Advances in Pediatrics 61 (2014) 75–125
ADVANCES IN PEDIATRICS

Update in Pediatric Imaging

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Keywords

• Update • Pediatric imaging • Future trends

Key points

- The need for an ongoing partnership between the pediatric radiologist and pediatrician to insure the appropriate selection of examination is crucial.
- More emphasis should be placed on enhancing the pediatrician's skill in interpretation of the common examinations and knowing age-related variants.
- The benefit/risk ratio must be considered when ordering imaging procedures. This demands knowledge of the pathophysiology of disease.
- New techniques (eg, MR special sequences and MR musculoskeletal indications) and controversial aspects of diagnosis (eg, child abuse) are discussed.

INTRODUCTION

Recently, there has been a shift in emphasis in the ordering of pediatric imaging examinations. We have become more aware of the risks (radiation and sedation) and benefits whenever a study is suggested. We have appropriate criteria to help us select the best test to make the diagnosis least invasively [1–3]. A more complete knowledge of the natural history of disease allows us to reevaluate our imaging workup (eg, for urinary tract infection) [4]. In an era of cost containment, in which imaging accounts for 9% of medical care, we need to consider not only whether a test is necessary but also whether a cheaper test can be performed with the same outcome.

The emphasis on teaching imaging interpretation to the pediatrician has diminished, and few pediatric training programs have routine sessions on reading the image. It is perceived to be more important to order the correct test and then obtain a report on an electronic medical record (EMR) or a picture archiving communication system (PACS), sometimes without an image.

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0065-3101/14/$ – see front matter
http://dx.doi.org/10.1016/j.yapd.2014.03.010

Although EMR and PACS have forever changed medical practice, it is less than optimal to accept results without reviewing the images and knowing how to interpret them within the framework of the patient's clinical condition. This observation is especially true when many examinations are read off site. In many instances, the reader knows little about the patient. If the radiologist reads few pediatric examinations, they know even less about pediatric diseases.

The rapid advances in technology, particularly magnetic resonance (MR) and computed tomography (CT), have made it difficult for all of us to keep up. Despite this gap, many pediatricians and pediatric subspecialists do not seek consultation with the pediatric imager. The pediatric health care provider and the pediatric imager with both the clinical information and the child's images and reports can decide together which test (or no test) would be best toward solving the child's problem.

This update discusses these issues and emphasizes examinations that are most frequently used by the practicing pediatrician. We also predict the most important advances in pediatric imaging over the next 5 years.

Appropriate examination plus risk-to-benefit consideration equals decreased imaging costs

Many tests are ordered without a full understanding of the pathophysiology of the disease. For example, skull radiographs are requested for head trauma in young infants when 50% of epidural/subdural hematomas occur in babies who do not have a skull fracture or abnormality visible on the skull examination. Ninety-five percent of pneumonia in infants and toddlers younger than 2 years is viral. The radiographic findings show peribronchial cuffing, subsegmental atelectasis, and sometimes, hyperexpansion: the same findings as in spasmodic airway disease (Fig. 1). Yet, we frequently obtain chest radiographs and treat the patients with antibiotics. We must understand that the radiologic resolution of pneumonia or empyema lags behind the clinical changes, so we must avoid unnecessary, nonproductive short-interval imaging. In the unusual case of pneumonia when it is necessary to reimage, the repeat examination should not occur until 21 days after diagnosis (assuming that the child responds appropriately). In empyema, complete resolution may take months, and interval radiographs are necessary only for clinical worsening (Fig. 2). Another blatant example of overuse of imaging is in the child who presents with abdominal pain and constipation. Constipation is a clinical symptom and does not need radiographic confirmation or quantification [5].

Ideally, the use of imaging should add value to clinical care and help determine the proper therapy or next step. For this reason, the American Academy of Pediatrics and American College of Radiology guidelines for imaging exist. Some of the most useful guidelines are on the workup of urinary tract infection, nonfebrile seizures, and chronic headaches (discussed later) [1,3,4,6]. There is a large, multi-institutional study regarding head trauma that suggests when imaging is helpful and can give a high sensitivity and negative predictive value so you know when not to image [7]. By using these guidelines, we can reduce