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*Early Decision-Making and Referral Indications for  
Newly Identified Bone Lesions*  
Musculoskeletal Tumor Society  
Evidence Based Medicine Committee  
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### *Information Statement*

## Guidelines for Specialist Referral in Newly Identified Bone Lesions

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of the Musculoskeletal Tumor Society

### **Summary Statement**

Although the detection of abnormal skeletal findings on plain radiographs is common, the subsequent management can be a source of concern and uncertainty for medical providers. Most abnormal bony findings are discovered incidentally and indicate the presence of developmental imperfections or indolent tumors that require no intervention; however, lack of familiarity with interpreting skeletal radiographs can result in undue patient and provider anxiety and unnecessary urgent referrals to orthopaedic oncologists. Alternatively, radiographs concerning for an underlying malignancy that go unrecognized also compromise expeditious patient referral, diagnosis, and treatment. The apprehension surrounding management of new bone lesions presents an opportunity for improvement in the care of patients with these common findings.

This information statement is directed toward “front line” medical personnel, such as primary care physicians, pediatricians, advanced practice providers, and orthopaedic generalists and specialists without training in oncology, who often are the first to evaluate radiographs and recognize an underlying skeletal abnormality. Our goal is to provide a simple, algorithmic framework for managing patients with newly identified bone lesions with *three aims*:

- 1. To facilitate timely and appropriate referral to tertiary centers for definitive diagnosis and management of bone lesions with radiographic features indicating a likely malignant or aggressive-benign diagnosis.*
- 2. To avoid inappropriate diagnostic testing and tertiary referral that incurs unnecessary healthcare costs and/or delays the diagnosis of malignant or aggressive-benign bone lesions.*
- 3. To avoid unnecessary patient and provider anxiety due to ambiguous radiographic impressions in the setting of an indolent or non-aggressive bone lesion.*

Following new identification of a bone lesion, the Evidence Based Medicine Committee of the Musculoskeletal Tumor Society recommends expert review of high-quality plain radiographs of the identified lesion by a fellowship-trained musculoskeletal radiologist and a thorough medical history review and physical examination. Radiographic review of the lesion should lead to the

classification of the lesion as *non-aggressive/indolent* or *all others*. Lesions described as *non-aggressive/indolent* should be assessed for the presence of local symptoms. Lesions may be then managed according to the following groupings:

- *Asymptomatic non-aggressive/indolent* → observation with serial radiographs
- *Symptomatic non-aggressive/indolent OR all others* → referral to orthopaedic oncology

### Statement of Clinical Concern

Newly identified bone lesions, often discovered incidentally on plain radiographs, are a source of substantial concern for patients and their medical providers.<sup>1</sup> Generalist and non-oncologic practitioners of medicine, radiology, and orthopaedic surgery may be uncomfortable or unfamiliar with the interpretation and diagnosis of these lesions, potentially leading to unnecessary patient and provider anxiety and orthopaedic oncological referral. Conversely, lack of accurate interpretation of active or aggressive lesions may lead to circuitous and expensive work-ups, delays in diagnosis, and biopsies performed without appropriate planning. These consequences have the greatest potential to negatively impact patients in the setting of malignant primary bone tumors, for which *en bloc* resection is recommended due to a demonstrated survival benefit; more limited evidence suggests similar benefits for isolated renal cell carcinoma metastases.<sup>2</sup> These consequences also negatively affect, although without the survival ramifications, patients with indolent bone lesions who are led to believe they have malignant diagnoses.

The objective of this information statement is to provide recommendations regarding the management of newly identified bone lesions.

### Background and Literature Review

Bony abnormalities that trigger orthopaedic oncological referral span a wide range of diagnostic entities that include benign and malignant neoplasms, developmental and metabolic anomalies, and post-traumatic sequelae.<sup>3</sup> The true incidence of bone tumors and tumor-like bone lesions is unknown because most benign lesions likely go undetected.<sup>3,4</sup> The most common scenario for discovery of a previously unknown bone lesion is incidental detection during radiographic workup for an unrelated, symptomatic complaint or trauma.<sup>5</sup> Patients may also present with a bone lesion that is the pain generator. In either situation, the detection of a new bone lesion is often the source of substantial and unwarranted anxiety for both the patient and the primary physician.<sup>6</sup> Less commonly the detection of a new bone lesion with concerning symptoms and radiographic findings may be misinterpreted and lead to a delay in diagnosis.<sup>7</sup>

Concern regarding a newly identified bony lesion is understandable. Tumor-like bony lesions and true bone neoplasms proffer challenging features: 1) there are numerous, distinct diagnostic entities with wide-ranging implications for patient outcome;<sup>3</sup> 2) true bone neoplasms are uncommon;<sup>6</sup> 3) as a group, bone lesions have a broad spectrum of radiographic appearances with overlapping characteristics.<sup>8</sup> These three features make the interpretation of radiographs containing bone anomalies both challenging and anxiety-provoking for medical providers without training in and frequent exposure to these lesions.

## **Proposed Intervention**

### *Intervention Aims*

The Evidence Based Medicine Committee of the Musculoskeletal Tumor Society recommends an algorithmic approach to managing newly identified bone lesions. We hope that the use of this method will accomplish the following aims:

1. To facilitate timely and appropriate referral to tertiary centers for definitive diagnosis and management of bone lesions with radiographic features indicating a likely malignant or aggressive-benign diagnosis.
2. To avoid inappropriate diagnostic testing and tertiary referral that incurs unnecessary healthcare costs and/or delays the diagnosis of malignant or aggressive-benign bone lesions.
3. To avoid unnecessary patient and provider anxiety due to ambiguous radiographic impressions in the setting of an indolent or non-aggressive bone lesion.

### *Intervention in Practice*

Upon recognition of a newly identified bone lesion, the algorithm developed by the Evidence Based Medicine Committee of the Musculoskeletal Tumor Society supports the following steps:

- Expert review of high-quality plain radiographs of the lesion by a fellowship-trained, board-certified musculoskeletal radiologist or, if immediately available, an orthopaedic oncologist with special attention to the radiographic features indicating the likely correlative diagnosis and histological grade of the lesion<sup>9,10</sup>
- Thorough review of the patient's medical history with special attention to patient or family history of benign or malignant tumors, common cancer risk factors, and conditions resulting in altered bone development and/or metabolism
- Complete physical examination with special attention to local findings at the site of the bone lesion

Based on the fellowship-trained, board-certified musculoskeletal radiologist's impression and, if necessary, follow-up communication, the bone lesion should be designated as either:

- Non-aggressive/indolent
- All others

Lesions classified as non-aggressive/indolent with a chief complaint of pain in the area of the radiographic abnormality should be assessed through history and physical examination for the presence of local symptoms. Often incidental findings will have alternative explanations for pain, such as adjacent joint arthritis, bursitis, or tendonitis. Non-aggressive/indolent lesions that are asymptomatic may be managed with observation in the form of serial plain radiographs of the lesion every 3-6 months for two years. These radiographs should be interpreted by a

fellowship-trained, board-certified musculoskeletal radiologist with access to the original radiographs.

Lesions classified as *all others* should be referred to an orthopaedic oncologist for further evaluation.

This intervention is described graphically in two figures. Medical providers who seek to understand the radiographic classification of these lesions in greater depth may reference our unabridged algorithm (Fig. 1). Medical providers who seek only to facilitate management of their patient may reference our abridged algorithm (Fig. 2).

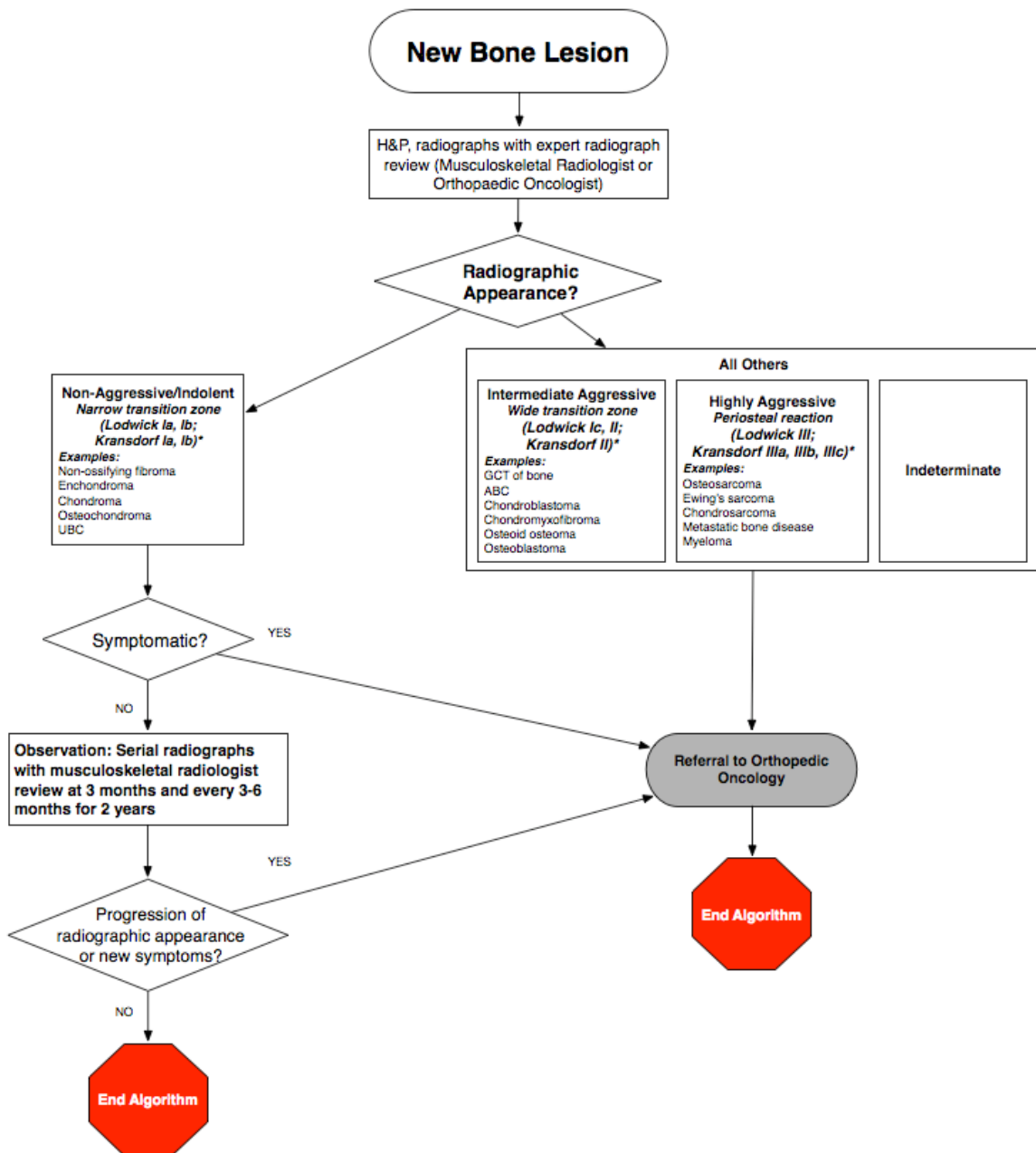


Figure 1. Unabridged algorithm for early management of a newly identified bone lesion<sup>9,10</sup>

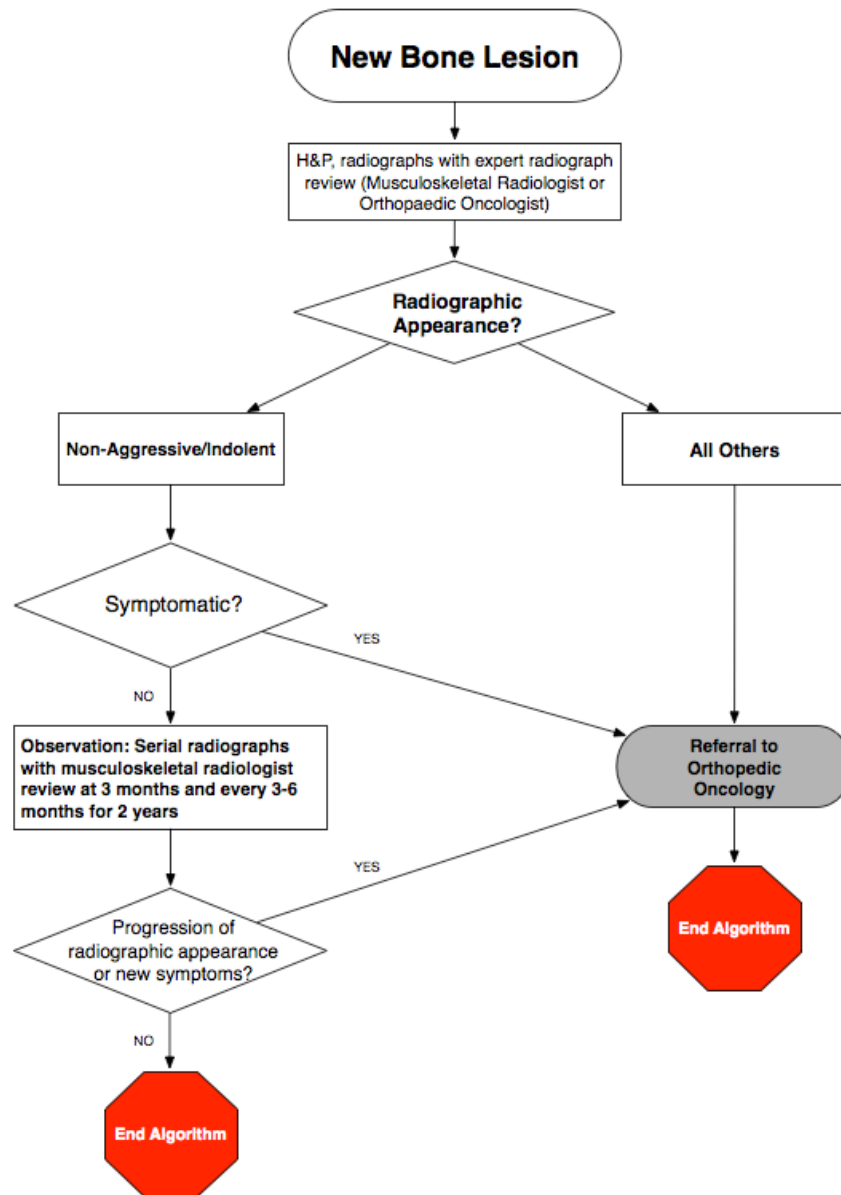


Figure 2. Abridged algorithm for early management of a newly identified bone lesion

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