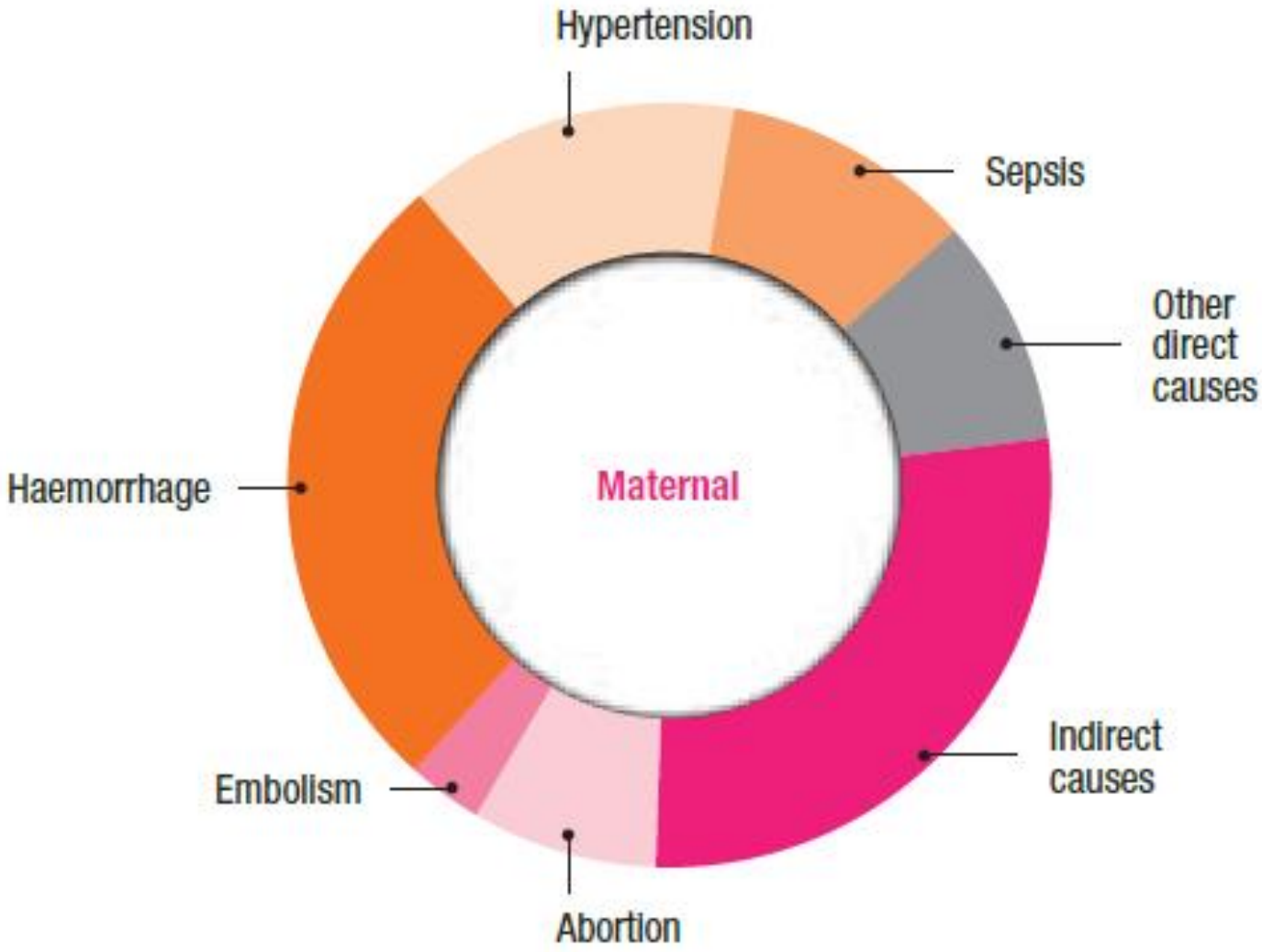
- Are there ways to recognize the unstable maternal patients in a timely manner and make their management more effective in line with evidence based medicine and internationally recognised critical care guidelines?

- Can we introduce the critical care to the obstetrics/gynecology specialty so that they could take the responsibility for the maternal critical care patients?

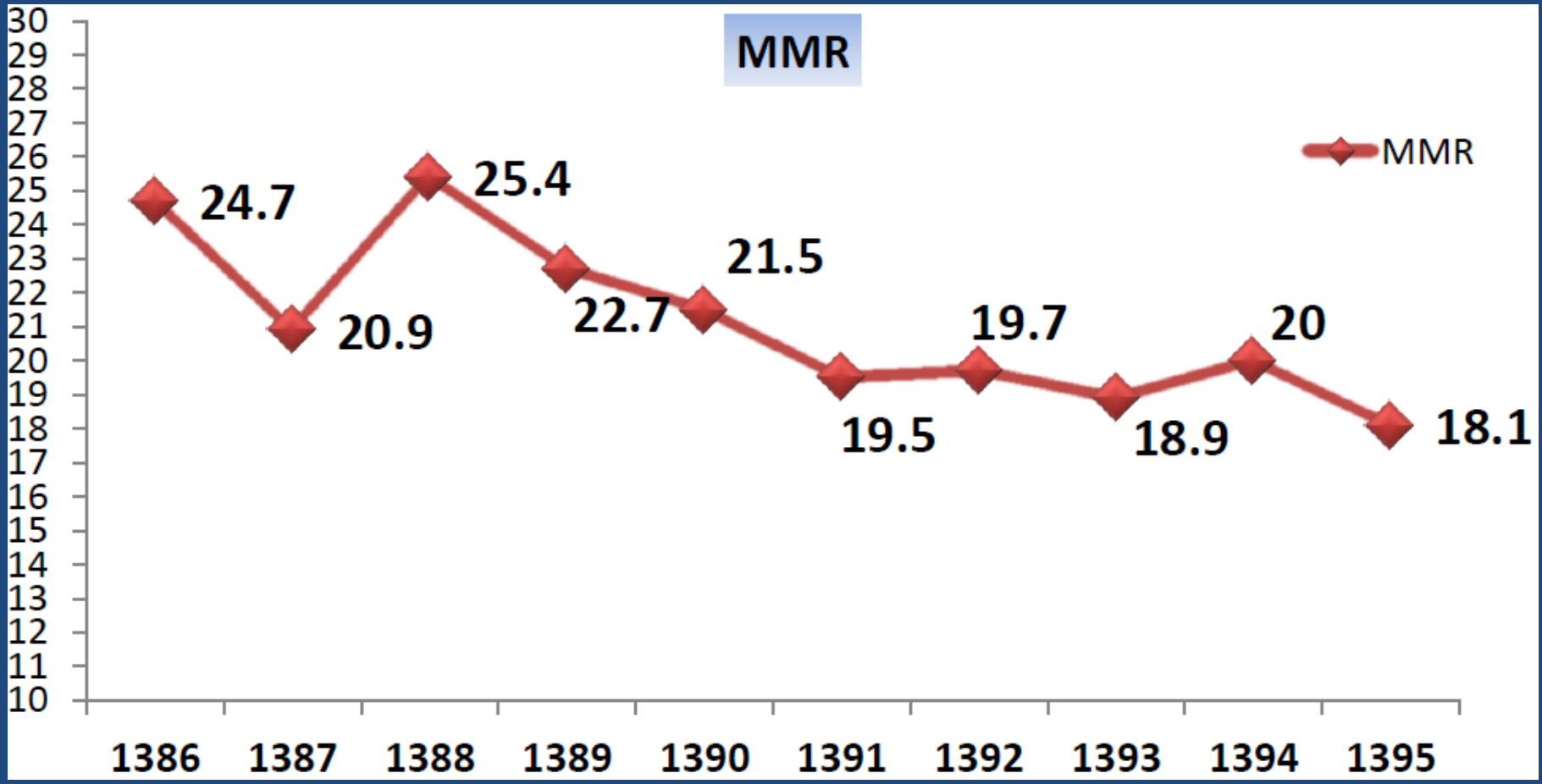
Current Trends in Global Maternal Morality



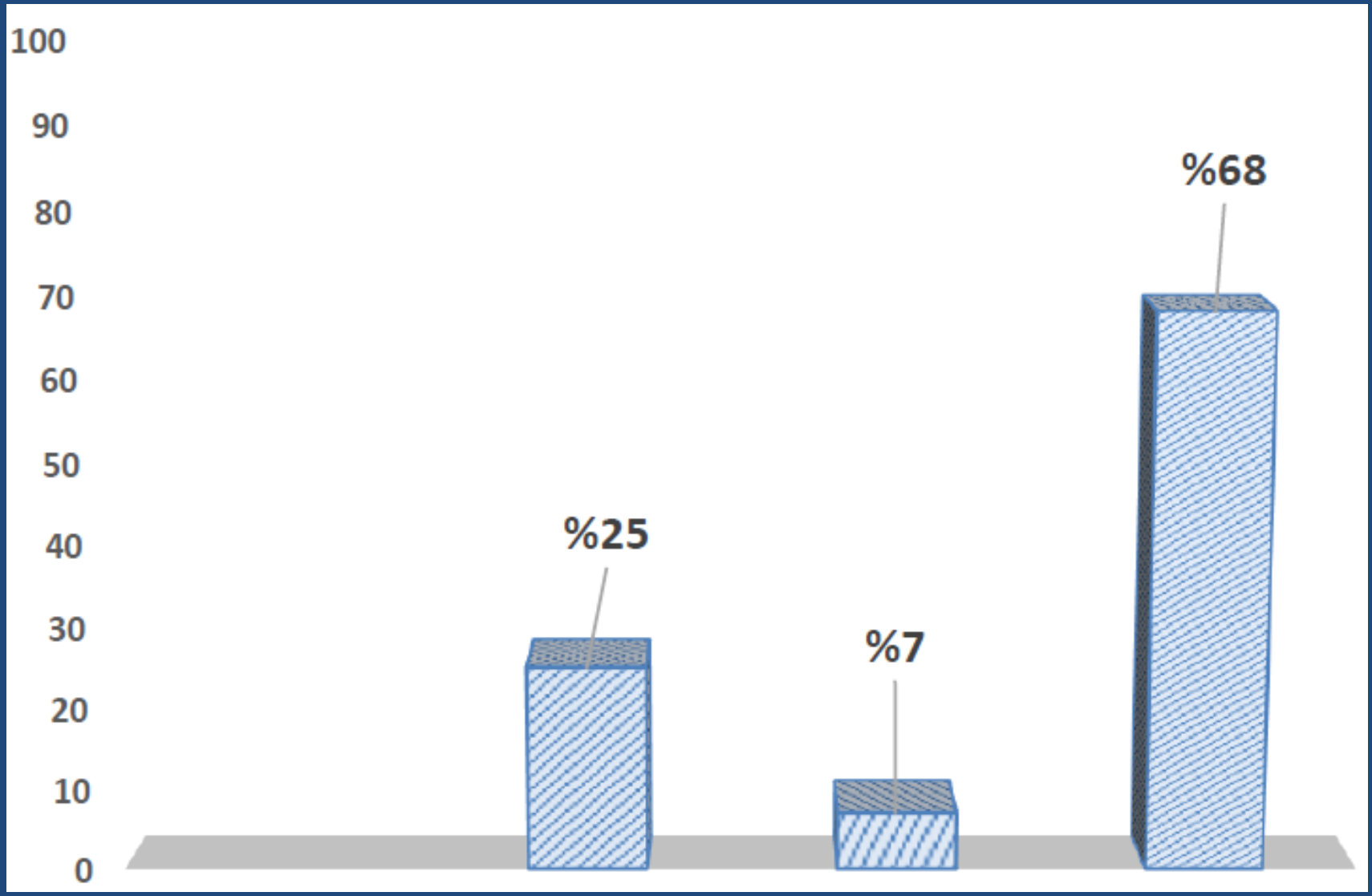
Global Major Causes of Maternal Mortality



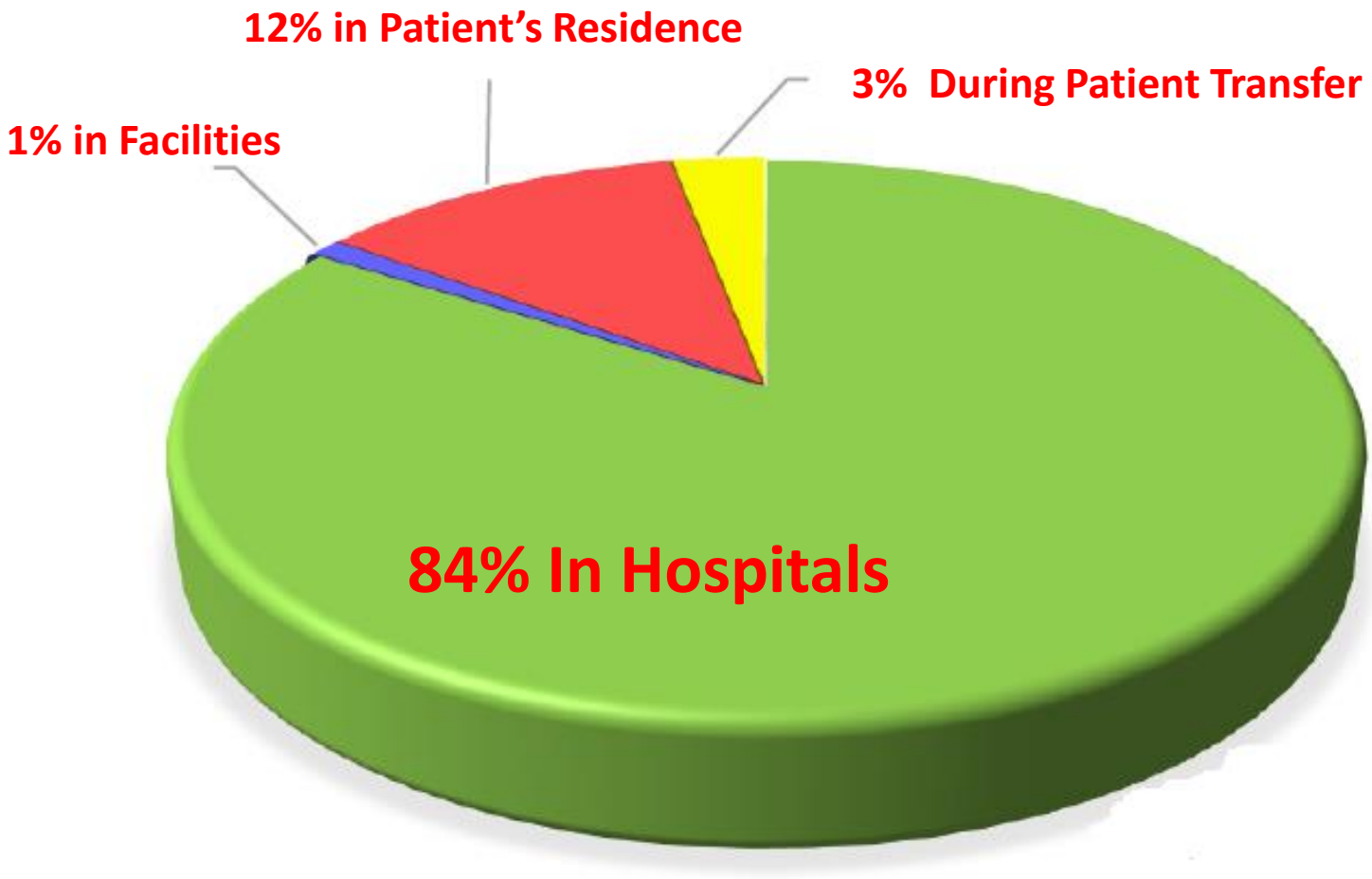
Current Maternal Mortality Statistics in Iran



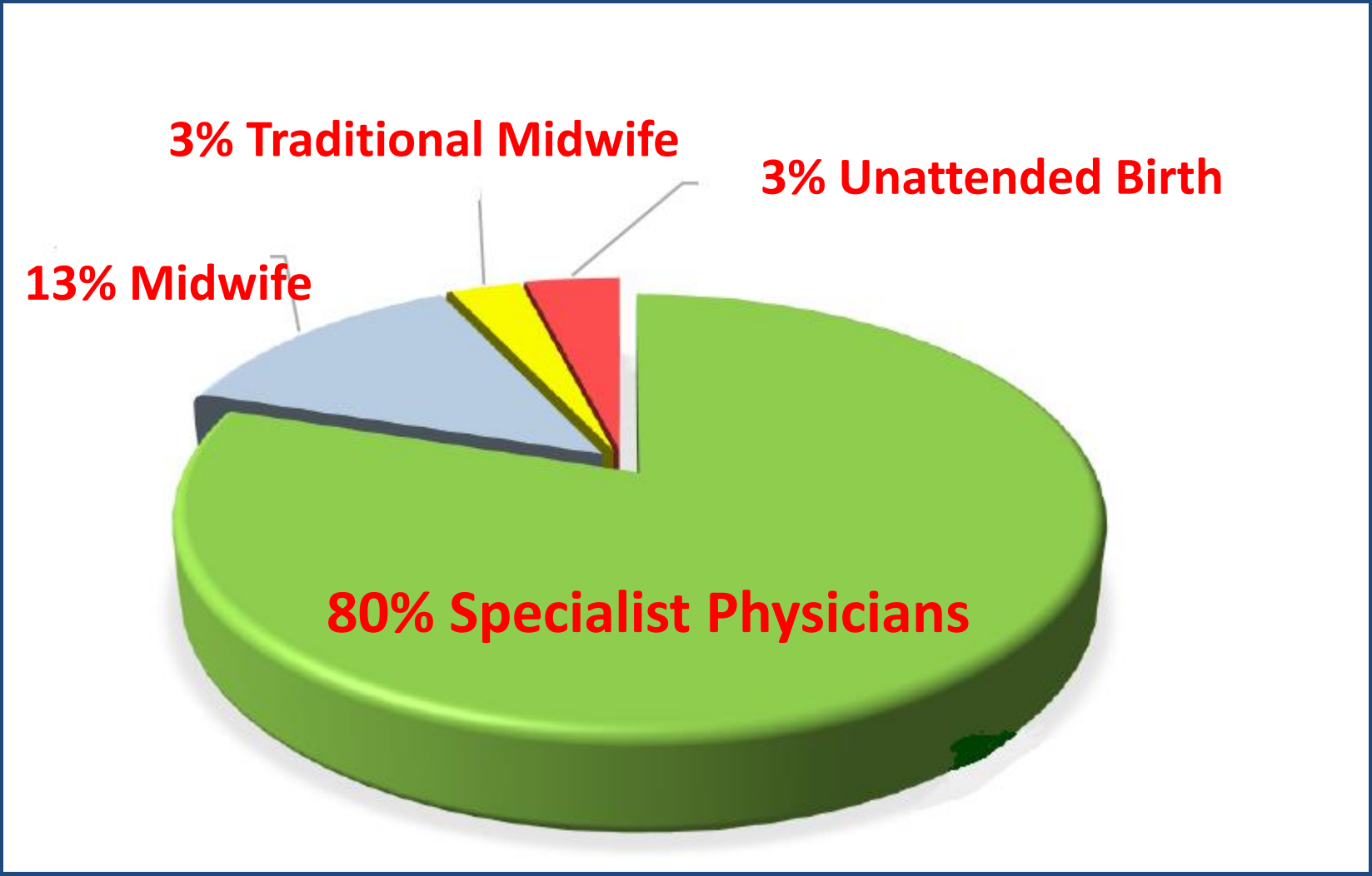
Timing of Maternal Mortality in Relation to Pregnancy



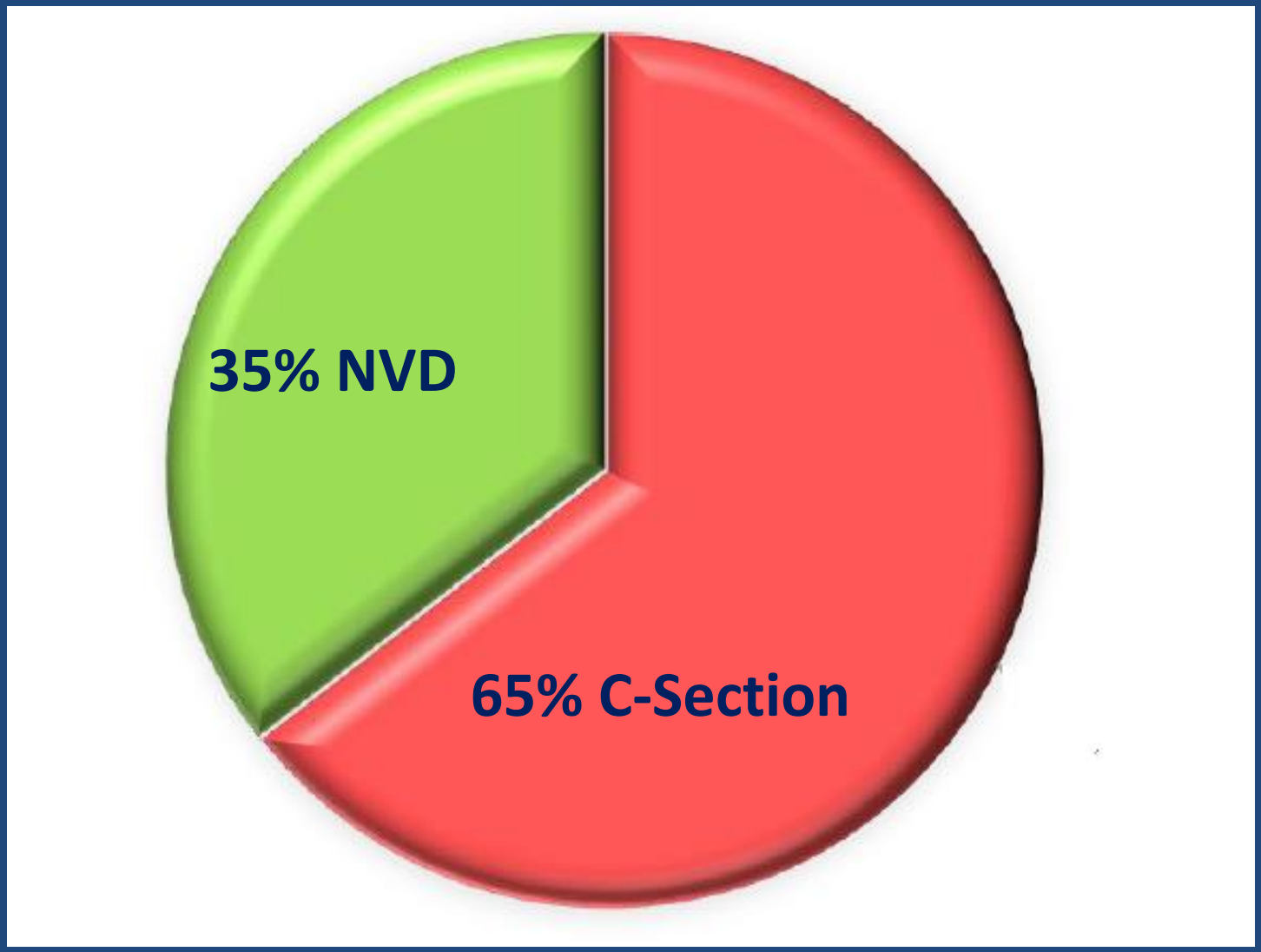
Location of Maternal Mortality



Birth Attendance for Maternal Mortality



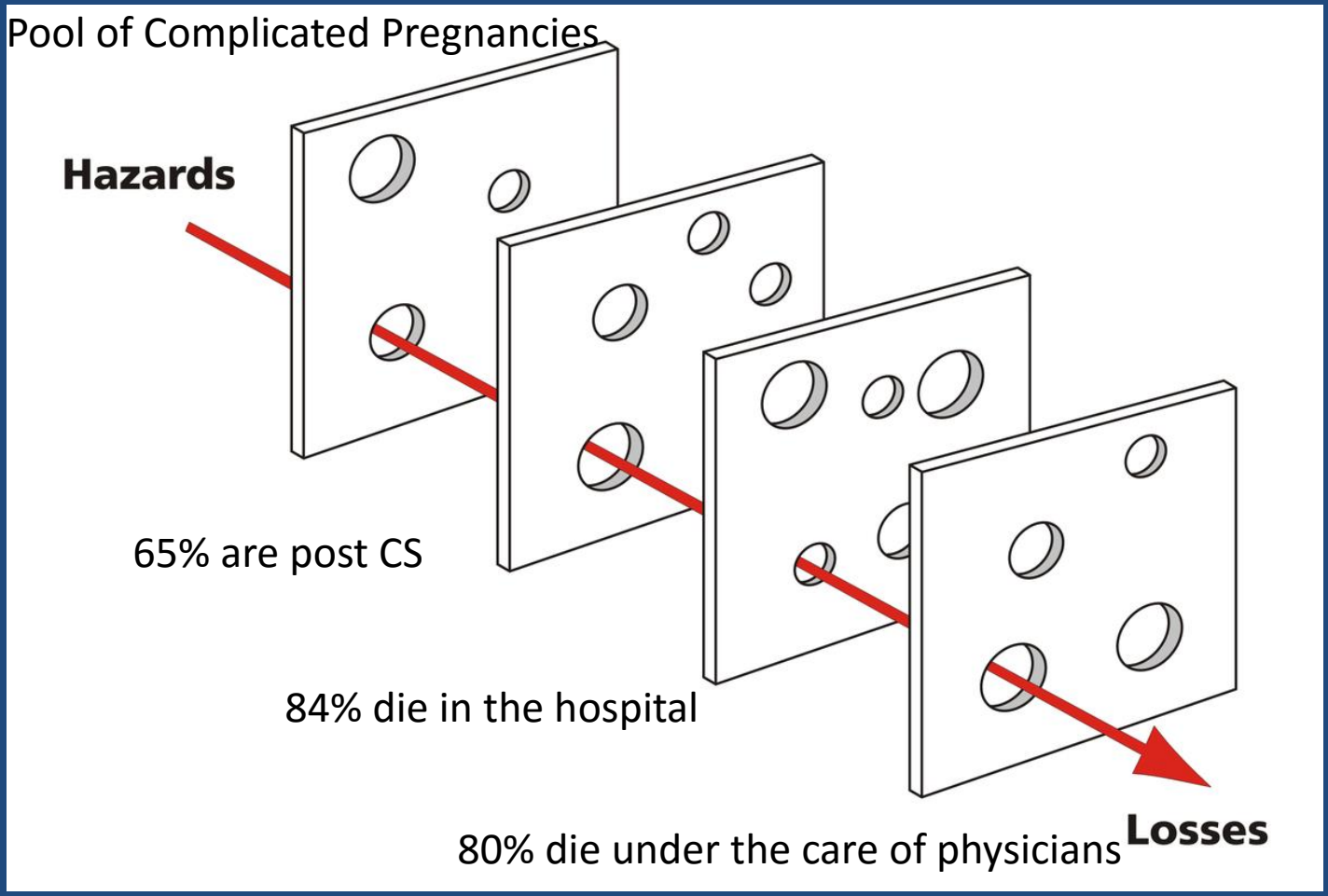
Maternal Mortality According to Mode of Delivery



Aetiologies of Maternal Mortality

• Pregnancies with abortive outcome	3%
• Hypertensive disorders in pregnancy,	12%
• Obstetric haemorrhage	22%
• Pregnancy-related infection	7%
• Other obstetric complication	15%
• Unanticipated complications of management	2%
• Non-obstetric complications	24%
• Unknown/undetermined	9%
• Coincidental causes	2%
• Suicide	5%

The Swiss Cheese Model of Maternal Mortality



Safety Net Concept in Maternal Mortality, (Pathway of MM)

1-Pregnancy Pool

2-Pool of patients at risk of pregnancy complication (~10%)

3-Complicated Pregnancy Pool

4-Unstable Maternal Patient

5-Coding Maternal Patient

6-Maternal Mortality

What is Maternal Critical Care?

- Where does an unstable maternal patient belongs to?

- As a Subspecialty how one could define Critical Care Medicine as it relates to Maternal Patient?

The discipline of Critical Care Medicine and Maternal Mortality

- It is likely that majority of unstable and critically ill maternal patients will be admitted to ICU in some point of their critical illness,
- If recognized on time and managed well, it is likely that critically ill maternal patient may be stabilized and returned to other maternal words.
- There is a clear need for specialized words where physicians who specialize in Maternal Critical Care could care for unstable and critically ill maternal patients.
- Thus there needs to be a merge of the two disciplines of critical care and obstetrics/gynecology.

Excellence in Maternal Critical Care

- **Unlike some other critical care patients, often a maternal patient is very likely to survive and overcome critical illness.**

- **It is believed that very rarely a maternal Patient should die, since a women in child bearing age who has succeeded to be pregnant and maintain the pregnancy, has shown an overall reasonable health.**

- **Thus the maternal ICU is where the *Clinical Excellence* and *Outstanding Procedural Skills in maternal care* are combined to close the *Gates of Death* and stabilize an unstable maternal patient.**
- **Often an unstable patient in critical condition will have *no second chance* in life. Thus suboptimal care in Maternal Critical Care, is simply *not acceptable*.**

Death and Critical Care

- Helping a critically ill maternal patient to live, starts with “Not letting them die”.

- At times it is mastering the death that helps the maternal patient to live and come back to a normal life.

The Highways of Death and the Sideways of Death

Respiratory Gate

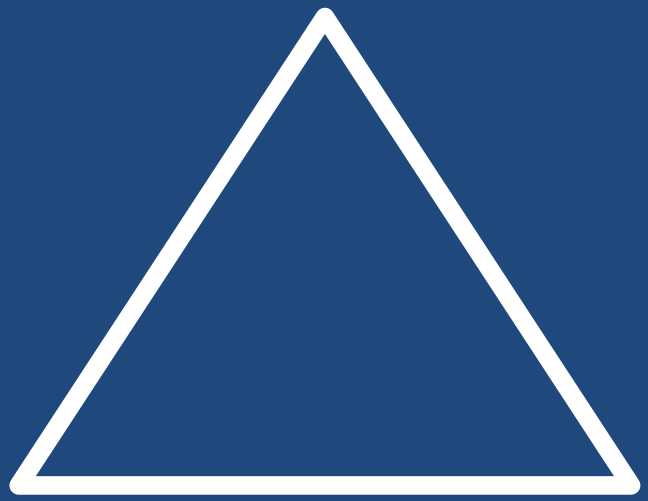
Death

CV Gate

CNS Gate

The Triangle of Maternal Mortality Highways

CNS death;
-For most intracranial bleed and raised ICP
-Brain Stem Injury
-CNS infection
-Decreased LOC

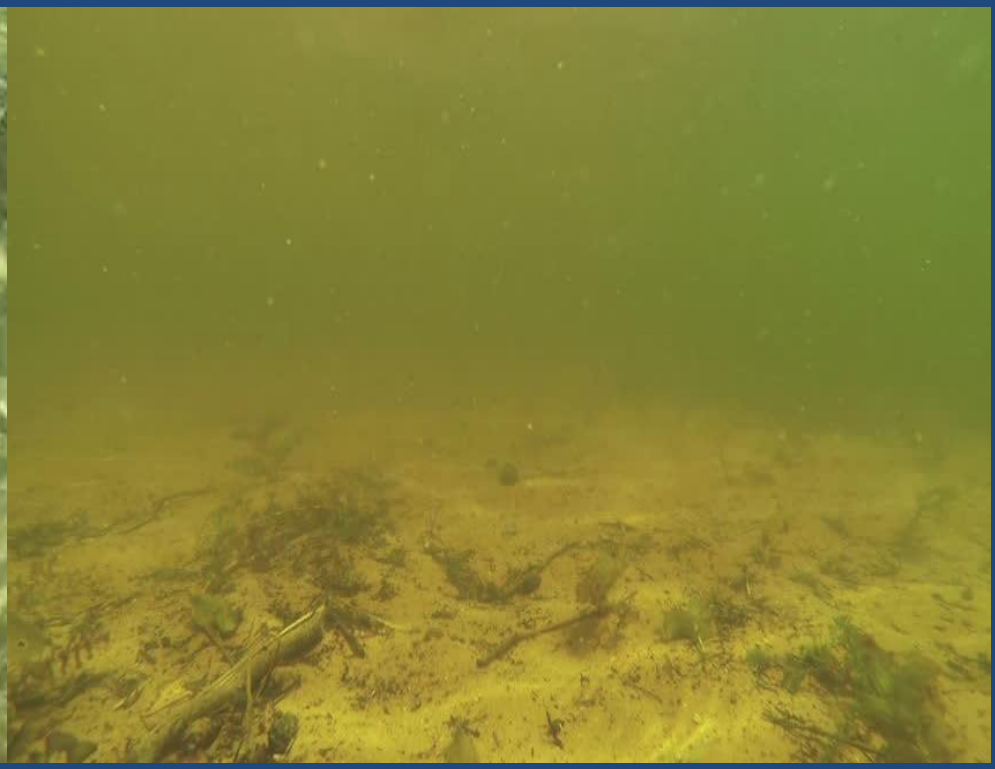


Cardiovascular death;
-For most haemorrhagic shock
-Distributive Shock
-Cardiac Dysrhythmias
-Heart Failure
-Pericardial Tamponed

Respiratory death;
-Pulmonary Infection including TB
-Pulmonary Embolism
-Pulmonary Edema secondary to preeclampsia

Your first try has to be your best try

A- Unstable maternal patient, when first arrives in a health facility



B-Unstable maternal patient, three days and four consultations later

How to work on your first impression?

- If you can not summarize and introduce your critically ill maternal patient in less than 20-30 words, then you have to work on your clinical prospective….

- i.e. 38 years old female with past medical history of HTN and DM2, 32 weeks pregnant, presenting with sudden onset SOB and hypoxia likely secondary to PTE, yet other etiologies such as pulmonary edema and …

- Let us put the above concepts to a "Practical Interactive Case Series in Maternal Critical Care" and exercise the recognition and management of unstable maternal patient.

United Nations Educational, Scientific and Cultural Organization

Tell me and I forget, Teach me and I may remember, Involve me and I learn

United Nations Educational, Scientific and Cultural Organization

We Learn…

- 10% of what we READ
- 20% of what we HEAR
- 30% of what we SEE
- 50% of what we SEE and HEAR
- 70% of what is DISCUSSED with OTHERS
- 80% of what is EXPERIENCED PERSONALLY

Basic Principles of Clinical Case Series

For most it relies on;

- Methodical Clinical Approach,
- Evidence Based Medicine,
- Medical Reasoning,
- Interactive and multidisciplinary
- Ethical Medicine,

Case # 1

- 19 Y/O female, 29 weeks pregnant, first pregnancy, subjected to family violence, presenting to an emergency department of a community hospital in a small city in the North Western Iran, with facial bruises and forehead lacerations. Several episodes of vomiting while in ER waiting room.

- How would you proceed?

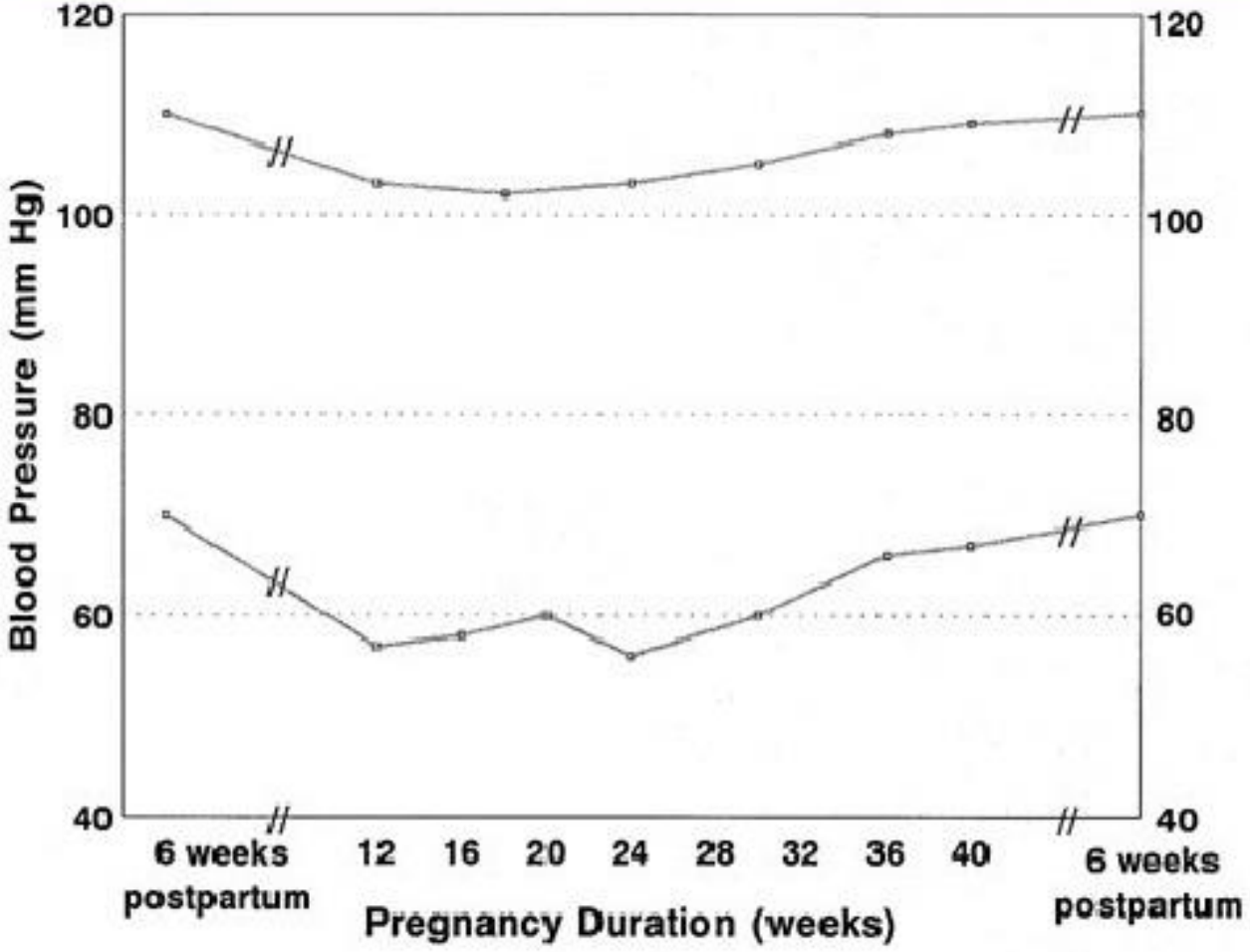
"The Heart of Every Clinical Encounter is Vital Signs"

- Vital Signs:
- BP: 92/48, HR 130, RR 24, O2 Sat 90%, GCS 12, (E3V3M6)
- No detailed history is provided except she has been subjected to family violence on several occasions during the day.
- What would you do?

How would you approach this patient?

- Is this patient hypotensive?
- How would the BP change in pregnancy?
- Is this patient tachycardic?
- How would the heart rate change in pregnancy?
- Is this patient tachypnic?
- How would respiratory rate change in pregnancy?
- Finally, is this patient hypoxic?
- How would the oxygen saturation change in pregnancy?

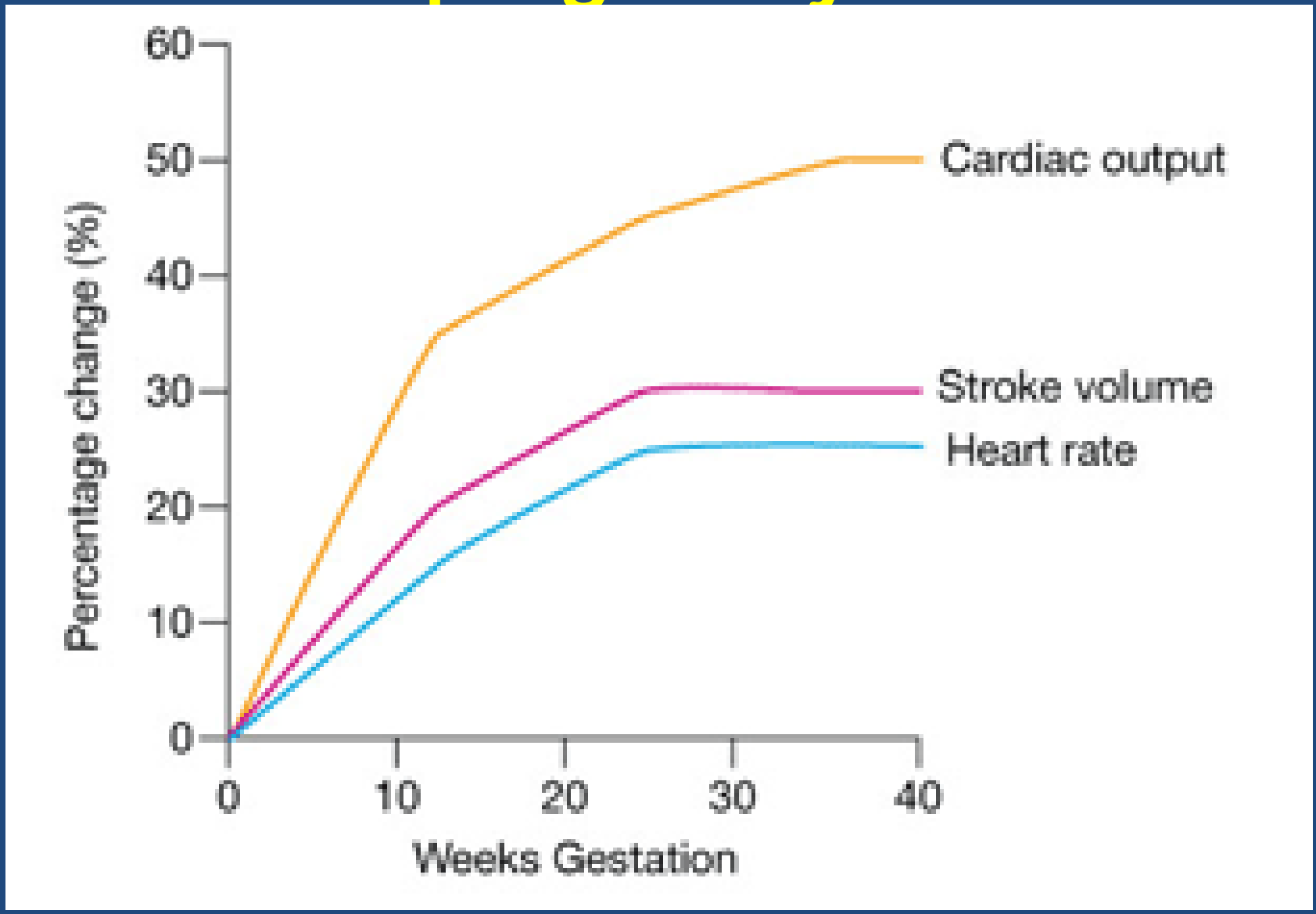
Normal Pregnancy Blood Pressure



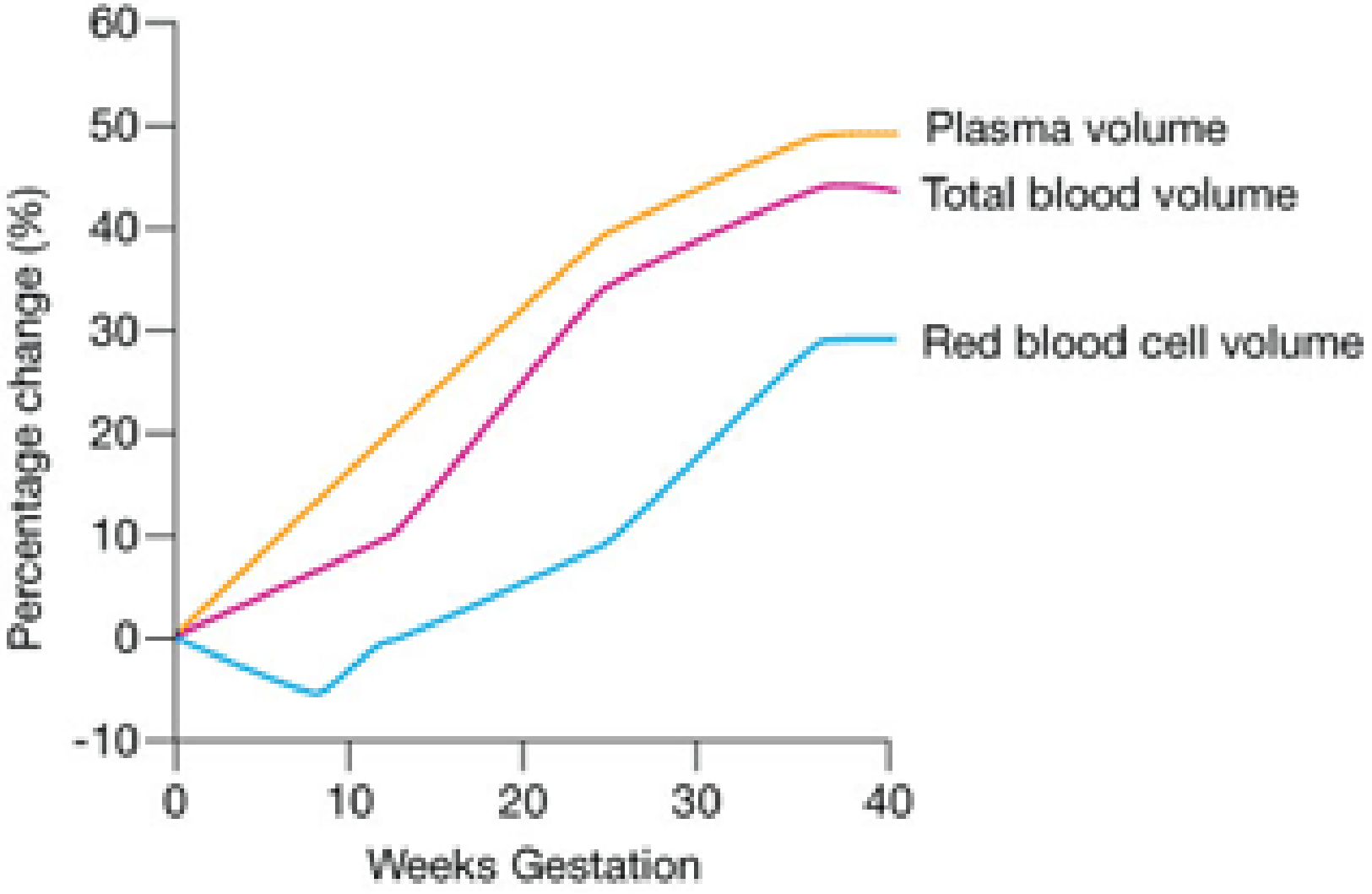
CVS Changes During Pregnancy

PARAMETER	DIRECTION	TIME COURSE
Heart rate	↑	1st and 2nd trimester (TM)
Blood pressure	↓	Fall in TM 1 and 2, returns to baseline in 3
Cardiac output	↑	45% above baseline by TM 3
Stroke Volume	↑	Peak at weeks 16 to 24
Systemic vascular resistance	↓	Nadir by mid pregnancy
Pulmonary vascular resistance	↓	20- 30% decrease

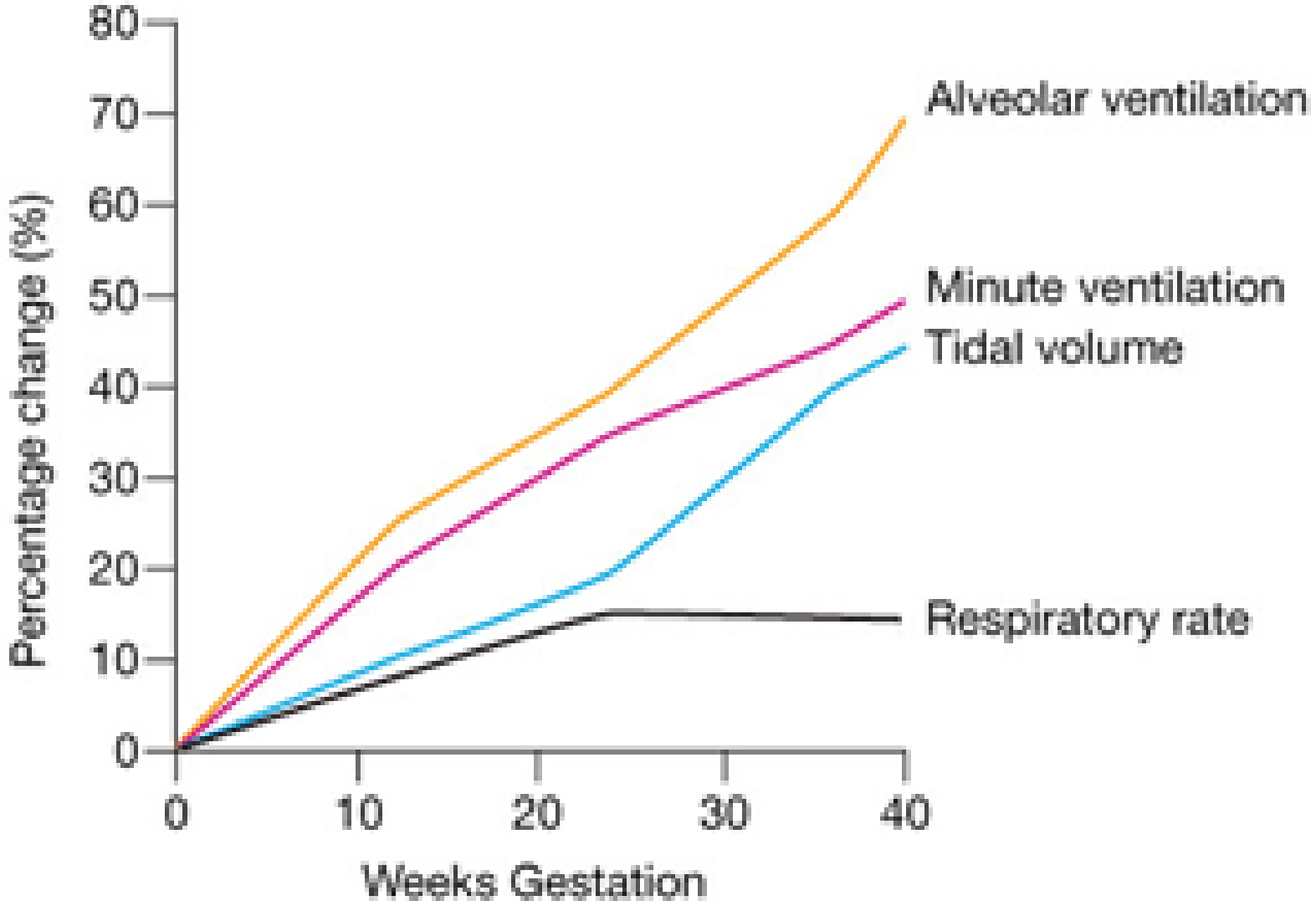
Cardiovascular changes during pregnancy



Maternal Intravascular changes during pregnancy



Respiratory changes during pregnancy



Case #1 Continued

- Vital Signs:
- BP: 92/48, HR 130, RR 24, O2 Sat 90%, GCS 13, (E3V4M6)

- As an attending physician you need to make a decision, is this patient stable or unstable?

- How would you manage this patient?

- If ever this patient dies, what would she die from? Which gate she may enter the triangle of death?

Case #1 Continued

Patient received a litter of IV fluid and forehead laceration was sutured and discharged home.

In passing hours she had a cardiac arrest outside the hospital and resuscitation was unsuccessful!

Appropriate and Evidence Based Approach to the Case

- Following vital signs full physical exam
- IV-Access (Does it matter what kind of IV access?)
- Hemodynamic monitoring and basic lab work.
- Airway Management, O2 therapy,
- Head imaging, Abdominal FAST…

Case # 2

- 18 years old female 2 months postpartum presented to ED at 4 PM with SOB and cough
- Several Weeks History of Progressive Cough and SOB
- Significant weight loss and constitutional Symptoms
- Normal Vaginal Delivery
- Unremarkable past medical history
- Unremarkable Family History
- Unremarkable Pregnancy
- Not on any medication currently
- So far has seen 4 physicians in last 5 weeks and has taken 4 doses of antibiotics and used several inhalers, with no improvement but only worsening symptoms
- What would you do?

- As a receiving physician what would you do?
- What would you start with?

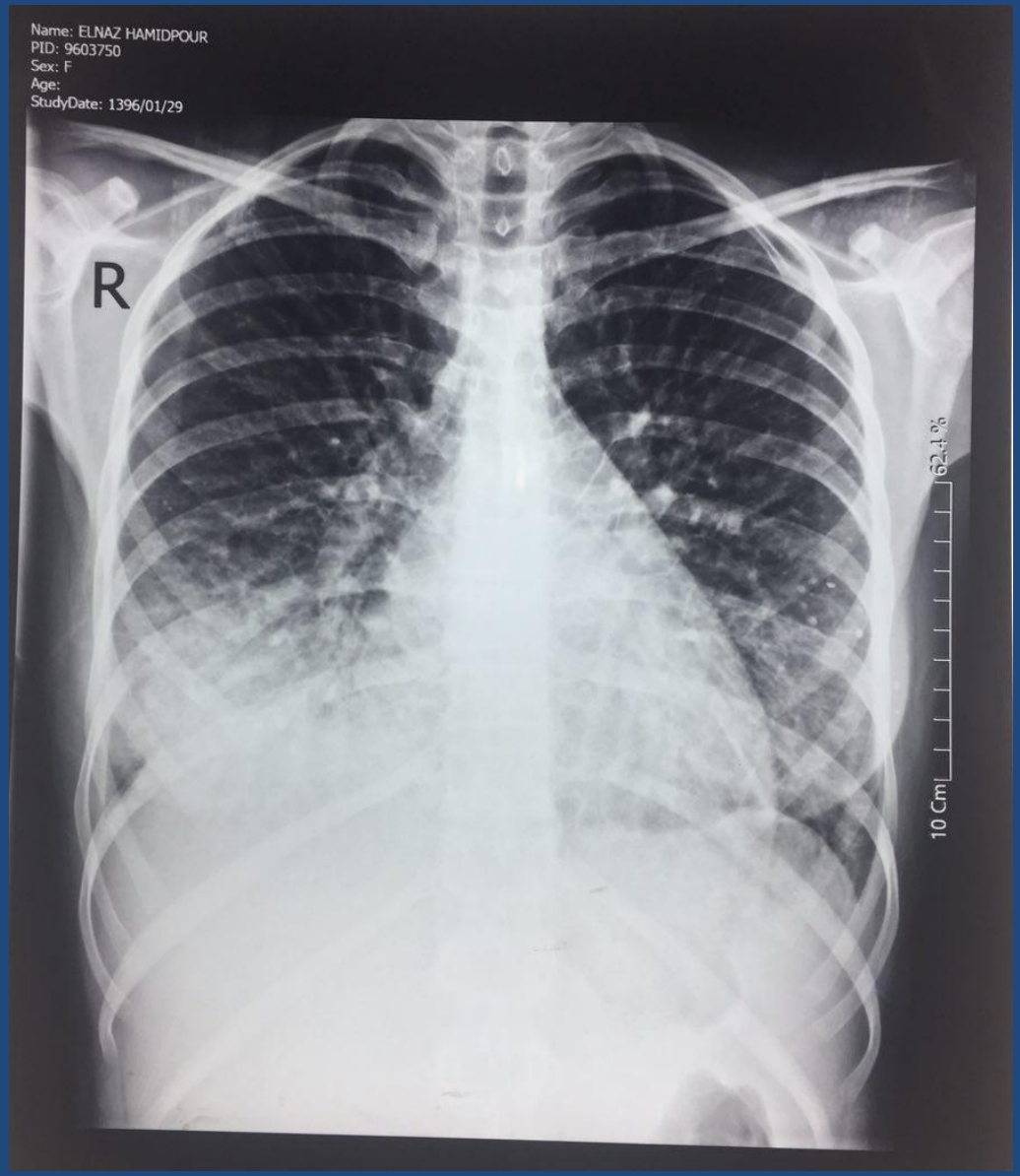
Physical Exam

- Vital Signs: BP 85/58, HR 130, RR 40, O2Sat 85%, Temp: 38.8, GCS 15,
- Underweight, clearly in respiratory distress, normal mental status but unable to speak in full sentences,
- On Physical Exam; Soft Heart Sounds, Bilateral Inspiratory Crackles, Elevated JVP, cold extremities,….
- How would you precede with stabilization?

Sequence of Stabilization

- Maximum O2 therapy
- Central IV access
- Before attempting intubation, need to stabilize hemodynamic parameters and preoxygynation;
- Would you give fluid to this patient?
- What inotrope will you give to this patient?

What do you think about this CXR?



Case Unfolding!

- Day after admission to the infectious disease word, patient was in sever respiratory fatigue, hypoxic, hypotensive, with altered mental status,

- Patient was given 2 units PRBC for her low hemoglobin, following which became profoundly hypoxic,

- Had a cardiac arrest during intubation and resuscitation was unsuccessful,

گزارشات کلینیکی و موضوع مشاوره :
Subject of Consultation & Clinical Notes:

با سلام و عرض ادب

احتراماً بیمار خانم 18 ساله که بدون سابقه بیماری قبلی سرفه را از چند ماه قبل ذکر
می کند که طی روزهای گذشته افزایش یافته و همراه با تنگی نفس و ویزینگ بوده است
بیمار در طی چندین ماه گذشته تحت درمان آسم طبق تشخیص متخصص داخلی بوده
است ولی بهبودی نداشته؛ بیمار در طی بستری ... تشدید شده و دیسترس تنفسی
واضح دارد (علی رغم O2 ... با ماسک نازال) و تاکیکاردی در حد 130-140
نیز دارد؛ خواهشمند است بیمار را از نظر R/O ... ریه ویزیت نموده و ...
را ارجاع فرمایید

مشاهدات و نظریات پزشک مشاور (خلاصه نظریات، تشخیص و توصیه ها) :
Consultant Physicians Observation & Notes :

بیمار فوق الذکر با تشخیص
اولیه پنومونی تحت درمان است و تشکر که به ...

[redacted]

از ...

با سلام و احترام. بیمار ویزیت شد. خانم 18 ساله که طی ... گذشته تنگی نفس داشته است و طبق شرح بالا
با تشخیص آسم در حال درمان بوده. و از دیروز با ... Consolidation در قاعده ریه راست با تشخیص پنومونی بستری
در بخش ... شده است. در معاینه هوشیار است و دیسترس تنفسی شدید دارد. عضلات فرعی
تنفسی استفاده می کند. افت O2Sat پیدا کرده است که بدون O2 تا 80-85 پایین می آید
با گذاشتن ماسک 90% است. در معاینه علایم حیاتی HR=125-130
BP: 80/ RR=40

نام پزشک مشاور و امضاء :
Consultant Physician Name & Signature:

تب ندارد. در معاینه ریه‌ها صداهای ریه وزیکولر و قرینه است. رال واضح ندارد. ویز شنیده نمی‌شود
کاهش صدا ندارد. نبضهای فوقانی بسیار ضعیف و غیر قابل لمس هستند. نبضهای محیطی ... لمس ...

تاریخ :
Date

Case # 3

- 28 years old female, 28 weeks pregnant, has presented several times to emergency department of a rural hospital with escalating headache for last two weeks, now presenting with several episode of tonic colonic seizures and loss of conciseness, some lasting several minutes.
- You are the physician on call what would you do?

Case # 3 Continues,

- How would you start?

Case # 3 Continues,

Patient is conscious but confused, does not obey command,

What do you need, to make clinical decisions?

Case # 3 Continues,

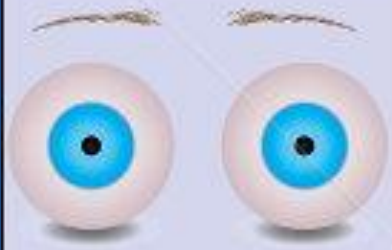
At the heart of every clinical encounter is vitals,

Patient's Vitals:

BP 150/64, HR 54, RR 24, T 39.2,

O2 Sat 86%, GCS 8, (E2V2M4),

What is Glasgow Coma Scale?

Behaviour	Response
 Eye Opening Response	4. Spontaneously 3. To speech 2. To pain 1. No response
 Verbal Response	5. Oriented to time, person and place 4. Confused 3. Inappropriate words 2. Incomprehensible sounds 1. No response
 Motor Response	6. Obeys command 5. Moves to localised pain 4. Flex to withdraw from pain 3. Abnormal flexion 2. Abnormal extension 1. No response

Principles of Stabilizing an Unstable Patient

- The aim of the initial treatment is to keep the patient alive, and achieve some clinical improvement. This will buy time for further treatment and making a diagnosis.
- Airway, Indication for intubation and securing of the airways,
- Breathing, what should one do in this regard?
- Circulation, How could we ensure circulation?
- Disability, What does this mean in terms of Resuscitation?
- Exposure, What would one look for in Exposing the patient?

Case # 3 Continues,

- With that in mind what would you do?
- Should we sedate and intubate the patient?
- What would you use for sedation in a pregnant women?
- What about anti-seizure medication in a pregnant patient?
- Would you terminate the pregnancy?
- Can we analyze the history and vitals to understand the clinical case better and make relevant decisions?
- How would this patient die?

How Would You Investigate this Patient?

- Can we agree on a differential diagnosis so that we can carry the stabilization to the treatment phase?

- Can you choose the three most relevant investigations that you could ask for?

Differential Diagnosis?

DIMS as a Pneumonic for “Decreased Level of Conciseness”,

- D, Drugs, Could that be drug toxicity,
- I, Infection/Inflammation/Ischimia,
- M, Metabolic Disorder,
- S, Structural Abnormality, Stroke, Trauma, Cerebrovascular thrombosis
-

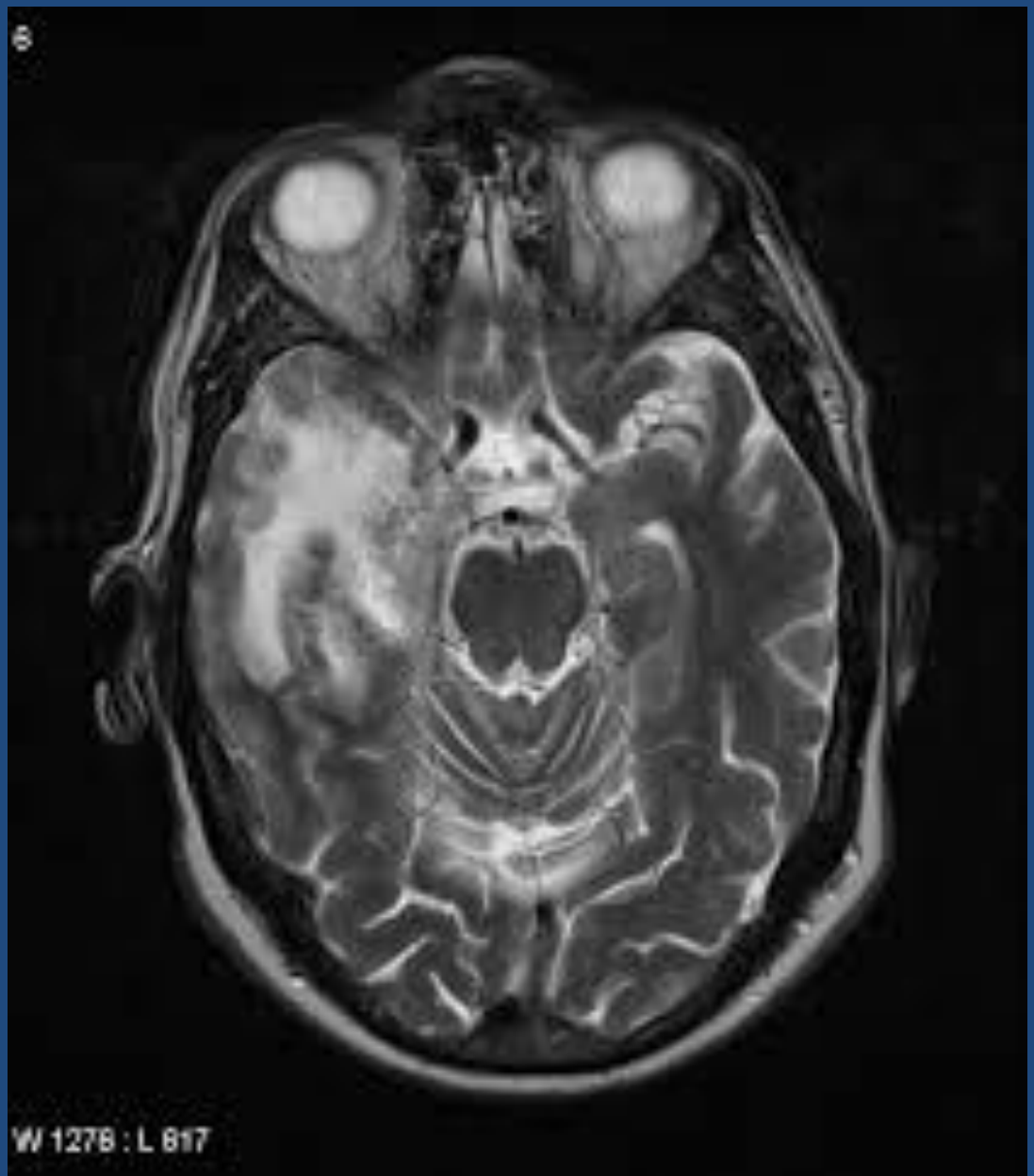
Relevant Investigations

- If you are asking for more than 3 investigations, perhaps you need to understand the case better!
- Toxicology (Urine and Blood Toxic Screen)
- CBC
- MRI of the Brain,
- Why this could not be a case of Metabolic Disorder?

Investigations Outcome

- WBC 14, Lymphocytes 60%,
- Toxicology Screen Negative
- MRI to follow,

MRI image of the Patient's head



Case # 3 Continues,

What would you find in the physical exam of this patient?

Do you remember the vitals?

What should we do to manage a raised ICP?

Case# 3 Outcome

- Patient suffered significant raised ICP
- Her raised ICP was managed medically
- Given the worsening clinical course, surgical intervention was implemented

Case Study # 4

- 34 y/o female, obese, DM2, 14 weeks gestation, Mother of 4, with 6 total pregnancy, 2 previous miscarriage, seen in outpatient clinic,
- Which pool does she belong to?
- What would you do?

Case #4 Continued

- Patient returns at 38 weeks gestation, with preeclampsia which was diagnosed at 24 weeks of gestation,
- Admitted for previously arranged C-Section.
- Which pool does she belong to?

Case #4 Continues

- 3 weeks post-C-Section returns with abdominal pain and secretions from surgical site?
- Surgical site is debrided and an abscess was drained
- Which pool does she belong to?
- What would you do?

Case # 4 Continues

- 6 PM, phone call from nursing station reports a brief episode of “loss of conciseness”
- What is on your differential diagnosis?
- What would you do?

History and Physical!

- No details of the event is documented!
- No Physical Exam is Documented with the exception of a set of vitals:
- HR: 110, BP: 85/60, RR 24, O2 Sat 89%
- What should have we done?

Case # 4 Continues

- At 6 AM patient was found unconscious, (no pulse), in her hospital bed?
- In terms of resuscitation what are you thinking about?
- What would you do?
- Do we know ACLS in peripartum?

Case #4 Continued

- Why would this patient have a cardiac arrest?
- What if this patient was still pregnant?
- Given you don't know the time of the arrest would you still run a code on the patient?

ACLS in Pregnancy

Objectives

- Discuss incidence and causes of maternal cardiac arrest during pregnancy
- Discuss pregnancy related physiologic changes
- Differences in ACLS algorithms during pregnancy?
- What therapy options are available?
- What drugs are safe?
- Emerging therapies for maternal cardiac arrest?

Incidence of Cardiac Arrest in Pregnancy

- Incidence of cardiac arrest is about 1 in 30,000 pregnancies

- Because most pregnant women are young and healthy, causes of arrest differ slightly from the general population

- Significant Causes (nearly 70% of all maternal arrests) include:

1) Maternal hemorrhage (accounts for 20-25% of Maternal Death in IRI)
2) Pulmonary Embolism
3) Pre-ecclamsia/Ecclampsia
4) Sepsis

- Amniotic fluid embolism, trauma, peripartum cardiomyopathy, stroke and MI account for the remainder 25%
- Iatrogenic causes- hypermagnesmia, anaphylaxis, anesthesia complications are less than 5%

Differences in Pregnant Resuscitation

In general, resuscitation algorithms during cardiac arrest are the same for pregnant and non- pregnant patients (with a few exceptions)

1- More aggressive airway management

2- Slight modification in CPR/chest compressions

3- Early consideration of perimortem cesarean delivery

Why Aggressive Airway Management?

- Physiological Changes in a pregnant women's airways necessitates a more aggressive approach to airway management,

1- Upper airway edema and increased secretions

2- Most women go from Mallampati class 1 or 2 to a grade 4 airway by term

3- Progesterone delays gastric emptying, increasing risk of aspiration

4- Gravid uterus compresses diaphragm making Bagmask Ventilation Mode more difficult

Mallampati Grading System

Class 1

Class 2

Class 3

Class 4

Why Aggressive Airway Management?

- Progesterone induced increase in minute ventilation through increased tidal volume,
- ABG's during late pregnancy shows a compensated respiratory alkalosis (PCO_2 of 28-32)
- Decreased functional residual capacity and limited oxygen reserve leads to rapid desaturation of pregnant women during RSI, and without proper pre-oxygenation cardiac arrest is likely
- Chest wall compliance is reduced secondary to mechanical effects (enlarged breasts and gravid uterus)

Cardiovascular Physiologic Changes Impacting Resuscitation

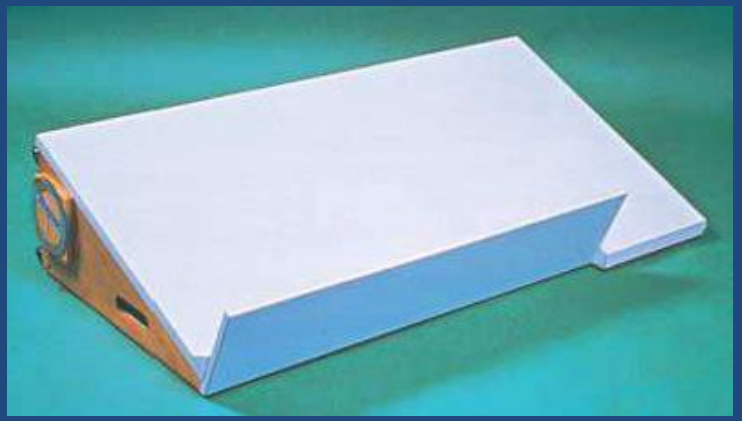
- Increased cardiac output (30-50% by 32 weeks)
- Increased oxygen consumption
- Decrease in SVR secondary to uteroplacental blood flow
- Up to 30% of CO goes to Gravid Uterus, compared to 2% in non-gravids
- Aortocaval compression by the gravid uterus in the supine position, venous blood return may be completely obstructed with all blood return supplied by the azygous, lumbar and paraspinal veins

Cardiovascular Physiologic Changes Impacting Resuscitation

- Cardiac output during optimal CPR is estimated to be ~30% of normal
- Uteroplacental blood flow is markedly reduced even with optimal chest compressions
- During the second half of pregnancy, when performing CPR, an attempt is made to relieve the aortocaval compression that occurs in the supine position
- However, a true “lateral decubitus” position is not optimal when performing chest compressions

Cardiovascular Physiologic Changes Impacting Resuscitation

- Rees and Willis in 1990 measured the force achieved with chest compressions in the supine, lateral decubitus, and various intermediary angles as compared to optimal CO
- their work led to the development of the Cardiff wedge inclined at 27cm to specifically perform CPR on pregnant patients
- However; the latest guidelines recommend manual displacement of the uterus to the left across the midline



ACLS in Pregnancy

- No changes in defibrillator pad placement in pregnancy
- No changes in defibrillator energy requirements
- Nanson et al studied transthoracic impedence looked at 45 women at term and then again at 6-8 weeks post-partum no difference in the two groups
- No contraindication to external defibrillation in pregnancy
- Multiple studies have demonstrated no adverse fetal effects
- Countershocks up to 400 J have been used without adverse fetal effects

ACLS in Pregnancy

- ACLS medications are given in the standard doses and routes
- Theoretically, the α-adrenergic agents may cause uteroplacental vasoconstriction
- This further compromises already poor uterine blood supply
- However, actual clinical effects are not known
- Sodium Bicarb use controversial May worsen fetal acidosis
- But it is important to remember that ultimate goal of the resuscitation is the survival of the mother.

Bradycardia in Pregnancy

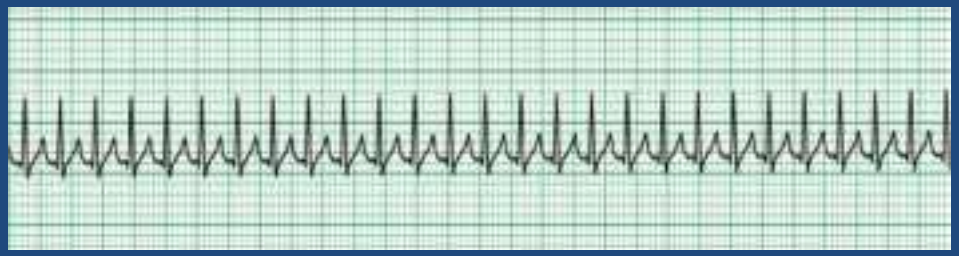
- Symptomatic bradycardia rare occurrence during pregnancy

- Common causes include:
  - ✓ Vasovagal events
  - ✓ Hypothyroidism
  - ✓ Hypothermia
  - ✓ Myocardial ischemia
  - ✓ Supine Hypotensive Syndrome of Pregnancy (bradycardia, hypotension, syncope)

- Treatment for symptomatic pregnant patients no different
- Atropine still treatment medication of choice
- Transcutaneous pacing also safe during pregnancy

SVT in Pregnancy

- Most frequent tachyarrhythmia of pregnancy
- Pregnancy increases risk for new onset SVT
- Pregnancy also increases frequency and severity of pre-existing SVT
- Treatment algorithm same as for non-gravids
- Stable vs unstable
  - ✓ Again, DC cardioversion safe
  - ✓ Adenosine at standard doses also safe

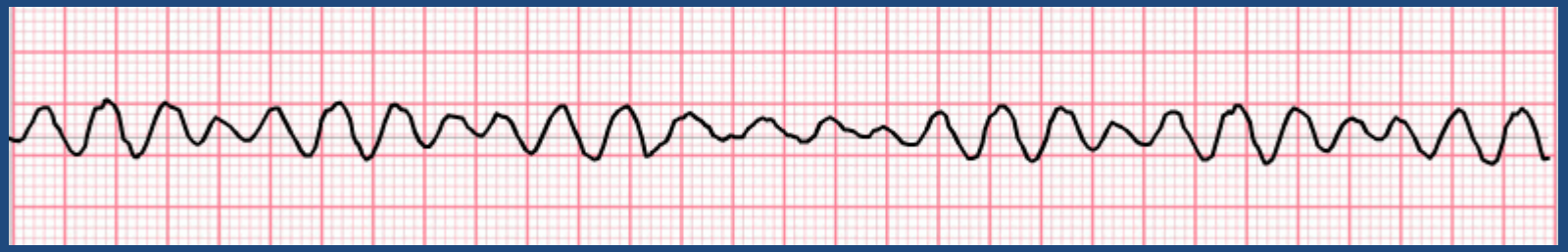


Ventricular Tachycardia in Pregnancy

- In setting of structurally normal hearts, VT in pregnancy is rare
- When VT does occur in pregnant patient consider these causes:
  - ✓ Severe acid-base disorder
  - ✓ Severe electrolyte disorder
  - ✓ Abuse of stimulants
- Again, cardioversion and defibrillation safe
- Lidocaine (class B) and Procainamide (class C) safe for sustained, stable VT
- Amiodarone (class D)- use limited by teratogenic profile
- Use for pharmacologic and shock resistant VT

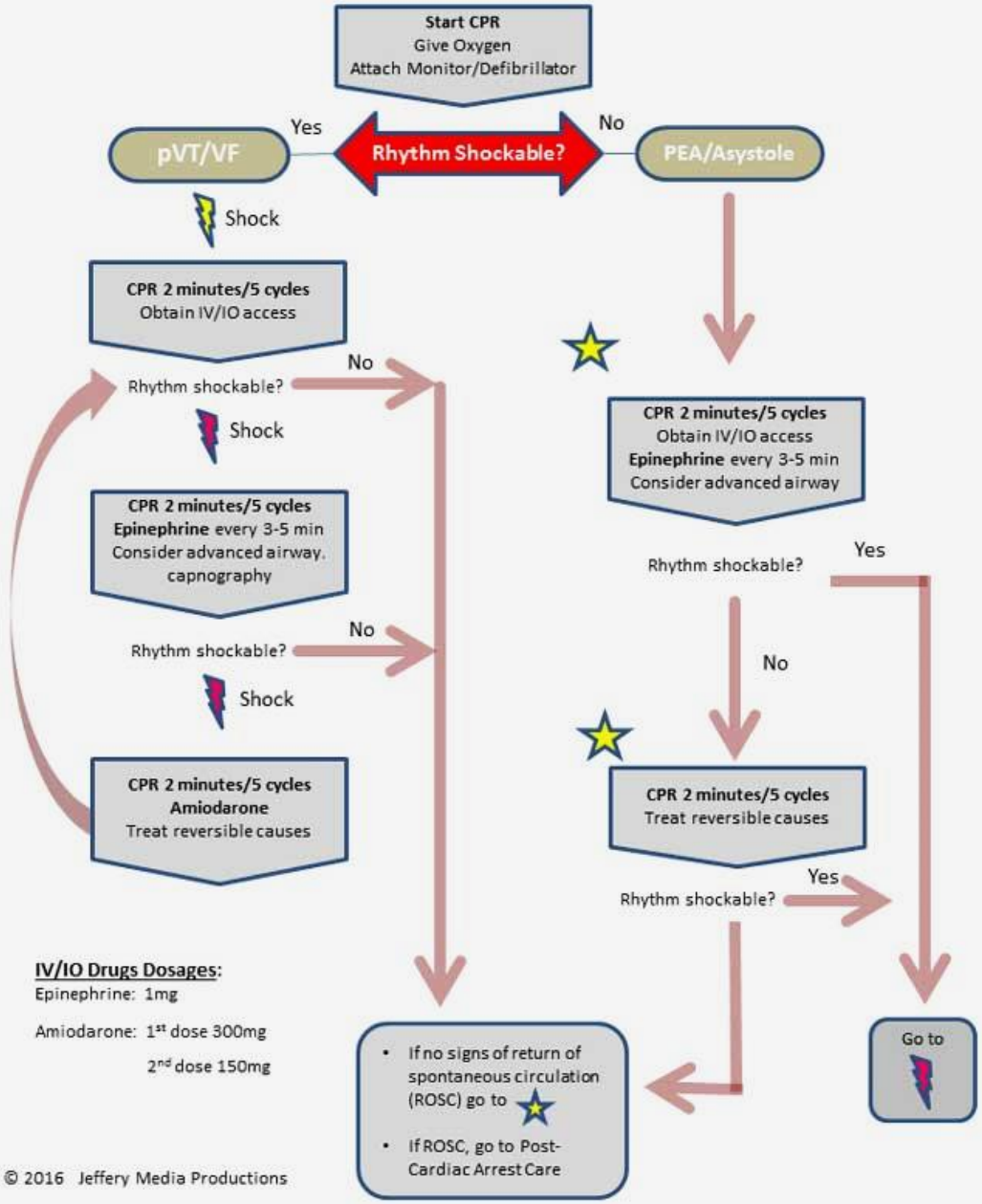
Ventricular Fibrillation in Pregnancy

- Rare in Pregnancy, yet as discussed previously, ACLS algorithms basically unchanged
- Remember the left positioning of the gravid uturs post 20 weeks of gestation for chest compressions
- Intubate sooner than during other code situations
- Defibrillate at same energies
- Epinephrine, Atropine or any other code medication should not be withheld because of concern for fetal effects
- How long do you resuscitate the mother before you turn your attention to a viable or non-viable fetus?



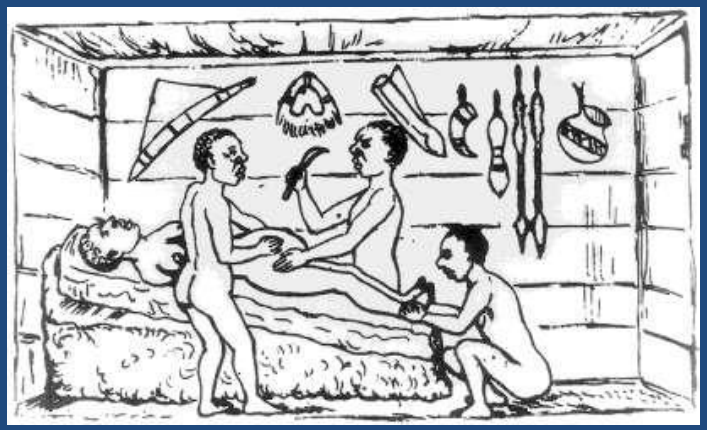
AHA ACLS Adult Cardiac Arrest Algorithm

Shout for Help/Activate Emergency Response



Perimortem C-Sect

- Cesarean delivery is one of the oldest surgical procedures, dating back nearly 3000 years.
- The procedure is believed to have derived it's name from the *Lex Cesare* or "Law of Caesar".
- Fetuses had to be separated from the mothers who died during child birth for religious purposes Interestingly, some of the infants survived
- Perimortem C-section first began to be described in the medical literature in the late 19th and early 20th centuries.



Perimortem C-Sect

- Katz and colleagues in 1986 reviewed all the reports of perimortem C-sections
- Found reports of 188 such precedures 61 of the reports included time of arrest or death of the mother to time of delivery of infant

Time (in minutes)	# of infants surviving	% surviving neuro intact
0-5	45	98
6-15	18	83
16-25	9	33
26-35	4	25
36+	1	0

Perimortem C-Sect

- Based on these findings, Katz and colleagues recommended “initiation of C-section within 4 minutes of maternal arrest and fetal delivery within 5 minutes.”
- These findings, which; have been supported by other studies and consensus panels, forms the basis of the “4 minute” rule
- Case reports of prolonged time (>20) do not make this “4 minute rule “ absolute

Perimortem C-Sect

- Gestational age is an important factor in predicting the prognosis for infants after perimortem cesarean deliveries
- What is the gestational age threshold for expected fetal viability?
- Most institutions agree between 24-26 weeks
- Because exact gestational age is sometimes unknown during an arrest situation, what are some ways you can estimate GA?
- Ultrasound (also gives info on fetal lie, placental location, or presence of fetal cardiac activity)
- Measure from pubic symphysis to top of uterine fundus

Perimortem C-Sect

- The primary goal of perimortem C-section traditionally was to save the fetus, yet there are new evidence to indicate that the procedure may be life saving for both mother and fetus
- There is significant aortocaval compression by grater than 20 week uterus, and delivery of fetus may significantly improve maternal cardiac output
- A number of case reports support this (more than 30)
- As for cardiac arrest in early pregnancy, it is unknown if C-section is beneficial, as there is much smaller fetal-placental mass, and little to no aortocaval compression
- Thus, less hemodynamic benefits and Not recommended at gestational age of less than 20 weeks
- Focus needs to remain optimizing resuscitation of mother

Remember

- Every resuscitation, Maternal or non, starts with CABDE…

Practice Scenarios Hs and Ts

- Hypovolemia
- Hypoxia
- Hydrogen ion
- Hyperkalemia
- Hypokalemia
- Hypothermia
- Hypoglycemia

- Toxins
- Tamponade
- Tension PTX
- Thrombosis (coronary)
- Thrombosis (Pulmonary)
- Trauma

Management of non-shockable rhythms (asystole or PEA)

- On recognizing organized electrical activity, seek evidence of ROSC and if absent (PEA), resume chest compressions immediately and continue for two minutes
- After the *first rhythm check*, give epinephrine 1 mg IV
- After the *third rhythm check*, given epinephrine 1 mg IV; continue giving epinephrine after alternate rhythm checks ie fifth, seventh, ninth, eleventh etc
- If a shockable rhythm is identified during a rhythm check, switch to the shockable algorithm but continue giving after alternate rhythm checks

Case Study # 4

- 34 y/o female, obese, DM2, 14 weeks gestation, Mother of 4, with 6 total pregnancy, 2 previous miscarriage, seen in outpatient clinic,
- Which pool does she belong to?
- What would you do?

Case #4 Continued

- Patient returns at 38 weeks gestation, with preeclampsia which was diagnosed at 24 weeks of gestation,
- Admitted for previously arranged C-Section.
- Which pool does she belong to?

Case #4 Continues

- 3 weeks post-C-Section returns with abdominal pain and secretions from surgical site?
- Surgical site is debrided and an abscess was drained
- Which pool does she belong to?
- What would you do?

Case # 4 Continues

- 6 PM, phone call from nursing station reports a brief episode of “loss of conciseness”
- What is on your differential diagnosis?
- What would you do?

History and Physical!

- No details of the event is documented!
- No Physical Exam is Documented with the exception of a set of vitals:
- HR: 110, BP: 85/60, RR 24, O2 Sat 89%
- What should have we done?

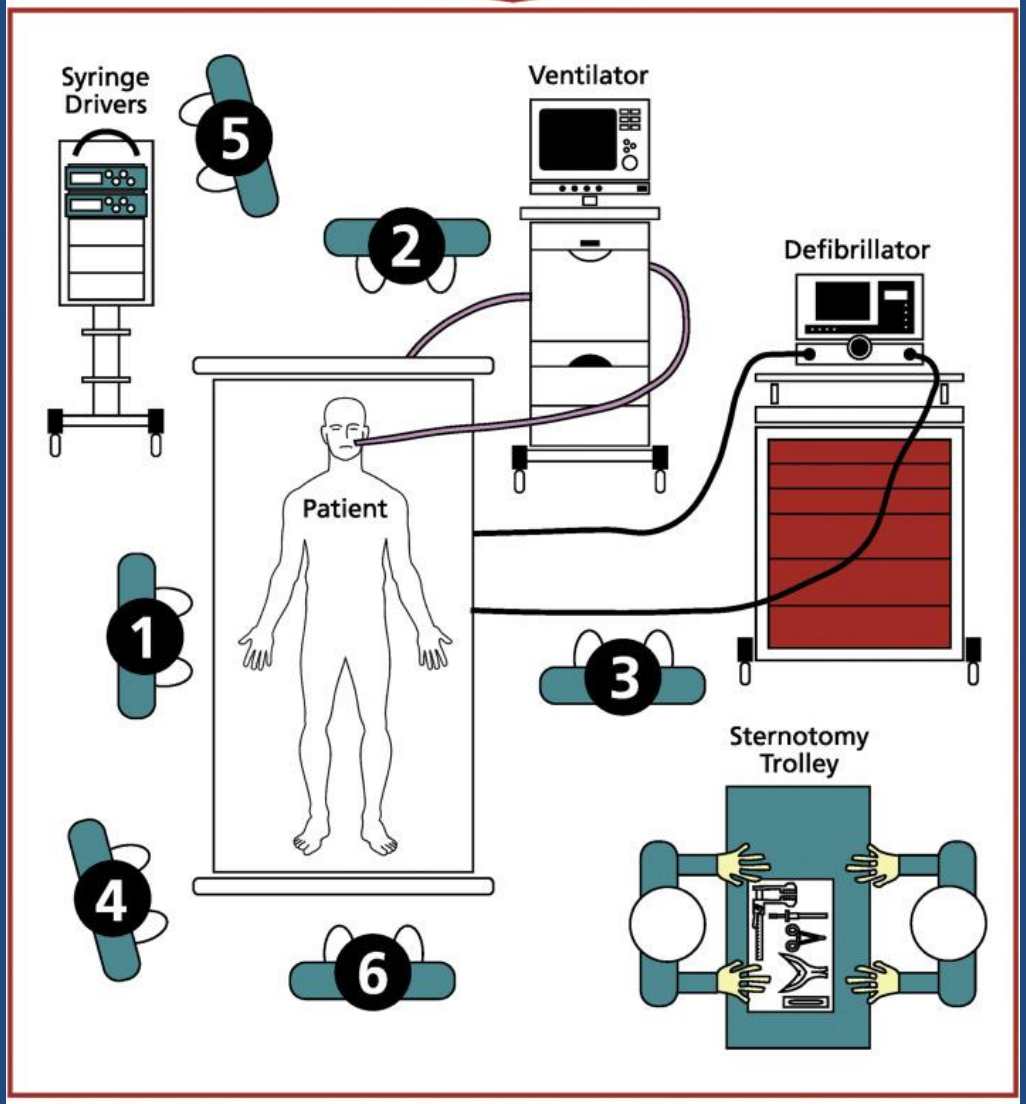
Case # 4 Continues

- At 6 AM patient was found unconscious, (no pulse), in her hospital bed?
- In terms of resuscitation what are you thinking about?
- What would you do?
- Do we know ACLS in peripartum?

How would you precede with the code?

- What are the priorities?
- How many people do you need?
- How is leading the code?
- Sequence of events?

Six key roles in the cardiac arrest



Six key roles in the cardiac arrest:

1. External cardiac massage
2. Airway and breathing
3. Defibrillation
4. Team leader
5. Drugs and syringe drivers
6. ICU co-ordinator

Outcome!

- ABCD… of maternal resuscitation
- Is there any counter indications in Code Blue?

Case Study # 5

31 y/o female, 27 weeks pregnant, with 2 weeks history of progressive SOB, Cough, sputum production, palpitation and occasional lightheadedness

BP 90/52
HR 130
RR 36
O2 Sat 96%
T 39.2
GCS 15

Case # 5 History

- Symptoms started about tow weeks ago with soar throat headache and body ache, but progressed to SOB, cough and decreased exertional capacity which seems to be progressive, feels week and unable to do activities of daily living in last few days
- She knows of some people being ill around her
- Past medical history not documented
- Family History not documented
- Currently on no Medication

Physical Examination

Practically no significant physical findings documented or presented …

Ideally what would you look for?

What is your Differential Diagnosis?

-Vital Analysis

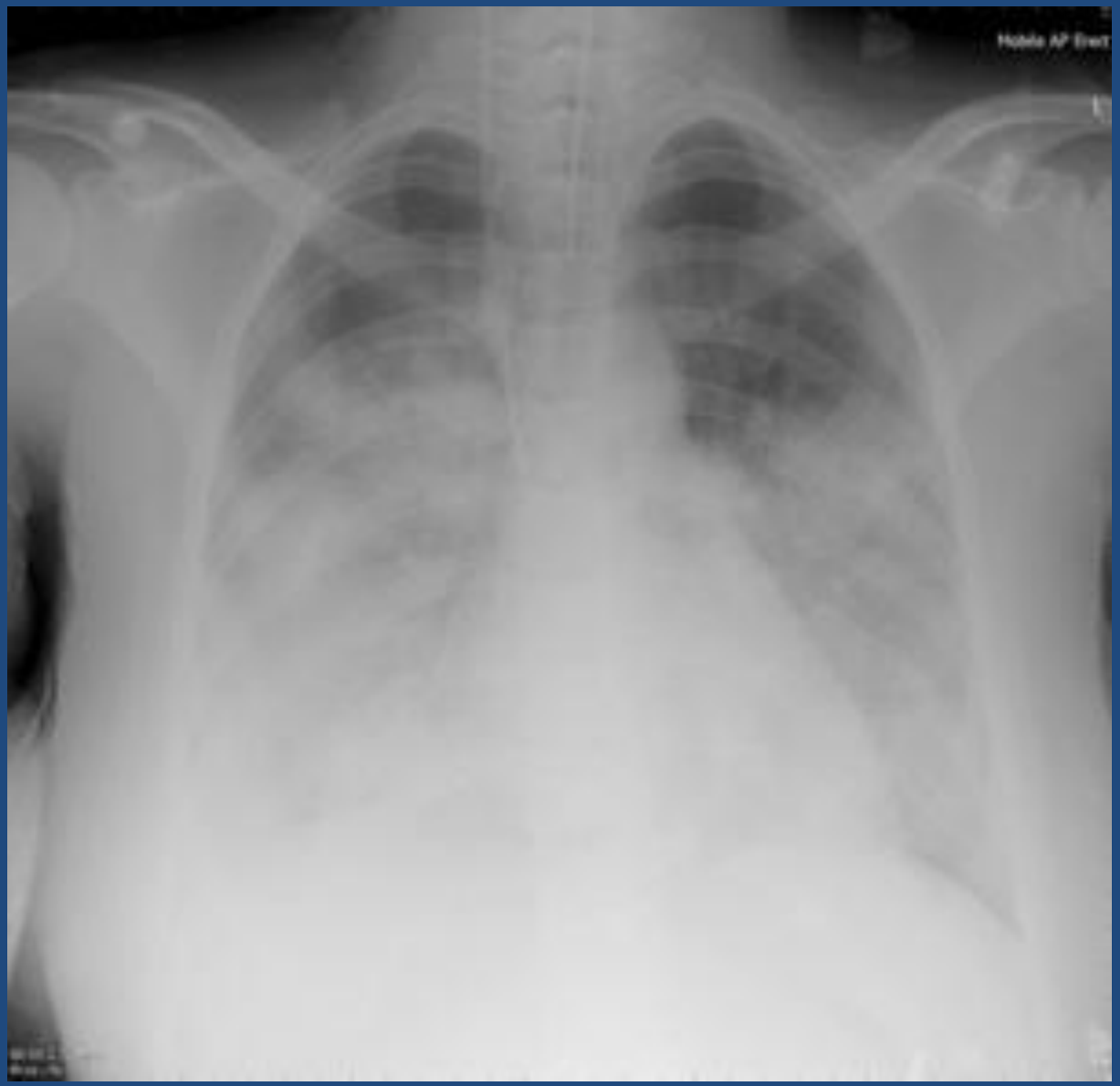
-Critical thinking and medical reasoning

-Medical Reasoning of differential diagnosis and history, physical exam and Para clinical investigations…

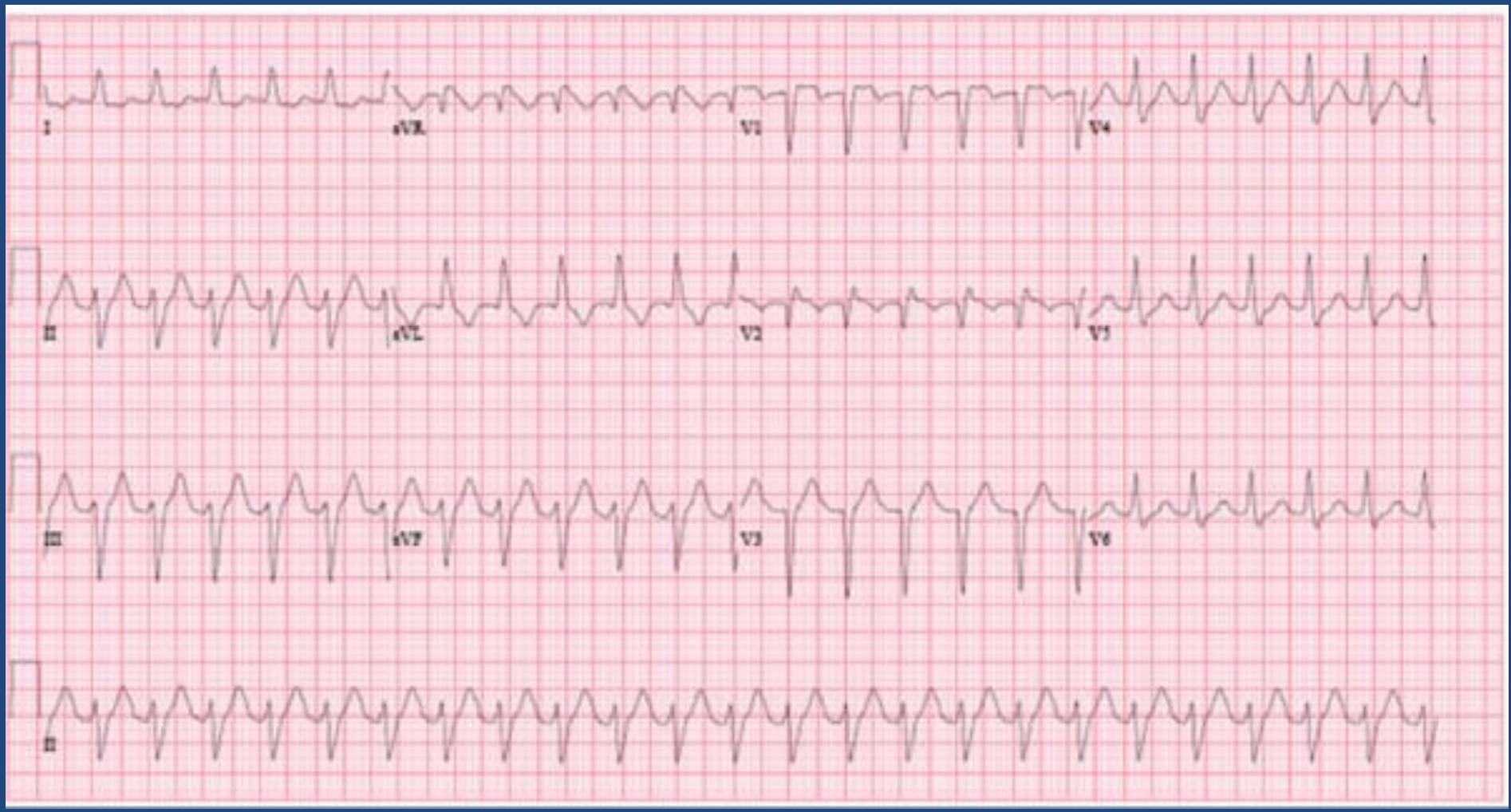
Significant Lab and Imaging Findings

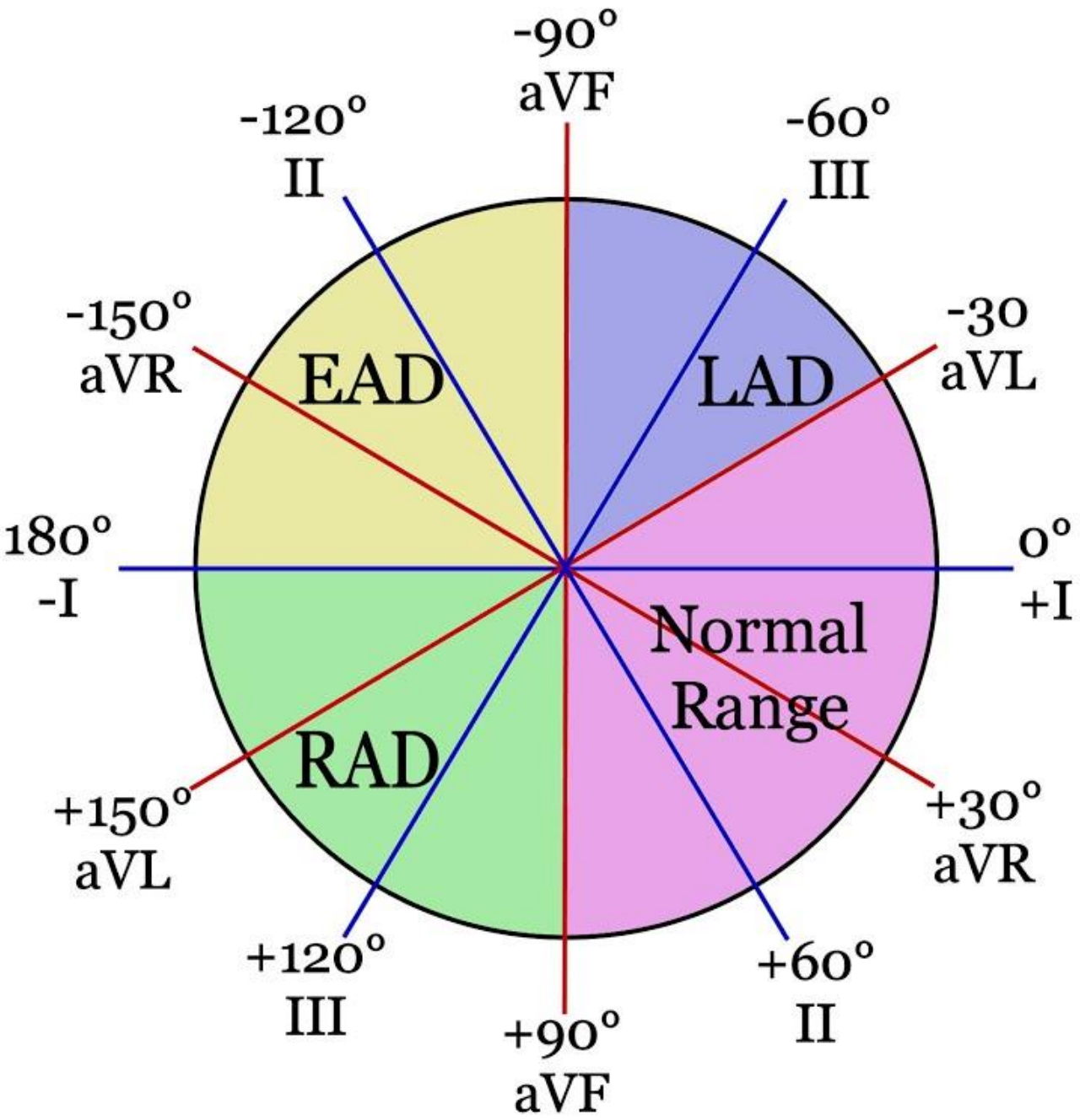
- Leukocytosis WBC 19000
- Neutrophilia and left shift
- Elevated INR (1.2) and liver enzymes
- Raised creatinine and Urea
- Elevated liver transaminases

Patient's Chest X-Ray



Patient's ECG




-90°
aVF
-120°
II
-60°
III
-150°
aVR
EAD
LAD
-30
aVL
180°
-I
0°
+I
Normal
Range
RAD
+150°
aVL
+30°
aVR
+120°
III
+60°
II
+90°
aVF

Patient's Outstanding Issues

- How would you manage the patient?
- Would you intubate this patient? If yes how?
- Would you give volume to this patient?
- Would you start this patient on vasoactive medications?
- Would you terminate the pregnancy?
- How would this patient die?
- Would you isolate the patient?
- What would you treat this patient with?

Patient's Course in the Hospital

- Early AM hours, patient is profoundly hypotensive (Systolic BP 70, diastolic un-measurable), Bradycardic (HR 40s) with poor O2 sat (68% with 10 L nasal flow), encephalopathic….

- What do you think will happen next?

Outcome

- Patient coded in process of being intubated
- Resuscitated after 35 minutes of CPR
- Day 2 of ICU admission, right arm is swollen with absent pulse, what might have happened?
- Day # 3 in ICU, Hypotensive, Bradycardic, Pa02 44%,
- Cardiac Arrest and Unsuccessful resuscitation!

Complications of Cardiac Arrest

- Anoxic Brain Injury and consequences
- Anoxic Renal Injury and consequences
- Academia and consequences
- Acute Liver Injury and consequences
- Cardiac Injury
- Lung Contusion and consequences
- Hematological Abnormalities and coagulopathies

Case Study # 6

- 28 years old female 18 hours post C-Section found unconscious in the bathroom

- Vitals: BP 75/58, HR 140, RR 24, O2Sat 84%, GCS 12 (M6 V3 E3)

- Detailed approach:

  A, B, C, D, ….

Case # 6 Unfolds

- What is on your differential diagnosis and why?
- No IV access
- No blood work since the C-Section
- Blood Type is A+ but no blood is urgently available in the ward
- How would you precede in a detailed manner?
- In the process of resuscitation your nurse tells you that patient has no pulse but there is electrical activity on cardiac monitor!

Resuscitation of Hypovolemic Cardiac Arrest

- Circulation, CPR and its details, Cardiac Monitor leads attachment…
- Airway Management
- Breathing
- (IV access, Central Line, Crystalloid Volume estimate, PRBC, FFP, Platelet, tranexamic Acid,

- A randomized double-blind, placebo-controlled trial by the WOMAN Trial Collaborators reported that Tranexamic acid significantly reduced death due to bleeding in women with postpartum hemorrhage when compared to the placebo group….)

Patient's Rhythm Strip

Management of non-shockable rhythms (asystole or PEA)

- On recognizing organized electrical activity, seek evidence of ROSC and if absent (PEA), resume chest compressions immediately and continue for two minutes
- After the *first rhythm check*, give adrenaline 1 mg IV
- After the *third rhythm check*, given adrenaline 1 mg IV; continue giving adrenaline after alternate rhythm checks ie fifth, seventh, ninth, eleventh etc
- If a shockable rhythm is identified during a rhythm check, switch to the shockable algorithm but continue giving adrenaline after alternate rhythm checks

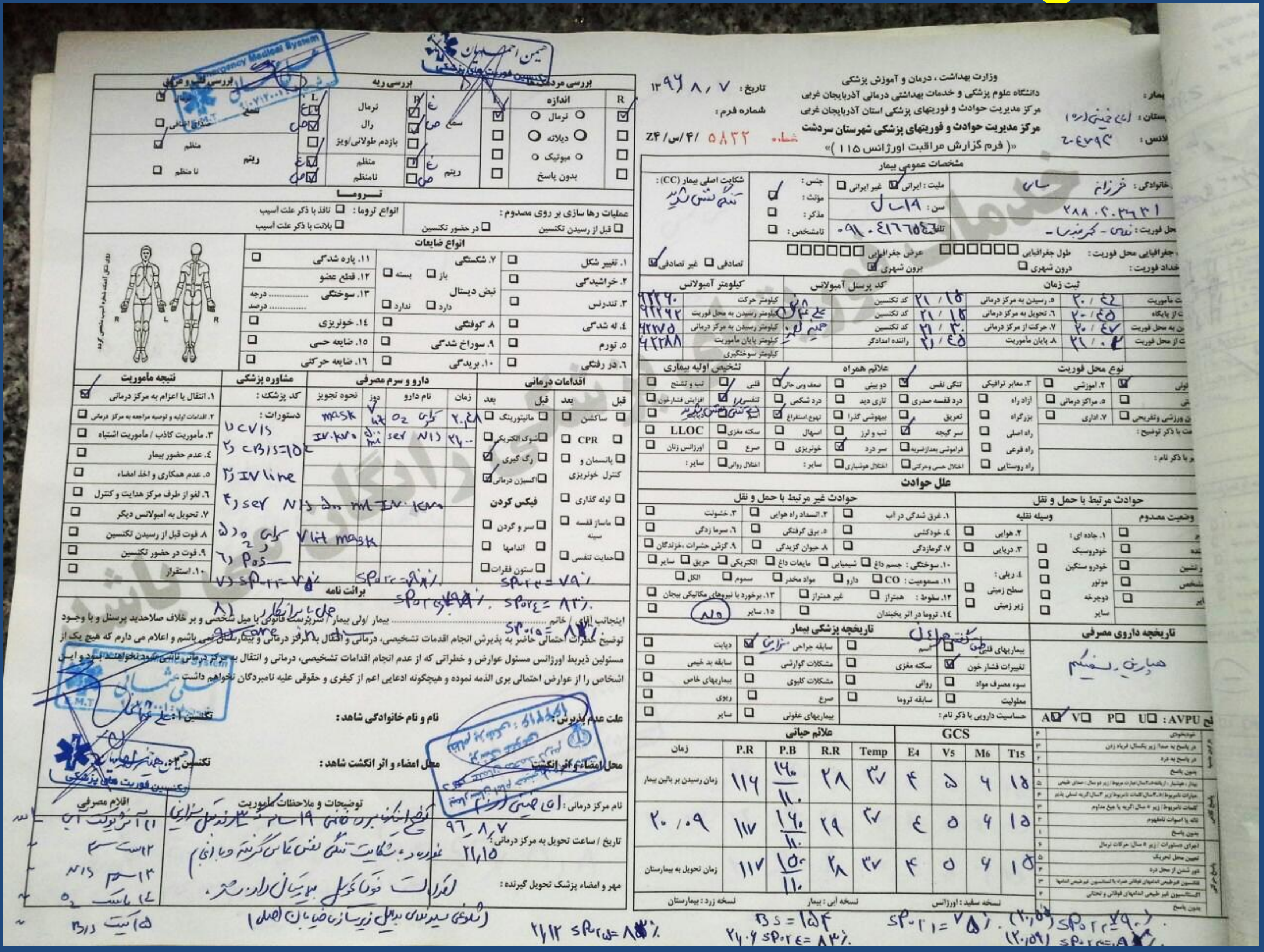
Case # 6 Continues

- After 18 minutes of Resuscitation Patient has the return of spontaneous circulation.
- So far patient has received (4L of N/S, 10 Units of PRBC, 8 Units of FFP, 8 doses of Platelet, 1 gr of tranexamic Acid, Oxytosin 40 Units….)
- Uterine rupture is suspected and total hysterectomy is performed (with more intraoperative fluids and PRBC)
- What would you expect to see in coming days?
- BP and heart rate has stabilized but she is difficult to ventilate!
-
- In coming days patient becomes hypotensive, bradycardic and hypoxic, non-responsive to vasoactive agents. Sever pulmonary edema, significant renal impairment…
- Forth day post resuscitation patient had a cardiac arrest and unsuccessful resuscitation.

Complications of Massive Transfusion

- Acidosis
- Hyperkaliemia
- Citrate Toxicity and Hypocalcaemia
- Depletion of Fibrinogen and Coagulation Factors (hypocoagulable state)
- Depletion of Platelets
- Disseminated Intravascular Coagulation
- Hypothermia…

Case # 8 Clinical Seen Investigation



وزارت بهداشت، درمان و آموزش پزشکی
دانشگاه علوم پزشکی و خدمات بهداشتی درمانی آذربایجان غربی
مرکز مدیریت حوادث و فوریتهای پزشکی استان آذربایجان غربی
مرکز مدیریت حوادث و فوریتهای پزشکی شهرستان سردشت
«(فرم گزارش مراقبت اورژانس ۱۱۵)»

تاریخ: ۱۳۹۶ / ۸ / ۷

مشخصات عمومی بیمار

علائم حیاتی

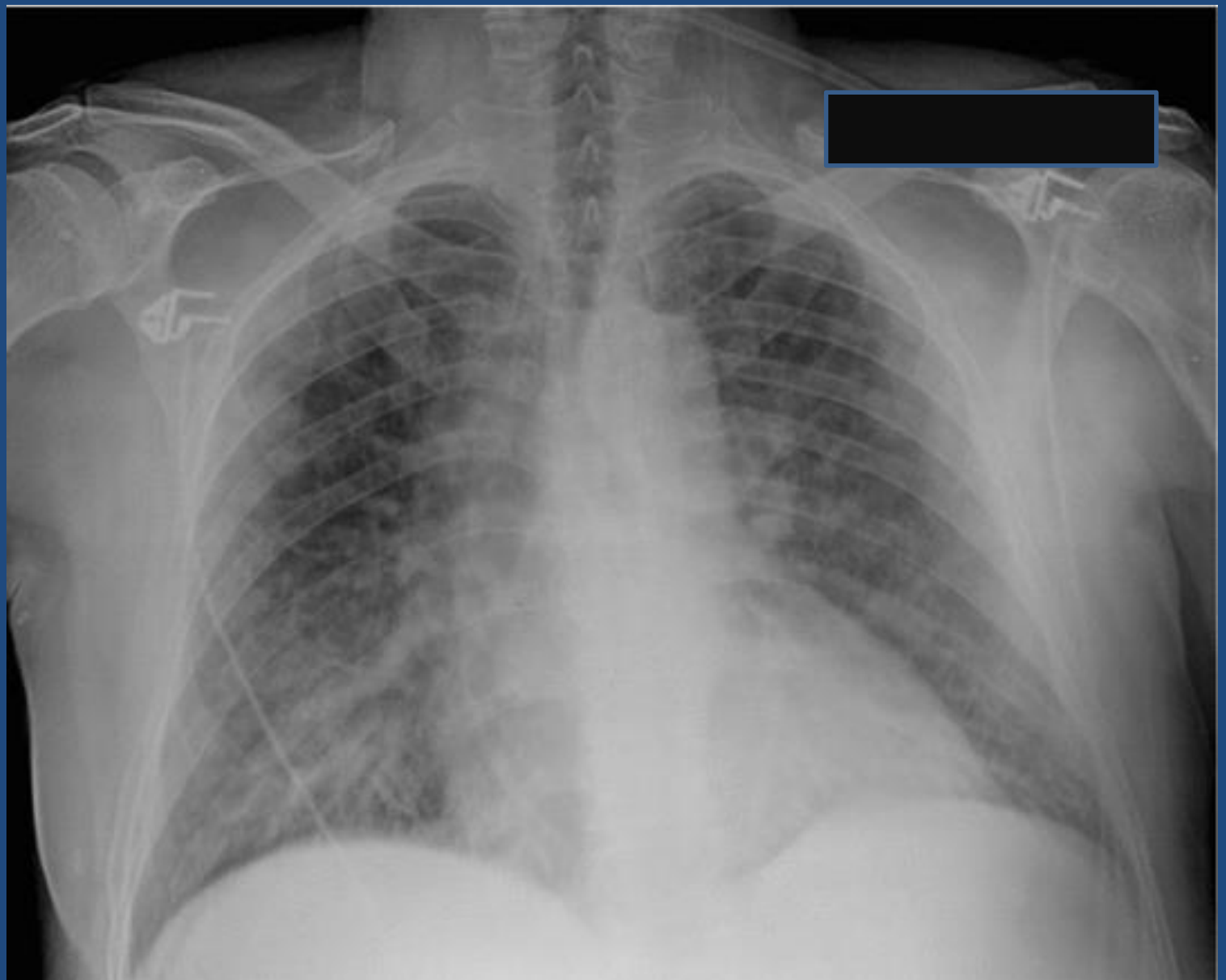
زمان	P.R	P.B	R.R	Temp	E4	V5	M6	T15
زمان رسیدن بر بالین بیمار	۱۱۴	۱۴۰/۱۱۰	۲۸	۳۷	۴	۵	۶	۱۵
۲۰/۰۹	۱۱۷	۱۴۰/۱۱۰	۲۹	۳۷	۴	۵	۶	۱۵
زمان تحویل به بیمارستان	۱۱۷	۱۵۰/۱۱۰	۲۸	۳۷	۴	۵	۶	۱۵

BS = ۱۵۴

How should we analyze this death?

- What are your thoughts about the vitals?
- What do you think the vitals of this patient looked like before the discharge?
- Why would a 19 years old, day 3 post C-Section be so profoundly hypoxic?
- How would this patient die?
- What would your detailed approach entail to close the gates of death?
- On the way to Hospital patient arrested, how would you manage her cardiac arrest?

Patient's Chest X-Ray



Putting the Pieces of the Puzzle Together

- What do you think might have happened?
- Vital Analysis?
- Presumed Diagnosis prior to C-Section,
- Presumed Discharge condition,
- Presumed Etiology of Unstable Presentation,
- Presumed Arrest Scenario
- Presumed Resuscitation
- Presumed outcome?

What do you think about this Description?

- دکتر عضو هیات علمی دانشگاه علوم پزشکی در مصاحبه با خبرنگار وب دا در خصوص فوت مادر گفت: چهارم آبان ماه بیمار خانم ۱۹ ساله از اهالی در هفته سی و هفتم حاملگی با فشار خون بالا به بیمارستان مراجعه می کند که پس از ویزیت توسط متخصص زنان و زایمان دستور ختم حاملگی داده میشود و بیمار تحت عمل جراحی سزارین قرار گرفته و ۴۸ ساعت در بیمارستان تحت نظر قرار می گیرند و مشکل خاصی نداشته و فشار خون بیمار کنترل شده بود و با نظر متخصص محترم بیمار از بیمارستان مرخص می گردد.
- وی در ادامه افزود: متاسفانه شب همانروز ترخیص بیمار دوباره با حال عمومی بد، با تنگی نفس، اختلال در هوشیاری، فشار بالا و خونریزی از ریه به بیمارستان انتقال می یابد.
- پزشک متخصص داخلی پس از ویزیت و اقدامات لازم با بنده تماس تلفنی برقرار نمودند و من نیز با توجه به نارسایی کلیه و خونریزی ریه و فشار خون بالای بیمار دستور اقدامات لازم را به پزشک زنان و داخلی برای تثبیت وضعیت بیمار از جمله دیالیز دادم تا اعزام گردد.
- دکتر تصریح نمود: بیمار صبح روز دوشنبه هشتم آبان ماه به بیمارستان امام خمینی(ره) رسید و این در حالی بود که بیمار بسیار بد حال و با افت قلب و افت فشار خون روبرو بود و حتی چند بار دچار ایست قلبی شد و احیا گردید و اقدامات تخصصی مربوطه انجام شد ولی متاسفانه علیرغم تمامی این اقدامات و ویزیتهای مداوم توسط پزشکان متخصص مختلف بیمار فوت کرد .
- وی یادآور شد: بر اساس تمامی آزمایشات انجام گرفته و بررسی همه موارد و بر اساس نظر اساتید ، بیماری TTP
- پورپورای ترومبوتیک ترومبوسیتوپنیک تایید گردید که یک (Thrombotic thrombocytopenic purpura) بیماری انتقادی خون می باشد .

Bear Hand Resuscitation
"Basic Life Support"

2:30 AM phone call from a satellite phone of MSF,

23 y/o female 7 months pregnant presenting to rural area clinic in Zimbabwe,

What would you do? How would you manage this patient?

Tele Medicine/Blind Code

What Important Questions Would You Ask About Physical Exam?

What Would You Have Your Colleague Do and Report Back?

Vitals

- BP: 210/110
- HR: 83
- RR: 19
- No O2 sat
- Temp: 39 ‘C
- GCS 3

Every Human Dies yet every life deserves a fight for sustenance

Thank you for your attention and Time to have your say

My Contact Information

- Dr. Saren Azer
- Telephone Number: 0914-485-0551
- Email: baran.serbest4@gmail.com

Visual Representation of Maternal Mortality Worldwide,