## STANDARD OPERATING PROCEDURE- GUIDELINE

## UTILIZATION OF DOPPLER IN OBSTETRICS

**SCOPE/APPLICABILITY:**
This is a clinical guideline for utilization of Doppler techniques in fetal medicine.

**Indications for the use of Doppler in Obstetrics:**
- Fetal Growth Restriction
- Evaluation of Fetal Anemia

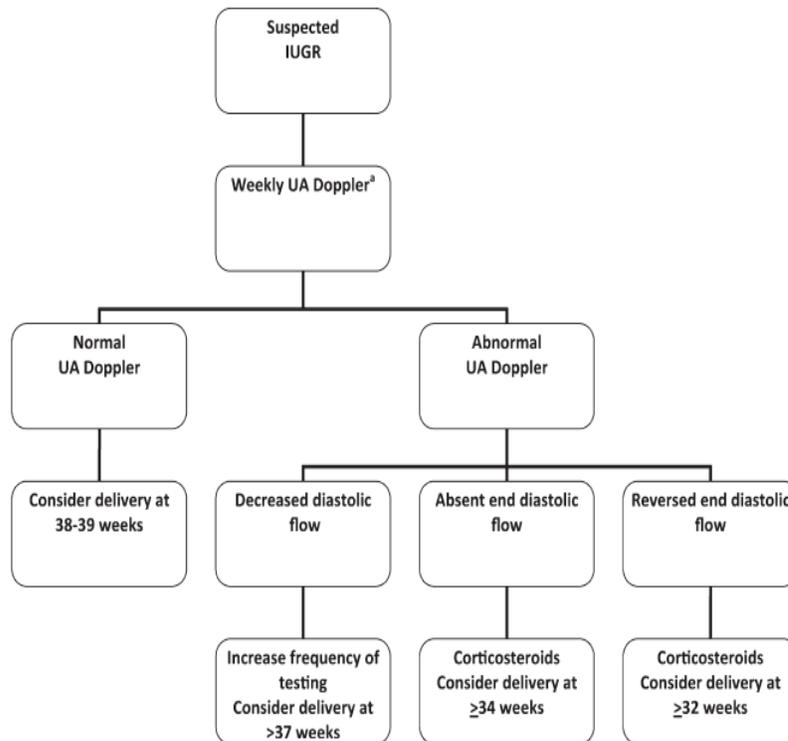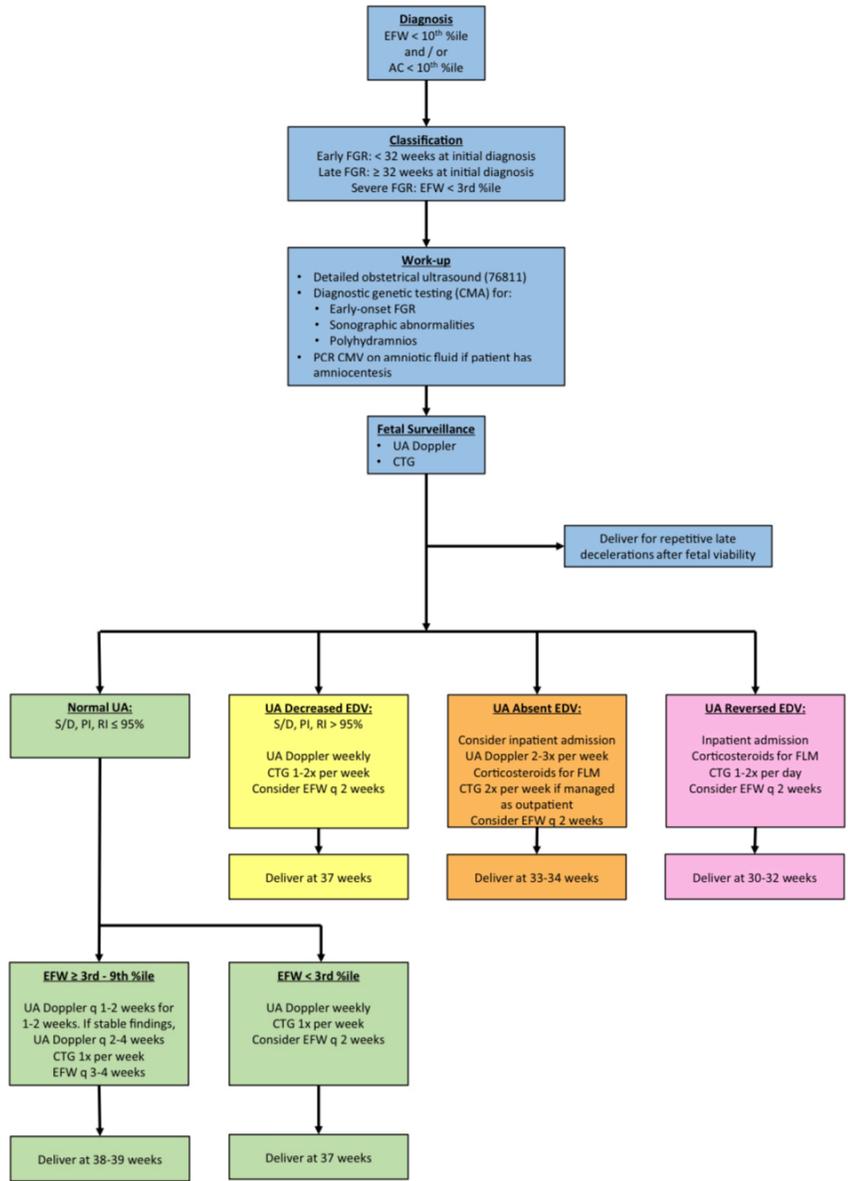**A: Fetal Growth Restriction Clinical Considerations**



Fig. 6. Management recommendation for fetal growth restriction incorporating Doppler velocimetry. [a]In conjunction with antepartum testing. IUGR, intrauterine growth restriction; UA, uterine artery. Reprinted from Berkley E, Chauhan SP, Abuhamad A. Doppler assessment of the fetus with intrauterine growth restriction. AJOG 2012;206:300–8. Copyright 2012, with permission from Elsevier.

Copel. Practical Approach to Fetal Growth Restriction. Obstet Gynecol 2014.

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**NOTE: as you all know the Society of Maternal Fetal Medicine has proposed the following adaptation to the management of Growth Restriction. A copy of this in included. We are in the process of adjusting the logistics for this management strategy.**

**FIGURE 1**
**Algorithm for the diagnosis and management of fetal growth restriction**

**Diagnosis**
EFW < 10th %ile
and / or
AC < 10th %ile

**Classification**
Early FGR: < 32 weeks at initial diagnosis
Late FGR: ≥ 32 weeks at initial diagnosis
Severe FGR: EFW < 3rd %ile

**Work-up**
- Detailed obstetrical ultrasound (76811)
- Diagnostic genetic testing (CMA) for:
  - Early-onset FGR
  - Sonographic abnormalities
  - Polyhydramnios
- PCR CMV on amniotic fluid if patient has amniocentesis

**Fetal Surveillance**
- UA Doppler
- CTG

Deliver for repetitive late decelerations after fetal viability

**Normal UA:**
S/D, PI, RI ≤ 95%

**UA Decreased EDV:**
S/D, PI, RI > 95%

UA Doppler weekly
CTG 1-2x per week
Consider EFW q 2 weeks

Deliver at 37 weeks

**UA Absent EDV:**

Consider inpatient admission
UA Doppler 2-3x per week
Corticosteroids for FLM
CTG 2x per week if managed as outpatient
Consider EFW q 2 weeks

Deliver at 33-34 weeks

**UA Reversed EDV:**

Inpatient admission
Corticosteroids for FLM
CTG 1-2x per day
Consider EFW q 2 weeks

Deliver at 30-32 weeks

**EFW ≥ 3rd - 9th %ile**

UA Doppler q 1-2 weeks for 1-2 weeks. If stable findings, UA Doppler q 2-4 weeks
CTG 1x per week
EFW q 3-4 weeks

Deliver at 38-39 weeks

**EFW < 3rd %ile**

UA Doppler weekly
CTG 1x per week
Consider EFW q 2 weeks

Deliver at 37 weeks

**B. Maternal Alloimmunization Clinical Considerations for the detection of fetal anemia**

> - Isoimmunization with anti-Kell or anti-c (regardless of titers)
>
> - Isoimmunization with anti-D or other minor or irregular anbodies with a titer ≥ 16 or 1:16
>
> - Previous Hydropic Fetus
>
> - Previous baby affected with severe hemolytic disease of the newborn

> Start Measuring Peak Systolic Velocity of the Middle Cerebral Artery weekly at 18 weeks according to guidelines

**NOTE: if the peak systolic velocity of the middle cerebral artery is greater than 1.5 MOM for gestational age, MFM should be consulted**

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**PURPOSE:**
The use of Doppler in obstetrics is widespread for decision making. Standardized protocols and systematic use limit the probability of error of a technique that otherwise presents a great variability. Moreover, knowledge of the pathophysiology and hemodynamic changes associated with the individual maternal/fetal conditions correct interpretation of Doppler studies in each individual case.

Umbilical artery Doppler assessment is most useful in pregnancies complicated by fetal growth restriction and/or preeclampsia. Doppler velocimetry is recommended as a primary surveillance tool for monitoring these pregnancies.

A systematic review of well-designed observational studies provided compelling evidence that Doppler assessment of the fetal middle cerebral artery (MCA) peak systolic velocity is the best noninvasive tool for predicting fetal anemia in at-risk pregnancies.

**PROCEDURE:**
    A. Umbilical artery Doppler should be used for assessment of the fetal-placental circulation in suspected severe placental insufficiency. (I-A). Depending on other clinical factors, reduced, absent, or reversed umbilical artery end-diastolic flow is an indication for enhanced fetal surveillance or delivery. If delivery is delayed to enhance fetal lung maturity with maternal administration of cortiosteroids, intensive fetal surveillance until delivery is suggested in the setting of reversed end-diastolic flow. (II-1B)
    B. Umbilical artery Doppler should not be used as a screening tool in healthy pregnancies, as it has not been shown to be of value. (I-A)
    C. Measurement of the fetal middle cerebral artery Doppler peak systolic flow velocity is a predictor of moderate or severe fetal anemia and can be used to avoid unnecessary invasive procedures in pregnancies complicated with red blood cell isoimmunization. (II-1A)
    D. Since inaccurate information concerning fetal Doppler studies could lead to inappropriate clinical decisions, measurements must be undertaken and interpreted by expert operators who are knowledgeable about the significance of Doppler changes.
    E. Duplex mode with pulsed Doppler and color Doppler flow mapping is the minimum required ultrasound equipment. (II-1A)
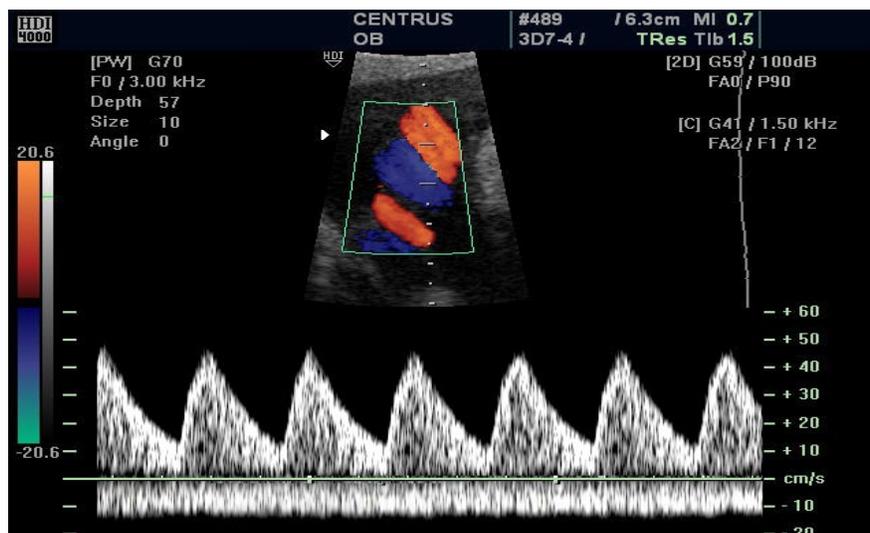
**Umbilical Artery Doppler (UMB A):**
The UMB A can be studied at the paravesical are in free loop of cord or in the insertion of the cord in the placenta. We typically use a free loop of cord for technical ease, and because most reference curves have been developed utilizing this level. Understand that all randomized studies that have established the utility of Doppler of the UMB A have used this portion. In multiple pregnancies, and/or when comparing repeated measurements longitudinally, recordings from

fixed sites, i.e. fetal end, placental end or intraabdominal portion, may be more reliable. As a general concept, it is essential to continue to use the same location utilized in previous Doppler exams.

Technical Aspects:
- You must identify the vessel and use color Doppler mean velocity scales (between 20 and 40 cm/s) to initiate the selective identification of the vessel.
- The angle of insonation should always be less than 30°, which is easy in these vessels. Even if Doppler indices are mathematically independent of the angle, an angle of excessive insonation can affect the measurement accuracy.
- The size of the Doppler sample must be equivalent to the diameter of the artery and must be placed in the center of the vessel.



**Middle Cerebral Artery Doppler:**

Technical Aspects:
- An axial section of the brain, including the thalami and the sphenoid bone wings, should be obtained and magnified.
- Color flow mapping should be used to identify the circle of Willis and the proximal MCA
- The pulsed-wave Doppler gate should then be placed at the proximal third of the MCA, close to its origin in the internal carotid artery (the systolic velocity decreases with distance from the point of origin of this vessel).
- The angle between the ultrasound beam and the direction of blood flow should be kept as close as possible to 0°
- Care should be taken to avoid any unnecessary pressure on the fetal head.
- At least three and fewer than 10 consecutive waveforms should be recorded. The highest point of the waveform is considered as the PSV (cm/s).

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- The PSV can be measured using manual calipers or autotrace. The latter yields significantly lower medians than does the former, but more closely approximates published medians used in clinical practice. PI (for IUGR) is usually calculated using autotrace measurement, but manual tracing is also acceptable.
- Appropriate reference ranges should be used for interpretation, and the measurement technique should be the same as that used to construct the reference ranges.
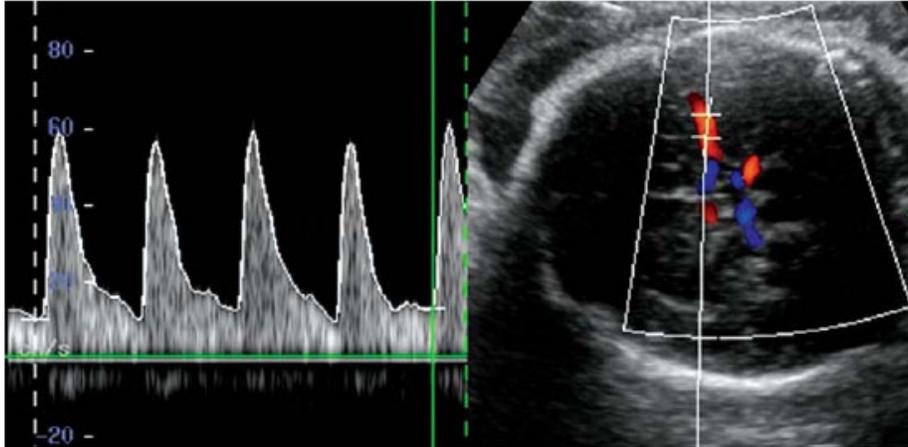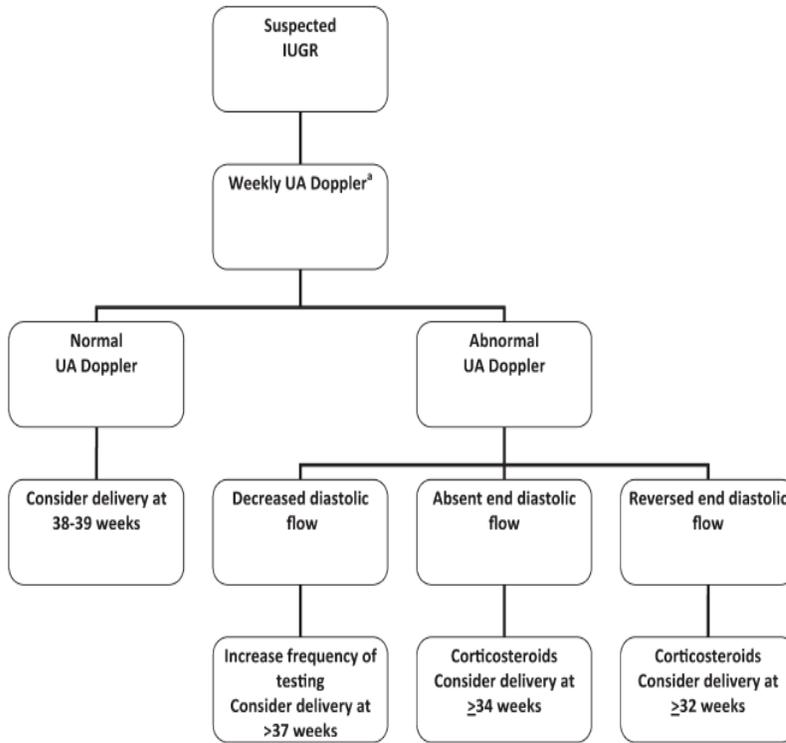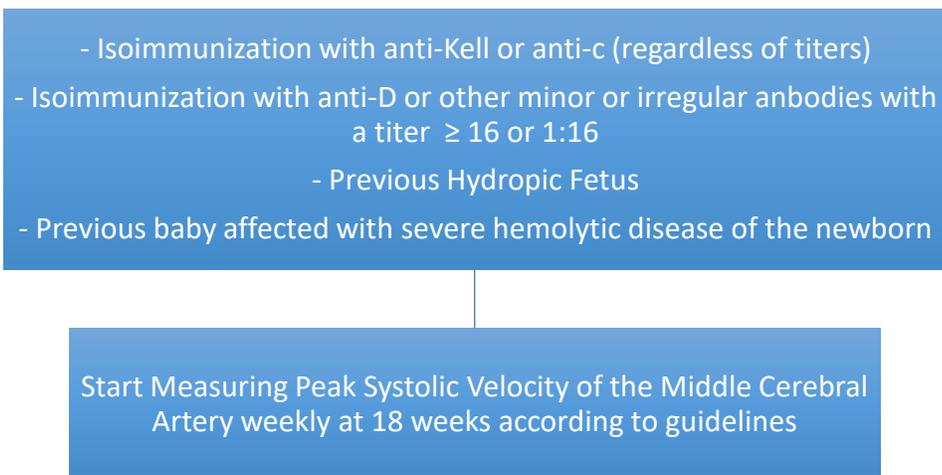
## Algorithm for IUGR:



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*Copel. Practical Approach to Fetal Growth Restriction. Obstet Gynecol 2014.*

Copel JA, Bahtiyar MO. A practical approach to fetal growth restriction. Obstet Gynecol 2014; 123: 1057-69.

## Doppler for the Detection of Fetal Anemia:



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Moise K. in Creasy and Resnik's, Maternal Fetal Medicine, Principles and Practice, 7th Edition. Elsevier Saunders. Philadelphia, PA, 2014.

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**APPROVALS:**

| SOP Owner: | Luis Izquierdo, MD, MBA<br>Ellen Mozurkewich, MD | Date: 1/20/21 |
|---|---|---|
| Chair Approval: | | Date: 06/07/2021 |
| Effective Date: | June 7, 2021 | |

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