Quality Control in Obstetric Ultrasound

Laurent J SALOMON
Maternité Necker-IPP
Paris
• Follow the guidelines

• Qualitative quality control

• Quantitative quality control

• Ultrasound machine quality control
ACR PRACTICE GUIDELINE FOR THE PERFORMANCE OF ANTEPARTUM OBSTETRICAL ULTRASOUND

PREAMBLE

These guidelines are not an educational tool designed to assist practitioners in providing appropriate diagnostic care for patients. They are not infallible rules or requirements of practice and are not intended, nor should they be construed, to establish a legal standard of care. For these reasons and those set forth below, the American College of Radiology cautions against the rule of these guidelines in litigation in which the clinical decisions of a practitioner are called into question.

The ultimate judgment regarding the propriety of any specific procedure or course of action must be made by the physician or medical practitioner in light of all the circumstances presented. Thus, an approach that differs from the guidelines, standing alone, does not necessarily imply that the approach was below the standard of care. In the country, a conscientious practitioner may responsibly adopt a course of action different from that set forth in the guidelines when, in the reasonable judgment of the practitioner, such course of action is indicated by the conditions of the patient. Limitations on available resources or advances in knowledge or technology subsequent to publication of the guidelines may reasonably alter the approach taken.

The practice of medicine involves not only the science, but also the art of dealing with the prevention, diagnosis, observation, and treatment of disease. The variety and complexity of human conditions make it impossible to always reach the most appropriate diagnosis or to predict with certainty a particular response to treatment. It should be recognized, therefore, that adherence to these guidelines will not assure an accurate diagnosis or a successful outcome. All that should be expected is that the practitioner will follow a reasonable course of action based on current knowledge, available resources, and the needs of the patient to deliver effective and safe medical care. The sole purpose of these guidelines is to assist practitioners in achieving this objective.

1. INTRODUCTION

The clinical aspects of this guideline (Specifications of the Examination and Equipment Specifications) were developed collaboratively by the American College of Radiology (ACR), the American Institute of Ultrasound in Medicine (AIUM), and the American College of Obstetricians and Gynecologists (ACOG). Recommendations for physician qualifications, procedural documentation, and quality control vary among these organizations and are addressed by each separately.

This guideline has been developed for use by practitioners performing obstetrical ultrasonographic studies. Fetal ultra-
• Follow the guidelines

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• Ultrasound machine quality control
Nuchal translucency audit: a novel image-scoring method

A. Herman, R. Maymon, E. Dreazen, E. Caspi*, I. Bukovsky and Z. Weinraub

Department of Obstetrics and Gynecology, Assaf Harofeh Medical Center, Zerifin;* The Tarnovsky Tarnowsky Chair for Family Planning and Fertility Regulation, Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel
Effect of plane

HC : 293 mm → 70th p.

HC : 287 mm → 50th p.

HC : 266 mm → 10th p.
AC: +5 -10%
Feasibility and reproducibility of an image-scoring method for quality control of fetal biometry in the second trimester

L. J. SALOMON*, J. P. BERNARD*, M. DUYME†, B. DORIST†, N. MAS† and Y. VILLE‡

*Service de Gynécologie–Obstétrique, Centre Hospitalier Intercommunal de Poissy-St Germain, Poissy and †Laboratoire Biostatistique, Recherche Clinique et Santé Publique, Faculté de Médecine de Montpellier, Université Montpellier I, France
• Symmetrical plane
• Plane showing the thalami
• Plane showing the cavum septi pellucidi
• Cerebellum not visible
• Head plane occupying more than half of the total image size
• Callipers and dotted ellipse correctly placed
• Symmetrical plane
• Plane showing the stomach bubble
• Plane showing the portal sinus
• Kidneys not visible
• Abdominal plane occupying more than half of the total image size
• Callipers and dotted ellipse correctly placed
• Both ends of the bone clearly visible
• < 45° angle with the horizontal line
• Femoral plane occupying more than half of the total image size
• Callipers correctly placed
A score-based method for quality control of fetal images at routine second-trimester ultrasound examination

L. J. Salomon\textsuperscript{1,2}, N. Winer\textsuperscript{2,3}, J. P. Bernard\textsuperscript{1,2} and Y. Ville\textsuperscript{1,3,*}

\textsuperscript{1}Department of Obstetrics and Gynecology, Université Paris-Ouest Versailles-St. Quentin, Centre Hospitalier Intercommunal Poissy-St. Germain, Poissy, France
\textsuperscript{2}Department of Obstetrics and Gynecology, Centre Hospitalier Universitaire de Nantes, Nantes, France
\textsuperscript{3}Société Française pour l'Amélioration des Pratiques Échographiques (SFAPE)
Each criterion met scored one point yielding a maximum score of thirty two

<table>
<thead>
<tr>
<th></th>
<th>4 chambers visible.</th>
<th>Pulmonary artery bifurcation visible</th>
<th>Circular view of the 1\textsuperscript{st} kidney</th>
<th>Heart visible</th>
<th>Dorsal spine visible</th>
<th>Superior lip visible</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Heart apex visible.</td>
<td>Ascending aorta visible</td>
<td>Circular view of the 2\textsuperscript{nd} kidney</td>
<td>Stomach visible</td>
<td>Sacrum visible</td>
<td>2 nostrils visible</td>
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<tr>
<td>3</td>
<td>Heart crux visible.</td>
<td>Right ventricle visible</td>
<td>Posterior kidney clear from the rachis acoustic shadow.</td>
<td>Rachis non visible</td>
<td>Rachis visible from the dorsal level to the sacrum</td>
<td>2 lip angles visible</td>
</tr>
<tr>
<td>4</td>
<td>One pulmonary vein visible</td>
<td>Pulmonary artery curling up the aorta.</td>
<td>CM differentiation or pyelic cavity visible.</td>
<td>Diaphragmatic interface visible from back to front</td>
<td>Skin line continuity</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Descending thoracic aorta visible.</td>
<td>-</td>
<td>-</td>
<td>Thigh and neck visible</td>
<td>Amniotic fluid visible beyond the skin</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>ROI &gt; 50% image</td>
<td>ROI &gt; 50% image</td>
<td>ROI &gt; 50% image</td>
<td>ROI &gt; 50% image</td>
<td>ROI &gt; 50% image</td>
<td>ROI &gt; 50% image</td>
</tr>
</tbody>
</table>

• Follow the guidelines

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CUSUM....

Biau, Porcher & Salomon UOG 2008
EXEMPLE 1:

BIASED MEASUREMENTS!
EXEMPLE 2:

UNDER CONTROL
Z score = 0.04
Z score = -0.42
Z score = -0.9
Z-score distribution

Moyenne = 0
SD = 1

5% 5%

-1.645 0 1.645

5% 5%
Salomon LJ et al
UOG
The impact of choice of reference charts and equations on the assessment of fetal biometry

L. J. SALOMON*, J. P. BERNARD*, M. DUYME†, I. BUVAT‡ and Y. VILLE*

*Service de Gynécologie-Obstétrique, Centre Hospitalier Intercommunal de Poissy-St Germain, Poissy, †Laboratoire Biostatistique, Recherche clinique et Santé Publique, Faculté de Médecine de Montpellier, Université Montpellier I, Montpellier and ‡Unité 494, Institut National de la Santé et de la Recherche Médicale, Centre Hospitalier Universitaire Pitié-Salpêtrière, Paris, France

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<th>Parameter</th>
<th>Reference</th>
<th>5th or 95th centile</th>
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<th>TP</th>
<th>FP</th>
<th>FN</th>
<th>Number misclassified</th>
<th>Se (%)</th>
<th>Sp (%)</th>
<th>Youden’s index</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
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<td>439</td>
<td>448</td>
<td>350</td>
<td>98</td>
<td>89</td>
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<td>434</td>
<td>443</td>
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<td>191</td>
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<td>C</td>
<td>435</td>
<td>440</td>
<td>273</td>
<td>167</td>
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<td>97.51</td>
<td>0.571</td>
<td>72.78</td>
<td>94.53</td>
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Analysis of Z-score distribution for the quality control of fetal ultrasound measurements at 20–24 weeks

L. J. SALOMON, J. P. BERNARD and Y. VILLE
Service de Gynécologie – Obstétrique, Centre Hospitalier Intercommunal de Poissy-St Germain, Poissy, France

Figure 1 Distribution of biparietal diameter Z-scores in the second trimester for sonographer D, illustrating how a discrepancy between expected (standard normal distribution) and measured distribution generates false-positive (Example 1) and false-negative
• Follow the guidelines

• Qualitative quality control

• Quantitative quality control

• Ultrasound machine quality control
### Echographie
- Connexions
- Câbles
- Râles
- Capot
- Supp. sonde
- Freins
- Accès Modes
- TGC

**Visuel**

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### Clavier
- Mouvement
- Touches
- Réacteurs
- Potentiomètres
- Trackball

**Visuel**

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### Moniteur
- Mouvement
- Connexions
- Boutons
- Contraste
- Lumière

**Visuel**

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### Nettoyage
- Clavier
- Trackball
- Moniteurs
- Sondes
- Support de sondes
- Filtres
- Ventilateurs
- Cartes Internes

**Visuel**

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### Réalisé
- Oui
- Non

### Convexe
- Modèle 4C1
- N° série 11132202
- Date

**Visuel**

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### Convexe
- Modèle 6C2
- N° série 21640509
- Date

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### Convexe
- Modèle 8.5
- N° série 20287706
- Date

**Visuel**

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### Convexe
- Modèle 15.8v
- N° série 30688702
- Date

**Visuel**

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### Réprographe N/B
- Marque Sony
- Modèle UP-895MD
- N° série 60530
- Date 14.10.2002

**Visuel**

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### Réprographe C
- Marque
- Modèle SVO-9500MD
- N° série 23021
- Date 14.10.2002

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### Magnétophone
- Marque Sony
- Modèle
- N° série
- Date

**Visuel**

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### Test de Sécurité Électrique
- Impédance Masse - Terre : 0,3 Ω
- Impédance Masse - Phase : 4 Ω
- Impédance Masse-Neutre : 4 Ω
- Tension secteur : 230,4V

**Commentaire**

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### Gel et Désinfectant
- Désinfectant : Oui
- Gel utilisé : Nicongel

**Commentaire**

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### Mesures des Tensions d’Alimentation
- : 0 Ω
- : 0 Ω

**Commentaire**

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RMI 403 LE-0.7 Precision Multi-Purpose Phantom

RMI 403-0.5 Precision Multi-Purpose Phantom

RMI 403-0.7 Precision Multi-Purpose Phantom

RMI 403GS LE-0.5 Precision Multi-Purpose Grey
Possibilité ou non de distinguer nettement les fils Nylon les uns par rapport aux autres
• Follow the guidelines

• Qualitative quality control: training, random image analysis..

• Quantitative quality control: choose the reference chart, stick to it

• Ultrasound machine quality control
“Quality is never an accident; it is always the result of intelligent effort.”

John RUSKIN
Nobody can care more than yourself!