Goal
Guide clinicians in the appropriate ordering/use of general diagnostic imaging testing for the pregnant patient. This guideline is intended for application to patients with known pregnancy. For information regarding pregnancy testing/screening, refer to the Policy and Procedure for Assessment of Patients, Section 2 “Scope of Assessment by the Medical Staff”, Item C. “Pregnancy Assessment”.

Other specific diagnostic guidelines include: Acute Pyelonephritis Diagnosis and Management, Pulmonary Embolism: Evaluation and Initial Management, and Deep Venous Thrombosis (DVT): Initial ED Management.

Key Points
• Imaging modalities utilizing ionizing radiations (radiography, mammography, CT and nuclear medicine) are associated with potential health hazards for the woman and fetus.
  o Potential hazards associated with ionizing radiation exposure levels are summarized in Table 1.
  o The risk of carcinogenesis at diagnostic dose levels remains controversial.
• Ultrasound or MRI are the preferred modalities over those involving ionizing radiation, when appropriate.
• Most diagnostic radiologic procedures are associated with little, if any, known significant fetal risks.
• Balance the risk/benefit of the study. Consider consulting a dosimetry expert to estimate the fetal dose.
• Efforts should always be made to minimize radiation exposure to the embryo or fetus, and to follow the principle of ALARA (as low as reasonably achievable).

Diagnostic Imaging Information

Ultrasound
• Does not involve ionizing radiation; therefore generally a safe modality for use at all time during pregnancy
• Breast ultrasound is safe during pregnancy
• Thermal effect usually negligible for diagnostic sonography
  o 2D color Doppler ultrasound to detect fetal cardiac activity in the first fourteen weeks of pregnancy should not be used (M-mode Doppler can be used instead)

Magnetic Resonance Imaging (MRI)
• No ionizing radiation or evidence of harmful effects to the fetus
• Safely demonstrates a wide range of pathologic conditions in the abdomen and pelvis
• Is preferable to ultrasound in the diagnosis of appendicitis in pregnancy

Radiography (X-Ray)
• Single studies are generally considered safe
• When multiple diagnostic tests are anticipated during pregnancy, consider ultrasonography and/or MRI
• For exams where the uterus/fetus are not directly irradiated, the fetal dose is negligible
• In cases where the uterus/fetus will be in the primary beam, the fetal dose is generally low, but the number of exposures should be limited to only those necessary for diagnosis

Computed Tomography (CT)
• For studies where the fetus/embryo is not directly irradiated, the fetal dose is typically low (below 1 mGy)
• For studies where the fetus/embryo is in the primary beam, the fetal dose can potentially be as high as 50 mGy
  o Such studies should only be conducted when the benefits clearly outweigh the risks

Mammography
• Can be performed safely at any time during pregnancy
• Radiation exposure to the fetus from a properly performed screening exam is inconsequential
• Pregnancy may limit the sensitivity of mammography due to increased breast density

Nuclear Imaging
• Use of radioactive isotopes of iodine is contraindicated for therapeutic use during pregnancy
• Diagnostic procedures that are performed using short-lived radionuclides (such as Tc-99m) typically do not deposit high doses to the embryo or fetus
  o Proceed if clinically important in making the appropriate diagnosis
  o Exposure risk to very early embryos is unknown (due to limited data). For early stage embryos, counsel patient regarding potential risks/benefits and include in decision making

Contrast Agents
• Iodinated agents commonly used in CT can cross the placenta
  o Animal studies have found no adverse effects
• Gadolinium-based contrast agents (GBCA) used in MRI can cross the placenta
  o Very limited human studies on fetal effects
  o Given the paucity of available animal/human data and the potential adverse effects, GBCA should only be used in situations where clinical judgment determines the benefits outweigh the potential risks
Table 1: Potential Deterministic Radiation Effects on the Fetus by Gestational Age and Radiation Exposure*

<table>
<thead>
<tr>
<th>Gestational Age (weeks)</th>
<th>Potential Effects by Radiation Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 50 mGy</td>
</tr>
<tr>
<td>0-2</td>
<td>None</td>
</tr>
<tr>
<td>3-4</td>
<td>None</td>
</tr>
<tr>
<td>5-10</td>
<td>None</td>
</tr>
<tr>
<td>11-17</td>
<td>None</td>
</tr>
<tr>
<td>18-27</td>
<td>None</td>
</tr>
<tr>
<td>&gt;27</td>
<td>None</td>
</tr>
</tbody>
</table>

*Adapted from (ACR-SPR Radiology, 2018)

Consults

For questions regarding radiation exposure, consults are available 24 hours a day with Radiology and OB/Gyn through WebExchange.

Dosimetry consultation is available through the Medical Physics Division (RAD_MedicalPhysics@osumc.edu).

Policy

- For information regarding pregnancy testing/screening, refer to the Policy and Procedure for Assessment of Patients, Section 2 “Scope of Assessment by the Medical Staff”, Item C. “Pregnancy Assessment”.

References


Quality Measures

- Percentage of pregnant patients who received both CTPE and V/Q scan.
- Percentage of pregnant patients who received abdominal CT without getting abdominal ultrasound or abdominal MRI.

Guideline reviewed by:

- Radiology Quality & Safety Committee
- OB Quality & Safety Committee

Guideline Authors

- Xia Jiang, Ph.D.
- Philip Samuels, M.D.

Guideline Approved


Disclaimer: Clinical practice guidelines and algorithms at The Ohio State University Wexner Medical Center (OSUWMC) are standards that are intended to provide general guidance to clinicians. Patient choice and clinician judgment must remain central to the selection of diagnostic tests and therapy. OSUWMC’s guidelines and algorithms are reviewed periodically for consistency with new evidence; however, new developments may not be represented.