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# No. 375-Clinical Practice Guideline on the Use of First Trimester Ultrasound



This Clinical Practice Guideline has been prepared by the Diagnostic Imaging Committee and approved by the Board of the Society of Obstetricians and Gynaecologists of Canada.
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**Key Words:** Ultrasonography, prenatal, prenatal diagnosis, genetic screening, diagnostic tests, routine, pregnancy, first trimester

## CHANGES IN PRACTICE

1. Use of ultrasound for first trimester dating
2. Use of ultrasound for early anatomy review
3. Use of ultrasound for nuchal translucency assessment
4. Use of ultrasound for preeclampsia risk assessment

## KEY MESSAGES

1. Use of ultrasound for first trimester dating
2. Use of ultrasound for early anatomy review
3. Use of ultrasound for nuchal translucency assessment
4. Use of ultrasound for preeclampsia risk assessment

## ABSTRACT

**Objective:** This guideline reviews the clinical indications for first trimester ultrasound.

**Outcome:** Proven clinical benefit has been reported from first trimester ultrasound.

**Evidence:** A Medline search and bibliography reviews in relevant literature provided the evidence.

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**Values:** Content and recommendations were reviewed by the principal authors and the Diagnostic Imaging Committee of the Society of Obstetricians and Gynaecologists of Canada. Levels of evidence were judged as outlined by the Canadian Task Force on Preventive Health Care.

**RECOMMENDATIONS:**

1. First trimester ultrasound is recommended for assessment of threatened abortion to document fetal viability (II-2B) or for incomplete abortion to identify retained products of conception (II-2B).
2. First trimester ultrasound is not recommended to diagnose pregnancy but is recommended to date a pregnancy (ideally at 7–12 weeks). If menstrual dating is reliable and an early comprehensive pregnancy ultrasound (11–14 weeks) is planned, dating should be confirmed concurrently with this exam (III-A).
3. First trimester ultrasound is recommended prior to pregnancy termination (II-2B).
4. First trimester ultrasound is recommended during diagnostic or therapeutic procedures requiring visual guidance (e.g., chorionic villus sampling) and prior to prophylactic cervical cerclage placement (I-A).
5. First trimester ultrasound is recommended for suspected multiple gestation to allow for reliable determination of chorionicity and amnionicity and to establish early fetal genetic and anatomic screening (II-2A).
6. First trimester ultrasound is recommended in the workup for suspected ectopic pregnancy, molar pregnancy, and suspected pelvic masses (II-1A).
7. Basic fetal anatomy should be reviewed whenever obstetric ultrasound is done at 11–14 weeks, while women at increased risk of fetal structural and genetic abnormalities can be offered enhanced screening, if performed by ultrasound providers with appropriate imaging expertise (II-3C).
8. Nuchal translucency screening should be offered as part of a prenatal genetic screening and counselling program by experienced operators with appropriate quality assurance processes in place. Any patient with a nuchal translucency greater than 3.5 should be offered referral to maternal-fetal medicine (II-2A).
9. When appropriate expertise and resources are in place to screen women for the risk of preeclampsia, first trimester ultrasound is recommended as a valuable component of the screening protocol (I-A).

**Table. Key to evidence statements and grading of recommendations, using the ranking of the Canadian Task Force on Preventive Health Care**

| Quality of evidence assessment[a] | Classification of recommendations[b] |
|---|---|
| I: Evidence obtained from at least 1 properly randomized controlled trial | A. There is good evidence to recommend the clinical preventive action. |
| II-1: Evidence from well-designed controlled trials without randomization | B. There is fair evidence to recommend the clinical preventive action. |
| II-2: Evidence from well-designed cohort (prospective or retrospective) or case-control studies, preferably from more than 1 centre or research group | C. The existing evidence is conflicting and does not allow one to make a recommendation for or against use of the clinical preventive action; however, other factors may influence decision making. |
| II-3: Evidence obtained from comparisons between times or places with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of treatment with penicillin in the 1940s) could also be included in the category | D. There is fair evidence to recommend against the clinical preventive action. |
| III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees | E. There is good evidence to recommend against the clinical preventive action. |
| | L. There is insufficient evidence (in quantity or quality) to make a recommendation; however, other factors may influence decision-making. |

[a] The quality of evidence reported in these guidelines has been adapted from The Evaluation of Evidence criteria described in the Canadian Task Force on Preventive Health Care.

[b] Recommendations included in these guidelines have been adapted from the Classification of recommendations criteria described in The Canadian Task Force on Preventive Health Care.

## INTRODUCTION

This clinical practice guideline provides an evidence-based review of conventional clinical indications for first trimester ultrasound and outlines how the information from early ultrasound can influence therapy and pregnancy outcomes. For the purposes of this document, the definition of "first trimester ultrasound" includes all examinations at or before 14 weeks. The embryonic period lasts until 11 weeks, and the early fetal period includes weeks 11−14. This guideline also introduces the concept of a more comprehensive pregnancy review for the early fetal period of 11−14 weeks. Late first trimester findings are now recognized to predict adverse pregnancy events and lay the basis for implementation of this assessment. This document introduces and describes the concept of an early comprehensive pregnancy ultrasound as a component of this review. A separate and more detailed guideline dedicated to this topic will follow.

An understanding of the various indications for first trimester ultrasound is important to ensure that imaging is used only when appropriate and in a manner that manages resources wisely while minimizing unnecessary ultrasound exposure.[1]

The level of evidence reported in these guidelines has been determined using the criteria described by the Canadian Task Force on Preventive Health Care (Table).[2]

## PREGNANCY DIAGNOSIS

Ultrasound is neither a clinically effective nor cost-effective method to diagnose pregnancy.[3]

### Dating the Pregnancy

Accurate gestational dating has been the strongest argument for routine first trimester ultrasound.[4] Crown-rump length at 7 to 12 weeks[5] is the most accurate method to date pregnancy; it will predict the expected date of birth to within 5 days (2 standard deviations).[6]

Accurate gestational dating decreases the number of labour inductions for post-term pregnancy and is important for determining the optimal timing of scheduled Caesarean deliveries to prevent iatrogenic prematurity.[7,8] Accurate dating is also important in the assessment of fetal growth and improves performance of maternal serum aneuploidy screening.[9]

If menstrual dating is reliable and an early comprehensive pregnancy ultrasound (11−14 weeks) is planned, dating should be confirmed concurrently with this exam.[10]

## THREATENED ABORTION

Early pregnancy bleeding can cause anxiety for the woman and her partner and uncertainty for their physician. In such

circumstances, ultrasound identification of fetal cardiac activity is reassuring and helps to guide management.[11–14] Ultrasound is not indicated if abortion is inevitable, as defined by the finding of a dilated cervix. However, with a suspected incomplete abortion, ultrasound can identify retained products of conception.[15]

**Recommendations**

1. First trimester ultrasound is recommended for assessment of threatened abortion to document fetal viability (II-2B) or for incomplete abortion to identify retained products of conception (II-2B).
2. First trimester ultrasound is not recommended to diagnose pregnancy but is recommended to date a pregnancy (ideally at 7–12 weeks). If menstrual dating is reliable and an early comprehensive pregnancy ultrasound (11–14 weeks) is planned, dating should be confirmed concurrently with this exam (III-A).

## FIRST TRIMESTER INDUCED ABORTION

First trimester induced abortion is associated with lower maternal morbidity than second trimester termination procedures.[16,17] An inaccurate estimation of gestational age or a missed diagnosis of ectopic pregnancy can be avoided by ultrasound examination prior to procedure selection.[18]

**Recommendation**

3. First trimester ultrasound is recommended prior to pregnancy termination (II-2B).

## INVASIVE DIAGNOSTIC OR THERAPEUTIC PROCEDURES

Chorionic villus sampling and amniocentesis should be done under continuous ultrasound guidance.[14,19] Following the confirmation of fetal cardiac activity, the success of transabdominal or transcervical chorionic villus sampling depends upon reliable placental localization.[20,21]

Although ultrasound guidance is required for early amniocentesis, this procedure is rarely done because of the increased risk to the fetus.[22] Selective reduction in multifetal pregnancies can be done transabdominally or transvaginally, and both approaches require continuous ultrasound guidance.[23]

## CERVICAL CERCLAGE

A National Institutes of Health Consensus Development conference on Diagnostic Imaging in Pregnancy concluded that ultrasound aids in the timing and placement of a cervical cerclage.[24] This ultrasound imaging is particularly relevant given a known or potential cervical abnormality secondary to cone biopsy or cervical trauma[17] or a history concerning for cervical insufficiency. It is important to confirm fetal cardiac activity and to perform an early comprehensive pregnancy ultrasound to establish normal early fetal anatomy prior to a cerclage placement.

**Recommendation**

4. First trimester ultrasound is recommended during diagnostic or therapeutic procedures requiring visual guidance (e.g., chorionic villus sampling) and prior to prophylactic cervical cerclage placement (I-A).

## MULTIPLE GESTATION

First trimester ultrasound to identify multiple gestations should be considered with

- The use of assisted reproductive technologies
- A uterine size greater than expected by the last normal menstrual period
- Severe or unexpected hyperemesis gravidarum
- A family history or ethnic-related increased likelihood of multiple gestation

In multiple gestation, the ultrasound examination should include the number of fetuses, their location/position in the uterus, confirmation of cardiac activity, crown-rump lengths and/or biparietal diameters, and an assessment of chorionicity and amnionicity. Multiple pregnancies present a higher risk for fetal genetic and anatomic abnormalities, and screening for these by maternal serum testing is not as effective in multiple gestation compared to singleton pregnancies. If resources are available, a comprehensive 11–14 week assessment including nuchal translucencies is recommended for genetic screening in multiples. In monochorionic pregnancies, such an assessment will also provide screening for potential twin-to-twin transfusion syndrome.[25,26] Ultrasound can define chorionicity or amnionicity most reliably in the first trimester.[27] Accurate diagnosis of a monoamniotic twin pregnancy is important because of the risk of perinatal loss from cord entanglement. In this circumstance, fetal surveillance and elective preterm delivery are indicated.[28]

The accurate diagnosis of a monochorionic, diamniotic twin pregnancy is important, as this subgroup of twin pregnancies is at higher risk for twin-to-twin transfusion syndrome, congenital anomalies, intrauterine growth restriction, and perinatal mortality.[19,29] Specific fetal surveillance is indicated in these circumstances.[30]

**Recommendation**

5. First trimester ultrasound is recommended for suspected multiple gestation to allow for reliable determination of chorionicity and amnionicity and to establish early fetal genetic and anatomic screening (II-2A).

## ECTOPIC PREGNANCY

The value of ultrasound in ectopic pregnancy diagnosis has been demonstrated.[31,32] The incidence of ectopic pregnancy has increased, and although only approximately 1% of gestations are extrauterine, these pregnancies account for 4% of direct maternal deaths.[33] The combination of specific ultrasound findings with serum $\beta$-human chorionic gonadotropin measurements can detect as many as 96% of ectopic pregnancies with a specificity of 100%. These same studies showed a positive predictive value of 100% and a negative predictive value of 92% in women with a clinical suspicion of an ectopic pregnancy.[34–36] Given established risk factors or clinical suspicion of ectopic pregnancy, early ultrasound is recommended.

## MOLAR PREGNANCY

Ultrasonography is a sensitive and reliable method for diagnosing a molar pregnancy.[37–39] When there is a suspicion of a hydatidiform mole based on maternal symptoms or signs, ultrasound permits accurate diagnosis of this neoplasm. Early diagnosis of a hydatidiform mole is desirable to decrease the risk of significant complications, particularly those related to respiratory function.[40]

Following the treatment of a molar pregnancy, ultrasound can be used to monitor ovarian cyst resolution and uterine involution.[38]

## PELVIC MASS

If a pelvic mass predates the pregnancy or is discovered incidentally, ultrasound can identify its location and characteristics.[20] Pattern recognition and subjective evaluation of the ultrasound image can suggest whether the lesion is benign or malignant.[41] Doppler assessment provides minimal contribution to the diagnosis.[42] Most pelvic masses are asymptomatic and discovered incidentally at the time of an unrelated imaging study. Significant lesions require urgent referral to gynaecology services and are usually best managed in the early second trimester.

**Recommendation**

6. First trimester ultrasound is recommended in the workup for suspected ectopic pregnancy, molar pregnancy, and suspected pelvic masses (II-1A).

## THE EARLY COMPREHENSIVE PREGNANCY ULTRASOUND

There are many potential components to an early comprehensive pregnancy ultrasound. Some are well established, such as genetic screening and early fetal anatomy review, while others are in areas of clinical service development, such as screening for preeclampsia (PE) and abnormal placentation.

Genetic screening: Ultrasound with crown-rump length from 45 to 84 mm can modify the estimated risk of Down syndrome and other genetic abnormalities using the nuchal translucency (NT) measurement. NT refers to a sonolucent area in the posterior fetal neck. NT screening should be offered as part of a prenatal aneuploidy screening and counseling program.[43] Increased NT is associated with trisomy 21,[44–50] 18,[50–52] and 13[50–54]; certain other chromosomal[50,55,56] or developmental abnormalities; and numerous genetic syndromes.[57] In particular, for chromosomally normal fetuses with an increased NT measurement, there is an associated higher risk of certain congenital anomalies, including heart disease. With any NT greater than 3.5 mm referral to maternal-fetal medicine is recommended. In this circumstance, a detailed ultrasound review of early fetal anatomy, with an emphasis on the fetal heat, is recommended. A multidisciplinary approach, including other member of the prenatal diagnosis team (i.e., medical genetics) is encouraged.[58]

Large differences have been reported in aneuploidy detection using NT.[44,59] There is also variability in the ability to achieve appropriate and consistent measurements.[60–63] The best results are obtained by centres where sonographers and sonologists have been trained specifically in NT screening and where strict measurement guidelines with quality assurance processes are used.[50] Combining NT with maternal serum biochemistry significantly improves the aneuploidy detection rate

and thus is encouraged as a program of concurrent, sequential, or contingent screening.[51,64]

The use of nasal bone hypoplasia as an additional early ultrasound marker for fetal Down syndrome has also been established but, similar to NT, should be undertaken only by experienced operators who are credentialed for its use and who undergo annual performance audits. It should only be used if the screening program has the capacity to include it in the screening algorithm.[65–67]

Early fetal anatomy review: First trimester review of fetal anatomy is limited by fetal size and requires suitable ultrasound equipment and an ability to complement the exam with transvaginal scanning. Basic fetal anatomy should be reviewed whenever obstetric ultrasound is done at 11–14 weeks, while women at increased risk of fetal structural and genetic abnormalities can be offered enhanced screening, if performed by ultrasound providers with appropriate imaging expertise.[26,68]

Unlike imaging at 18–22 weeks, when fetal anatomy correlates more closely to postnatal findings, assessment of fetal anatomy in the first trimester requires an understanding of early fetal (post 8 embryonic weeks) development. It is important to be aware of variations in anatomic appearance at different gestational ages to avoid false-positive diagnoses of anomalies. For example, the fetal brain looks distinctly different at 11 weeks than it does later in gestation, as the choroid plexus initially fills the lateral ventricles. Hydrocephalus cannot be easily diagnosed in this circumstance. Similarly, the physiological midgut herniation should not be mistaken for an omphalocele, as this cannot be considered abnormal until the fetus is beyond 12 weeks gestation.[69]

Early screening for abnormal placentation: Given the level of potential morbidity associated with an abnormally invasive placenta or Caesarean scar pregnancy, efforts have been made to establish markers for early sonographic diagnosis of these complications. Although signs can be present even before 11 weeks, the early comprehensive pregnancy ultrasound does provide an opportunity to assess for early abnormal placentation.[70]

Early screening for preeclampsia (PE): Combining risk factors for PE into an algorithm has been shown to reliably predict those women at increased risk.[71,72] The algorithm includes maternal clinical factors, maternal mean arterial pressure, bilateral uterine artery pulsatility index, maternal serum pregnancy associated plasma protein A, and placental growth factor at 11–14 weeks. With a risk cut-off of 1 in 100, the detection rate was 76.7% for early PE and 43.1% for term PE, with a screen false-positive rate of approximately 10%. This same study also demonstrated the effectiveness of low-dose acetylsalicylic acid to prevent early onset PE, which is the more clinically important type.[73] Based on this evidence, medical centres may wish to embark on a program of PE screening and primary prevention. The screen involves early ultrasound and clinical and lab data and should only be undertaken and coordinated by individuals with the appropriate laboratory and maternal-fetal medicine expertise. The ultrasound portion should be performed by individuals who have undergone specific training in uterine artery Doppler studies. The screening program should ensure that screen-positive women are offered counselling, preventive treatment (low-dose acetylsalicylic acid), and suitable follow-up. As for any screening program, a system of clinical audit should also be in place.

### Recommendations

7. Basic fetal anatomy should be reviewed whenever obstetric ultrasound is done at 11–14 weeks, while women at increased risk of fetal structural and genetic abnormalities can be offered enhanced screening, if performed by ultrasound providers with appropriate imaging expertise (II-3C).
8. Nuchal translucency screening should be offered as part of a prenatal genetic screening and counselling program by experienced operators with appropriate quality assurance processes in place. Any patient with a nuchal translucency greater than 3.5 should be offered referral to maternal-fetal medicine (II-2A).
9. When appropriate expertise and resources are in place to screen women for the risk of preeclampsia, first trimester ultrasound is recommended as a valuable component of the screening protocol (I-A).

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