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Conservative Management of Low Back Pain

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1. Introduction

Low back pain is a common human experience. Especially in developed countries, low back pain has become a health condition with significant socio-economic implications. The costs of treating back and neck pain disorders in the US have increased substantially over the past 15-20 years, with the majority of these costs attributed to relatively invasive medical procedure such as injections and surgery. Despite the increased cost, there does not appear to be a corresponding improvement in function among individuals reporting spine pain over this same time period, nor improved general health outcomes (Martin BI et al, 2008).

Back pain is a symptom and not a specific health condition or disease. There are many musculoskeletal and non-musculoskeletal causes of low back pain. Health care providers who treat back pain must engage in differential diagnosis as a first step in addressing a person with a back complaint. When back symptoms are caused by visceral or systemic disease, the patient must be referred to an appropriate medical specialist. Similarly, when back symptoms are caused by serious musculoskeletal pathology, the clinician should refer the patient appropriately. There conditions involving pathophysiologic changes in the lumbosacral spine, however, which can be successfully managed with more conservative approaches to care (Weinstein JN et al, 2006). Importantly, in many cases back pain can be considered *non-specific* and unrelated to pathologic change (Savage RA et al, 1997). Movement impairments can underlie both pathoanatomic and non-pathoanatomic causes of low back pain and these impairments are often the focus of conservative management (Sahrmann SA, 2002).

Beyond the first step of differential diagnosis, the major challenge for health care professionals involved in the treatment of back pain is diagnosing the problem in ways that will direct appropriate treatment and establish a more accurate prognosis. The International Classification of Disease (ICD) system (World Health Organization, 2005), which is universally accepted as a classification system for health conditions, has not been found to be particularly helpful from a prognostic standpoint or in directing interventions for back pain (Riddle DL, 1998). One of the reasons for this is that there is often a weak relationship between pathologic changes noted on imaging and an individual's level of symptomotolgy or function (Boos N et al, 200). Another reason is that again, by far, the majority of cases of low back pain can be considered non-specific and are not attributable to serious underlying pathology. So there is a need for new models of diagnosis that are more meaningful.

One of the themes of this chapter is that the diagnostic process is central to the overall management of back pain. It is a pivotal point around which clinical decisions are rendered.

Diagnostic classification systems for back pain have been developed within various health professions due to the need to look beyond the pathology-based orientation and for the purpose of guiding clinical decisions for spine management. For example, the McKenzie system, utilized most extensively in physical therapy, places patients with back pain into one of several categories or subcategories based upon their response to specific spinal movements (McKenzie RA, 1981). The selection of intervention is based upon the patient category. There are numerous other systems that have been developed as well. Each system possesses its own set of rules and each will direct different types of interventions. The end result of having so many different approaches to treating back pain is that it creates considerable clinical variance in back pain management. Nonetheless, the diagnostic process is the key to effectively treating back pain.

A second theme of this chapter is that a comprehensive diagnostic system for back pain must be consistent with a biopsychosocial model of healthcare and it must incorporate a person's level of function. The International Classification of Functioning, Disability and Health (ICF) provides an expanded system of classification and offers a broader perspective on the inter-relationships between health conditions and function (World Health Organization, 2008). Although the ICF is not currently being widely used as a diagnostic system for back pain, the codification scheme found in the ICF may help the health care community better understand the relationships between health conditions and functioning in the future. This system will be discussed in more detail later in the chapter.

There is a growing body of evidence that for most people who experience back pain, conservative care should placed front and center in the overall management of their problem. In addition, patient response to conservative care is being used more and more in the decision-making process relative to the need for surgical intervention (Chou R et al, 2011). In other words, people that fail to improve after a course of conservative care are more likely to benefit from surgery.

So how is conservative care defined? Conservative care may be viewed differently depending upon the orientation or discipline of the health care practitioner. For the conservative care practitioner, it would likely include only non-surgical treatment options. For the purposes of this chapter, conservative care will be defined as follows: *conservative care is the least invasive treatment for a given condition that can be justified based upon a preponderance of the evidence.*

Conservative care for back pain can take many forms, especially if one considers complimentary and alternative medicine options. If only licensed health care professionals are considered, physical therapists and chiropractors together account for the largest groups of providers that offer comprehensive conservative care. Although the two professions differ in many significant ways, especially with regard to philosophic underpinnings, there is at the same time considerable overlap in the types of treatment rendered by these providers. As will be discussed, conservative management is more than just specific treatment approaches; it is the entire framework for understanding back pain, evaluating and diagnosing back problems, and directing treatment.

Conservative care practitioners are in the best position to help reverse the trend in developed countries to over-treat back pain. These practitioners are less likely to believe that

back pain is a symptom in need of treatment and more likely to view back pain as a common human experience that involves the whole person – including the individual's perceptions about their condition. With the exception of cases that involve serious pathology, people with back pain need to learn how to help themselves. To this end, education is singularly the most important "treatment" for the conservative care provider.

This chapter will explore the various elements of comprehensive conservative management of back pain. There are three general elements of patient management that comprise comprehensive care for the health care practitioner:

- Patient Examination
- Diagnostic Process
- Intervention

These elements are sequential and inter-related. In addition, to complete the cycle, outcomes of care must be assessed. An episode of care is complete when outcomes are favorable and treatment goals are met. When goals are not met, any or all elements of patient management may have to be revisited.

2. Patient examination

A comprehensive patient examination is essential for conservative management of back pain. The art and science of the clinical exam has been lost for many health care practitioners, which seems to parallel the advancement in technology – especially technology related to diagnostic imaging. Far too often when a person with back pain seeks medical care, emphasis is placed upon symptomology and imaging findings. It is imperative that both symptoms and imaging findings are interpreted within the context of a thorough clinical examination (Chou R et al, 2011). This will not only lead to a more accurate diagnosis, but will also help to limit unnecessary medical tests and procedures.

Table 1 provides an overview of the major components of a comprehensive patient examination.

Exam Item	**Example**
Medical Screening	General Health Assessment, R/O Serious Pathology
Review of Paraclinical data	Medical reports, imaging results
Functional Outcomes Measures	Oswestry Disability Index, Rolland Morris Scale
History of Current Condition	Oral History, Follow-Up Questions From Medical Screening
Observation & Postural Assessment	Standing and Sitting
Active Movement Testing	Cardinal Plane Movements, Repeated Movements
Neurological Screening	Reflexes, Myotomes, Dermatomes
Muscle Performance Testing	Abdominal/Back Extensor Strength , Gluteal Strength
Muscle Length Testing	Hamstring, Hip Flexors, Hip Adductors
Orthopedic Special Tests	Straight Leg Raise, Slump Test, Prone Lumbar Instability Test
Joint Mobility Assessment	P-A Vertebral Pressures
Palpation	Lumbar Paraspinal Muscles, Myofascial Pain

Table 1. Comprehensive Patient Examination

2.1 Medical screening

Medical screening begins as part of the general patient intake process. Health questionnaires provide the most efficient way to collect this information. Figure 1 is an example of a health questionnaire that can be used in an outpatient care setting, which provides detailed information on the patient's health status. The clinician will review this information prior to taking an oral history of the current complaint. Health conditions that are identified on the screening tool may require follow-up questions by the clinician. In addition, in cases where there is suspicion of possible visceral or systemic involvement in the current complaint, the clinician can use this information to investigate the problem in greater depth. There will be one of three possible outcomes from the medical screening process: (1) medical referral, (2) medical consultation, (3) patient is deemed appropriate for conservative care

PAST MEDICAL HISTORY

Please checkmark "√" if you or anyone in your immediate family (specify whom) has had any history of the following:

Condition	Personal	Family	Condition	Personal	Family
Acid Reflux (GERD)	□	□	Hepatitis (any type)	□	□
Alcoholism	□	□	HIV/AIDS	□	□
Allergies (any)	□	□	Huntington's Disease	□	□
Anemia	□	□	Inflammatory Bowel	□	□
Asthma	□	□	Kidney Disease	□	□
Autoimmune Disease	□	□	Kidney Stones	□	□
Bleeding disorders	□	□	Latex Sensitivity	□	□
Blood Pressure Problem	□	□	Liver Disease	□	□
Bronchitis	□	□	Lupus	□	□
Cancer (any type)	□	□	Mental illness	□	□
Chest Pain/Angina	□	□	Multiple Sclerosis	□	□
Cholesterol problems	□	□	Osteoarthritis	□	□
COPD	□	□	Osteoporosis/Osteopenia	□	□
Deep Vein Thrombosis	□	□	Ovarian Cysts	□	□
Diabetes	□	□	Parkinson's Disease	□	□
Diverticulitis	□	□	Peptic Ulcer	□	□
Drug Addiction	□	□	Pneumonia	□	□
Emphysema	□	□	Prostate Disease (males)	□	□
Endometriosis (females)	□	□	Rheumatoid Arthritis	□	□
Epilepsy/seizures	□	□	Skin problems	□	□
Fibromyalgia	□	□	Sexually Transmitted Disease	□	□
Glaucoma	□	□	Stroke/TIA	□	□
Gout	□	□	Thyroid Disorder	□	□
Guillain-Barré	□	□	Tuberculosis	□	□
Headaches	□	□	Urinary Incontinence	□	□
Heart Attack	□	□	Urinary Tract Infection	□	□
Heart Disease	□	□	Vascular Disease	□	□

Please list any additional family or personal past medical history information here _____

Current Medical Symptoms ***(Please check if you are currently having any of the following…)***

☐ Fever/chills/sweats (day or night)
☐ Unexplained weight loss or gain
☐ Unusual fatigue/drowsiness
☐ Sudden weakness
☐ Confusion/memory loss
☐ Nausea/vomiting/loss of appetite
☐ Changes in bowel or bladder function
☐ Numbness or tingling
☐ Trouble sleeping
☐ Other _____

Medical/Surgical History

Do you have a pacemaker? ☐ Yes ☐ No
Have you ever had a joint replacement? ☐ Yes ☐ No
Have you ever been hospitalized? ☐ Yes ☐ No If yes please specify_____
_____
_____

Medical/Surgical History (*continued*)

Please list any operations you have had and the date(s):

	Date of Surgery	**Reason for Surgery**
1.)	_____	_____
2.)	_____	_____
3.)	_____	_____
4.)	_____	_____
5.)	_____	_____

Prescription Medications ***(Please list all prescription medications you are currently taking)***

Medication	Dosage	Medication	Dosage
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Over-the-Counter Medications ***(Please list all over the counter medications you are currently taking. This includes vitamins, minerals, pain relievers, cold medicines, supplements.)***

Medication	Dosage	Medication	Dosage
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Living Environment

Please specify your current living situation. I currently live:
☐ Alone ☐ With family, spouse, partner ☐ Assisted living ☐ Other _____
Do you have any stairs/steps in your home? ☐ Yes ☐ No
If yes, how many?_____
Do you exercise regularly? ☐ Yes ☐ No
If yes, what kinds and how often?_____
What types of sports/recreational activities do you participate in?_____
What do you hope to get out of physical therapy?_____
Do you have any other concerns that you would like your physical therapist to be aware of? ☐ Yes ☐ No
If yes, please specify:_____
EMERGENCY CONTACT:_____ RELATION:_____ PHONE_____
PRIMARY CARE PHYSICIAN: _____ PHONE: _____
_____

Fig. 1 Medical Screening Questionnaire

2.2 Review of paraclinical data

Many people with back pain have sought care from a number of different health care providers and have already undergone diagnostic testing. Medical reports generated from

this prior care can be very useful to the clinician conducting the patient examination. The clinician should make an effort to obtain this information and review it as part of the examination process. Any conflicting information should be rectified. Otherwise, the data can be added to the rest of the clinical findings during the course of the patient examination and ultimately corroborated during the diagnostic process.

2.3 Functional outcome measures

It is very important to assess the level of disability associated with an episode of back pain. The standard way to obtain this information is through self-report disability scales. Several of these types of scales have been established as both reliable and valid measures, such as the Oswestry Disability Index (Vlanin M, 2008). Scores derived from these measures can be used to determine a level of disability ranging from mild to severe. The Roland Morris Disability Index is another self-report disability tool that is clinically useful (Roland M, Morris R, 1983). A simple scale that can be used for any patient with back pain is the *Patient Specific Functional Scale.* This scale has been studied for its psychometric qualities more for cervical spine conditions (Cleland JA et al, 2006), however use of this scale insures that the function being measured is meaningful to the patient. These scales can complement one another (Beurskens AJHM et al, 1996). There are other ways of evaluating a patient's level of function. Direct measures, or performance tests, can also be conducted. Examples of performance tests for back pain include assessment of bending and lifting tasks. All of these tests should be utilized to evaluate treatment outcomes, and may be the most valuable measures of treatment effectiveness.

2.4 History of current condition

The health care provider must obtain an accurate and complete history from the patient seeking care for back pain. The patient interview can provide pivotal information that is then used by the clinician to diagnose the patient problem. This interview is both an art and a science. Good communication skills are essential. The history usually begins as an open-ended question such as "so tell me about your problem". The value of an open-ended question is that the patient has an opportunity to tell their "story" and often it is an efficient way to collect critical information. Follow-up questions can then begin. Sometimes patients provide extraneous information and may need to be directed by the clinician. Table 2

Mechanism of onset/injury
Length of time since onset of symptoms for current condition
Previous history of back pain
If recurrent, number and typical length of time of episodes
Location and characteristics of symptoms
Symptom behavior (24 hour)
Aggravating/Relieving factors
Previous diagnostic tests
Previous treatment
Occupation/Work environment
Level of physical activity

Table 2. Essential Information Obtained in History

contains the essential information that is to be collected during the history. At the completion of the interview, it can be very insightful for the clinician to query the patient on their own views of what is causing their back pain. This is particularly important when the patient has sought care from a number of different providers. Many times, the patient has received opinions from these providers that reflect a variety of perspectives on back pain and this can lead to confusion as the patient attempts to resolve conflicting information. Patients also often misinterpret information. A person's beliefs about their problem can be a significant factor in their overall prognosis for recovery.

2.5 Observation & postural assessment

Observation and postural assessment is where the physical examination of the patient begins. The primary objectives of observation/postural assessment in a person with back pain is to determine: (1) the general orientation of the spine and extremities in space, (2) if there are impairments related to structural alignment, (3) if there is muscle atrophy, joint or tissue swelling, or skin discoloration, and (4) how posture may be contributing to the patient problem. In many, if not most cases of back pain, the condition is caused by accumulated stress on the spine, which is in turn due to the way in which the individual functions day in and day out. For example, work demands for many people entail prolonged sitting or standing postures. If the orientation of the body in space or alignment of body segments lacks efficiency from a movement health standpoint, tissues are exposed to excessive loading. Accumulated stress can overload body tissues, which can lead to tissue breakdown and eventually symptoms of back pain. The clinician should note any significant findings, then correlate these findings with the patient's symptoms and other physical findings.

2.6 Active movement testing

Assessment of the patient's range of motion and symptomatic response to trunk movement contributes a great deal to a movement system diagnosis of back pain. For some clinicians, it is the most critical aspect of the physical examination for both diagnosis and treatment. Figure 2 contains the most basic trunk movements assessed. Single plane, multi-plane, and repeated movements are performed during this portion of the exam. Most of the time, active movement testing begins in the standing position. Baseline pain level, utilizing the numeric pain rating scale, and location is established before active movement is performed. Symptomatic responses can include: increased, decreased, no effect, and produced. The clinician should note whether pain occurs through the range of movement or only at end range. Range of motion measurement in the clinic setting is most reliable and valid when obtained with an Inclinometer (Saur PM et al, 1996). The quality of the movement is also noted. Aberrant movement, such as the presence of a painful arc or frontal plane deviations associated with trunk flexion, can indicate lumbar instability (Hicks GE et al, 2005). Quality of movement can be assessed in other ways as well. For example, does the patient flex primarily at the hip joint and avoid thoraco-lumbar flexion? Or, is there excessive lumbar flexion? Upon return to neutral from the flexed position, does the patient initiate the movement with the hip extensors, or the trunk extensors? Quality of movement assessment reveals a great deal about movement strategies (Sahrmann SA, 2002).

In addition, the clinician may evaluate how extremity joint movement impacts back symptoms and spine movement in order to obtain more detailed information. For example,

in standing can the patient perform unilateral hip and knee flexion without rotating the lumbar spine and without pain? If the examiner controls the impaired spine movement, can the corrective movement be performed without provoking symptoms? Test items can be chosen based upon the most frequent functional movements the patient performs, or those that are reported to reproduce symptoms.

TRUNK MOVEMENTS (STANDING)	ROM Loss	Symptomatic Response	Quality of Movement
Flexion			
Extension			
Right Lateral Flexion			
Left Lateral Flexion			
Right Rotation			
Left Rotation			
Right Side-Glide			
Left Side-Glide			
Supine Flexion			
Prone Extension			
Comments:			

COMBINED MOVEMENTS:

REPEATED MOVEMENTS:

PERIPHERAL JOINT SCREEN:

Fig. 2. Active Movement Testing

Limitations in range of movement and/or joint mobility, and altered motor control contribute to altered movement patterns of the spine. A movement system diagnosis relies heavily on the clinical picture that emerges during active movement testing. These findings are then correlated to the information gleaned during the history, particularly with symptom behavior during functional tasks, as well as muscle performance testing. Indeed, the result of this portion of the examination helps in the planning for muscle strength/length testing.

2.7 Neurological screening

A neurological screen can be considered a basic component of the physical examination of the patient with back pain. It is especially important when the patient presents with extremity pain, or with neurological symptoms such as numbness or paraesthesia. It is the discretion of the clinician to forego a neurological exam when the patient's complaint is local spine pain in the absence of neurological symptoms. A summary of neurological tests can is presented in figure 3.

Neurological impairments need to be considered in the context of the patient's mechanism of onset, symptoms and other clinical findings. Positive neurological signs must be considered in the differential diagnosis, and may serve to prompt appropriate medical referral.

REFLEXES	RIGHT	LEFT
Patellar		
Achilles		

LUMBAR MYOTOMES	RIGHT	LEFT
Hip Flexion (L2)		
Knee Extension (L3)		
Ankle Dorsiflexion (L4)		
Great Toe Extension (L5)		
Ankle Plantarflexion/Eversion (S1)		
Knee Flexion (S2)		

SENSATION: L1/L2/L3/L4/L5/S1/S2 Dermatomes
Light Touch
Other

Fig. 3. Neurological Testing Lumbar Spine

2.8 Muscle performance testing

There are many ways to evaluate muscle strength, including dynamometry, manually applied resistance, EMG and isokinetic testing. The most practical and common method in the outpatient clinic setting is manual muscle testing. It is important to be selective in this portion of the patient examination since muscle strength tests can be provocative; in some cases muscle testing should be deferred if the patient's condition is irritable. The determination of specific tests is based upon information gleaned primarily from the posture and active movement assessments. Muscle atrophy and left versus right muscle asymmetries can be observed during the static standing posture analysis. During active movement, motor recruitment patterns can lead the examiner to identify both weak and dominant muscles or muscle groups. The examiner can then confirm these findings through direct assessment of muscle function. Most muscles or muscle groups can be isolated during manual testing to a reasonable degree, (Kendall FP et al, 1993) although complete isolation is not possible. For people with back pain there are key muscle groups that should be given consideration, including the back extensors, abdominals (upper and lower divisions), hip extensors, hip abductors and hip flexors. Figure 4 provides a list of muscles typically considered during examination of a person with back pain.

Knowledge of impairments of muscle performance contributes substantially to the diagnosis of movement system impairment. In addition, impaired muscle function is targeted specifically in the plan of care for the patient through corrective exercise.

MANUAL MUSCLE TEST/ MUSCLE LENGTH TEST	RIGHT	LEFT	RIGHT	LEFT
Erector Spinae			Normal / short / stiff	
Gluteus Maximus			Normal / short / stiff	Normal / short / stiff
Gluteus Medius			Normal / short / stiff	Normal / short / stiff
Psoas			Normal / short / stiff	Normal / short / stiff
Hip Adductors			Normal / short / stiff	Normal / short / stiff
Hamstrings			Normal / short / stiff	Normal / short / stiff
Quadriceps			Normal / short / stiff	Normal / short / stiff
Piriformis			Normal / short / stiff	Normal / short / stiff
Quadratus Lumborum			Normal / short / stiff	Normal / short / stiff
Gastroc/Soleus			Normal / short / stiff	Normal / short / stiff

Fig. 4. Muscle Strength and Length Tests

2.9 Muscle length testing

Adaptive muscle shortening can either be a consequence of impaired movement, or a contributing factor in movement dysfunction. Muscle length deficits will limit joint movement, and the joints spanned by the muscle will not be able to achieve a neutral position. Alternatively, muscles can develop stiffness, which can be defined as an increased resistance to passive movement. For muscle length testing, the examiner generally attempts to passively lengthen a muscle over the joint(s) that it crosses while ensuring stabilization of the proximal bony lever. A short muscle will be incapable of lengthening fully across the joint(s); a stiff muscle will achieve adequate length but will demonstrate increased resistance to passive stretch. In either case, the consequence of short or stiff muscles is altered and inefficient movement patterns. Further, muscle length and strength deficits tend to be interdependent and reflect, and contribute to, an imbalance of forces across joints.

As with the results of muscle performance testing, the identification of muscle length deficits will assist in the diagnosis and treatment of movement impairment.

2.10 Orthopedic special tests

The primary purpose of special tests in an orthopedic spine examination is to selectively expose the tissues to mechanical stresses in order to rule in or rule out specific musculoskeletal causes of back pain. Tissue sources of pain can then be identified. The clinician must be aware of the limitations of special tests and mindful that in many cases, a specific tissue source of pain cannot be accurately determined.

Figure 5 contains a list of special tests frequently used in the examination of the lumbar spine. This list is only representative of the numerous tests that currently exist (Magee DJ, 2002). Sensitivity and specificity data can be found in the literature for some but not all of these tests, which helps the clinician evaluate the utility of each test. Selection of tests is based upon information obtained in the history, including results of diagnostic imaging, and the clinician's hypothesis generated by the collective information from the rest of the examination. It is beyond the scope of this chapter to analyze individual tests; this information can be found in standard orthopedic evaluation texts.

SPECIAL TESTS	RIGHT	LEFT
SLR	+ / -	+ / -
Bragard's Test	+ / -	+ / -
Lindner's Sign	+ / -	+ / -
Slump Test	+ / -	+ / -
Well Leg Raise	+ / -	+ / -
Bowstring Test	+ / -	+ / -
Bechterewis Test	+ / -	+ / -
Quadrant Test	+ / -	+ / -
Prone Knee Flexion	+ / -	+ / -
McKenzie's Slide Glide	+ / -	+ / -
Stork Standing Test	+ / -	+ / -
Prone Lumbar Instability	+ / -	
Valsalva Maneuver	+ / -	

Fig. 5. Orthopedic Special Tests

When a tissue source of pain can be discerned, it is important to include this in the diagnostic complex. This enables the health care provider to be as specific as possible in assigning an ICD code to the patient problem. It also can lead the clinician to request follow-up tests or may lead instead to an appropriate medical referral.

2.11 Joint mobility assessment

Impairments of joint mobility frequently accompany active range of motion (AROM) deficits, however joint mobility is considered a distinct aspect of joint movement and therefore impaired joint mobility can be present when AROM is normal. Joint mobility is assessed through passive movements imparted by the examiner. These movements can be physiologic, meaning there is a corresponding active movement associated with the passive movement, or accessory, meaning there is no associated physiologic movement. Examples of physiologic movements in the lumbar spine extension and flexion; examples of accessory movements include posterior-to-anterior glide and lateral glide.

Clinical findings during joint mobility assessment that would be indicative of impairment are reproduction of the patient's symptoms, altered mobility (too much are too little movement), and/or the production of involuntary muscle guarding. Joint mobility can be categorized as: (1) Hypomobile, (2) Normal, or (3) Hypermobile. This is determined based

upon what is considered normal for the individual; a "within person" reference standard is used as opposed to a "between person" reference standard. The 3-point scale has been found to have adequate validity and reliability (Landell R et al, 2008).

Joint mobility impairments can contribute to abnormal and inefficient active joint movement. The clinical findings during joint mobility assessment are used in the diagnostic process and to help direct treatment. In particular, decisions about whether or not the patient is a candidate for joint mobilization and manipulation are often based upon this aspect of the patient examination. Figure 6 is representative of the common accessory and physiologic movements examined in the lumbar spine.

JOINT MOBILITY ASSESSMENT	RIGHT	LEFT
P-A Central Vertebral Pressure	Normal / hypo / hyper	Normal / hypo / hyper
P-A Unilateral Vertebral Pressure	Normal / hypo / hyper	Normal / hypo / hyper
Transverse Vertebral Pressure	Normal / hypo / hyper	Normal / hypo / hyper
Flexion	Normal / hypo / hyper	Normal / hypo / hyper
Extension	Normal / hypo / hyper	Normal / hypo / hyper
Side Flexion	Normal / hypo / hyper	Normal / hypo / hyper
Rotation	Normal / hypo / hyper	Normal / hypo / hyper

Fig. 6. Joint Mobility Assessment

2.12 Palpation

Palpation of accessible body structures is often performed last in the physical examination due to the potential for the provocation of symptoms, particularly in more acute conditions. If symptoms are produced, increased or worse following palpation, this may influence the accuracy of other tests and measures. On the other hand, for subacute and chronic conditions, the clinician may want to start with palpation in order to better direct the remainder of the exam.

When the clinician is knowledgeable in surface anatomy and skilled in the art of palpation, this portion of the exam can provide important information relative to the tissue source of symptoms. This is particularly true for tissues that, when irritated or inflamed, produce pain that is well localized.

2.13 Summary

In the patient exam, essentially the clinician is asking a series of questions through a thoughtful selection of tests and measures. The intake data, medical screening process and history all inform this selection of tests for the physical examination. It is very important that the examination is systematized and consistent in a general way from one patient to the next. This helps to ensure that the exam is thorough and that all critical data is collected. Figure 7 provides a collection of signs and symptoms of common clinical conditions obtained through the patient examination process. This information can assist the clinician in determining specific health conditions that are contributing to the patient's low back complaints.

Condition	Presenting Symptoms/History	Clinical Findings
Lumbar Strain	Acute trauma/microtrauma Pain localized to lumbar spine Pain relieved by rest	Pain with active movement multidirectional Trunk ROM pain limited Segmental Hypomobility/ palpatory tenderness Negative neurologic signs
Disc Herniation	Acute or insidious onset Unilateral back and/or leg pain Flexion positions/postures aggravate	Spinal tilt may be evident Pain with active trunk flexion Centralization of pain with trunk extension + neurological signs with nerve root compromise + nerve tension signs (SLR, Slump Test)
Lateral Stenosis	Long history of back pain Leg pain > back pain Extension positions/postures aggravate	Pain with active trunk extension/lateral flexion + neurological signs with nerve root compromise + nerve tension signs (SLR, Slump Test)
Central Stenosis	Bilateral leg pain/paresthesia Extension positions/postures aggravate Flexion positions/postures relieve	Loss of active trunk extension ROM + neurological signs + quadrant test
Facet Joint Sprain	Acute trauma/microtrauma Unilateral back pain Extension positions/postures aggravate	Pain with active trunk extension Negative neurological signs Segmental hypomobiltiy (subacute phase)
SI Joint Syndrome	Pain in lumbosacral region/buttock Flexion postures/positions aggravate Common in women after childbirth	Pelvic asymmetries noted with palpation Pain with active trunk flexion Negative neurological signs + SI provocation tests (Thigh Thrust, Distraction) Palpatory pain in sacral sulcus Hypo or hyermobility of SI joint

Fig. 7. Musculoskeletal Differential Diagnosis

At the completion of the examination phase of management, the patient data must be interpreted and a treatment plan can then be established. The critical link between analysis and intervention is diagnosis. Diagnosis is the central element of patient management and will be discussed next.

3. Diagnosis

Diagnosis can be considered both a process, and a label that is generated from this process. In medicine, the *International Statistical Classification of Disease and Related Health Problems* (ICD) is utilized extensively by health care providers and most medical diagnoses are expressed as ICD codes. The ICD is a hierarchical system, whereby the most specific diagnosis is rendered that can be supported by diagnostic testing. For many musculoskeletal conditions, and especially back pain, the reliability of assigning diagnostic codes has not been studied extensively. Therefore, the reliability and validity of the coding system as a whole has not been established. The lack of consistency in categorizing patient conditions leads to clinical variance in managing conditions.

The dilemma surrounding diagnosis of back pain has significant implications, since diagnosis drives treatment decisions. Further, accurate diagnosis is essential to evaluating the effectiveness of treatments, which is a core value in evidence-based practice.

In addition to the challenges of accurate application of the ICD system, the system itself is considered inadequate in directing conservative treatment. Back pain is a largely a problem of the movement system. Back pain can occur in the absence of pathology. Many times a specific pathology cannot be identified in a person with back pain, so constructs other than pathology have to be considered in a clinically useful diagnostic system.

There are many ways in which clinicians can categorize back pain that fall outside the traditional ICD system. Numerous systems have been developed over the years within the professions involved in managing back pain, including medical primary care, physical therapy and chiropractic. Physical therapists in particular are on the front lines of conservative musculoskeletal care. In the physical therapy profession, a practical need exists to find a way to create subgroups of patients for the purpose of determining the most targeted interventions. Diagnostic systems have been developed to help fill this need. These methods of classification all vary in the constructs that serve as a basis for the categories, however there are also points of convergence. For example, patient response (symptomatic) to active movement is used to categorize patients in several of the more common systems. As expected, since the focus in conservative care is more functionally oriented, patient data derived from movement or functional testing is utilized in clinical decision-making.

The existing diagnostic classification models all have merit, however the diversity found in these systems creates variability in the way that clinical decisions are rendered. The lack of a standardized taxonomy has led to challenges not only for clinicians, but also the research community and ultimately people experiencing back pain.

Much of the research on diagnostic systems for back pain has been quantitative in nature. Several of the more common systems have undergone analysis of both reliability of assigning diagnostic categories to people with back pain, and validity of the systems. Validity has been investigated by determining if a targeted intervention is more likely to be effective when it is matched to the patient subgroup (Childs JD, 2004). These studies have begun to build a case for the usefulness of at least 3 systems used in physical therapy practice: (1) McKenzie, (2) Treatment-based, and (3) Movement System Impairment. All of these systems are structured and have explicit inclusion criteria. However little is known about how these are being used in clinical practice.

Since one point of agreement among health care professionals and researchers is that classification systems must be clinically pragmatic, there is a need for qualitative studies to explore what clinicians are actually doing in practice with regard to diagnosis. In order to fulfill this need, the author conducted a survey of physical therapists in clinical practice (Spoto MM, Collins J, 2008). A purposeful sample of physical therapists that are certified specialists in orthopedic practice was obtained. The participants were recognized for having a depth of knowledge and skill in orthopedic practice beyond that required for general practice. The general characteristics of the subjects can be found in table 3. These subjects were asked to answer both open and close-ended questions about how they approach diagnosis.

Primary Practice Setting		**Secondary Practice Setting**		**Years in Practice**	
Patient Care	84%	*Patient Care*	16%	3-8	18%
Teaching: Graduate	8%	*Teaching: Graduate*	25%	9-14	23%
Teaching: Postgraduate	1%	*Teaching: Postgraduate*	8%	15-20	26%
Management	6%	*Management*	40%	21-26	21%
Research	5%	*Research*	3%	>26	11%
Consultant	0%	*Consultant*	3%		

Table 3. Subject characteristics for physical therapists

The results of this study demonstrate that considerable variability is found in the way in which physical therapists classify back conditions. This is not surprising given the existence of numerous diagnostic systems in practice. In addition, over one-half of the physical therapists surveyed used more than one classification system. All of this contributes to the lack of consistency in the labels used by physical therapists to name the patient condition. Several themes emerged from this study and are summarized in figure 8. The first two themes reflect the need to move beyond the ICD and incorporate other constructs in the diagnosis. Psychiatrists and psychologists, for example, utilize a multi-axial system of diagnosis for psychological disorders in the *Diagnostic and Statistical Manual of Mental Disorders*. For back disorders, constructs such as impairments and functional limitations should be considered and incorporated with the ICD.

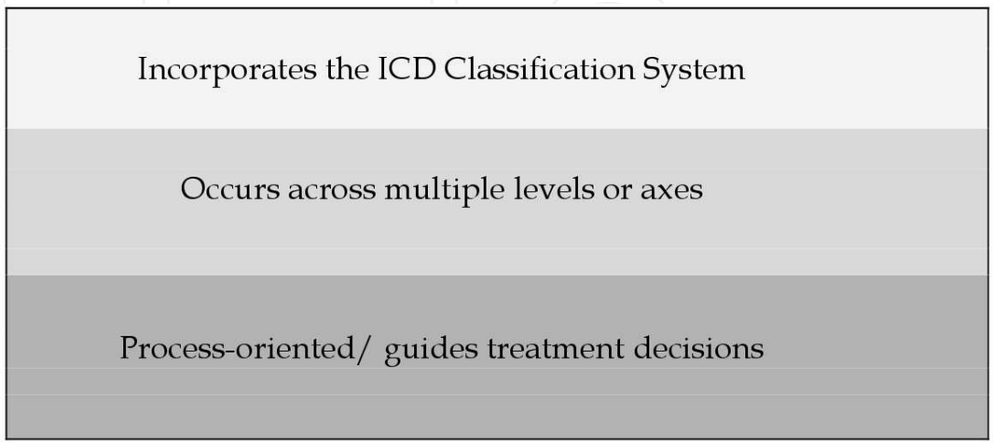

Fig. 8. Diagnosis by Physical Therapists

For physical therapists, diagnosis tends to be process-oriented. The various classification systems all have rules for interpreting patient data in ways that direct treatment. Until a more standard system is developed, with explicit criteria for selecting diagnostic categories, physical therapists engage in clinical reasoning to derive treatment decisions. Clinical reasoning, supported by the rules that govern the diagnostic system, is essentially the diagnostic process. Further, physical therapists indicate that they believe the primary role of diagnosis is to determine appropriate treatment. Since the overarching goal of treatment is to restore function, diagnosis must address (movement) function.

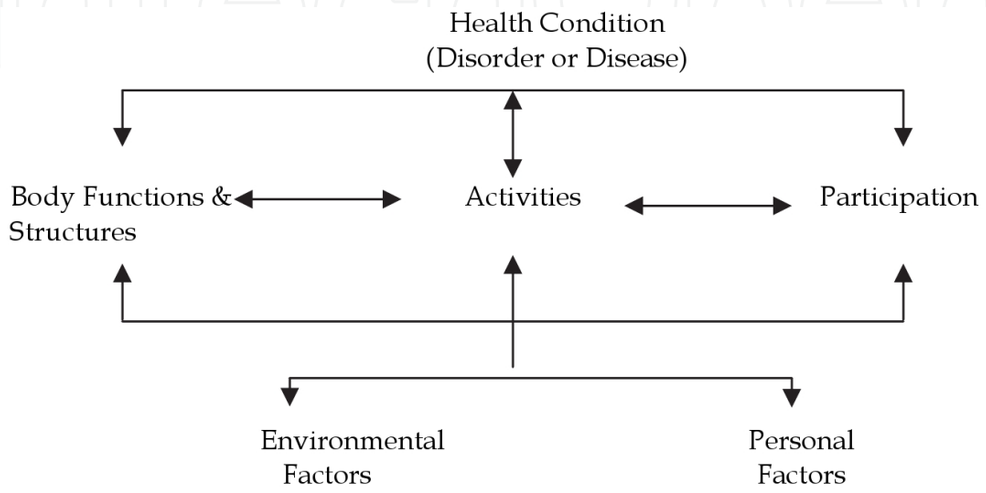

Fig. 9. ICF Model of Functioning & Health

A multidisciplinary model of functioning has been established in the *International Classification of Functioning, Disease and Health* (ICF). The ICF framework includes multiple factors or components that contribute to human functioning and health (WHO, 2008). Health conditions or diseases comprise one aspect of a person's health, however health conditions interact with body functions, both at the individual parts (tissues, joint, body part) and whole person levels, and these in turn interact with personal and environmental factors. The ICF framework is an expanded and more accurate way to define and address both health and disability. There are efforts ongoing in the health care professions to incorporate this new model into diagnostic classification systems for musculoskeletal conditions (Childs JD et al, 2008).

It is clear that health care providers recognize the need for a more meaningful way to approach diagnosis of back problems. Given that the ICD and ICF coding systems are universal, it seems reasonable that the constructs expressed in these systems could be integrated so that all components of health and disability are captured, and meaningful subgroups of back problems can emerge. In the meantime, conservative care practitioners will continue to use clinical subgroups, comprising clusters of signs and symptoms, to categorize patients in order to direct appropriate treatment.

4. Conservative intervention (Non-pharmacologic)

The conservative practitioner generally employs a combination of interventions in the treatment of back pain. A multi-modal approach is most common. Many of the research

studies investigating the effectiveness of non-pharmacologic conservative treatments are designed to compare one intervention to either another intervention, or to no treatment. Since a single type of intervention is not likely to demonstrate a large treatment effect, especially when compared to another single-modal intervention, there is a need to develop a larger pool of high-quality studies investigating overall conservative management strategies. Another challenge is that in clinical trials investigating effectiveness of interventions for people with back pain, research subjects are often heterogeneous – reflecting the lack of a standard way to categorize back conditions. There is a growing pool of evidence that when similar groups are studied, and interventions are matched to treatment subgroups, outcomes are better (Childs JD et al, 2004). Figure 10 provides common treatment categories and the patient characteristics that would predict success with the specific types of conservative interventions.

Treatment Group	Patient Profile
Manipulation	Relatively acute pain Lumbar intersegmental hypomobility Local Pain Low FABQ Score
Lumbar Stabilization	< 40 years of age Episodic/recurring pain Aberrant trunk movements Lumbar intersegmental hypermobility
Specific Exercise	Directional preference (extension/flexion) Centralization with active movement tests
Traction	Radicular pain No directional preference Peripheralization with active movement

Fig. 10. Treatment-based classification: matching interventions to patient subgroups

Parallel to the challenge of providing high quality evidence supporting the effectiveness of conservative interventions for back pain, however, is the growing speculation about the role of invasive medical procedures in treating back pain. A recent study that investigated treatment outcomes of injured workers found that back patients that underwent spinal fusion had worse outcomes at 2 years compared to those receiving conservative care (Nguyen TH et al, 2011). These findings should be taken within the context of the considerable increase in both risk and cost for invasive treatments. Martin and Deyo have recently provided an interesting cost analysis of spine care in the US. They found that costs associated with spine care have risen substantially over the past decade and that there is no corresponding improvement in health status for people with spine problems (Martin BI, Deyo RA, 2008). The medical profession needs to develop evidence-based criteria for surgical intervention, in particular, by identifying the patient characteristics that predict success with surgical management. With ever increasing medical costs associated with

musculoskeletal care, the current focus should be on finding the most cost effective treatments.

There is growing support in the literature for multi-modal, conservative treatment of spine pain (UK BEAM Trail Team, 2004). With the pursuit of more meaningful ways to categorize back disorders combined with more pragmatic clinical trials – where the focus is on studying overall management strategies rather than specific interventions – there is likely to be higher quality evidence in support of conservative intervention for the majority of people with back disorders.

Conservative interventions considered here will include the most common treatments utilized in practice: (1) Joint Mobilization/Manipulation, (2) Exercise Interventions, (3) Patient Education, (4) Physical Modalities, (5) Cognitive-Behavioral Interventions, and (6) Traction. A description of each intervention and a summary of the evidence on effectiveness will follow.

4.1 Joint mobilization/manipulation

Joint mobilization can be defined as: "a manual therapy technique comprising a continuum of passive movements to the joints and/or related soft tissues that are applied at various speeds and amplitudes, **including a small amplitude, high velocity therapeutic movement**" (APTA, 1997). Joint mobilization encompasses manipulation since manipulation is generally considered specifically the small amplitude, high velocity movement imparted to a joint. Another way of expressing this is to distinguish between "Non-Thrust" and "Thrust" techniques, the former referring to mobilization and the latter manipulation.

Joint mobilization is utilized to treat primarily impairments of joint mobility, range of motion and pain. Many disciplines employ joint mobilization, including the professions of chiropractic, physical therapy, osteopathy and medicine. Manipulative therapy has been studied extensively and therefore a high volume of information can be found on the topic. There has been great interest in better understanding the mechanisms of action of manipulation, and in investigating the effectiveness of manipulation in treating back pain.

The mechanisms of action of spine manipulation can be broadly divided into (1) mechanical and (2) non-mechanical effects. Although there have been many theories relative to the mechanical effects of manipulation over the years, recent evidence based upon more direct measurement of spine movement supports the conclusion that thrust techniques result in multi-axial intervertebral displacements. These displacements increase in association with the applied force and occur at multiple segmental levels (Keller TS et al, 2003). This suggests that a manipulative force will impact an entire spinal region as opposed to a specific segmental level. However it is common practice to apply the force to the most restricted segmental level, determined by joint mobility assessment findings. Non-mechanical effects of manipulation are thought to be related to altered pain processing, both at the peripheral and central nervous system levels. A Hypoalgesic effect has been found to occur immediately following joint manipulation (Bialosky JE et al 2008). Also of interest is the somewhat paradoxical effect of manipulation to either increase motorneuron firing, when it is desirable to facilitate deep segmental muscle activity for example, or decrease motorneuron firing when heightened muscle activity is unwanted (Colloca CJ et al, 2006).

Numerous clinical trials have been conducted investigating the effectiveness of manipulation for treating back pain. In a systematic review of non-pharmacologic

interventions for back pain, Chou suggests that manipulation, along with cognitive behavioral therapy, exercise and interdisciplinary rehabilitation, is moderately effective in reducing pain and improving function in people with acute or chronic back pain (Chou R , Huffman LH, 2007). A recent systematic review, however, concludes that spinal manipulation has a small effect on pain and function compared to other interventions, and that this difference is not clinically significant (Rubinstein SM et al, 2007).

A clinical prediction rule has been established to better predict which patients respond favorably to manipulation (Flynn T A, 2002). Predictors of success with manipulation can be found in table 4. The positive Likelihood Ratio (LR) for the presence of 4 or more patient characteristics is 24, indicating that when patients meet the criteria, they have a very good chance of responding positively to manipulation. This rule has undergone validation studies, which support the contention that when patients are placed in subgroups based upon their presenting signs/symptoms and exam findings, treatment can be better targeted to their condition and outcomes will improve (Childs et al, 2004).

It is worthy to note that all national clinical guidelines for low back pain address spinal manipulation, although the recommendations vary. The majority of countries recommend manipulation for the treatment of acute low back pain (Bigos S et al, 1994).

Patient Characteristics
Duration of symptoms < 16 days
No symptoms distal to the knee
Hypomobility of at least one lumbar segmental level
At least one hip with >35 degrees of internal rotation
Fear-Avoidance Belief Questionnaire work score <19

Table 4. Clinical Prediction Rule for Spinal Manipulation

Spinal manipulation is a safe, conservative care option for the treatment of back pain. There are few contraindications, however: the presence of serious underling pathology, advanced osteoporosis, infection and cauda equina syndrome would be considered absolute contraindications to spinal manipulation. The mechanisms of action of manipulation are not fully understood, however currently it is believed that there are both mechanical and non-mechanical effects.

In general, manipulation has been found to have a small to moderate effect on decreasing pain and improving function in people with back pain. Most conservative care practitioners who perform spinal manipulation employ other types of interventions when treating back pain. Finally, clinical decision rules can be used to help identify which patients are likely to respond favorably to manipulation. Table 4 summarizes the patient characteristics that would predict success with a treatment program that includes spinal manipulation. The likelihood of the patient benefiting from manipulation increases in relation to the number of criteria met; if patients meet all or most criteria they have a high probability of improving with manipulation.

4.2 Exercise

Exercise interventions, along with patient education, are foundational in the conservative approach to treating musculoskeletal conditions of the spine. It is through exercise that body

tissues adapt to the stresses and demands of everyday living, and recover from injury. The majority of cases of back pain are mechanical in nature, and ultimately a functional approach will produce the greatest long-term benefit. Exercise also requires active participation on the part of the patient, and therefore helps to foster self-efficacy.

There are many types of exercise and exercise programs for the back. The terminology used to describe these types of exercise can be confusing, and there is overlap in their descriptors. Examples of exercise types include: strengthening, flexibility, endurance (aerobic), motor control, stabilization, corrective, posture retraining, and functional. It is important in analyzing research on the effectiveness of exercise to understand what type of exercise was employed in the study because exercise is not a single entity. Ideally, exercise is prescribed and specifically targeted to the patient's movement impairments. For example, there are a subset of people with back pain who may not demonstrate strength deficits, however they demonstrate faulty patterns of muscle recruitment in the performance of functional tasks. For these individuals, motor control exercises – which emphasize the correct execution of the movement – will best address the patient problem.

In addition to specific categories of exercise, several exercise programs exist which are directed at treating low back pain. For example, William's flexion exercises were developed in the 1930's and consist of a series of exercises designed to improve the strength and flexibility of the trunk and pelvic girdle. These exercises favor flexion-based spinal movements. Later, The McKenzie approach to treating back pain was developed and the "extension principle" was established (McKenzie RA, 1981). This principle is in turn based upon the general concept of *directional preference*, whereby the prescription of exercise is dependant upon the patient's symptomatic response with specific trunk movements. The McKenzie approach is inclusive of the diagnostic procedures used to determine the type of mechanical problem causing the patient's symptoms. Interpretation of the many clinical trials conducted relative to the efficacy of the McKenzie system (Machedo LAC, 2006). Other more general exercise programs, those designed for the general population, have been incorporated into conservative management strategies; examples of these programs include yoga (Chou R, 2007) and Pilates.

There have been numerous clinical trials investigating the effectiveness of exercise in the treatment of back pain. A randomized control trial involving patients who had undergone microdiscectomy compared the effectiveness of lumbar stabilization exercise to general exercise and to no exercise. The lumbar stabilization subgroup demonstrated the most significant improvement in pain and function (Yilmaz A et al, 2003). Koumantakis also found that lumbar stabilization was effective in decreasing pain and improving function in people with non-specific low back pain (Koumantakis GA, 2005). In another systematic review, Ferreira found that spine stabilization exercise has a modest benefit for people with spine pain. Generally, outcomes of treatment are better with spine stabilization compared to no treatment, "usual care", and patient education. Further, spine stabilization is more effective in treating chronic pain than acute pain, although it does help prevent recidivism after acute pain episodes (Ferreira PH, 2006). In a systematic review of clinical trials that involved subjects with various stages of back pain, acute, subacute and chronic, Hayden found exercise to be effective in reducing pain in people with chronic pain . A particular approach to exercise, graded activity, was found to result in fewer absences from work in people with subacute pain. For the acute population, exercise was as effective as other conservative interventions in treating back pain (Hayden JA et al, 2005).

A clinical prediction rule has been developed to help identify back pain patients who are likely to respond favorably to spine stabilization exercise (Hicks GE et al, 2005). This clinical decision-making tool can be found in table 5. Relatively younger patients that demonstrate aberrant movements during active movement testing, who have a SLR of at least 91 degrees and who test positive on the prone instability test are more likely to benefit from spine stabilization exercise.

Patient Characteristics
Age < 40 years
Positive Prone Instability Test
Aberrant movement observed
Straight Leg Raise > 91 degrees

Table 5. Clinical Prediction Rule for Spine Stabilization Exercise

It appears that there is more support in the literature for exercise interventions in the chronic versus acute back pain population, however as the research community refines methodology in studying treatment for acute pain, there is promise that exercise will gain support in certain subgroups of patients. For example, there is evidence that on active movement testing, when patients demonstrate decreased symptoms with select trunk movements, prescribing exercise that is consistent with the directional preference improves outcomes (Long A et al, 2004).

Of all interventions for back pain, exercise is the one most directly oriented to improving the structural integrity of the spine. For many people with back pain, not only can skilled movements help to control pain, but most importantly if performed regularly, they will maintain function and prevent re-occurrence.

4.3 Patient education

Educational interventions have always been an integral part of the conservative approach to treating musculoskeletal conditions. Patient education for back patients should address, among other things, the importance of maintaining an active life and avoidance of bed rest, activity modification, and prevention. There is evidence that empowering patients with knowledge of their condition and fostering a sense of self-efficacy improves health outcomes. It is especially important in the acute phase to emphasize the need to stay active (Liddle SD, 2007).

When addressing patient education, it is important to distinguish between acute injury and chronic pain. In acute injury states, patients should be instructed to control forces on the spine as a first measure. This may mean a short period of rest. Then the patient can begin an *active rest* phase, where they modify activities as needed to control pain but stay active and move throughout the day. Following this phase, they can gradually return to normal activity.

For people with chronic or chronic recurring back pain, it is important for the health care practitioner to evaluate the patent from a pain management perspective. This may include the utilization of scales to assess pain response, such as the *Fear-Avoidance Belief Questionnaire* and the *McGill Pain Questionnaire.* Elevated fear- avoidance beliefs have been associated with poorer health outcomes for musculoskeletal conditions, so it is important to include strategies to address these beliefs (Nicholas MK, George SZ, 2011).

Individual education appears to be most effective, although it is not clear what mode of education is best (Engers AJ, 2008). In a large prospective controlled trial, patients that were given an educational pamphlet in a medical care setting demonstrated decrease pain and improved satisfaction with care compared to patients that did not receive the educational intervention (Coudeyre E et al, 2007). A simple back booklet has been developed that de-emphasizes back pain as a medical problem and promotes self-efficacy. When tested in a randomized controlled trial, investigators found that for back pain patients with elevated fear-avoidance beliefs, there was a significant improvement in self-report disability scores compared to a control group who were given a more traditional educational intervention (Burton AK et al, 1999).

Patient Education for Back Pain
Pain mechanisms & pain control
Advice on staying active/Avoidance of bed rest
Emphasis on back pain as a common human experience
Risk factors for chronic pain
Activity modification/ Joint protection
Promote self-efficacy
Role of anxiety and stress

Table 6. Components of patient education for people with back pain

Patient education should be part of a comprehensive program of care for people with back pain. This needs to be considered when analyzing the research on patient education. As with other conservative interventions, the impact of patient education on pain and function is small to moderate. However, the costs associated with patient education are relatively low and therefore worth the time investment for the patient and health care provider.

4.4 Physical modalities

The role of physical agents in the treatment of low back pain is primarily for pain control and to aid in the healing response in the presence of acute injury. The most common physical modalities are: heat, cold, ultrasound and electrotherapy (including TENS). Although many clinical guidelines for low back pain do not recommend passive therapies, this is generally due to the small effect size of individual physical modalities on improving outcomes for people with back pain (Bigos S et al, 1994). This is especially true for chronic pain. In acute pain, the use of heat has relatively stronger support than the other modalities (Chou R, 2007). In contemporary practice, modalities are used in conjunction with active therapies. When patients present with acute back pain that impacts their quality of life and interferes with their ability to function, early pain control can speed recovery. There is evidence that the inclusion of physical agents to standard treatment approaches has added benefit and improves treatment outcomes (Hurwitz EL et al, 2002).

4.5 Cognitive behavioral interventions

Cognitive behavioral therapy has long been used in the mental health arena to treat a variety of psychological conditions such as anxiety disorders and depression. This psychotherapeutic approach is structured, requires a step-by-step progression, and is time-intensive. The cognitive-behavioral approach has also been found to benefit people with back pain. Cognitive-behavioral strategies have been applied especially to the chronic pain

population in recognition of the strong role that patient's beliefs, thought processes and behaviors have on their experience of back pain. A patient's cognition interacts with their movement system and can influence the level of disability and the intensity of the pain experience (Nicholas MK, George SZ, 2011). The physical therapist is in a good position to help modify patient's belief systems to enhance functional recovery due to the relatively long relationship physical therapists develop with their patients.

A list of common strategies used in conservative management of musculoskeletal condition can be found in table 7.

Pain mechanisms & pain control
Advice on staying active/Avoidance of bed rest
Emphasis on back pain as a common human experience
Risk factors for chronic pain
Activity modification/ Joint protection
Promote self-efficacy
Role of anxiety and stress

Table 7. Cognitive-behavioral strategies utilized in the treatment of back pain

Cognitive behavioral interventions have been found to be effective in decreasing pain and improving function in patients with low back pain - either alone or in combination with active exercise. (Smeets RJ, 2006). In a systematic review of behavioral interventions for chronic low back pain, the authors found moderate-level evidence in support of behavioral interventions for short-term pain control (Henschke N et al, 2011).

It is likely that cognitive-behavioral interventions will become more integrated into conservative back pain management as knowledge of the role of psychosocial factors in the pain experience increases. Identification of yellow flags in back pain patients helps the healthcare provider select patients most likely to benefit from a cognitive behavioral approach. Likewise, recognition of yellow flags in the acute pain population has the potential to prevent future episodes of back pain.

4.6 Traction

There is almost no treatment for back pain that can claim greater longevity than traction. However, despite this long history and the many innovative ways that have been developed to apply traction forces to the spine, there is little evidence to support its use in practice. A systematic review based upon an analysis of 25 randomized controlled trials involving traction concludes: "the results of the available studies involving mixed groups of acute, sub-acute and chronic patients with LBP with and without sciatica were quite consistent, indicating that continuous or intermittent traction as a single treatment for LBP is not likely effective for this group" (Clarke JA et al, 2010).

There is some evidence that a subgroup of patients, those that experience leg pain, signs of nerve root compression and either perpheralization of symptoms with trunk extension movements or display a positive well leg raise have better outcomes with traction. In addition, a clinical prediction rule has been developed that can help identify patients that are more likely to respond favorably to tractions: (1) FABQ score < 21, (2) absence of neurological signs, (3) age > 30 years, and (4) does not perform manual labor (Cai C et al, 2009).

5. Conclusion

The conservative approach to treating back pain encompasses all elements of patient management from the initial examination, through the diagnostic process and finally to the prescription of the most appropriate interventions. It is based upon principles that are now well supported in the literature, including selection of the least invasive treatments that can be supported by the current scientific evidence, the orientation toward helping patients help themselves, and utilizing an active program of care. These principles reflect a biopsychosocial model of healthcare, where the experience of pain is viewed as a multi-faceted phenomenon. The best hope for reversing the trends toward ever more costly care for back pain is to focus treatment on the underlying factors that contribute to it, and to encourage people to take responsibility for their health.

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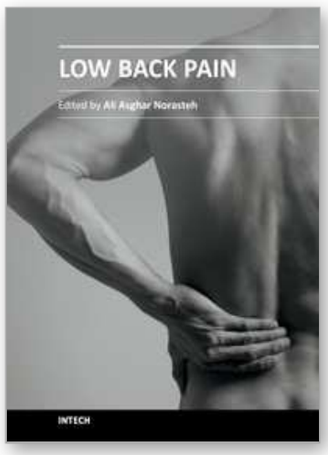

Low Back Pain

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This book includes two sections. Section one is about basic science, epidemiology, risk factors and evaluation, section two is about clinical science especially different approach in exercise therapy. I envisage that this book will provide helpful information and guidance for all those practitioners involved with managing people with back pain-physiotherapists, osteopaths, chiropractors and doctors of orthopedics, rheumatology, rehabilitation and manual medicine. Likewise for students of movement and those who are involved in re-educating movement-exercise physiologists, Pilates and yoga teachers etc.

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