Imaging and Radiology
A Sample Policy for the
Care of Children in the Emergency Department

Date: November 5, 2012

Introduction

Outline of Priorities

Imaging studies can be of significant utility in the evaluation, diagnosis, and development of a care plan for pediatric patients presenting in the emergency department. Despite undeniable benefits, however, some radiological studies that use radiation (CT scans, fluoroscopy, radiographs and nuclear medicine studies) come with potential risks for children, including cancer. Other issues such as sedation, contrast media allergies, potential pregnancy, claustrophobia, and patient motion may also be relevant. Because emergency medicine (EM) physicians are often responsible for requesting imaging evaluation of children, it is their responsibility, when appropriate, to consult with available radiologists regarding the necessity and practicality of such studies and whether alternate strategies that do not use ionizing radiation, such as ultrasound can be substituted. Furthermore, the EM physician, along with the care team as a whole, is responsible for communication with both the patient and the patient's family regarding the use of imaging in the diagnosis differential, and discussions may include information on what to expect during performance of the examination.[1-3] Educational materials for the family is part of medical literacy and should be encouraged [4.] Resources such as the Image Gently parent pamphlets and medical image record card (www.imagegently) that are open source may be especially useful in this regard. Use of a medical imaging record card for families to record the name of their child's test, location and date of study should be considered.

Definitions

Emergency Medicine Care Team: Those individuals who work in the emergency department and who are participating in the pediatric patient's care and/or stay at the emergency department. Members of the EM care team might include a physician, and intermediate provider, nursing staff, social workers, administrators, and environmental services staff.

Computed Tomography (CT) Scan: A CT scan is an imaging study that utilizes ionizing radiation to create a detailed depiction (often in multiple planes) of a patient's anatomy. The single test can often be performed in a few seconds to up to about 30 seconds depending on the size of the patient; given this rapidity, sedation sedation is rarely needed[5]

Magnetic Resonance Imaging (MRI): An imaging study that takes advantage of the resonance frequency of the body's water molecules when placed within a strong magnetic field and does not use ionizing radiation. These tests tend to be longer than a CT scan (30-45 minutes or more), more expensive than a CT, and likely require sedation in children under the age of 6 years.[5]

Radiation: The emission of particles and/or electromagnetic waves as the result of nuclear decay; for medical radiation the source is called an x-ray tube. There is the potential that very high dose ionizing radiation may cause immediate effects such as skin burns and hair loss (these doses though are seen primarily in radiation therapy and are much higher than what is needed for medical imaging); relatively low dose radiation from any single exam has no known increase risk of cancer at this time. Small potential risks can be associated with multiple examinations, such as CT examinations The goal of pediatric imaging is to provide safe and effective imaging: using the most appropriate study, and the lowest radiation dose to answer the clinical question.

Sedation: The use of pharmaceuticals to place a patient into a medically-induced sleep, so that an imaging study can be completed without the patient moving. This step is rarely needed in the emergency setting as CT but may be required with MRI scans.

Purpose

The purpose of this policy is to provide guidelines and direction for members of the medical staff with the responsibility of requesting x-ray, computed tomography, nuclear medicine, fluoroscopy, ultrasound or magnetic resonance imaging to pediatric patients in an emergency medical setting.

Target Group

Medical providers who work in the acute care setting, including emergency departments, responsible for requesting imaging evaluation in pediatric patients.

Procedure/Action

I. At all times, the EM care team will maintain honest, direct, and timely communication with the patient and the patient's family regarding the decision to utilize justified imaging studies in the patient's care.

II. When communicating with the pediatric patient, the EM care team will maintain "child-friendly" language and mannerisms
   a. The EM care team will allow the pediatric patient choices when possible, and will be forthright when choice is not possible
   b. The EM care team will communicate to the best of their ability and with available resources, the necessity for imaging, the length of imaging studies, or other requirements necessary for the examination.

III. The EM physician or other physician or designee working as part of the emergency care team will assess the utility of an imaging study (whether it be an US, CT scan, MRI, or x-ray) in the emergency setting or in the planning of longer-term treatment or follow-up. The EM physician will provide the justification for the test to the radiologist either through consultation or on the requisition and a clinical history to perform only those tests that are medically indicated. Clinical guidelines through the American Academy of Pediatrics and imaging guidelines through the American College of Radiology(ACR) or ACR registries that address appropriate imaging and target radiation dose values(diagnostic reference levels) should be followed where available.[6]

IV. The EM physician will initiate a cost-benefit evaluation with the on-call radiologist as needed to weigh the utility of imaging in affecting the acute or follow-up care for the pediatric patient versus potential physical and psychological effects.

V. The EM physician will consider additional concerns; such as the need for patient sedation, the patient's psychological and emotional state regarding the imaging study, and the patient's family's concerns regarding imaging. Concerns regarding allergies to contrast media, poor renal function that may contraindicate the use of intravenous contrast tests and potential pregnancy in female patients of appropriate age should be communicated [7,8,9]. Direct communication with the radiologist, particularly as it relates to special circumstances or medical concerns or past medical history are encouraged

VI. The EM physician will speak with the patient and patient's family regarding his/her rationale for recommending or not recommending an imaging study. The EM team is encouraged to provide educational materials (brochures) that discuss the procedure and small potential risk from tests that use ionizing radiation. We suggest linking to Image Gently (www.imagegently.org), Image Wisely

VII. (www.imagewisely.org), and RadiologyInfo (www.radiologyinfo.org) websites for educational materials.

VIII. Whenever possible in the imaging study process, the EM care team will allow a family member to be present with the patient, and should be aligned with the radiology department/practice policy.

IX. The radiologist should protocol the imaging study to answer the specific clinical question Survey studies or comparison exams of normal anatomy (comparison radiographs) are discouraged. Alternate imaging strategies that do not use ionizing radiation (ultrasound, MRI) are encouraged. For CT, routine multi-phase scanning (pre-and post- contrast scans or delayed imaging) is discouraged. The CT scan length should be carefully selected to include only those organs that need to be examined. CT techniques that are appropriate for the clinical question and region scanned should be used. American College of Radiology appropriateness criteria should be followed.[10] The CT scanner should be accredited through the American College of Radiology or other similar organization and include pediatric accreditation. [11] Registered radiologic technologists with particular expertise in pediatrics is encouraged. Radiologist with American Board of Radiology certification or eligibility is essential.

X. The imaging test should only include the patient anatomy to answer the clinical questions. Collimation or shielding of radiosensitive organs such as gonads or the lens of the eye may be considered depending on the individual imaging practice and follow national guidelines where available.[12,13,14]

XI. Size-based imaging (preferred over age or weight based) is encouraged. Protocols for CT scans should be "child-sized".[10] Universal CT protocols are provided in the Image Gently website.[15] The North American Guidelines for Use of Radiopharmaceuticals in children should be followed.[16]

XII. A member of the EM care team will follow up with the pediatric patient and patient's family as soon as possible following the study to ensure patient comfort.

XIII. The EM physician will share the results of the imaging study with the pediatric patient and patient's family as soon as clinically appropriate.

XIV. In the event of transfer of care of the patient to another facility, duplicate copy of all relevant imaging tests (CD-ROM) and reports should accompany the transfer of a child to another facility. Not only does this save time, but reduces the need for repeat imaging, a source of excess radiation to patients.

Outline quality indicators

Sedative, contrast allergy, potential pregnancy and psychological factors will be considered by both the emergency medicine physician and the on-call radiologist prior to selection and administration of an imaging study.

Comfort-based care and psychological preparation will be given to the patient prior to the initiation of any imaging study, unless counter indicated by emergent concerns.

Discussion of risks associated with pertinent imaging studies will be offered to the patient's guardian(s) prior to study's occurrence, unless contra-indicated by emergent concerns. The use of patient information brochures for family prior to the imaging test and a medical imaging record card to document the exam for future reference is encouraged.

Justification and use of medical imaging that uses ionizing radiation should be used judiciously and protocoled for the individual patient.[17]Alternate imaging that does not use ionizing radiation or clinical observation may be a reasonable alternative.

Size-based protocols should be considered to ensure the lowest possible radiation dose to answer the clinical question (optimization).

Special Considerations (as appropriate)

Sedation

Patient's families are likely to have concerns about their children participating in sedated imaging studies. These concerns may include fears about the safety of medications with sedative properties, anxiety regarding the patient's comfort while becoming sedated, and uncertainty about the patient's mental status once they awake from sedation. Given the added clinical concerns that come with sedating a pediatric patient, it is preferred to refrain from sedating pediatric patients for imaging studies whenever possible. That being said, there are safe sedation procedures that can be followed when sedation is necessary.[18]

Claustrophobia

Some imaging studies (CT scans and MRIs, specifically), require confinement in a small, uncomfortable, possibly noisy machine (MRI). Depending on the child, this requirement could be of no concern or could be immensely terrifying. As such, it is the EM care team's responsibility to comfort the patient and be honest (but kind) regarding exactly what will happen during the study. If necessary, members of the radiology team might be able to provide the patient with the most comfort, given their expertise with the imaging process.

Patient motion or pain during imaging

Imaging studies – MRIs in particular – can be relatively lengthy, and patient motion can be detrimental to the final study quality. Depending on the child, it might be difficult for the patient to remain still for the duration of the study. Techniques, including familiarizing the child with the nature of the exam and use of child life specialists for example, may be helpful strategies, and positive reinforcement should be offered throughout the duration of the imaging. Should the likelihood of patient motion be very high or concern for pain, such as from an emergency interventional radiology procedure, sedation and analgesia should be considered. A standardized approach with expertise as to the medical professional responsible for the sedations and appropriate communication to ensure safety is necessary.

Radiation risk

Ionizing radiation at high doses, typically above those used during routine medical imaging, is a known carcinogen. However, the radiation dose used in most medical imaging procedures is much lower and the risk is debatable. [19] The EM physician is encouraged to become familiar with relative radiation dose of common imaging tests that use ionizing radiation. Information regarding dose and potential risk, as well as benefits of the examination should be available to parents or care givers if needed in a non-alarmist fashion; emphasize that the benefit of the imaging test far outweighs any small potential risk.

_____ _____

Signature Date

Attachments & Addendums

1. TEXT

Relevant JCAHO Standards

1. Sentinel Event Alert. Radiation Risk of diagnostic imaging.Issue 47, August 24, 2011.

Reference List

1. Fahey FH, Treves ST, Adelstein SJ (2011). Minimizing and communicating radiation risk in pediatric nuclear medicine. The Journal of Nuclear Medicine. 52(8): 1240-1251.
2. American College of Emergency Physicians (2009). Guidelines for care of children in the emergency department. ACEP Policy Statement.
3. Brody AS, Frush DP, Huda W, Brent RL (2007). Radiation risk to children from computed tomography. Pediatrics. 120(3): 677-682.

4. Bulas D, Goske MJ , Applegate KE, Wood BP (invited editorial). Image Gently: Improving Health Literacy for Parents about CT scans for Children. Pediatr Radiol. 2009 Feb; 39(2): 112-116. Epub 2008 Dec 16.
5. www.radiologyinfo.org
6. http://www.acr.org/Quality-Safety/National-Radiology-Data-Registry/Dose-Index-Registry
7. http://www.acr.org/~/media/ACR/Documents/PDF/QualitySafety/Resources/Contrast%20Manual/FullManual.pdf
8. http://guideline.gov/content.aspx?id=13685&search=Acute+renal+failure+syndrome+
9. http://www.acr.org/~/media/0249FD9C739D4AF2B3519AE5FB09E648.pdf
10. Strauss KJ , Goske MJ , Kaste SC et al. Image Gently: Ten steps you can take to optimize image quality and lower CT dose for pediatric patients. AJR. 2010 Apr;194(4):868-73.
11. http://www.acr.org/~/media/ACR/Documents/Accreditation/CT/Requirements.pdf
12. Sidhu M, Strauss KJ, Connolly B, Yoshizumi TT, Racadio J, Coley BD, Utley T, Goske MJ. Radiation Safety in Pediatric Interventional Radiology. Tech Vasc Interventional Rad. 2010 Sep; 13(3):158-66.
13. Hernanz-Schulman M, Goske MJ, Bercha IH, Strauss KJ. Pause and Pulse: Ten steps that help manage radiation dose during pediatric fluoroscopy. AJR Am J Roentgenol, 2011. 197(2): p. 475-81.
14. Don S, MacDougal R, Strauss, Moore Q, Goske MJ et al. Image Gently – Back to Basics:Ten steps to help manage radiation dose in pediatric digital radiography. Accepted to AJR October, 2012.
15. CT protocols. http://pedrad.org/associations/5364/files/Protocols.pdf
16. Gelfand M, Parisi M, Treves ST. Pediatric Radiopharmaceutical Administered Doses: 2010 North American Consensus Guidelines.THE JOURNAL OF NUCLEAR MEDICINE • Vol. 52 • No. 2 • February 2011
17. Goske MJ, Applegate KE, Bell C et al. Image Gently: Providing Practical Educational Tools and Advocacy to Accelerate Radiation Protection for Children Worldwide. Invited commentary in Semin in Ultrasound, CT MRI. 2010 Jan; 31: 57-63.
18. Rutman MS (2009). Sedation for emergent diagnostic imaging studies in pediatric patients. Current Opinion in Pediatrics. 21(3): 306-312.
19. Hricak H, Brenner DJ, Adelstein SJ, Frush DP, Hall EJ, Howell RW, et al. Managing radiation use in medical imaging: a multifaceted challenge. Radiology 2011;258(3):889-905. Epub 2010/12/18. doi: 10.1148/radiol.10101157. PubMed PMID: 21163918.

We gratefully acknowledge the contribution of the following organization and individuals:
Alliance for Radiation Safety in Pediatric Imaging
Marilyn J. Goske, MD, FAAP
Cincinnati Children's Hospital
Cincinnati, Ohio

Priscilla F. Butler, M.S., FACR, FAAPM
Senior Director and Medical Physicist, Quality and Safety American College of Radiology
Reston, VA

Dorothy I Bulas, MD, FAAP, FACR
Children's National Medical Center
Washington DC

Donald Frush, MD, FAAP, FACR
Duke University Medical Center
Durham, North Carolina