1. **Key Messages**

   Diagnostic imaging in trauma is essential to guide diagnosis and prevent mortality.
   
   Indications for imaging are based on a number of different factors to include the mechanism of injury, the patients’ stability, Examination findings, availability of resources and whether transfer to a MTS is likely.
   
   Consideration should be given to the amount of exposure to radiation relevant to each intervention and whether it is the most appropriate imaging modality.
   
   Imaging in the Paediatric population should be tailored so that the required information is obtained with the fewest images and the least amount of radiation.

2. **Introduction**

   Trauma imaging has evolved over the years in response to new techniques, access to imaging facilities and provider training. Medical Imaging is a dedicated team focused on the imaging of patients to assist in diagnosis, with staff and access available for emergency
department patients 24/7 in the MTS. Radiology itself requires specific knowledge of
aetiology (mechanism of injury), common patterns of disease (injury patterns) and what not
to miss. A system of electronic display of images and reports (i.e. Picture Archiving
Communications System or PACS) is highly desirable.

Diagnostic imaging is an important part of the Emergency Department patient workup.
Prompt and appropriate imaging can prevent significant morbidity and mortality in all
trauma patients. 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 with caution.

The initial trauma series of x-rays should include systematic examination and assessment of
Alignment, Bony structures, Cartilage and Soft tissue (ABCS). The Standard Trauma Series
has been composed of X-rays of the chest, pelvis and lateral cervical spine.\(^2\)

The CXR performed is usually supine (AP) rather than erect (PA) owing to the inability to
clear the spine and sit the patient up. The CXR should include imaging of both clavicles, ribs,
lungs, mediastinum and diaphragm. With adequate penetration the thoracic spine may be
seen. The mediastinum may appear falsely enlarged owing to AP projection and this should
be taken into consideration when evaluating the x-ray.

Most trauma services have abandoned the lateral cervical spine x-ray as it poorly visualises
both the occipito-atlantal junction and the cervico-thoracic junction. It is used mainly as a
screening tool. Almost all cervical spine imaging is acquired with MDCT with sagittal and
coronal reconstructions due to the significant mechanisms of injury in trauma.

The pelvic x-ray will include all the bony pelvic components and the hip joints.

### 3. Modalities of Imaging

**Plain film X-rays**

The X-ray department should have a general X-Ray table, upright X-Ray facilities and
additional portable facilities for use in the trauma bay/resuscitation area. The
presence/absence of a film processor is dependent upon proximity to the main Medical
Imaging Department or the use of digital radiography.

The trauma series of x-rays is commenced as soon as is practicable in the reception of the
patient to the ED. Direct digital radiography (DR) should be used in the emergency
department and the images viewed initially on a non-diagnostic built-in screen. The images
are subsequently uploaded to a picture archiving and communication system (PACS) system
for reporting.

Plain films can be used to evaluate limb injuries prior to surgery and are also used for
standard indications in the emergency department.

**Advantages:**
- Excellent evaluation of osseous structures.
- Fast.
- Portable.
- Inexpensive.
- Highest spatial resolution.

**Disadvantages:**
Ultrasound

Ultrasound is utilised in the form of Focused Assessment with Sonography in Trauma (FAST) at all trauma calls and is now the diagnostic imaging of choice in the unstable trauma patient with intra-abdominal haemorrhage who requires urgent surgery. The scan is performed in parallel with the primary survey of the patient as part of the initial resuscitation. The FAST scan is extended to include the pericardium and the pleural spaces, in addition to the abdomen and pelvis. If the patient is found to have free fluid in a body cavity, and is too unstable clinically to undergo MDCT, urgent surgery should be undertaken prior to imaging with MDCT.

When patients arrive who are undergoing cardio-pulmonary resuscitation (CPR), ultrasound of the heart is performed to establish if there is spontaneous cardiac motion and to exclude cardiac tamponade. Ultrasound is occasionally performed intra-operatively to identify sources of haemorrhage distant from the current operative site (e.g. chest and upper abdomen during a pelvic fixation procedure).

Ultrasound is also used for image-guided chest drain insertion, vascular access and pericardiocentesis when immediate surgery is not an available option.

Advantages:
- Portable.
- No ionising radiation.
- Less expensive than CT or MRI.

Disadvantages:
- Low sensitivity and specificity for detecting visceral injuries and haemoperitoneum.
- Operator dependant.
- Does not adequately evaluate retroperitoneum, gas containing structures and mediastinum.

CT scanning

MDCT is generally undertaken only on stable patients. If patients cannot be stabilised in the emergency department they are taken immediately to the operating theatre and receive damage control surgery. Once stabilised they can then receive MDCT.

Advantages:
- Excellent soft tissue contrast resolution.
- Fast / readily available.
- High sensitivity and specificity.
- Excellent evaluation of all tissues.

Disadvantages:
- Expensive.
- Requires the patient to be hemodynamically stable.
- Time consuming.
- Exposure to ionising radiation.

MRI

Rarely used in the trauma setting.
Advantages:
- Uses non-ionising radiation.
- No known deleterious effects.
- Excellent soft tissue contrast.
- Modality of choice for spinal cord injury.

Disadvantages:
- Longer image acquisition time.
- Limited availability.
- Expensive.

4. Early activation

Upon notification of a trauma call, the ED begins preparation to receive the patient, including notification to the Radiology team.

- Ultrasound machines should be available in the ED for experienced providers to use as part of the initial reception.
- The ED radiology staff are required to be ready and waiting to undertake the requested imaging in the resuscitation bay.
- CT facilities should be cleared of patients and ready to receive the patient once a decision is made to take the patient through the scanner.

Ultrasound has evolved to be a mainstay in the detection of life threatening bleeding in the emergency department and is now part of the standard training for doctors working in the Resuscitation environment.
5. Indications for imaging

Head

2.7 Adult with a blunt head injury

ADULT WITH A BLUNT HEAD INJURY

High Risk Head Injury
- Focal neurological deficit
- Patients on anticoagulants or with a bleeding disorder
- Penetrating skull injury
- Obvious depressed skull fracture
- GCS < 13 at any time since injury
- Post-traumatic seizure
- Unstable vital signs with major trauma

Minor Head Injury
- Patients with a history of loss of consciousness, amnesia, or disorientation and a GCS of 13 or greater when examined

Trivial Head Injury
- No loss of consciousness; no amnesia and no disorientation

The Canadian CT Head Rule is a clinical decision rule for adults with a minor head injury, although individual patient factors do need to be taken into account.

Canadian CT Head Rule
- High risk of abnormality requiring neurosurgical interventions
  - GCS score <15 at 2h after injury
  - Suspected open or depressed skull fracture
  - Any sign of basilar skull fracture (nasoethmoidal, nasofrontal, nasoethmoidal, mental, Bennett’s sign)
  - Vomiting two or more times
  - Aged 65 or older
- Medium risk (for demonstrating brain injury on CT not requiring neurosurgical intervention)
  - Retroorbital anemia of more than 30 minutes
  - Dangerous mechanism (seized vehicle struck by motor vehicle, occupant ejected from motor vehicle, fall from height of more than 3 feet or three stairs

Any High Risk Factors
- Head CT

Either of the Medium Risk Factors
- Head CT or closed observation depending on resources

No High or Medium Risk Factors
- Very low risk for significant intracranial injury
- Head Injury Advice

Notes: Canadian CT Head Rule
- Prospective validation in Canada reported sensitivity of 100%, specificity of 12% for clinically important brain injury. A Dutch study reported sensitivity of 100% for those requiring neurosurgical intervention but sensitivity of 84% for clinically important brain injury.
- Skull x-rays – analysis 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 hemorrhage and also cost.
- Note: NICE Health "Closed head injury management policy" mandates http://www.nice.org.uk/CG100/PDF/CG100_323.pdf
CT scanning is the preferred method of imaging if available and should be performed early in the severe to moderate TBI group. Except for an uncomplicated minor head injury, ideally all patients with a significant head injury should have a CT scan. If it appears that the patient will require transfer to an MTS, the decision as to whether to conduct a CT prior to retrieval must be considered. Any CT scans that are performed prior to transfer to the MTS must be sent with the patient. In virtually all situations the CT scan will be performed upon admission to the MTS, and expedient transfer of the patient to MTS must be facilitated. Any critical trauma patient must be very carefully monitored and attended while in the CT scanner.

Definite indications for CT scanning are:

- GCS under 9 after resuscitation.
- Neurological deterioration such as two or more points on the GCS; hemiparesis.
- Drowsiness or confusion (GCS 9–13 persisting > 2 hours).
- Persistent headache, vomiting.
- Focal neurological signs (pupil inequality, change in reactivity such as dilated pupils and unreactive on one side, hemiparesis involving the limbs on one side).
- Skull fracture – known or suspected.
- Penetrating injury – known or suspected.
- Age over 50 years following trauma d/t increased risk of injury in the elderly.
- Post-operative assessment such as emergency burr hole evacuation.
- Seizures.
- Other risk factors such as chronic liver disease or the use of anticoagulants.

**Spine**

All major trauma patients suspected of having a cervical spine injury should be evaluated using the NEXUS criteria. NEXUS provides a decision tool for use in the assessment of the conscious patient to indicate those at very low risk of c spine injury following blunt trauma who may not need radiographic imaging.

Patients are considered to be at extremely low risk of cervical spine injury if ALL of the following criteria are fulfilled:

- No midline cervical spine tenderness.
- No focal neurological deficit.
- No evidence of intoxication.
- No painful distracting injury.
- No altered mental status (including therapeutic or illicit drug effects)

If all of the above criteria are satisfied, clinical examination may then proceed. If there is no evidence of any bruising, deformity or tenderness on examination, and if a full range of active movement can be performed without pain (including 45 degree rotation to left and right), the cervical spine can be cleared without radiographic imaging and the cervical collar be removed.

Should the patient exhibit any of the criteria, however, clinical examination is unreliable and radiographic assessment of the cervical spine is advised.
Plain X-rays may provide initial information on spinal injury, however, are not used to clear the trauma patient of injury. The patient should be cared for as a possible cervical vertebral injury.

A CT scan should be undertaken if the NEXUS criteria for cervical spine clearance has not been met, or the patient is unconscious. Where facilities do not have CT imaging available, then consultation with ARV and the MTS regarding retrieval and transfer should take place. X-ray imaging of the cervical spine is not suitable to clear the neck of the trauma patient. It may be appropriate to delay exhaustive imaging investigations if they are not going to alter management. Definitive imaging may be performed at the receiving specialist unit.

If staff are trained in its application, a Philadelphia collar should be applied within 6 hours so as to prevent any pressure injuries and aid in patient comfort.

**Chest**

**X-ray**

A mobile chest x-ray should be performed in the resuscitation bay at the earliest opportunity. Findings on a chest radiograph include pneumothorax (which is difficult to see on a supine image), pneumo-mediastinum, airspace opacities (resulting from pulmonary contusion), and haemothorax. Repeat X-rays should be undertaken after each intervention such as insertion of a chest tube / intubation. Mechanical ventilation predisposes the patient to barotrauma and pneumothorax.

**FAST**

Conventional echocardiography has long been used to image the heart, the pericardial space, and the ascending aorta. Because ultrasonography is unique in being portable, rapid, and noninvasive, it is particularly suited to the trauma setting and offers immediate feedback that may be incorporated into the management plan for the patient. Ultrasonography is operator dependent and may cause some aortic injuries to be missed.

**CT**

Patients with severe trauma are often difficult to scan with CT because of resuscitative equipment. CT is an excellent modality, but patients are required to receive contrast agents and be transported from the protected resuscitation area to the radiology suite. Therefore, CT scanning is difficult to perform in hemodynamically unstable patients.

In the stable patient, further CT imaging can be obtained to identify aortic injuries (CT Angiogram). CT scans also demonstrate injuries to the lung, pleura, mediastinum, and chest wall better than plain radiographs do. Many serious thoracic injuries may be overlooked on initial chest radiographs; these include tracheobronchial tears, diaphragmatic rupture, esophageal tears, thoracic spine injuries, chest wall and seat-belt injuries, lung contusion, cardiac injuries, pneumothorax, haemothorax, and chest tube complications.

**MRI**

MRI in the acute trauma setting is predominantly used to evaluate spinal cord, discoligamentous injuries and epidural hematoma. It is also being more widely utilised for prognostication of traumatic brain injuries. MRI with breath-hold acquisition permits good visualization of diaphragmatic abnormalities, but this technique cannot be performed in emergency situations. Nevertheless, the indication is carefully weighed in patients with multiple trauma because of monitoring difficulties during the examination, which may be long. MRI is also expensive and is not universally available in emergency departments.
safety of the patient, staff and monitoring devices are also major consideration prior to putting patients through MRI scanners.

**Abdomen**

In the trauma patient with abdominal pain, a FAST should be performed early in the primary survey. This is a non-invasive procedure, is quick to perform and can be completed in the ED.

**FAST**
- Used to identify free fluid in the peritoneal cavity.
- Sensitivity approaching 96% in detecting >800mls blood.
- Involves directing the ultrasound probe in four main regions.
  1. Subxiphoid: to determine fluid in the pericardial space and to assess filling and contractility.
  2. Right upper quadrant: Liver, kidney, diaphragm (including Morrison’s pouch)
  3. Left upper quadrant: Diaphragm, spleen, kidney.

Positive results from a FAST scan warrant further investigation and management in accordance with the patients’ clinical status.

**X-rays**

AP Pelvis should be completed in the ED to confirm the presence of a pelvic fracture.
If the patient has a pelvic binder in place then an AP pelvic radiograph will be performed with the binder on and off. This is because pelvic fractures can be missed if they are completely reduced by the binder. Pelvic binder should only be released at a site where the triggering of further bleeding can be managed (e.g. MTS).

There is no role for performing abdominal x ray besides assessment of ingested foreign bodies and penetrating trauma with the foreign body or weapon in situ.

**CT abdomen /pelvis**

Must be performed with intravenous contrast and oral contrast is no longer used.
- Is the modality of choice in assessing hollow and solid visceral injuries, vascular injuries, spinal and bony pelvic injuries, haemoperitoneum and pneumoperitoneum & allows specific injuries to be graded.
- In the haemodynamically stable patient with suspected intra-abdominal injury the key decision is whether the patient requires CT scanning or a period of observation. It is the diagnostic modality of choice in the stable patient.
- Contrast extravasation found on CT is a sign of active bleeding and may require interventional radiology services if available. It is also a strong predictor of failure of non-operative management.
- Hollow viscus, diaphragmatic & pancreatic injuries are frequently missed on initial scanning. Isolated intraperitoneal fluid findings on CT should raise a high suspicion of hollow organ injury.
6. Radiation / Contrast considerations

The entire trauma team should be mindful of the risks of radiation for both the patient and the team members. The number of x rays taken in the resuscitation area should be kept to a minimum and the installation of permanent lead barriers in the resuscitation room should also be considered. Staff should position themselves at a maximum distance from x-ray equipment wherever possible. Exposure should be minimised and staff should wear protective lead gowns and thyroid shields which will protect against ionizing radiation within recommended occupational limits.

Background radiation is the ionizing radiation present in the environment, it originates from a variety of sources, both natural and artificial. Sources include cosmic radiation, naturally occurring radioactive materials such as radon, fallout from nuclear weapons testing and nuclear accidents. The average human exposure to artificial radiation is 0.6mSv/a with a typical chest x-ray delivering 0.02 mSv.

<table>
<thead>
<tr>
<th>Examination</th>
<th>Radiation dose (mSv)</th>
<th>Time to accumulate comparable natural background dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computed tomography</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinuses</td>
<td>0.6</td>
<td>2 mo</td>
</tr>
<tr>
<td>Head</td>
<td>2.0</td>
<td>8 mo</td>
</tr>
<tr>
<td>Chest</td>
<td>7.0</td>
<td>2 y</td>
</tr>
<tr>
<td>Chest (pulmonary embolism)</td>
<td>10.0</td>
<td>3 y</td>
</tr>
<tr>
<td>Abdomen and pelvis</td>
<td>10.0</td>
<td>3 y</td>
</tr>
<tr>
<td>Multiphase abdomen and pelvis</td>
<td>31.0</td>
<td>10 y</td>
</tr>
<tr>
<td>Radiography</td>
<td></td>
<td></td>
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<tr>
<td>Extremity</td>
<td>0.001</td>
<td>&lt;1 d</td>
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<tr>
<td>Chest</td>
<td>0.1</td>
<td>10 d</td>
</tr>
<tr>
<td>Lumbar spine</td>
<td>0.7</td>
<td>3 mo</td>
</tr>
<tr>
<td>Abdomen</td>
<td>1.2</td>
<td>5 mo</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mammography</td>
<td>0.7</td>
<td>3 mo</td>
</tr>
<tr>
<td>Bone densitometry (DEXA)</td>
<td>0.001</td>
<td>&lt;1 d</td>
</tr>
<tr>
<td>Nuclear medicine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung ventilation/perfusion</td>
<td>2.0</td>
<td>8 mo</td>
</tr>
<tr>
<td>Bone scan</td>
<td>4.2</td>
<td>1 y, 4 mo</td>
</tr>
<tr>
<td>Cardiac perfusion (sestamibi)</td>
<td>12.5</td>
<td>4 y</td>
</tr>
<tr>
<td>Fluoroscopy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barium swallow</td>
<td>1.5</td>
<td>6 mo</td>
</tr>
<tr>
<td>Coronary angiography</td>
<td>5-15</td>
<td>20 mo to 5 y</td>
</tr>
</tbody>
</table>

Ionising radiation in X-ray and CT examinations may directly or indirectly damage DNA which may not be corrected by cellular repair mechanisms. This damage to DNA has been associated with an increased risk of developing cancer. The radiation dose from various diagnostic exams may be calculated as an “effective dose” for the purposes of comparison and quantification of risk. Effective dose, calculated in milliseverts (mSv), refers to the radiation dose from an examination averaged over the entire body and accounts for the different tissues exposed.

The typical CT scan gives tissue doses in the range of 10-30mSv. Tissue doses in the range of 50 -200 mSv have been shown to cause an increase in cancer among atomic bomb survivors and the risk is higher for lower age at exposure.
Radiation dose values should be considered as an estimate only. Doses vary depending on the size of the patient, the type of procedure and equipment and the operational technique used. This is particularly relevant for CT, where estimates of effective dose can vary widely.

7. Paediatric Considerations

For all paediatric trauma patients, PIPER is the first point of call to initiate retrieval and transfer or for advice (1300 137 650). PIPER will coordinate connection to the paediatric trauma line and retrieval services as required.

Most hospitals will perform some paediatric imaging, particularly in the rural setting. However the majority of imaging patients are likely to be adults. Imaging in the Paediatric population should be tailored so that required information is obtained with the fewest images and the least amount of radiation. The aim is to perform the most appropriate test the first time.

Children are more sensitive to radiation exposure than adults, especially related to the thyroid breast tissue and gonads. There is a much longer life expectancy over which to express the radiation induced damaged to genes with girls being slightly more sensitive than boys. Radiography exposes children to relatively low doses of ionizing radiation while CT exposes them to the greatest.

All medical professionals must work towards the principles of ALARA (As Low As Reasonably Achievable) regarding radiation dose when utilising medical imaging, especially when it comes to children.

Trauma imaging

Three standard x-rays that should be considered routinely in major trauma:

- lateral C-spine
- chest
- pelvis (the desire to protect a child’s reproductive organs should not outweigh the risk of significant morbidity from a missed pelvic injury. Any abdominal/lower limb/spinal trauma, all true multi-trauma patients (i.e. MCA/MBA with suspected multi-system trauma, etc.), all intubated patients or if the patient is difficult to assess they must have a plain pelvic radiograph. Always safer to do the radiograph if unsure.)

These x-rays are basic tests for major injuries. Full monitoring should be continued while obtaining the x-rays. Ideally these are done in the resuscitation room while the child is supervised by emergency staff.

FAST (Focused Assessment with Sonography in Trauma) scan: evidence suggests there is little value in paediatrics due to the risk of false reassurance, particularly when conducted by an inexperienced clinician. It may be useful only in structurally adult adolescents. The presence of free fluid in the abdomen on FAST does NOT mandate laparotomy. The absence of free fluid on FAST does NOT rule out significant intra-abdominal bleeding, therefore limiting its application.

eFAST (Extended FAST) scanning in children is helpful in diagnosing acute haemo/pneumothorax and haemopericardium when used by a skilled clinician.
Further imaging should only take place after discussion with PIPER.

CT Scanning: CT can be a life-saving tool for diagnosing injury in children and its use is steadily increasing. Despite this, one of the major disadvantages is the inevitable radiation exposure. The risk of developing a radiation-related cancer may be several times higher for a younger child compared to an adult. The benefits of a properly performed and clinically justified CT examination must always outweigh the risks for an individual child.9

The following principles should be engaged when deciding on imaging a child:

- Ensure imaging is necessary
- Ensure that the appropriate exam is requested
- Communicate with the radiologist so that alternative modalities may be suggested
- Adjust imaging parameters (radiographer) to keep radiation exposure low, but maintain diagnostic image quality
- Only use IV contrast when absolutely necessary

It is strongly recommended that radiographers liaise with radiologists prior to taking plain x-rays if these are performed infrequently as well as for all CT’s. For CT, it is recommended that the radiologist consider whether ultrasound or MRI be performed as an alternative. A radiologist is always available at RCH to discuss imaging if you are uncertain about the most appropriate imaging modality for urgent requests.

It is important not to perform a study, especially CT if it is unlikely that the child will be cooperative or satisfactorily immobilised. General anaesthesia and sedation requires the appropriate medical and nursing expertise, equipment and recovery facilities.

Transfer: The patient’s transfer to a definitive centre of care should not be delayed to await further imaging. If imaging has been completed prior to transferring the patient, then ensure CD’s or films accompany the patient so that repeated imaging is not performed, thereby exposing the patient to unnecessary radiation exposure and a delay in diagnosis.

For detailed advice regarding Paediatric imaging please follow the link:

- Royal Children’s Hospital Clinical Practice Guidelines: Acute Indications
- The Royal Australian and New Zealand College of Radiologists Recommendations for Imaging in Children in Non-Dedicated Paediatric Centres & Position Statement on the use of Sedation and Anaesthesia in Paediatric Imaging
8. Education Modules

The following topics are available in the form of stand-alone web based educational modules (also available in iBook format and as PDF’s) that include a set of cases for each of the clinical scenarios, and incorporate the use of evidence based decision support tools for appropriate referral for imaging provided by The Royal Australian and New Zealand College of Radiologists.

Follow the link to http://www.ranzcr.edu.au/quality-a-safety/program/key-projects/education-modules-for-appropriate-imaging-referrals

**Adult:**
- Adult head trauma
- Adult cervical spine trauma

**Paediatric**
- Paediatric head trauma
- Paediatric cervical spine trauma
# AGREE II Score Sheet: Imaging in Trauma guideline

<table>
<thead>
<tr>
<th>Domain</th>
<th>Item</th>
<th>AGREE II Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope and purpose</td>
<td>1. The overall objective(s) of the guideline is (are) specifically described</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>2. The health question(s) covered by the guideline is (are) specifically described</td>
<td></td>
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<tr>
<td></td>
<td>3. The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described</td>
<td>X</td>
</tr>
<tr>
<td>Stakeholder involvement</td>
<td>4. The guideline development group includes individuals from all the relevant professional groups</td>
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<td></td>
<td>5. The views and preferences of the target population (patients, public, etc.) have been sought</td>
<td>X</td>
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<tr>
<td></td>
<td>6. The target users of the guideline are clearly defined</td>
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<tr>
<td>Rigor of development</td>
<td>7. Systematic methods were used to search for evidence.</td>
<td>X</td>
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<td></td>
<td>8. The criteria for selecting the evidence are clearly described</td>
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<td></td>
<td>9. The strengths and limitations of the body of evidence are clearly described</td>
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<tr>
<td></td>
<td>10. The methods for formulating the recommendations are clearly described</td>
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<tr>
<td></td>
<td>11. The health benefits, side-effects and risks have been considered in formulating the recommendations</td>
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<td></td>
<td>12. There is an explicit link between the recommendations and the supporting evidence</td>
<td>X</td>
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<tr>
<td></td>
<td>13. The guideline has been extensively reviewed by experts prior to its publication</td>
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<td></td>
<td>14. A procedure for updating the guideline is provided</td>
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<tr>
<td>Clarity of presentation</td>
<td>15. The recommendations are specific and unambiguous</td>
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<td></td>
<td>16. The different options for management of the condition or health issue are clearly presented</td>
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<td></td>
<td>17. Key recommendations are easily identifiable</td>
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<tr>
<td>Domain</td>
<td>Item</td>
<td>AGREE II Rating</td>
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<tr>
<td>Applicability</td>
<td>18. The guideline describes facilitators and barriers to its application.</td>
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<tr>
<td></td>
<td>19. The guideline provides advice and/or tools on how the recommendations can be put into practice.</td>
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<td></td>
<td>20. The potential resource implications of applying the recommendations have been considered.</td>
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<td></td>
<td>21. The guideline presents monitoring and/or auditing criteria.</td>
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<tr>
<td>Editorial independence</td>
<td>22. The views of the funding body have not influenced the content of the guideline.</td>
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<td></td>
<td>23. Competing interests of guideline development group members have been recorded and addressed.</td>
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<td>Overall Guideline Assessment</td>
<td>1. Rate the overall quality of this guideline.</td>
<td>1</td>
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<tr>
<td>Overall Guideline Assessment</td>
<td>2. I would recommend this guideline for use.</td>
<td>Yes</td>
</tr>
</tbody>
</table>
10. References


8 The Royal Australian and New Zealand College of Radiologists (RANZCR). (2012). Recommendations for Imaging in Children in Non-Dedicated Paediatric Centres. The Royal Australian and New Zealand College of Radiologists (RANZCR).