

Indications (Risk factors) of Surveillance

Maternal Conditions	Placental Conditions	Fetal Conditions	Miscellaneous
<ol style="list-style-type: none">1. Hyperthyroidism2. Cyanotic heart disease3. Chronic renal disease4. Diabetes5. Symptomatic haemoglobinopathy	<ol style="list-style-type: none">1. Antiphospholipid antibody syndrome2. Systemic lupus erythematosus3. Hypertensive disorders, including pregnancy-induced hypertension4. Thrombophilia5. Marked placental anomalies	<ol style="list-style-type: none">1. Decreased fetal movement2. Amniotic fluid abnormalities (Oligohydramnios, Polyhydramnios)3. Intrauterine growth restriction4. Post-term pregnancy5. Alloimmunization6. Macrosomia7. Fetal anomalies or aneuploidy8. Multiple gestation	<ol style="list-style-type: none">1. In vitro fertilization pregnancy2. Previous stillbirth3. Prior neurologic injury4. Previous recurrent abruption5. Obesity

Antepartum fetal surveillance methods

★ Fetal movement count

* first fetal movement (Quickening) → primigravida: 18-20 weeks ≠ multigravida: 16-18 weeks

* maximal activity → 28-32 weeks

* highest incidence → in the late evening

* gradual reduction toward term

* Reassuring fetal kick count defined as:

- Perception of at least 10 FMs during 12 hours of normal maternal activity.

- Perception of at least 10 FMs over 2 hours when the mother is at rest.

* Decrease Fetal Movement in 3rd trimester → impaired fetal growth, preterm birth, neonatal depression, emergency delivery, fetal death.

★ Non Stress Test (NST)

* assess Fetal Heart Rate in response to Fetal Movement.

* assess : ① Baseline FHR → at rest (110-160 beat/min)

② FHR variability (Beat to Beat variation) → normally variable → parasympathetic

③ Acceleration → normally FHR accelerate with movement → sympathetic

④ Deceleration → abnormal → parasympathetic

* Types :- ① Reactive (Normal) →

The test is reactive if there are 2 or more fetal heart rate accelerations reaching a peak of at least 15 bpm above the baseline rate and lasting for at least 15 seconds from onset to return in a 20-minute period.

② Non-Reactive →

Defined as one that does not show such accelerations over a 40-minute period. can be due to fetal immaturity, quiet fetal sleep, or maternal smoking

★ Contraction stress test (CST) (oxytocin challenge test OCT.)

Not In Use Now

* assess Fetal Heart Rate in response to Uterine Contractions.

* Types :- ① Positive → late decelerations occur with more than 50% of induced contractions.

② Negative → Normal baseline FHR without late decelerations.

③ Equivocal → repetitive decelerations, not late in timing or pattern.

☆ Biophysical Profile (BPP)

* Combine of :- ① Non Stress Test (NST)

Ultrasonographic estimation (in 30 min) of :

② Amniotic Fluid Volume

③ Fetal Breathing

④ Fetal Body Movements

⑤ Fetal Tone

Biophysical Profile (BPP) – Parameters

Biophysical Variable	Normal (Score = 2)	Abnormal (Score = 0)
Non-Stress Test (Part of modified BPP)	Reactive NST: ≥ 2 FHR accelerations in a 20-minute period, each acceleration reach a peak ≥ 15 bpm above the base line hear rate and last ≥ 15 seconds	Non-Reactive NST: does not show such accelerations over a 40-minute period
Estimation of AFV (Part of modified BPP)	1 or more pockets of fluid measuring ≥ 2 cm in vertical axis without fetal cord.	Either NO pockets or largest pocket < 2 cm in vertical axis.
Fetal breathing movements	≥ 1 rhythmic breathing episode(s) ≥ 30 seconds within a 30-minute period	Absent or NO episode of ≥ 30 sec within 30 min. Continuous breathing without cessation.
Fetal movement	≥ 3 body or limb movements within a 30-minute period	< 3 body or limb movements within a 30-minute period
Fetal tone	≥ 1 episodes of a fetal extremity or fetal spine extension with return to flexion (rapid eye movement, opening and closing of hand and mouth considered normal tone)	Slow extension with return to partial flexion. Movement of limb in full extension . Absent fetal movement or flaccid extremity positions, abnormal fetal posture .

Factors Affecting the Biophysical Profile

Activity	FHR	AFV	FBM	FM	FT
1 Fetal sleep	Decrease		Decrease	Decrease	Decrease
2 Artificial rupture of membrane		Decrease	Decrease		
3 Labor, preterm labor			Decrease		
4 Early gestational age	Decrease		Decrease		
5 Maternal Mg ²⁺ administration	Decrease		Decrease		
6 Late gestational age (>42 wk)	Decrease	Decrease	Decrease		Decrease
7 Antenatal corticosteroids (to accelerate fetal lung maturation)	Variable decrease		Decrease	Decrease	

- **FHR:** Fetal Heart Rate *All except 3+2*
- **AFV:** Amniotic Fluid Volume *only 2+6*
- **FBM:** Fetal breathing movements *All*
- **FM:** Fetal Movement *only 1+7*
- **FT:** Fetal Tone *only 1+6*

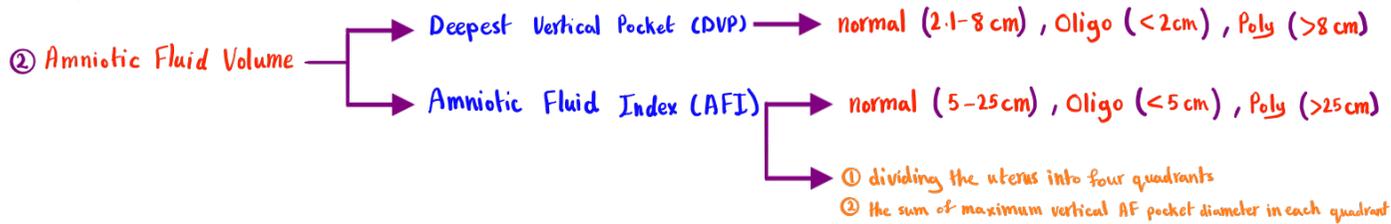
Biophysical Profile (BPP) – Interpretation

BPP score	Interpretation	Management
$\geq 8/10$ & Normal AFV	Non -asphyxiated	Reassurance
8/10 & Oligohydramnios	Chronic fetal compromise	<ul style="list-style-type: none"> • If mature (≥ 37 wk), deliver • If immature, antenatal steroids, serial testing (twice weekly)
6/10 & Normal AFV	Equivocal test	
6/10 & Oligohydramnios	Chronic asphyxia with possible acute	<ul style="list-style-type: none"> • If ≥ 32 wk, deliver • If < 32 wk, test daily
4/10 & Normal AFV	Acute asphyxia likely	
4/10 & Oligohydramnios	Acute on top of chronic asphyxia very likely	If ≥ 26 wk, deliver
2/10 & Normal AFV	Acute fetal asphyxia likely with chronic decompensation	(frequently requires cesarean section)
0/10	Severe, acute asphyxia virtually certain	If fetal status is viable , deliver immediately by cesarean section

- A reassuring BPP score ($\geq 8/10$) should be repeated periodically (weekly or twice weekly) until delivery when the high-risk condition persists.

★ Modified Biophysical Profile

* assess ① Non Stress Test (NST)



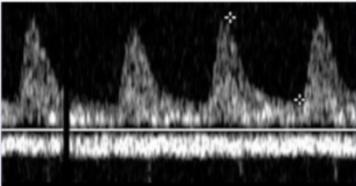
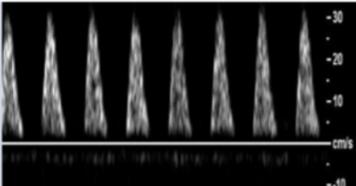
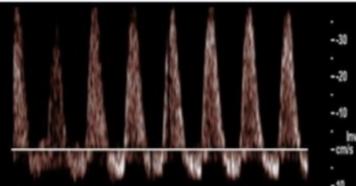
★ Doppler Velocimetry

* measurement of blood flow velocity in maternal & fetal vessels

❖ Tested vessels:

- Uterine artery (mother)
- Umbilical artery (baby) **most important**
- Middle cerebral artery (baby)
- Ductus venosus (baby)
- Umbilical vein (baby)

Assessment of the Umbilical Artery

	Elevated indices only	AEDV (Absent)	REDV (Reversed)
BPP Frequency	Weekly	Twice weekly	Daily
Decision to Deliver	<ul style="list-style-type: none"> Abnormal BPP term >36wks with no fetal growth 	<ul style="list-style-type: none"> Abnormal BPP >34wks Conversion to REDV 	<ul style="list-style-type: none"> Any BPP <10/10 >32wks of dexamethasone give
			

Doppler Velocimetry

Uterine Artery	Umbilical Artery	Umbilical Vein	MCA	Ductus Venosus
-	Assess placental function		Assess brain perfusion	-
<ol style="list-style-type: none"> Preeclampsia Assess risk of prematurity 	<ol style="list-style-type: none"> IUGR Placental insufficiency Umbilical artery change first later the umbilical vein change indicating a more severe case		<ol style="list-style-type: none"> Anemia Rh isoimmunization 	Indicated embedding death

❖ Umbilical Vein

- Blood flow in the umbilical vein is continuous in normal pregnancies after 15 weeks of gestation.
- In pathological states, such as fetal growth restriction, flow in the umbilical vein may be pulsatile, which reflects **cardiac dysfunction** related to increased after-load.

❖ Middle cerebral artery

- In the compromised fetus, systemic blood flow is redistributed from the periphery to the brain this is called **Brain-sparing effect**.

❖ Ductus Venosus

- The ductus venosus regulates oxygenated blood in the fetus and is resistant to alterations in flow except in the most severely growth restricted fetuses.