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# Lung Cancer Masquerading as Thoracolumbar Pain Detected in an Outpatient Physical Therapy Setting

Jeremiah Blankenship

Bon Secours Health System, Greenville, SC, USA
Arcadia University, Glenside, PA, USA

**Corresponding Author:**
Jeremiah Blankenship
School of Physical Therapy, College of Health Sciences, University of Lynchburg
300 Monticello Avenue, Lynchburg, VA 24501, USA
Tel: +1-434-544-8611
Email: blankenship_j@lynchburg.edu

## Abstract

**Study Design:** Case Study. **Background:** This case report describes the clinical course of a patient with right low back pain (LBP) and the use of clinical evaluation findings to initiate medical referral resulting in a diagnosis of cancer presenting as mechanical low back pain. **Diagnosis:** A 59-year-old male with primary complaints of progressive right-sided LBP affecting his job, sleep, and daily activities was seen by a physical therapist in an outpatient setting. The components of the patient's history and physical examination were consistent with mechanical thoracolumbar dysfunction. However, clustered examination findings suggested the possibility of a more serious underlying disease. Considering a review of evaluation findings, the patient was referred to a physician for medical evaluation and diagnostic imaging to rule out a non-mechanical cause of symptoms. Medical diagnostic imaging discovered metastatic cancer as the primary cause of this patient's thoracolumbar pain. **Discussion:** Physical therapists must perform systems screening and understand the clinical findings associated with the presence of serious underlying disease. In managing LBP systems, screening can provide an accurate differential diagnosis and guide the clinician in deciding if a physician referral is warranted.

**Keywords:** metastases, low back, differential diagnosis, systemic disease, red flags

## Introduction

Direct access to physical therapy in the United States of America is available in all 50 states, the District of Columbia, and the U.S. Virgin Islands.[1] Proficiency in medical or systems screening and recognition of "red flags" by physical therapists is a requirement, not an option, in practice today.[1–3] Identifying serious conditions in outpatient physical therapy settings is rare, but timely recognition improves the likelihood of positive outcomes for the clients affected.[1,4–12] A comprehensive evaluation includes a detailed history, range of motion measurement, motor strength testing, neurological assessment, soft tissue and joint examination, and appropriate special tests based on clinical hypothesis.[2,4,6,7,13] History and physical examination findings formulate a differential diagnosis that determines a physical therapy plan of care or referral to a medical provider when appropriate. Though singular "red flag" findings demonstrate limited validity in determining patient referral, a cluster of findings direct the clinician to make appropriate referrals when needed.[2,4,12,13] Clustered findings are considered the most efficient way to base clinical decisions.[4,6,7,11,12]

Back pain is the fifth most common reason clients visit healthcare practitioners in the U.S., with an estimated cost of care of more than $30 billion.[4,13] In physical therapy practice, lower back pain is the most common reason clients seek care in the outpatient setting.[7] In most cases, patients are appropriate for skilled physical therapy. Still, differential diagnosis of patient signs and symptoms through systems screening leads to recognizing conditions beyond the physical therapy scope of practice and requiring medical referral.[5–12] The American College of Physicians and American Pain Society Clinical guidelines recommend the classification of low back pain into one of three categories: 1) nonspecific low back pain, 2) back pain potentially associated with radiculopathy or spinal stenosis, or 3) back pain potentially associated with another specific spinal cause.[4] These guidelines recommend that diagnostic testing or imaging be reserved for patients with severe or progressive neurologic deficits or suspected serious underlying conditions based on history and physical examination.[4] Diagnostic imaging is recommended not to be immediately performed in cases of non-specific back pain.[4] Conditions that require immediate medical referral that can masquerade as mechanical low back pain include spinal fracture, neoplasm, abdominal aortic aneurysm, and cauda equine syndrome.[5,6,8,9,11,12] Estimates of any serious underlying pathology in patients with lower back pain are 1-5%, with estimates of spinal metastasis presenting as lower back pain being 0.1-0.7%.[4,8,9,12,14] This case details the benefits of systems screening during physical therapy evaluation. It demonstrates where a cluster of findings during the patient

evaluation led to physician referral and early diagnosis in a case of lung cancer presenting as low back pain.

## Patient History

The patient was a 59-year-old male referred to physical therapy by his family doctor due to persistent right-sided lower back pain lasting for more than three months. The patient did not remember a specific mechanism of injury and reported that the symptoms had progressively increased. He reported a "sharp, dull, tight, and pulling" pain that he rated as 6/10 on a 0-10 scale (10/10 at worst and 5/10 at best). Patient symptoms were exacerbated by long durations of standing at work and twisting and turning during work duties. He reported his most severe acute pain occurred when leaning over the side of a plane to work inside the hull of an aircraft during his job as an airplane mechanic. He reported intermittent symptoms with walking, standing, and sitting. He reported a recent onset of persistent cough and nightly pain that was severe enough to disturb his sleep regularly. He reported that his symptoms progressively increased throughout the day when active and gradually increased in intensity, duration, and frequency since initial onset. The patient reported increased daily fatigue and 10–15-pound weight loss over three to four months but attributed this to recent warmer weather and working without air conditioning. The patient reported that his symptoms were best when he took prescribed pain medication regularly at the maximal recommended doses. Current medications for pain were Tylenol (1000 mg, 3x/day), cyclobenzaprine (10 mg, 3x/day), and celecoxib (100 mg, 2x/day). The patient denied falls, bowel/bladder symptoms, urinary retention, saddle anesthesia, or fever.

The patient's health history included hypertension, previous removal of an abdominal mass (benign), and malignant hyperthermia. The patient's social history included 30+ years of smoking history (two packs per day), denied alcohol consumption, and denied regular exercise. Significant family health history included their father's death from lung cancer, with a report that his father was a smoker. At the time of initial physical therapy evaluation, no diagnostic imaging of the thoracic or lumbar regions had been performed.

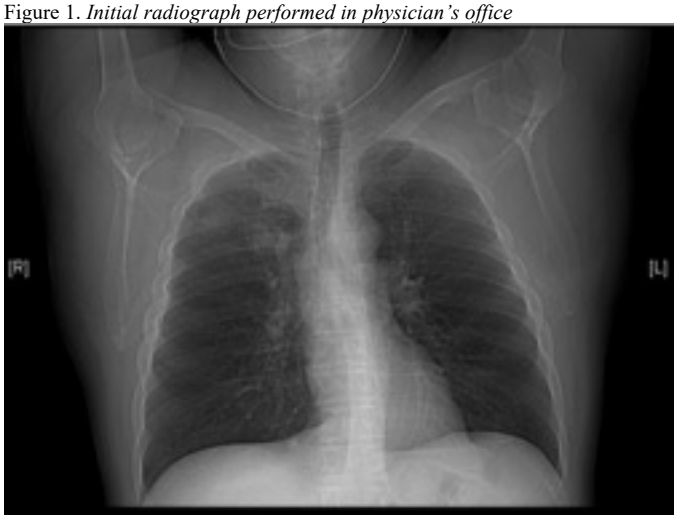
## Patient Examination

The patient examination began with observation of the patient in standing. A moderate right thoracolumbar concavity with a marked right rib hump was present. Palpation demonstrated elevated left shoulder position and level Iliac crest in standing and sitting positions. Palpation also demonstrated a more prominent right thoracolumbar paraspinal cross-sectional area and a palpable tissue mass at the right thoracolumbar junction. Deep pressure in the right lower ribcage (floating rib region) produced sharp pain radiating into the surrounding tissue area and residual ache after pressure was released. Thoracolumbar active range of motion (AROM) exam demonstrated gross spinal flexion of 30 degrees, left side bending of 22 degrees, and right side bending of 18 degrees using the double inclinometer method described in Norkin and White.[15] The patient reported pain with thoracolumbar flexion and right side bending at the end range and after returning to a neutral spinal position. Gross motor strength testing of bilateral upper and lower extremity myotomes was unremarkable and within normal limits. Elbow flexion, elbow extension, knee extension, and ankle plantar flexion reflexes were normal and equal bilaterally. Sensation testing throughout upper and lower extremity dermatomes demonstrated no deficits with light touch.[16] Slump testing presented posterior hamstring pain and tightness that was subjectively greater on the right with right-sided back pain but with minimal difference in knee extension range of motion (ROM) between extremities.[17] Spinal accessory motion and concordant sign assessment of the spine with spring testing was planned to be completed in prone. With the patient lying prone, the right-sided rib hump was visually more pronounced, and the patient reported pain with the pressure of lying on his stomach, which was his preferred sleeping position. At this point, the examining therapist had an increasing suspicion that the symptoms could be from a non-musculoskeletal cause. A senior colleague was consulted to discuss the examination findings, and both therapists concluded that a medical referral was necessary to rule out a more serious diagnosis. The evaluation was stopped, and a medical referral was initiated to ensure the patient was appropriate for physical therapy.

## Intervention

The referring physician's office was contacted, and the treating physical therapist reported a suspicion that the patient may be presenting with pain from a non-mechanical origin. After referral back to the physician, initial radiographs were completed in the office, which increased the suspicion of neoplasm (Figure 1).

Figure 1. *Initial radiograph performed in physician's office*




A low-dose CT examination was ordered based on the patient's age, smoking history, current symptoms, and physical therapy evaluation findings. Low-dose CT for early detection of lung cancer is a cost-effective and efficient screening procedure with an estimated 20% decrease in mortality due to disease in people screened.[14,18,19] Results of the low-dose CT examination showed right upper lobe nodules that suggested primary bronchogenic carcinoma. The patient was referred to a

pulmonologist, and subsequent CT findings indicated multifocal primary bronchogenic carcinoma in the right upper lobe, hyper-metabolic mediastinal and right-hillier lymphadenopathy, right retro-crural hyper-metabolic lymphadenopathy, small left lower lobe pulmonary nodule, and lytic osseous metastasis with osseous tissue destruction in the posterior right 12th rib (Figure 2 and 3).

Figure 2. *CT Of Osseous Tumor on Right 12th Rib. The arrow indicates the location of the osseous tumor on the right 12th rib. Note the decreased signal in the T12 transverse process and the 12th rib on the right, indicating loss of bony tissue.*

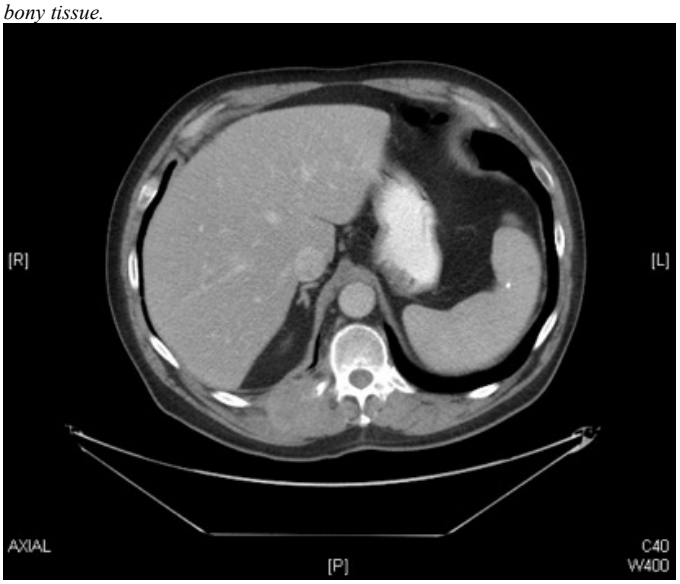
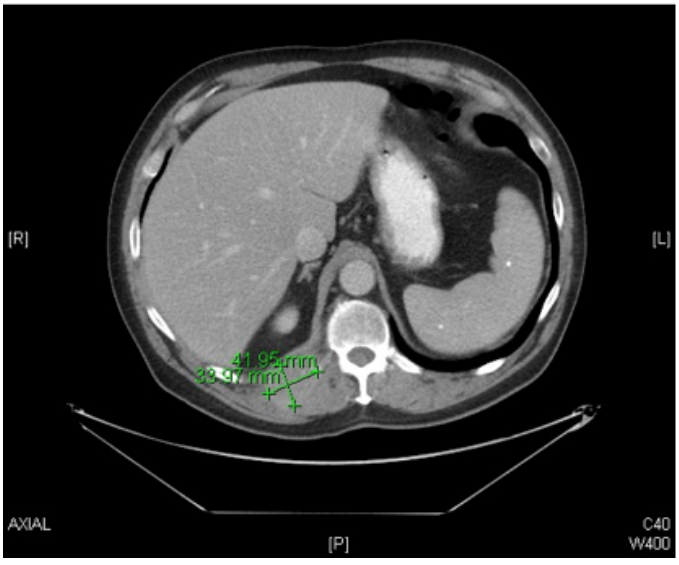



Figure 3. *CT Of Osseous Tumor on Right 12th Rib. The image shows the tumor size to be 4.2cm X 3.4cm.*




The patient referred to oncology and was diagnosed with stage III metastatic lung cancer and was referred to oncology. He underwent extensive treatment and succumbed to his condition 14 months after the initial PT evaluation.

After the initial cancer diagnosis, the case subject verbally consented to the author's request via phone for the examination information to be used for a graded course assignment before publication of this case. The case subject's widow gave the author written consent for publication.

## Discussion

The patient, in this case, presented with clustered findings of "red flags" during the pre-visit questionnaire, history/interview, and physical examination. Previous history of cancer, age >50 years, insidious onset of symptoms, night pain, unexplained weight loss, duration of pain > 1 month, and failure to improve with a month of conservative care are findings that could indicate a spinal region neoplasm, with no singular finding having enough validity to suggest referral.[12] The evaluation of this patient indicated a possible non-mechanical contribution to this patient's symptoms, and clinical judgment was a significant part of this. This patient presented with many signs and symptoms that were suggestive of mechanical pain mechanisms, and that could have delayed appropriate referral if not considered in total. Pain with sustained positions, forward bending postures, general spinal movement, and extended activity suggest mechanical origin. Pain with palpation of the lower right rib region was severe, and this, along with pain with the patient lying prone (putting pressure on the posterior spinal structures and rib cage), could have suggested a possible fracture. Fracture was less likely due to no history of falls, osteoporosis, or previous bone pathology. In addition, pain in patients in prone lying has been suggested as an indication of spine malignancy when considered in clinical exam clustering, and similar pressures were likely experienced by the patient when leaning into an aircraft.[4,13] Later, imaging showed the patient had an osseous tumor in the 12$^{th}$ rib that had already experienced some bone necrosis. Pain with right side bending ROM, lower right trunk palpation, and torso anterior-posterior loading likely originated from compression of the bony tumor. In addition to the complaint of night pain, the patient indicated that his symptoms were more significant as the day progressed. This could have been missed as mechanical pain. Still, the patient's entire clinical picture was attributed to the patient's higher level of activity at work and the possible implications of pulmonary disease. The patient's recent weight loss and fatigue could have been attributed to his work conditions, but the patient's complete clinical presentation suggested the weight loss was significant. Per chart review, the patient experienced considerable weight loss as his condition progressed. When considering the patient's limited improvement with pain medication, loss of body weight, smoking history, family history, lack of mechanism of injury, sleep disturbance, and abnormalities during palpation, it was determined that enough suspicion was present for medical referral. Lastly, A 2017 systematic review by Verhagen et al. determined that "history of malignancy" and "strong clinical suspicion" were the best indicators of spinal malignancy in LBP, with "strong clinical judgment" having a +LR of 12.0-54.2.[14] Though the patient, in this case, was referred for further medical care at the time of the initial physical therapy evaluation, unsuccessful conservative care or worsening symptoms with care must always be considered as signs of the possible need for referral.[4,7,12,13] After the initial evaluation, patient status must be continually assessed as serious conditions can present themselves at any time during an episode of care.[11]

## Conclusion

Early detection of metastatic lung and osseous cancer occurred through thorough physical therapy examination with systems screening in this case. The outcome was positive through proper referral to a medical practitioner for diagnostic imaging and condition-appropriate treatment. All direct access or entry-point clinicians must complete systems screening for their evaluation. In the case of lumbar spine pathology, there are multiple non-mechanical or non-musculoskeletal sources of pain. In cases where conditions aren't appropriate for skilled physical therapy, timely detection and proper referral can significantly improve patient outcomes and validate physical therapy as a direct-access profession.

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