

# **ULTRASOUND ASSESSMENT OF THE GRAVID CERVIX TO ASSESS FOR RISK OF PRETERM BIRTH:**

**Evidence-based guideline  
for Sonographers**

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# SECTION A: PRELIMINARY INFORMATION

## DEFINITIONS AND ABBREVIATIONS

<b>Asymptomatic patient</b>	For the purpose of this guideline, an asymptomatic patient is free of symptoms of spontaneous preterm birth: per vaginal bleeding, per vaginal amniotic fluid loss, pain, contractions.	<b>Preterm labour</b>	The onset of labour before 37 weeks of pregnancy. The onset of labour refers to regular uterine contractions (at least one every 10 minutes), associated with cervical change or rupture of fetal membranes.
<b>Cervical insufficiency</b> (formerly called cervical incompetence)	Refers to the inability to support a full-term pregnancy due to a functional or structural defect of the cervix, often characterised by dilatation and shortening (effacement) of the cervix prior to 37 weeks gestation.	<b>Preterm premature rupture of membranes (PPROM)</b>	Rupture of the fetal membranes before 37 weeks gestation.
<b>Cervical length (CL)</b>	The length of the closed endocervical canal, or the distance between the external os of the cervix and the internal os of the cervix. If the endocervical canal is open, then only the length of the closed endocervical canal is measured as the cervical length.	<b>Rupture of membranes</b>	Rupture of the fetal membranes with leakage of amniotic fluid.
<b>Clinical practice guideline (CPG)</b>	Systematically developed statement(s) based on the best available evidence to guide practitioners in their decision making about appropriate health care for patients in specific circumstances.	<b>Second trimester</b>	The middle trimester of pregnancy defined as the period from 13 weeks and 0 days to 27 weeks and 6 days of gestation.
<b>Endocervical canal (cervical canal)</b>	Canal within the cervix which connects the uterine cavity to the vaginal canal. It extends between the external os and internal os of the cervix.	<b>Spontaneous preterm birth (SPTB)</b>	Spontaneous labour and birth between 20 weeks and 0 days and 36 weeks and 6 days of pregnancy following either preterm labour or PPRM.
<b>Lithotomy position</b>	For the purpose of this guideline, this refers to the position used for transvaginal sonography examinations, the patient is supine with the hips flexed (80-100 degrees), the legs abducted, and knees flexed. The pelvis may be elevated.	<b>Symptomatic patient</b>	For the purpose of this guideline, a symptomatic patient has symptoms of spontaneous preterm birth: PV bleeding, PV amniotic fluid loss, pain, contractions.
<b>LLETZ</b>	Large Loop Excision of the Transformation Zone. A surgical procedure for diagnosis and treatment of pre-cancerous cells of the cervix identified during a colposcopy and cervical biopsy.	<b>Threatened preterm labour</b>	The onset of regular uterine contractions, without cervical change or rupture of fetal membranes prior to 37 weeks and 0 days gestation.
<b>Low-lying placenta</b>	The placental edge is located within 2 cm of the cervical internal os, but not covering it. If present in the second trimester, a review in third trimester is indicated to determine placental location prior to delivery. A low-lying placenta present prior to delivery is associated with bleeding and may be an indication for caesarean section.	<b>Transabdominal sonography (TAS)</b>	Ultrasound technique where images are acquired using an appropriate transducer placed on the abdominal wall.
<b>Obstetric care providers</b>	Medical or health professionals who provide primary or secondary care to obstetric patients during their pregnancy.	<b>Transperineal sonography (TPS)</b>	Ultrasound technique where ultrasound images are acquired using an appropriate transducer placed on the perineum. TPS is also known as translabial sonography.
<b>Placenta praevia</b>	When the placenta covers the internal cervical os in the third trimester of pregnancy.	<b>Transvaginal sonography (TVS)</b>	Sometimes referred to as endovaginal sonography; sonographic technique where ultrasound images are acquired using a specialised, intracavity ultrasound transducer inserted into the vagina.
<b>Preterm</b>	Gestational age less than 37 weeks 0 days gestation weeks.	<b>Vasa praevia</b>	The presence of fetal vessels covering the cervical internal os or located within 2cm of the cervical internal os.
<b>Preterm birth (PTB)</b>	Birth before 37 weeks of pregnancy.		

# EXECUTIVE SUMMARY

Spontaneous preterm birth (sPTB) has a rising incidence worldwide and is the leading cause of perinatal morbidity and mortality. <sup>(1, 2)</sup> Sonographers and ultrasound imaging play an important role in assessing a pregnant patient's risk of sPTB because ultrasound imaging can detect a shortened cervix, one of the most common contributors to sPTB.

The target audience for this clinical practice guideline (CPG) are sonographers in Australia and New Zealand who perform obstetric ultrasound examinations. There are three recognised sonographic approaches to assessing the gravid cervix; transvaginal sonography (TVS), transabdominal sonography (TAS) and transperineal sonography (TPS). The recommendations in this CPG are intended to assist sonographers in making decisions on which sonographic approach to use when assessing the cervix and its length in pregnant patients.

Recommendations in this CPG are organised by the following patient groups; 1) patients at low-risk for sPTB, 2) patients at increased risk for sPTB and 3) patients with symptoms of threatened preterm labour. This CPG also provides detailed guidance on how to assess the cervix and measure cervical length (CL) using TVS, TAS and TPS, together with minimum sonographer reporting requirements, considerations relating to contraindications, safety, acceptability, feasibility, cost effectiveness, and sonographer training. Supplements to this CPG include an Image Gallery to guide sonographers in the acquisition and interpretation of images, Patient information, a Short-form guide (includes minimum sonographer reporting guidelines and example sonographer worksheet), evidence tables to support each recommendation and appendices outlining the methods used to develop the CPG. Sonographers should use the recommendations in this CPG in combination with local protocols, the preferences of patients and referring obstetric care providers. The contents of this CPG do not constitute professional advice for those seeking information about their personal obstetric care and should not be considered a substitute for seeking the professional advice of an obstetric care or other health provider.

This CPG differs from existing evidence-based CPGs on the use of ultrasound in preterm birth risk assessment, in that it is tailored to sonographers and that it answers questions that sonographers need guidance on, rather than guidance for questions relevant to obstetric care providers.

This CPG was developed using evidence-based methods. Important steps in its development were 1) the development of questions that the CPG would answer 2) drawing on existing evidence-based CPGs to answer the questions and to inform the CPG, 3) undertaking literature searches when existing CPGs had deficits, and 4) consulting with stakeholders. The decision to draw on existing CPGs, rather than developing a de novo guideline, was made as this method is regarded to be more efficient, less time consuming and less expensive. It also allowed for review of existing evidence-based CPGs, thus reducing any contradictions between this CPG and existing evidence-based CPGs used by other professional groups involved in the care of obstetric patients.

For each recommendation in this CPG there is an evidence table (available in supplementary materials) and a summary statement to explain the rationale and evidence underpinning the recommendation.

## FUNDING ORGANISATION

The development of this CPG was funded by the Australasian Sonographers Association (ASA).

A volunteer guideline development group was convened for the purpose of developing the CPG. A list of the guideline development group members can be found in Appendix 2. Disclosure statements have been received by all members of the guideline development group.

This CPG has been endorsed by the ASA Board.

# SUMMARY LIST OF RECOMMENDATIONS

PATIENT GROUP	PATIENT SUBGROUP	RECOMMENDATION	QOE# SOR <sup>^</sup>
<b>PATIENT GROUP 1:</b> Singleton, low-risk pregnancy for short cervix, second trimester	<b>Subgroup 1a:</b> Asymptomatic patients with singleton pregnancy presenting for an obstetric TAS, including fetal morphology scan.	<b>Recommendation 1a:</b> <ul style="list-style-type: none"> <li>Routine screening of cervical length using TVS is not recommended for low-risk pregnancies.</li> <li>When performing a second trimester TAS obstetric scan, including fetal morphology scans, sonographers should include an assessment of the cervix with TAS, including a TAS CL measurement.</li> <li>In the absence of risk factors for preterm birth, a TAS CL of 35mm or greater is considered low-risk for a short cervix.</li> <li>If the TAS CL measures less than 35mm, with an appropriately distended bladder, or there is inadequate visualisation of the cervix*, or there is the appearance of an open/funnelling cervix, then a TVS assessment of the cervix should be offered and integrated into the obstetric ultrasound examination, if not contraindicated*.</li> <li>If TVS is contraindicated*, then TPS could be performed if not contraindicated*.</li> </ul> <p><b>*refer to Section D;</b> inadequate visualisation refers to inadequate visualisation of the cervix, the internal os and/or the external os. Inadequate visualisation may be due to obesity, degree of bladder filling, fetal position or lower uterine contractions.</p>	<b>QOE:</b> Consistent support for recommendation  <b>SOR:</b> Strong
	<b>Subgroup 1b:</b> Asymptomatic patients with a singleton pregnancy presenting for, or requiring a TVS scan, for any clinical or sonographic indications other than sPTB risk assessment.	<b>Recommendation 1b:</b> Sonographers should extend the TVS examination to sonographically assess the cervix and to measure the CL.	<b>QOE:</b> Consensus decision  <b>SOR:</b> Strong

**KEY:** CL; cervical length, sPTB; spontaneous preterm birth, TVS; transvaginal sonography, TPS; transperineal sonography, TAS; transabdominal sonography, \*refer to Section D, # Quality of Evidence (for explanation see Appendix 3), ^ strength of recommendation (for explanation see Appendix 3)

PATIENT GROUP	PATIENT SUBGROUP	RECOMMENDATION	QOE# SOR <sup>^</sup>
<b>PATIENT GROUP 2:</b> Singleton or multiple pregnancies at increased risk of spontaneous preterm birth (sPTB)	<b>Important notes about recommendations for sonographic assessment of the cervix in patient group 2.</b>  <i><b>Note 1:</b> Relating to the recommendations 2(a-c), a TAS assessment of the fetus and uterus may also be required, depending on indications on the referral and local protocols. This could include a full morphology scan, or a limited scan which would typically include assessment of fetal lie and presentation, fetal heart activity, fetal biometry, amniotic fluid volume and placental position. A TAS of the lower uterine segment and cervix can identify any prolapse of membranes, fetal parts or the cord into the cervix or vagina indicating preterm labour which is a contraindication to TVS. Dedicated TVS assessment of the cervix as part of cervical surveillance may only require a curtailed TAS assessment or no TAS prior to TVS.</i>  <i><b>Note 2:</b> When following these recommendations local protocols and the preferences of referring obstetric care provider(s) and the patient should be considered.</i>		
	<b>Subgroup 2a:</b> Patients with singleton pregnancy presenting for obstetric TAS between 16-24 weeks gestation and have factors that place them at increased risk of sPTB.  <i>(Note: this recommendation does not apply to patients presenting for sonographic cervical surveillance; instead refer to Subgroup 2b).</i>	<b>Recommendation 2a:</b> <ul style="list-style-type: none"> <li>Sonographers should measure and assess the cervix using the TVS approach.</li> <li>A TVS measured cervical length of &lt; 25mm is considered short and a high-risk factor for sPTB.</li> <li>If TVS is contraindicated*, then TPS should be performed if not contraindicated. TAS measured cervical length lacks accuracy and should only be performed if TVS and TPS are contraindicated*. A TAS CL of less than 35mm indicates an increased probability that the cervix is short.</li> </ul> <b>*refer to Section D</b>	<b>QOE:</b> Consistent support for recommendation  <b>SOR:</b> Strong
	<b>Subgroup 2b:</b> Pregnant patient presenting for sonographic cervical surveillance at intervals, as directed by the patient's obstetric care provider(s).	<b>Recommendation 2b:</b> Sonographic cervical surveillance should be undertaken using TVS unless contraindicated.* If TVS is contraindicated*, then TPS should be performed, unless contraindicated.* TAS measured cervical length lacks accuracy and should only be performed if TVS and TPS are contraindicated.*  <b>*refer to Section D</b>	<b>QOE:</b> Consistent support for recommendation  <b>SOR:</b> Strong
	<b>Subgroup 2c:</b> Patients presenting with multiple pregnancy in second trimester	<b>Recommendation 2c:</b> <ul style="list-style-type: none"> <li>If the patients' obstetric care provider(s) requests a sonographic assessment of the pregnancy, but not specifically for an assessment of the cervix, or any other condition requiring a TVS, then the sonographer should measure and assess the cervix using TAS.</li> <li>If the TAS CL measures &lt; 35mm, a TVS CL measurement should be considered#.</li> <li>If the patient's obstetric care provider(s) specifically requests a sonographic assessment of the cervix, or there is a clinically relevant reason to perform TVS, then the sonographer should measure and assess the cervix using TVS, unless it is contraindicated*.</li> <li>If TVS is contraindicated* then TPS should be performed, unless contraindicated*. If both TVS or TPS are contraindicated, then TAS can be performed. A TVS or TPS measured CL is considered short if ≤ than 25mm, and a TAS measured CL of &lt; 35mm indicates the cervix is at higher risk of being shortened.</li> </ul> <b>*refer to Section D</b>	<b>QOE:</b> consistent support for recommendation  <b>SOR:</b> Strong
<b>PATIENT GROUP 3:</b> Singleton or multiple pregnancies with threatened preterm labour (symptomatic patients) and referred for a sonographic assessment of the cervix	<b>Recommendation 3:</b>		
	a. In the setting of threatened preterm labour, and when the referring obstetric provider specifically requests an assessment of the cervix, it is usually appropriate to proceed with a TVS assessment of the cervix, including CL measurement, unless contraindicated*#.		
<b>KEY:</b> CL; cervical length, sPTB; spontaneous preterm birth, TVS; transvaginal sonography, TPS; transperineal sonography, TAS; transabdominal sonography, *refer to Section D, # Quality of Evidence (for explanation see Appendix 3), ^ strength of recommendation (for explanation see Appendix 3)			

## ACKNOWLEDGEMENTS

This clinical guideline would not have been possible if not for the support of the Australasian Sonographer's Association, the work of the Guideline Development Group and many others who provided written feedback on drafts.

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## DISCLAIMER

The information in this CPG, as outlined above, is general in nature and does not constitute professional advice.

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## DATE OF CLINICAL PRACTICE GUIDELINE AND TIMELINE FOR UPDATING

**Publication Date:** 11 September 2023

**Review Date:** September 2028

If new and significant evidence becomes available prior to the Review Date, this will be considered at the time and a Guideline Development review group meeting convened to determine if early revisions are required.

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## SUPPLEMENTARY MATERIALS

The following supplementary materials are available as supporting documents to the CPG.

[Image Gallery](#)[Patient information](#)[Short-form guide](#)[Appendices](#)[Evidence Tables](#)

## CONTACT FOR CORRESPONDENCE

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# SECTION B: BACKGROUND

**Spontaneous preterm birth (sPTB) has a rising incidence worldwide and is the leading cause of perinatal morbidity and mortality.<sup>(1, 2)</sup>**

sPTB is a multifactorial condition, the causes of which include infection and inflammation, cervical insufficiency, reduced progesterone action, uterine overdistension and malformations, vascular conditions, and allergy induced mechanisms.<sup>(2)</sup> The most important epidemiological risk factor for sPTB is a prior history of sPTB.<sup>(3)</sup> Patients with no prior preterm birth have a decreased risk of sPTB in subsequent pregnancies<sup>(3)</sup> and conversely, patients who have had a previous sPTB are at increased risk for sPTB.<sup>(2)</sup> However, a history of prior sPTB as a sole predictor for sPTB is not always useful as patients with a prior sPTB are only represented in 10% of deliveries before 34 weeks of gestation. Also, nearly 50 % of patients who experience sPTB are in their first pregnancy, and therefore present with no prior gestational history.<sup>(4)</sup> Sonographers play an important role in assessing a pregnant patient's risk of sPTB by sonographically assessing the cervix in the second trimester. Ultrasound imaging can detect a shortened cervix which is one of the most common mitigating factors for sPTB.<sup>(2)</sup> Accurate identification of a short gravid cervix can prompt preventative therapies, such as vaginal progesterone treatment or cerclage, which can reduce the risk of sPTB and the incidence of preterm births.<sup>(2, 5)</sup>

The cervix can be assessed using three different sonographic approaches; transvaginal sonography (TVS), transabdominal sonography (TAS) and transperineal sonography (TPS). TVS is considered the gold standard for measurement of the CL, as a short cervix identified based on TVS measurements is the best predictor of sPTB.<sup>(6)</sup> TPS is considered as an alternative approach when TVS is contraindicated. TAS is also an option however visualisation of the cervix can be suboptimal, and CL measurements can be inaccurate due to technical limitations of this technique. There is considerable debate amongst obstetric care providers as to whether TVS measurements to determine CL should be offered in all pregnancies, or only in those with risk factors for sPTB.<sup>(7)</sup> In this CPG, TVS is recommended for all high-risk patients, for patients with a shortened cervix measured on TAS and when TVS is not contraindicated. Risk factors can be classified as modifiable (e.g. infections of the urinary or genital tract, substance abuse including smoking, poor access to health care and physical abuse) or non-modifiable (e.g. previous spontaneous preterm birth, short cervix (effacement of the cervix), previous cervical surgery (such as electrosurgical excision procedures and cold knife conisation, cervical resection at a depth of greater than 10–12 mm), congenital uterine anomaly (such as unicornuate uterus or uterus didelphys) and fibroids).<sup>(2)</sup>

The recommendations in this CPG are intended to assist sonographers in making decisions on when and how they should sonographically assess the gravid cervix. The recommendations in this guideline are not intended to override existing, established local protocols, and the preferences of obstetric care providers and patients. Therefore, this CPG should be used in combination with local protocols and practices, the preferences of patients and the preferences of referring obstetric care providers. The recommendations in this CPG are organised by the sPTB risk status of the patient. This requires sonographers to understand the risk status of their patients. For the purpose of this CPG patients are considered low-risk if they have no history of sPTB or previous cervical therapy.<sup>(8)</sup> Patients are considered to be at increased risk if they have moderate or high-risk factors for sPTB (see Table 1) or exhibit symptoms of sPTB (per vaginal bleeding or amniotic fluid loss, abdominal or pelvic pain, contractions).

Many CPGs are available on the topic of ultrasound assessment for sPTB, however most focus on the clinical management of patients, rather than providing answers to questions that arise in the clinical practice of sonographers. While the technical requirements of the ultrasound assessment are often included in these CPGs, few guide the clinical decisions that sonographers need to make. This CPG aims to address this gap. Its primary purpose is to provide evidence-based guidance for sonographers on when and how to sonographically assess the gravid cervix using TVS, TAS, or TPS. Each recommendation in this CPG is supported by an evidence table and a summary statement collated from best evidence existing CPGs (refer to Table 3 in Appendix 3 for list of best evidence CPGs). The evidence table includes an Overall Level of Evidence rating, and a Strength of recommendation rating. Please refer to 'Notations for recommendations' in Appendix 3 for information on how these ratings were derived. The summary statement provides an explanation and justification for each recommendation.

The methodology used to develop this CPG is described in Appendix 3. Key features of developing the CPG plan were 1) to develop questions that the CPG would answer, 2) draw on existing evidence based clinical practice CPGs to inform the CPG, 3) undertake literature searches when existing CPGs had deficits, and 3) consult with stakeholders. The decision to draw on existing CPGs, rather than developing a de novo CPG, was regarded as a more efficient, less time consuming and less expensive approach compared to de novo CPG development which requires teams of methodologists and experts to search, critique and debate the evidence base. This approach also enabled review of existing evidence-based CPGs developed for other professional groups involved in the care of obstetric patients, to ensure the recommendations in this CPG did not contradict any existing CPGs in use by these professionals.

## TARGET AUDIENCE

**The target audience for this CPG are sonographers in Australia and New Zealand who perform obstetric ultrasound examinations.**

Sonographers are specialist allied health professionals who perform diagnostic examinations using high frequency ultrasound on patients who are referred to a sonography service after consultation with their health/medical practitioner. Sonographers work collaboratively with a reporting physician, such as a radiologist or obstetrician, to interpret the ultrasound images and provide a report to the referring obstetric care provider(s). At the time of writing sonographers practicing within the Australian Medicare framework are accredited and listed with the Australian Sonography Accreditation Registry (ASAR) as either an Accredited Medical Sonographer (AMS) or Accredited Student Sonographer (ASS). In New Zealand, sonographers hold a current annual practising certificate issued by the New Zealand Medical Radiation Technologists Board (NZMRTB).



# SCOPE OF THE CLINICAL PRACTICE GUIDELINE (CPG)

This CPG makes recommendations on the appropriate sonographic approaches to assess the gravid cervix to identify changes in the cervix that place the pregnancy at risk for sPTB.

Recommendations are provided to guide sonographers in typical clinical patient presentations when they are scanning pregnant patients 1) at low-risk for sPTB, 2) at increased risk for sPTB (moderate and high-risk) and 3) those with symptoms of threatened preterm labour. These recommendations may be applicable to either singleton pregnancies and/or multiple pregnancies. Each recommendation clearly specifies whether it applies to singleton, to multiple or to both singleton and multiple pregnancies. This guideline does not provide guidance on the timing of sonographic cervical assessment, as this will ultimately be dependent on the preferences of local obstetric care providers and on local context & protocols.

This CPG also provides detailed guidance for sonographers on how to assess the cervix and measure CL using TVS, TAS and TPS. Minimum sonographer reporting requirements are provided together with considerations relating to contraindications, safety, acceptability, feasibility, cost effectiveness, and sonographer training.

The CPG is relevant to sonographers working in private and/or hospital settings, and to those working in general or specialist settings. The equipment needed to meet the recommendations in this CPG would be available in most comprehensive or specialised ultrasound imaging departments in Australia and New Zealand. There may be exceptions in some rural and remote areas.<sup>(9)</sup>

The CPG is limited to B-mode sonography. Currently there is insufficient data to recommend the use of 3-D TVUS to assess the gravid cervix, although it may be of benefit in the future.<sup>(10)</sup> Similarly, for elastography, currently there are insufficient technical standards and normal reference values to recommend elastography for assessing the gravid cervix.<sup>(10)</sup>

Sonographic assessment of the lower uterine segment and abnormal placentation is referred to in this CPG, but specific technical guidance is not provided. The CPG does not provide recommendations on the care management of patients, as this is beyond the scope of the sonographer's role. However, in writing this CPG, consideration was given to existing CPGs intended for referring obstetric care providers to avoid providing contradictory advice.

The CPG provides general advice and recommendations addressing the questions outlined in Appendix 1. It does not override local protocols, and the preferences of obstetric care providers. These recommendations apply to all patients regardless of their sexual orientation, gender identity, race or religion. Good communication between the sonographer and patient is required to determine individual patient preferences.

# SECTION C: RECOMMENDATIONS AND SUMMARY STATEMENTS DESCRIBING SONOGRAPHIC APPROACHES TO ASSESS THE GRAVID CERVIX IN SPECIFIC PATIENT GROUPS

This section provides recommendations based on the risk status of the patient for sPTB..

Each recommendation is supported by an evidence table collated from relevant best evidence existing CPGs (refer to Table 3, Appendix 3 for list of best evidence CPGs).

The evidence table includes an Overall Level of Evidence rating, and a Strength of recommendation rating. Refer to 'Notations for recommendations' in Appendix 3 (Tables 4 and Table 5) for information on how these ratings are derived. A summary statement provides an evidence-based explanation and justification for each recommendation.

Patients are considered low-risk for sPTB if they have a singleton pregnancy with no moderate or high-risk factors for sPTB (Table 1), and/or no symptoms of sPTB (per vaginal bleeding or amniotic fluid loss, abdominal or pelvic pain, contractions).

Patients are considered high-risk for sPTB if they have moderate or high-risk factors for sPTB (Table 1), and/or symptoms of sPTB (per vaginal bleeding or amniotic fluid loss, abdominal or pelvic pain, contractions) and/or have a multiple pregnancy.

**Table 1: Indicators for TVS measurements of CL in asymptomatic patients: Factors that increase risk for sPTB in pregnant patients**

Moderate-risk factors for sPTB <sup>(15)</sup>	High-risk factors for sPTB <sup>(24)</sup>
Previous cervical surgery <ul style="list-style-type: none"><li>• 2 or more LLETZ</li><li>• Previous cone biopsy</li><li>• Previous 1 LLETZ of more than 10mm depth</li><li>• Congenital uterine anomalies such as subseptate, unicornuate and bicornuate uterus and no history of previous preterm birth</li></ul>	Previous sPTB at < 34 weeks gestation And/or Previous pregnancy loss at 16-24 weeks gestation

# PATIENT GROUP 1: SINGLETON, LOW-RISK PREGNANCY FOR SHORT CERVIX, SECOND TRIMESTER

## **Subgroup 1a: Asymptomatic patients with singleton pregnancy presenting for an obstetric TAS, including fetal morphology scan.**

**Recommendation 1a:** Routine screening of cervical length using TVS is not recommended for low-risk pregnancies. When performing a second trimester pregnancy TAS obstetric scan, including fetal morphology scans, sonographers should include an assessment of the cervix with TAS, including a TAS CL measurement. In the absence of risk factors for preterm birth, a TAS CL of  $\geq 35$ mm is considered low-risk for a short cervix. If on TAS, the CL measures less than 35mm with an appropriately distended bladder, or there is inadequate visualisation of the cervix\*, or there is the appearance of an open/funnelling cervix, then a TVS assessment of the cervix should be offered and integrated into the obstetric ultrasound examination, if not contraindicated\*. If TVS is contraindicated\*, then TPS could be performed if not contraindicated\*.

**(Level of evidence: consistent support for recommendation, Strength of recommendation: Strong)**

\*refer to Section D; inadequate visualisation refers to inadequate visualisation of the cervix, the internal os and/or the external os. Inadequate visualisation may be due to obesity, the degree of bladder filling, fetal position or lower uterine contractions.

### Summary Statement for Recommendation 1a

Although transvaginal imaging is the validated test for measuring CL and is the best predictor of sPTB, TAS is currently the accepted practice in low risk pregnancies in Australia and New Zealand.<sup>(7)</sup>

Subject to local protocols, contraindications and preferences of obstetric care providers and patients, recommendation 1a advises that for all singleton, asymptomatic, low-risk for sPTB pregnancies presenting in the second trimester for TAS for any clinical reason, the sonographer should assess and measure the cervix with TAS. This provides a first stage screen to identify a short cervix. A TAS CL measurement of  $\geq 35$ mm indicates the CL measured with TVS will be greater than 25mm with 95% sensitivity.<sup>(11)</sup>

TVS assessment in this group is not routinely recommended because universal TVS screening for a short cervix has not been widely adopted in Australia and New Zealand, even though evidence is building to perform TVS assessment of CL at 18-24 weeks gestation in low-risk pregnancies.

<sup>(11)</sup> Arguments for universal screening include that it reduces the incidence of sPTB; whereas selective screening of patients with risk factors would miss nearly 40% of patients with a short cervix, including women in their first pregnancy who have no history of previous sPTB.

<sup>(2)</sup> Barriers to the adoption of universal TVS CL screening include lack of evidence that it prevents preterm delivery or reduces neonatal morbidity or mortality,<sup>(13)</sup> resource or cost implications,<sup>(9, 12)</sup> the unknown prevalence in population prevalence of sPTB,<sup>(9, 15)</sup> and variance of the views and perceptions of medical practitioners.<sup>(14)</sup> Before a universal screening program is implemented a feasibility analysis is required to assess the availability of preventive interventions and sufficient resources including funding, skills and equipment.<sup>(2)</sup> While universal TVS CL screening in Australia and New Zealand is not yet recommended,<sup>(7, 14, 16)</sup> individual medical practitioners may opt to use it in the management of their patients.

Instead of a TVS universal screening program, Australian and New Zealand sonographers can use TAS measurements of the cervix to provide a first stage TAS assessment of the cervix, followed by a second stage TVS assessment if deemed necessary. The timing of the morphology scan coincides with the optimum time to perform CL measurements. This two-staged recommendation is consistent with 2017 and updated 2022 guidelines published by The Royal Australian and New Zealand College of Obstetricians and Gynaecologists.<sup>(7, 11)</sup> This approach reduces the need for TVS in a proportion of pregnancies, an examination which is less comfortable, and adds more time to the examination compared to TAS. TVS should be offered as a second stage assessment if the TAS CL measurement is less than 35mm, or if the full CL is unable to be clearly viewed.<sup>(7, 11, 12)</sup>

It is also supported by a state-wide West Australian study in which one of the interventions was to encourage sonographers undertaking morphology scans to measure CL transabdominally and proceed to TVS only if the cervix was not clearly imaged, or if the TAS measured CL was  $< 35$ mm. The results demonstrated that the two-stage ultrasound approach combined with other interventions reduced sPTBs by 7.6%.<sup>(17)</sup> The lower limit threshold for the length of a normal cervix measured with TAS varies slightly with both 35mm<sup>(7, 11)</sup> and 36mm recommended.<sup>(10)</sup> Sensitivities of greater than 96% to detect a TVS short cervix ( $< 25$ mm) have been achieved by using either of these lower limit cut-offs.<sup>(9)</sup> The lower limit threshold of  $< 35$  mm was chosen in this recommendation (1a) to be consistent with the 2022 Royal Australian and New Zealand College of Obstetricians and Gynaecologists guideline.<sup>(7, 13)</sup>

## **Subgroup 1b: Asymptomatic patients with a singleton pregnancy presenting for, or requiring a TVS scan, for any clinical or sonographic indications other than sPTB risk assessment**

**Recommendation 1b:** Sonographers should extend the TVS examination to sonographically assess the cervix and to measure the CL. A consensus decision was made for this recommendation in the absence of any available evidence.

**(Level of evidence: consensus decision, Strength of recommendation: Strong)**

### Summary Statement for Recommendation 1b

This recommendation applies when sonographers are performing TVS on the pregnant patient for reasons other than to assess the cervix, or a TVS has been specifically requested by the referring obstetric care provider or the reporting physician. TVS is optimal for visualisation of the lower uterine segment including assessment of the placenta and low presenting fetal parts. Subject to local protocols, contraindications and preferences of obstetric care providers and patients, if a sonographer is performing an ultrasound in the second trimester on a low-risk patient, and there is also a need for TVS assessment due to clinical or sonographic indications, then the TVS examination should also include an assessment of the cervix, including CL measurement. This approach represents little or no increase in resource utilisation, patient inconvenience, or patient discomfort, whilst providing an accurate measurement of CL to assess the risk for sPTB.

# PATIENT GROUP 2: SINGLETON OR MULTIPLE PREGNANCIES AT INCREASED RISK OF SPONTANEOUS PRETERM BIRTH (SPTB)

## Important notes about recommendations for sonographic assessment of the cervix in patient group 2.

**Note 1:** Relating to the recommendations for Group 2 (a-c), a TAS assessment of the fetus and uterus may also be required. Depending on indications on the referral and local protocols this could include a full morphology scan, or a limited scan which would typically include assessment of fetal lie and presentation, fetal heart activity, fetal biometry, amniotic fluid volume and placental position. A TAS of the lower uterine segment and cervix may identify any prolapse of membranes, fetal parts or the cord into the cervix or vagina indicating preterm labour which is a contraindication to TVS. Dedicated TVS assessment of the cervix as part of cervical surveillance may only require a curtailed TAS assessment.

**Note 2:** When following these recommendations local protocols and the preferences of referring obstetric care provider(s) and the patient should be considered.

**Subgroup 2a: Patients with singleton pregnancy presenting for obstetric TAS in the second trimester and have factors that place them at increased risk of sPTB. (note: this recommendation does not apply to patients presenting for sonographic cervical surveillance; instead refer to Subgroup 2b)**

**Recommendation 2a:** Sonographers should measure and assess the cervix using the TVS approach. A TVS measured cervical length of < 25mm is considered short and a high-risk factor for sPTB. If TVS is contraindicated\*, then TPS should be performed if not contraindicated. TAS measured cervical length lacks accuracy and should only be performed if TVS and TPS are contraindicated\*, A TAS CL of < 35mm indicates an increased probability that the cervix is short.

(Level of evidence: consistent support for recommendation, Strength of recommendation: Strong)

\*refer to Section D

## Summary Statement for Recommendation 2a

In patients at increased risk of sPTB, TVS measurements of CL can identify a short cervix, which is associated with a high-risk of PTB. <sup>(14)</sup> Current evidence suggests that, in an asymptomatic population, using a TVS CL threshold CL of < 25mm will identify pregnancies at high-risk of preterm birth and which could then be offered therapeutic intervention. <sup>(5, 16)</sup>

Subject to local protocols, contraindications and preferences of obstetric care providers and patients, recommendation 2a requires sonographers to understand if their patients presenting for any obstetric scan are at increased risk of sPTB, in order to identify patients who should also be offered TVS and TVS CL measurement. Table 1 summarises the risk factors (moderate and high) which indicate when patients should be offered TVS assessment of the cervix, in addition to other relevant obstetric ultrasound assessments, such as fetal morphology.

If the patient has one or more of the risk factors listed in Table 1 or is experiencing symptoms of sPTB sonographers should assess the cervix with TVS. TPS is an alternative when TVS is contraindicated. Although this approach is often considered more challenging, with training accurate results can be achieved. <sup>(18)</sup> TAS lacks accuracy when assessing for short cervix, <sup>(19)</sup> and should only be performed if both TVS and TPS are contraindicated. A TAS CL measurement of  $\geq 35$ mm indicates the CL measured with TVS will be greater than 25mm with 95% sensitivity. <sup>(11)</sup> Contraindications to each ultrasound approach can be found in Section D of this CPG. Decisions on the ultrasound approach used should be made with consultation with the patient.

While CL is relatively stable over the first two semesters in the general obstetric population, <sup>(6)</sup> the optimal time for measuring it is between 16-24 weeks gestation. <sup>(20)</sup> CL measurements in the first trimester and early second semester have not been validated either for diagnostic accuracy or for clinical outcomes; <sup>(7, 20)</sup> the lower uterine segment is undeveloped at this time, making it difficult to differentiate from the endocervical canal. <sup>(20)</sup> TVS CL measurements which are  $\geq 25$ mm (the lower threshold for normal) in gestations less than 20 weeks at high-risk of preterm birth, does not preclude preterm birth. <sup>(5)</sup> CL measurement has little clinical value after 24 weeks gestation as this is considered the upper limit for initiating interventions, <sup>(20)</sup> with some exceptions. <sup>(6)</sup>

## ***Subgroup 2b: patients with singleton or multiple pregnancies presenting for sonographic cervical surveillance at intervals, as directed by the patient's obstetric care provider(s)***

**Recommendation 2b:** Sonographic cervical surveillance should be undertaken using TVS unless contraindicated\*. If TVS is contraindicated\*, then TPS should be performed, unless contraindicated\*. TAS measured cervical length lacks accuracy and should only be performed if TVS and TPS are contraindicated\*.

(Level of evidence: consistent support for recommendation, Strength of recommendation: Strong)

\*refer to Section D

### **Summary Statement for Recommendation 2b**

Sonographers may be asked to perform serial or surveillance TVS measurements of CL, to follow-up on a short measurement seen on a previous scan, or where there is a history of preterm delivery, <sup>(11,14)</sup> including patients on progesterone therapy. The obstetric care provider(s) will typically direct the timing and frequency of serial ultrasound measurements and their interpretation of those measurements in the context of the patient's clinical history, clinical management and stage of pregnancy, together with their own preferences and protocols. Previous CL measurements will also influence their approach. For instance, patients with a history of sPTB may be monitored every 2 weeks if TVS CL is long and closed, or every week if the TVS CL is shorter. <sup>(2)</sup>

CL normally decreases as the pregnancy progresses, <sup>(19)</sup> remaining relatively constant in pregnancy until 26 weeks gestation. In pregnancies that go on to deliver preterm, the rate of CL shortening is variable, ranging from 0.5mm to 8mm per week, <sup>(6)</sup> with greater shortening occurring after 26 weeks. <sup>(21)</sup> One millimetre of CL shortening has been reported to be associated with a 3% increase in odds of sPTB. <sup>(21)</sup> Sonographers with training and experience in TVS CL measurements can achieve good repeatability and interobserver agreement, with reported mean differences of CL less than 1mm (range 0.33-0.73mm). <sup>(22)</sup>

TVS CL surveillance may be offered as a safe alternative compared to clinically indicated cerclage and data indicates that only 42% of pregnancies undergoing TVS CL surveillance will require an ultrasound indicated cerclage. <sup>(6)</sup> The value of TVS CL surveillance post cerclage has been debated, with little evidence available to support it. <sup>(2) (6)</sup>

Sonographers should aim to achieve high quality, accurate, and repeatable CL measurements to reduce measurement error. TVS is the most accurate approach to measure CL. <sup>(6)</sup> Subject to local protocols, contraindications and preferences of obstetric care providers and patients, sonographers should use TVS for CL surveillance. The gestational age at the time of the scan and any increase, decrease or no change in CL since the previous scan(s) should be noted.

## ***Subgroup 2c: Patients presenting with multiple pregnancy in the second trimester***

**Recommendation 2c:** If the patients' obstetric care provider(s) requests a sonographic assessment of the pregnancy, but not specifically for an assessment of the cervix, or any other condition requiring a TVS, then the sonographer should measure and assess the cervix using TAS. If the TAS CL measures < 35mm, a TVS CL measurement should be considered using local protocols, contraindications, and the preferences of obstetric care providers(s) and the patient as guidance for decision making.

If the patient's obstetric care provider(s) specifically requests a sonographic assessment of the cervix, or there is a clinically relevant reason to perform TVS, then the sonographer should measure and assess the cervix using TVS, unless it is contraindicated\*.

If TVS is contraindicated\* then TPS should be performed, unless contraindicated\*. If both TVS or TPS are contraindicated, then TAS can be performed. A TVS or TPS measured CL is considered short if < 25mm, and a TAS measured CL of < 35mm indicates the cervix is at higher risk of being shortened.

(Level of evidence: consistent support for recommendation, Strength of recommendation: Strong)

\*refer to Section D

### **Summary Statement for Recommendation 2c**

The risk of sPTB is higher in multiple pregnancies than in singleton pregnancies <sup>(19)</sup>. Despite this, TVS to assess for short cervix is not recommended because the evidence around the value of therapeutic intervention in multiple pregnancy is conflicting. <sup>(7)</sup> Decisions about TVS screening for short cervix in multiple pregnancies are best made by obstetric care provider(s) who have a good understanding of each individual patient's clinical history and presentation. If the referring obstetric care provider requests an assessment of cervical length, then it is appropriate to proceed with TVS. This guideline recommends a first stage TAS as the appropriate method to screen for short cervix (< 35mm). If there is evidence of a short cervix on TAS, the decision to perform TVS is to be guided by local protocols and obstetric care provider preferences.

If assessment for a short cervix is requested, then TVS is the preferred method in twins. <sup>(23)</sup> The optimum cut-off is dependent on gestational age, but pragmatically it has been recommended that a TVS CL represents a short cervix if < 25mm. <sup>(7)</sup>

Whilst evidence is lacking to support using TAS to screen for a short cervix in multiple pregnancies, pragmatically it makes sense to at least make a TAS assessment of the cervix in this high-risk group in case there are obvious sonographic signs of a short (CL < 35mm) or open cervix.

# PATIENT GROUP 3: SINGLETON OR MULTIPLE PREGNANCIES WITH THREATENED PRETERM LABOUR (SYMPTOMATIC PATIENTS) AND REFERRED FOR A SONOGRAPHIC ASSESSMENT OF THE CERVIX

## **Recommendation 3:**

- a) In the setting of threatened preterm labour, and when the referring obstetric provider specifically requests an assessment of the cervix, it is usually appropriate to proceed with a TVS assessment of the cervix, including CL measurement, unless contraindicated\*.

**(Level of evidence: consensus decision, Strength of recommendation: Strong)**

- b) Decision-making on whether to proceed with a TVS examination should be made following any established local protocols, or in consultation with the patient's obstetric care provider(s) and the patient. Prior to undertaking the TVS assessment, the sonographer should ask the patient if there has been any change in symptoms (such as excessive bleeding or amniotic fluid loss) since visiting their obstetric care provider and perform a survey TAS to assess fetal heart activity, fetal lie, placental position, and the presence of membranes of fetal parts bulging into the cervix or vagina or cord prolapse. These assessments may change the clinical context for the patient resulting in revisions to the patient's ultrasound imaging pathway, including using a TPS approach or cancelling the sonographic assessment. Sonographers should assist in the revised ultrasound imaging pathway by sharing all relevant information with referring obstetric care provider(s), reporting physician(s) and the patient.

**(Level of evidence: consistent support for recommendation, Strength of recommendation: Strong)**

\*refer to Section D

## **Summary Statement for Recommendation 3**

Ultrasound assessment of the cervix does not have a primary role in threatened preterm labour. <sup>(2, 24, 25)</sup> If sonographers are requested to assess the cervix sonographically in a patient presenting with threatened preterm labour, they should be cautious in their approach. Threatened preterm labour can progress rapidly to preterm labour which is a contraindication to TVS. <sup>(26)</sup> Threatened preterm labour also carries a higher risk of changing fetal presentation and prolapse of umbilical cord. <sup>(27)</sup> These factors intensify the need for interdisciplinary team-work and communication. <sup>(28)</sup>

It is recommended to begin with a TAS because its only contraindication is patient refusal. While in this setting there is no consistent evidence for lack of safety in TVS, there have been concerns of precipitating bleeding in the setting of undiagnosed abnormal placentation, <sup>(33)</sup> and the increased risk of chorioamnionitis in Preterm premature rupture of membranes (PPROM). <sup>(29)</sup> TAS can also be a rapid method of making a number of assessments which provide valuable information to the patient's obstetric care provider(s); fetal lie and presentation, fetal heart activity, movement and breathing, placental position, placental masses or retroplacental haemorrhages, the presence of oligohydramnios, if the cervix is open or closed, identification of prolapses of the amniotic membranes or fetal parts, <sup>(28)</sup> and identification of cord prolapse and other worrying cord presentations (i.e. cord below cervix, cord between cervix and fetal presenting part, cord alongside fetal presenting part) <sup>(30)</sup>. However, some of these conditions or presentations may not always be visible on TVS or TAS.

If TVS is deemed appropriate after the initial TAS assessment, and possibly after consultation with reporting physicians and obstetric care providers, TVS can be undertaken. The clinical predictive value of TVS is uncertain for threatened PTB and more research is needed, however TVS measurements of CL may help stratify risk of PTB and prevent unnecessary intervention and prolong the pregnancy. <sup>(6, 11)</sup> Treatments to delay delivery are important to reduce risks of fetal death and long or short-term disabilities. <sup>(11, 20)</sup> There is some, limited evidence demonstrating that knowledge of TVS measured CL, in singleton pregnancies with symptoms of preterm labour, appears to prolong pregnancy by approximately four days. <sup>(31)</sup> CL has also been shown to predict women with threatened preterm labour who will deliver in 7 days (CL < 15mm), and those who deliver beyond 7 days (CL ≥ 15 mm). <sup>(32)</sup>

TVS provides the best detail compared to TPS or TAS to assess the cervix in women with threatened PTB preterm labour, however there is not sufficient evidence to support its routine use in predicting labour, or to distinguish true labour from false labour. <sup>(11)</sup> TPS is an adequate alternative to TVS, if TVS is contraindicated (see section D). There has been little research on the use of TAS to inform the use of TAS to evaluate the cervix for threatened PTB. <sup>(10)</sup>

# SECTION D: 'HOW TO' GUIDANCE FOR TVS, TPS, TAS

The following sections provide 'how to guidance' to sonographically assess the gravid cervix using B-mode sonography for each of three techniques; TVS, TVS and TPS. Notations are included in this section, to indicate where relevant images are available in the Image Gallery (supplementary material).

Existing CPGs were consulted (including best evidence and low evidence CPGs), to inform this section (refer to Appendix 3 for list of CPGs 1-44). This guidance should be read in conjunction with other ASA guidelines listed in Section F. Sonographers should also be aware that if during scanning they have concerns about imminent preterm delivery based on either clinical or sonographic finding, then the patient's obstetric care provider(s) should be contacted promptly, adhering to local protocols.

## TRANSVAGINAL SONOGRAPHIC IMAGING OF THE CERVIX (TVS)

### Introduction

**This section assumes knowledge and skill competency in routine TVS scanning.**

TVS cervical assessment is regarded as the most detailed, complete, accurate, and reproducible assessment of the cervix compared to TPS and TAS. It provides detailed assessment of the internal os, the first site where predisposing changes for sPTB occur. <sup>(10)</sup> TVS is superior to other approaches because it enables higher frequencies to be used due to the shorter distance between the transducer and cervix. <sup>(10)</sup>

TVS measured CL is the reference standard to identify a short cervix; a predictor of sPTB. <sup>(10)</sup> Intra- and interobserver variability of CL measurements from TVS images has been reported at 10%. <sup>(33)</sup> CL should be obtained according to a standardised technique to reduce measurement variability and because most normal ranges / likelihood ratios describing the associated risk of PTB have been calculated using a standardised CL measurement technique. <sup>(11)</sup>

During TVS cervical assessment, it is recommended the lower uterine segment should also be assessed for vasa praevia, placenta praevia and low-lying placenta. Colour and pulsed wave Doppler should be used to identify low-lying vessels indicating vasa praevia. <sup>(34,35)</sup> The distance from the inferior edge of the placenta to the internal os, or in cases of funnelling, to the internal edge of the remaining endocervical canal should be measured. Refer to ASA Guideline: Vasa praevia diagnosis in the mid trimester ultrasound (link provided in Section F). Adding this assessment to the scan represents little or no increase in resource utilisation but provides an opportunity to identify these placental conditions with high resolution ultrasound imaging.

### Contraindications of TVS\*

- Patient does not provide consent. <sup>(36)</sup>
- Labour. <sup>(26)</sup>
- Unavailability of appropriate equipment (e.g. appropriate intracavity transducer, high level transducer disinfection facilities).
- Unavailability of a sonographer (or other health/medical professional) who is competent in TVS assessment of the gravid cervix.

**\*Note:** Where TVS is indicated under these guidelines, but contraindicated by the criteria above, then this may be discussed with the referrer/reporting specialist to ensure the appropriate examination/care is provided.

### Other considerations

- Placenta praevia +/- PV bleeding is not a contraindication to TVS, however TVS should be used discriminately, and care should be taken while advancing the transducer into the vagina. Real-time imaging should be used, so that the relationship between the transducer tip and the cervix can be continually assessed. <sup>(10)</sup> In cases where there is active, heavy vaginal bleeding, the decision to use TVS will depend on the clinical context, referrer input, local protocols, and the patient's preferences.
- PPROM has been considered a contraindication for TVS due to the fear of it causing ascending infection and decreasing the latency period. However, a small study has demonstrated that TVS does not increase these complications. <sup>(37)</sup> With only weak evidence available, the decision to use TVS, or progress to TPS will depend on guidance of the obstetric care provider and/or local protocols.
- Avoid recording images of the cervix when a uterine contraction is present; contraction of the uterus can make the lower uterine segment appear thicker (**Image 17**).

## Pre-scanning considerations

- Transducer selection: intracavity transducer, which is suitable for transvaginal scanning and with a frequency which offers the best possible resolution while providing sufficient depth of ultrasound field to demonstrate the cervix.
- The transducer should be covered with a single-use high quality transducer cover (e.g. condom, pre-packaged commercial specific transducer cover, or surgical drapes). Sterile, single use ultrasound gel should be applied between the transducer and transducer cover, and on the outside of the transducer cover (ASA Clinical Statement: The safe use and storage of ultrasound gel, (refer to Section F)).
- In cases of patients with latex sensitivity, special non-latex covers should always be used. <sup>(38)</sup> A high-level disinfected transducer should always be used; i.e. the transducer should always be cleaned between use of different patients using disinfectant procedures outlined in ASA Practice Update: Disinfection of intracavity ultrasound transducers (refer to Section F).
- The patient should empty their bladder prior to the examination. <sup>(2)</sup> A filled bladder can obscure funnelling and falsely increase CL. <sup>(39,40)</sup> The presence of some urine in the bladder may not affect visualisation of the cervix and can be useful to visualise the interfaces between the uterus, placenta and bladder wall when assessing for abnormal placentation in the lower uterine segment.
- The patient should be scanned whilst in the lithotomy position; <sup>(6, 41)</sup> having the legs abducted allows a full range of movements whilst scanning. <sup>(47)</sup> Elevation of the pelvis can assist in allowing for a larger range of transducer movements. This can be achieved either using a cushion placed under the pelvis, or by lowering the end of the examination couch.

## Scanning and image recording

To image the cervix, the transducer should be passed along the vaginal canal under real time visualisation, and into the anterior vaginal fornix to obtain a sagittal view of the cervix. <sup>(6, 11, 42, 43)</sup> The bladder will be seen anteriorly with the amniotic fluid and fetal presenting part behind the bladder. <sup>(46)</sup> The depth and width of field should be optimised so that the cervix occupies between 50 and 75% of the image. <sup>(6, 35, 42)</sup> Undue transducer pressure on the cervix should be avoided, because this will falsely increase CL or mask funnelling or an open cervix. <sup>(11, 41, 42)</sup> Transducer pressure can be reduced by withdrawing the transducer once it is inserted and the cervix seen, and then gently reapplied to obtain the best image. <sup>(6, 34, 35, 43)</sup> Excessive transducer pressure can be recognised if the antero-posterior measurement of the posterior portion of the cervix is thicker than the anterior portion (**Image 18**). <sup>(41)</sup> Care must be taken not to include the vaginal wall in the CL measurement as if included it will overstate the CL measurement. Recording images of the cervix when a uterine contraction is present can make the lower uterine segment appear thicker and compromise the identification of the internal os (**Image 17**). Visualisation of the internal os can also be compromised in women who have a scar in the cervix due to a history of a full dilation caesarean section.

## Interpreting images

The anterior and posterior cervical portions of the cervix should be of similar thickness and echogenicity. <sup>(45)</sup> Care should be taken to avoid misinterpreting a thickened lower uterine segment coming together in the midline, as a longer endocervical canal. <sup>(47)</sup> The internal os can be recognised where the anterior and posterior cervical walls touch an internal V-shaped notch. The external cervical os can be seen as an echogenic triangular area at the inferior portion of the endocervical canal. <sup>(6, 34, 35, 40, 43)</sup>

A cervix of < 25mm measured by TVS is considered short and presents an increased risk for sPTB. <sup>(7)</sup> Other assessments of the cervix have been studied but none have proved more reliable or predictive than CL, and there is insufficient evidence to demonstrate that adding other assessments to CL measurement improves its the predictive accuracy. <sup>(40)</sup> These additional assessments include cervical index (funnel length +1/functional length), anterior and posterior cervical width, uterocervical angle, endocervical canal contour (straight vs. curved), cervical position (horizontal vs. vertical) and lower uterine segment thickness. <sup>(40)</sup>

Table 2 lists and explains the minimum reporting requirements for an assessment of the gravid cervix. An example worksheet/checklist is provided in Appendix 4. Sonographers should also record any information obtained from the patient and/or referring obstetric care provider(s) relating to clinical signs, risk factors, contraindications and consent, and document limitations of the sonographic examination or deviations from this CPG or relevant local protocols.

If an open cervix is identified, then this requires immediate management, and an obstetric care provider should be immediately informed so that appropriate action can be taken. <sup>(44)</sup> If a short cervix is identified, then a same day phone discussion with the referring obstetric care provider is required. <sup>(43)</sup> Notification of abnormal findings to the obstetric care provider is a joint responsibility between the sonographer and the reporting physician. At minimum, the sonographer should make these findings available to the reporting physician at the time of ultrasound examination who can communicate the findings to relevant obstetric care providers. If a reporting physician is not available to communicate these findings within appropriate timeframes, then the sonographer should take alternate actions to ensure an obstetric care provider is informed and the patient can be managed appropriately.



**Table 2: Minimum sonographer reporting requirements for an assessment of the gravid cervix**

Minimum requirements for image recording	Notes
Bladder <sup>(45)</sup>	The inferior portion of the bladder should be visualised on images of the cervix for orientation purposes.
<b>Sagittal view of cervix including the following anatomical features:</b> 1) Internal os, 2) External os, 3) Full length of endocervical canal seen as area of increased echogenicity, can be used to help demarcate the internal os, 4) Body of cervical corpus, and 5) Cervical/vaginal interface to help demarcate external os.	<p>This image should be used to measure cervical length. To take this measurement, at minimum, anatomic features 1-4 should be visible on the image (<b>Image 1,3</b>). <sup>(6)</sup></p> <p>To measure, electronic calipers should be placed where the anterior and posterior walls of the cervix touch at the internal os and external os and not beyond to the outermost edge of the cervical tissue (<b>Images 4-9</b>).</p> <p>As the cervix is a dynamic structure, the cervix should be observed over 3-5 minutes to allow time to capture the shortest measurement. Three measurements should be performed and the shortest, most accurate measurement recorded (rather than taking an average measurement). <sup>(6,14, 19, 39, 40, 47, 48)</sup></p> <p>The straight-line measurement technique is recommended to measure CL, as it has greater reproducibility between measurers <sup>(39)</sup>, and any differences in CL using different measurement techniques are unlikely to be clinically significant as short cervixes are usually straight. <sup>(39)</sup> If the endocervical canal is curved, the straight line measurement technique should also be used. Other measurement techniques such as sum segmental measurements, trace or spline techniques should not be used. <sup>(6,38,40)</sup></p> <p>If a lower uterine contraction is present, the CL should be measured from an image taken following relaxation of the contraction). If this is not possible, during a contraction, the prominence of the cervical glandular tissue or cervical mucosa in the endocervical canal can be used to delineate the internal os from the lower uterine segment. <sup>(39)</sup></p>
Image of funnelling (effacement of the internal aspect of the cervix) is present.	Use the endocervical mucosa to provide accurate assessment of the amount of funnelling. A thickened lower uterine segment can mimic funnelling; this can be recognised by the absence of mucosa extending along the walls of the funnel. <sup>(47)</sup> Note that quantifying the extent of funnelling (funnel width, funnel length, percent funnelling (funnel length divided by total CL.) does not appear to be useful as this can change during the ultrasound examination <sup>(6, 19, 40,45)</sup> and has not been shown to be an independent predictor of spontaneous preterm birth. <sup>(40)</sup> The shape of funnelling may be recorded. Funnelling progresses from a normal T shape, to Y ( <b>Image 7</b> ), then V ( <b>Images 11-12</b> ), and finally a U shape. U-shaped funnelling ( <b>Images 8-10</b> ) is more likely to be associated with sPTB compared to a V-shaped funnel, although this is subjective. <sup>(45)</sup> If funnelling is present, the CL measurement is made of the remaining closed cervix, (from tip of funnel to external os). <sup>(6)</sup>
Images of undeveloped or 'immature' lower uterine segment if present.	This occurs into early second trimester and is more common in primiparous patients. During the TVS, the lower cervix may be orientated parallel with the vagina and ultrasound beam ( <b>Image 24</b> ), leading to suboptimal imaging. Withdrawing the transducer and gently re-inserting it into the anterior fornix may assist in identifying the CL. A lower frequency may be used to image the full length of the cervical mucosa to the internal os. <sup>(39)</sup>
Images of amniotic fluid sludge if present.	Amniotic fluid sludge appears as echogenic aggregates close to the internal os or within a funnel ( <b>Image 10</b> ). It likely represents microbial invasion of the amniotic cavity. <sup>(40)</sup> While it is an independent risk factor for spontaneous preterm delivery, preterm rupture of membranes and histological chorioamnionitis in asymptomatic patients at high-risk for sPTB, <sup>(40)</sup> there is insufficient evidence to demonstrate that adding these to the CL measurement improves the predictive accuracy. <sup>(45)</sup>
Images of any amnion-chorion separation if present.	While there is no clear evidence, it is reasonable to assume that risks of PPRM or sPTB increases when short CL and amnion-chorion separation are both present. <sup>(6)</sup>
Endocervical canal dilation if present.	The endocervical canal is in most cases represented by a thin line. Sometimes, often in the third trimester, it may have a thin layer of hypoechoic contents. This most likely represents an accumulation of mucus, but needs to be differentiated from a thin cervical funnel. If the fetal membranes (chorion and amnion) are located at the level of the internal os, and they are not prolapsing into the endocervical canal, then the presence of an endocervical dilation is unlikely. <sup>(40)</sup>
Images of cerclage if in situ.	If the patient has cerclage in situ, the location of the stitches should be identified and recorded in images. Cerclage is seen as two echogenic foci in the anterior and posterior walls of the cervix ( <b>Image 19</b> ). CL should be measured as it has good predictive accuracy even in when a cerclage is in place. <sup>(45)</sup> An additional 2 measurements may be made; 1) from the internal os to the level of the cerclage, and 2) from the level of the cerclage to the external os. <sup>(45)</sup> ( <b>Image 2</b> )

# TRANSABDOMINAL SONOGRAPHIC IMAGING OF THE CERVIX (TAS)

## Introduction

Most pregnant patients in Australia and New Zealand are offered TAS in the second trimester. This scan also provides an opportunity to assess for a shortened cervix using TAS as a first stage screen. If the TAS CL is < 35mm or the cervix is not adequately visualised, then a second stage TVS assessment, including CL measurement should be performed to more accurately assess the cervix and CL (see Recommendation 1a).

## Contraindications\*

- Patient does not provide consent.
- Unavailability of appropriate equipment (eg. appropriate transducer or high-level disinfectant equipment and materials).
- Unavailability of a sonographer (or other health/medical professional) who is competent in TAS assessment of the gravid cervix or high-level disinfectant equipment and materials).

*\*Note: Where TVS is indicated under these guidelines, but contraindicated by the criteria above, then this may be discussed with the referrer/reporting specialist to ensure the appropriate examination/care is provided.*

## Pre-scanning considerations

Transducer selection: curved array transducer with a frequency which offers the best possible resolution while providing sufficient depth of ultrasound field to demonstrate the cervix should be selected.

The patient should be scanned in the supine position. <sup>(6)</sup>

A minimally distended bladder can be used to balance the trade-off between adequate visualisation of the cervix and the artificial elongation of the cervix that occurs with excessive bladder filling. The CL can measure 6mm longer with a full bladder compared to an empty bladder <sup>(9)</sup> and an overfull bladder can also increase the chance of a lower uterine contraction developing, making it difficult to define the true CL. <sup>(45)</sup> If the cervix can be adequately visualised when the bladder's deepest urine pocket is < 5cm (measured vertically-anterior to posterior), then TAS CL measurements will not be significantly different from TVS measurements of CL. <sup>(46)</sup>

## Scanning and image recording

Scan using oblique and parasagittal movements of the transducer to delineate the full length of the cervical mucosa and internal and external os in the most horizontal orientation possible, to improve identification of the internal and external os and allow accurate placement of calipers. An appropriately distended bladder is required for optimal visualisation (**Image 25**). This will vary depending on each case, and may range from a post-void bladder to different levels of partial bladder filling. A very full bladder or over-distended bladder should not be used.

Optimise visualisation of the cervix by utilising the amniotic fluid as a sonographic window. This can be achieved by insonating inferiorly through the amniotic fluid from a more superior position on the maternal abdomen. <sup>(45)</sup> The cervix should be assessed multiple times during the course of the obstetric ultrasound examination, due to dynamic nature of the cervix, and its changing appearances during different phases of bladder filling to capture optimal images of the cervix. <sup>(45)</sup>

The depth and width of field should be optimised so that the cervix occupies between 50 and 75% of the image. <sup>(6, 35, 42)</sup> The sonographer should aim to record the same structures, including the same landmarks used for a measurement of the CL, that are described in Table 2 for TVS. <sup>(6)</sup> However, TAS has multiple technical limitations including sub-optimal visualisation of the cervix due to decreased imaging resolution, poor sonographic windows and bladder distension (**Images 31-32**), shadowing or obscuration by the fetus, bladder edge-artifact obscuring portions of the cervix, unexplained obscuration of the cervix, large body habitus and the potential for a short CL to be missed. <sup>(6, 10)</sup> TAS assessment of the cervix should include colour Doppler to identify low lying vessels (such as vasa praevia).

## Interpreting images

The internal os of a normal cervix will have a flattened T-shape appearance. The amnion may be visible especially in cases of a prominent mucus plug. The external os often appears as a very slight indentation. Use the posterior wall of the cervix as a guide when placing the caliper delineating the external os. <sup>(34)</sup>

The pressure from a full bladder can falsely elongate the cervix (**Image 31**), making it difficult to assess the cervical glandular tissue delineating the true endocervical canal. A post void bladder (empty or with minimal filling) can improve visualisation of the full CL, by reducing the compression of the endocervical canal and therefore alleviating the false elongation (**Image 33**). <sup>(46)</sup> After voiding, the cervix may appear 'curved', or 'vertical' (**Image 34**). <sup>(45)</sup> Care must be taken not to include the vagina in the CL measurement as if included it will overstate the CL measurement.

When a TAS CL of < 35mm is measured, this is considered high-risk for a short cervix (TVS CL < 25mm) <sup>(7)</sup> and a TVS should be offered to the patient as appropriate for a more accurate identification of a shortened cervix, and prediction for sPTB. Although TAS CL when measured with an empty bladder correlates with TVS CL, a higher cut-off is required for TAS CL to accommodate overestimation of CL which may occur with the bladder distension required for adequate visualisation.

# TRANSPERINEAL SONOGRAPHIC IMAGING OF THE CERVIX (TPS)

## Introduction

TPS measurements of CL appear to be comparable to TVS<sup>(44)</sup>, although this has been less studied.<sup>(6, 10)</sup> TPS is an alternative to TVS, when TVS is contraindicated.<sup>(6, 10)</sup> TPS is often perceived as technically challenging to perform and interpret, but with training accurate results can be achieved.<sup>(18)</sup> As with all ultrasound assessments of the cervix TPS should be performed by sonographers trained and competent in the technique.<sup>(2)</sup>

## Contraindications\*

- Patient does not provide consent.
- Unavailability of appropriate equipment (eg. appropriate transducer or high-level disinfectant equipment and materials).
- Unavailability of a sonographer (or other health/medical professional) who is competent in TPS assessment of the gravid cervix.

*\*Note: Where TVS is indicated under these guidelines, but contraindicated by the criteria above, then this may be discussed with the referrer/reporting specialist to ensure the appropriate examination/care is provided.*

## Pre-scanning considerations

- Transducer selection: curved array transducer with a frequency which offers the best possible resolution while providing sufficient depth of ultrasound field to demonstrate the cervix should be selected. The transducer should be covered with a clean cover (freezer bag, or gloves) and sterile gel used as a coupling agent.<sup>(6, 44)</sup>
- The patient should be scanned with an empty bladder, and whilst in the lithotomy position with the hips elevated to reduce rectal gas over the external os.<sup>(42, 45)</sup>
- The transducer should be covered with a single-use high quality transducer cover. In cases of patients with latex sensitivity, special non-latex covers should always be used.<sup>(38)</sup> Sterile, single use ultrasound gel should be applied between the transducer and transducer cover, and on the outside of the transducer cover (ASA Clinical Statement: The safe use and storage of ultrasound gel, refer to Section F).
- Transducers used during TPS are at risk of coming into contact with mucous membranes, blood or body fluids and therefore a high-level disinfected transducer should always be used.<sup>(28)</sup> I.e., the transducer should always be reprocessed using high-level disinfection between use of different patients, or between TAS and TPS examinations of the same patient.

## Scanning and image recording

Place the transducer on the labia or perineum of the patient, just posterior to the symphysis pubis, in a sagittal plane along the direction of the vagina. Slight oblique transducer movements may be needed to delineate the internal and external os, the cervical corpus, and the endocervical canal in its full length.<sup>(6, 35, 45)</sup>

The sonographer should aim to record the same structures, including the same landmarks used for a measurement of the CL, that are described in Table 2 for TVS.<sup>(6)</sup> Technical limitations include obscuration of the cervix by adjacent bowel/rectal gas. This can be alleviated by using an elevated lithotomy patient position, and by scanning with a slightly anterior approach on the labia with a slight posterior angulation to help overcome the shadowing from gas.<sup>(45)</sup> Another technical issue is the distance to the gravid cervix from the transducer face, which usually requires a lower frequency transducer than used in the TAS approach, and therefore more difficult to delineate the landmarks of the external os, cervical glandular tissue and internal os. This is more problematic when a lower uterine contraction is present.<sup>(45)</sup> Sonographers may also lack experience in this technique.

## Interpreting images

- Ideally, the full length of the echogenic endocervical canal should be seen, and the hypoechoic cervical glandular tissue may also be visible. The internal os is recognised as the point where the anterior and posterior walls of the cervix come together and should have a flattened T-shape appearance or a small V-shaped notch. The external os is recognised as the point adjacent to the endocervical canal where the cervix meets the vagina. This may be seen as a small echogenic interface in some patients. The posterior cervical corpus can be used to guide for calliper placement at the elevated external os.<sup>(45)</sup> Refer to **Image 39** for an example of a short cervix measured on TPS.

While TPS is often considered challenging; this sonographic approach should not be discounted as recent studies using contemporary equipment have demonstrated that high correlations and small mean differences between TPS CL and TVS CL are achievable.<sup>(18)</sup> Similarly, high accuracy of TPS when using a minimum threshold for normal CL of < 25mm high accuracy has been demonstrated (sensitivity 88.07%, specificity 91.67%, positive predictive value 96.0%, negative predictive value, 77.19%, accuracy 89.17%).<sup>(47)</sup> TPS CL appears to be shorter than TVS CL at 14-20 weeks gestation, but accuracy improves as pregnancy progresses.<sup>(45)</sup>

# SECTION E: SAFETY, ACCEPTABILITY, FEASIBILITY AND COST EFFECTIVENESS OF SONOGRAPHIC ASSESSMENT OF THE GRAVID CERVIX

In this CPG, unless otherwise indicated, TVS is the method of first choice to assess the gravid cervix in pregnancies at high-risk of sPTB and threatened preterm labour.

In most instances, TAS is the method of first choice to screen for a short cervix in pregnancies at low-risk of sPTB before proceeding to TVS if the TAS measurement is less than 35mm. <sup>(7)</sup>

## Acceptability

All recommendations are subject to the acceptability of the ultrasound method to the patient and their consent. Patient preferences will be influenced by communications with their referring obstetric care provider(s) and the sonographer, information they have gained from other sources and any previous experiences. While acceptance rates for TVS are as high as 75% <sup>(48)</sup>, this does not mean TVS is preferred over TAS or TPS. A number of studies have demonstrated that TVS is more often associated with discomfort, pain, and is more often less acceptable compared to TAS or TPS. <sup>(45, 49)</sup>

## Feasibility

The recommendations should be feasible in most settings in Australia and New Zealand, as the equipment including transducer types to meet these recommendations would be available in most comprehensive or specialised ultrasound imaging departments. The exception may be in rural and remote areas. <sup>(9)</sup> Sonographers should clearly communicate to referring obstetric care provider(s) and reporting clinicians if the unavailability of appropriate equipment has compromised the quality of the examination, or restricted adherence to this guideline document.

## Safety

Whilst ultrasound cervical assessment is considered safe with no evidence of harms, <sup>(6, 16)</sup> care should be taken to minimise risks (refer to contraindications, and other ASA guidelines). To reduce potential bioeffects, exposure times and acoustic output (mechanical and thermal indices) should be kept within recommendations.

## Cost-effectiveness

TVS CL screening is considered cost-effective in populations at increased risk of sPTB, but its cost effectiveness in low-risk populations is argued. <sup>(9)</sup> Some studies have demonstrated cost-effectiveness, others have suggested there may be an increase in the overall medical costs associated with the strategy. <sup>(7)</sup> Specific to the situation in Australia and New Zealand, there have been no cost-effectiveness studies published.

If TVS assessment of the cervix is added to a routine second trimester obstetric scan, the additional time and resource needs translates into additional costs which must be borne by either the patient or the imaging department <sup>(7)</sup> and can potentially limit resource allocation to other ultrasound services. It has been stated that adding a TVS cervical assessment should only take 3-5 minutes <sup>(10)</sup> and does not significantly increase the time for completion of ultrasound examination. <sup>(5)</sup> However, it is likely these statements are made without considering the time required for the associated activities with the TVS procedure, such as explanation of the procedure, patient voiding, reconfiguration of the scanning room. A recent study considered this additional time, and found that adding a TVS CL assessment to a morphology scan prolonged the examination by 25%. <sup>(50)</sup> Additional time and resources are also required for the high-level disinfection of transvaginal transducers. The approach of using TAS for a first stage cervical assessment (Recommendation 1a) at the time of a routine second trimester scan, decreases the number of TVS assessments and associated additional resource load on the imaging department and reduces patient inconvenience. <sup>(49)</sup>

# SECTION F: SONOGRAPHER TRAINING

For accurate and reproducible results for ultrasound assessment of the gravid cervix, whether using TVS, TAS or TPS, it is important that sonographers are adequately trained, follow standardised ultrasound techniques, and apply quality assurance methods.

At the time of writing the minimum requirements for sonographers to practice in Australia within the Medicare framework, is that they are accredited and listed with the Australian Sonography Accreditation Registry (ASAR) as either an Accredited Medical Sonographer (AMS) or Accredited Student Sonographer (ASS). In New Zealand, sonographers must hold a current annual practising certificate issued by the New Zealand Medical Radiation Technologists Board (NZMRTB).

In Australia, the competency standards state that sonographers should have the underpinning knowledge, without specifically stating they require skills to sonographically assess the gravid cervix.<sup>(51)</sup> Similarly, the competency standards applicable to New Zealand sonographers do not provide specific requirements relating to sonographic assessment of the gravid cervix.<sup>(52)</sup> While obstetric sonography is included in the curriculum of Australia and New Zealand pre-accreditation or pre-registration courses, sonographers may not have competency in sonographic assessment of the gravid cervix. To achieve optimal patient outcomes, sonographers performing obstetric ultrasound should be competent to appropriately perform ultrasound assessments of the gravid cervix. Additional post-graduate training may be required to achieve competency.

Sonographers undertaking obstetric examinations should take responsibility, with support from employers and colleagues, to develop and/or maintain competent skill levels in assessing the gravid cervix using the techniques described in this CPG. This can be achieved through inhouse or external training sessions. The TVS method can be rapidly learned, with an adequate technique achieved in beginners with no previous ultrasound experience after simple theoretical training, followed by two practice sessions, and only 23 scans performed with trainer supervision.<sup>(52)</sup> TPS for cervical assessment is often perceived as more challenging, however an inexperienced operator with specific training was able to achieve good TPS CL measurements which correlated closely to TVS CL measurements, with only small mean differences.<sup>(18)</sup> Regular education can increase competency,<sup>(9)</sup> and quality can be regularly monitored via audits integrating constructive, educative feedback on selected images, CL measurements and sonographer reports.<sup>(53)</sup>

# SECTION G: REFERENCE TO OTHER GUIDELINES

This guideline should be read in conjunction with the following guidelines

ASA Clinical Statement: Disinfection of Intracavity and Semi-critical ultrasound transducers

***Clinical-Guideline-Disinfection-of-intracavity-and-semi-critical-ultrasound-transducers-MAR22.pdf (sonographers.org)***

ASA Guideline: Intimate examinations, consent and chaperones

***UPDATE---PUB\_0602\_GUIDELINE-Intimate-examinations-Consent-and-Chaperones-Jan22.pdf (sonographers.org)***

ASA Clinical Statement: Infection Prevention and Control

***UPDATE---PUB\_0874\_CS-Infection-Prevention-and-control-update.pdf (sonographers.org)***

ASA Clinical Statement: The safe use and storage of ultrasound gel

***PUB\_0872\_Safe\_Use\_and\_Storage\_of\_Ultrasound\_Gel\_FEB21.pdf (sonographers.org)***

ASA Guideline: Vasa praevia diagnosis in the mid trimester ultrasound

***Vasa praevia diagnosis in the mid trimester ultrasound - Humphries-Hart - 2020 - Sonography - Wiley Online Library***

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