

AIUM Practice Parameter for the Performance of Obstetrical Ultrasound Examinations



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Director of Accreditation, AIUM

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Disclosures

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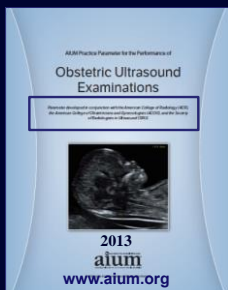
Therese Cooper BS RDMS

Relevant Financial Relationships: None

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Learning Objectives

After completing this presentation, the learner will be able to:



1. Acquire practical knowledge of scanning.

1. Recognize the minimum requirements for a 1st trimester Ob ultrasound.

2. Describe the minimum requirements for a basic 2nd trimester Ob ultrasound.

3. Utilize principles of ALARA.

4. Demonstrate compliance with Documentation of an US examination.

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Lecture Outline

1. Practical Aspects of Scanning
2. Classification of Fetal Sonographic Examinations
3. Fetal Safety (ALARA)
4. Specifications of First trimester fetal ultrasound
 - Indications
 - Required Components
 - Nuchal Translucency
 - Early anatomic imaging: the basics
4. Second and Third Trimester fetal ultrasound
 - Indications
 - Required Components
5. Documentation
6. Training, Quality Control, Infection Control

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Ultrasound Transducers (Probe)



- US waves from piezoelectric crystals under transducer footprint
- Marker (groove/dot) on the probe determines orientation
 - Transverse: marker to pt RIGHT
 - Sagittal: marker to pt HEAD

Abuhamad A. **ULTRASOUND** in Obstetrics and Gynecology: A practical approach. First Edition 2014. ISBN-14: 978-0-692-26142-2

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Coupling Agents



- Ultrasound waves do not pass through air; a coupling agent is required to eliminate the air interface between the skin and the transducer
- Water soluble gel is applied to the skin or mucosa to allow sound transmission and probe movement

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Coupling Agent

- If sterile gel is required, only unopened gel bottles that are labeled as sterile meet this requirement
- Review institutional policies as to whether sterile US gel is recommended for a specific procedure
- Use open bottles of gel only for scanning on intact skin in low-risk patients
- Sterile gel is recommended for transvaginal sonography (TVS)
- For TVS, gel must be placed between the probe and the probe cover and sterile gel must be placed on between the probe cover and the vaginal mucosa

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CDC-COCA statement April 2012

Transducer Cleaning

EXTERNAL PROBES: Manually remove visible organic and inorganic material from surface; wash with soap and water or quaternary ammonium spray or wipes.

INTERNAL PROBES: Remove probe cover. Manually remove any visible organic or inorganic material from the surface; wash probe with soap and water or wipe down with a quaternary ammonium spray or wipe. Probe must then undergo High-Level Disinfection (HLD) to reduce microbial load. Protocol vary based on the specific HLD.

AIUM Official Statement (2014): Guidelines for Cleaning and Preparing External-and Internal-Use Ultrasound Probes Between Patients.

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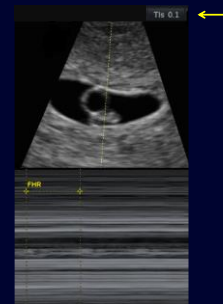
Fetal Safety and ALARA

- Fetal ultrasound should be performed only when there is a valid medical reason
- Lowest possible ultrasound exposure setting should be used to gain the necessary diagnostic information
- Keepsake Imaging is not appropriate
- Spectral Doppler discouraged

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Energy Output Monitored

- Thermal Index for soft tissue (TIs) prior to 10 weeks GA
- Lowest ratio is optimal.
Optimal: TI < 0.5
Compliant: TI < 0.7
Acceptable: TI < 1.0



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Energy Output Monitored

- Thermal Index for bone (TIb) at 10 weeks GA and greater
- Lowest ratio is optimal.
Optimal: TI < 0.5
Compliant: TI < 0.7
Acceptable: TI < 1.0



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Fetal Safety and ALARA

- 2D video clip or M-mode should be used to document cardiac activity
- Spectral Doppler imaging is discouraged in the first trimester and should be used thereafter as clinically indicated



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Classification of Fetal Ultrasound Examinations

1. First-Trimester Examination
2. Standard Second and Third Trimester Ultrasound

1. Limited Ultrasound

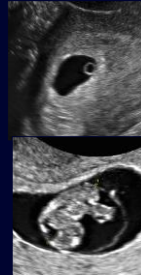
- Performed when a specific question arises. (Fetal presentation in laboring patient)
- Prior complete examination available

4. Specialized Ultrasound (Detailed)

- Anomaly suspected based on standard imaging, history, aneuploidy screening, laboratory results

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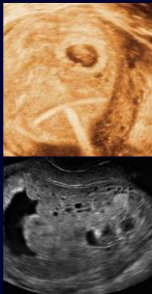
First Trimester: Indications*



- Confirmation of IUP
- Suspected ectopic
- Bleeding
- Pelvic pain
- Gestational age
- Dx of multiple pregnancy
- Cardiac activity

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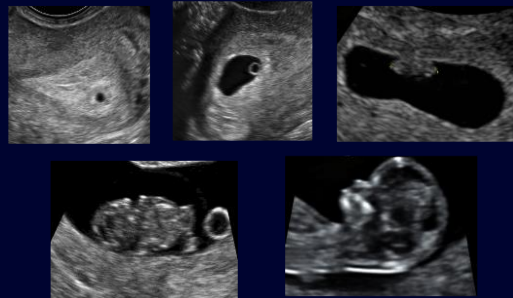
First Trimester: Indications*



- Adjunct to CVS, embryo transfer or IUD location
- Assessing for certain fetal anomalies
- Measuring the nuchal translucency**
- Evaluation of suspected mole

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First Trimester

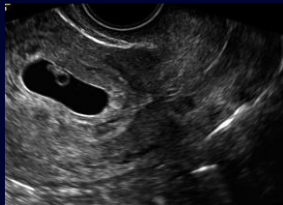


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1st Tri: Imaging Parameters



Transabdominal



Transvaginal

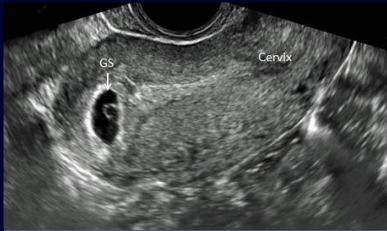
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First Trimester

- Uterus (including cervix) and adnexa
- Presence, size, location and # of gestational sacs
- Gestational sac examined for yolk sac and embryo/fetus
- When an embryo is detected it should be measured
- Cardiac activity recorded by 2D video clip or M-mode
- Cul-de-sac evaluated.

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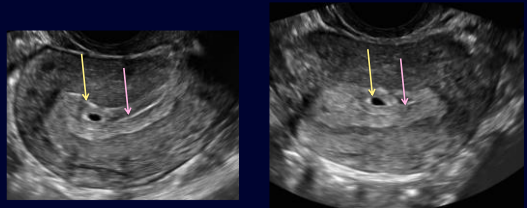
Presence, Size, Location and Number of Gestational Sac(s)



Definitive diagnosis of an IUP when a yolk sac or embryo/fetus with cardiac activity is visualized.

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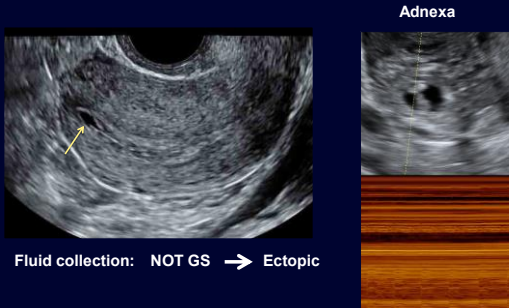
Presence, Size, Location and Number of Gestational sac(s)



A small, eccentric intrauterine fluid collection with an echogenic rim can be seen before the yolk sac and embryo are detectable.

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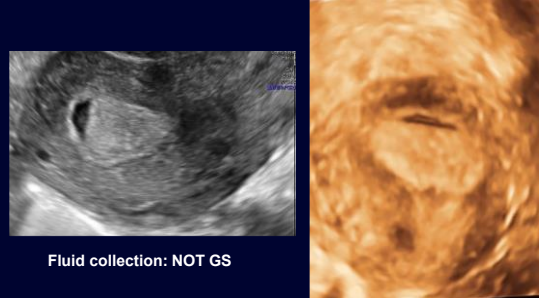
The Uterus (Incl. Cervix) and Adnexa Should be Evaluated for the Presence of a Gestational Sac



Fluid collection: NOT GS → Ectopic

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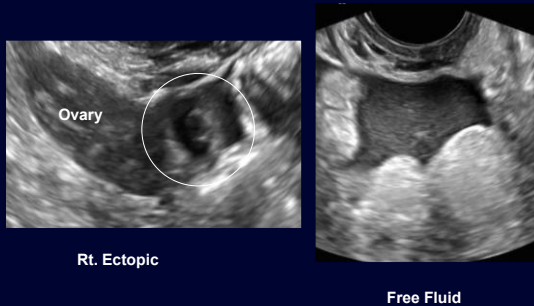
Case 1:



Fluid collection: NOT GS

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Case 1:

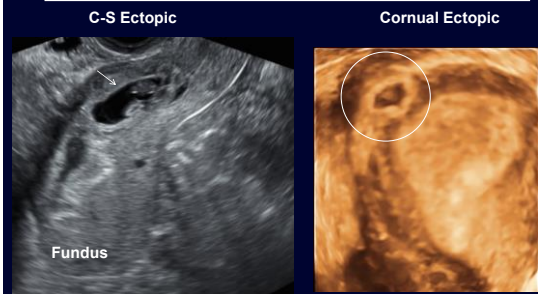


Rt. Ectopic

Free Fluid

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Uterus and Adnexa Evaluated for GS



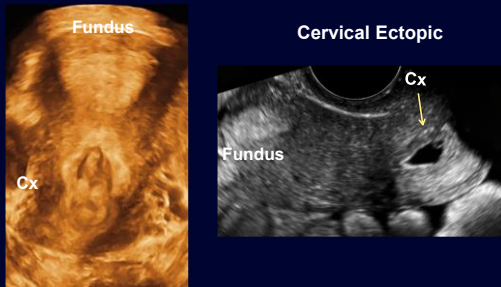
C-S Ectopic

Cornual Ectopic

Fundus

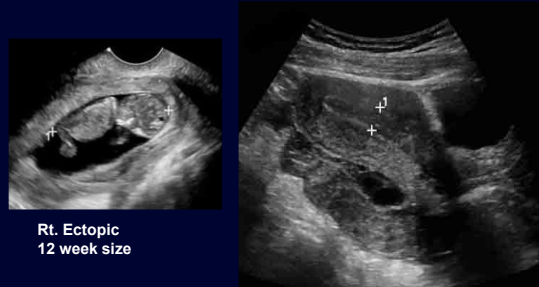
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The Uterus (Incl. Cervix) and Adnexa Should be Evaluated for the Presence of a Gestational Sac



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The Uterus (Incl. Cervix) and Adnexa Should be Evaluated for the Presence of a Gestational Sac



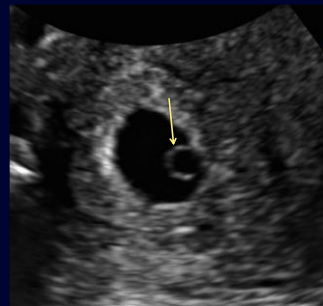
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Examine Gestational Sac for Yolk Sac

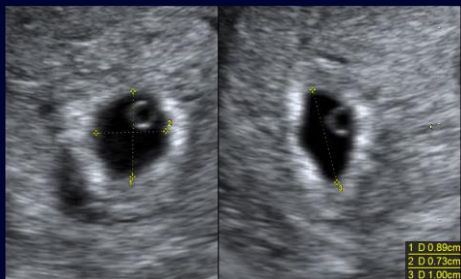


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Examine Gestational Sac for Yolk Sac



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Prior to the identification of an embryo, the mean sac diameter (MSD) may be recorded.

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Examine Gestational Sac for Yolk Sac and Embryo

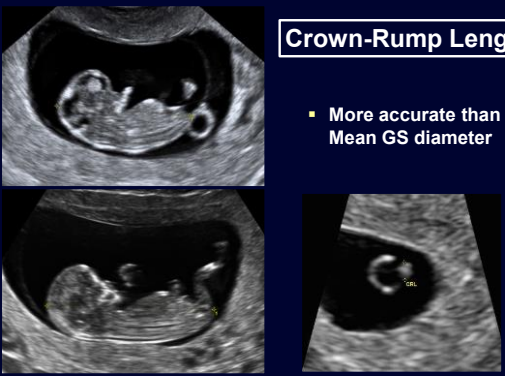


Note the location of the embryo directly adjacent to the yolk sac.

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Crown-Rump Length


- More accurate than Mean GS diameter



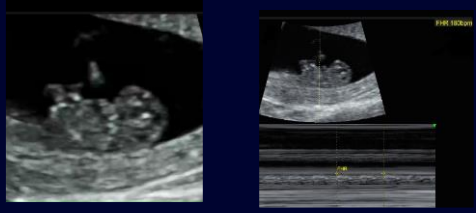
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Crown Rump Length Measurement

- Fetus fills majority of image space
- Fetus midsagittal
- Profile, spine and rump visible
- Neutral position: Spine in line with head, fluid between chin and chest
- Angle of insonation perpendicular to fetus
- Calipers on outer border of skin at crown and rump



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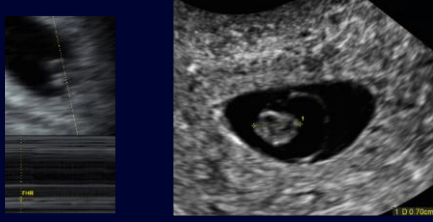


The presence or absence of **CARDIAC ACTIVITY** should be recorded. This may be done by M-mode or recording a 2D video 'clip' of the cardiac activity.

Doppler should **NOT** be used in the first trimester unless clinically indicated.


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- FH usually seen with CRL of 2 mm or greater
- If an embryo measures **< 7 mm**, without cardiac activity, a subsequent scan in one week is recommended to ensure that the pregnancy is nonviable



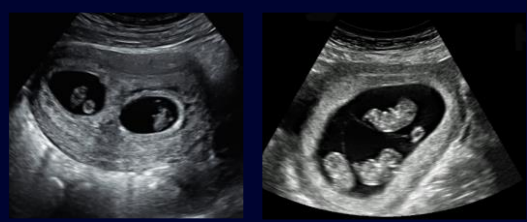
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Fetal Number Should be Documented



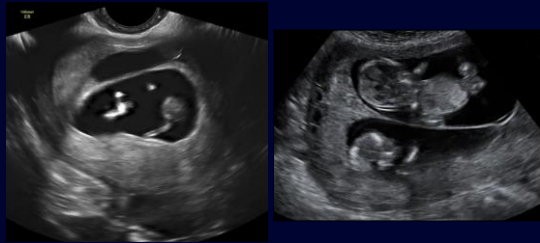
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Presence, Size, Location and Number of Gestational Sac(s)



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**Multiple Gestation: Chorionicity and Amnionicity
Should be Documented When Possible**



Dichorionic - Diamniotic

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**Multiple Gestation: Chorionicity and Amnionicity
Should be Documented When Possible**



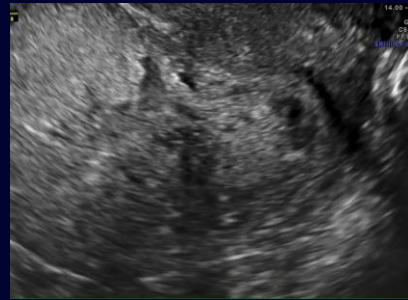
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Monozygotic - Diamniotic



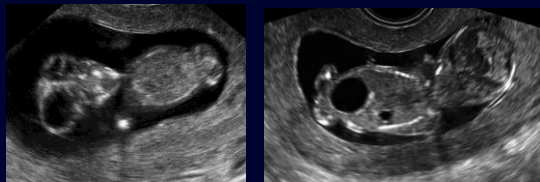
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Monozygotic - Monoamniotic



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**Embryonic/Fetal Anatomy Appropriate for
the First Trimester Should be Assessed**



Abnormal cranial contour

Megacystis

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**The nuchal region should be imaged and abnormalities
such as cystic hygroma should be documented.**

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In Patients desiring risk assessment for aneuploidy; a specific NT measurement (with biochemistry) can be used to determine the risk of aneuploidy.**

****Quality Assessment Program**

www.ntqr.org
www.fetalmedicine.org

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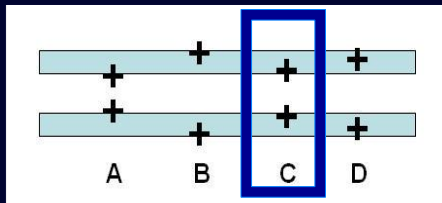


Measurement Criteria

1. Fetus in mid-sagittal plane
2. Fetus occupies majority of image
3. Fetal neck in neutral position
4. Margins of NT edges clear
5. Fetus observed away from amnion
6. (+) calipers used
7. Measurement at widest NT space
8. Calipers placed \perp to long axis of fetus
9. Horizontal crossbars placed correctly

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Caliper Placement



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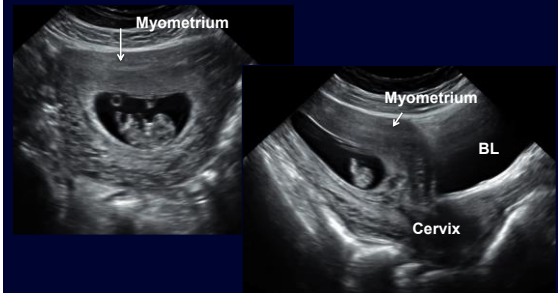


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The Uterus, Cervix, Adnexal Structures and Cul-de-Sac Should be Evaluated



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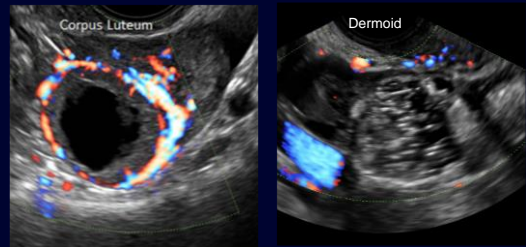
The Presence and Number of Leiomyomata Should be Documented



The measurement of the largest or any potentially clinically significant leiomyomata should be documented.

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The Presence, Location and Size of Adnexal Masses Should be Recorded



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Uterine Anomalies Should be Documented



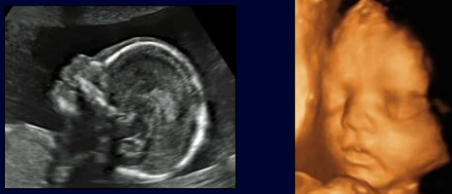
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The Presence or Absence of Fluid in the Cul-de-Sac Should be Noted



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Second and Third Trimester Evaluation



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ALARA: As Low As Reasonably Achievable



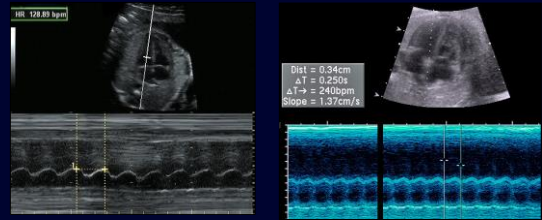
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Indications: Including but Not Limited to

Fetal anomalies	Fetal Anatomy
Gestational age	Size Dates Discrepancy
Fetal Well Being	Suspected Fetal Death
Abnl Biochemistry	Screening for Aneuploidy
Fetal Position	Amniotic Fluid
Multiple Gestation	Cervical Insufficiency
Preterm Labor	Preterm PROM
Bleeding per vagina	Suspected Abruption
Placental Location	Adjunct to a procedure
Pelvic Mass	Suspected uterine anomaly
Molar Pregnancy	Abdominal -Pelvic Pain

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Fetal Cardiac Activity: Rate and Rhythm



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Fetal Number Should be Documented



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Multiple Gestations

- Chorionicity
- Amnionicity
- Comparison of fetal sizes
- Estimation of AFV in each sac
- Genitalia when visualized



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Chorionicity and Amnionicity



Dichorionic - Diamniotic

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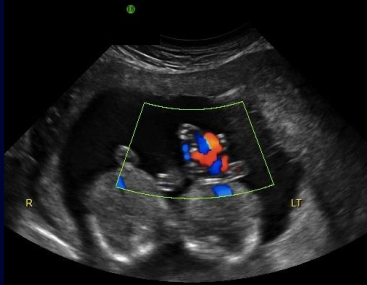
Chorionicity and Amnionicity



Monochorionic - Diamniotic

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Chorionicity and Amnionicity



Monochorionic - Monoamniotic

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Fetal Presentation Should be Documented



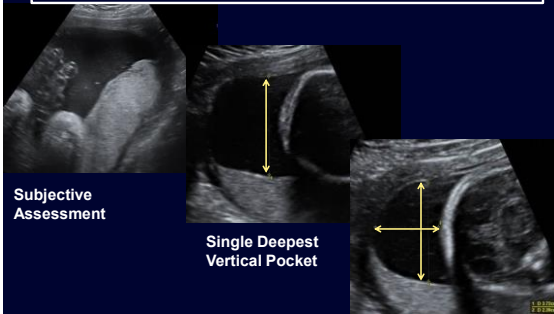
Cephalic



Breech

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A Qualitative Or Semi-quantitative Assessment of Amniotic Fluid Volume Should be Documented



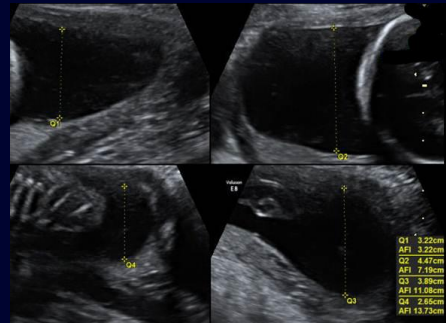
Subjective Assessment

Single Deepest Vertical Pocket

2-Diameter Pocket

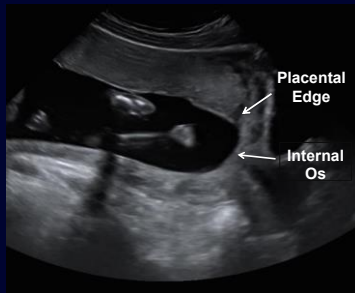
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Amniotic Fluid Index



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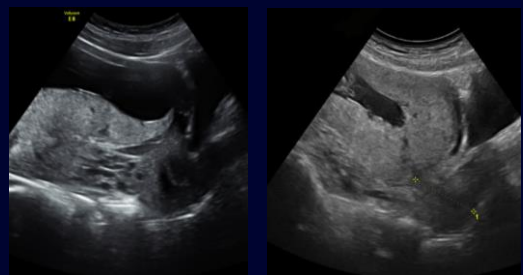
Placental Location, Appearance, and Relationship to the Internal Cervical Os Should be Documented



Placental Edge
Internal Os

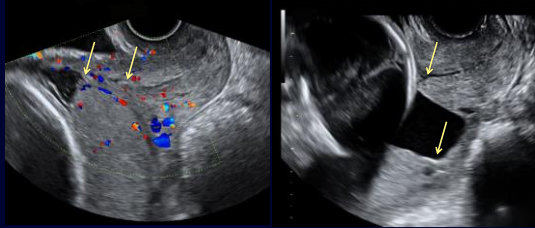
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Placental Location, Appearance, and Relationship to the Internal Cervical Os Should be Documented



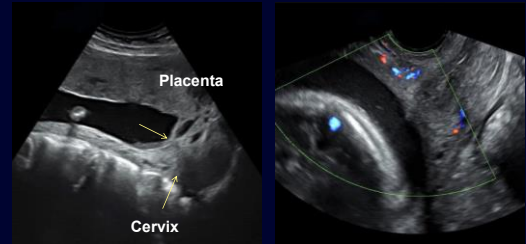
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Transperineal or Transvaginal Views May be Helpful in Visualizing the Internal Cervical Os and its Relationship to the Placenta.



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Placental Position Early In Pregnancy May Not Correlate Well With Location At Time Of Delivery

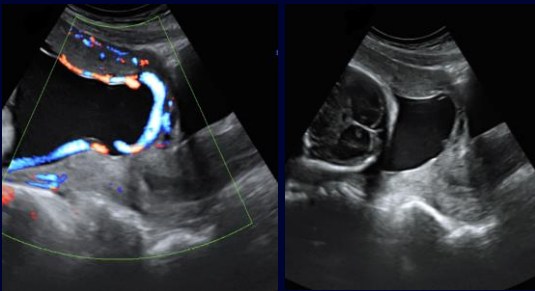


18 weeks

32 weeks
Transvaginal

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TIP: Color and Transvaginal Sonography May be Helpful in Follow-up of a Previously Recognized Low-lying Placenta

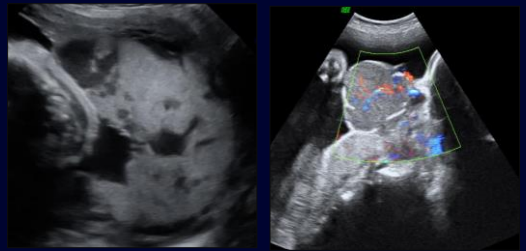


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Placental Location, Appearance, and Relationship to the Internal Cervical Os Should be Documented

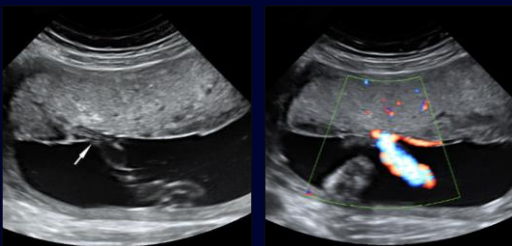
Placenta Accreta

Chorioangioma



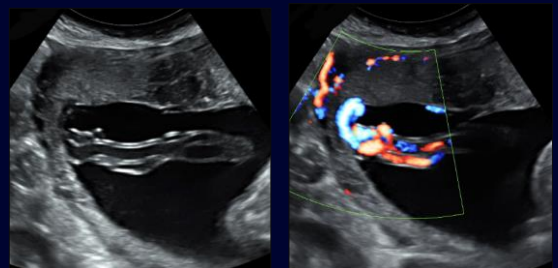
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The Placental Cord Insertion Site Should be Documented When Technically Feasible



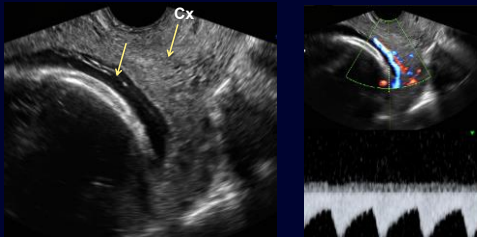
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Velamentous Cord Insertion



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Velamentous Cord Insertion That Crosses The Internal Cervical Os: Vasa Previa



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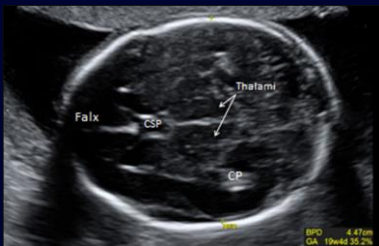
Biometry: Less Accurate with Advancing Gestational Age

BPD	Biparietal Diameter
HC	Head Circumference
AD or AC	Abdominal Diameter or Circumference
FL	Femoral Diaphysis Length

Pregnancy should **not** be re-dated after an accurate earlier scan has been performed and is available for comparison!

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Biparietal Diameter



Measured at the level of the thalami and cavum septi pellucidi or columns of fornix.

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Biparietal Diameter



The cerebellar hemispheres should not be visible. Measurement is from the outer edge of the proximal skull to the inner edge of the distal skull.

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Variation in Head Shape (Dolicho- Or Brachy-) May Make HC More Reliable Than BPD for Estimating GA



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Femoral Diaphysis Length: ≥ 14 weeks



Diaphysis length should not include the distal femoral epiphysis. The beam of insonation should be perpendicular to the shaft of the bone.

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Abdominal Circumference is Measured on a Transverse View of the Fetal Abdomen



The stomach and the junction of the umbilical vein and portal sinus should be seen. A single rib should be seen. The ellipse is at the skin edge.

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Abdominal Circumference is Measured on a Transverse View of the Fetal Abdomen



The stomach and the junction of the umbilical vein and portal sinus should be seen. A single rib should be seen. The calipers are at the skin edge.

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Weight Estimates: BPD, HC, AC, AD, FL

- Appropriateness of Growth
- Scans 2- 4 weeks apart
- Error +/- 15%



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Maternal Anatomy: Evaluation of The Uterus, Adnexa and Cervix Should be Performed When Appropriate



The measurement of largest or potentially clinically significant leiomyomata should be documented.



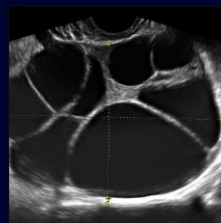
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The Measurement of the Largest or any Potentially Clinically Significant Leiomyomata Should be Documented



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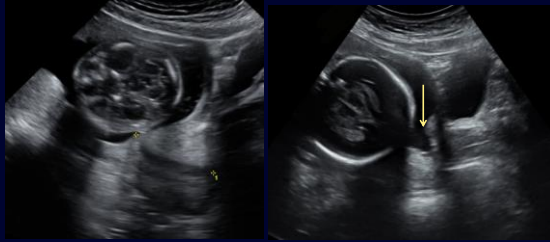
Maternal Anatomy: Evaluation of The Uterus, Adnexa and Cervix Should be Performed When Appropriate



Document location, size and appearance of adnexal masses.

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Maternal Anatomy: Evaluation of The Uterus, Adnexa and Cervix Should be Performed When Appropriate



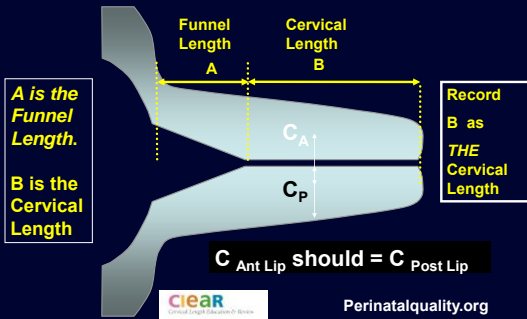
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Transvaginal or Transperineal Ultrasound May be Considered if the Cervix Appears Shortened or Cannot be Adequately Visualized During the Transabdominal Scan



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Cervical Length Measurement: Transvaginal



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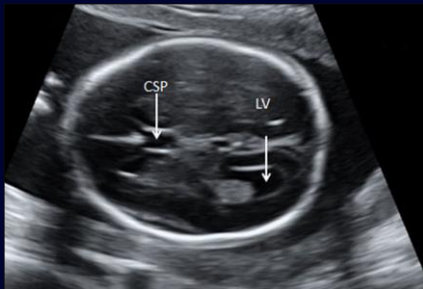
Fetal Anatomic Survey



The following areas of assessment represent the minimal elements of a basic examination of fetal anatomy.

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Lateral Cerebral Ventricles



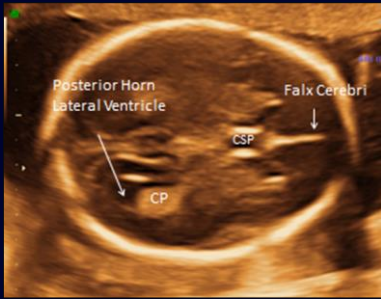
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Choroid Plexus



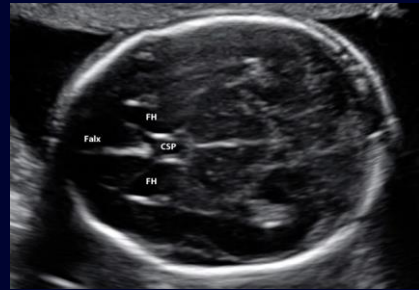
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Midline Falx



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Cavum Septi Pellucidi



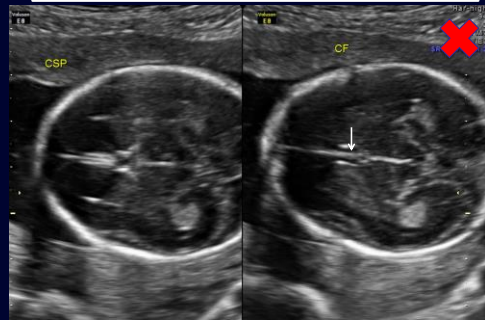
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CSP Appears as a Fluid Filled Rectangular Structure in the Anterior Midline; Situated Between the Frontal Horns of The Lateral Ventricle



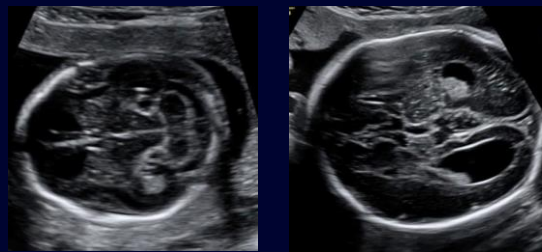
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PITFALL: Do Not Confuse the CSP With the Columns of The Fornix (CF)



Bromley and Cooper Note the parallel line traveling through the CF.

Mistaking CF for CSP: Missed Dx Agenesis of Corpus Callosum at Anatomic Survey



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Cerebellum and Cisterna Magna



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Upper Lip



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Nuchal Fold Measurement May be Helpful During a Specific Age Interval to Assess the Risk of Aneuploidy



Normal NF



Thick NF

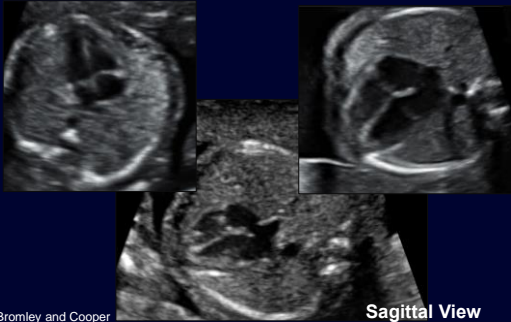
Axial scan through the fetal head which includes the thalami and the cerebellum. The measurement is made from the occipital bone to the outer skin edge.

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4-Chamber View

Apical

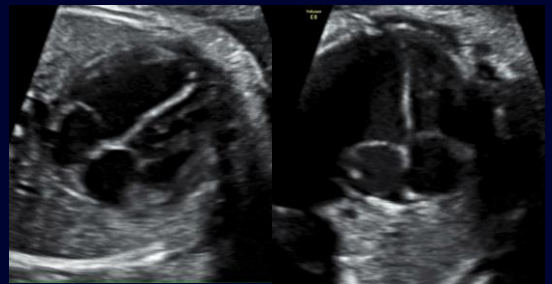
Basal



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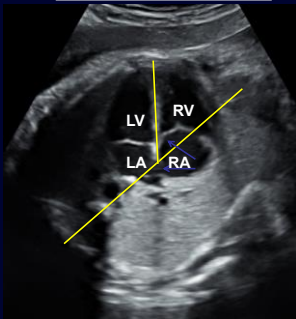
Sagittal View

4-Chamber View



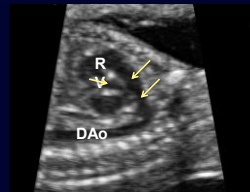
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4-Chamber View



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Cardiac Outflow Tracts: RVOT and LVOT

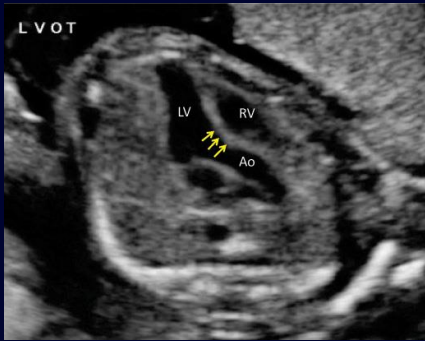


RVOT

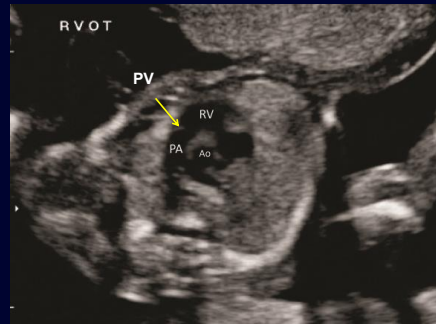


LVOT

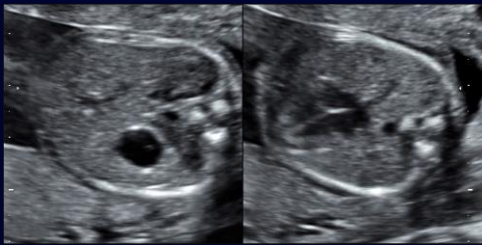
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Evaluation of situs demonstrated on split image of the abdomen and thorax. Fetal position within the uterus must be evaluated.

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Stomach: Presence, Size and Situs



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Kidneys



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Bladder



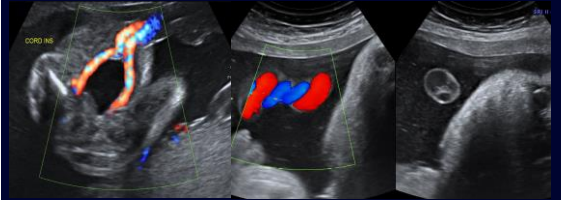
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Umbilical Cord Insertion Into Fetal Abdomen



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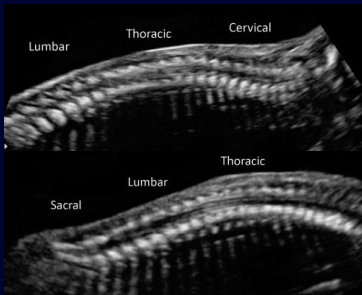
Umbilical Cord Vessel: Number



Can be demonstrated by color Doppler as the umbilical arteries course around the bladder, or by transverse/longitudinal imaging of a free loop of cord with color or gray scale.

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Cervical, Thoracic, Lumbar and Sacral Spine



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Lower Extremities



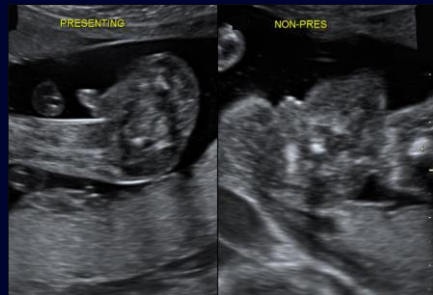
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Upper Extremities



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Genitalia Should be visualized in Multiple Gestations and When Medically Indicated



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Documentation: Images

Image labeling

- Patient Name and other identifying information
- Facility identifying information
- Date of US exam
- Image orientation when appropriate

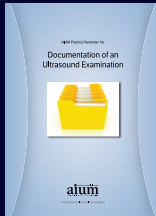


Image storage

- Retrievable format
- In accordance with clinical need, relevant legal and local healthcare facility requirements

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Interpreting Physicians: Qualifications

Physicians who evaluate and interpret diagnostic obstetric ultrasound examinations should be licensed medical practitioners who have a thorough understanding of the indications and guidelines for ultrasound examinations as well as familiarity with the basic physical principles and limitations of the technology of ultrasound imaging. They should be familiar with alternative and complementary imaging and diagnostic procedures and should be capable of correlating the results of these other procedures with the ultrasound examination findings. They should have an understanding of ultrasound technology and instrumentation, ultrasound power output, equipment calibration, and safety. Physicians responsible for ultrasound examinations should be able to demonstrate familiarity with the anatomy, physiology, and pathophysiology of those organs or anatomic areas that are being examined. These physicians should provide evidence of training and requisite competence needed to successfully perform and interpret diagnostic obstetric ultrasound examinations. The training should include methods of documentation and reporting of ultrasound studies.

Training and Guidelines for Physicians Who Evaluate and Interpret Diagnostic Ultrasound Examinations. AIUM, 2015

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Documentation Should Be Done According to AIUM Documentation Parameter: **ROUTINE***

- Patient name and other identifying information
- Name of health care provider and US facility information
- Date of US exam, type of US and indication
- Comments on components of the relevant parameter
- Appropriate anatomic/sonographic terminology
- Pertinent measurements (biometry)
- Use of endovaginal probe
- Limitations of the examination
- Comparison with prior studies
- Differential Diagnosis and rec. follow-up studies
- Final report signed and dated by interpreting physician within 24 hours or 1 business day

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Documentation Should Be Done According To AIUM Documentation Parameter: **COMMUNICATION**

- Urgent and unexpected findings which require immediate action; communication between interpreting physician and patient's health care provider should be done by phone or in person immediately after the US examinations.
- Institutional protocol should be followed to minimize potential communication errors.
- The final report should include the date, time and method that the report was conveyed to the patient's health care provider.

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Conclusions

- Imaging should be performed in compliance with the AIUM Practice Parameters for Obstetrical Ultrasound
- Occasionally a limited ultrasound may be performed to answer a specific clinical question in a patient who has had a prior complete study. Some patients require a more detailed evaluation of the fetus
- All imaging should be done with attention to ALARA (As Low as Reasonably Achievable) and acoustic output should be monitored with the appropriate thermal index
- Documentation of US should be done in compliance with AIUM Documentation Parameter

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Key References

American Institute of Ultrasound in Medicine (AIUM) Practice Parameter for the Performance of Obstetric Ultrasound Examinations. 2013

American Institute of Ultrasound in Medicine (AIUM) Practice Parameter Documentation for an Ultrasound Examinations. 2014

Abuhamad A. ULTRASOUND in Obstetrics and Gynecology: A practical approach. First Edition 2014. E-book. ISBN-14: 978-0-692-26142-2

Nelson TR, Fowlkes JB, Abramowicz JS et al. Ultrasound Biosafety Considerations for the Practicing Sonographer and Sonologist. J Ultrasound Med 2009;28:139-150

Reddy UM, Abuhamad AZ, Levine D et al. Fetal Imaging Executive Summary. J Ultrasound Med 2014; 33: 745-757.

www.perinatalquality.org (NT criteria/CLEAR requirements)

www.aium.org (prudent use, Doppler safety statements, transducer cleaning and high level disinfection)

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