Diagnostic Imaging Pathways - Paediatric, Neck or Back Pain

Population Covered By The Guidance

This pathway provides guidance on imaging children with neck or back pain.

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Quick User Guide

Move the mouse cursor over the PINK text boxes inside the flow chart to bring up a pop up box with salient points.
Clicking on the PINK text box will bring up the full text.
The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

Pathway Diagram

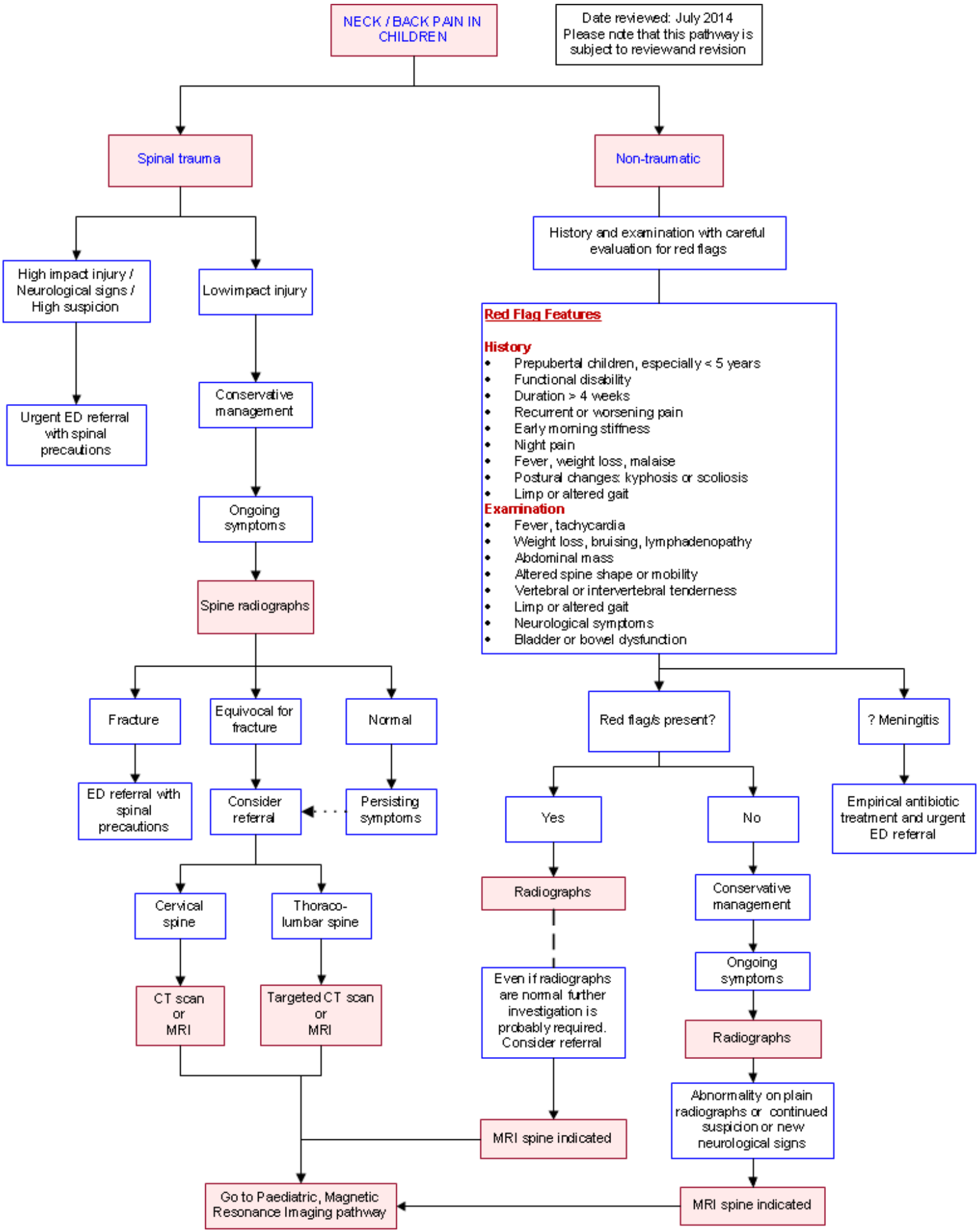

Image Gallery

Note: Images coming soon

Teaching Points

- Neck pain in children and adolescents is reported to have a prevalence rate between 20% -40%. Neck pain with disability is relatively less common 1
- Prevalence of back pain in children was reported in one study to be between 28% - 48%. The exact prevalence is unknown 2,3
- An important distinction to be made while evaluating a patient with neck or back pain is to note whether the pain is associated with trauma or otherwise and to identify the duration of symptoms as acute, sub-acute or chronic
- In the majority of acute traumatic presentations, plain radiography followed, if necessary, by Computed Tomography (CT) would be ideal to rule out any major bony injury. For most other non-acute and chronic presentations, Magnetic Resonance Imaging (MRI) should be the preferred choice of imaging
- It should be noted that in the absence of trauma and red flags, evidence to support other diagnostic imaging is lacking, especially in non-emergency presentations 1
- Cervical spine injury is less common in children compared to adults. Young children suffer spinal injury mainly from motor vehicle accidents where as older children from sports related injuries 4
- The main aim of imaging children with suspected cervical injury is to rule out spinal cord injury, assess the extent of injury to spinal cord, and prevent further damage if any or to avoid it completely with timely spinal precautions or spinal surgery. Morbidity and mortality from significant spinal cord injury can be high. Also, it is worth noting that young children can have cord injury without any radiographic evidence of bony or ligamentous injury owing to the laxity of ligaments in this age group 4
- Clinical Decision Rules (CDRs) like Nexus criteria and Canadian C-Spine rules have been well validated in adults but their application in children has not been positive. Caution should be applied when these are used in young children (<10 years old) especially 4
- **Red-flags** that have been associated with increased risk of having a serious organic pathology in the absence of trauma 2,5,6,7,8,9
    - *History-related* – Prepubertal age especially when below 5 years of age, loss of function, pain of more than 4 weeks duration, recurrent or worsening pain, early-morning stiffness, night pain, fever, weight loss, malaise, kyphosis or scoliosis, altered gait
    - *Clinical examination-related* – Fever, tachycardia, weight loss, bruising, lymphadenopathy, abdominal mass, altered shape of the spine, vertebral or intervertebral tenderness, limp, neurological deficits, bladder or bowel dysfunction
- In one study it was found that radicular pain and abnormal neurological examination had 100% specificity for a specific diagnosis whereas night pain had a specificity of 95%. Sensitivity was the highest at 67% for lumbar region pain 5

Plain Radiography

- Plain radiography is an excellent initial imaging test in all traumatic causes of neck or back pain as

it provides good structural imaging with relatively low radiation exposure 2
- In one study more than 65% diagnoses were made on plain radiography alone. Hence, can be used as a screening examination 5
- Plain radiography was reported to have a sensitivity of 73% and a specificity of 92% for cervical spine injuries in which CT was the reference standard. Lateral view radiographs alone were reported to have similar sensitivity and specificity. Flexion-extension views do not add to the accuracy in the acute setting 4

Magnetic Resonance Imaging (MRI)

- First choice cross-sectional imaging in the majority of institutions when back pain is sub-acute or chronic or when the cause of back or neck pain is suspected to be of nonosseous origin 10
- Excellent at detecting spinal contents, bone marrow changes, intervertebral disc disease, spinal tumours, infections and congenital anomalies 11
- Superior to CT in detecting ligamentous injuries in acute spinal trauma 4,12
- Major advantage of lack of ionising radiation but can be time consuming and a significant number of children may require sedation/anaesthesia which carries their own risk
- MRI of spine is the imaging modality of choice for spondylosis, spondylolisthesis, disc degeneration, disc herniation, discitis, vertebral osteomyelitis, Langerhans cell histiocytosis and Ewing's Sarcoma 2
- Reported to have a sensitivity ranging from 56% - 96% for sub-acute causes of spinal pathology and a specificity ranging from 43% to 100% 13

Nuclear Medicine Scans

- Single-Photon emission CT (SPECT) scans were used frequently in evaluating non-acute back pain but for the lack of specificity, MRI has replaced them as the initial imaging of choice with a SPECT bone scan reserved for negative MRI but with continued suspicion due to on-going pain 2, 11

Computed Tomography (CT)

- Excellent at detecting fractures and is generally accepted as being superior to MRI in this area 8, 11
- Several studies report higher rates of detection for fractures in spinal injuries on CT scans compared to those detected on MRI alone 12,14,15
- More widely available than MRI, quicker to perform and does not require sedation but has a major disadvantage of radiation exposure, particularly relevant in children who are more radiation-sensitive than adults. Whenever possible, targeted CT scans should be done for the level of interest (e.g. L3 and L4 instead of lumbar spine) reducing the effective radiation dose
- Can be the imaging modality of choice for traumatic vertebral fractures (following plain radiography), disc calcification and osteoid osteoma 2
- Less sensitive than MRI in detecting ligamentous injuries in acute trauma situations 4
- Pooled sensitivity of around 98% for bony spinal injury in a meta-analysis comparing 3-view plain radiography and CT scan for cervical spine injury 16,17

References

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. Download the document

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Information for Consumers

Information from this website	Information from the Royal Australian and New Zealand College of Radiologists' website
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