Radiology Stewardship at Primary Children's Hospital

As healthcare delivery moves towards shared accountability, we continue to pursue ways to deliver the best care in the most efficient manner. In imaging this has caused us to look for methods of standardizing processes and imaging protocols to gain that efficiency. We would like to implement a radiology stewardship program[1] to aid us in this goal.

This program would create imaging guidelines as part of care process models for common clinical conditions. The guidelines will be developed using local and national clinical evidence as well as expert input from those involved in the treatment of the patient. The intent of the models is to create the most efficient and accurate pathway to arrive at a diagnosis and initiate treatment. Education would be performed around these imaging guidelines.

Periodic auditing of compliance with the care process models will occur. A report will be generated for each practice on the care process models that are being monitored. Initially, these care process models will include imaging for screening of hip dysplasia and spinal imaging in the setting of sacral dimple or other midline cutaneous abnormalities. Over time other common clinical questions will be added to the program.

WHAT THE RADIOLOGY STEWARDSHIP PROGRAM IS

1. A method to monitor use of radiology resources and compliance with radiology service process models.
2. A method to decrease unnecessary radiologic studies.
3. A method to gather outcomes data to continue to improve radiology processes.
4. A method to educate clinicians on the best practices regarding medical imaging.

1. Durand DJ, Lewin JS, Berkowitz SA Medical-Imaging Stewardship in the Accountable Care Era. N Engl J Med 2015 Oct 29;373(18):1691-3

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WHAT THE RADIOLOGY STEWARDSHIP PROGRAM IS NOT

1. A system of penalties for clinicians. Compliance with the model will be reported back to your practice, but there will be no penalty for non-compliance.
2. A way to deny access to imaging procedures. Ordered procedures that are not in compliance with the models will not be denied.

We look forward to working with you and your practice in this process. We believe that this will continue to improve the care that we give to your patients and the pediatric population of Utah.

As always, if you have any questions or concerns please feel free to contact us at: Primary Children's Medical Imaging, 100 North Mario Capecchi Drive, Salt Lake City, Utah, 84113, 801.662.1900.

IMAGING OF HIPS FOR POSSIBLE DYSPLASIA

Developmental dysplasia of the hip (DDH) is a spectrum of abnormalities that are present at birth or develop during infancy. The abnormality involves an insufficient acetabulum which can in some cases lead to an unstable hip. The long term consequences of untreated hip dysplasia is early degenerative joint disease of the hip and contributes significantly to early hip replacement. For this reason it important to screen for hip dysplasia where clinically appropriate. Screening imaging is best performed by hip ultrasound in patients under the age of 4 months. Over the age of 6 months, hip radiographs are the most appropriate. Between the ages of 4 and 6 months the most appropriate method depends on the degree of ossification in the femoral heads.

Risk factors for DDH include female gender, breech positioning at delivery, and a positive family history. Primiparity, high birth weight, oligohydramnios, post-maturity, high birth weight, and infant swaddling are lesser risk factors. Screening imaging should be considered for these patients. Additionally patients with physical exam findings of hip clunk, hip click, and asymmetric thigh skin folds should undergo screening imaging[2].

Currently we are finding some patterns in the imaging evaluation of at risk patients that is leading to some waste of resources that we believe could be improved. We would like to address this in the interest of improving the delivery of care in our system.

First, when patients are imaged very early in life, there is a high likelihood that the hips will have an immature appearance by ultrasound. These patients are expected to mature to a normal hip without any intervention. However, we feel obligated to document that normalization with a follow-up ultrasound. If this first ultrasound could be avoided, there could be significant savings in the system.

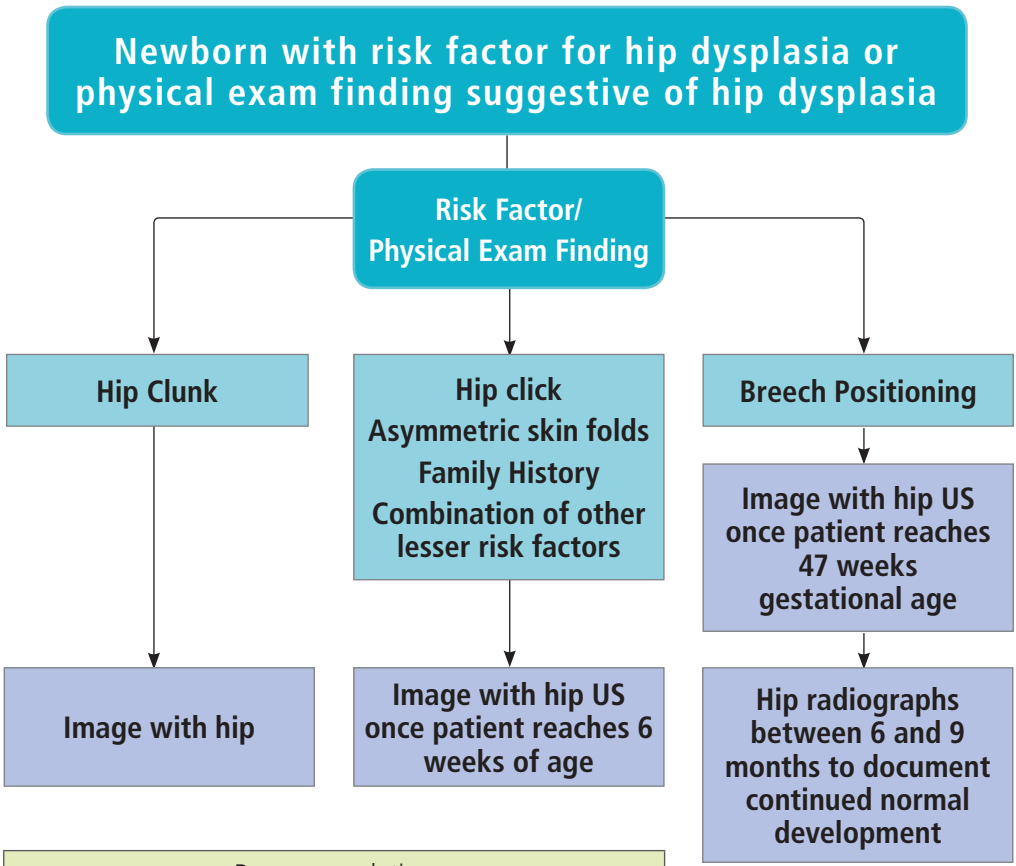
A recent review of patients evaluated at Primary Children's Hospital and Primary Children's Riverton between January of 2015 and June of 2015 showed 344 patients screened by ultrasound for a possible hip dysplasia. Of this group 204 were under 7 weeks of age. 65 (31.8%) of these patients were categorized as having immature hips and a recommendation for a follow-up ultrasound was made. 52 of these patients had the follow-up ultrasound and only one patient remained abnormal. Waiting to perform the screening ultrasounds until the patients were 6 weeks gestational age would have avoided a large number of repeat ultrasounds.

We would request that screening hip ultrasounds be performed after the patient reaches 6 weeks of age. This will avoid a significant number of repeat ultrasounds and allow us to deliver care more efficiently. This is one of the items that we would like to track in the radiology stewardship program.

2. Bracken J, Ditchfield M. Ultrasonography in develpmental dysplasia of the hip: what have we learned? Pediatr Radiol 2012(42):1418-1431

Second, there are published studies which would suggest that DDH may develop in patients with breech presentation despite a normal hip ultrasound at birth[3]. Based on this evidence, we have been recommending follow-up radiographs of the hips at 6 months of age in this patient group. Our own experience has shown a small number of patients have had a mild dysplasia at the time of this follow-up, however, in consensus with the pediatric orthopedic service believe that this follow-up is necessary because of the risk of missing a developing hip dysplasia.

The radiology stewardship program will report patients from your practice that undergo hip ultrasound before 6 weeks of age.



Recommendation
• All patients with immature hips at time of ultrasound should have a repeat ultrasound to document maturation of the hip. • All patients with abnormal hip ultrasounds (DDH) should be referred for orthopedic management.

3. Imrie M, Scott V, Stearns P, Bastrom T, Mubarak SJ. Is ultrasound screening for DDH in babies born breech sufficient? J Child Orthop 2010 Feb;4(1):3-8.

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IMAGING OF THE SPINE IN INFANTS WITH SACRAL DIMPLE OR OTHER CUTANEOUS ABNORMALITY

Tethered cord syndrome has a strong association with cutaneous abnormalities of the lumbosacral region such as hairy patches, cutaneous hemangioma, skin tag, or rudimentary tail. Traditionally, a simple dimple has been grouped with these other risk factors as a reason to screen for possible tethered cord. However, a growing body of evidence would suggest that simple dimples do not require screening imaging.

Screening imaging is performed by lumbar spine ultrasound before the age of 4 months. The ultrasound assesses the level of the conus medullaris and motion of the nerve roots in the cauda equina. If a patient is over the age of 4 months at the time of evaluation, lumbar spine MRI without contrast is the imaging method of choice.

A simple dimple is defined as occurring in healthy neonates/young infants with

- solitary dimple < 5mm diameter
- < 2.5 cm from the anus
- midline in location
- no visible drainage
- no additional associated cutaneous stigmata

A patient with a simple dimple in the setting of other congenital abnormalities or genetic syndromes should be screened.

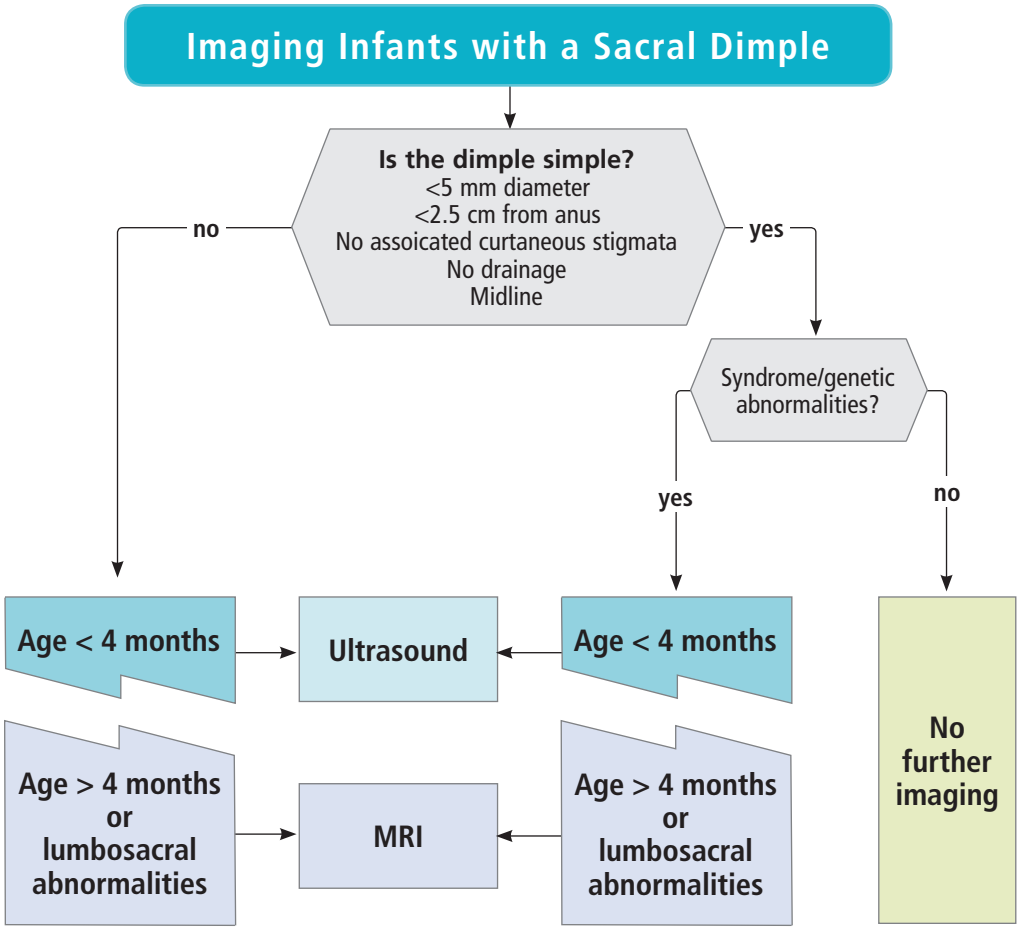
A recent study from Cincinnati Children's Hospital Medical Center demonstrates the rarity of cord tethering associated with simple dimple. A review of patients over a 12 year period reviewed 3884 healthy infants that underwent screening spinal ultrasound. Of these 133 were abnormal. Forty-nine of the 133 were abnormal on MRI. The vast majority in this group had nonsurgical lesions with only 5 advancing to surgical intervention[4]. Four of the 5 had tethered cord at surgery. Our experience at Primary Children's Hospital mirrors that in this published paper.

Based on this evidence and consensus with the pediatric neurosurgical group, we would recommend the following.

1. Patients with a simple sacral dimple do not undergo screening imaging
2. Patients with hairy tuft, cutaneous hemangioma over the lower spine, or skin tag over the lower spine undergo spinal ultrasound for screening if under 4 months of age. Lumbar spine MRI without contrast should be performed in this group if they are over 4 months of age.

4. Kucera JN, Coley I, O'Hara S, Kosnik EJ, Coley BD. The simple sacral dimple: diagnostic yield of ultrasound in neonates. Pediatr Radiol 2015 Feb;45(2):211-6

3. Patients with osseous abnormalities of the lumbar spine or sacrum should be evaluated with lumber spine MRI for associated cord tethering.



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