Fetal distress
(nonreassuring fetal status)

- **Dr Muhammad El Hennawy**
- **Ob/gyn specialist**
- **Rass el barr central hospital and**
  dumyat specialised hospital
- **Dumyatt – EGYPT**
- **www.geocities.com/mmhennawy**

What is fetal distress?

- While fetal distress is a widely used term, it is poorly defined in the medical literature
- It should be defined as:-

Hypoxia that may result in permenant fetal brain damage or death

if not reversed by immediate alleviation of the cause (to restore proper blood supply and oxygenation to the fetus) or the fetus delivered immediately (often by cesarean section)

- It is made by indirect methods

because Direct assessment of fetal oxygenation is Under investigation

(which gives most meaningful, reliable and reproducible data)

What can cause Fetal Distress?

- **Intrauterine Fetal distress**
- Maternal hypoxia (anaesthesia,heart faliure, severe anaemia, during eclamptic fits , severe pulmonary disease)
- Placental (placental compression –prolonged labour, tonically contracted uterus, placental separation, Uteroplacental insufficiency --.Improper / inadequate trophoblastic invasion and placentation in the first trimester, Lateral insertion of placenta,Reduced maternal blood flow to the placental bed,.Foetoplacetal insufficiency--Vascular anomalies of placenta and cord,.Decreased placental functioning mass(.Small placenta, abruptio placenta, placenta previa, post term pregnancy.)
- Obestetrical (true knot,tight coiling around fetal neck ,rupture of vasa previa ,hematoma of cord)
- Prolonged compression of head of fetus –compression of respiratory center
- **Asphyxia neonatorum**
- Persistance of intrauterine causes after birth –edema of brain due to compression
- Obstruction of respiratory passages(mucus,amniotic fluid, blood)
- Paralysis of respiratory center due to cerebral haemorrhage
- Depression of respiratory center due to anaesthesia,drug like pethedine
- Congenital malformation like atelectasis
- prematurity

Effects of Fetal hypoxia

- Fetal hypoxia is associated with severe complications in all systems.
- **The fetus** may suffer:
- IUGR
- Fetal movement decrease
- Oligohydramnios
- Meconium stained amniotic fluid
- IUFD
- **The infant** may suffer:
- Hypoxic ischemic encephalopathy
- Meconium aspiration syndrome
- Acidosis with decompensation
- Cerebral palsy
- Neonatal seizures

(ACOG)

- The American College of Obstetricians and Gynecologists (ACOG) now recommends that instead of the term "fetal distress," the term "nonreassuring fetal status" be used to refer to suspicious fetal heart tracings, since most nonreassuring tracings end with the birth of normal, healthy infants
- Birth asphyxia should be replaced with asphyxia with reference to its specific time

- Hypoxemia-----decreased oxygen content in blood
- Hypoxia----decreased level of oxygen in tissue

- Acidemia-------increased concentration of hydrogen ions in blood
- Acidosis--- increased concentration of hydrogen ions in tissue

- Asphyxia----hypoxia with metabolic acidosis

Perinatal Fetal Distress

- Intrauterine Fetal distress
  ---antepartum Fetal distress
  ---intrapartum Fetal distress
- Asphyxia neonatorum

Antepartum Fetal Distress

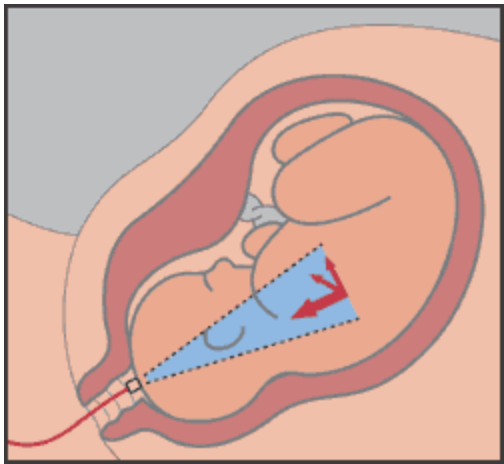
- It is usually Chronic Fetal Distress
- Abnormalities in GROWTH(clinical, U/S)
- Abnormalities in Uteroplacenal Function (fetal movement count–decrease-then stop , hormonal, NST, OCT, BPP)
- Abnormalities in Amniotic Fluid (hydramnios, oligohydramnios , Meconium stained)

Intrapartum Fetal Distress

- Intermittent auscultation of the fetal heart rate --abnormal

or Continuous electronic fetal monitoring --abnormal

- Fetal Movement --struggle –then ---stop
- Scalp pH measurement ---acidosis
- Meconium Stained (amnioscopy , Amniocentesis)
- **Fetal Pulse Oximetry**



Asphyxia neonatorum

- It is the inability of a newborn to initiate and sustain breathing at birth
- Asphyxia----hypoxia with metabolic acidosis
- **It is diagnosed by**
- **APGAR score**
- **Umblical cord --***pH of 7.25 or more* is normal,

  -pH <7.2(mild hypoxia)

  - pH <7.1 (severe Hypoxia),

  values in between 7.25 – 7.2 denotes pre-acidotic range and repeated estimation is indicated
- ***Time to spontaneous Breathing*** *(more than one minute)*
- ***Hypoxic Ischemic Encephalopathy grade 1 , 2, 3,***

Antepartum Fetal Distress

- It is usually Chronic Fetal Distress
- Abnormalities in GROWTH(clinical, U/S)
- Abnormalities in Uteroplacenal Function (fetal movement count–decrease-then stop , hormonal, NST, OCT, BPP)
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CLINICAL ASSESSMENT

Clinical examination in each antenatal visit is the primary and main assessment of fetal wellbeing. This includes detection of :

- - fetal heart sound,
- - fetal size,
- - fundal level
- - amount of amniotic fluid.

ULTRASONOGRAPHY

- **(I) Real-time sonography:**
- It can be used for detection of :
- Gestational age: by measurement of gestational sac, crown rump length, biparietal diameter or femur length.
- Viability of the fetus: by fetal heart movement or fetal movement.
- Fetal weight.
- Amniotic fluid volume.
- Fetal breathing movement. Foetal activity.
- Placenta: location , size and maturity.
- Congenital anomalies.
- **(II) Doppler ultrasound:**
- *Principle:*
- It depends upon the reflection of the ultrasound waves on the RBCs inside the blood vessels, so the blood velocity and flow through these vessels can be calculated.
- *Application:*
- Detection of fetal heart rate as early as 10-12 weeks.
- Assessment of fetal cardiac function.
- Measurement of blood flow in high risk cases as IUGR, post-term pregnancy and pregnancy induced hypertension.

AMNIOSCOPY

- Inroduced through the cervix without rupturing the membranes. It may reveal meconium stained liquor indicating placental insufficiency.

HORMONAL STUDIES

- (1) Estriol :
- - Maternal urinary and serum estriol level is an important index for the integrity of the fetal adrenal and liver as well as the placenta.
- - Urinary estriol increases as pregnancy advances to reach about 35-40 mg/ 24 hours at full term. Progressive fall in urinary estriol by serial measurement indicates that the fetus is jeopardous.
- (2) Progesterone:
- - Progesterone level can be detected in the serum and saliva of the pregnant mother and its end product pregnandiol in 24 hours collection of urine.
- - It is of little practical value in comparison to urinary estriol detection as the fetus is not sharing in its synthesis.
- (3) Human Placental Lactogen(hPL):
- - Although it was found that hPL falls before fetal death, it may be within normal range until after fetal death.
- - A single value of < 4 m g/ ml after 36 weeks is associated with 30% incidence of fetal distress.
- (4) Human Chorionic Gonadotrophin (hCG):
- It has no practical value as it can be detected up to few weeks after fetal death or delivery

Daily Fetal Movement Count (DFMC)

- **Procedure:**
- - The test is valid after 30 weeks of pregnancy.
- - The mother counts the fetal movements she feels in 3 hours during the period of 12 hours e.g. from 9 am to 9 p.m , one hour at the beginning, one hour at the middle and one hour at the end of this period.
- - The count is multiplied by 4 to get the fetal movements in 12 hours. If it is less than 10 movements, this indicates that the fetus may be at risk and non-stress test is indicated.
- - *Count-to -ten Cardiff system* : The mother counts the fetal movements from 9 am till she reaches 10 movements. No further count is needed unless she did not count 10 movements in up to 12 hours.
- - It was found that there is a reduction or cessation of the fetal movement 12-24 hours before stoppage of the heart " movement alarm signal".
- **Advantages:**
- 1- Informative and non-invasive.
- 2- Pregnant woman can monitor herself.
- 3- No cost.
- 4- Accurate gestational age not required.
- **Drawbacks:**
- Awareness of the fetal movement is differing from a mother to another.
- Cessation of fetal movement may occur due to intrauterine sleep.
- Sedation of the fetus occurs if the mother is taking sedatives.
- Sudden death of the fetus may occur without proceeding slowing of the fetal movement as in abruptio placenta or it may be preceded by increased flurry movements.

Antepartum FHR Assessement

- Simplified or traditional method
  a head stethoscope (fetoscope),
  a hand held Doppler ultrasound

obestetrician can do NST, OCT by pinard or doppler in his clinic

NST (count FHR , then after fetal movement which is spontaneously or after do first pelvic grip to initiate fetal movement ,when patient tell you there is a movement, count again

OCT (count FHR in 5 second before contraction , also at top of contraction, also within 3o second after end of contraction

- Electronic FHR monitoring (NST.OCT)

A Cardiotocograph (CTG)

- It is a record of the fetal heart rate (FHR) either measured Externally from a transducer on the abdomen or internally by a probe on the fetal scalp.
- In addition to the fetal heart rate another transducer measures the uterine contractions -- Externally with tocodynamometer over the fundus or internally with IU pressure catheter

F H Acceleration Test or Nonstress Test (NST)

- **How the test is performed**
- The test is carried out for 20 minutes. A fetal monitoring belt will be placed around abdomen , women asked to press a button when the baby moves so that the heart rate can be seen in relationship to that movement.
- If fetal movement did not occur the test is extended for another 20 minutes. the mother is offered a drink of something usually containing sugar or bubbles to perk the baby up .during which the fetus is stimulated mechanically by the 1st pelvic grip or by acoustic stimulation using an artificial larynx placed against the maternal abdomen to " awaken the fetus
- **Results:**
- *Reactive test:* 2 or more fetal movements are accompanied by acceleration of FHR of 15 beats/ minute for at least 15 seconds' duration. Reactive test means that the fetus can survive for one week, so the test should be repeated weekly.
- *Non -reactive test:* no FHR acceleration in response to fetal movements so contraction stress test is indicated.

Contraction Stress Test
(Oxytocin Challenge Test)

- To high-risk pregnancy or if a non-stress test or biophysical profile are abnormal
- **Procedure:**
- - It is done after 32 weeks of pregnancy.
- - Two transducers are applied to the mother's abdomen; one to record the FHR pattern and the other to record the uterine activity.
- - Three uterine contractions per 10 minutes are induced by one of the following :
- i) IV oxytocin drip starting with 0.5mU/ minute and doubled gradually or
- ii) tactile stimulation of the nipple.
- **Results:**
- *Positive test:* consistent and persistent late deceleration of FHR, so placental insufficiency is diagnosed and delivery by caesarean section is indicated.
- *Negative test:* late deceleration does not occur with uterine contractions. It denotes that the fetus can survive safely for one week when it should be repeated.
- **Contraindications:**
- 1- Threatened preterm labor.
- 2- Placenta praevia.
- 3- Rupture of membranes.
- 4- Previous classical C.S.
- 5- Multiple pregnancy.

The biophysical profile

- is a test that combines both fetal monitoring and ultrasound information.
- It may take an hour to complete
- and consists of the following five different parts:
- the non-stress test;
- the amniotic fluid index;
- the smaller movements made by baby's arms and legs;
- the larger movements made by the baby;
- and the ability of baby to move its chest muscles, called fetal breathing.
- This test would be done for a variety of reasons, including: testing without increasing baby's heart rate; rupturing of membranes or bag of waters prematurely; and reassuring women and doctor of baby's well-being.

Variable	Score 2	Score 0
Fetal breathing movements	Last for 30 seconds in 30 minutes of observation.	Less than 30 seconds in 30 minutes of observation.
Fetal movements	3 or more discrete body or limb movements within 30 minutes.	Less than 3 movements.
Fetal tone	One or more episodes of limb extension with return to flexion within 30 minutes.	Not observed.
Non-stress test	Reactive.	Non-reactive
Amniotic fluid volume	One or more amniotic fluid pockets measures 1 cm or larger in 2 perpendicular planes.	Largest pocket measures less than 1 cm in 2 perpendicular planes.
Maximum score 10 Minimum score 0		

A score of 8-10 is normal.
A score of 4-6--- deliver if lung is mature otherwise corticosteroids are given for 48 hours before delivery.
A score of < 4 is abnormal-- evaluate for immediate delivery

Intrapartum Fetal Distress

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or Continuous electronic fetal monitoring --abnormal

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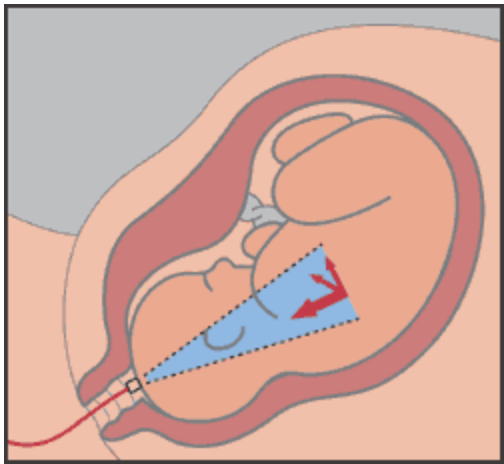


F H R Periodic Auscultation

- The Fetal Heart Rate can be auscultated with a Pinards Stethoscope or handheld doppler
- The panel defined periodic auscultation to include auscultation of the fetal heart every 15 minutes during the first stage of labor and every five minutes during the second stage.
- In either case, the fetal heart should be auscultated within 30 seconds of the end of a contraction.

Interpretation of intrapartum FHR

- Tracing the fetal heart beat with a cardiotocograph (CTG) monitor can be used to assess fetal well-being, and fetal heart rate response to uterine activity, during labor and delivery.

(A)Baseline FHR changes

- : The pattern between uterine contractions.
- *i- Baseline tachycardia:*

- Mild: 160-180 beats/min.
- Severe: > 180 beats / min.

- *ii- Baseline bradycardia:*

- Mild : 100-120 beats/min.
- Severe: <100 beats/ min.

- *iii- Loss of beat - to - beat variation:*

Normally there is a change of 5-10 beats/ minute every minute in FHR. Absence of this beat -to - beat variation indicates fetal compromise.

(B) Periodic FHR changes:

- The pattern with uterine contractions.
- *i- Early deceleration:*

  - Decrease in the FHR with the onset of the uterine contraction and return to the baseline with the end of the contraction.

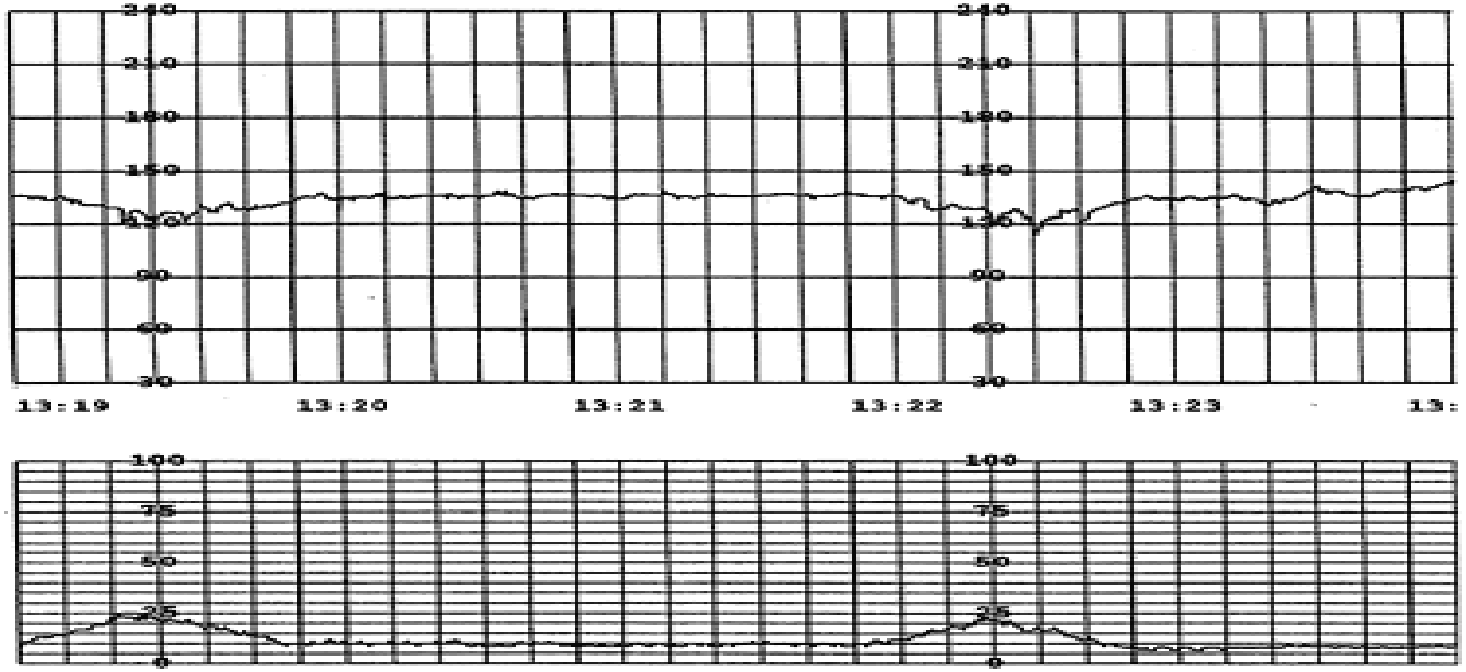
  This is usually due to compression of the fetal head with vagal stimulation.
- *ii- Late deceleration:*

  - Decrease in the FHR starts after a lag time from the onset of contraction and ends after a lag time from its end.

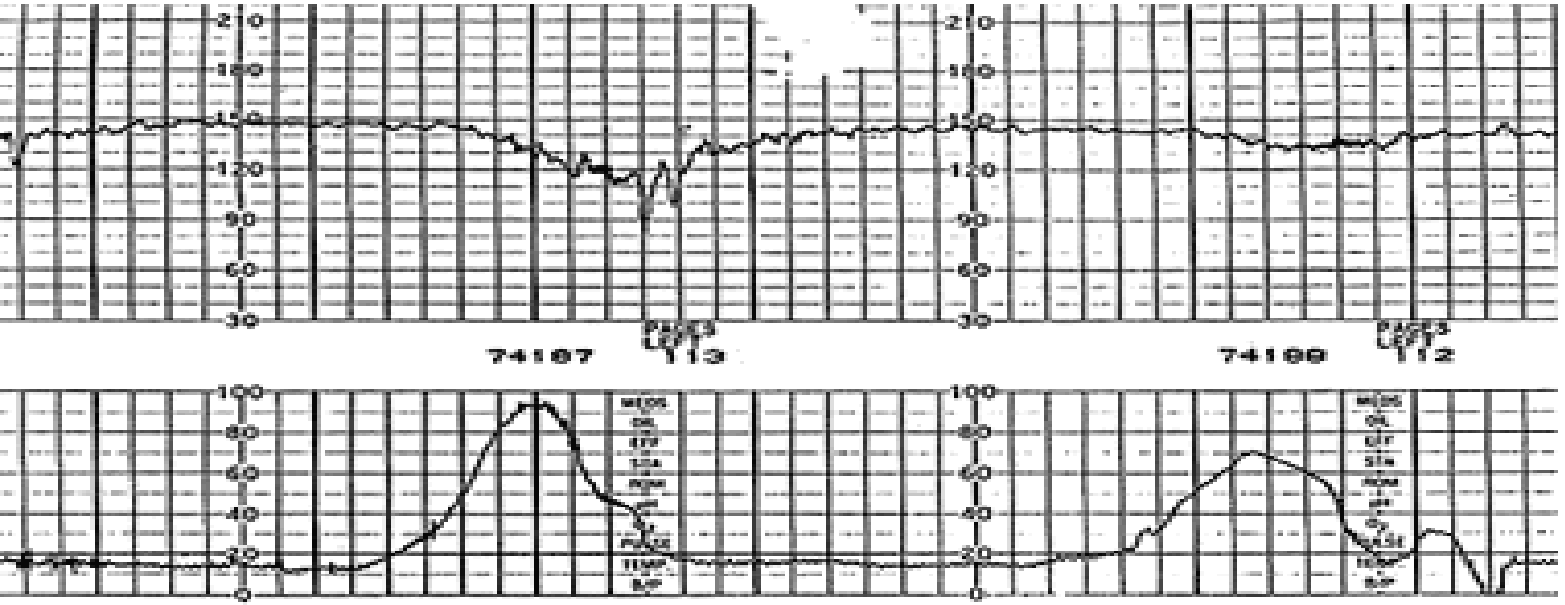
  It denotes uteroplacental insufficiency --- hypoxemia leads to hypoxia and metabolic acidosis the delayed return to baseline worsens due to myocardial depression
- *iii- Variable deceleration:*

  - of different intensity, pattern, time of onset and offset.

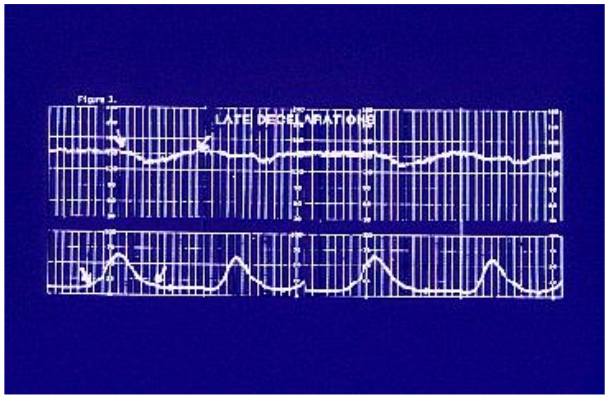
  It usually denotes cord compression especially in the presence of oligohydramnios.



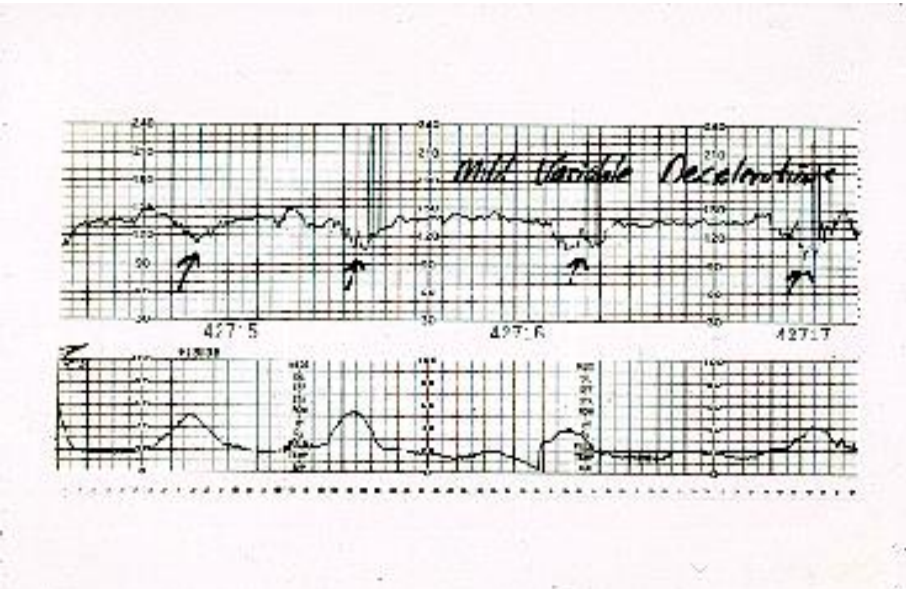
Early decceleration

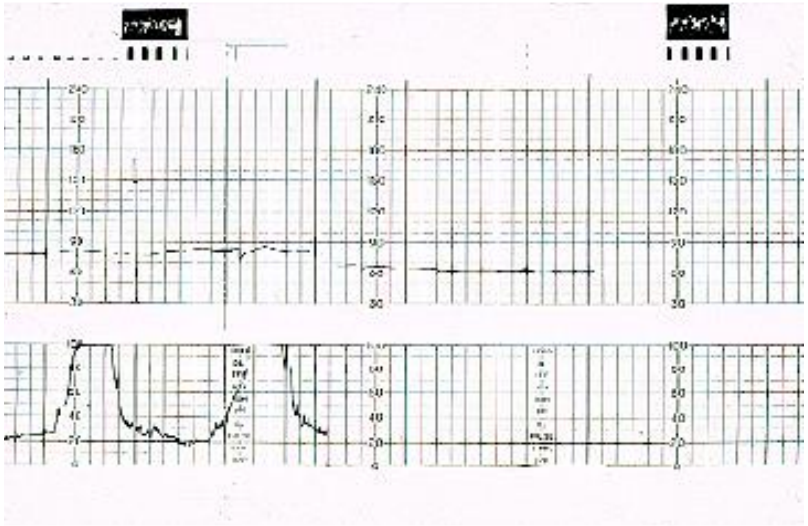


Late decceleration



Late decelerations

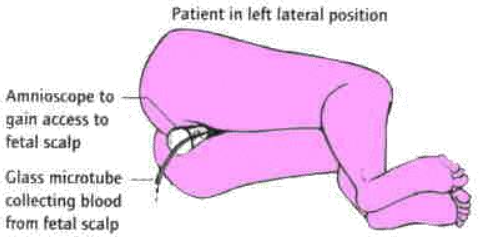




Variable decelerations

FHR Bradycardia

Fetal Scalp pH (and pCo2, pO2) Monitoring



- Fetal Blood Sampling (FBS) is a useful tool for the diagnosis of fetal distress.
- Fetal Scalp Blood Sampling: After rupturing the membrane, a special guarded needle is introduced through an amnioscope to take a drop of scalp blood for detection of its pH. blood is collected in a microtube
- - *pH of 7.25 or more* is normal,
- - *pH of 7.20 or less* denotes acidosis,
- values in between denotes pre-acidotic range and repeated estimation is indicated
- When the fetal heart tracing is nonreassuring, ACOG recommends that the physician consider obtaining a confirmatory scalp pH sample while attempting to correct the underlying problem
- Direct assessment of fetal oxygenation: gives most meaningful, reliable and reproducible data
- Under investigation

Alternatives to scalp sampling

- Like fetal acoustic stimulation and fetal scalp stimulation.
- these techniques have been found to correlate reliably with a fetal scalp pH of 7.2 or greater if they produce a reassuring heart rate acceleration.
- examined the ability of transabdominal vibroacoustic stimulation (VAS) to predict an acidotic fetal scalp blood pH.
- fetal scalp stimulation – stimulating fetal scalp while fetus in birth canal

if fetus is not acidotic this stimulation should cause an acceleration of fetal heart rate ,

if it does not ,the fetus is generally in distress .

To determine if an acceleration occurs , scalp stimulation must br performed between contraction when fetal heart rate is at its baseline

Fetal Pulse Oximetry

- Direct assessment of fetal oxygenation: gives most meaningful, reliable and reproducible data
- Under investigation
- Increased sensitivity and specificity for fetal surveillance
- Reflectance pulse oximeter with light emiters and photo cell on the same surface
- Problems: meconium, thick hair,vasospasm, edema

Recommendation

- Routine electronic fetal monitoring is not recommended for low-risk women in labor when adequate clinical monitoring including intermittent auscultation by trained staff is available ("D" recommendation).
- There is insufficient evidence to recommend for or against electronic fetal monitoring over intermittent auscultation for high-risk pregnancies ("C" recommendation).
- For pregnant women with complicated labor (i.e., induced, prolonged, or oxytocin augmented), recommendations for electronic monitoring plus scalp blood sampling may be made on the basis of evidence for a reduced risk of neonatal seizures, There is currently no evidence available to evaluate electronic fetal monitoring in comparison to no monitoring.

Immediate delivery of the baby

- When fetal distress is present,
- immediate action must be taken in order to restore proper blood supply and oxygenation to the baby.
- If conservative measures are unsuccessful, immediate delivery of the baby (often by cesarean section) is required in order to avoid prolonged periods of oxygen deprivation that cause permanent brain damage and may even lead to death.

Intrauterine Resuscitation (Intrapartum hypoxia Treatment)

- Treatment of asphyxial events are dependent upon the cause of the hypoxia. The mother's condition must be treated to prevent hypoxia to the fetusit
- It may be appropriate to resuscitate the baby in the uterus before performing the cesarean delivery in order to decrease the risk that the baby will suffer from oxygen deprivation.
- general measures to improve fetal oxygenation may help while the fetal tracing is monitored

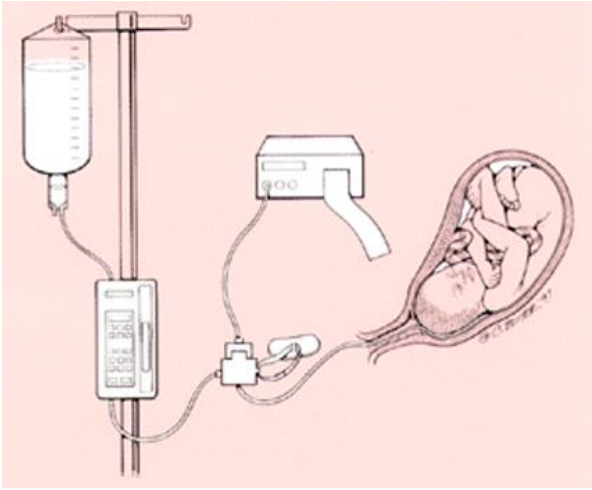
Fetal oxygen content and saturation can be improved by placing the mother in the lateral recumbent position

administering oxygen at 8 to 10 L per minute by mask. .

- Check for maternal hypotension (time of last epidural injection)-- Ephedrine & fluid for ↓ B.P
- Oxytocin (Pitocin, Syntocinon) should be discontinued.
- Tocolysis should be considered, Beta-mimetics (0.25 mg terbutaline) and magnesium sulfate to slow down the contractions, which will increase oxygen to to the fetus
- intravenous hydration if the volume status is in question.
- Perform vaginal examination to check for prolapsed cord -- If the cord has prolapsed, the physician should elevate the presenting part with the examining fingers while preparing for immediate cesarean delivery. This strategy may be effective even with an occult cord prolapse
- Amnioinfusion -- Repetitive variable decelerations suggest umbilical cord compression, especially in the presence of oligohydramnios or amniotomy

Transcervical amnioinfusion

- Amnioinfusion is a procedure in which normal saline or lactated Ringer's solution is infused into the uterine cavity to replace amniotic fluid through a catheter; IT is instilled transabdominally or transvaginally/transcervically into the uterus.
- **Indications**
- Oligohydramnios with or without Fetal Distress
  - Preterm prolonged rupture of membranes(amniotomy)
  - Recurrent Variable Decelerations (suggest umbilical cord compression)
- Cephalic presentation
- Thick particulate Meconium staining of amniotic fluid
- **Technique**
- Place fetal scalp elctrode
- Place double lumen intrauterine pressure catheter (IUPC)
- Initial Bolus
  - Warmed normal saline OR LACTATED RINGER at 10-20 ml/minute infused through a standard intrauterine pressure catheter.
  - Stop bolus at 250 to 500 cc
- Maintenance infusion of warmed normal saline: 3 cc/min
- Document intrauterine pressure continuously
- In this situation, transcervical amnioinfusion reduces decelerations by reducing cord compression and the rate of cesarean sections by nearly one half. to dilute moderate or thick meconium-stained amniotic fluid, reducing the risk of meconium aspiration syndrome. a dilutional or irrigational effect in cases where microorganisms have invaded the amniotic cavity.
- It is extremely important to verify that fluid is flowing from the vagina and that volume overload is not occurring.
- Amnioinfusion should not be performed if there are late decelerations, a fetal scalp pH of less than 7.2, abruptio placentae, placenta previa, previous vertical uterine incision or known uterine anomalies.



(Cochrane Review)
about amnioinfusion

- There is not enough evidence concerning the use of amnioinfusion for preterm rupture of membranes.
- Amnioinfusion appears to reduce the occurrence of variable heart rate decelerations and lower the use of caesarean section

piracetam in fetal distress during labour.

- received piracetam were superior to those of the babies treated with the placebo, as evaluated with the Apgar at 1, 5 and 10 minutes after birth and on the basis of the neurological and clinical examination as from 24 hours until they were released. In addition, the reduction of the duration of the labour in the patients treated with piracetam as compared with the control group was obvious.

Method of Delivery

- If **fetal heart rate abnormalities persist** or there are **additional signs of distress** (thick meconium-stained fluid), plan delivery:
- **-** If the **cervix is fully dilated** and the **fetal head is not more than 1/5 above** the symphysis pubis or the leading bony edge of the **head is at 0 station**, deliver by vacuum extraction or forceps;
- **-** If the **cervix is not fully dilated** or the **fetal head is more than 1/5 above** the symphysis pubis or the leading bony edge of the **head is above 0 station**, deliver by caesarean section.

Asphyxia neonatorum

- It is the inability of a newborn to initiate and sustain breathing at birth
- **It is diagnosed by**

APGAR score of 0-6 for longer than 5 minutes

Umblical cord *pH <7.2(mild hypoxia)- pH <7.1 (severe Hypoxia)*

Time to spontaneous Breathing *(more than one minute)*

Hypoxic Ischemic Encephalopathy grade 1 , 2, 3,

APGAR Scoring for Newborns

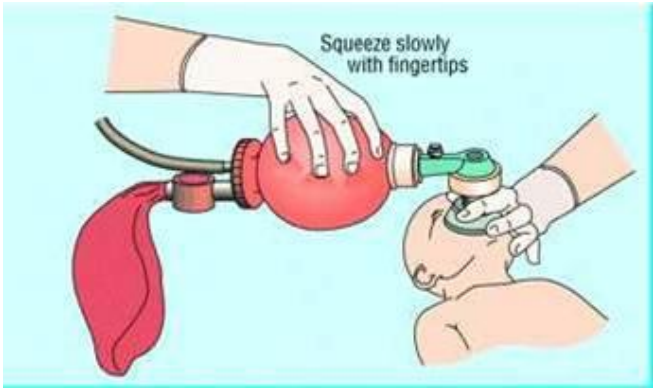
		Sign	0 Points	1 Point	2 Points
A	Activity (Muscle Tone)	Absent	Arms and Legs Flexed	Active Movement	
P	Pulse	Absent	Below 100 bpm	Above 100 bpm	
G	Grimace (Reflex Irritability)	No Response	Grimace	Sneeze, cough, pulls away	
A	Appearance (Skin Color)	Blue-gray, pale all over	Normal, except for extremities	Normal over entire body	
R	Respiration	Absent	Slow, irregular	Good, crying	

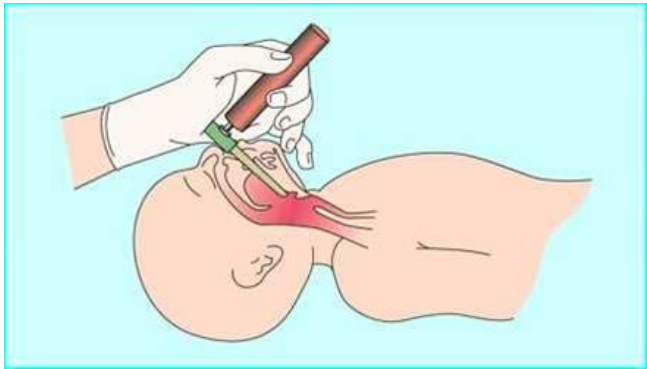
Newborn Resuscitation: A Simple, Effective Approach

A simple self-inflating bag and small mask can be used to resuscitate most newborns with asphyxia

. In most cases, any skilled provider who is trained in good resuscitation skills and who continues to maintain those skills can easily perform the procedure.

More complex procedures, such as intubation and the use of oxygen, are needed only in about 10 percent of cases of birth asphyxia, when the newborn's prognosis is very poor.





Meconium Aspiration Syndrome

- **Clinical Presentation**

Tachypnea and grunting respirations

in a meconium stained infant

with meconium noted below the vocal cords during intubation.

Meconium aspiration ttt

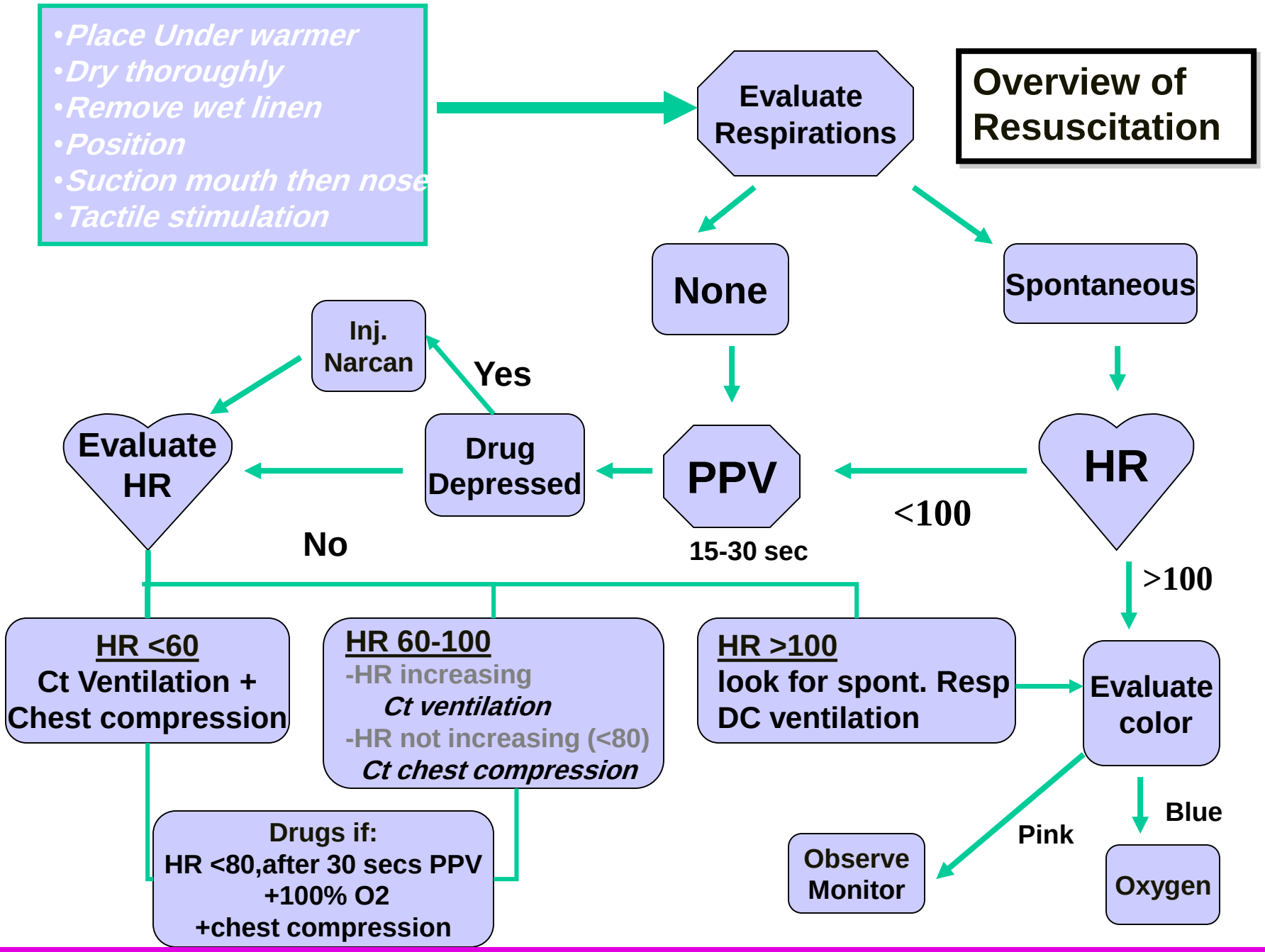
- The newborn's mouth should be suctioned as soon as the head is delivered.
- Intrapartum aspiration of term infants with meconium-stained amniotic fluid before shoulder delivery did not alter the risk for developing meconium aspiration syndrome also did not change neonatal mortality rates
- Further intervention is necessary if there is thick meconium staining and fetal distress. A tube is placed in the infant's trachea and suction is applied as the endotracheal tube is withdrawn.
- This procedure is repeated until meconium is no longer seen in the suction contents
- If there have been no signs of prenatal fetal distress, and the baby is a vigorous term-birth newborn, however, experts now recommend *no* deep suctioning of the trachea for fear of causing aspiration pneumonia.
- Occasionally, a saline solution is used to "wash" the airway of particularly thick meconium.
- Other treatments may include chest physiotherapy (tapping on the chest to loosen secretions), antibiotics to treat infection, use of a radiant warmer to maintain body temperature and mechanical ventilation to keep the lungs inflated.

The deficiency of surfactant or surfactant dysfunction may contribute to respiratory failure in a broader group of disorders, including meconium aspiration syndrome (MAS). Meconium inhibits the surface tension lowering properties of surfactant (Chen 1985, Moses 1991).

- Surfactant replacement therapy has been proven beneficial in the prevention and treatment of neonatal respiratory distress syndrome (RDS)
- Respiratory distress syndrome is due to a primary deficiency in the production and release of pulmonary surfactant. Surfactant therapy has been shown to improve oxygenation, decrease the need for ventilatory support, and improve clinical outcome in infants with RDS. Surfactant treated infants have a reduced mortality and a decreased incidence of pneumothorax.

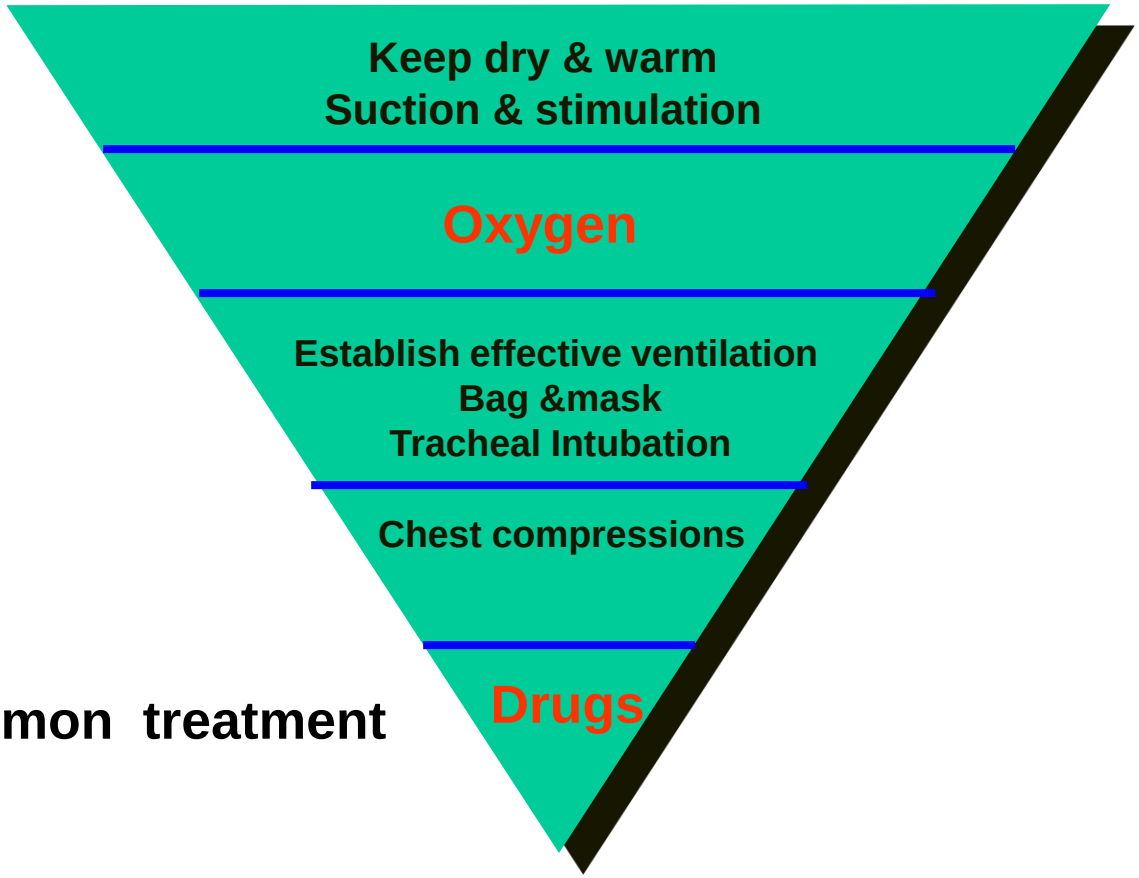
Overview of Resuscitation

- *Place Under warmer*
- *Dry thoroughly*
- *Remove wet linen*
- *Position*
- *Suction mouth then nose*
- *Tactile stimulation*



Triangle of Resuscitation

Most common treatment



Least common treatment

Severity of Distress

- Mild (first degree)= NST, OCT changes
- Moderate (Second degree)= FM changes
- Severe (Third degree) = ominous FHR changes