

Primer: history and examination in the assessment of musculoskeletal problems

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SUMMARY

Musculoskeletal problems are very common, and clinical assessment is central to their appropriate management; however, many clinicians are not sufficiently competent to carry out this assessment. A standardized approach to the clinical assessment of a musculoskeletal problem is, therefore, necessary, whether the patient is presenting to primary care, rheumatology or orthopedics. Such a standardized approach gives a benchmark for this competency and can also be used as a teaching aid. As doctors become increasingly competent in clinical assessment and reach into training programs within musculoskeletal specialities, more detailed information will be required from the medical history of the patient, in addition to the use of special tests on clinical examination. These clinical skills need to be taught and also assessed.

KEYWORDS clinical assessment, examination, history, musculoskeletal system, objective structured clinical examination

REVIEW CRITERIA

Recommendations for taking a medical history and performing a clinical examination relevant to a musculoskeletal problem are based on clinical experience and that of teaching of undergraduates and postgraduates in rheumatology and orthopedics. A review of the literature and of recommendations given in rheumatology and orthopedic texts was also performed.

INTRODUCTION

The importance of gaining a clear description of a clinical problem has long been recognized. Reasoning and rational practice based on clinical observation was taught by Hippocrates in the 4th century BC, but was discarded from the 5th century AD until the revolution of medical science and practice in the 17th century, when Thomas Sydenham, the 'English Hippocrates', was a major proponent of clinical medicine. He described the clinical features and differences between conditions such as gout and rheumatism. The value of clinical observation was further promoted by physicians such as William Heberden, eponymously known for his observation of 'digitorum nodi' (Heberden's nodes) in osteoarthritis of the distal interphalangeal joints. Good clinical observation remains central to the management of musculoskeletal problems.

Musculoskeletal problems are very common,¹ and all clinicians should be able to assess, by appropriate history and examination, a patient with musculoskeletal symptoms.² Some musculoskeletal conditions can be managed in primary care, whereas other more complex or progressive conditions will require secondary care by a multidisciplinary team.³ Further competencies will be required at these different levels of care and by the different disciplines.⁴

Identification of the earliest signs of musculoskeletal conditions is crucial for improving their management,⁵ but the musculoskeletal system is seldom appropriately assessed in everyday clinical practice.^{6,7} There is a lack of ability in this core competency;⁸ primary care physicians do not always have adequate musculoskeletal knowledge and confidence,⁹ and patients are often dissatisfied following consultations, with their expectations not being met.¹⁰ Inadequate priority is given to musculoskeletal health in the curricula of many medical schools,¹¹ and a further issue is that the assessment of the musculoskeletal system is often taught differently by the various specialties involved in the management of musculoskeletal conditions.¹²

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In this article, we aim to provide a standardized approach to the clinical assessment of a musculoskeletal problem—whether presenting to primary care, rheumatology or orthopedics—that gives a benchmark for this competency. Teaching and assessing clinical skills are also considered. The described approach can also be used as a teaching aid. It is aimed, therefore, as a guide for any physician to whom someone will present with a musculoskeletal problem. As doctors become increasingly competent in clinical assessment and reach into training programs within musculoskeletal specialities, more detailed information will be required from the medical history, in addition to the use of special tests on examination; this level is not considered here.

IMPORTANCE OF HISTORY AND EXAMINATION

The aim of clinical assessment is to characterize the problem, establish the cause (if possible), and to assess the impact of the problem on the patient, family and care-givers. From this assessment, a plan for further investigation and management can be logically developed in partnership with the patient.

The clinician must be alert to identifying potentially serious conditions, although most consultations will concern less serious, common problems; however, any problem is important to the patient, who would not otherwise have consulted the physician. About 20% of adults in Europe with a musculoskeletal problem fail to consult a physician, and another 20% take a year before they do so.¹⁰ The patient's concerns and expectations of the consultation need to be established, and the physician must address these and explain what they think is wrong and the proposed management plan so that the patient is engaged as an active partner in any decision making. Such communication between patient and physician is essential for a satisfactory consultation, as well as concordance with any treatment recommendations. Good communication is a core competency for all doctors and is key to patient-centered care.¹³ There are certain additional core competencies that all doctors who manage musculoskeletal problems should attain (Box 1). Clinical assessment is also needed to monitor the response to treatments, and various scoring systems are often used.^{14,15}

Clinical assessment and its interpretation require core knowledge about the structure and

Box 1 Core competencies in the clinical assessment of a musculoskeletal problem.

All doctors who manage musculoskeletal problems should be able to perform several key competencies.

- Take a relevant history, with the knowledge of the characteristics of the major musculoskeletal conditions
- Perform a clinical examination of the musculoskeletal system
- Distinguish abnormal from normal features by history and examination
- Apply a screening history and examination as part of a general inquiry
- Assess the impact of the problem on the person in terms of symptoms, structure, function, activities and participation with respect to self care, home care, work and leisure
- Assess acute and chronic pain
- Monitor the outcomes of management of a musculoskeletal condition against the expected natural history of the condition

function of, and the effects of aging, injury and specific diseases on, the musculoskeletal system. The symptoms and signs of different conditions, especially those that are common and potentially serious, need to be known.² The interpretation of examination findings requires knowledge of surface and functional anatomy, which is often lacking amongst modern medical graduates.

The interpretation of clinical findings is largely based on experience over many generations; many findings are sufficiently sensitive to identify an abnormality but not specific as to the cause. Additional investigations might be needed to confirm clinical suspicions of diagnosis or to assess disease activity, prognosis, and to help decide on treatment.

HISTORY

During the consultation, the physician must initially observe the patient well and listen to what he or she has to say about their problem and concerns before asking specific questions to characterize their problem (Box 2). After this, the nature of the problem has to be clarified—the physician must establish the symptoms and their characteristics, other clues to diagnosis (such as preceding injuries, other illnesses or family history), the response to any previous treatment,

Box 2 Questions for characterization of a musculoskeletal problem.

- What are the symptoms?
- What are the characteristics of the symptoms (localization, time pattern etc.)?
- What is the impact on the individual, family and carers?
- Are there any associated symptoms, preceding factors, risk factors or prognostic factors?
- How have the symptoms responded to treatment (if at all)?

and the impact on activities and participation. Is it a joint condition and, if so, is it inflammatory or osteoarthritic? If it is back pain, is it nonspecific, is it an inflammatory condition, or is it the result of vertebral fracture? Is it related to a systemic condition—is there weight loss, fever or other organ involvement? Could it be a potentially serious condition that needs urgent management—are there any ‘red flags’?

Characterizing the symptoms

Characterizing the symptoms is important as this will guide the clinician towards a diagnosis. Pain is the most common symptom of a musculoskeletal problem; it might be associated with stiffness and swelling (Box 3). The characteristics of the pain, the site and distribution of these symptoms, as well as their chronology, are important. Are the symptoms generalized, localized or referred? Do they affect joints, bones, or are the symptoms muscular? When did they start and what pattern has developed with time?

The characteristics of pain give important clues as to the cause. Gout, for example, is recognizable by the rapid onset of extreme pain and tenderness, although acute monoarthritis has to be considered infective until proven otherwise. Bone pain owing to metastatic bone disease is usually persistent day and night. Inflammatory pain occurs at rest, and is associated with stiffness, especially in the mornings, in patients with, for example, rheumatoid arthritis (articular) and ankylosing spondylitis (low back). Osteoarthritic pain is related to joint use (except in advanced cases), and is associated with short-lived stiffness after periods of inactivity. Neuralgic pain is deep and might be associated with parasthesia.

Box 3 Symptoms of musculoskeletal problems.

Specific

- Pain
- Swelling
- Stiffness
- Deformity
- Weakness
- Instability
- Loss of function

General

- Fatigue and malaise
- Generalized weakness
- Depression and fear
- Sleep disturbance
- Symptoms of systemic disease

Red flags

- Weight loss
- Fever
- Temple headache or pain with scalp tenderness or visual disturbance
- Loss of sensation
- Loss of motor function
- Difficulties with urination or defecation

Other possibly relevant symptoms

- Color changes or coldness of digits or limbs
- Altered sensation

Any response to treatment can also be informative: inflammatory back pain, compared with mechanical back pain, responds far better to NSAIDs than to simple analgesics; the generalized pain and stiffness of polymyalgia rheumatica responds rapidly and dramatically to only 15 mg prednisolone within 24–48 hours.

Preceding factors, associated symptoms and risk factors

Clues to the cause of the problem can come from associated symptoms or preceding factors. Is there, or has there been, any general ill health such as fever or weight loss accompanying the onset of the musculoskeletal symptoms? Nonspecific symptoms of fatigue and malaise can have a dominant effect in inflammatory conditions, as well as being a characteristic feature of

fibromyalgia syndrome. Weight loss is seen in inflammatory conditions, but malignancy must also be considered. Septic arthritis is also associated with generalized symptoms, whereas preceding diarrheal illness, urethritis or psoriasis is associated with arthritis. If the problem is back pain, is there any parasthesia, loss of sensation or numbness in the limbs; can the patient urinate and defecate normally?

There are several recognized risk factors for the development and outcome of musculoskeletal conditions. These include obesity, lack of physical activity, inadequate dietary calcium and vitamin D, smoking, excess alcohol, and activities that expose the person to sprains, strains and trauma, such as occupations or sports. The patient's prognosis is important, and relates to both personal and disease-related factors. For example, there are well-recognized 'yellow flags' that need to be sought for chronicity of back pain, such as job dissatisfaction, unavailability of light work, depression and low educational level.⁵

Assessing the impact of the problem

The impact of the problem needs to be assessed against the expectations and needs of the patient. Are activities related to self care, home care, work and/or leisure limited? Are patients restricted in what they can participate in? Musculoskeletal conditions commonly affect dexterity and mobility, and pain often disturbs sleep. What is the impact on family and carers? The WHO International Classification of Functioning, Disability and Health (WHO ICF) gives a framework to understand the impact of a musculoskeletal condition on a person,¹⁶ and also emphasizes the importance of the context in which that person lives—both personal factors and the environment—in determining the outcome. Personal factors include age, sex, social status, beliefs, work and leisure activities, whereas the environment includes all aspects of the patient's surroundings, such as other people, attitudes and values of people and society, social systems and services, and policies and laws.

EXAMINATION

The medical examination complements the history in characterizing the problem. It is an exercise in applied anatomy, and requires knowledge of surface and functional anatomy, such as the normal ranges of movement and function. The key questions of examination aim to identify

Box 4 Identification of clinical signs of musculoskeletal problems.

Look for attitude, swelling, range, deformity, muscle wasting and skin changes, at rest and during movement.

Feel for tenderness, swelling, deformity and crepitus with movement and temperature.

Move actively, then passively and against resistance to see if different. Look for pain, range, stability and crepitus.

Function should be assessed. Test strength and common functions.

Special tests might be necessary. There is a range of special tests—mainly orthopedic—to try to further characterize the problem, such as tests for shoulder pain. Consider testing for neurological signs and peripheral circulation.

and characterize the abnormality; to look for any pattern and any other abnormalities that will contribute to making a diagnosis, and to identify the structures that are abnormal, and the possible reasons. There are various signs of abnormality. A core set of clinical skills has been established for medical students.¹² In particular, it is important to be able to differentiate an abnormal joint that has arisen from inflammation from one that is the result of osteoarthritis, and to know when the features are indicative of infection. Musculoskeletal conditions are common and they can occur simultaneously or in combination.

The procedure

The examination should begin with the whole person; observe their posture, the attitude in which they hold and move the symptomatic region or limb, their overall movement and their behavior. Then continue to examine region by region. Examination might focus on the symptomatic region, as well as adjacent regions or the opposite side for comparison; however, as many musculoskeletal conditions are widespread it is often necessary to examine the whole musculoskeletal system, at least with a screening approach (see below). Examination of the musculoskeletal system should also be part of a general examination in view of the systemic nature of many problems. In particular, a dermatological, neurological or peripheral vascular examination might be relevant.

The aim is to identify the clinical signs of musculoskeletal conditions by looking, feeling

Box 5 Regional examination of the musculoskeletal system: standing.

SPINE AND UPPER LIMBS

- Cervical spine

Look at posture.

Feel the vertebrae for tenderness; palpate the paraspinal muscles for spasm or tenderness.

Move the head to the right and left; flex, extend and rotate to the left and right and laterally flex left and right actively, with the examiner gently guiding the movements to ensure that maximum range is reached. Do not test neck movements following trauma, or if instability is suspected.

- Temporomandibular joints

Feel over the joint line for tenderness, and during movement for crepitus or clicking.

Move the mouth wide open; deviate the lower jaw side-to-side.

- Spine

Look at the spinal posture for asymmetry of the scapulae, pelvic brim or crease of the buttocks.

Feel down the spinous processes to confirm posture, percuss the vertebrae for tenderness, and palpate the paraspinal muscles for spasm or tenderness.

Move: whilst standing erect, bend fully forwards, backwards and from side-to-side, observing the range of movement and the presence of pain. Fix the pelvis by sitting and rotate the upper body to the right and left. To assess flexion at the lumbar spine, place several fingers on the lumbar spinous processes and then bend forward.

Special tests: femoral or sciatic nerve stretch tests should be performed if buttock or leg pain is present (when the patient is lying supine on couch). Neurological examination should be performed if neurological symptoms are present. Check peripheral pulses if leg pain is present, especially if exercise-related.

- Shoulder

Look for asymmetry of the scapulae or posture and muscle wasting.

Feel over the midpoint of each trapezius and supraspinatus to identify tender spots, feel bony structures and the sternoclavicular, acromioclavicular and glenohumeral joint lines and the bicipital groove.

Move: actively elevate arms into the air, place hands behind the head and then behind the back. Steady the scapula and, with the elbow at 90°, rotate internally and externally, then passively abduct and flex the shoulder.

- Elbow

Look for any swelling or deformity.

Feel over the para-olecranon groove for synovial swelling or tenderness, and feel over the medial and lateral epicondyles for tenderness.

Move: actively and then passively extend and flex the elbow and look for hyperextension.

- Wrist

Look for any swelling or deformity.

Feel over the joint line for tenderness or synovial swelling.

Move: actively and then passively flex and extend the wrist. Test resisted flexion, extension or pronation if assessing epicondylitis at the elbow.

- Hand

Look for any swelling or deformity, and examine the skin and nails.

Feel over each joint line for tenderness and bony or synovial swelling.

Move: actively make a tight fist and a firm pinch grip between thumb and fingers individually.

LOWER LIMBS

- Hip, pelvis and sacroiliac joints

Look for asymmetry of the pelvic brim or crease of the buttocks when standing, and for wasting of the buttock or thigh muscles. Look at the patient walking.

Feel: hold the pelvis and ask the patient to stand on one leg, then the other, to establish if there is any dropping of the pelvis (Trendelenberg's test). Palpate to clarify the origin of any symptoms, including over the sacroiliac joints and greater trochanter of femur.

and moving, and by testing function (Box 4). It is important to be observant, remembering that most structures are normally symmetrical. Feel all the structures—soft tissues, bones, peri-articular structures and the joint. Look at the active range of movement of a joint before seeing if the passive range is greater, establishing whether movement is restricted or painful during the full range of movement or just at the extremes. A variety of more specialist tests aimed at further characterizing the problem exist, but these will not be considered here.

If undertaking a full examination, it is important for it to flow, starting by looking at the whole person and then working from the head downwards and comparing one side with the other, avoiding making the patient get up and down from a couch unnecessarily (Boxes 5 and 6).

A screening assessment to identify any musculoskeletal problems

Musculoskeletal conditions are common, but are often not identified if the person presents with other health problems.⁶ A simple screening

assessment, the GALS (gait, arms, legs and spine; Box 7),¹⁷ has been developed to enable the identification and documentation of any musculoskeletal problem, which all doctors should be able to undertake.² It is very sensitive at identifying any abnormality of the musculoskeletal system. Any such problems will then need to be fully assessed, as proposed above.

TEACHING CLINICAL SKILLS

Taking a history and performing a clinical examination are core skills that are taught at an early stage of undergraduate medical education, but the practical skills of musculoskeletal examination are often lacking when the student participates in a clinical attachment to a rheumatology or orthopedics department. When teaching clinical skills of the musculoskeletal system, it is essential that students acquire a standardized approach to physical examination. This will improve their ability to assess a patient, as examination of the musculoskeletal system is often regarded as complex in comparison with other organ systems. An integrated musculoskeletal disease course for medical students, bringing together orthopedics, rheumatology, and physical medicine and rehabilitation has been found to be effective.¹⁸

It is best for one tutor to teach the basic skills to small groups (maximum 10 students).¹⁹ The primary goal of the initial sessions, which should be completed in the first few days of a rotation, is for the students to be aware of the structure of the clinical examination and to be able to examine a normal person, preferably coupled with a student-directed session that reviews the anatomy of the musculoskeletal system. History-taking is an integrated part of these initial sessions but, as history is related to knowledge of the conditions, it needs to be highlighted in the context of the teaching session for each specific problem.

With these basic generic skills, and skills in regional examination, the students can move on to examine patients in the clinical setting, and learn to recognize and characterize abnormalities. This can be done by attending outpatient clinics, by serving in the emergency room or at the admission of patients for elective procedures. Patient educators, such as the Patient Partner Program, in which people with arthritis are trained to teach students about taking a history and performing a clinical examination, have also been shown to be an effective method of teaching clinical skills.^{20–23}

Box 6 Regional examination of the musculoskeletal system: lying.

LOWER LIMBS

- Hip, pelvis and sacroiliac joints

Move: with the patient supine, actively and then passively flex the hip as far as possible with the knee in flexion, looking for contralateral movement. With the hip passively flexed to 90°, rotate it internally and externally; then with the leg fully extended, hold the contralateral anterior superior iliac spine to prevent movement of the pelvis and passively abduct the leg and then adduct the legs beneath each other with a scissor-like movement. With the patient lying prone or on their side, passively extend the straightened leg if possible.

Stress the sacroiliac joints for tenderness by pressing downwards on a flexed knee and hip while simultaneously holding one hand over the joint.

- Knee

Look at the patient walking; look for quadriceps wasting, swelling and deformity.

Feel for tenderness or swelling; palpate the joint line with the knee flexed for tenderness and palpate the tibial tubercle and collateral ligaments. Assess for articular swelling and effusion by 'bulge sign' or 'patella tap'. Palpate for a popliteal cyst. Check for patella stability and alignment.

Move: with the patient supine, actively and then passively flex the knee as far as possible with the hip in flexion, and then fully extend the leg in an attempt to touch the back of the knee onto the couch. Test quadriceps strength. Test anterior and posterior stability to assess cruciate ligaments, and test medial and lateral stability to assess collateral ligaments and loss of joint space.

- Foot and ankle

Look at the feet when standing and walking for normal longitudinal arch. Look for normal heel strike and take-off from the forefoot during gait cycle. Look for any callosities beneath the metatarsal heads and for any swelling and redness of the toes, and for any deformities.

Feel for tenderness or swelling to establish the affected structures. Palpate the malleoli, Achilles tendon insertion and beneath the calcaneum. Squeeze across the metatarsus for tenderness.

Move: actively and then passively flex and extend the ankle. Passively deviate the heel medially (inversion) and laterally (eversion) by grasping the heel between the examiner's thumb and index finger of one hand and moving it whilst anchoring the lower leg with the other hand. Passively rotate the forefoot on the hindfoot by grasping the forefoot between the examiner's thumb and fingers whilst anchoring the heel with the other hand to assess the midtarsal joint.

The clinical teacher or tutor is a most important person in instructing the students; however, to ensure consistency of education, all other doctors in the department should be aware of how the students are taught, and have agreed on the content and structure for all regions of the examination. Towards the end of the rotation, each student should be able to examine one patient adequately while being observed as part of the formative assessment.

Assessing competency in clinical skills

To evaluate the competency of a student fully, clinical skills in musculoskeletal examination should be an integrated part of the student assessment process. At the planning stage of a

Box 7 A rapid screening assessment.

Screening questions

- “Do you suffer from any pain or stiffness in your arms, legs, neck or back?”
- “Do you have any swelling of your joints?”
- “Do you have any difficulty with washing and dressing?”
- “Do you have any difficulty with going up or down stairs or steps?”

Screening examination

Gait: observe the patient walking forwards for a few meters, turning and walking back again. Recognize abnormalities of the different phases—heel strike, stance phase, toe-off and swing phases. Look for abnormalities of the movement of arms, pelvis, hips, knees, ankles and feet.

Inspection of standing patient: view the patient from the front, side and back, looking for any abnormalities, particularly of posture and symmetry. Apply pressure in the midpoint of each supraspinatus and roll an overlying skin fold to examine for tenderness.

Spine: ask the patient to flex the neck laterally to each side. Place several fingers on the lumbar spinous processes and ask the patient to bend forward and attempt to touch their toes whilst standing with legs fully extended, observing for normal movement and feeling for expansion of space between spinous processes.

Arms: ask the patient to place both hands behind their head and then move elbows right back, then straighten the arms down the side of the body and bend elbows to 90° with palms down and fingers straight. Turn hands palms up and make a tight fist with each hand, then place, in turn, the tip of each finger onto the tip of the thumb. Squeeze the metacarpals from second to fifth cautiously for tenderness.

Legs: get the patient to recline on a couch, then flex, in turn, each hip and knee while holding and feeling the knee. Passively rotate the hip internally. With the leg extended and resting on the couch, press down on the patella while cupping it proximally to examine for tenderness or swelling of the knee. Squeeze all metatarsals and then inspect the soles of the feet for callosities.

Documentation

An example of associated documentation:

	Appearance	Movement
Gait	✓	N/A
Arms	✓	X
Legs	✓	✓
Spine	✓	X
Restricted movement left shoulder		
Restricted movement cervical spine with crepitus		

course, the teacher should define what competencies need to be tested and, ideally, design the assessment at the same time.

Only a limited number of validated methods can objectively assess clinical skills. Some methods are very resource-intensive, which limits their usefulness. Objective Structured Clinical

Examination (OSCE) is currently the most widely used method, as it is feasible to conduct with large groups of students within reasonable time constraints. The OSCE relies on a defined task that is identical for all students, a structured scoring sheet, a standardized patient or situation and a defined time (5–10 minutes) to perform the task.²⁴ The OSCE can include a normal patient or a patient with a clear problem; it is easier to have identical defined tasks performed on a mannequin or models, but this runs the risk of producing a purely artificial test. Standardized patients or patient educators can help overcome this. A balance should be aimed for, as exemplified in the following two set-ups: at station 1, the students would perform an examination of a normal hip (normal person) and at station 2 they would carry out a knee-joint puncture and aspiration (mannequin knee model); or, at station 1, students would examine the hand of a patient with rheumatoid arthritis and at station 2 they would evaluate and describe the findings of radiographs of a hand with typical features of rheumatoid arthritis.

The OSCE should ideally be organized as a single-occasion event with students moving from station to station, which makes it easier for the examiners to be consistent in their judgement and, therefore, in their scoring of the particular skill tested by their assignment. Through the OSCE, all students are assessed equally for a particular clinical skill; consistency from the student when performing the task, as well as from the examiner who assesses the performance, is key. The musculoskeletal module often forms part of a larger module or semester, and the OSCE might also contain other stations. It is important to define the pass level prior to the examination; as the OSCE tests skills that should be mastered by all students, the pass level should be set at 70–80%.

CONCLUSIONS

Musculoskeletal problems are common, but many clinicians lack the competencies that are needed for their assessment and management. Barriers include inadequate teaching as well as a lack of a simple, standardized approach. Such an approach is proposed, along with ways of teaching and assessing it. Improving the competency of all doctors in the clinical assessment of musculoskeletal problems, as well as improving communication skills, will improve the management of these common conditions.

KEY POINTS

- Assessment of the musculoskeletal system should be as thorough as that of other organ systems
- Assessment of the musculoskeletal system needs to be systematic and sequential; look, feel and move—active and passive
- Clinical examination of the musculoskeletal system involves many specific tests, but only a limited number needs to be mastered (except by a specialist)
- A rapid screening assessment should be included in all standard clinical examinations of any patient

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Competing interests

The authors declared no competing interests.