



## GUIDELINES ON DIAGNOSTIC IMAGING

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### 1. INTRODUCTION

Diagnostic imaging is an important aspect of an Emergency Department patient workup. Given the high cost of imaging and the potential of patient harm (e.g. radiation dose, contrast reactions), it is essential that imaging be used judiciously.

Representatives from the Australasian College for Emergency Medicine (ACEM) and the Royal Australian and New Zealand College of Radiologists (RANZCR) formed a working group that developed the following imaging guidelines, using available evidence and best practice.

It is strongly suggested that all Emergency Departments and Radiology Departments make these guidelines available to clinical staff and encourage their use.

Emergency clinicians and radiologists should also be encouraged to discuss cases to determine the best imaging modality and pathway to use for a given presentation, especially for difficult and unusual presentations.

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### 1.1 Incident Reporting

Incident Reporting systems are a critical component of high risk/high reliability organisations. The Radiology Events Register (RaER) is an incident reporting system for Medical Imaging. The aim of RaER is to develop a means of systematic data collection and analysis of incidents in radiology, in order to obtain reliable data to assist quality improvement and increase patient safety. RaER incidents most frequently involve the Emergency Department (ED) by a substantial margin.

To report an incident, go to the RaER website (<http://www.raer.org>) and click on 'Report an Incident'. You can then enter the reporting site anonymously. The data entry is intuitive and on average takes about five minutes per incident.

Quality improvement at the ED-ED Imaging interface will benefit significantly from a shared approach to incident reporting and analysis, as well as the formulation of appropriate strategies that reduce the risk of patient harm.

### 1.2 Other Resources

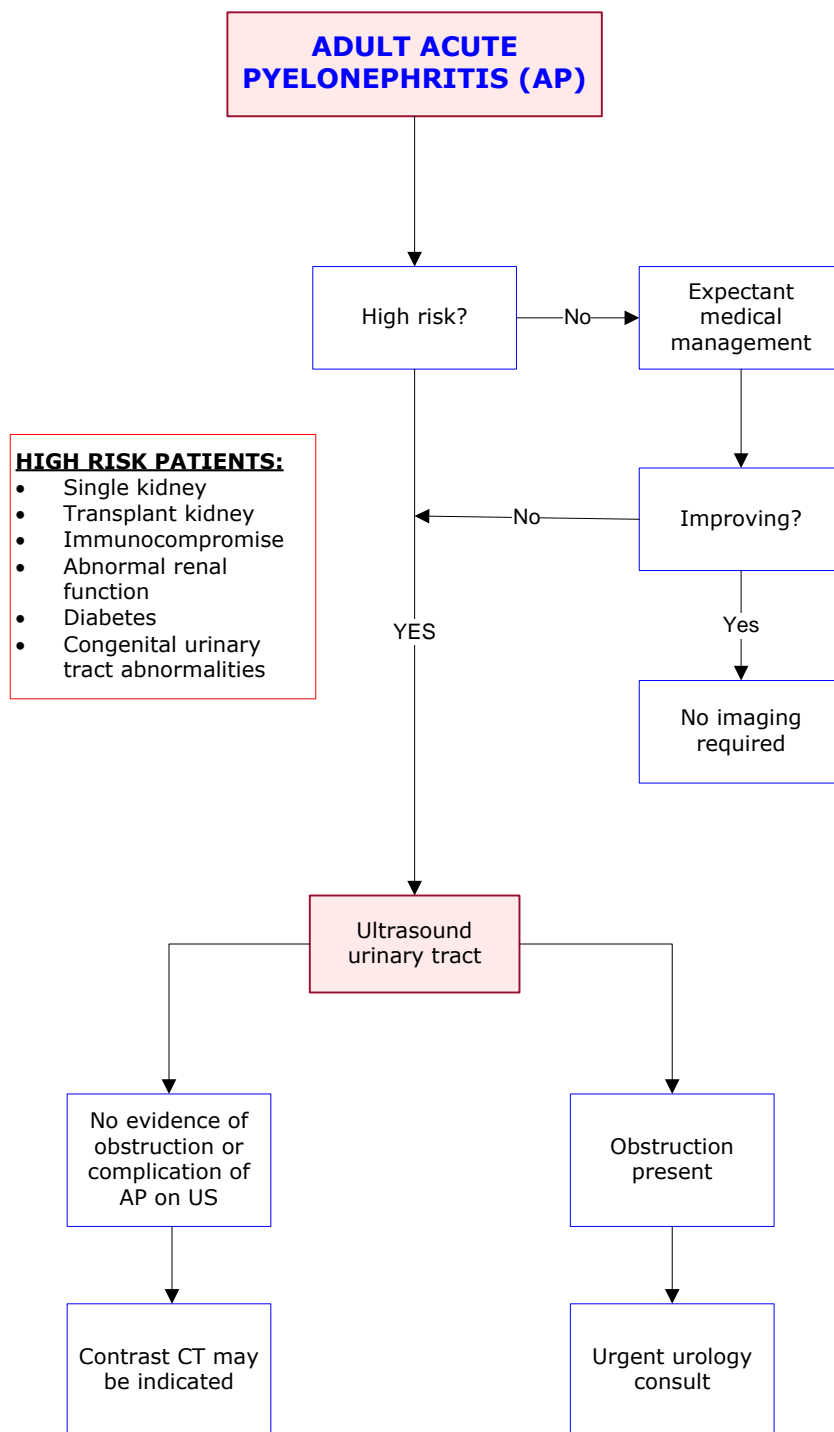
The guidelines presented here have been developed for use in the Emergency Medicine setting. A source of these guidelines is Diagnostic Imaging Pathways (<http://www.imagingpathways.health.wa.gov.au/>) which has been developed in Perth and endorsed by RANZCR. The extensive set of DIP guidelines encompasses use in all settings as well as Emergency Medicine.

### 1.3 Committee Members

Dr Yusuf Nagree, Emergency Physician (Chair)	Dr Neil Jones, Radiologist
Dr Carmel Crock, Emergency Physician	Dr Richard Mendelson, Radiologist
Dr Kim Hansen, Emergency Physician	Dr Dinesh Varma, Radiologist

## 2. GUIDELINES – USE OF DIAGNOSTIC IMAGING FOR CLINICAL DIAGNOSIS

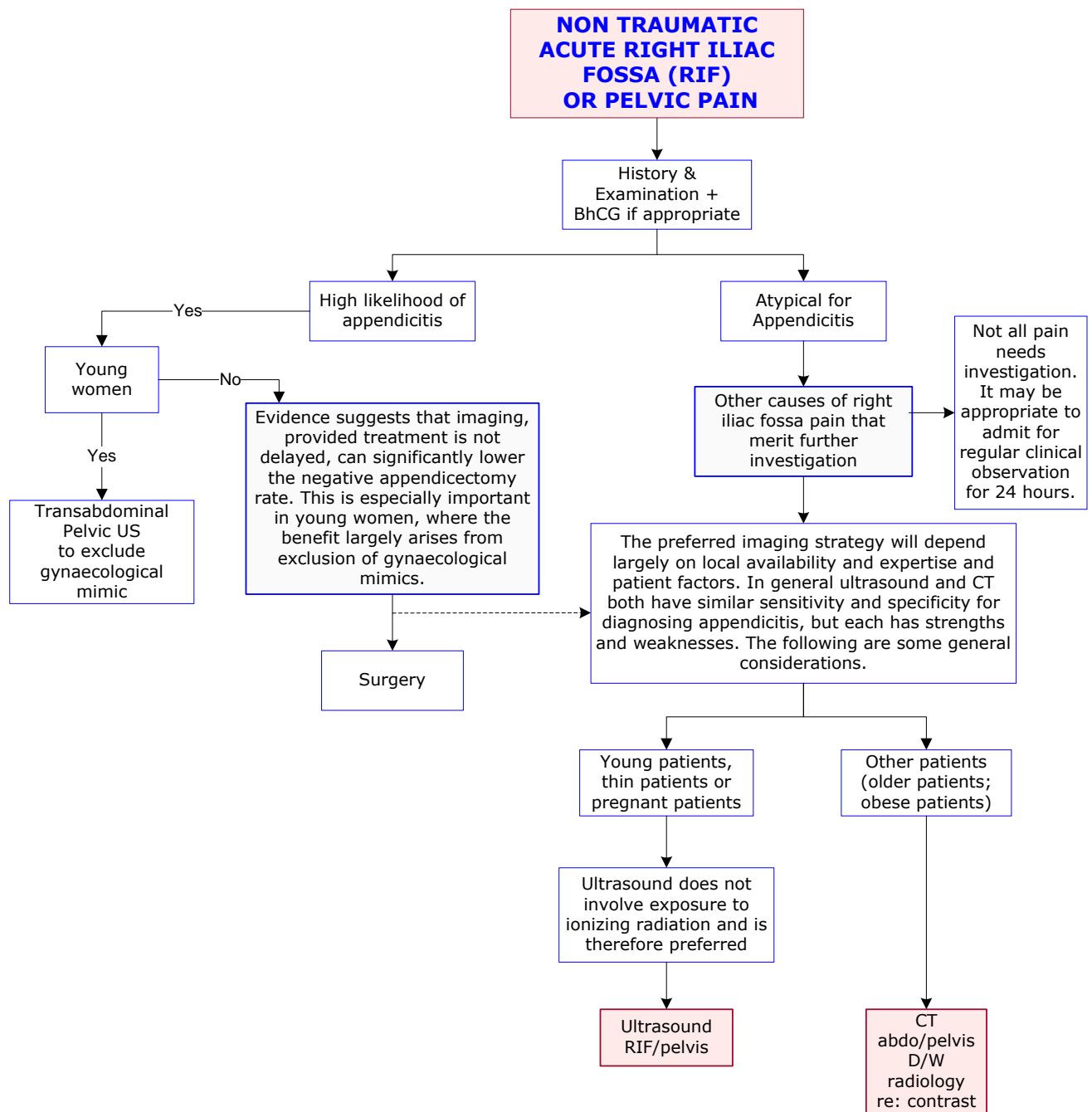
### 2.1 Adult acute pyelonephritis (AP)



**Notes:**

- The majority of cases are diagnosed clinically with appropriate confirmatory evidence from laboratory testing.
- Routine imaging is not recommended in uncomplicated acute pyelonephritis.
- If obstruction is suspected, prompt imaging should be undertaken.

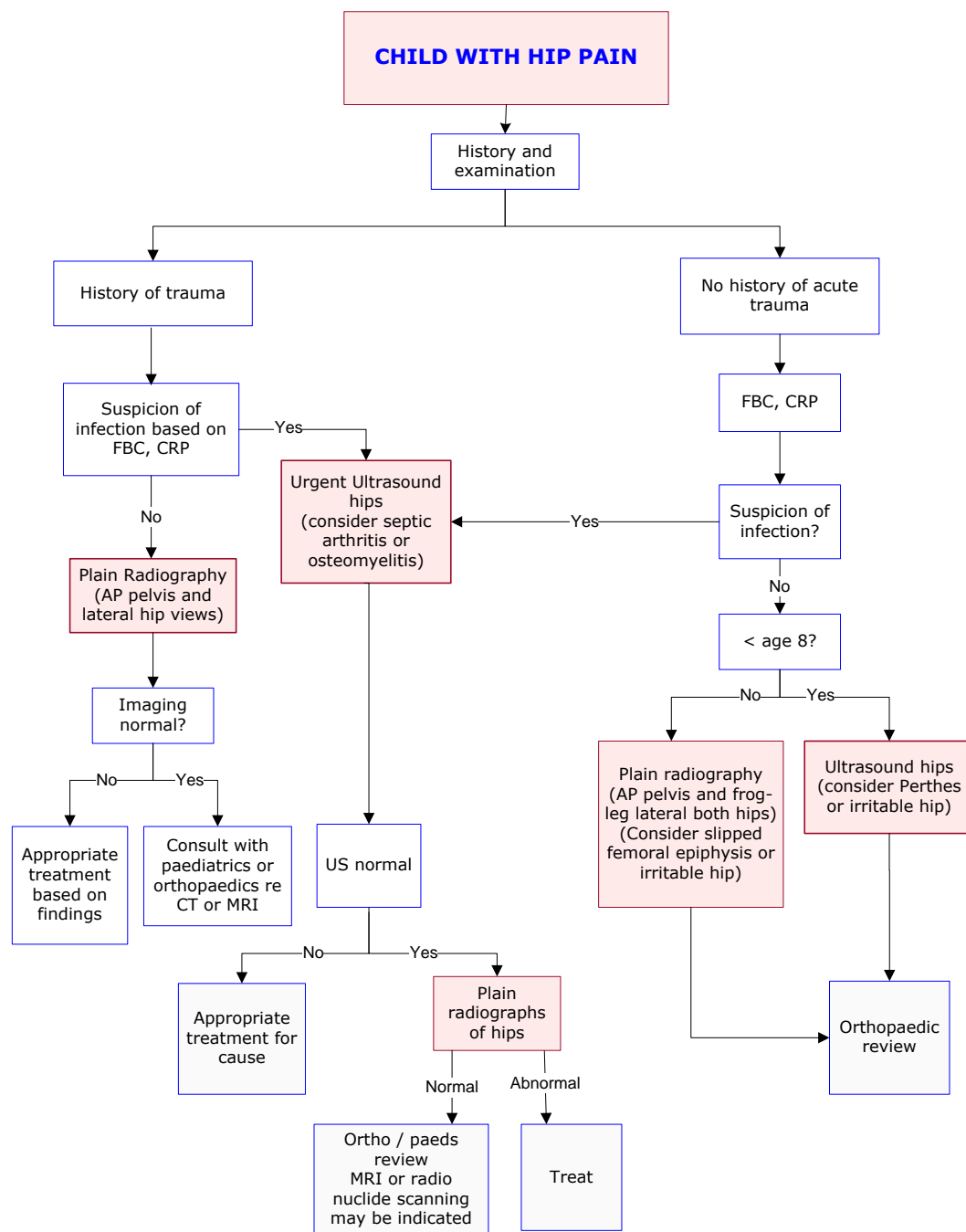
**2.2 Non traumatic acute right iliac fossa (RIF) or pelvis pain**



**Notes:**

- Males 16-40 and females < 16 may not need imaging, but advise early surgical referral.
- Early surgical review is best practice – imaging should not be used as a substitute for review nor used to delay review.
- Causes of acute RIF pain include appendicitis, mesenteric adenitis, inflammatory bowel disease, right sided diverticulitis, omental torsion/infarction, renal colic
- Causes of acute RIF pain in women include ectopic pregnancy, pelvic Inflammatory disease (PID), ovarian or ovarian cyst complication, rupture/haemorrhage, and endometriosis.
- US – sensitivity: 75-90%, specificity: 78-100% for appendicitis. No radiation. Good for gynae pathology. Operator dependent. Reduced value in larger patients.
- CT – sensitivity: 76-100%, specificity: 83-97% for appendicitis. Good for obese patients and for identifying alternate diagnoses. May require intravenous and/or oral contrast. Reasonably high radiation dose.

### 2.3 Child with hip pain



**Notes:**

Plain Radiographs

- Imaging of choice for older child with no trauma.
- Slipped capital femoral epiphysis (SCFE) is usually posteromedial and best seen on a frog-leg lateral view.
- Plain radiography should include both hips.
- Plain radiography not sensitive in early osteomyelitis.

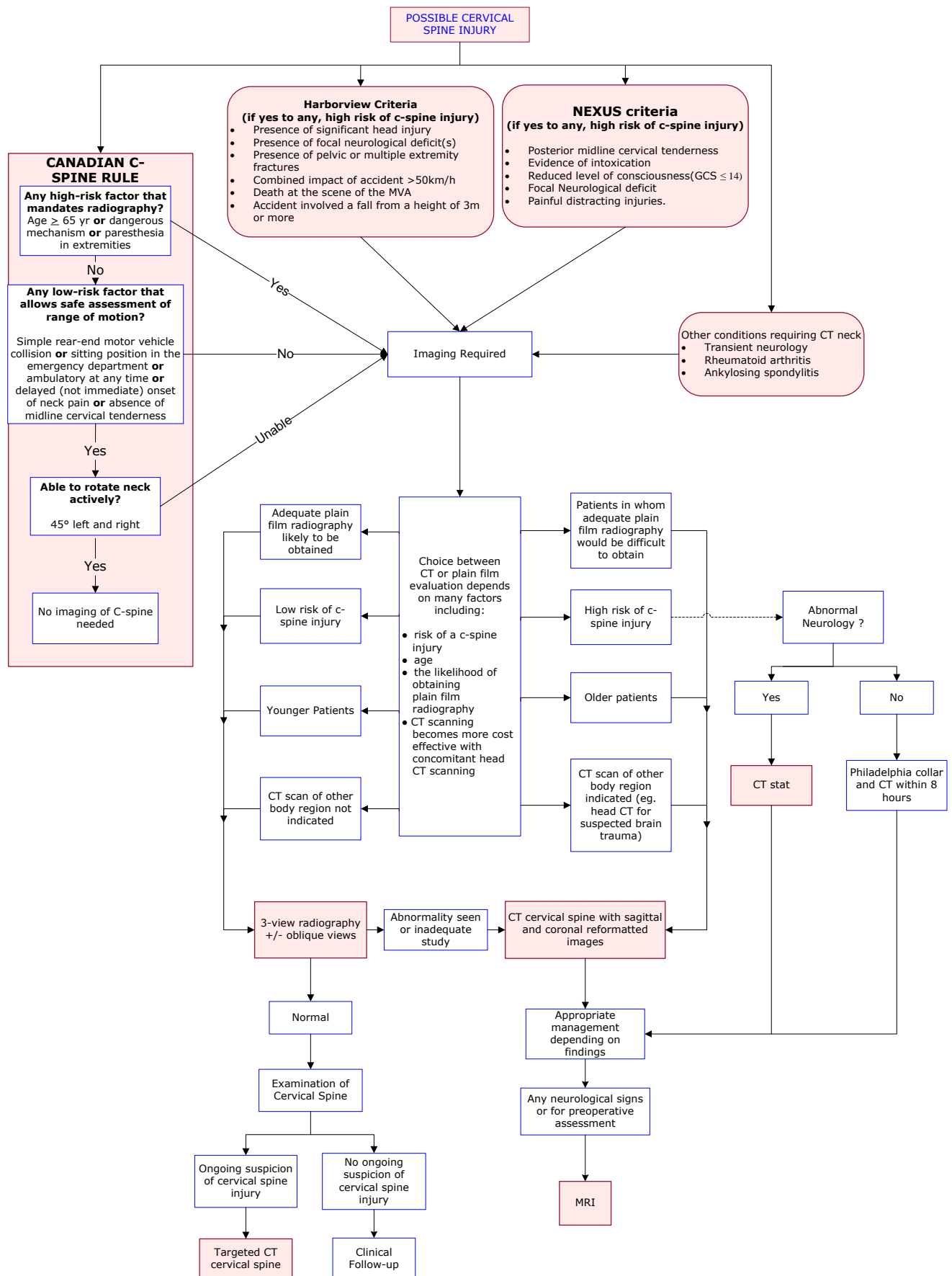
Bone Scans

- High sensitivity/specificity for osteomyelitis (which may be multifocal).
- Lower sensitivity for septic arthritis and difficult to distinguish septic arthritis & transient synovitis.
- High ionizing radiation dose.

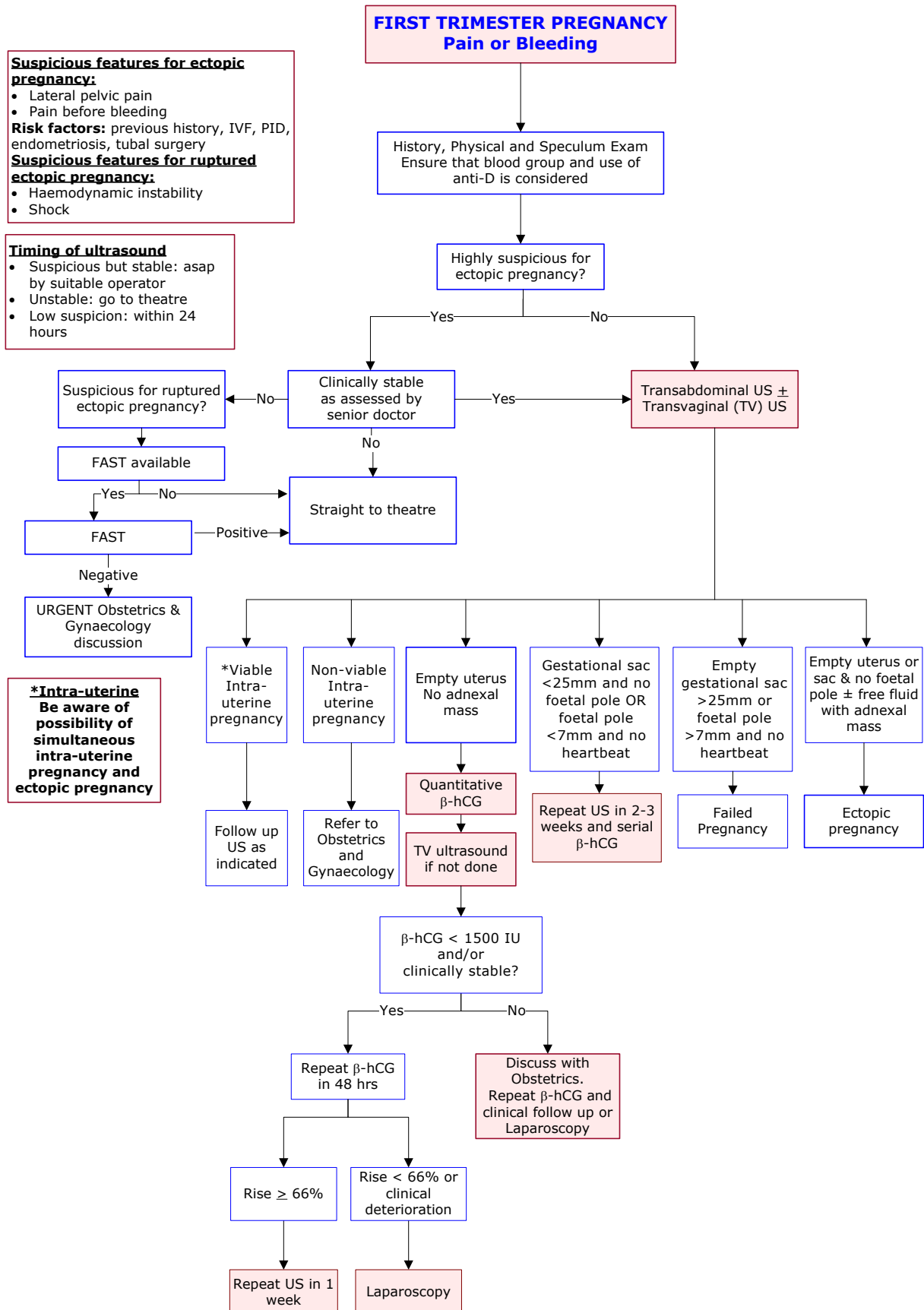
US

- Imaging of choice for young children in the absence of trauma.
- US better for joint effusions.
- No ionizing radiation.

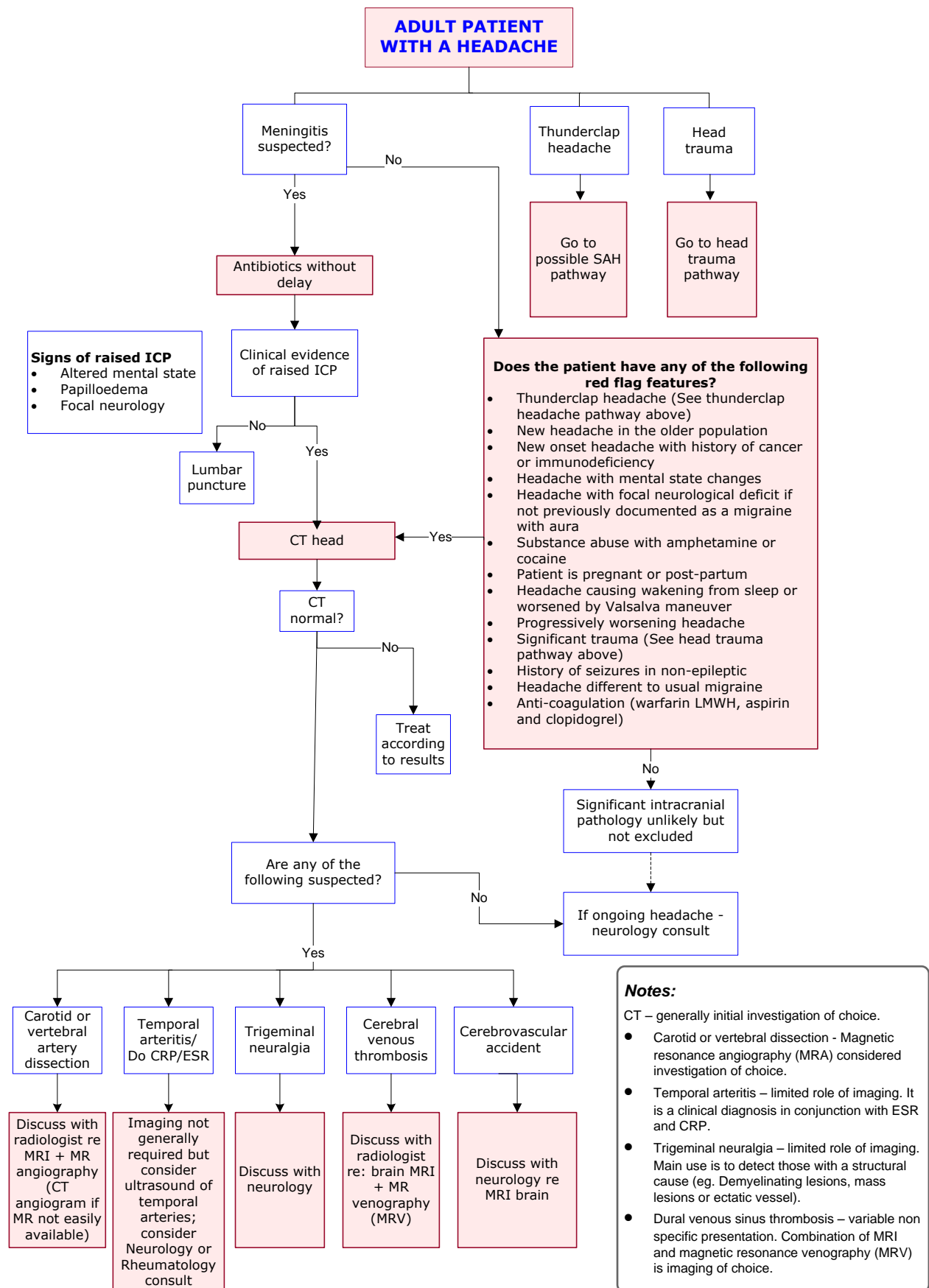
### 2.4 Possible cervical spine injury



## 2.5 First trimester pregnancy – pain or bleeding

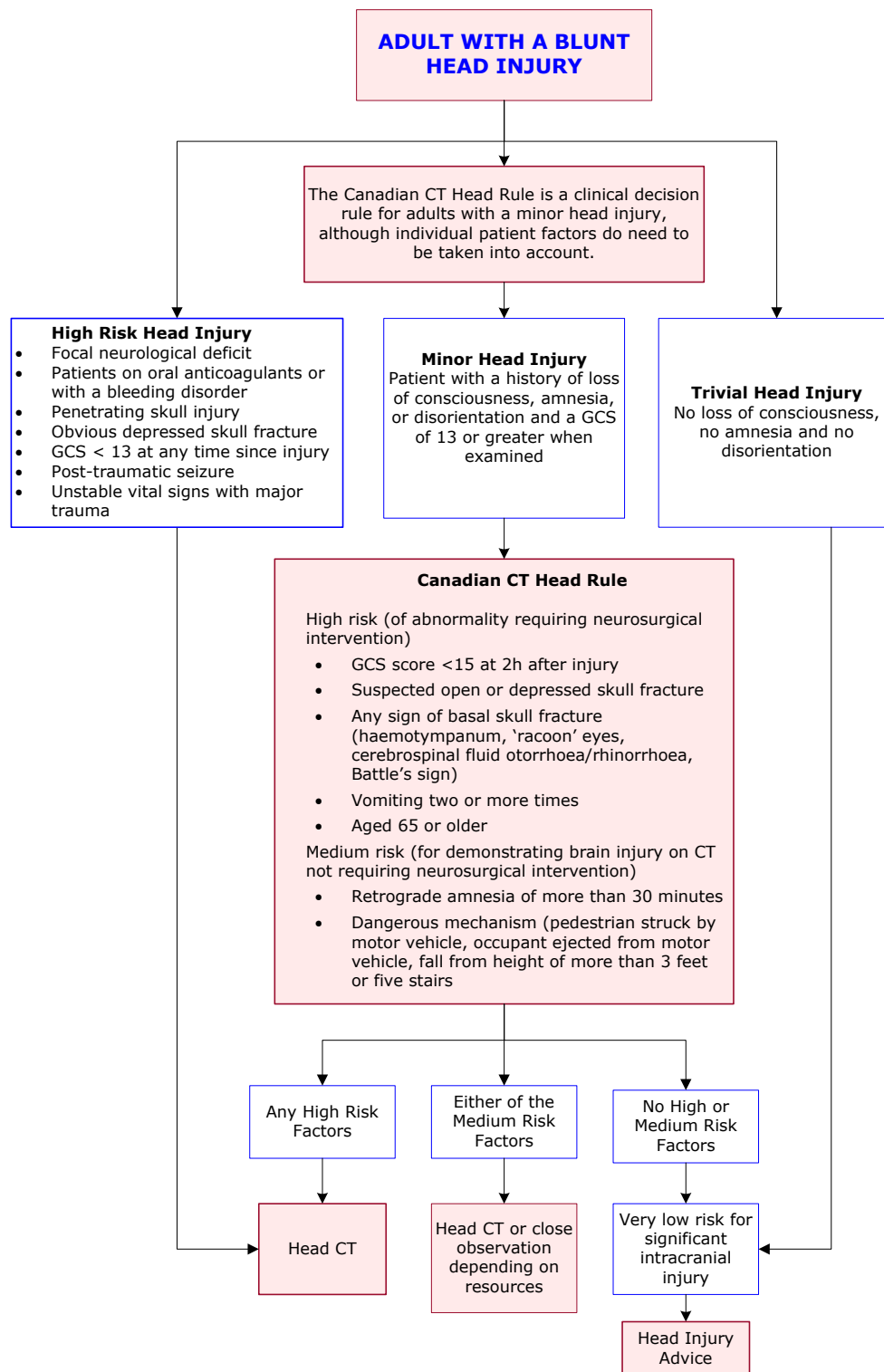


## 2.6 Adult patient with a headache





## 2.7 Adult with a blunt head injury

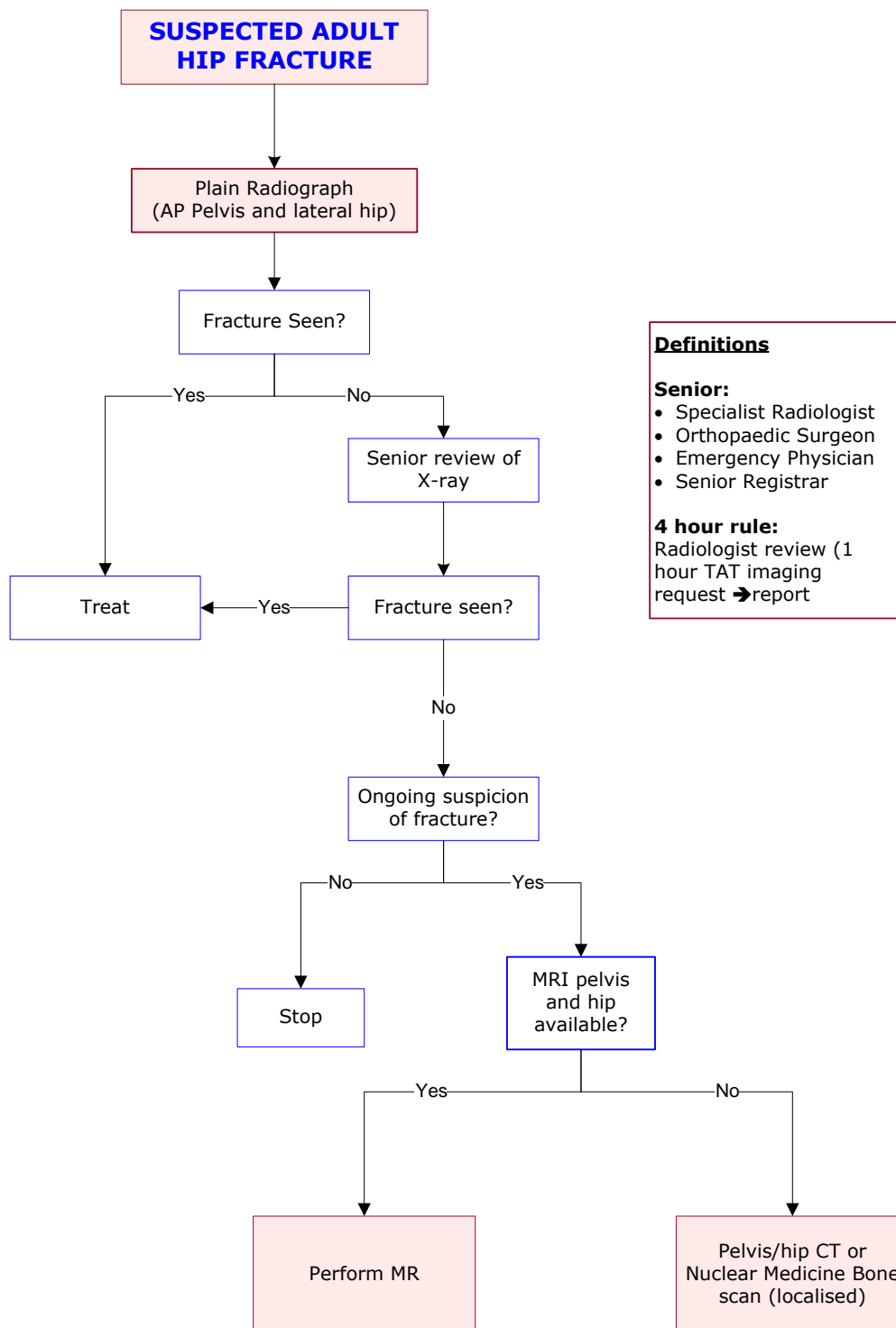


**Notes:** Canadian CT Head Rules

- Prospective validation in Canada reported sensitivity of 100%, specificity of 52% for clinically important brain injury. A Dutch study reported sensitivity of 100% for those requiring neurosurgical intervention but sensitivity of 85% for clinically important brain injury.
- Skull x-rays – rarely used because of the lack of correlation between skull fracture and significant intracranial injury.
- MRI – superior to CT in identifying diffuse axonal injury but lower sensitivity in detection of acute subarachnoid or parenchymal haemorrhage and skull fracture.

**Note:** NSW Health 'Closed Head Injury Management Policy' mandated.  
[http://www.health.nsw.gov.au/policies/pd/2008/PD2008\\_008.html](http://www.health.nsw.gov.au/policies/pd/2008/PD2008_008.html)

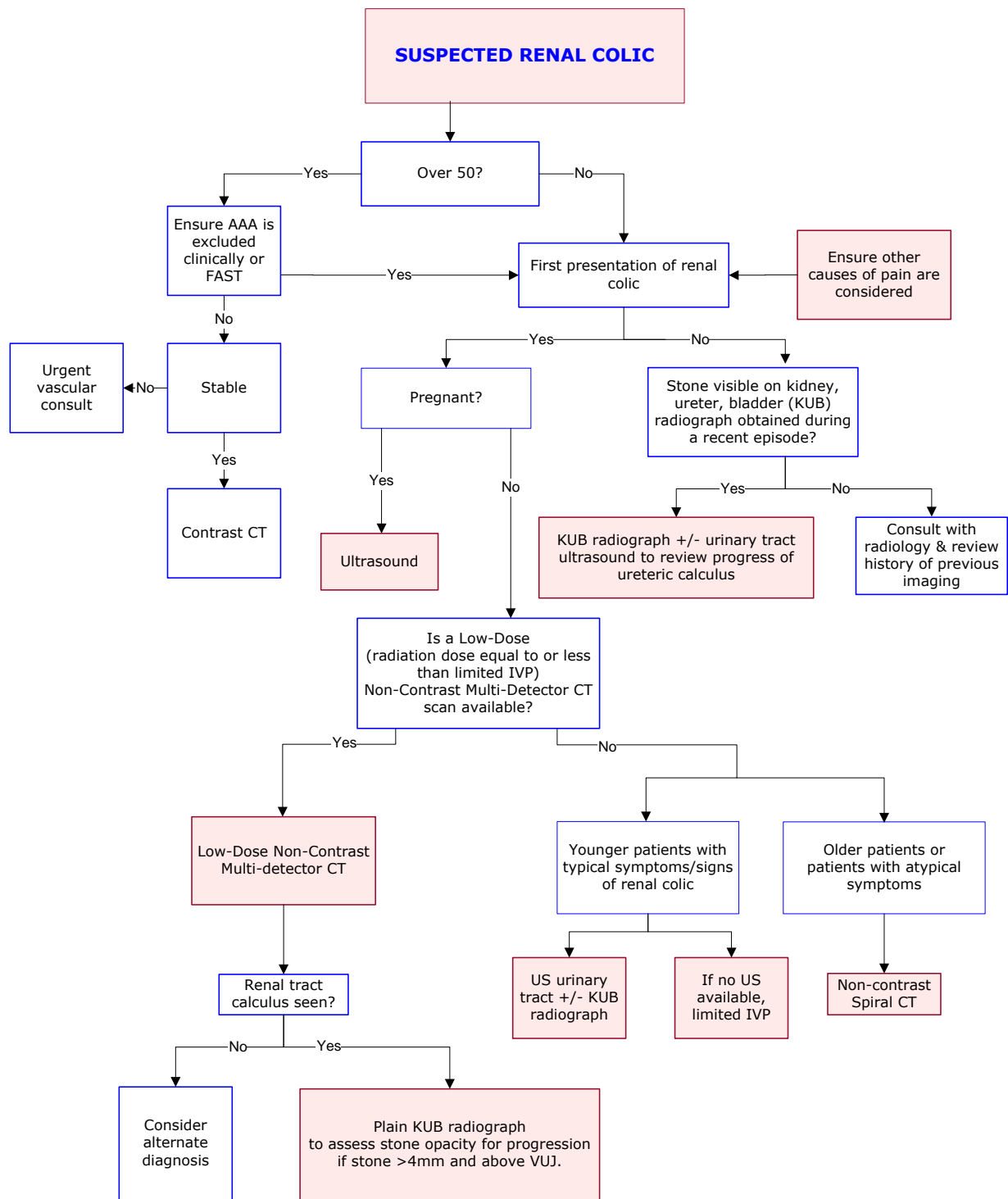
## 2.8 Suspected adult hip fracture



**Notes:**

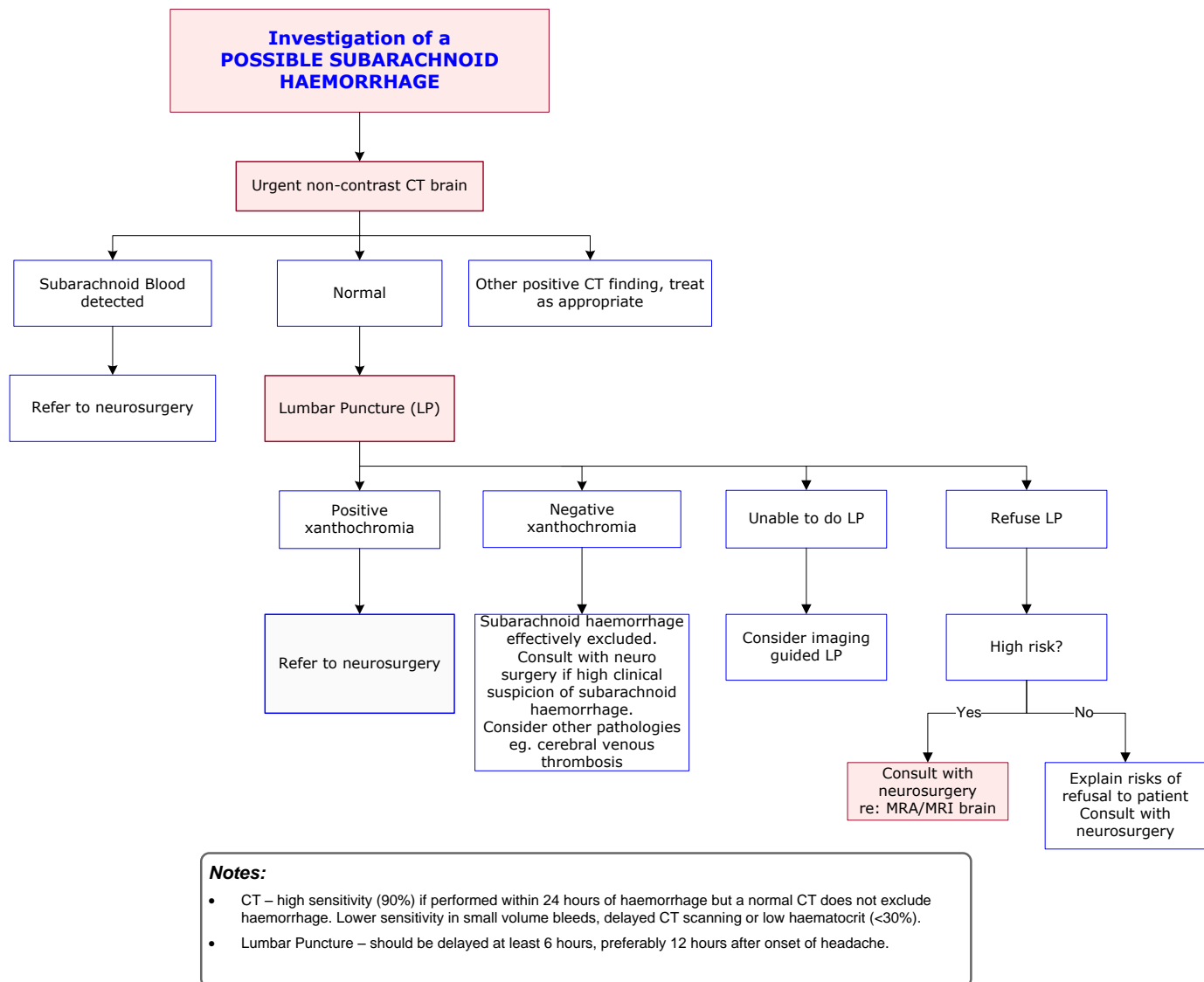
- MRI has sensitivity & specificity close to 100% for occult fracture. CT widely available but may miss impacted fractures or undisplaced fractures parallel to axial plane (sensitivity = 93%).
- Bone Scan – sensitivity 92%, specificity of 95%. Optimal results if delayed up to 72 hours (early scanning may be associated with false negative results).

### 2.9 Suspected renal colic



- Notes:**
- CT considered gold standard – sensitivity of 97%, specificity of 98% compared with IVP (69% and 94%), Low radiation dose protocol seems to be as sensitive & specific as regular protocol.
  - Limited IVP – not as accurate as CT and not recommended unless CT not available.
  - US – low sensitivity (10-50%) but high specificity (90%). In combination with KUB, sensitivity of 79%, specificity of 90%. Stones missed tend to be small (<5mm). Investigation of choice for pregnant women. Not recommended for older patients due to high incidence of non-renal calculi pathology.
  - KUB – useful after CT if stone detected in order to determine visibility on KUB to allow stone follow up if clinically indicated.
  - Patients presenting with multiple episodes of typical renal colic in whom CT has previously demonstrated calculi may not require CT at each presentation.

### 2.10 Investigation of a possible subarachnoid haemorrhage



### 3. DATES AND NOTES

Approved by Council: July 2012

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