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The role of routine cervical length screening in selected high- and low-risk women for preterm birth prevention

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Preterm birth remains a major cause of neonatal death and short and long-term disability in the US and across the world. The majority of preterm births are spontaneous and cervical length screening is one tool that can be utilized to identify women at increased risk who may be candidates for preventive interventions. The purpose of this document is to review the indications and rationale for cervical length screening to prevent preterm birth in various clinical scenarios. The Society for Maternal-Fetal Medicine recommends (1) routine transvaginal cervical length screening for women with singleton pregnancy and history of prior spontaneous preterm birth (GRADE 1A); (2) routine transvaginal cervical length screening not be performed for women with cervical cerclage, multiple gestation, preterm premature rupture of membranes, or placenta previa (GRADE 2B); (3) practitioners who decide to implement universal cervical length screening follow strict guidelines (GRADE 2B); (4) sonographers and/or practitioners receive specific training in the acquisition and interpretation of cervical imaging during pregnancy (GRADE 2B).

Key words: cervical insufficiency, cervical length, cervical length screening, preterm birth, short cervix, spontaneous preterm birth, transvaginal ultrasound

Worldwide, fifteen million babies are born too soon every year, causing 1.1 million deaths, as well as short- and long-term disability in countless survivors.[1] The majority (two thirds) of preterm births (PTB) are spontaneous, and recurrence risks are high; a history of a prior spontaneous PTB is historically the strongest risk factor for spontaneous PTB. Few prognostic tests are available to predict which pregnancies will deliver preterm; transvaginal cervical length (CL) measurement is an important clinical tool to identify women at high risk for PTB in order to allow for interventions to prevent, delay, or prepare for PTB. The purpose of this document is to review the currently accepted indications for CL length screening to prevent PTB in various common clinical scenarios.

What is the clinical significance of a sonographically short cervix?

Women with a history of a prior spontaneous PTB account for only 10% of all births < 34 weeks of gestation.[2,3] Thus, researchers and clinicians have studied a variety of factors separate from past pregnancy history in order to further risk-stratify women and attempt to identify those at highest risk for PTB. Currently, mid-trimester CL assessment by transvaginal ultrasound is the best clinical predictor of spontaneous PTB.[4] Depending on the population studied and the gestational age of assessment, the threshold chosen in clinical practice as "short" ranges from 20 to 30 mm.

The risk of spontaneous PTB is inversely proportional to the length of the cervix; those with the shortest CL have the highest risk of prematurity. In one study of unselected pregnant women 22-24 weeks of gestation, only 1.7% had a CL <15mm, but they accounted for 86% of PTB <28 weeks of gestation and 58% of PTB less than 32 weeks of gestation.[5] The specificity of a short CL is related to the cutoff used; in one study (including both high- risk and low-risk women), the specificity was 99.9% (95% CI 99.8-100.0%) for PTB < 34 weeks of gestation for a CL ≤ 20mm; this decreased to 90.1% (95% CI 89.0-91.2%) for a CL ≤ 30mm, and fell further to 65.5% (95% CI 63.8-67.3%) for CL ≤35 mm.[6] The finding of a short CL, irrespective of prior pregnancy history, has been consistently and reproducibly associated with an elevated risk of spontaneous PTB across

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different gestational age cutoffs and multiple patient populations. In addition, women with a history of a prior spontaneous PTB *and* a short CL are at the highest risk.[7]

Should the cervical length be evaluated by transabdominal or transvaginal ultrasound?

Transvaginal ultrasound is considered the 'gold standard' measurement when assessing CL. In contrast to transabdominal ultrasound, transvaginal ultrasound measurements are highly reproducible, and measurements are unaffected by maternal obesity, cervical position, and shadowing from fetal parts.[8-11]

Transvaginal ultrasound is also more sensitive than transabdominal ultrasound using CL cutoffs typically used to screen for a short cervix.[12] For example, the sensitivity using transabdominal ultrasound to identify a (confirmed by transvaginal ultrasound) short cervix <25 mm ranges from 44.7% (using a transabdominal cutoff of 25mm) to 96.1% (using a transabdominal cutoff of 36mm).[12,13] Transvaginal ultrasound is safe, and when performed by trained operators results are reproducible with a relatively low inter-observer variation rate of 5-10%.[14,15]

What steps should be performed to accurately evaluate the cervical length?

With the woman's bladder emptied, the vaginal transducer should be inserted into the anterior fornix of the vagina and positioned so that the endocervical canal is visualized. The ultrasound probe should be gradually withdrawn until the image is just visible to ensure there is not excessive pressure on the probe. A minimum of 3 CL measurements should be obtained by placing calipers at the internal and external os. The shortest, best measurement should be recorded.[16-18] (Box 1)

Ideally, measurements should be obtained by sonographers and/or practitioners who have received specific training in the acquisition and interpretation of cervical imaging during pregnancy in order to avoid improper measurement. As part of a multicenter RCT involving CL measurement conducted by the *Eunice Kennedy Shriver* NICHD MFMU Network, a quality control study was performed. In this analysis, one in four CL ultrasound images initially submitted for certification by investigators at the participating centers did not meet published quality criteria.[19] Improper measurement (caliper placement and/or failure to identify the shortest best image) and failure to obtain a satisfactory image (excessive compression, required landmark not visible, incorrect image size, brief examination and/or full maternal bladder) were the major reasons for deficient cervical images. Thus, similar to assessment of nuchal translucency with first trimester screening,[20] improper measurement of the cervix may lead to impaired performance of CL as a screening test.

Several training programs are available online, including the Cervical Length Education and Review (CLEAR) program (sponsored by SMFM and its Perinatal Quality Foundation, available at https://clear.perinatalquality.org), and the Fetal Medicine Foundation's Certificate of Competence in cervical assessment (available at https://fetalmedicine.org). **We recommend sonographers and/or practitioners receive specific training in the acquisition and interpretation of cervical imaging during pregnancy. (GRADE 2B)**

BOX 1
Steps for proper cervical length measurement

(1) Ensure patient has emptied her bladder.
(2) Prepare the cleaned probe using a probe cover.
(3) Gently insert the probe into the patient's vagina.
(4) Guide the probe into the anterior fornix.
(5) Obtain a sagittal, long-axis image of the entire cervix.
(6) Remove the probe until the image blurs and then reinsert gently until the image clears (this ensures you are not using excessive pressure).
(7) Enlarge the image so that the cervix occupies two thirds of the screen.
(8) Ensure both the internal and external os are seen clearly.
(9) Measure the cervical length along the endocervical canal between the internal and external os.
(10) Repeat this process twice to obtain 3 sets of images/measurements.
(11) Use the shortest best measurement.

Cervical Length Education and Review (www.perinatalquality.org/CLEAR), a program of training and certification, is offered through the Perinatal Quality Foundation.

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If the cervical length is assessed by ultrasound, when during pregnancy should it be evaluated?

If transvaginal CL screening is performed, the cervix should be assessed between 16 and 24 weeks gestation. It should not be routinely measured prior to 16 weeks of gestation.[21] Prior to this time, the lower uterine segment is underdeveloped, making it challenging to distinguish this area from the endocervical canal. In fact studies evaluating first and early second trimester CL had not consistently shown adequate predictive value of CL measurement for preterm birth.[22-25]

Routine CL screening is also not advised beyond 24 weeks of gestation in asymptomatic women, because studies of interventions (e.g., cerclage, vaginal progesterone) have most often used 24 weeks of gestation as the upper gestational age limit for screening and initiation of therapies or interventions. CL screening after 24 weeks of gestation in asymptomatic women provides limited clinical value and there is absence of data to suggest it improves outcomes.

How should the approach to cervical length screening differ for women with and without a prior preterm birth?

The approach to CL screening varies based on patient characteristics and risk factors. Current SMFM and American College of Obstetricians and Gynecologists (ACOG) guidelines recommend women with a prior