Clinical Practice Guideline: **X-Ray Guidelines**

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INDICATIONS for RADIOGRAPHIC EXAMINATION

Summary

Radiography is a valuable and important tool in the evaluation of patients with musculoskeletal disorders. While exposure to use of ionizing radiation for diagnostic purposes poses both risks and benefits, its use should be tailored as much as feasible to situations where it is capable of producing diagnostically or therapeutically significant information for clinicians. Scientific evidence clearly supports the medical necessity of radiographic examination when the information received from the exam is essential to ascertain the safety and appropriateness of planned treatment interventions. Periodic and systematic review of literature and practices provides benefit to patients, practitioners and clients regarding best practices use of radiography. American Specialty Health – Specialty (ASH) Clinical Quality Administration and Clinical Quality Evaluation consistently apply the current body of knowledge to the decisions made regarding quality improvement initiatives, verification of medical necessity, and the credentialing and re-credentialing of practitioners for its networks. A recent review of the most current body of clinical knowledge by a professional expert consensus panel and a panel of doctors representing professional societies and academic institutions provided information to ASH regarding the relative risks and benefits of performing an examination that requires exposure to ionizing radiation.

Performing manual therapy has been shown to provide significant benefit to patients with certain types and severity of mechanical disorders of the osseous articulations of the body. However, manual therapy can also cause harm if the procedure is performed in a manner or location contraindicated by underlying pathology or structural anomaly. Performing manual medicine procedures to the articular structures of the body requires a clear understanding of the biomechanics of the affected and related structures. Often, these mechanical characteristics of the patient's presenting symptoms can be assessed through history and physical examination alone. However, in some cases, it will be essential and medically necessary for the physician to have a radiographic examination performed in addition to diagnostic history and physical examination in order to fully understand the risks and benefits of high load manual procedures to the osseous structures of the body. The number of views taken to adequately assess the osseous structures will be dictated by the various indications identified via the history and physical examination (and on occasion laboratory examination). This Clinical Practice

Guideline (CPG) provides a description of those evaluation factors that may indicate such a need for obtaining plain film radiographs.

RADIOLOGICAL SAFETY

Summary

Current evidence indicates the reality of cellular and tissue level damage caused by radiation. Radiation has long been known to cause increased risk of neoplasia and birth defects. While it is still unclear whether there is a threshold dose below which the risk of ionizing radiation approaches negligible levels, expert opinion and government regulation affirms that clinicians should strive for exposures that are "As Low As Reasonably Attainable" (ALARA). This effort includes the use of appropriate technology (digital imaging, high speed screens, etc.), minimum necessary views, and appropriate assessment of "medical necessity" for imaging in the first place. ASH clinical committees have adopted the summation in BEIR VII, Phase II Panel report which states, "The committee concludes that the assumption that any stimulatory hormetic effects from low dose of ionizing radiation will have a significant health benefit to humans that exceeds potential detrimental effects from the radiation exposure is unwarranted at this time". There is potential risk of harm caused by radiation received during the radiological exam; however, there are well established benefits to obtaining the clinical information provided by the radiograph.

A major objective of the initial triage should be to determine the presence of clinical indicators ("red-flags") for conditions that may be both:

- A contraindication to the initiation of a trial of manual therapies, and
- Properly assessed by a radiographic study.

In the absence of such clinical indicators, simple decisions based on separation into articular versus non-articular disorders and on the duration of the patient complaint (acute, sub-acute, or chronic) are favored by the most recent expert consensus statements. Proper patient selection involves balancing the established benefits of the clinical information obtainable from a radiograph with the potential for harm.

GUIDELINE AND RATIONALE

The diagnostic procedure(s) necessary to ensure appropriate care for each patient must be based upon recognition of key indicators from the patient's history and physical examination. These guidelines are designed to assist you in the imaging decision process.

Plain film radiography is the most widely used skeletal imaging method. The primary value of plain films is to show pathologies of bone or joint structures, especially if there is a question of a possible fracture, demineralization, or other bone-weakening disease. A normal x-ray **does not always** rule out skeletal pathology. Pathology can only be ruled

out through the appropriate assessment of red flags identified through careful history and physical examination combined with appropriate diagnostic triage.

Recent literature reviews conclude there is insufficient evidence for using x-rays for biomechanical analysis, including but not limited to the detection and characterization of subluxation(s), except for scoliosis evaluation or intersegmental instability when correlated with evidence obtained through careful history and physical examination.

Plain film radiographs should not be used as a screening procedure without clinical indications. If prior imaging of the area in question has been performed at another facility, all reasonable attempts should be made to obtain the results of those studies prior to considering further studies.

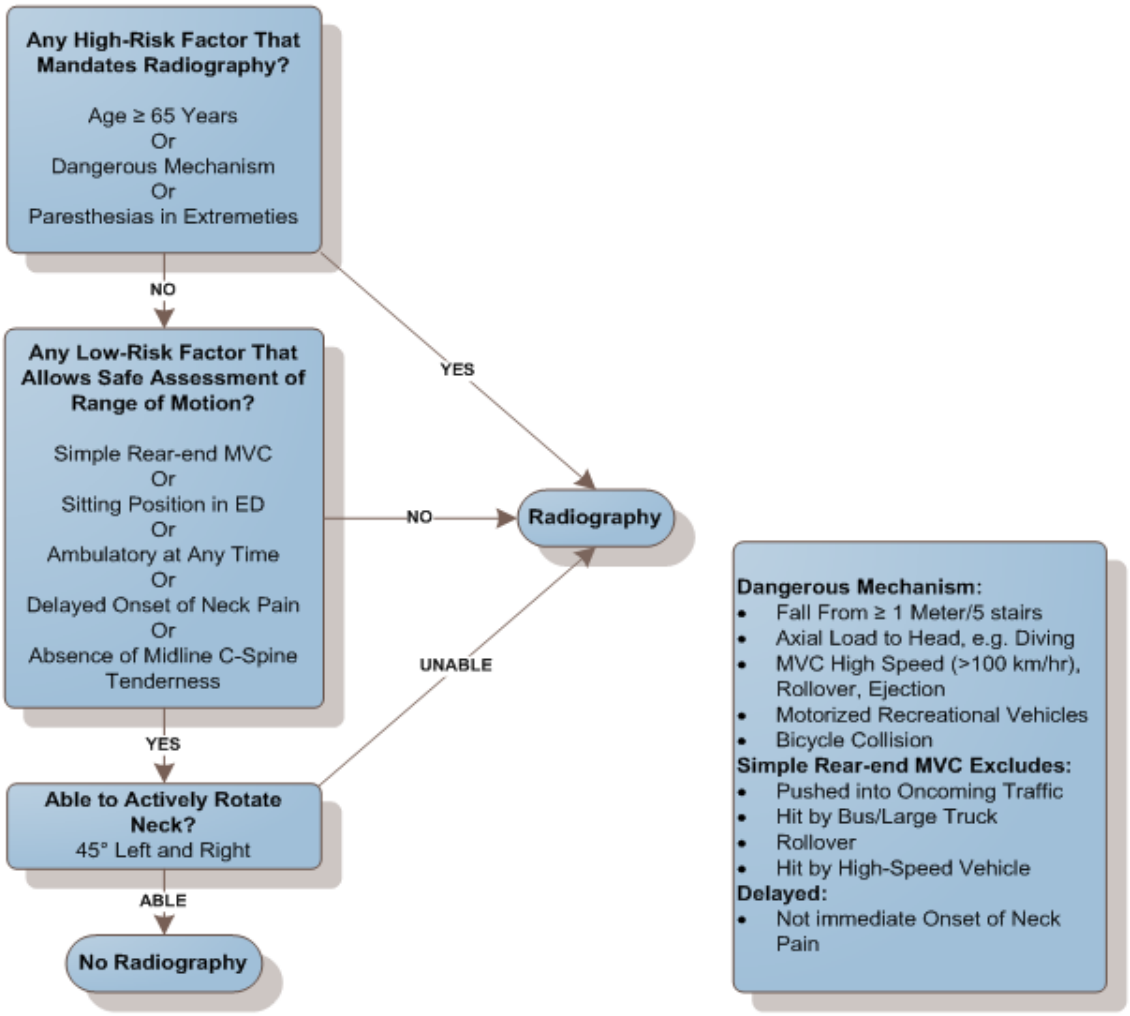
The following discussion of clinical indicators may help inform the decision to obtain plain film radiographs, however, the clinical presentation as a whole must be considered.

Red Flag Indicators from History and Physical Examination

1. Fracture, Dislocation, Ligamentous Incompetence:

- Recent injury or trauma (at any age) sufficient to cause fracture such as a motor vehicle collision (MVC), blunt trauma, or fall, especially from height. A reasonable attempt should be made to obtain previous studies/reports if prior imaging was performed in the emergency center;
- Age over 70 accompanied by historical factors or physical examination findings that would raise suspicion of fracture;
- History of osteoporosis or any known disease that could lead to bone loss and minor trauma such as lifting, accompanied by localized bone pain;
- History of repetitive trauma sufficient to cause fracture (e.g., patients participating in contact sports, gymnasts, and/or laborers who perform heavy repetitive lifting);
- Prolonged oral corticosteroid use accompanied by historical factors and physical examination findings that would raise suspicion for fracture;
- Suspicion or known history of spondylolisthesis for which symptoms suggest spinal stenosis with progressive neurologic deficits;
- History of alcohol or drug abuse where the abused substances may result in loss of consciousness or poor recollection of activities or actions that could include trauma sufficient to cause fracture **and** symptoms or clinical presentation suggestive of fracture; and
- Failure to improve with treatment when accompanied by historical factors or physical examination findings that would raise suspicion of fracture or other suspected skeletal pathology.
- When cervical spine injury is a concern the following considerations for determining the need for radiographic assessment may be helpful and sensitive for detecting clinically important injuries.

- Canadian C-Spine Rule:



- The Nexus guidelines suggest a low probability of injury to the cervical spine if the patient meets all five of the following criteria:
  - they do not have tenderness at the posterior midline of the cervical spine,
  - they have no focal neurological deficit,
  - they have a normal level of alertness,
  - they have no evidence of intoxication, and
  - they do not have a clinically apparent, painful injury that might distract them from the pain of cervical-spine injury.

2. Neoplasia: Cancer/Malignancy/Tumor

- History of malignancy with suspicious physical examination findings (e.g., acute localized bone pain);
- Age over 50 or under 20 with unexplained localized bone pain;
- Non-mechanical pain (e.g., severe ongoing pain, especially at night, that is unrelenting and is unrelieved by rest or position);
- Severely restricted lumbar flexion that is not improving when correlated with other factors from history and physical examination;
- The presence of a palpable mass;
- Unexplained weight loss (i.e., unintentional weight loss of 4.5 Kg or 10 lbs. or greater over preceding six (6) months);
- Symptoms of urinary tract infection, HIV, or other risk factors that may be red flags for tumor; and
- Failure to improve with treatment when accompanied by historical factors or physical examination findings that would raise suspicion for cancer/malignancy/tumor/pathological fracture.

Consider coordinating appropriate co-management actions when red flags are present for cancer/malignancy/tumor/pathological fracture. Radiography has limitations when red flags are present for these conditions, and other tests as well as co-management must be considered when suspicion for these conditions arises.

3. Infection

- Non-mechanical pain (e.g., severe ongoing pain, especially at night, that is unrelenting and is unrelieved by rest or position);
- Symptoms of urinary tract infection, IV drug abuse, HIV, or other risk factors that may be red flags for infection;
- Constitutional symptoms such as recent fever of unknown origin greater than 101°, chills, localized bone pain, and lymphadenopathy raising suspicion for osteomyelitis;
- Intermittent fever of unknown origin with focal pain and/or deformity;
- Mono-articular inflammatory joint pain that does not have a clear explanation of origin;
- Severely restricted lumbar flexion that is not improving when correlated with other factors from history and physical examination; and
- Failure to improve with treatment when accompanied by historical factors or physical examination findings that would raise suspicion for infection.

Consider coordinating appropriate co-management actions when red flags are present for infection. Radiography has limitations when red flags are present for infection, and other tests as well as co-management must be considered when suspicion for infection arises.

4. Miscellaneous Scenarios

- Active or inactive spondylolysis and spondylolisthesis must be considered in patients under the age of 20 presenting with recurrent spinal pain accompanied by other key historical factors (participating in sports that cause the patient to perform repetitive hyperextension of the lumbar spine such as gymnastics, wrestling, diving, and weight lifting). Special testing (SPECT scan or MRI) may be indicated in patients with suspected spondylolysis and spondylolisthesis when historical and physical examination findings warrant the need;
- Recurring pain of unknown origin with no indication by history, treatment, or examination findings of a mechanical basis for the recurring pain and no films or reliable reports are available. A reasonable attempt should be made to obtain previous studies/reports if prior imaging was performed within two (2) years;
- Previous history of surgery, fracture, or x-ray abnormality in the area of complaint as reported by the patient but no films or reliable reports are available. A reasonable attempt should be made to obtain previous studies/reports if prior imaging was performed within two (2) years; and
- Presence of historical factors or physical examination findings that would raise suspicion for traumatic inflammatory or degenerative spinal instability sufficient to be a contraindication to manual manipulative treatment. This is especially a concern at the Atlas-Axis articulation.

Indicators of Various Conditions or Factors Requiring Clinical Correlation and Possible Co-management

- Signs indicating cauda equina syndrome such as saddle dysesthesia (found in 75% of patients with cauda equina syndrome), urinary frequency, incontinence, or possible neurological deficit require urgent surgical consultation. Plain film radiographs are no longer considered as an initial imaging procedure;
- Focal neurological deficit (absent deep tendon reflexes, gross muscle weakness, and/or measurable atrophy of an extremity) suggestive of compressive lesions to the spinal cord or nerve roots **if** bony stenosis due to severe degenerative disease of segmental listhesis is suspected. Other causes of neurologic deficit, such as cord tumor or herniated nucleus pulposis are more effectively evaluated with advanced imaging modalities such as MRI;
- Neck pain with radicular symptoms may lower the threshold for plain film imaging. Correlation with clinical findings is recommended;
- History including complaint of dizziness or impaired consciousness of unknown origin;
- Dysphagia;
- Poorly controlled diabetes may be associated with bone loss and diffuse idiopathic skeletal hyperostosis (DISH);
- Poorly controlled hypertension may be associated with increased risk of aneurism;
- Clinical suspicion of and/or positive lab findings for ankylosing spondylitis;

- Suspicion of or confirmed presence of inflammatory arthritis that may contraindicate manipulation/mobilization;
- Symptoms and signs that suggest back pain from non-spinal causes such as subclinical pyelonephritis, kidney stones, or dissecting aneurysm;
- Prolonged drug and/or alcohol abuse;
- Immunosuppression; and
- In children, hip pain with limping or refusal to bear weight.

Full Spine Radiography

- Full spine (14 x 36) x-rays should not be used as a routine screening procedure for scoliosis or any other global spinal postural dysfunction;
- Full spine (14 x 36) films should not be utilized as a substitute for sectional views;
- Full spine (14 x 36) films are appropriate only for a scoliosis study of the appropriate patient when, upon inspection, the patient appears to have a significant scoliosis with a rib hump present and Adam's position confirms a structural problem;
- Full spine (14 x 36) films are rarely indicated for patients who have reached skeletal maturity; and
- Multiple sectional studies (e.g., cervical spine AP/Lat and lumbar spine AP/Lat on the same patient) to obtain a full spine view should only be performed when indications are noted for each region.

SCOLIOSIS X-RAY STUDY (CPT Code 72090)

- Clinical documentation must clearly describe that upon inspection the patient has a significant scoliosis with a rib hump present. Signs of a significant scoliosis may include, but not limited to: 1) a tilted head that does not line up over the hips; 2) one hip or shoulder that is higher than the other; 3) an obvious curve in the spine; 4) a protruding shoulder blade; 5) leaning more to one side than the other. The presence of a rib hump is detected by the performance of the Adam's Forward Bend Test and confirms that the patient has a structural problem. A structural problem is present when the abnormal curve does not correct (goes away, straightens out) when you bend forward and/or laterally (to the side).
- A Scoliosis x-ray study (CPT Code 72090) includes four views of the thoracic (torso) and lumbar (low back) spine. These views include: 1) one from front to back (or back to front) with the patient standing; 2) one from front to back with the patient lying supine; and 3) two views with alternate right and left flexion in the supine position. In addition, a lateral (side) view taken with the patient standing is often recommended. As with all x-ray studies, this procedure requires a written report of the findings. The following information must be clearly described: 1) the method of assessment (measurement) of the curvature; 2) the magnitude (amount) of the curvature (in degrees); 3) the direction of the curve

(right = dextro, left = levo); 4) the vertebrae used to measure the curvature (ends and apex); 5) assessment of rotation; 6) skeletal maturity of the patient (Risser's sign); 7) cause; and 8) secondary complications.

Stress Radiography

Stress radiography, when indicated, should not be performed until acute instability has been ruled out by clinical evaluation and there remains a question about whether undetected ligamentous instability exists. The neutral lateral projection should be evaluated and the patient carefully examined before these exposures are taken. If severe instability is suspected, advanced imaging studies (MRI or CT) may be indicated prior to obtaining stress views.

Flexion-extension stress study of the cervical spine. This study should only be performed in a fully alert and cooperative patient. Contraindications to these studies include vertebrobasilar ischemia, postural vertigo, fracture-dislocations, odontoid lesions, and significant neurological deficits. This study is indicated in the diagnosis of latent instability of the upper cervical spine to diagnose laxity or damage of the transverse ligament of the atlas caused by trauma or pathology affecting the ligament. The diagnosis is based on an abnormally wide space (greater than 3 mm in adults and 5 mm in children) between the posteroinferior margin of the anterior arch of the atlas and the anterior surface of the odontoid process. The most frequent causes include trauma, occipitalization, Down's syndrome, pharyngeal infections, inflammatory arthropathies (e.g., rheumatoid, ankylosing, psoriatic forms), and Reiter's syndrome. A minimum interspace is 1 mm in children and adults. A decreased space is to be expected with advancing age due to degenerative joint disease of the atlantodental joint.

Cervical lateral bending views are not generally used in the radiographic community and are considered to be of limited value.

Stress radiography of the thoracic and lumbar spine. Stress studies of the thoraco-lumbar spine are not supported by the current scientific literature except in limited circumstances. Lateral bending studies may be indicated to assess the flexibility of a potentially progressive scoliosis. These studies are done bilaterally with the patient supine, but the evaluation is primarily made from the radiograph taken when the patient is bending toward the side of convexity.

Flexion–extension views of the lumbar spine may be considered appropriate in the assessment of an unstable spondylolisthesis. The clinical implications usually include failure to respond to conservative treatment and the need for consideration of surgical options. Routine use of flexion-extension views in the presence of spondylolisthesis is not supported.

Standard Radiographic Views and Minimal Radiographic Series

Only standard projections are generally considered reasonable or necessary. Opposing views are considered to be the minimal projections needed when choosing to image any area. Single plane views are generally considered insufficient. Supplemental views such as oblique and spot views should be obtained only when clinically indicated or when abnormal findings are found on an initial study. A Davis series (i.e., A-P open mouth, A-P lower cervical, lateral, oblique, and flexion and extension views) is only appropriate when history and physical examination findings such as those that may be present following a significant whiplash trauma justify the need for the additional views that are included in this study.

Comparative, Post-Treatment, and/or X-Rays to Monitor Patient Progress

Follow-up studies and/or exit films are not necessary unless specific indications are observed. The practitioner must have a clear clinical rationale to explain the benefit and necessity of the repeat x-ray series considering the known health risks associated with the additional radiation exposure. Indications may include monitoring healing of a fracture, monitoring aggressive bone/joint diseases (e.g., various inflammatory arthritic disorders), or a potentially progressive idiopathic scoliosis. Scoliosis monitoring should be performed in accordance with national guidelines. If prior imaging has been performed at another facility for a patient presenting with a condition including indicators for imaging, then all reasonable attempts must be made to obtain the results of those studies prior to repeating the study.

In conclusion, diagnostic procedure(s) necessary to ensure appropriate care for each patient must be based upon recognition of key indicators through careful assessment of the patient's history and physical examination and documented in the patient record.

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