IMAGING ULTRASOUND BEFORE 24 WEEKS OF PREGNANCY

2022 update to the WHO antenatal care recommendations for a positive pregnancy experience

Technical Brief

BACKGROUND

Ultrasound is a common clinical imaging technique that uses sound waves to create a picture (also known as a sonogram or scan) of organs, tissues, and other structures inside the body. Obstetric ultrasound may be performed to examine the fetus, uterus, placenta, and surrounding anatomy to generate results that inform clinical decision-making during antenatal care, and optimally improve experience of care. Correctly performed ultrasound measurement of the fetus enables accurate estimation of gestational age, which facilitates appropriate, time-sensitive interventions during pregnancy and management of pregnancy complications. Routine antenatal ultrasound performed by a competent health worker may in turn enable earlier detection of pregnancy states that are not readily apparent, such as multiple pregnancies and placenta praevia, thereby contributing to timely and appropriate clinical management strategies by health systems with functioning referral processes and relevant provider expertise. In 2016, the World Health Organization (WHO) published the *WHO recommendations on antenatal care for a positive pregnancy experience*,[1] a landmark global guideline for pregnancy care that included a recommendation for one obstetric ultrasound scan before 24 weeks gestation. A guideline panel review of updated evidence convened by the WHO resulted in this recommendation being retained and re-affirmed (Box 1). The 2022 recommendation updates and supersedes the ultrasound recommendation published in the 2016 WHO antenatal care (ANC) guideline. **This technical brief describes the re-affirmed WHO recommendation on ultrasound examination in the context of routine ANC and outlines policy and programme implications for translating this recommendation into action at the country level.** Refer to the full WHO guideline for additional information.[2]

BOX 1. WHO RECOMMENDATION ON IMAGING ULTRASOUND BEFORE 24 WEEKS OF PREGNANCY

One ultrasound scan before 24 weeks of gestation is recommended for pregnant women to estimate gestational age, improve detection of fetal anomalies and multiple pregnancies, reduce induction of labour for post-term pregnancy, and improve a woman's pregnancy experience.

[1] https://www.who.int/publications/i/item/9789241549912

[2] https://apps.who.int/iris/bitstream/handle/10665/352620/9789240046009-eng.pdf

The WHO ANC recommendations aim to empower all women and adolescent girls to access the type of person-centred ANC that they want and need and to provide a sound foundation for such care in accordance with a human rights-based approach. Additional guidance on comprehensive routine care during pregnancy is available in the *WHO recommendations on antenatal care for a positive pregnancy experience*.[3] Detailed technical guidance on obstetric ultrasound is available in volumes I and II of the WHO *Manual of diagnostic ultrasound*.[4]

IMPLEMENTATION CONSIDERATIONS

The evidence on effects of routine imaging ultrasound before 24 weeks of pregnancy has not changed substantially since the 2016 recommendation. However, implementation considerations described in the guideline have been expanded based on the findings of a new qualitative evidence synthesis of the views and experiences of ultrasound service users and health workers.[5] Ensuring that pregnant women receive high-quality obstetric ultrasound services requires planning at multiple levels of the health system. Before introducing routine antenatal ultrasound services in facilities, stakeholders should plan for the impact on national policies and standards of practice, regulatory bodies, health sector finance, equitable access to ANC, health worker training, and delivery of ultrasound and ANC services (see Table 1). The ultimate goal of such plans should be to support high-quality care (including experience of care) and individual clinical encounters that are safe and informative for women and health workers.

TABLE 1: IMPLEMENTATION CONSIDERATIONS FOR INTRODUCTION OF OBSTETRIC ULTRASOUND SERVICES

	LEVEL			
Consideration	**National**	**Subnational**	**Facility**	**Health Worker**
National policies and standards of practice	Create/update and promote evidence-based policies, quality standards, and key measures for US use. Establish and update standards for education, training, and maintaining competencies to provider cadre. Promote a defined scope of practice for different cadres who conduct routine US. Include both public and private sector in policy dialogue and design.	Provide supervision and training to ensure pregnant women's confidentiality and adherence to other quality standards. Oversee QI processes to achieve and sustain standards. Promote mechanisms that facilitate sharing US reports among facilities across the continuum of care.	Track key measures to assess adherence to national standards, including those that assess impact on overall quality and coverage of ANC services. Engage staff responsible for IPC in implementation of evidence-based standards.	Conduct/refer for US according to evidence-based practice, and document results. Understand how to determine GA/estimated date of birth and conduct standard components of US using evidence-based guidelines. Understand legal scope of practice for conducting routine obstetric US.

[3] https://www.who.int/publications/i/item/9789241549912

[4] https://digicollections.net/medicinedocs/documents/s21383en/s21383en.pdf

[5] Moncrieff, Gill et al. 2021. "First and Second Trimester Ultrasound in Pregnancy: A Systematic Review and Metasynthesis of the Views and Experiences of Pregnant Women, Partners, and Health Workers." *PLoS ONE* 16(12): e0261096. https://doi.org/10.1371/journal.pone.0261096.

LEVEL				
Consideration	**National**	**Subnational**	**Facility**	**Health Worker**
Financial	As part of an overall national maternal health budget, calculate the cost of equipment, ongoing supplies, service contracts, power supply and surge protection, environmental upgrades, and health worker capacity-building.	Contribute to budget estimation, particularly in regard to power supply and surge protection, environmental upgrades, and capacity-building of health workers.		Understand the cost of ongoing training/ refreshers for health workers, additional staff, maintenance, and recurring supplies and implications of adequate versus inadequate care and maintenance of equipment (including maintenance contract).
Service delivery, including environment of care and equipment	Understand geographic distribution of functional machines, health workers, and maintenance. Confirm power supply and surge protection for facilities. Purchase equipment based on intended use or purpose, distribution of working machines, health workers, and clinical needs.	Contribute to national and regional discussions on appropriate settings and timeline for introduction of US services. Guide decisions about rational distribution of US services (geographic, health system levels, etc.).	Install equipment in facilities that have met conditions to protect equipment from heat, electrical power surges, moisture, damage, and theft. Have adequate staff and maintain IPC practices. Comply with standards for equipment care, security, and maintenance.	Understand individual responsibilities for service delivery, including US assessment and/or referral, documentation, counselling, safe and effective use of US equipment, and IPC practices to avoid cross-contamination. Ensure findings from US are used to benefit the ANC clients and stay confidential. Understand and comply with requirements for care, security, and maintenance of equipment at local levels.

ANC: antenatal care; GA: gestational age; IPC: infection prevention and control; QI: quality improvement; US: ultrasound

WHO Department of Maternal, Newborn, Child and Adolescent Health http://www.who.int/maternal_child_adolescent WHO Department of Reproductive Health and Research http://www.who.int/reproductivehealth WHO Department of Nutrition for Health and Development http://www.who.int/nutrition

INDIVIDUAL CLINICAL ENCOUNTERS

High-quality clinical encounters for obstetric ultrasound require an appropriate environment of care. Ideally, the scan and related counselling should take place in a private location, away from waiting areas, to ensure confidentiality. Extra space and seating may be required to facilitate bringing a partner and other family members to ultrasound examinations. Where possible, health workers should ensure that women (and their partners) can see the image on the screen when discussing fetal wellbeing.

Photo: Karen Kasmauski/Jhpiego

Prior to the first ultrasound appointment, pregnant women and their partners/families should be provided with clear information about the clinical purpose of an ultrasound scan along with details of the potential consequences of fetal anomaly detection. Health facility staff should make them aware of potential out-of-pocket costs. Women may come with expectations and preferences around ultrasound that should be acknowledged, considered, and addressed by

health workers in a framework of shared decision-making. Pregnant women and their partners/families should also be informed that an ultrasound scan is a choice and not compulsory. Attention should be paid to helping them understand the limitations of ultrasound, for example, in predicting fetal weight or mode of delivery, as well as the possibility of undetected/undetectable anomalies, especially early in pregnancy.

Box 2 lists components of antenatal ultrasound screening. In a first trimester ultrasound, the health worker can use the crown-rump length to estimate gestational age; in general, this measurement is superior to gestational sac diameter for gestational age estimation. Crown-rump length is optimally measured after 10 weeks gestation but before 14 weeks gestation. Four sonographic parameters are frequently used to estimate gestational age and assess fetal size in the second or third trimester: biparietal diameter, head circumference, abdominal circumference, and femur length.

Where the skill set and health systems allow, the following, which are more informative after 18 weeks of pregnancy, may also be assessed:

- Presence of any structural abnormality in the fetal head, neck, face, spine, chest, heart, abdomen, abdominal wall, or extremities
- Placental appearance and location and umbilical cord

BOX 2. COMPONENTS OF ANTENATAL ULTRASOUND SCREENING

- Location of pregnancy (intrauterine or extrauterine)
- Fetal number (singleton or multiple)
- Cardiac activity (present or absent, fetal heart rate)
- Fetal size and gestational age estimation
- Chorionicity and amnionicity if multiple pregnancy
- Where the skill set and health systems allow, the following, which are more informative after 18 weeks of pregnancy, may also be assessed:
  - Presence of structural abnormality in the fetal head, neck, face, spine, chest, heart, abdomen, abdominal wall, and/or extremities
  - Placental appearance and location

Ultrasound findings should be communicated in a timely and clear manner that the woman and her partner can understand and opportunities to ask questions should be provided. The health workers should document results in the woman's care record and share the results with her, including any recommended follow-up care, particularly for findings requiring urgent intervention (e.g., ectopic pregnancy). Follow-up scans may be recommended in particular cases, such as multiple gestation and placenta praevia. Health workers should be aware of and consider possible social, cultural, and legal implications of documenting or revealing fetal sex following an antenatal scan.

Since ultrasound may detect fetal abnormalities, such as fetal demise or anomalies, the provision of associated support services for pregnant women and their partners/families is important. Cases of suspected fetal demise or anomalies should be confirmed by another competent ultrasound provider. Families require counselling and optimally access to social support networks when an abnormal diagnosis is possible or confirmed.

NATIONAL POLICY CONSIDERATIONS

Policymakers at national and local levels should promote evidence-based standards for health workers (physicians, nurses, midwives, and sonographers). Policymakers should consider the financial implications of creating/updating national policies and standards for ultrasound use, including which cadres will perform ultrasound scans; standardised training of relevant health workers (initial and refresher); extra personnel, including trained staff to replace those lost to attrition; power supply and availability (including surge protection and environmental upgrades); infection prevention and control supplies and processes; routine maintenance and repair; and monitoring and evaluation for quality assurance. Policymakers should also be aware of the potential for overuse of ultrasound and restrict use to the recommended number according to the woman's condition.

Photo: Maternal and Child Health Integrated Program (MCHIP)

Together with frontline health workers, policymakers and health system managers should design systems that allow gestational age information derived from ultrasound to be available in all settings where women (especially those in preterm and post-term labour) may present for care, thus facilitating clinical decision-making that considers the most appropriate interventions and setting for birth, given estimated gestational age. Health system managers should also consider competing priorities in maternal and newborn health services. Potential diversion of resources from other health care needs should be given careful consideration, and in countries where maternal and perinatal mortality is very high, priority should be given to implementation of interventions that improve maternal and newborn survival. Policymakers should also consider health system capacity for consultations and referral upon suspicion or detection of complications, given the possibility of clinical, legal, or other ramifications of problems that do not get addressed through higher level care.

TRAINING AND HEALTH WORKFORCE CONSIDERATIONS

Countries should adopt a standardised curriculum and competency assessment for teaching health workers, for example, physicians, nurses, midwives, and sonographers, how to perform obstetric ultrasound scans to improve safety and quality of clinical care. Consideration should be given to distinguishing training curricula for basic scans (e.g., for fetal number and gestational age) versus more advanced competencies (e.g., anomaly scan). Such training should include both didactic and supervised clinical practicum components. Only health workers who are trained and updated regularly in the appropriate clinical use of ultrasound and related counselling should conduct ultrasound examinations. Many settings use a tiered approach to obstetric ultrasound, whereby some components are performed routinely by health workers who are trained in ultrasound skills but not ultrasound specialists (e.g., assessment of fetal number and gestational age estimation), and scans requiring more advanced ultrasound skills (e.g., diagnosis of fetal anomalies) are performed by more experienced specialists. Education programmes should also promote standards and training in clinical skills for routine gestational age assessment during ANC, for example, strengthening skills of health workers to conduct history and physical exams and understand the strengths and limitations of

ultrasound, which are more accurate and precise for estimating gestational age in the first trimester than later in pregnancy.

To maximise the potential benefits of routine antenatal screening ultrasound, comprehensive training of health workers also includes the importance of appropriate referral and management of abnormalities diagnosed by ultrasound. Obstetric ultrasound has an excellent safety record, and, to date, no independently confirmed study has suggested otherwise. In general, health workers should understand how to monitor mechanical and thermal indices on ultrasound equipment and follow the ALARA principle—that total exposure be "as low as reasonably achievable."[6]

Consideration should be given to training health workers on infection prevention and control measures, proper cleaning and disinfection of equipment and patient care areas, appropriate methods for adjusting transducer position and ultrasound system controls to optimise images, interpretation of images, calculation of best obstetric estimate for gestational age, when and when not to re-date pregnancies, and special counselling considerations related to fetal loss and anomalies. Health workers should have comprehensive training on the use and maintenance of equipment, on how to perform standard components of ultrasound screening, how to record and counsel women regarding results, and how to manage any abnormalities diagnosed by ultrasound. In some cases, appropriate management will include referral to a centre with capacity for more complex care, as well as support for families to access such care.

Photo: Dr. Matthew Reeves, Johns Hopkins University

Sonography (where conducted by sonographers) can be an emotionally challenging and sometimes lonely vocation and the role may require additional training (e.g., in counselling, medical ethics, and communication skills) and regular opportunities for peer support. Expanding the scope of practice for health workers can have both positive and negative consequences. While the opportunity to acquire new skills may be welcome and rewarding for some health workers, others may find new requirements to be burdensome and/or distracting from their current duties. Policymakers should also be mindful of the potential negative impact of shifting nurses, midwives, or physicians to performing scans in settings with staff shortages. The health system must be aware of the risk of medico-legal exposure and develop mechanisms to protect clinicians performing ultrasound, including the use of an informed consent process. Notably, some pregnancy complications, including fetal malformations, may develop later in pregnancy or may not be detectable even with appropriate ultrasound training and equipment.

EQUIPMENT AND OTHER COST CONSIDERATIONS

The cost of equipment, especially for point-of-care ultrasound (POCUS) devices, has decreased in the past decade. However, additional costs, such as for different transducers, additional viewing devices, if needed (e.g., phone or tablet), product guarantee (warranty), and periodic maintenance should also be considered. In addition, some devices may require paid accounts or cloud-based storage of reports and images. Other POCUS devices, while affordable, may lack software capacity to calculate gestational age. Before purchasing equipment, health systems should clarify that the equipment is fit for purpose and if associated software applications are subject to regulatory constraints in their country. Given the cost of equipment, routine and

[6] Salomon, L.J. et al. 2019. "ISUOG Practice Guidelines: Ultrasound Assessment of Fetal Biometry and Growth." *Ultrasound in Obstetrics & Gynecology* 53(6): 715–723.

incidental maintenance, conductive agents (gel), initial and ongoing staff training and supervision, environmental and electrical surge protection for equipment, and staffing (allowing 15–45 minutes per scan), performing routine examinations has multiple resource implications.

Proper handling and care of equipment can prevent costly losses. Prior to purchasing equipment, stakeholders should determine if warranties or repair engineers are locally available to maintain the equipment in question; if not, stakeholders should work to build this capacity. In some locations (e.g., isolated or rural areas) portable equipment may be useful, especially in communities that may not have resources to engage with formal maternity services or where poor infrastructure limits access. However, these settings may face significant challenges in charging and protecting devices.

MONITORING, EVALUATION, AND PROGRAMME LEARNING

New routine antenatal ultrasound programmes should aim to design and implement a service delivery system that includes a strong evaluation component and, where possible, engages in implementation research to generate programme learning on implementation strategies in various settings, including health centre and hospital levels. The WHO ANC monitoring framework includes a specific indicator: "Percentage of pregnant women with an ultrasound scan before 24 weeks".[7] A thorough approach to monitoring and evaluation should ensure that a minimum set of data is available and of good quality to facilitate improvements in obstetric ultrasound practice. These data collected should include the reason for ultrasound (screening versus diagnostic), gestational age at examination, and appropriate referral and management. These data should be used to track financial implications for the facility and health system overall, including attention to appropriate and inappropriate use of ultrasound. Finally, these data should enable an understanding of health and gender equity issues related to the availability and accessibility of routine antenatal ultrasound services. For example, if women are expected to pay for scans, or if scans are not available to women living in rural areas, this intervention could perpetuate existing inequalities. In some countries, determination of fetal sex via ultrasound has a negative impact on gender equity and should be monitored. There remain some uncertainties around undesirable effects of obstetric ultrasound, including risk of litigation, potential for female sex-selective termination of pregnancy, short- and long-term psychological impact of an inconclusive or positive scan finding, and the potential for overuse.

OPTIMIZING IMPACT OF ANTENATAL ULTRASOUND SERVICES

Assessing health system readiness prior to introduction of antenatal ultrasound services can help to identify bottlenecks in care that may impede the potential benefits of ultrasound.[8] In communities where there may be misunderstandings about the potential benefits or harms of ultrasound, new or updated community education programmes should be considered. These should be open to partners and family members, culturally sensitive, and flexible. Functional obstetrical ultrasound programmes include strong systems to ensure safe management of conditions requiring urgent or emergent intervention (e.g., extrauterine pregnancy or placenta praevia). Planning proactively and collaboratively with frontline health workers providing ANC services will facilitate allocation of appropriate human resources needed to accommodate new services and high-quality implementation of other routine ANC services. To facilitate maximum clinical

[7] Lattof, Samantha R. et al. 2020. "Implementation of the New WHO Antenatal Care Model for a Positive Pregnancy Experience: A Monitoring Framework." *BMJ Glob Health* 5(6):e002605.

[8] https://alignmnh.org/resource/guide-to-develop-a-comprehensive-approach-for-introducing-or-scaling-up-obstetric-ultrasound-services-in-low-resource-settings/

benefit to women, programmes should consider implementation strategies, with particular attention to the following:

- Increasing health worker and community awareness of the benefits of ANC, especially beginning in the first trimester, while addressing cultural and health system barriers to ANC access;
- Promoting health worker practices that address women's personal desires and needs in ANC and developing counselling skills to share information and interact with women and their families;
- Promoting service delivery readiness at different health system levels before offering services (readiness includes having trained staff, practice and referral guidelines, equipment and other supplies with maintenance and resupply issues addressed, infection prevention and control standards, environmental controls, and routine quality assurance measures);
- Establishing reliable referral pathways, and coordinating specialised care for women with follow-up needs and abnormal findings that are suspected or diagnosed through obstetric ultrasound; and
- Engaging with national obstetrics, radiology, nursing, and midwifery associations to update members on the WHO ANC recommendations and contribute to discussions on implementation.

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