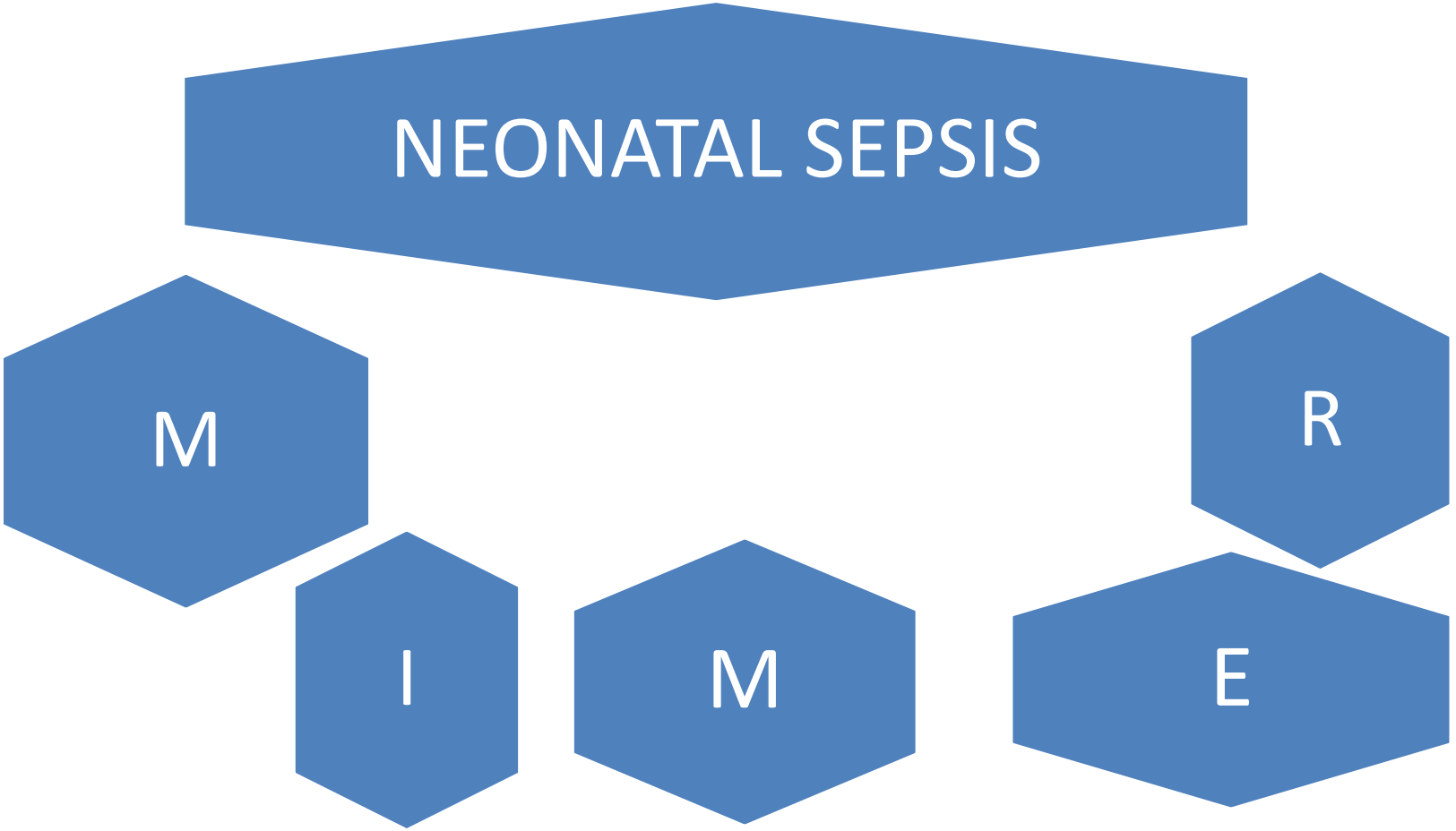
NEONATAL SEPSIS
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Superficial infections:Local

- Omphalitis: Any redness/induration around the umbilicus or pus draining
- Oral thrush
- Conjuctivitis

Systemic infections(Neonatal Sepsis)

Bacterial Sepsis in Neonate

Definition :

Clinical syndrome of infection with bacterimia in first month of life.

- **May get predominantly localized to lung (Pneumonia)**
- **May be localized to meninges (meningitis)**

Bacterial Sepsis in Neonate

Patterns

Early Onset

- Within 72 hrs of birth
- Complicated pregnancy +
- Maternal Genital tract
- Fulminant course
- Pneumonia
- 5-50 % mortality

Late Onset

- Symptoms beyond 72 hrs of birth
- Complicated pregnancy ±
- Maternal Genital tract / Environmental
- Slower progression
- Meningitis
- 2-6 % mortality

Neonatal Sepsis

Major Risk Factors

- Ruptured membranes > 24 hrs.
- Maternal Fever (100.4°F(38°C)
- Chorionamnionitis
- Sustained fetal heart rate >160/min
- Multiple obstetric procedures

Minor Risk Factors

- Ruptured membranes > 12 hrs.
- Foul smelling liquor
- Maternal Fever > 99.5°F (37.5°C)
- Low APGAR < 5 at 1 min, < 7 at 5 min
- Prematurity
- Multiple gestation

Presence of 1 major or 2 minor risk factors -> High Risk of Sepsis

Neonatal Sepsis

Pathogenesis

- Infection in the birth canal
- Colonization of skin, umbilical stump, nasopharynx, conjunctiva, etc.
- Transient bacteremia
- Invasion of blood stream
- Metastatic foci
- Meningitis, etc.

Neonatal Sepsis

Risk factors for Community acquired sepsis

- Bottle feeding
- Poor hygiene
- Poor cord care
- Over crowding

Neonatal Sepsis

Risk factors for Late onset sepsis (LOS)

- Prolonged hospitalization
- Prematurity
- LBW
- Previous antibiotic use
- Invasive procedures
- Presence of foreign material (ET Tubes/ catheters)
- Lack of disposables
- Over crowding / understaffing

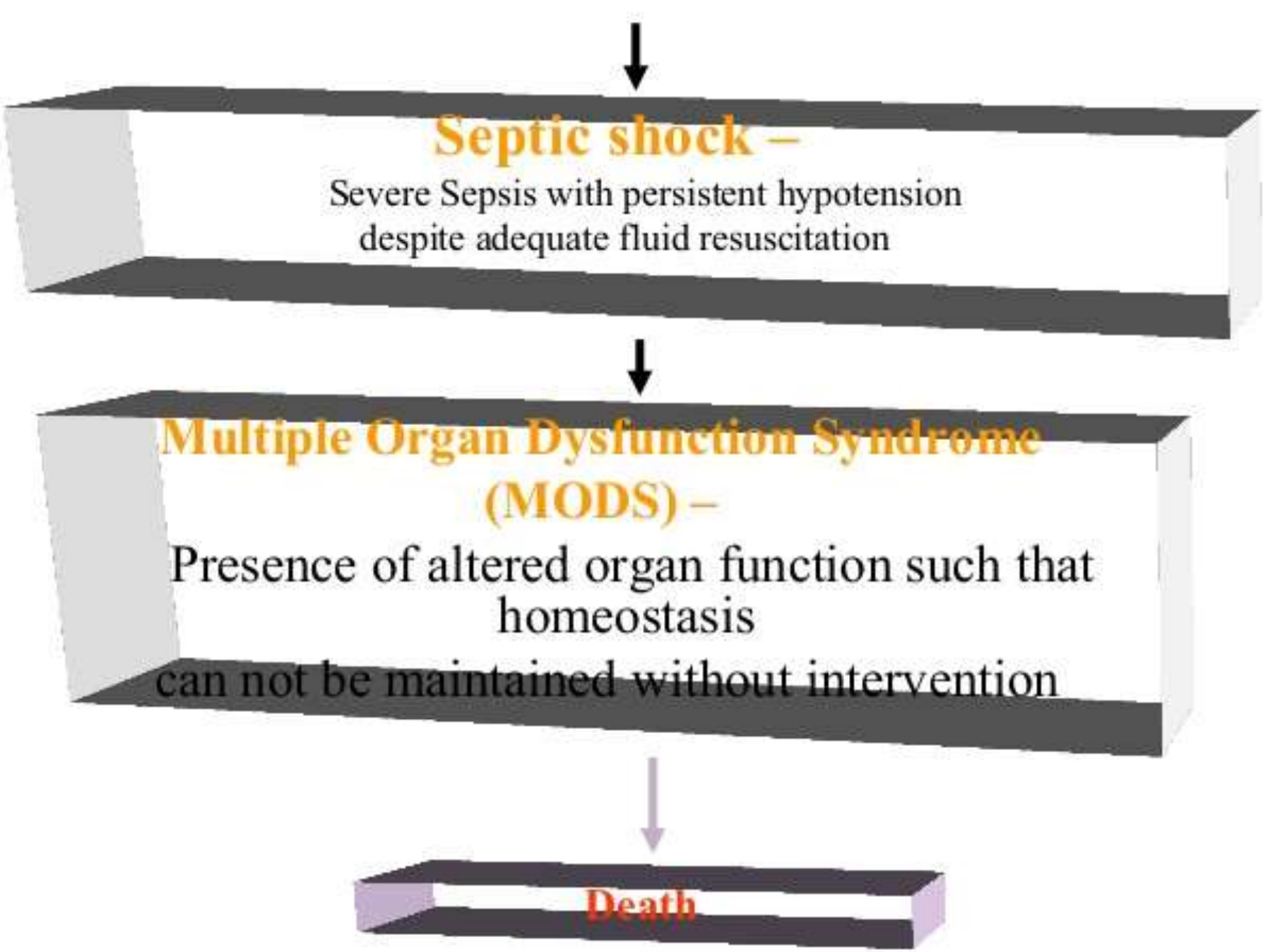
Infection > SIRS

Sepsis –

- Systemic response to infection with bacteria :
  SIRS with hypotension

Severe Sepsis –

- Sepsis with organ dysfunction, hypoperfusion or hypotension
- Changes in mental status, oliguria, hypoxemia or lactic acidosis


Septic shock –
Severe Sepsis with persistent hypotension
despite adequate fluid resuscitation
Multiple Organ Dysfunction Syndrome
(MODS) –
Presence of altered organ function such that
homeostasis
can not be maintained without intervention
Death

Clinical features

- Often vague , ill-defined
- Require high index of suspicion
- Non specific
- Refusal of feeds ,lethargy , poor /shrill cry,
- Hypothermia, abdominal distension, feed intolerance,vomiting
- Apnoea ,respiratory distress,
- Seizures,neck retraction,bulging fontanel
- Shock,bleeding,sclerema,renal failure

Infection

Systemic Inflammatory Response Syndrome (SIRS)

Resp:

Tachypnoea	> 2 SD
Hypoxia PaO_2	< 70 mm Hg

CVS :

Tachycardia	> 2 SD
Hypothermia	< 2 SD or hyperthermia

Peripheral Perfusion:

Delayed Capillary Filling	> 3 Sec.
Oliguria	< 0.5 ml / kg / hr
Lactic acidosis	
Altered mental status	

Increased or decreased white blood count:

Investigations

- **CBC**: TLC, ANC, Bandemia, IT ratio
- **CRP**
- Micro ESR>15 mm in first hour
- **Blood culture: gold standard for diagnosis**
- X ray chest
- CSF
- Urine culture

Newer marker

- Procalcitonin in blood
- Normal <0.05ng/ml.It starts increasing within 2-3 hours of beginning of infection peaking by 12 hours and return in 2 days.
- Procalcitonin>2ng/dl higher sensitivity,NPV than CRP
- Can guide us in reducing unwanted use of antibiotics

Neonatal Sepsis

Cultures

- Blood
- Urine
- CSF (For Late Onset type)]

Two positive cultures are more significant

Normal Neonatal CSF

TEST	TERM	PRETERM
WBCs (per cm)	Up to 30	Up to 90
Polymorphs	60%	60%
Protein (mg/dL)	Up to 150	Up to 150
Glucose (mg/dL)	35-120	25-65

Neonatal Sepsis

Chest X-Ray

- Persistent focal changes with infiltrative process
- Findings similar to RDS in GBS infection

Neonatal Sepsis

Acute Phase Reactants - Sepsis Screen

Positive CRP (> 6 mg/ L or 10 times normal)

Elevated hepatoglobin level

Micro ESR After 14 days of age 15 mm or more for the first hour is abnormal.

(Normal ESR = Age in days + 2)

If all results are -ve : Probability that infection absent = 99%

If all results are +ve : Probability of infection = 90%

Neonatal Sepsis

Total neutrophil count & Immature to total ratio:

- TWBC : < 5000 / micro liter or >24000
- Tot. neutrophil count : < 1000 / micro liter
  (Normal= 1,750 /µL)
- Band / Total Neutrophil : > 0.2
  (Normal = 0.16 in 1st Day,
  0.12 after 24 Hrs.)
- Platelet Count : < 1 Lakh/mm^3
  (Normal = 1.5 to 4 Lakhs /mm^3)

- Increased risk of infection

Repeat TWBC & DC at 8 - 12 hrs in a symptomatic neonate may have more predictable value than single record.

Neonatal Sepsis

Lumbar Puncture

- **Valuable in symptomatic infants who have risk factors for sepsis.**
- **CSF studies prior to antibiotic therapy is preferable**

LP in RDS is difficult

Interpretation is difficult if LP is traumatic

Sometimes meningitis may be present with normal CSF picture

NNF Criteria
Suspected sepsis

- **One out of three indication for starting antibiotics**

1)Predisposing factors like

- PROM >18HRS,
- chorioamnoinitis,foul smelling liquor
- >3 vaginal examinations
- maternal fever,
- gastric aspirate>5 pus cells

2)Sepsis screen(2/4criteria)

- TLC <5000/cu mm
- Absolute neutrophil count(ANC)<1800/cu mm
- Immature to total neutrophil ratio(IT ratio)>0.2

  Or >20% band cells
- Micro ESR >=15mm in the first hour

3) X ray showing pneumonia

Treatment

1)Antibiotics

2)Supportive care

- Intravenous fluids
- Correct hypothermia
- Correct hypoglycemia
- Inotrope support: dopamine,dobutamine
- Oxygen, CPAP, Mechanical ventillation

Indications for starting antibiotics

(a) presence of three risk factors for early onset sepsis

(b) presence of foul smelling liquor

(c) presence of ≥2 antenatal risk factor(s) with a positive septic screen and

(d) strong clinical suspicion of sepsis.

ANTIBIOTICS

- Depending on prevalant etiologic agent and their sensitivity
- Antibiotic stewardship
- Prevent misuse of antibiotics

Clinical situation	Septicemia/pneumonia	meningitis
First line(community acquired,resistance unlikely)	Ampicillin gentamycin	Add cefotaxime
Second line Hospital acquired(some resistant strains)	Ampi/cloxacillin Genta/amikacin	Add cefotaxime
Third line(Hospital acquired,most resistant strains)	Cefotaxime or Piperacillin Tazobactum or Ciprofloxacillin,Amikacin	Add cefotaxime/meropenam /colisin

Duration of antibiotic therapy

Diagnosis	Mode	Duration
Meningitis (with/without positive blood/CSF culture)	intravenous	21 days
Blood culture positive no meningitis	intravenous	14 days
Culture negative sepsis screen positive,clinical course consistent with sepsis	intravenous	7-10 days
Culture negative sepsis screen negative,clinical course consistent with sepsis	intravenous	5-7 days

- Exchange transfusion: when sclerema
- IVIG
- GMCSF

THANK YOU