

# Perinatal Progress

## Fundamentals of Obstetric Ultrasound

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### Obstetric ultrasound has become a cornerstone in the management of both routine and complex pregnancies.

In this edition of *Perinatal Progress*, we present a basic primer on the current guidelines and indications for routine obstetric ultrasound. As our patients and healthcare systems in general place an increasing emphasis on value-based care, the responsibility falls on the shoulders of care providers to optimize the use of healthcare resources. It is our hope that what follows will provide obstetric care providers greater clarity on current recommendations for ordering these studies and the rationale behind follow-up recommendations when indicated.

While the basis for these recommendations is derived from national guidelines from sources such as the American Institute of Ultrasound in Medicine (AIUM), the American Congress of Obstetrics and Gynecology (ACOG), and the Society for Maternal-Fetal Medicine (SMFM), where gaps exist the content is supplemented with consensus-driven recommendations from the providers at Northwest Perinatal Center (NWP).

### First trimester ultrasound (CPT 76801)

An initial ultrasound in the first trimester is often performed to assess pregnancy viability and establish gestational dating with pregnancy recognition or as a routine part of an initial prenatal evaluation; however, the timing of this exam is important. Multiple professional guidelines and OHA coverage guidelines recommend against “routine” first trimester ultrasound solely for dating or to confirm an ongoing pregnancy. All suggest that in the absence of a specific indication, the exam should be deferred until 11-14 weeks. At that time, the pregnancy dating can be confidently confirmed or adjusted (if > 5 days different from the LMP-derived EDC). Additionally, much more information can be provided to the patient regarding the status of the pregnancy, including 1) the number of fetuses and chorionicity if a multifetal pregnancy; 2) an initial evaluation of some basic fetal anatomic structures; and 3) a subjective evaluation of the nuchal translucency.

**We recommend that the first trimester ultrasound be**

### deferred until 12 weeks in a healthy patient with regular cycles and a confident last menstrual period (LMP) date.

This accrues all the benefits of the 11-14 week scan while minimizing the risk of missing the window for aneuploidy screening because the pregnancy is further along than expected. It also minimizes patient anxiety associated with pregnancies of uncertain viability often seen with very early first trimester ultrasound exams.

Performing an ultrasound prior to 12 weeks may be considered for the following medical indications:

- Estimation of gestational age (if unsure LMP, irregular menstrual cycles, or uterine size-date discrepancy on exam)
- Evaluation of vaginal bleeding
- Evaluation of pelvic pain
- Evaluation of a suspected ectopic pregnancy
- Assessment for certain limited fetal anomalies in high-risk patients (e.g. anencephaly)
- As an adjunct to CVS, embryo transfer, or localization and potential removal of an IUD

### Nuchal translucency measurement

(CPT 76813)

Nuchal translucency (NT) measurements are typically performed as part of an aneuploidy screening methodology (e.g. sequential screening). NT measurements are obtained when the fetal crown-rump length (CRL) falls between 45-84 mm (11 0/7 - 13 6/7 weeks) and are measured in the fetal mid-sagittal plane. There are multiple criteria involved in obtaining a satisfactory measurement, some of which include a mid-sagittal fetal plane, neutral head position, visualization of the amnion distinct from the fetus and proper caliper placement. NT certification is a requirement to assure quality images. This certification involves ongoing assessment of NT measurements and has been shown to improve detection rates while decreasing false positive rates.

In general, a patient with a fetal NT measurement < 3.0 mm should proceed with anticipated blood analyte testing

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to further refine the risk assessment based on maternal age and NT alone. We recommend sequential screening (which includes first trimester and second trimester blood analyte testing) which provides improved detection rates with fewer false positive results.

Fetal NT measurements  $\geq 3.0$  mm are associated with progressively increasing risks for both aneuploidy and structural abnormalities (especially cardiac defects). These patients require additional counseling at the time of the study. Table 1 illustrates the potential associations based upon the NT measurement. Current guidelines recommend that fetuses with an NT  $\geq 3.0$  mm be evaluated with a detailed anatomy survey (20 weeks) and those with an NT  $\geq 3.5$  mm with an echocardiogram (22 weeks). However, given the increasing risk of anomalies even in euploid fetuses, we currently offer all women with an NT  $\geq 3.0$  mm both a detailed exam and an echocardiogram.

## Routine Fetal Anatomy Survey (CPT 76805)

The standard fetal anatomic survey is typically performed at 18-20 weeks' gestation in patients without indications for a detailed survey. Providers at NWP currently recommend that the standard anatomy survey be performed, if possible, at 20 weeks—especially if the patient has had a well-timed first trimester exam that confirms the pregnancy dating. The likelihood of suboptimal visualization of the standard anatomic structures is reduced while still providing adequate time for further evaluation should an anomaly be identified.

Some of the components of this study include:

- Fetal presentation
- Estimation of fetal weight (NWP uses the Williams equation)
- Placental position
- Amniotic fluid volume assessment
- Cervical evaluation
- Maternal uterine and adnexal evaluation
- Standard fetal anatomic evaluation – based upon the AIUM Practice Guidelines.<sup>1</sup>

**Table 1: Rates of associated complications based upon nuchal translucency size**

| NT (MM)    | CHROMOSOMAL DEFECTS (%) | FETAL DEATH (%) | MAJOR FETAL ABNORMALITIES (%) | ALIVE AND WELL (%) |
|------------|-------------------------|-----------------|-------------------------------|--------------------|
| 3.5 – 4.4  | 21.1                    | 2.7             | 20.0                          | 70                 |
| 4.5 – 5.4  | 33.3                    | 3.4             | 28.5                          | 50                 |
| 5.5 – 6.4  | 50.5                    | 10.1            | 24.2                          | 30                 |
| $\geq 6.5$ | 64.5                    | 19.0            | 46.2                          | 15                 |

Derived from Souka AP. Increased nuchal translucency with normal karyotype. *Am J Obstet Gynecol* 2005;192:1005-1021.

That said, it is the practice of NWP in general to attempt to obtain not only the standard images but also the additional images included in the detailed fetal anatomic survey for every patient referred. We have adopted this practice for several reasons:

- 1) even though the actual incidence of anomalies is lower in “low risk” women, the absolute number of defects is actually higher because the number of women in this group is also much higher;
- 2) because the additional images can sometimes be challenging to obtain, routine inclusion improves quality and consistency of the image acquisition; and
- 3) it minimizes the chance of inappropriately performing a lower level exam when a detailed study is clinically indicated.

Expanding the routine evaluation when possible has been suggested to increase the detection rate for fetal anomalies (e.g., an increase in cardiac anomaly detection by 65-70% in low-risk populations by including outflow tract and great vessel views).<sup>2</sup> Table 2 illustrates the list of these structures.

Our billing charges are based on standard coding practices and driven by the indication rather than the number of images obtained (i.e., low-risk women are only charged for a routine fetal survey).

## Suboptimal views

Many factors may influence the ability to adequately visualize the recommended structures of an ultrasound study, such as gestational age, fetal position, maternal body characteristics and available imaging time. At times, there may be structures that are identified as “suboptimally seen” on the imaging report. Determining appropriate follow-up imaging for structures that are suboptimal-

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**Table 2: Components of the 76805 and 76811 anatomy surveys**

| ROUTINE ANATOMY SURVEY (76805)                             |   | Anatomic structures for which visualization should be attempted for all anatomy surveys | DETAILED ANATOMY SURVEY (76811)                            |   |
|--|---|---|--|---|
| Marked as suboptimally seen when not adequately visualized | Follow-up imaging may be indicated when suboptimally seen |   | Marked as suboptimally seen when not adequately visualized | Follow-up imaging is indicated when suboptimally seen |
|  |   | profile   | X  |   |
|  |   | nasal bone measurement (15-22 wks)  | X  |   |
| X  |   | lateral ventricles  | X  | X   |
| X  |   | choroid plexus  | X  | X   |
| X  | X   | midline falx  | X  | X   |
| X  | X   | cavum septi pellucidi   | X  | X   |
| X  | X   | cerebellum  | X  | X   |
| X  | X   | cisterna magna  | X  | X   |
|  |   | cerebellar vermis   | X  |   |
| X  |   | upper lip   | X  | X   |
|  |   | palate  |  |   |
|  |   | neck  | X  |   |
|  |   | nuchal fold (16-20 wks)   | X  |   |
| X  | X   | four chamber heart  | X  | X   |
| X  |   | cardiac outflow tracts  | X  | X   |
|  |   | aortic arch, SVC/IVC, 3 vessel view, 3 vessel trachea view, lungs                       | X  |   |
|  |   | video clip showing four chamber heart view and crossing outflow tracks                  | X  |   |
|  |   | diaphragm   | X  |   |
| X  | X   | stomach   | X  | X   |
|  |   | liver   | X  |   |
| X  | X   | kidneys   | X  | X   |
| X  | X   | bladder   | X  | X   |
| X  |   | ventral wall  | X  | X   |
| X  |   | umbilical cord vessel number  | X  | X   |
| X  |   | umbilical cord insertion at placenta  | X  | X   |
| X  |   | spine   | X  | †   |
| X  |   | legs and arms   | X  | X   |
|  |   | hands and feet  | X  |   |
|  |   | genitalia   |  |   |
| X  |   | sex in twins  | X  | X   |

†As clinically appropriate based upon the indication for the detailed study (e.g. diabetes, BMI >30).

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ly seen during the anatomy survey can be challenging. However, the clinical utility and cost-effectiveness of follow-up evaluations for low-risk patients when portions of the recommended fetal anatomy are not well visualized as part of an otherwise normal-appearing survey have not been established. In fact, there is evidence that a follow-up ultrasound for reevaluation of suboptimally seen structures has very low yield.<sup>3</sup> Despite this, current NICHD guidelines suggest that “it may be reasonable to repeat the examination in 2-4 weeks depending on the limitations and findings on the initial ultrasound study.”<sup>4</sup>

With the lack of clear guidelines, the providers at NWP have identified certain structures that we believe warrant a repeat evaluation when they are not adequately seen—either because:

- 1) they are rarely not well seen and non-visualization dramatically increases the risk of an anomaly (e.g., stomach);
- 2) anomalies are relatively common (e.g., four chamber heart); or
- 3) despite being rare, missed anomalies may have significant consequences (e.g., cavum septi pellucidi or cerebellum).

Table 2 on the previous page presents a compilation of these structures.

## Detailed Anatomy Survey (CPT 76811)

The detailed fetal anatomic survey is “an indication-driven examination performed for a known or suspected fetal anatomic abnormality, known fetal growth disorder, genetic abnormality, or increased risk for a fetal anatomic or genetic abnormality.”<sup>5</sup> Only a single detailed survey may be performed by an individual practice in each pregnancy. Table 3 provides some common medical indications for performing a detailed survey.

The components of a detailed fetal anatomic evaluation include all aspects of a routine survey, numerous additional required structures (Table 2) and several structures that are imaged when medically indicated. Finally, the performance and interpretation of a detailed survey requires additional training, such as a formal subspecialty fellowship in fetal imaging, according to AIUM guidelines.

## Fetal Echocardiogram

A fetal echocardiogram is an advanced, medically-indicated imaging study of the fetal cardiac structures and function. Fetal echocardiography routinely incorporates the use of segmental grayscale imaging in conjunction with both color and pulse wave Doppler technology to evaluate the fetal heart. Performance of fetal echocardiography is typically reserved for sonologists with advanced training and certification for this study. Some of the indications for fetal echocardiogram are presented in Table 4 on the following page.

**Table 3: Indications for performance of a detailed fetal anatomic survey**

- **Previous fetus or child with congenital, genetic, or chromosomal abnormality**
- **Known or suspected fetal anomaly or known growth disorder in current pregnancy**
- **Fetus at increased risk for a congenital anomaly, such as the following:**
  - **Maternal pregestational diabetes or gestational diabetes diagnosed before 24 weeks**
  - **Pregnancy conceived by assisted reproductive technology**
  - **High maternal body mass index (BMI ≥ 30)\***
  - **Multiple gestation**
  - **Abnormal maternal serum analytes**
  - **Teratogen exposure**
  - **Nuchal translucency ≥ 3.0 mm**
- **Fetus at increased risk for genetic or chromosomal abnormality, such as the following:**
  - **Parental carrier of a chromosomal or genetic abnormality**
  - **Maternal age ≥ 35 years at delivery**
  - **Positive screening test results for aneuploidy**
  - **Sonographic marker for aneuploidy on an ultrasound examination**
  - **Nuchal translucency ≥ 3.0 mm**
- **Other conditions affecting the fetus, such as the following:**
  - **Congenital infections**
  - **Maternal drug dependence**
  - **Isoimmunization**
  - **Oligohydramnios**
  - **Polyhydramnios**

Derived from Consensus Report on the Detailed Fetal Anatomic Ultrasound Evaluation. *J Ultrasound Med* 2014;33:189-195.

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Specifically addressing the commonly-cited indication of a family history of congenital heart disease (CHD), **a fetal echocardiogram is indicated when there is a history involving a first-degree relative of the fetus (e.g. parent or sibling)**. A family history of CHD beyond a first-degree relative carries approximately the same risk as the general population (about 1%) and does not require the performance of a fetal echocardiogram.

### Transvaginal Cervical Length Evaluation (CPT 76817)

The use of transvaginal ultrasound to assess maternal cervical length between 16-24 weeks' gestation is a fundamental component of contemporary management of the singleton pregnancy with a prior history of spontaneous preterm birth (sPTB). The identification of cervical shortening in this high-risk cohort of patients is used to guide clinical management and adjunct evidence-based interventions, such as progesterone therapy and cerclage placement.

rather to extend transvaginal cervical length (TVCL) surveillance to all singleton pregnancies with universal TVCL

**Table 4: Indications for performance of a fetal echocardiogram**

- **Maternal indications:**
  - In vitro fertilization
  - Metabolic disease (e.g. diabetes, phenylketonuria)
  - Familial inherited disorders (e.g. 22q11.2 deletion syndrome)
  - Autoimmune antibodies (e.g. anti-SSA, anti-SSB)
  - Teratogen exposure (e.g. lithium, retinoids)
- **Fetal indications:**
  - Abnormal cardiac screening examination
  - First-degree relative of a fetus with congenital heart disease (e.g. parent, sibling)
  - Abnormal heart rate or rhythm
  - Fetal chromosomal abnormality
  - Extracardiac anomaly
  - Hydrops
  - Increased nuchal translucency ( $\geq 3.5$  mm)\*
  - Monochorionic twins

surveillance is widely debated. At this time, NWP does not endorse universal TVCL screening for patients without a history of prior sPTB based upon the following points:

- the incidence of clinically significant cervical shortening ( $\leq 20$  mm) is 1-2%
- the sPTB rate for our regional patient population is low
- universal TVCL screening is costly, time consuming and uncomfortable for some patients

Rather, NWP recommends universal transabdominal cervical length (TACL) screening between 16-24 weeks' gestation with conversion to TVCL evaluation if the measurement is  $\leq 30$  mm or unattainable by transabdominal imaging. This approach is based on evidence that TACL measurements  $> 30$  mm are associated with a 99.6% negative predictive value for clinically significant TVCL measurements  $\leq 20$  mm (the point at which vaginal progesterone therapy would be considered in a low-risk patient).<sup>6</sup>

Finally, additional TVCL surveillance is no longer recommended by both NWP and SMFM for the following groups of patients who historically may have undergone TVCL surveillance in the past. It is reasonable to screen these patients per routine protocol (i.e., TACL screening).<sup>7</sup>

- multiple gestations (no evidence-based interventions available)
- history of LEEP or cervical conization (only mildly increased risk of sPTB)
- most uterine anomalies (no increased risk except for uterus didelphys)

### Follow-up Evaluation (CPT 76816)

A follow-up ultrasound study may be performed to further evaluate a pregnancy following an initial survey for a variety of reasons. Common indications for follow-up sonographic evaluations include prior suboptimally visualized anatomy, size-date discrepancy, placental abnormality, known fetal abnormality or specific maternal medical complications (e.g., diabetes, hypertension). Medically indicated serial fetal growth evaluations are usually recommended at intervals of every 4-6 weeks. Please refer to the previously published *NWP Antenatal Surveillance Guidelines* (2013) for more specific recommendations.

Derived from AIUM Practice Guideline for the Performance of Fetal Echocardiography. *J Ultrasound Med* 2013;32:1067-1082.

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Dr. Lee has been with Northwest Perinatal Center since 2002. He currently serves as the Managing Partner of NWP and as the Director of Obstetric Ultrasound Operations for WHA. In addition to being a full-time clinical MFM, Dr. Lee has strong interests in healthcare operations, clinical efficiency, and EMR optimization – both locally and on a national level. He currently serves on the SMFM Board of Directors, the Advisory Board of the SMFM Practice Management Division, and the SMFM Committee on Patient Safety & Quality. He also leads the SMFM Operational Benchmarking Working Group.



If NWP has not previously scanned the patient, as part of the exam a clinically-directed fetal survey (either routine or detailed) will be performed in accordance with standard coding practices (i.e., follow-up studies require a prior 76805 or 76811).

## Summary – Key Points

1. In a healthy patient with regular cycles and a confident last menstrual period (LMP) date, the first trimester ultrasound should be deferred until 12 weeks.
2. Fetuses with NT measurements  $\geq 3.0$  mm should have a detailed fetal anatomic survey and echocardiogram at 20-22 weeks.
3. Anatomic structures that are identified as “suboptimally seen” do not necessarily require additional follow-up imaging – please refer to Table 2 for NWP recommendations.
4. Fetal echocardiogram is only indicated for a family history of congenital heart disease in a first degree relative of the fetus.
5. Transvaginal cervical length surveillance is not routinely recommended for multiple pregnancies, history of LEEP or conization or most uterine anomalies.

We hope this brief overview provides insight into our consensus approach to some of the standard obstetric ultrasound studies. If you have any questions or concerns about the information presented in this primer on ultrasound, please do not hesitate to reach out to any of the MFM providers at Northwest Perinatal Center.

## References

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