Evidence-based Cancer Imaging Program
Appropriate Use Criteria

Shoulder Pain

October 26, 2022

Memorial Sloan Kettering
Cancer Center

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Background

The Evidence-based Cancer Imaging Program (ECIP) was established to ensure ongoing compliance with the Centers for Medicare and Medicaid Services (CMS) Appropriate Use Criteria Program by expanding upon our existing evidence-based practices at Memorial Sloan Kettering Cancer Center (MSK). ECIP develops and implements appropriate use criteria (AUC) for ordering advanced diagnostic imaging services, and takes into consideration the unique needs of patients with cancer and our expertise as a cancer center.

AUC are guidelines developed by our Imaging Disease Management Teams (IDMT) that link: a specific clinical condition or presentation; one or more imaging exams; and an assessment of the appropriateness of each exam. Using AUCs helps to achieve the goal that all patients receive only what imaging is best for them, while avoiding unnecessary tests.

Abbreviations

Abbreviation	Definition
AUC	Appropriate use criteria
CAP	Chest, abdomen, and pelvis
CMS	Centers for Medicare and Medicaid Services
CT	Computed tomography
ECIP	Evidence-based Cancer Imaging Program
FDG	Fluorodeoxyglucose
IDMT	Imaging Disease Management Team
IV	Intravenous
MDP	Methylene diphosphonate

Abbreviation	Definition
MRI	Magnetic resonance imaging
MSK	Memorial Sloan Kettering Cancer Center
NaF	Sodium fluoride
OCEBM	Oxford Centre for Evidence-Based Medicine
PET	Positron emission tomography
SPECT	Single-photon emission computed tomography
WB	Whole-body
WBC	White blood cell

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Clinical Context

Clinical Context	Description	Relevant for this AUC?
Cancer screening	Neoplasm detection in asymptomatic patients. Imaging type and schedule informed by guidelines.	☐
Neoplasm detection or diagnostic workup	Assessment of signs or symptoms concerning for neoplastic disease.	☑
Cancer staging or restaging	Establishing location and extent of neoplastic disease. Restaging may occur after treatment or intervention.	☑
Cancer pre-treatment assessment	Imaging performed to optimize the cancer treatment plan.	☐
Therapeutic response assessment	Assessment of treatment response to guide subsequent management.	☐
Therapeutic complication assessment	Evaluation of possible treatment-related complications or adverse events.	☑
Cancer complication or comorbidity assessment	Evaluation of cancer or comorbidity-related complications or adverse events.	☑
Cancer surveillance	Ongoing scheduled assessment of neoplastic disease status.	☐
Survivorship	Assessment of long-term or late effects from cancer or cancer treatment as well as ongoing health needs of cancer survivors.	☑
Imaging unrelated to cancer	Imaging obtained for indication or concern not related to cancer.	☐

Age

Adults only (≥ 18 years)

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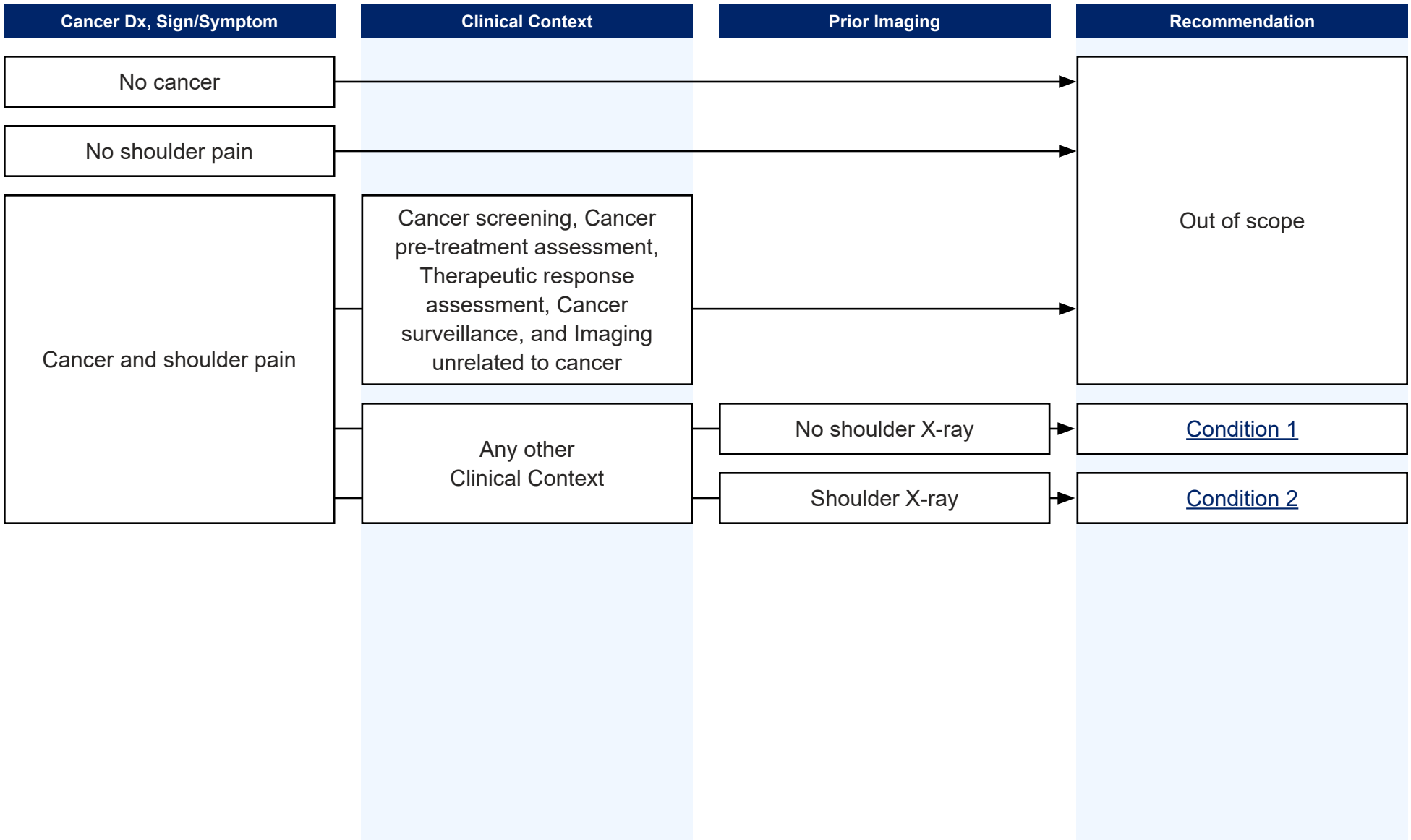
Appropriate Use Criteria



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Condition 1:
Shoulder Pain, Cancer, No Prior X-ray

USUALLY APPROPRIATE	SOMETIMES APPROPRIATE	RARELY APPROPRIATE
X-ray shoulder Initial imaging should include radiography to detect calcific tendinitis (which may mimic tumor deposits at MRI), assess cortical bone integrity and tumor matrix.		

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Condition 2:
Shoulder Pain, Cancer, Prior X-ray

USUALLY APPROPRIATE
MRI shoulder without and with IV contrast
MRI shoulder without IV contrast
CT upper extremity with IV contrast

SOMETIMES APPROPRIATE
X-ray shoulder
CT upper extremity without IV contrast
FDG PET/CT head to toe/limbs
FDG PET/CT neck/CAP

RARELY APPROPRIATE
Ultrasound
MDP bone scan (with or without SPECT)
NaF PET/CT
CT angiography
CT venography
MR angiography
WBC nuclear scan
MR arthrography
WB MRI

- If pretest probability of metastasis in shoulder is moderate or high, MRI or CT should be performed if radiography is unremarkable.
- CT, FDG-PET/CT, or bone scan (MDP or NaF) may be useful for patients with contraindications to MR scanning.
- IV contrast is recommended for both CT and MRI to optimally evaluate soft tissue tumor deposits and extraosseous extension of bone tumors.
- T1-weighted MR images should be obtained for optimal evaluation of bone marrow; proton density images are suboptimal for this purpose.
- In patients with a history of cancer, ultrasound should not be utilized as an isolated test.
- Conditional: MRI of brachial plexus should be considered in a patient treated for breast cancer if MRI of shoulder does not explain the patient's pain.
- Conditional: MRI or CT should be considered if shoulder region had been irradiated at least 3 years earlier, to assess for radiation-associated sarcoma.

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Key Evidence

SHOULDER PAIN

Ref No.	Published Evidence	Grade*
1	Cascini G, Falcone C, Greco C, Bertucci B, Cipullo S, Tamburrini O. Whole-body magnetic resonance imaging for detecting bone metastases: comparison with bone scintigraphy. Radiol Med. 2008 Dec;113(8):1157-70. PMID: 18958408	4
2	Qayyum A, MacVicar AD, Padhani AR, Revell P, Husband JE. Symptomatic brachial plexopathy following treatment for breast cancer: utility of MR imaging with surface-coil techniques. Radiology. 2000 Mar;214(3):837-42. PMID: 10715054	3
3	Robinson D, Halperin N, Agar G, Alk D, Rami K. Shoulder girdle neoplasms mimicking frozen shoulder syndrome. J Shoulder Elbow Surg. 2003 Sep-Oct;12(5):451-5. PMID: 14564266	4
4	Sano H, Hatori M, Mineta M, Hosaka M, Itoi E. Tumors masked as frozen shoulders: a retrospective analysis. J Shoulder Elbow Surg. 2010 Mar;19(2):262-6. PMID: 19574068	4
5	Thornton MJ, O'Sullivan G, Williams MP, Hughes PM. Avascular necrosis of bone following an intensified chemotherapy regimen including high dose steroids. Clin Radiol.1997 Aug;52(8):607-12. PMID: 9285421	4

Notation	Consensus-based Statement	Grade*
§	In addition to reviewing the published literature for evidence, the MSK Musculoskeletal Imaging Disease Management Team leveraged consensus-based expert opinion and clinical best practices to supplement the evidence in this area to define the appropriate imaging guidelines for this clinical condition. Key points: • Advanced imaging is often needed to determine the cause of pain in an oncology patient, due to the potential of many cancers to metastasize to bone marrow or soft tissues. Such metastases are often inapparent at radiography. Treatment decisions will be based on the cause of the pain, and are clearly different for traumatic, degenerative, or oncologic causes.	5

*Grade assigned in accordance with the Oxford Centre for Evidence-Based Medicine (OCEBM) Levels of Evidence 2011: https://www.cebm.ox.ac.uk/resources/levels-of-evidence/ocebm-levels-of-evidence

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  Internist & Hospitalist
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  Surgeon

Methodology

Details about our methodology can be found here:
https://www.mskcc.org/departments/radiology/evidence-based-cancer-imaging/methodology

Resources

CMS Appropriate Use Criteria Program Website
https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Appropriate-Use-Criteria-Program

MSK's ECIP Website
https://www.mskcc.org/departments/radiology/evidence-based-cancer-imaging

OCEBM Levels of Evidence
https://www.cebm.ox.ac.uk/resources/levels-of-evidence/ocebm-levels-of-evidence

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