Oncology
Imaging studies are today the most important tool in the diagnosis, initial assessment of the extent, evaluation of the response to treatment, and follow-up of pediatric malignancies.

Modern advances in technology have allowed the development of sophisticated imaging modalities such as proton magnetic resonance spectroscopy (MRS) or positron emission tomography (PET). However, these new techniques entail a greater cost and increased difficulty in diagnostic procedures.

At the present time it can be accepted that conventional CT and MR imaging—for their sensitivity, anatomic delineation, and cost—are the best choice for the detection of central nervous system (CNS), abdominal, and pelvic lesions. Moreover, plain film radiographs must be considered of value as a first screening modality in patients with suspected thoracic or skeletal abnormalities.

However, it is to be noted that in the diagnosis of pediatric tumors, conventional CT and MR imaging should be performed with contiguous cuts of 10 mm or less in slice thickness in order to completely detect lesions of at least 20 mm in longest diameter. As a rule, we can correctly evaluate lesions no less than double the slice thickness applied.

Moreover, pulmonary lesions can be evaluated with chest radiography only when they are clearly defined and surrounded by aerated lung.

The above observations concern the baseline evaluation of a child with a suspected diagnosis of malignancy, but the evaluation of the extent of most solid tumors needs more accurate staging procedures. In the case of CNS location, MR imaging is considered to be more accurate and to offer better resolutions than CT. CT with and without contrast represents a far more valuable imaging modality than plain film radiographs for staging lesions in the lungs or mediastinum. In such cases, even more useful are spiral CT scan, also known as volumetric acquisition CT, and high-resolution CT; with both techniques there is little chance of missing small lesions falling between slices, as can happen with conventional CT. For bone lesions, radionuclide studies and MR imaging have proven to be more sensitive than plain films or CT in detecting early metastatic disease.

Assessment of tumor response to treatment, as a prospective end point in clinical trials or as a guide for the clinician in decisions regarding a single patient, is another important step in the management of pediatric solid tumors.

Criteria to measure tumor lesions were defined by the World Health Organisation in 1979. Recently, they have been revised by a large cooperative group in order to provide a simplified and reproducible response evaluation method based on the use of unidimensional measurements. This work has led to the publication of the Response Evaluation Criteria in Solid Tumors (RECIST) Guidelines, to which we refer.

At diagnosis, tumor lesions should be identified and defined as measurable if they can be accurately measured in at least one dimension, turning out equal to or greater than 20 mm with conventional techniques or to 10 mm with spiral CT scan. These lesions, up to a maximum of five per organ and ten in total, should be recorded at initial staging as “target lesions.” Bone lesions, leptomeningeal disease, ascites, pleural and pericardial effusions, and cystic lesions are considered a priori nonmeasurable.

Correct evaluation of response requires that the same method of assessment and the same technique be used at baseline and during follow-up. It is particularly important, when using MR imaging, that lesions are measured by the same imaging sequences on subsequent examinations.

RECIST criteria of response are as follows: complete response is the disappearance of all target lesions; partial response is at least a 30% decrease in the sum of the longest diameter of target lesions, taking as reference the baseline sum longest diameter; progressive disease is at least a 20% increase in the sum of the longest diameter of target lesions, taking as reference the smallest sum longest diameter recorded since the treatment started or the appearance of one or more new lesions; stable disease is neither sufficient shrinkage to qualify for partial response nor sufficient increase to qualify for progressive disease, taking as reference the smallest sum longest diameter since the treatment started.

We now believe that we already have optimal tools in pediatric tumor imaging, provided that we use them correctly.