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Ultrasound assessment of fetal biometry and growth

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Clinical Standards Committee

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A. INTRODUCTION

These guidelines aim to describe appropriate assessment of fetal biometry and diagnosis of fetal growth disorders. These disorders mainly consist of fetal growth restriction (FGR) also named intrauterine growth restriction [IUGR] or, for a large for gestational age fetus (LGA) which may lead to fetal macrosomia (i.e. weight above a given cut-off); both have been associated with a variety of adverse maternal and perinatal outcomes. Screening and adequate management of fetal growth abnormalities are essential components of the antenatal care, and fetal ultrasound plays a key role in these conditions.

The most commonly measured fetal biometric parameters are the fetal biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), and femur diaphysis length (FL). These biometric measurements can be used to estimate fetal weight (EFW) using different formulae [1]. It is important to differentiate conceptually the idea of biometric measurement of fetal size at a given time point from the assessment of fetal growth, which is a dynamic process and requires at least two ultrasound scans separated in time. Maternal history and symptoms, amniotic fluid assessment and Doppler velocimetry can provide additional information that may be used to identify fetuses at risk of adverse pregnancy outcomes.

Accurate estimation of gestational age (GA) is an essential prerequisite to assess whether fetal size is appropriate for gestation. Except for pregnancies arising from assisted reproductive technology (ART), the exact day of conception cannot be precisely determined. Clinically, most pregnancies are dated by the last menstrual period (LMP), though this may sometimes be uncertain or unreliable. Because of this, dating pregnancies by early ultrasound based on measurement of the fetal crown rump length (CRL) at 8-14 weeks' appears to be the most reliable method to establish the gestational age. Once the CRL exceeds 84 mm, HC should be used for pregnancy dating [2–4]. Head circumference, with or without FL, can then be used from mid-trimester if a first trimester scan is not available and the menstrual history is unreliable. When the EDD (expected delivery date) has been established by an accurate early scan, subsequent scans should not be used to recalculate the gestational age [1]. Serial scans can then be used to determine if interval growth has been normal.

In this document, we will assume that GA is known and has been determined as described above; that

the pregnancy is a singleton; and that the fetal anatomy is normal.

B. GUIDELINE

Appropriate for Gestational Age (AGA), refers to a fetus whose size is within the normal range for its gestational age. AGA fetuses typically have individual biometric parameters and / or estimated fetal weight between the 10th and 90th percentile.

Small for Gestational Age (SGA), refers to a fetus that is below a predefined threshold for its gestational age. SGA fetuses typically have an estimated fetal weight or AC below the 10th percentile, although 5th, 3rd centile, -2SD and z-score deviation are often used in the literature.

Fetal growth restriction also called IUGR refers to a fetus that has not achieved its growth potential. The difficulty in determining growth potential means that this is difficult to reach a consensus regarding a clinically useful [5]. This condition can be associated with adverse perinatal and neurodevelopmental outcomes and has been divided into early-onset (detected before 32 weeks' gestation) and late-onset (detected after 32 weeks' gestation) [5,6]. Fetuses with suspected FGR will not necessarily be associated with a SGA newborn; and a fetus may fail to achieve its growth potential despite not being SGA at birth. Similarly, not all SGA fetuses are growth restricted and most are likely to be "constitutionally" small [7].

The fetal body proportions were traditionally seen as indicative of the underlying etiology for FGR, with symmetrical FGR thought to correspond to fetal aneuploidy and progressive asymmetrical FGR thought to indicate placental insufficiency. However, fetal aneuploidy can result in asymmetrical [8] and placental insufficiency can result in symmetrical FGR [9]; moreover, the symmetry of body proportions alone is not a consistent prognostic predictor [10–12].

Large for Gestational Age (LGA), refers to a fetus whose EFW or AC is above the reference range for its gestational age. LGA fetuses typically have an estimated fetal weight above the 90th percentile, although 95th, 97rd centile, +2SD and z-score deviation have also been used as 'cut-offs' in the literature. Macrosomia at term usually refers to a weight above a fixed cut-off (4000 or 4500g).

Recommendations

- ISUOG recommends using the following abbreviation to describe fetal size and growth: appropriate for gestational age (AGA), small for gestational age (SGA), large for gestational age (LGA), fetal growth restriction (FGR) (**Good Practice Point**)
- The terms early-onset (detected before 32 weeks' gestation) and late-onset (detected after 32 weeks' gestation) can be added in case of FGR (**Grade of Recommendation: C)**
- Symmetrical or asymmetrical forms of FGR should no longer be used given that they do not provide additional information as regards to the etiology or prognosis (**Grade of Recommendation: D**)

Main fetal measurements: what should be measured, when and how?

Training and equipment:

Individuals performing ultrasound scans and fetal biometry on a routine basis should have specialized training on the practice of diagnostic obstetric ultrasound, including training in ultrasound safety. Exposure to ultrasound should comply with the "as low as reasonably achievable" (ALARA) principle [1,2]. Equipment should have real-time, grey-scale, two-dimensional transducers, adjustable and displayed output power, freeze frame and zoom options with electronic calipers. Image storage and

printing should follow local guidelines [1,2]. These machines should have a regular maintenance schedule.

What to measure?

Before 14 weeks, CRL should be used to assess fetal size and estimate gestational age. After 14 weeks, usual measurements include biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC) and femur diaphysis length (FL) [1,2].

How to perform the measurements

Measurements can be taken transabdominally or transvaginally. For all measurements, clear images with sufficient magnification and correct depiction of landmarks are needed to allow precise caliper placement [1]. Caliper placement should be done as described in the charts that are chosen for gestational age or size determination. Regular quality assurance should be performed [1,2,13]. A review of measurement techniques and pitfalls can be found on line at the INTERGROWTH-21st website: https://intergrowth21.tghn.org/site_media/media/articles/US_Manual_FINAL.pdf. For the measurement of HC or AC the use of the ellipse tool or of the two diameters methods, placing the calipers in an outer to outer position, is equally reproducible [14]. It is essential that, within the same institution or within the same referring hospital local or national network, the same method is adopted to allow consistency. The measurements should be taken following the same methodology as in the studies that produced the references curves which are applied in the given hospital/system.

Recommendations

- ISUOG recommends BPD, HC, AC and FL measurements at the time of US scan from 14 weeks onwards (**Grade of Recommendation: D**).
- HC and AC should be obtained using the ellipse measurement tool by placing the calipers on the outer edges of the soft tissue circumference.
- The measurements should be taken following the same methodology as in the studies that produced the references curves which are applied in the given hospital/system (**Good Practice Point**).

How should fetal weight be estimated?

Estimated Fetal Weight (EFW) may be used to monitor fetal size and growth [4]. Using the EFW allows:

- clinicians to summarize fetal growth, depending on which size parameters are included;
- use of the same anatomic parameter (s) for monitoring pre- and postnatal growth (ie weight);
- communication with parents and pediatricians on the anticipated birth weight.

However, it also has disadvantages [15,16]:

- errors in single parameter measurements are multiplied;
- accuracy of EFW is compromised by large intra- and interobserver variability, and errors in the range of 10-15% are common [17].
- errors are relatively larger in those fetuses of greatest interest, i.e. those that are SGA or LGA
- very different fetal phenotypes can have identical EFW – for example, a fetus with a large HC and small AC may have same EFW as one with a small HC and large AC.
- Most EFW prediction models require abdominal circumference, a size parameter that can be difficult to measure due to technical factors.

Given the errors in the estimation of fetal weight, the time interval between scans to be at least two to

three weeks to minimize false positives for the detection of fetal growth disorders [18]. However, monitoring of fetal status may require interval scans with no EFW computation. The EFW should be compared to one of several dedicated nomograms for this purpose. EFW should not be plotted on newborn BW charts, given that the latter include a large proportion of growth restricted fetuses that are delivered early in gestation [19,20] .

Recommendations

- ISUOG recommends careful interpretation of individual anatomic size parameters. When EFW is computed, ISUOG recommends interpretation of the calculated value based on existing nomograms (**Good Practice Point)**.
- EFW should not be plotted on newborn BW charts, given that the latter include a large proportion of growth-restricted fetuses delivered early in gestation (**Grade of Recommendation: C**).

Quality control of fetal biometric measurements

Quality control (QC) in fetal biometry is essential for auditing and monitoring purposes. A comprehensive QC strategy should involve image storage and review, and assessment of intra- and inter-observer reproducibility [3,13,21]. National guidelines and local institution guidelines should promote the use of standardized planes of acquisition and calipers placement methods. Such an approach has been demonstrated to improve measurements reproducibility [22].

Quality control of images for CRL, HC, AC and FL has been proposed using scored criteria; such scoring is proposed below (Table 1) [23,24]. Quality control of data can also be performed by assessment of intraobserver reproducibility (by re-acquisition of images and caliper placement on stored images by the same operator) or interobserver reproducibility (by caliper replacement by a second operator) [25]. Last, analysis of measurements distribution can also be performed [26].

Recommendations

- ISUOG recommends the routine quality control of biometric images (**Good Practice Point)**.
- National and local institution guidelines should be followed (**Good Practice Point)**.
- Quality control processes may include the following points (**Good Practice Point)**:
  - Image review (best performed by an experienced individual who understands basic principles of quality assurance and ultrasound practice).
  - Performance of QC on at least 10% random selection of stored images for inter-observer reproducibility, by replacing calipers on stored images; and intra-observer reproducibility by re-acquisition of images and caliper placement by the same operator.
  - Analysis of z-score distribution of specific fetal size parameters, including EFW
- ISUOG recommends re-training if images are poor, measurements are persistently outside 95% limits of agreement, or if z-score distributions differ from expected values (**Good Practice Point)**.

What are the main differences between various references and standards to assess biometry?

The choice between descriptive reference ranges and prescriptive standards of growth is important. It should be emphasized here why this difference is fundamental:

i) Several retrospectively constructed reference curves are available that describe the distribution of a measurement in a given population over a given time period (for example Hadlock et al. 1985) [27]. However, only limited number of these descriptive

"reference ranges" or "population based charts" are of high methodological quality [21].

ii) Prescriptive standards describe growth under optimal conditions: they provide ranges for what should be expected when women are healthy and arise from healthy populations (for example Intergrowth charts [4]. The comparison with healthy population standards is the usual method of comparing observations of a single case in medicine; this may be different from what is seen in populations at higher risk of growth aberrations.

iii) Prescriptive standards are mainly built from prospective data for which sample size and population selection are predefined, preferably from international geographical sites, with appropriate pregnancy dating, ultrasound protocols and quality control;

Independently from the prescriptive or descriptive design:

iv) Fixed or random sampling should allow for uniformly balanced data across gestation;

v) Owing to the nature of prospective cohort studies, pregnancy outcomes should be documented with minimal rates of loss to follow-up and low prevalence of pregnancy complications.

What reference / standard ranges should be used?

Different reference charts may report different centiles for the same fetal measurement; this may be due to methodological differences in creating fetal reference charts [3,21]. More recently, prescriptive charts have reported on how a population "should grow" (rather than how a population has grown at a specific point in time) [4,28–31]. This concept led to the construction of international standards for fetal biometry, which describe the optimal growth in fetuses from pregnancies at low risk of fetal growth restriction [4,29]. These standards, derived from multicenter, multiethnic, geographically diverse populations at low risk of adverse maternal and perinatal outcomes, may reflect more appropriately modern clinical practice. Adoption of such prescriptive charts would also allow continuity of assessment of growth between intrauterine and postnatal life. Customized and conditional charts have been proposed in alternative to population or reference charts [30,32–34]. Customized reference charts are used by adjusting for variables known to affect fetal weight and growth, such as maternal height and weight, ethnic origin, parity and fetal sex. Compared with population-based non-customized reference charts, a customized chart will identify a different proportion of SGA fetuses at birth. This may be relevant by better capturing fetuses at risk of perinatal complications, for units where the antenatal population is very diverse in those factors, but the benefit of such approaches over population-based charts could not been demonstrated in recent prospective studies [35]. Evaluating the impact of using one chart or another by applying it to a local database may be performed as an exploratory and preliminary process.

The following WHO criteria should be considered to produce growth charts. They can be grouped into three main domains:

1- Selection of the observed population
2- Collection of outcome
3- Standardization of the technique for observation.

1- Regarding the selection of the population, the study should be large and prospective, truly population-based (different from reference population-based). Institutions providing pregnancy

care should be geographically limited in urban areas with low rates of adverse perinatal outcomes and low pollution, domestic smoke, radiation, and other toxic substances. Those should be essentially delimited geographic areas where the health, educational, and nutritional needs of all the inhabitants are mostly reached.

2- Sampling of women should use predefined criteria for construction of standards and specific outcome should be collected: neonatal anthropometry (newborn body composition, infant feeding practices, and preterm postnatal growth, as well as postnatal growth), perinatal conditions recorded for total population, postnatal motor development assessment following WHO milestones using standardized procedures, identical equipment, and centrally trained staff.

3- Finally, ultrasound equipment should be selected based on predefined criteria after extensive public consultation according to WHO administrative requirements. Ultrasound measures should be taken in multiple observation and be corroborated by newborn anthropometry. Ultrasound biometry results should be masked to operators to eliminate expected result bias. Quality-control strategy for all maternal and postnatal measures should include training, standardization, and certification of ultrasound operators using protocols for quality control of ultrasound image review, data monitoring, and random sample re-measurement.

Recommendations for the generation of growth standards

- ISUOG recommends the use of fetal biometry charts which are prescriptive, prospectively obtained, truly population based, derived from studies with lowest methodological bias (**Good Practice Point)**
- ISUOG recommends routine evaluation of the number (%) of fetuses considered as abnormally grown (ie below of above a given cut-off) (**Good Practice Point)**.
- Practitioners should be aware of nationally or locally mandated charts (**Good Practice Point)**

What metric should be used in describing biometry (raw values, centiles, z-score, MoMs)? What cut-off should be used to define abnormal biometry?

Fetal ultrasound observed measurements can be reported as raw data, expressed in mm or cm; because measurement and their distributions change with advancing gestation centile, z-score, percentage of deviation from the mean or multiple of median [22] should also be used to when referring to raw data of a reference range. Centiles or z-scores are measures of deviation from the mean of a population, under the assumption of an underlying normal distribution of the measured parameter. The use of z-scores has several advantages, as the scale is linear and it allows comparison between different biometric variables at different gestations [36]. Centiles are intuitively more understandable and there is an exact correspondence with z-scores in case of standard normal distribution of the population (5^{th} centile is equivalent to -1.64 z -score, 10th centile is equivalent to -1.28 z-score) [37].

Traditionally, a cut-off point below the 10th centile for gestation for AC and/or EFW is a commonly accepted definition of FGR. However, the 10th centile cut off value varies depending on the chart used. Moreover, most SGA babies are not growth-restricted at birth, and some of the babies with growth restriction due to placental insufficiency who are at risk of compromise or stillbirth are AGA [38]. The lower is the cut off of AC and EFW, the higher is the risk of true FGR [35]. An international consensus statement recently proposed that a cut off of AC or EFW <3^{rd} centile may be used a sole diagnostic criterion for FGR in isolation. In case of AC or EFW <10th centile, the diagnosis of FGR should be

considered only in association with other parameters (Table 2) [5]. Depending on the gestational age, these are represented by maternal (uterine artery) or fetal (umbilical or cerebral/umbilical artery) Doppler findings or by an AC and EFW centile drop in serial scans (> 2 quartiles).

Recommendations

- ISUOG recommends to plot observed values in mm and to use calculated centiles or Z scores (**Good Practice Point)**.
- A small fetus (AC or EFW < 10th centile) should be considered at risk for FGR **(Grade of Recommendation: C)**
- Diagnostic criteria for FGR may also be based on published Delphi consensus criteria[5] (**Good Practice Point**).

What is the difference between fetal size and growth? How could growth be evaluated?

Differences between size and growth

There are various methods to construct standards for fetal growth: ideally, studies should assess serial measurements of size parameters in growing fetuses as these provide significant advantages in evaluating the growth process: 1) ability to use true growth parameters (growth rates); 2) evaluation of growth trajectories, particularly in the 3rd trimester when most growth abnormalities occur; 3) determination of outcomes for correlation with prenatal growth assessments. The challenges of such studies are their cost, time required for data acquisition and the necessity for strong patient compliance.

Serial ultrasound scans must be used to construct **longitudinal growth charts** where several measurements are taken on the same fetuses at different gestational ages [39]. Fetal **growth velocity** is typically represented by growth velocity charts deviation (change in centiles or z-score with advancing gestation), and is particularly relevant for assessing fetal growth, rather than fetal size. Some [35,40,41], but not all [42–44] studies have reported that reduced third trimester growth velocity of fetal biometry is associated with an increase in incidence of some adverse pregnancy outcomes, but the association of growth velocity in earlier trimesters and adverse outcomes is still not definite or clear. **Individualized growth assessment** (IGA) is based on measuring second-trimester growth velocity of fetal size parameters to estimate growth potential. These estimates specify size models that generate individualized third-trimester size trajectories and predict birth characteristics [45]; **Conditional biometry** is intuitively done when a clinician undertakes visual assessment of the patterns of acceleration or deceleration of growth over time; it is possible to assess conditional distributions of growth formally, using information from previous measurements to assess individual growth [39].

Overall, direct growth rate measurements have generally not been shown to add significant information to growth assessment. However, a 2015 publication by Sovio et al indicated that if AC growth rate was abnormally low in fetuses considered SGA by EFW, there was a significant increase in neonatal morbidity, suggesting that growth rates may have to be combined with other assessment procedures to be useful in 3rd trimester evaluation of growth [35].

Recommendations

- Appropriate statistical procedures should be used to develop fetal growth standards (**Good Practice Point)**.
- Fetal growth analysis may help in the management of pregnancies, although the clinical implementation will depend on local practice and institutional guidelines (**Good Practice**

Point).

- Observation of centiles or z-score drops on growth charts may trigger further monitoring (**Grade of Recommendation: C**); a drop of two quartiles has been recommended by consensus criteria for FGR [5].
- The relationship between growth velocity over time and the detection of small fetuses at risk for adverse outcome requires additional investigation.

How and When Should We Screen for Fetal Growth Restriction and/or SGA Fetuses, including Distinction Between Normal and At-Risk Pregnancies?

A routine mid-trimester ultrasound scan is typically performed between 18 and 22 weeks of gestation [1]. This period represents a compromise between dating the pregnancy (more accurate if established earlier) and the timely detection of major congenital anomalies. The practice or the need for any additional 3rd trimester scans is based on local guidelines, on the presence or absence of maternal or fetal conditions, risk factors or related findings that are known to be associated with abnormal growth [6]. Serial scans for interval growth are optimally performed at least 3 weeks after a preceding scan [1], when indicated. Computer modeling indicates that ultrasound scanning for abdominal circumference at 2-week intervals is associated with false-positive rates for growth restriction in excess of 10%, leading to excessively higher rates late in the third trimester [18].

Additional scans may also be beneficial for monitoring fetal status and for subsequent detection of fetal growth abnormalities [35]. Ultrasound examination at 36 weeks' gestation was more effective than that at 32 weeks' gestation in detecting FGR and related adverse perinatal and neonatal outcomes [46]. Future research should include more accurate sonographic detection of SGA infants, to identify a small fetus at risk for morbidity, and to determine interventions that could improve neonatal outcome [47].

What to do in case of abnormal biometry?

The management of fetal growth restriction is beyond the scope of this guideline.

Abnormal biometry should trigger a referral for detailed assessment of the fetus including:

- Confirmation of accurate dating of the pregnancy
- Assessment of potential factors that have resulted in the abnormal biometry, including:
    - Maternal factors with appropriate treatment (hypertension, diabetes, infectious exposure)
    - Detailed evaluation of fetal anatomy and consideration of karyotype
    - Evaluation for uteroplacental insufficiency including uterine and umbilical artery Doppler and objective placental morphology assessment (location of the cord insertion, size and aspect of the placenta).

Management will depend on the cause for FGR. In many cases, this will include assessment of fetal well-being in order to identify those fetuses requiring delivery. There is no consensus on the optimal approach to fetal assessment under these circumstances. Antenatal testing strategies include: cardiotocography (non- stress test), including by means of computerized assessment (e.g. Dawes-Redman criteria) [48]; Biophysical profile (BPP); amniotic fluid volume assessment (AFV); evaluation of Doppler indices of the umbilical artery (UA), middle cerebral artery (MCA), or combination of the two (cerebro-placental ratio); aortic isthmus and ductus venosus (DV) [49–51].

Recommendations

- ISUOG recommends timely referral to an appropriate unit for individualized management. This will depend on many factors including maternal factors, fetal gestational age, and the results of ultrasound and other tests (**Good Practice Point**).
- In the presence of abnormal biometry, maternal symptoms of de novo hypertension and/or absent/reverse end diastolic umbilical blood flow should prompt urgent referral to a subspecialist in high risk pregnancy (**Good Practice Point**).

What document should be produced/stored/printed to demonstrate measurements?

Fetal biometry / growth report typically include:

- *Relevant medical or obstetrical conditions*
- Scan Indication
- Scan Date
- Best estimate of gestational age and estimated delivery date (EDD)
- Agreed gestational age on date of scan
- *Amniotic fluid assessment (*either by visual assessment, deepest vertical pool or amniotic fluid index)
- BPD (biparietal diameter) - centile AND/OR z-score and reference/standard used
- HC (head circumference) - centile AND/OR z-score and reference/standard used
- AC (abdominal circumference) - centile AND/OR z-score and reference/standard used
- FL (femur diaphysis length) – centile AND/OR z-score and reference/standard used
- EFW (estimated fetal weight) - grams, centile AND/OR z-score, formula and reference/standard used
- *Graphs (e.g. size parameters and estimated fetal weight vs gestation age)*
- *Antenatal testing results (e.g. BPP or Doppler scans (REF to Doppler ISUOG GL)) if relevant*
- *Diagnostic Impression*
- Recommendations for follow-up examination or management

Assessment of Fetal Growth and Development – Additional Approaches

Conventional 2D size parameters (e.g. BPD, HC, and FL) emphasize skeletal development. Even abdominal circumference primarily reflects liver size with a small amount of surrounding skin and subcutaneous fat. Soft tissue quantification allows indirect assessment of fetal nutritional status. Improvements in gray scale ultrasound resolution and the more recent application of 3D ultrasonography have made technically easier to evaluate fetal fat and muscle components such as whole fetal limb volume measurements [52,53]. The concept of fractional limb volume was developed to improve the reproducibility and efficiency for manually tracing fetal limb volumes [54]. These measurements can serve as an index of fetal nutritional status and there are studies suggesting that combination of fractional limb volume with 2D biometry improves the precision of EFW [55–57] with some improvement for detecting late onset FGR at 34-36 weeks [57].

Normative MRI biometric reference ranges have been developed for several fetal anatomic structures with many publications describing the growth and developmental landmarks for the brain and lung. However, poor inter-observer agreement indicates a need for technical refinement and reference ranges that are specific for MRI [58]. A recent meta-analysis of MRI and US for the prediction of neonatal macrosomia concluded there is insufficient evidence to conclude MRI based EFW is more sensitive

than ultrasonography in this setting [59].

Areas for future research

Current research on FGR has focused on the poorer outcome of fetuses with an EFW of less than 10% with abnormal Doppler measurements. However, there are still babies born with birth weights of more than 10% whose postnatal outcome is inexplicably poor. Fetuses whose birthweight falls within normal range but, nevertheless do not reach their growth potential may represent those with higher risk of poor perinatal outcome. Given this heterogeneity of the groups defined by estimated weight/birth weight, it may be necessary to study individual fetuses with additional anatomical parameters or parameter sets. As growth abnormalities evolve in different ways, longitudinal studies of affected fetuses with methods that quantify growth pathology may be necessary to define those individuals truly at risk for adverse outcomes.

The placenta may play a key role in abnormal growth and functional imaging of the placenta may help in predicting such outcomes [60]. Future research is needed to improve the antenatal care of these cases

CONCLUSION

The acquisition and interpretation of fetal biometry is an important component of obstetrical ultrasound practice. In fetuses where gestational age has been appropriately established, measuring key biometric parameters, together with transformation of these measurements into EFW using one of many validated formulae, permits one to detect and monitor small fetuses. Serial sonographic assessments of fetal size over time can provide useful information about growth with the possibility for improving the prediction of SGA infants, particularly those at risk for morbidity. However, errors and approximations that may occur at each step of such a process greatly hamper our ability to detect abnormal growth, most importantly IUGR. Therefore, in clinical practice, fetal biometry could represent only one component of how we should screen for abnormal growth. It is reasonable to believe that no measurement, EFW formula, or chart will significantly improve our current practices. Improved FGR screening may be feasible by using a combined approach that includes biometry as well as other clinical, biological and/or imaging markers. This goal will be more likely once the "biometric component" is better standardized for all healthcare providers who care for pregnant women.

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