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## Low Back Pain

Chronic low back pain is a common reason for hospital admission. The keys to determining if surgical treatment is indicated for hospitalized chronic low back pain patients are a thorough patient history, physical examination and judicious use of imaging studies.

The history should focus on determining the anatomic site, character, inciting factors, current treatment regimen, presence of neurologic deficits and past treatments for the pain. Whether the patient has any so-called “red flags” of back pain (Chap. 7) (Table 41.1) [1], is important as these may be the reason for admission for acute worsening of chronic pain and may necessitate more urgent intervention.

**Table 41.1** Red flags of back pain

Older age
History of trauma
Prolonged corticosteroid use
Fever
Injection drug use
Neurological deficit
History of cancer

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The physical examination should focus on strength testing of the major muscle groups of the upper and lower extremities as well as testing for sensation to pain, light touch and proprioception. Upper extremity neurologic examination is important to rule-out cervical or thoracic stenosis or myelopathy leading to lower extremity neurologic dysfunction. Reflex testing should be performed as well. Asking the patient to walk and perform tandem gait are useful tests as well to check for myelopathy. Rectal examination to evaluate rectal tone is recommended.

Imaging studies the low back in patients with chronic low back pain can cloud the clinical picture if not ordered for the correct indications [2]. Imaging studies, especially advanced imaging studies such as computed tomography (CT) or magnetic resonance imaging (MRI), will frequently show *radiographic* evidence of pathology in the lumbo-sacral spine, especially as patients age. However, correlating the radiographically evident pathology with the history and physical exam findings is paramount. If the radiographic findings do not correlate with patient symptoms and the physical exam, alternative explanations for the pain must be sought.

Antero- posterior (AP) and upright flexion and extension dynamic lateral plain lumbar spine radiographs are the recommended initial imaging study for patients hospitalized with chronic low back pain. The flexion and extension radiographs help identify dynamic instability in the lumbar spine consistent with spondylolisthesis (“slipped disc”). If there is a history of recent trauma, all imaging studies should be performed supine without dynamic views to abide by strict spine precautions. CT scans of the spine, in addition to or in lieu of, plain radiographs are the study of choice for diagnosis of vertebral fractures, especially in the cervical spine [3]. CT myelograms are helpful for evaluating spinal stenosis, epidural abscesses or hematoma, disc herniation or other causes of spinal compression in those patients who cannot undergo MRI scans or those with pre-existing spinal hardware.

The appropriate use of lumbar MRI and other advanced imaging studies in hospitalized chronic low back pain patients is essential and challenging [2]. Worsening of chronic low back pain alone, without associated signs or symptoms such as the “red flags”, is not sufficient to justify ordering advanced imaging as often the clinical outcome is not changed by the study [2].

Surgery for chronic low back pain in hospitalized patients is one part of a myriad of treatment options. Any decision to proceed with surgical intervention should be made with expert input from a spine surgery specialist. A clinical practice guideline was published in 2009 which included interventional and surgical techniques for low back pain [4]. The grading system for the guidelines is listed as A (strong evidence/should recommend), B (fair evidence/reasonable to recommend), C (fair evidence/cannot recommend for or against), D (fair evidence/should *not* recommend), I (insufficient evidence/cannot recommend for or against) [4]. The treatment recommendations, indications and level of evidence for surgical treatments are summarized in Table 41.2.

**Table 41.2** Summary of recommendations for surgical intervention for low back pain

Surgery	Clinical indication	Level of evidence	Recommendation grade
Fusion surgery	Non-radicular low back pain with common degenerative changes	Fair	B
Artificial disc replacement	Single-level degenerative disc disease	Fair	B (through 2 year), I (long-term outcomes)
Open discectomy or Microdiscectomy	Radiculopathy with prolapsed lumbar disc	Good	B
Laminectomy with or without fusion	Symptomatic spinal stenosis with or without degenerative spondylolisthesis	Good	B

## Osteoarthritis/Rheumatoid Arthritis

Chronic pain from osteoarthritis (OA) or Rheumatoid Arthritis (RA) is common [5]. Patients may be hospitalized with intermittent flairs of significant joint pain in either condition. When these patients are admitted the history and physical exam should focus on ruling out alternative causes of joint pain. A recent history of trauma should increase the suspicion for a periarticular fracture. A recent febrile illness or current fevers should alert the clinician a superimposed joint infection may be present. A concurrent history of gout or other crystalline arthropathies should be elicited. Changes in pain regimen, or disease modifying agents in the case of RA, may cause an exacerbation of pain as well. If the patient has recently increased their activities, then a painful exacerbation of either arthritis type is possible. Furthermore, a stress fracture is also possible especially because OA and RA patients with chronic pain are likely older or possibly taking systemic corticosteroids and thus bone quality may be poor.

The physical exam should focus on identifying the joint(s) affected and the severity of the involvement. If the patient has lower extremity joint involvement the ability to walk should be ascertained. The location of the pain and whether it is reproduced with range of motion of adjacent joint(s) is essential. For example, it is often forgotten that medial groin pain is more indicative of hip joint pain than lateral thigh pain, which is more indicative of greater trochanteric bursitis. The presence of joint effusions should be evaluated. In addition, it is important to ask the patient if a specific joint is more swollen than usual, as both OA and RA patients are likely to have chronic joint effusions. The range of motion of affected joints should be examined. Pain with both active and passive range of motion in the presence of an increased effusion, erythema and warmth of a joint increases the suspicion of infection.

Imaging evaluation should almost always begin with AP and lateral plain radiographs of the affected joint(s). If a lower extremity joint is involved the plain

radiographs should be taken with the patient weight bearing if possible. Weight bearing radiographs are superior to non-weight bearing radiographs for evaluating the joint space narrowing indicative of arthritis [6].

If occult fracture is suspected a CT or MRI scan of the affected bone and adjacent joint are recommended. If a peri-articular soft tissue mass, infection or intra-articular ligamentous or meniscal injury is suspected MRI of the joint is recommended. Bone scans can also detect occult fractures and bone infections however their usefulness is reduced in OA and RA as these conditions have increased tracer uptake in affected joints at baseline.

Laboratory work-up is primarily indicated to help differentiate between chronic OA or RA pain and septic arthritis or crystalline arthropathies. C-reactive protein (CRP) levels and erythrocyte sedimentation (ESR) levels should be drawn if there is suspicion of infection. If elevated, especially in a patient with joint swelling and fever, it should raise the concern for superimposed infection. CRP and ESR elevations in RA patients are likely not as sensitive or specific for infection but comparing current lab values to prior values if available can help determine if the values are elevated beyond the patient's baseline RA inflammation. If the history, exam, imaging and laboratory values are concerning for joint infection, aspiration of joint fluid is indicated. The typical synovial fluid aspiration results of OA, RA and septic arthritis are beyond the scope of this chapter. The joint aspiration and interpretation of the results should be performed with the assistance of a rheumatologist and/or orthopedic surgeon.

Surgery for debilitating chronic joint pain depends on the joint affected and the etiology and orthopaedic surgery consultation is recommended for the hospitalized chronic joint pain patient. If septic arthritis is present prompt irrigation and debridement of the affected joint is recommended. Common surgical options for chronic OA or RA include arthroplasty (joint replacement) and arthrodesis (joint fusion). For the shoulder, hip and knee, total joint arthroplasty is the mainstay of treatment and reliably reduces pain and increases function in both OA and RA patients [7, 8]. Arthrodesis of the shoulder, hip or knee is not recommended when arthroplasty is possible. For small joints of the hand, and foot and the ankle and wrist joints arthrodesis is commonly used as well. Total elbow replacement and total ankle replacement have more prominent roles in RA patients. The surgical options for chronic joint pain from OA or RA are reasonable to consider and of reliable benefit when patients are refractory to conservative options such as medication management, physical therapy, bracing and injections.

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## Cancer-Related Musculoskeletal Pain

Skeletal metastatic disease is a significant cause of chronic pain, loss of function and permanent disability [9]. The most common cancers causing bony metastatic disease are lung, breast, prostate, renal and thyroid carcinomas [10]. Multiple myeloma is another potential cause of chronic bone pain. Typically, this patient

population has incurable, advanced stage cancer and thus complete resolution of pain and disability is unlikely. The essential goals of treatment for bony metastatic disease are: pain management, slowing or halting disease progression and preserving musculoskeletal function. A multidisciplinary team is therefore needed. Medical oncology, radiation oncology, orthopedic surgery, pain specialists, nutritionists and palliative care specialists all play essential roles in treating these patients.

There are two populations of skeletal metastatic disease patients to consider: those with known skeletal metastatic disease hospitalized with chronic pain and those who have chronic pain presenting with skeletal metastatic disease for the first time. The patient group with known metastatic disease is more straightforward and medical treatment of pain and radiation and/or surgical treatment can commence immediately. Consultation from pain specialists, orthopedic surgery, radiation oncology, medical oncology and palliative care should be sought as appropriate to help determine overall treatment course and the specific treatment for various skeletal sites of disease.

The patient who is hospitalized with a new lytic bone lesion with or without a personal cancer history is more challenging. The history should focus on the duration, location and character of the pain. Pain that is worse with weight bearing and better with laying or sitting down should raise suspicion for a pathologic fracture. Trivial injury mechanisms such as fracturing the femur while getting up from a chair should be considered a pathologic fracture due to malignancy until proven otherwise. The past medical history should focus on identifying any personal history of cancer, relevant occupational exposures, smoking history and constitutional symptoms such as fever, weight loss and anorexia. Questions about hematuria, hematochezia, hemoptysis and difficulty swallowing can help narrow down the possible primary cancer site. The results of recent mammograms, colonoscopies, urinalyses, chest radiographs and laboratory results such as prostate specific antigen (PSA) testing should be sought or inquired about in the history. Questions should also focus on identifying additional sites of pain as these may represent other sites of bony involvement.

The physical exam should focus on palpable of painful areas looking for bony and soft tissue masses including the spine. A breast exam should be performed to check for palpable masses. A prostate exam is recommended. The ability for the patient to ambulate should be evaluated.

Imaging work-up should begin with AP and lateral plain radiographs of the entire affected bone(s). More than one lesion may exist in the symptomatic bone thus imaging the entire bone is essential. Once plain radiographs identify a lesion concerning for bony metastatic disease further imaging and lab work-up is appropriate. Skeletal metastases usually cause bone destruction and cause the bone to have a “moth-eaten” appearance indicative of punctate areas of bony lysis [11]. Occasionally, especially in the case of prostate or breast carcinoma, the bone can be stimulated to make more bone by the tumor causing increased bone formation (“blastic metastases”) [12]. It is important to note that not all lytic bone lesions are metastatic carcinoma. Primary bone sarcoma, benign bone tumors, infections and

bone metabolic abnormalities can also have a similar appearance [13]. MRI and CT scans are indicated of the affected bone to evaluate associated soft tissue masses and help with surgical planning as indicated. They are not substitutes for plain radiographs.

Once a bone lesion is identified a specific imaging and lab work-up is indicated to help determine the origin of the cancer and complete staging. A CT of the chest, abdomen and pelvis with intravenous contrast and a whole-body bone scan are indicated. Labs should include a complete metabolic panel, PSA test in a male, and serum and urine protein electrophoresis to check for multiple myeloma. A study found that this diagnostic strategy for a patient presenting with a lytic bone lesion identified the primary site malignancy 85% of the time [14]. Positron emission tomography combined with triple CT scans are indicated for initial staging and surveillance of certain malignancies as well [15].

Once the staging is completed, the next step is a biopsy for tissue sampling of an appropriate lesion. Doing this after the staging work-up is recommended as the staging work-up may find a more easily accessible and thus safer lesion to biopsy. Orthopaedic surgery consultation is recommended to evaluate the need for biopsy and potentially palliative surgical intervention for the lesion(s). It is vitally important that the biopsy, even if percutaneous, and any potential surgery is carefully planned in concert with the surgical team to prevent mistakes in the execution of the biopsy [16]. There are a myriad of surgical options for chronic pain caused by skeletal metastases including fracture fixation, arthroplasty, arthrodesis and amputation. The discussion and indications of each is beyond the scope of this chapter. However, palliative surgery for painful skeletal metastases in concert with radiation and medical oncology typically decreases pain and increases or maintains patient function [17].

## Summary

- Chronic low back pain alone is not sufficient justification for advance imaging work-up or surgical intervention. Surgery has efficacy in specific causes of chronic low back pain with the appropriate associated imaging and physical exam findings.
- Chronic joint pain in Osteoarthritis or Rheumatoid Arthritis responds well to arthroplasty or fusion of the affected joint when conservative options have been exhausted.
- Chronic pain from skeletal metastatic disease is debilitating and requires a multi-disciplinary team to optimize patient care. Surgery is palliative and can decrease pain and maintain function.

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