**DRAFT – Appropriate Imaging for Common Situations in Primary and Emergency Care**

DRAFT FOR EXTERNAL REVIEW - The online questionnaire is available at [https://survey.health.gov.bc.ca/imaging](https://survey.health.gov.bc.ca/imaging)

**Scope**

This guideline provides recommendations to primary and emergency care providers on how to assess the need for diagnostic imaging in five common situations: low-back pain, minor head injuries, uncomplicated headache, hip and knee pain, and suspected pulmonary embolism. Management of these conditions is beyond the scope of this guideline. However, in some cases, notes and alternatives to imaging are provided for additional clinical context.

**Key Recommendations**

- It is not recommended to order imaging for low back pain unless red flags are present (page 2).
- It is not recommended to order CT head scans in adults and children who have suffered minor head injuries unless positive for a head injury clinical decision rule (page 5).
- It is not recommended to order imaging for uncomplicated headache unless red flags are present (page 7).
- It is not recommended to order MRIs of hip or knee joints in patients with co-existent pain and osteoarthritis unless red flags are present (page 9).
- It is not recommended to order chest CT for suspected pulmonary embolism in low-risk patients with a normal D-dimer result (page 10).
- Practitioners are encouraged to consult a radiologist if they have any concerns or questions regarding which imaging test is appropriate to choose for a given problem.

**Background**

The five recommendations in this guideline were agreed to by a provincial expert advisory group on medical imaging in British Columbia. The recommendations were developed by consensus to decrease the rate of inappropriate medical imaging. The purpose of this guideline is to communicate best practice for imaging in common situations in primary and emergency care, in order to promote appropriate use of imaging resources in BC. Access to diagnostic imaging services, and the ability to respond to emergency/urgent imaging requests, will depend on local availability. When in doubt, direct consultation with a radiologist is encouraged.
Appropriate Imaging for Low Back Pain

**Objective:** to guide decision making regarding whether imaging is needed in an adult patient presenting to primary care or the emergency department with low back pain of less than 6 weeks duration.

Imaging of low back pain without red flags is unlikely to change management or improve treatment.\(^2\)\(^{-6}\) Acute low back pain usually resolves by 6 weeks.\(^5\)\(^,\)\(^7\)

**Decision Rule:** Do not order diagnostic imaging (x-ray, CT or MRI) for low back pain of less than 6 weeks duration unless red flags are present.\(^8\)

- severe or progressive neurologic deficit
- significant acute traumatic event immediately preceding onset of symptoms
- suspected compression fracture (risk factors include long term steroid use)
- suspected cancer, cancer related complication, or history of cancer
- suspected infection (e.g. discitis/osteomyelitis, suspected epidural abscess, risk factors include history of IV drug use) or hematoma
- cauda equina syndrome
- older age (e.g. > 65) with first episode of severe back pain

**Key messages for counselling patients if imaging is not indicated:**
- Acute low back pain usually resolves within 6 weeks
- Provide brief education:
  - CT, MRI and X-rays for uncomplicated low back pain do not help patients get better faster and may expose them to unnecessary risks. Low back pain is very common and often caused by back strain. It usually resolves within weeks without medical treatment. Check back with your health care provider if the pain is getting worse not better, or if you have new symptoms. Treat low back pain with heat, acetaminophen, NSAIDS, and gradual return to usual activities.
- Exercise may decrease low back pain symptoms\(^4\) and may reduce recurrence\(^5\)
- Address fear of activity and return to work and normal activities\(^6\)
- Recommend physiotherapy if exercise persistently makes the pain worse\(^5\)
- Providing expected timelines for recovery and clear communication can improve patient satisfaction and support recovery\(^7\)

**Practitioner resources**
- BC Guideline *Managing Pain*: link to be added when it is available.

**Patient and caregiver resources**
- Patients can call 8-1-1 to speak with an exercise physiologist to receive individualized care including:
  - exercises to address low back pain
  - advice on how to increase physical activity
  - support for motivation, education, identifying and overcoming barriers, and return to work
- Patient Handout - Imaging Tests for Lower Back Pain: When you need them and when you don’t
- HealthLinkBC: Low Back Pain: Exercises to Reduce Pain
Appropriate Imaging for Minor Head Injury

CT of the head exposes the patient to radiation and has associated iatrogenic cancer risks. Radiation risks are highest in infants and decrease with age. The following clinical decision rules balance the benefit of identifying a treatable brain injury with the risks associated with radiation exposure.

Do not order CT head scans in patients who have suffered minor head injuries unless positive for a validated head injury clinical decision rule such as the Canadian CT Head Rule for adults age 16+, or the PECARN Rule for pediatrics.

- Adults age 16+: Canadian CT Head Rule
- Children: PECARN Rule (page 4)

In situations where CT is not readily available, consultation with a specialist is encouraged to help guide medevac decisions.

Canadian CT Head Rule (age 16+)³

The Canadian CT Head Rule can be applied to patients with a “minor” head injury. In this context, “minor” means a head injury with GCS 13-15 AND with one of:

- a witnessed loss of consciousness (LOC), or
- amnesia to the head injury event, or
- witnessed disorientation.

A CT head is recommended for patients who fulfil the inclusion criteria above AND any ONE of the following findings:

- **High risk (for neurological intervention)**
  - GCS score <15 at 2h after injury
  - Suspected open or depressed skull fracture
  - Any sign of basal skull fracture (haemotympanum, ‘raccoon’ eyes, cerebrospinal fluid otorrhoea/rhinorrhoea, Battle’s sign)
  - Vomiting ≥2 episodes
  - Age ≥65 years

- **Medium risk (for brain injury on CT)**
  - Amnesia > 30 minutes preceding impact
  - Dangerous mechanism of injury (e.g. pedestrian struck by motor vehicle, occupant ejected from motor vehicle, fall from height >3 feet or five stairs)

Patients who are on blood thinners or have a post-traumatic seizure are excluded from the Canadian CT Head Rule and require individualized assessment.
PECARN Rule (age <2 years with GCS score ≥14)\textsuperscript{10}

- GCS = 14 or other signs of altered mental status*, or signs of basilar skull fracture → Yes → CT recommended
- History of LOC, or history of vomiting, or severe mechanism of injury*, or severe headache → Yes → Observation vs. CT on the basis of other clinical factors including:
  - physician experience
  - multiple vs. isolated findings**
  - worsening symptoms or signs after emergency department observation
  - parental preference
  - CT not recommended

PECARN Rule (age ≥ 2 years with GCS score ≥14)\textsuperscript{10}

- GCS = 14 or other signs of altered mental status*, or palpable skull fracture → Yes → CT recommended
- Occipital or parietal or temporal scalp haematoma, or history of LOC ≥5 s, or severe mechanism of injury**, or not acting normally per parent. → Yes → Observation vs. CT on the basis of other clinical factors including:
  - physician experience
  - multiple vs. isolated findings
  - worsening symptoms or signs after emergency department observation
  - age <3 months
  - parental preference
  - CT not recommended

*Other signs of altered mental status: agitation, somnolence, repetitive questioning, or slow response to verbal communication
**Severe mechanism of injury: motor vehicle crash with patient ejection, death of another passenger, or rollover; pedestrian or bicyclist without helmet struck by a motorised vehicle; falls of more than 3 feet for children <age 2 or 5 feet for children age 2+, or head struck by a high-impact object

Patient and Family Resources:
- BC Children’s Hospital – [Head Injury Advice for Parents and Caregivers](#)
- Concussion Awareness Training Tool (for medical professionals, coaches, parents, caregivers, athletes)
Appropriate Use of CT for Uncomplicated Headache in Adults

The need for imaging must be balanced against the risk of radiation. When in doubt, consult with radiology through the RACE Line.

- **Think twice before ordering head CT for:**
  - migraine
  - syncope
  - temporal arteritis
  - multiple sclerosis
  - sinusitis
  - chronic post-concussion syndrome with normal neurological exam

- **Consider imaging in the following “red flag” situations:**
  - sudden onset of severe headache (thunderclap)
  - recurrent headache with unexplained focal neurological signs
  - new onset in HIV or cancer
  - abnormal neurological exam
  - suspected of intracranial infection
  - new onset or worsening seizure
  - new headache age >50
  - headache causing awaking from sleep
  - papilledema
  - focal neurological deficit
  - worsening headache frequency or severity in a patient with previous headache history or recent head trauma
  - acute head trauma if scenario complies with CT head rules (page 5)

**Key messages for counselling patients if imaging is not indicated:**
- Most headaches are benign and self-limiting and do not require a CT head scan for diagnosis.

**Patient and Caregiver Resources**
- [Imaging Tests for Headaches: When you need them and when you don’t](#) – Choosing Wisely Canada
Appropriate Use of MRI for Hip and Knee Pain

In the absence of red flags, acute or chronic hip or knee pain with plain film x-ray evidence of moderate to severe osteoarthritis (OA) does not require MRI. MRI should be reserved for evaluation of possible red flag diagnoses or common conditions treatable with arthroscopy, e.g. meniscus and ligamentous tears.

- **Indications for knee or hip MRI in the presence of joint pain (red flags):**
  - Age <40 years* with knee or hip OA in subject joint
  - Query tumour/neoplasm
  - Query infection
  - Fixed locked knee (not intermittent)
  - Previous knee or hip surgery
  - Osteonecrosis
  - MRI was recommended on a previous imaging report

**Key messages for counselling patients:**
- Having an x-ray can inform the appropriate investigation pathway
- In absence of red flag symptoms, there is no evidence for the utility of MRI in patients with significant OA.
- Most orthopaedic surgeons do not require obligatory MRI prior to consultation. If an MRI is required, the surgeon can request it.
- Discuss options for treatment and pain management.

**Patient and caregiver resources**
- [MRI for Knee and Hip – when is it appropriate? Information for patients (Vancouver Coastal Health)](#)

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* Note: All outpatient MRI requisitions for Lower Mainland Medical Imagign sites across Fraser Health, Vancouver Coastal Health and Providence Health Care must be directed to the MRI Central Intake program. Referring clinicians must complete and attach the regional knee and hip appropriateness checklist to their MRI requisition for patients 40 years of age and older.
Appropriate Use of CT for Suspected Pulmonary Embolism in the Non-Pregnant Adult

**Objective:** To guide decision making regarding the use of CT in a non-pregnant adult patient presenting with a suspected pulmonary embolism (PE), based on history and physical exam.

Practitioners are reminded to consider risk factors that might alter the pre-test probability. This strategy applies to the majority of people and does not account for unique risk factors (e.g. anabolic steroids, athletes, elderly, paraplegics, etc.). If patients have persistent symptoms beyond 24-48 hours, they should return to the emergency department for further assessment.

**Key points:**
- For low risk adult patients: Do not order imaging (CT pulmonary angiogram [CTPA] or ventilation-perfusion [VQ] lung scan) for pulmonary embolism in those with a normal D-dimer result (see below).
- For high risk adult patients: Start empiric treatment with anticoagulant therapy if confirmatory imaging (CTPA, VQ lung scan) is not immediately available.

When a patient presents with signs and symptoms suspicious for PE, the following sequential steps should be done to determine whether a CTPA is required:

1. **Assessment of pre-test probability using a clinical decision rule (e.g. Wells Score)**

   - If the total Wells score is ≥4.5 (PE likely), proceed to imaging.
   - If <4.5 (PE unlikely), proceed to the pulmonary embolism rule-out criteria (PERC Rule).

2. **PERC Rule**

   - If the patient is low-risk (PE unlikely) and the PERC score is 0 (all of the items are true), the likelihood of PE is <2% and CTPA is not recommended.
   - If the patient is low-risk and the PERC score is >0 (one or more items is not true), proceed to D-dimer.

3. **D-dimer:** CTPA is recommended if D-dimer is above the normal range for your institution. Age-adjusted D-dimer testing has not been thoroughly validated and should not be used at this time.
Diagnostic imaging for suspected PE in pregnant patients

- Specialist consultation is recommended (radiology, obstetrics)
- It is unclear whether CTPA or ventilation-perfusion (V/Q) scanning is preferable in pregnant patients\(^5,6\)
- Radiation dose from CTPA and V/Q scanning may be dependent on the scanners available at a given site

Practitioner Resources

- **RACE Line**: [raceconnect.ca](https://raceconnect.ca)
  - A telephone consultation line for select specialty services for physicians, nurse practitioners and medical residents. If the relevant specialty area is available through your local RACE line, please contact them first. Contact your local RACE line for the list of available specialty areas. If your local RACE line does not cover the relevant specialty service or there is no local RACE line in your area, or to access Provincial Services, please contact the Vancouver Coastal Health Region/Providence Health Care RACE line.
    - Vancouver Coastal Health Region/Providence Health Care: [www.raceconnect.ca](https://www.raceconnect.ca) or 604-696-2131 or 1-877-696-2131
    - Northern RACE: 1-877-605-7223 (toll free)
    - Fraser Valley RACE: [www.raceapp.ca](https://www.raceapp.ca)
    - South Island RACE: [www.raceapp.ca/](https://www.raceapp.ca/) or see [www.divisionsbc.ca/south-island/race](https://www.divisionsbc.ca/south-island/race)
- **Pathways**: [pathwaysbc.ca](https://pathwaysbc.ca)
  - An online resource that allows GPs and nurse practitioners and their office staff to quickly access current and accurate referral information and wait times for specialists and specialty clinics. Pathways also has hundreds of patient and physician resources that are categorized and searchable.
- **BC Emergency Medicine Network**: [bcemergencynetwork.ca](https://bcemergencynetwork.ca)
  - Includes practitioner resources and patient handouts.
- **Lower Mainland Medical Imaging MRI Central Intake Program**: [vch.ca/for-health-professionals/resources-updates/mri-central-intake](https://vch.ca/for-health-professionals/resources-updates/mri-central-intake)

Associated Documents

- BC Guideline: [Ultrasound Prioritization](https://bcemergencynetwork.ca)
- BC Guideline: [Ankle Injury – X-Ray for Acute Injury of the Ankle or Mid-Foot](https://bcemergencynetwork.ca)
References


