

New Triple I Classification Scheme: Updates in Diagnosis and Management

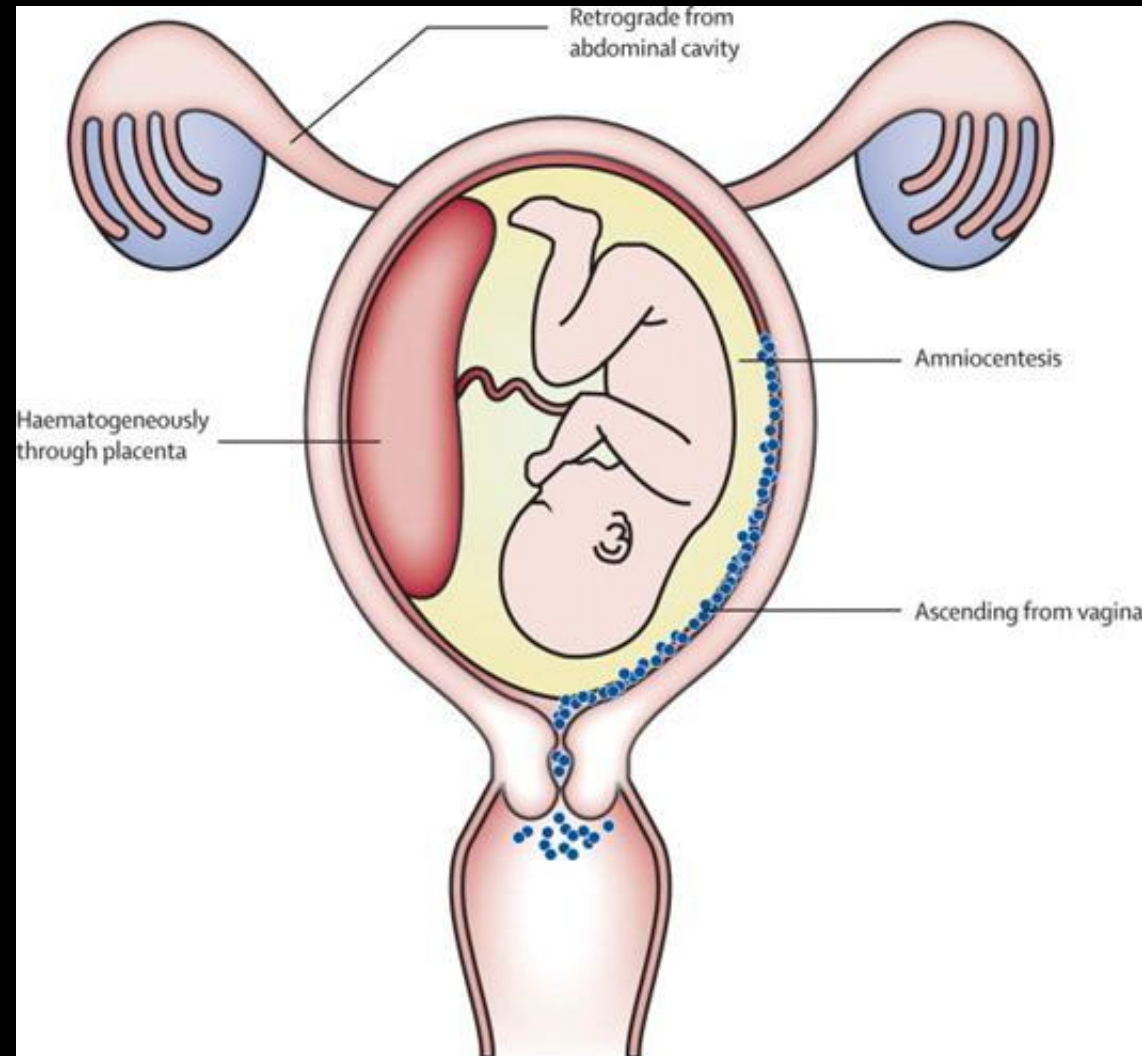
Christina A. Herrera, MD

February 10th, 2017

Project ECHO



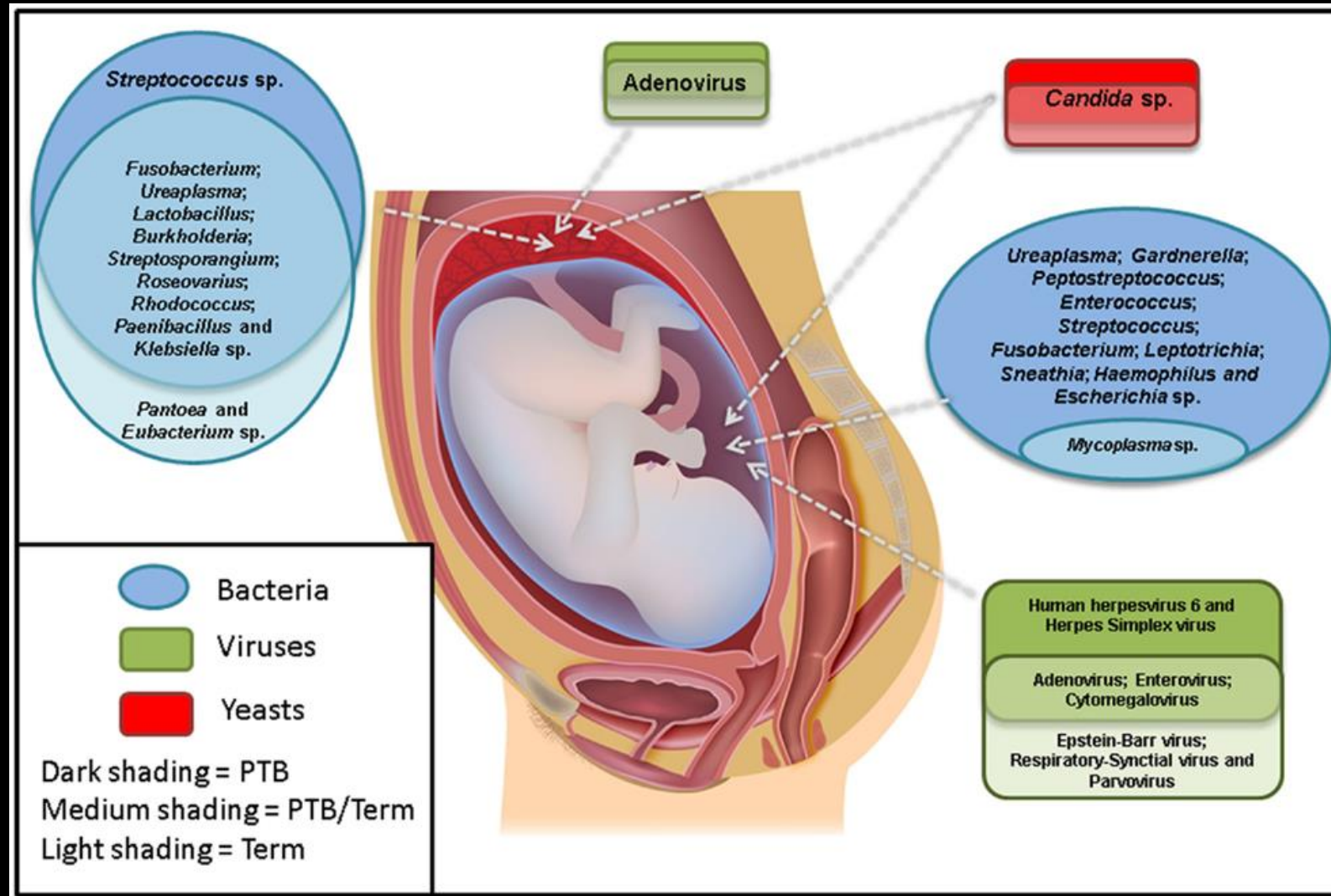
Pathogenesis of Intraamniotic Infection



Incidence and Risk Factors

- 1-4% of TERM pregnancies
- 40-70% of PRETERM pregnancies
- Risk Factors:
 - Prolonged labor
 - Prolonged membrane rupture
 - Meconium staining
 - Genital tract pathogens (STIs, GBS)
 - Alcohol or tobacco use
 - History of intraamniotic infection
 - ? Internal monitoring

Microbiology



Microbiology

Organisms isolated in the amniotic fluid of 404 patients with intraamniotic infection

Organism	Number	Percent
<i>Ureaplasma urealyticum</i>	190	47.0
Any gram-negative anaerobe	155	38.4
<i>Mycoplasma hominis</i>	123	30.4
<i>Bacteroids bivius</i>	119	29.5
<i>Gardnerella vaginalis</i>	99	24.5
Group B <i>Streptococcus</i>	59	14.6
<i>Peptostreptococcus</i> spp	38	9.4
<i>Escherichia coli</i>	33	8.2
<i>Enterococci</i>	22	5.4
<i>Fusobacterium</i> spp	22	5.4
<i>Bacteroides fragilis</i>	14	3.5

Adverse Maternal Outcomes

- Abnormal labor
- Uterine atony and postpartum hemorrhage
- Endometritis
- Wound infection
- Sepsis

Adverse Neonatal Outcomes

- Pneumonia
- Meningitis
- Early-onset sepsis
- Asphyxia
- Periventricular leukomalacia
- Intraventricular hemorrhage
- Cerebral palsy
- Death

How do we diagnose it?

- Fever?
- Uterine tenderness?
- Maternal or fetal tachycardia?
- Foul-smelling fluid?
- Leukocytosis?
- Hypotension?
- Amniocentesis?

Amniocentesis

Gram stain	Any bacteria and leukocytes (6/hpf)
Glucose	< 15
WBC	> 30
Leukocyte esterase	Trace or more
Culture	Positive

Placental Histopathology

Maternal immune response	Neutrophilic inflammation of the chorioamnion
Fetal immune response	Neutrophilic inflammation of the: Umbilical cord (funisitis) Fetal vessels (chorionic plate vasculitis)

What the heck is Triple I?

- **Intrauterine inflammation, infection, or both**
- Why the change?
 - Chorioamnionitis is ambiguous
 - Heterogeneous array of conditions
 - Implies potentially serious consequences for mothers and fetuses
 - Management tends to be irrespective of probable cause or clinical findings
- Isolated maternal fever is NOT synonymous with chorioamnionitis

''Chorioamnionitis''

- Prior to Triple I classification, chorio diagnosed by fever PLUS 1 or 2 of the following:
 - Maternal leukocytosis ($>15,000$)
 - Maternal tachycardia
 - Fetal tachycardia
 - Uterine tenderness
 - Foul smelling amniotic fluid
- However, this evolved into fever +/- clinical suspicion → lots of moms and babies getting treated

Classification

Temperature greater than 39 on one occasion or greater than 38 on two occasions 30 minutes apart

Fever PLUS any of:

1. Fetal tachycardia
2. Maternal WBC > 15,000
3. Purulent fluid

Suspected Triple I PLUS any of:

1. Amnio + gram stain
2. Amnio + Cx or low glucose
3. Placental path

Table 1. Features of Isolated Maternal Fever and Triple I With Classification*

Terminology	Features and Comments
Isolated maternal fever ("documented" fever)	Maternal oral temperature 39.0°C or greater (102.2°F) on any one occasion is documented fever. If the oral temperature is between 38.0°C (100.4°F) and 39.0°C (102.2°F), repeat the measurement in 30 minutes; if the repeat value remains at least 38.0°C (100.4°F), it is documented fever
Suspected Triple I	Fever without a clear source plus any of the following: 1) baseline fetal tachycardia (greater than 160 beats per min for 10 min or longer, excluding accelerations, decelerations, and periods of marked variability) 2) maternal white blood cell count greater than 15,000 per mm ³ in the absence of corticosteroids 3) definite purulent fluid from the cervical os
Confirmed Triple I	All of the above plus: 1) amniocentesis-proven infection through a positive Gram stain 2) low glucose or positive amniotic fluid culture 3) placental pathology revealing diagnostic features of infection

Isolated Maternal Fever

- Variety of causes:
 - Epidural anesthesia
 - Prostaglandin use
 - Dehydration
 - Ambient heat
 - Hyperthyroidism
- Temperature should be taken **ORALLY** to diagnose fever

Maternal Management

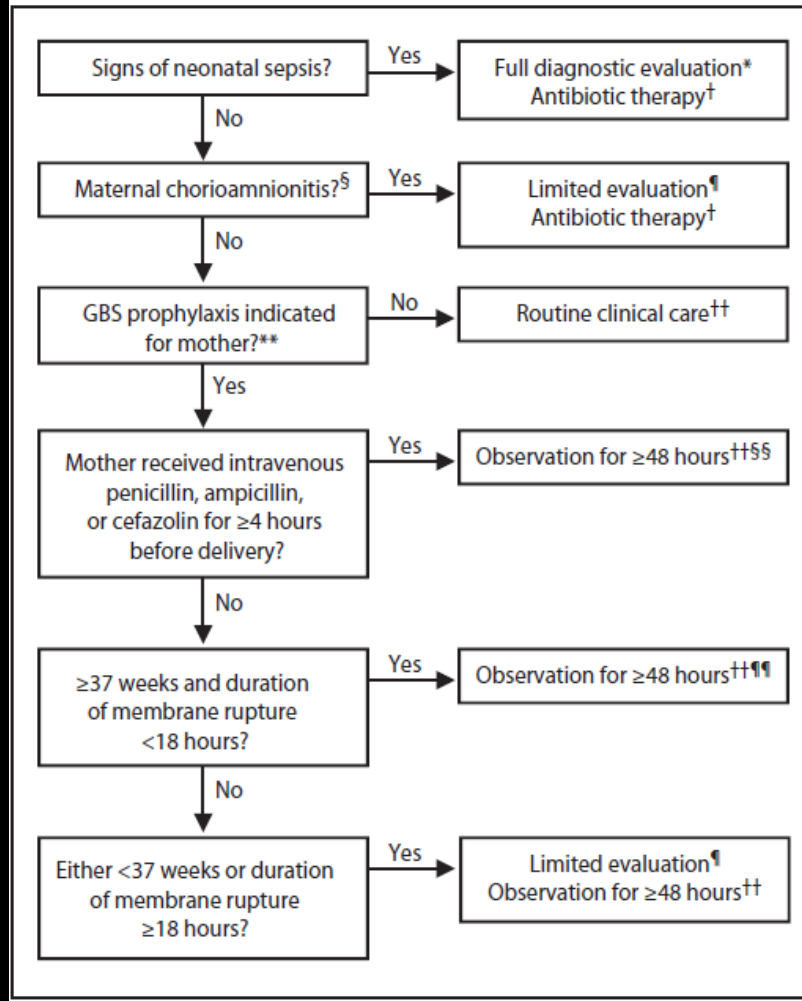
- In cases of **isolated fever**, it may be appropriate to avoid antimicrobials
- In cases of **suspected Triple I**, antimicrobials are recommended
 - Ampicillin and Gentamicin for vaginal deliveries
 - Addition of anaerobic coverage for cesarean deliveries
 - Anaerobic coverage: Metronidazole, Clindamycin, Carbapenems, β -lactam/ β -lactamase combinations (Piperacillin-tazobactam (Zosyn))
 - Alternatives: Cefoxitin, Ampicillin-sulbactam, Vancomycin (penicillin allergic)

Maternal Management

- Duration of therapy:
 - **Vaginal delivery** → Reasonable to stop antibiotics after delivery vs. one additional dose
 - **Cesarean delivery** → One additional dose after delivery appears as effective as longer course
 - Consider treating until 24-48 hours afebrile in sicker* patients
 - *Sicker= Patients with signs of sepsis, continued fevers, underlying high-risk morbidity (immunosuppression, etc...)

Neonatal Management- Term Infants

FIGURE 9. Algorithm for secondary prevention of early-onset group B streptococcal (GBS) disease among newborns



Veroni, CDC, 2010

Neonatal Management- Term Infants

Please enter details below.

Predictor	Scenario
Incidence of Early-Onset Sepsis ?	<input type="text"/>
Gestational age ?	<input type="text"/> weeks <input type="text"/> days
Highest maternal antepartum temperature ?	<input type="text"/> Fahrenheit <input type="text"/>
ROM (Hours) ?	<input type="text"/>
Maternal GBS status ?	<input type="radio"/> Negative <input type="radio"/> Positive <input type="radio"/> Unknown
Type of intrapartum antibiotics ?	<input type="radio"/> Broad spectrum antibiotics > 4 hrs prior to birth <input type="radio"/> Broad spectrum antibiotics 2-3.9 hrs prior to birth <input type="radio"/> GBS specific antibiotics > 2 hrs prior to birth <input type="radio"/> No antibiotics or any antibiotics < 2 hrs prior to birth

Calculate »

Clear

Risk per 1000/births			
EOS Risk @ Birth			
EOS Risk after Clinical Exam	Risk per 1000/births	Clinical Recommendation	Vitals
Well Appearing			
Equivocal			
Clinical Illness			

Classification of Infant's Clinical Presentation [Clinical Illness](#) [Equivocal](#) [Well Appearing](#)

Neonatal Management- Preterm Infants

- **Isolated fever:**
 - Well-appearing infant and no prolonged rupture → screening labs, observe (no blood culture)
 - Not well-appearing or prolonged rupture → screening labs, culture, +/- 48hr antibiotics
- **Suspected Triple I:**
 - Well-appearing infant: screening labs, culture, 48hrs antibiotics
 - Clinically septic infant: above + lumbar puncture and 5-7 days antibiotics
 - Culture-positive sepsis: above + 7-10 days antibiotics
 - Meningitis: above + 21 days antibiotics

OB and Neonatology Communication

- Important to note the following at delivery:
 - What was the diagnosis?
 - How sick was mom?
 - Did baby appear sick prior to or at delivery?
 - How was mom treated?

Our Delivery Note (Epic)

Complications

Intrauterine inflammation or infection (Triple I, formerly chorioamnionitis) or maternal fever?

None	Abnormal Labor - Prolonged First Stage	Retained Placenta without Hemorrhage	Uterine Rupture
Anesthetic Complications	Abnormal Labor - Prolonged Second Stage	Unsuccessful TOLAC	Abnormal or nonreassuring FHR tracing leading to delivery
Dysfunctional Labor	Cord Prolapse	Unsuccessful Forceps Attempt	Suspected Cephalopelvic Disproportion
Seizures During Labor	Hematoma	Unsuccessful Vacuum Attempt	Abnormal Labor - Arrest in First Stage
Abruptio Placenta	Malpresentation	Urinary Tract Injury	Abnormal Labor - Arrest in Second Stage
Shoulder Dystocia	Placenta Accreta Spectrum	Uterine Inversion	Intrauterine inflammation or infection (Triple I, formerly called chorioamnionitis)
Abnormal Labor - Prolonged Latent Stage	Postpartum Hemorrhage		

Intrauterine inflammation or infection (Triple I, formerly called chorioamnionitis) details:

Please choose one diagnosis:

- ☐ Isolated maternal fever (39.0 degrees C on any one occasion or two documented temperatures of ≥ 38.0 at least 30 minutes apart)
- ☐ Suspected Triple I (maternal fever as defined above AND at least one of the following - fetal tachycardia (> 160 for > 10 minutes), maternal WBC $> 15,000$, purulent amniotic fluid)
- ☐ Confirmed Triple I (suspected triple I as defined above AND at least one of the following - amniocentesis with positive gram stain, amniocentesis with low glucose, amniocentesis with positive

Maternal antibiotic treatment given?

****Please send the placenta to pathology on all suspected Triple I cases****

Will this lead to better care of mothers and infants?

- May decrease the risk of over-treatment
 - Increase maternal bonding
 - Decrease cost
 - Decrease risk of adverse effects
- May not predict adverse maternal/neonatal outcomes

Questions?

